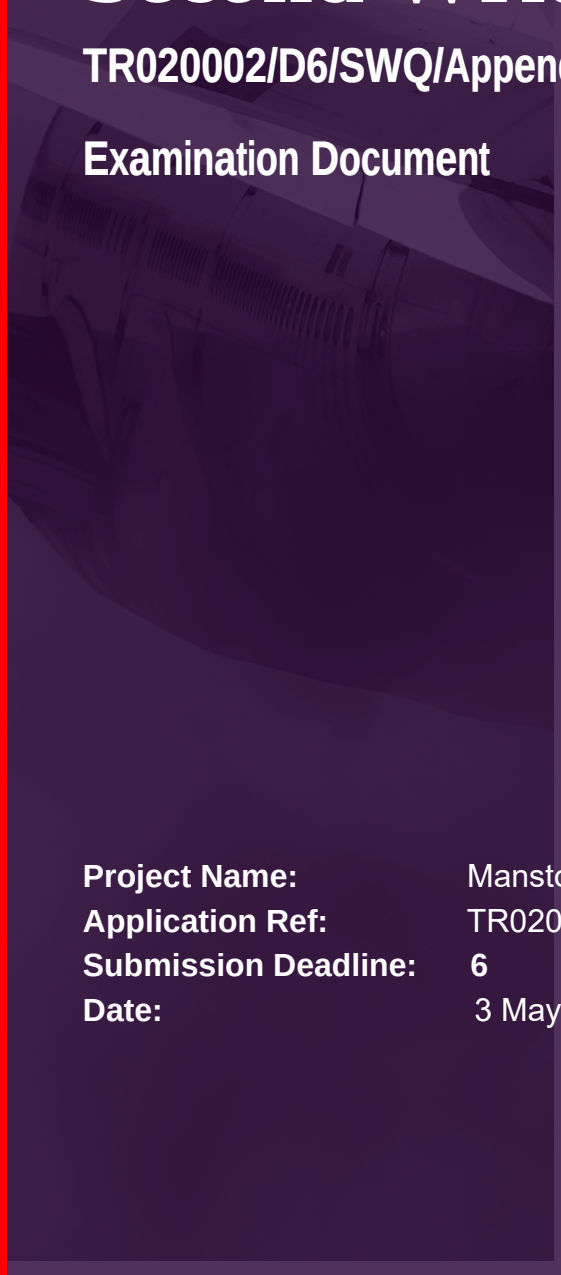
RiverOak Strategic Partners

Appendices to Answers to Second Written Questions

TR020002/D6/SWQ/Appendices

Examination Document



Project Name:	Manston Airport Development Consent Order
Application Ref:	TR020002
Submission Deadline:	**6**
Date:	3 May 2019

Manston Airport Development Consent Order

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The Planning Inspectorate

Independent Examination of the Thanet Local Plan

Examination Hearing Programme – Final

Matthew Birkinshaw BA(Hons) Msc MRTPI

Victoria Lucas LLB MCD MRTPI

Inspectors appointed by the Secretary of State

Date: 28 March 2019

Hearing Day 1: Tuesday 2 April (Week 1)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 1 - Compliance with the Act and Regulations, the Habitats Regulations and Strategic Flood Risk Assessment

Morning – 10:00

1) Introduction and Inspectors' Opening Announcements
2) Opening statement on behalf of Thanet District Council
3) Vision for Thanet and Plan Objectives
4) Matter 1 Issues 1-4 – Duty to Cooperate, Public Consultation, Local Development Scheme and Sustainability Appraisal

Participants

- Thanet District Council
- Dover District Council
- Minster Parish Council
- RPS on behalf of River Oak
- Barton Willmore on behalf of Ptarmigan Land
- Courtley Planning Consultants on behalf of Ed Spanton Farms
- Kenneth Wraight
- Michael Holden
- Craig Solly

Afternoon – 14:00

5) Matter 1 Issues 1-4 – Duty to Cooperate, Public Consultation, Local Development Scheme and Sustainability Appraisal continued…
6) Matter 1 Issues 5-7– Habitats Regulations, Strategic Flood Risk Assessment and Public Sector Equality Duty

Participants

- Thanet District Council
- Kent County Council
- Natural England
- Broadstairs and St. Peter's Town Council
- Kenneth Wraight
- Craig Solly

Hearing Day 2: Wednesday 3 April (Week 1)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matters 2 and 3– Objectively Assessed Needand the Housing Requirement (Policy SP11) and Affordable Housing Need (Policy SP20)

Morning – 10:00

1) Matter 2 Issues 1-6–Housing Market Area, Population and Household Projections, London Migration, Market Signals, Housing Trajectory and Housing Requirement

Afternoon – 14:00

2) Matter 2 Issues 1-6 – continued…

3) Matter 3 Issues 1-3 – Definition of Affordable Housing, Need and Viability

Participants

- Thanet District Council
- Minster Parish Council
- Westgate Neighbourhood Planning Group
- HBF
- CPRE
- Savills on behalf of St. John's College
- RPS on behalf of River Oak
- GVA on behalf of Stone Hill Park Ltd
- Barton Willmore on behalf of Ptarmigan Land
- RPS on behalf of China Gateway International Ltd
- Gillings Planning on behalf of Millwood Designer Homes Ltd
- Jane Scott on behalf of Finn's
- Montagu Evans LLP on behalf of Quinn Estates
- Courtney Planning on behalf of Ed Spanton Farms
- David Green
- Kenneth Wraight
- Michael Holden
- Margate Civic Society
- Lee Turner
- Ramsgate Town Council
- Craig Solly
- John Repsch
- Councillor Bambridge
- Councillor Messenger

Hearing Day 3: Thursday 4 April (Week 1)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter4 – Spatial Strategy (Policies SP12, SP21, HO1, HO10, HO11 and HO18)

Morning – 10:00

1) Matter 4 Issues 1–5 – Settlement Hierarchy and Housing Distribution, Housing Development, Cliftonville West and Margate Central, Housing at Rural Settlements and Development in the Countryside

Afternoon – 14.00

2) Matter 4 Issues 1–5 – continued…

Participants

- Thanet District Council
- HBF
- CPRE
- Savills on behalf of St. John's College
- RPS on behalf of River Oak
- RPS on behalf of China Gateway International Ltd
- GVA on behalf of Stone Hill Park Ltd
- Courtley Planning on behalf of Baxter Farms and Ed Spanton Estates
- Courtley Planning on behalf of Ed Spanton Estates
- Barton Willmore on behalf of Ptarmigan Land
- Gillings Planning on behalf of Millwood Designer Homes Ltd
- Nexus Planning on behalf of Margate Estates
- Montagu Evans LLP on behalf of Quinn Estates
- Lee Evans Planning on behalf of Friends Growers
- David Green
- Craig Solly
- John Barar
- Julie Nunn
- John Repsch
- Councillor Bambridge
- Councillor Messenger

Note to Participants – Hearing Day 3 relates to the overall spatial strategy of the Plan. Participants who have made representations regarding the distribution of new developmentshould attend this session.

Hearing Day 4: Tuesday 9 April (Week 2)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 5- Strategic Sites (Policies SP13-SP18 and HO2)

Morning – 09:30

1) Matter 5Issues 1-2 – Methodology and Manston Green

Participants

- Thanet District Council
- Kent County Council
- CPRE
- Westgate Town Council
- Westgate Neighbourhood Planning Group
- GVA on behalf of Stone Hill Park Ltd
- Gillings Planning on behalf of Millwood Designer Homes Ltd
- Courtley Planning on behalf of Ed Spanton Farms
- Barton Willmore on behalf of Ptarmigan Land
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- Kenneth Wraight
- Ramsgate Town Council
- Craig Solly
- Julie Nunn
- Simon Lane
- Jacqueline Brown

Afternoon – 14:00

2) Matter 5 Issues 3-4 - Birchington and Westwood

Participants

- Thanet District Council
- Kent County Council
- GVA on behalf of Stone Hill Park Ltd
- Barton Willmore on behalf of Ptarmigan Land
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- CPRE
- Courtley Planning on behalf of Ed Spanton Farms
- Savills on behalf of St. John's College
- Kenneth Wraight
- Craig Solly
- John Repsch

Note to Participants – Hearing Days 4, 5 and 6 will consider housing allocations under Policies SP13-SP18 and HO2-HO17. The morning session on Hearing Day 4 will cover the methodology used to allocate the sites in the Plan. Individual sites will then be discussed in the sessions that follow.

However, participants should be aware that it is not part of the Inspectors' role to examine the soundness of 'omission' sites, and, subject to the legal right to be heard (please refer to the Examination Guidance Note), such sites will not normally be discussed in detail at the hearing sessions.

Hearing Day 5: Wednesday 10 April (Week 2)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 5 - Strategic Sites continued… (Policies SP13-SP18 and HO2)

Morning – 10:00

1) Matter 5 Issue 5 - Westgate-on-Sea

Participants

- Thanet District Council
- Kent County Council
- Westgate Neighbourhood Planning Group
- Westgate Town Council
- GVA on behalf of Stone Hill Park Ltd
- Gillings Planning on behalf of Millwood Designer Homes Ltd
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- Barton Willmore on behalf of Ptarmigan Land
- Savills on behalf of St John's College
- Julie Nunn
- Kenneth Wraight
- Susan Bradley
- Simon Lane
- Jacqueline Brown
- Craig Solly
- Councillor Messenger
- Councillor Bambridge

Afternoon – 14:00

2) Matter 5Issues 6-8 – Land fronting Nash and Haine Roads, Land at Manston Court Road/Haine Road and Land north and south of Shottendane Road

Participants

- Thanet District Council
- Kent County Council
- GVA on behalf of Stone Hill Park Ltd
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- JIG Planning and Development Ltd on behalf of CJ Martin
- Montagu Evans LLP on behalf of Greenacre (Thanet) Ltd
- Craig Solly

Hearing Day 6: Thursday 11 April (Week 2)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matters 6 and 7 – Non-Strategic Housing Allocations (Policies HO3-HO9) and Sites Allocated for Residential Development at Rural Settlements (Policies HO12-HO17)

Morning – 10.00

1) Matter 6 Issues 1-6–Land on west side of Old Haine Road, Land fronting Nash Road and Manston Road, Land south of Brooke Avenue, Land at Haine Road and Spratling Street, Land south of Canterbury Road East and Land at Melbourne Avenue

Participants

- Thanet District Council
- Kent County Council
- Southern Water
- Montagu Evans LLP on behalf of Greenacre (Thanet) Ltd

Afternoon– 14:00

2) Matter 7 Issues 1-7 – Land at Tothill Street, Minster, Land at Manor Road, Nicholas St. Wade, Land at Walter's Hall Farm, Monkton, Land south of A253, Cliffsend, Land north of Cottington Road, Cliffsend, Land south of Cottington Road, Cliffsend and 'Additional Information'

Participants

- Thanet District Council
- Kent County Council
- Minster Parish Council
- Savills on behalf of St. John's College

Hearing Day 7: Friday 12 April (Week 2)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 8 – Housing Land Supply

Morning – 10:00

1) Matter 8 Issues 1-6 – Five-Year Housing Land Requirement, Supply Methodology, Components of Supply, Windfall Allowance, Future Supply and Flexibility

Afternoon – 14:00

2) Matter 8 Issues 1-6 continued…

Participants

- Thanet District Council
- CPRE
- HBF
- The Ramsgate Society
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- RPS on behalf of River Oak
- Montagu Evans LLP on behalf of Greenacre (Thanet) Ltd
- GVA on behalf of Stone Hill Park Ltd
- Savills on behalf of St. John's College
- Barton Willmore on behalf of Ptarmigan Land
- Jane Scott on behalf of Finn's
- Gilling's Planning on behalf of Millwood Homes

Hearing Day 8: Tuesday 16 April (Week 3)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 9 – Meeting Housing Needs (Policies SP19-SP20, QD04-QD05 and HO20-HD26)

Morning – 10:00

1) Matter 9 Issues 1-10– Type and Size of Dwellings, Provision of Affordable Housing, Housing Standards, Accommodation for Gypsy and Travelling Communities, Care and Supported Housing, Non Self-Contained Residential Accommodation, Residential Use of Empty Property, Retention of Existing Housing Stock, Ancillary Accommodation for a Family Member and Fostering Homes

Afternoon – 14:00

2) Matter 9 Issues 1-10 continued…

Participants

- Thanet District Council
- Kent County Council
- HBF
- The Ramsgate Society
- Craig Solly

Hearing Day 9: Wednesday 17 April (Week 3)

Ruby Room, St. Augustine's, Canterbury Road, Westgate-on-Sea, CT8 8NL

Matter 10 – Economic Development (Policies SP02-SP04 and E01-E03)

Morning – 09:30

1) Matter 10 Issues 1-5 – Economic Growth, Land Allocated for Economic Development, Retention of Existing Employment Sites, Home Working and Digital Infrastructure

Afternoon – 14:00

2) Matter 10 Issues 5-7 – Manston Business Park and Manston Airport

Participants

- Thanet District Council
- Kent County Council
- The Ramsgate Society
- Minster Parish Council
- RPS on behalf of River Oak
- RPS on behalf of Tesco
- RPS on behalf of China Gateway International Ltd
- GVA on behalf of Stone Hill Park Ltd
- Nexus Planning on behalf of Margate Estates
- David Green
- H Frencken
- Jan Watson
- Jason Jones-Hall
- Julie Nunn
- Kenneth Wraight
- Samara Jones-Hall
- Christabel Bradley
- Ramsgate Town Council
- Craig Solly
- David Stevens
- John Repsch
- Margate Civic Society
- Dr Webber on behalf of Save Manston Airport

Note to Participants – Hearing Day 9 will include discussion on Policy SP04 – Manston Business Park, and the proposed supporting text which refers to Manston Airport. Representors wishing to make comments on strategic matters concerning the spatial strategy and distribution of housing should also attend Hearing Day 3.

Hearing Day 10: Thursday 18 April (Week 3)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

RESERVE DAY

Morning – 10.00

1) IF REQUIRED

Afternoon – 14:00

2) IF REQUIRED

Hearing Day 11: Tuesday 21 May (Week 4)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

Matters11 and 12 – Tourism (Policies E07-E14) and Town and District Centres (Policies SP06-SP10 and Policies E04-E06)

Morning – 10:00

1) Matter 11 Issues 1-6 – Serviced Tourism Accommodation, Self-Catering Accommodation, Protecting Existing Tourist Accommodation, Beaches, Language Schools and Quex Park

Participants

- Thanet District Council
- The Environment Agency
- The Ramsgate Society
- Nexus Planning on behalf of Margate Estates
- Samara Jones-Hall
- John Repsch

Afternoon – 14:00

2) Matter 12 Issues 1-8 – Thanet's Town Centres, Westwood, Margate, Ramsgate, Broadstairs, Primary and Secondary Frontages, Sequential and Impact Test and District and Local Centres

Participants

- Thanet District Council
- WYG on behalf of Ravenside Investments (Land Securities)
- Broadstairs and St. Peter's Town Council
- Burnett Planning on behalf of CD10 Properties Ltd
- Deal & Walmer Chamber of Trade
- RPS on behalf of Tesco
- Goddard Planning on behalf of Citi-Nests Ltd
- Nexus Planning on behalf of Margate Estates
- Adams Hendry Consulting Ltd on behalf of the RNLI
- Jason Jones-Hall
- Samara Jones-Hall
- Kenneth Wraight
- John Repsch

Hearing Day 12: Wednesday 22 May (Week 4)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

Matters13and 14- Transport (Policies SP41-SP47 and TP01-TP10) and Community Infrastructure (Policies and SP01, SP36-40 and CM01-CM04)

Morning – 09:30

1) Matter 13 Issues 1-6 – Safe and Sustainable Travel, New Railway Station, Strategic Road Network, Transport Assessments and Travel Plans, Walking, Cycling and Public Transport and Parking Provision and Traffic Management

Participants

- Thanet District Council
- Kent County Council
- Broadstairs and St. Peter's Town Council
- Barton Willmore on behalf of Ptarmigan Land
- Gillings Planning on behalf of Millwood Designer Homes Ltd
- Contour Planning Services Ltd on behalf of Pavilion Property Trustees
- Nexus Planning on behalf of Margate Estates
- RPS on behalf of Tesco
- Savills on behalf of St. John's College
- Courtley Planning on behalf of Ed Spanton Farms
- Jan Watson
- Ramsgate Town Council
- Jason Jones-Hall
- Samara Jones-Hall

Afternoon – 14:00

2) Matter 14 Issues 1-9 – Implementation, Community Infrastructure, Provision of New Community Facilities, Protection of Existing Community Facilities, Expansion of Margate and Minster Cemeteries

Participants

- Thanet District Council
- Savills on behalf of St. John's College
- Samara Jones-Hall
- John Barar
- Lee Evans on behalf of East Kent NHS Trust

Hearing Day 13: Thursday 23 May (Week 4)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

Matter 15 –Green Infrastructure and Open Space(Policies SP22-SP24, SP29-SP32 and GI04-GI07)

Morning – 10:00

1) Matter 15 Issues 1-6–Landscape Character, Landscaping and Green Infrastructure, Protection of Open Space and Playing Fields, Local Green Space, Open Space, Parks, Gardens, Recreation Grounds and Allotments and Jackey Bakers

Afternoon – 14:00

2) Matter 15 Issues 1-6 continued…

Participants

- Thanet District Council
- The Environment Agency
- Broadstairs and St. Peter's Town Council
- Goddard Planning on behalf of The Mockett Trust Ltd
- Lee Evans Planning
- Kenneth Wraight
- Samara Jones-Hall
- John Barar
- John Repsch

Hearing Day 14: Wednesday 29 May (Week 5)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

Matters 16and 17 – Design, Heritage and the Rural Economy (Policies QD01-QD03, QD06-QD07, SP33-SP34, HE01-HE05, HO19 and E15-E19) and Biodiversity and Geodiversity (Policies SP25-SP28 and GI01-GI03)

Morning – 10:00

1) Matter 16 Issues 1-3–Design, Conservation of the Historic Environment and the Rural Economy

Participants

- Thanet District Council
- Kent County Council
- The Environment Agency
- Margate Civic Society
- Samara Jones-Hall
- John Barar
- John Repsch
- Jason Jones Hall

Afternoon – 14:00

2) Matter 17 Issue 1 - Biodiversity and Geodiversity

Participants

- Thanet District Council
- The Environment Agency
- Natural England
- Kenneth Wraight
- John Barar
- John Repsch

Note to Participants – Matters relating to the protection of International and European designated sites will also be discussed on Hearing Day 1 under the Habitats Regulations Assessment.

Hearing Day 15: Thursday 30 May (Week 5)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

Matter 18 – The Environment and Climate Change (Policies SP35, CC01-CC07 and SE01-SE08)

Morning – 09:30

1) Matter 18 Issues 1-4 – Climate Change, Flooding, Renewable Energy and Contamination and Pollution

Participants

- Thanet District Council
- Kent County Council
- The Environment Agency
- Westgate Neighbourhood Planning Group
- Samara Jones-Hall
- John Barar

Afternoon – 14:00

2) Closing Statement on behalf of the Council

Hearing Day 16: Friday 31 May (Week 5)

Austen Room, Thanet District Council, Cecil Street, Margate, CT9 1XZ

RESERVE DAY

Morning – 10.00

1) IF REQUIRED

Afternoon – 14:00

2) IF REQUIRED

The Planning Inspectorate

Independent Examination of the Thanet Local Plan

Inspectors' Matters, Issues and Questions for Examination

Matthew Birkinshaw BA(Hons) Msc MRTPI

Victoria Lucas LLB MCD MRTPI

Inspectors appointed by the Secretary of State

Date: 15 February 2019, updated 4 March 2019

Introduction

Prior to the forthcoming Hearing sessions responses are invited from participants on the following Matters, Issues and Questions ('MIQs') for Examination. The MIQs are based on the Main Issues identified by the Council, the Inspectors' Initial Questions[1] and other relevant issues raised by representors.

Further information about the Examination, Hearings and format of written statements is provided in the accompanying Guidance Note, which should be read alongside the MIQs.

Update – 4 March 2019

1) Following comments by representors the MIQs have been updated. Six additional questions are shown in ***bold italics*** as follows:

- Matter 10, Issue 1, Question 8
- Matter 12, Issue 3, Question 4;
- Matter 13, Issue 3, Question 6;
- Matter 13. Issue, 6, Question 7;
- Matter 14, Issue 2, Question 3; and
- Matter 18, Issue 2, Question 5.

[1] Document L-001

Matter 1 – Compliance with the Act and Regulations, the Habitats Regulations and Strategic Flood Risk Assessment

Issue 1 – Duty to Cooperate

Q1. What strategic, cross-border matters have arisen through the preparation of the Plan and what cooperation took place to resolve them? Has the cooperation between neighbouring authorities been constructive and proactive?

Q2. What specific actions were identified as a result of dialogue with neighbouring authorities? What were the outcomes and how did they shape the preparation of the Plan?

Q3. Have any strategic, cross-border matters arisen through the preparation of the Plan which the draft policies do not seek to address at this stage? If so, what are the reasons for taking this approach?

Q4. Paragraphs 9.6-9.7 of the *Draft Thanet Local Plan Duty to Cooperate Statement* confirm that discussions have been held with Dover District Council regarding the extent of the housing market area referred to in the Council's *Strategic Housing Market Assessment* ('SHMA') but that no final agreement has yet been reached. What is the current status regarding ongoing discussions with Dover District Council on this issue? What were the outcomes of dialogue with other Kent authorities on the approach to housing market areas?

Q5. How has the effect of additional growth on the highways network across Kent been considered during the preparation of the Plan? What cooperation has taken place with neighbouring authorities and Kent County Council to consider these impacts? Has this led to any specific actions or policy outcomes?

Q6. How were issues surrounding economic growth, employment land requirements and retail capacity considered with neighbouring authorities? What actions were identified as necessary, and what were the outcomes?

Q7. Has the Duty to Cooperate under sections 22(5)(c) and 33A of the 2004 Act and Regulation 4 of the 2012 Regulations been complied with, having regard to advice contained in the National Planning Policy Framework (the 'Framework') and the National Planning Practice Guidance (the 'PPG')?[2]

Issue 2 – Public Consultation

Q1. Has public consultation been carried out in accordance with the Council's *Statement of Community Involvement*, the Framework, the PPG and the requirements of the 2004 Act and 2012 Regulations?

Q2. Were adequate opportunities made available for participants to access and make comments on the Plan, and other relevant documents, in different locations?

Q3. Were adequate opportunities made available for participants to comment on the Plan in paper, and electronic form?

[2] Inspectors' Note – Please refer to the Examination Guidance Note for commentary on the changes to national planning policy and guidance, and the implications for the examination of the Thanet Local Plan

Q4. Were representations adequately taken into account? Where is this set out?

Issue 3 – Local Development Scheme ('LDS')

Q1. Has the Plan been prepared in accordance with the LDS?

Q2. The Plan period runs from 2011 to 2031. Is this consistent with paragraph 157 of the Framework, which states that Local Plans should be drawn up over an appropriate timescale, preferably a 15-year time horizon?

Issue 4 – Sustainability Appraisal

Q1. Have the likely environmental, social and economic effects of the Plan been adequately assessed in the *Sustainability Appraisal – Environmental Report* ('SA')?

Q2. Does the SA test the Plan against all reasonable alternatives, such as different options for the scale and distribution of growth? Where is this set out?

Q3. Appendix G1 of the SA ('Justification of Preferred Options – Updated with further iterations of Policy') states that Option 9k (a new settlement) *"…would be unsustainable for the same reasons as freestanding countryside sites"*. Freestanding countryside sites were considered unsustainable due to their access to services, facilities and public transport connections. How does this correlate with paragraph 5.4 of the SA, which states that *"…sustainable implementation of a new settlement option could be achieved."*? Has the SA considered reasonable alternatives on a consistent basis?

Q4. How has the provision of a new settlement, as an alternative to the proposed growth strategy, been considered as part of the SA process?

Q5. In response to the Inspectors' Initial Questions the Council confirmed that the options of locating housing adjoining the urban area and adjoining villages was considered in Appendix G of the SA. However, Appendix G is taken from a report to Cabinet, dated 11 December 2014, and appears to be based on a different housing requirement to the one found in the Local Plan? Please can the Council point to where an assessment of reasonable alternatives has been carried out having regard to the housing requirement in draft Policy SP11?

Q6. Does the assessment of policies in the SA take into account the findings of the People Over Wind & Sweetman vs. Coillte Teoranta judgement? In particular, whether policies are likely to have an adverse effect on site integrity?

Q7. What is the justification for concluding that proposals for residential development and solar parks on greenfield sites will have a positive effect on the objective of conserving and enhancing biodiversity?

Q8. How has the SA considered infrastructure proposed in the Infrastructure Delivery Plan ('IDP'), which at this stage is only in draft form and may be subject to change?

Issue 5 - Habitats Regulations

Sandwich Bay Special Area of Conservation ('SAC')

Q1. How have the potential impacts of recreational disturbance (arising from policies and allocations in the Plan) on the Sandwich Bay SAC been considered?

Q2. What specific measures does the Plan include to ensure that its policies are not likely to give rise to adverse effects, either alone or in-combination with other plans and projects?

Q3. How have the potential impacts of atmospheric pollution (arising from policies and allocations in the Plan) on the Sandwich Bay SAC been considered?

Q4. How are traffic flows predicted to change as a result of the development proposed in the Plan on A or B roads within 200m of any emission-sensitive features of the SAC, both within and outside of Thanet District?

Q5. Paragraph 5.2 of the *Thanet Local Plan Habitats Regulations Assessment* ('HRA') states that, amongst others, Policy SP26 will mitigate against the in-combination effects of new development. However, Policy SP26 refers specifically to the Thanet Coast SPA and Ramsar Site. How will Policy SP26 benefit the dune features of the SAC?

Thanet Coast and Sandwich Bay Special Protection Area ('SPA') and Ramsar Site

Q6. How have the potential impacts of recreational disturbance (arising from policies and allocations in the Plan) on the Thanet Coast and Sandwich Bay SPA and Ramsar Site been considered?

Q7. How has the effect of development on functional habitats in close proximity to, and associated with the SPA, been considered?

Q8. What specific measures does the Plan include to ensure that its policies are not likely to give rise to adverse effects, either alone or in-combination with other plans and projects?

Q9. What is the justification for requiring proposals of 10 dwellings or more to include an assessment of the site's functionality as a roosting or feeding resource for the SPA, regardless of location? Is Policy SP12 necessary for all development proposals, including the re-use of previously developed land in urban areas?

Q10. What is the justification for requiring the assessment (referred to in Question 8 above) to include areas within 400m of the site's boundary?

Q11. What is the justification for requiring development proposals on land at Manston Court/Haine Road (Policy SP18) to include a survey of ground nesting bird habitats? How does this differ from other site allocations in the Plan?

Strategic Access Management and Monitoring

Q12. Does Policy SP26 (as referred to by Policy SP12) relate to all proposals for residential development, or just proposals for residential development on

allocated sites? Is this clear to decision-makers, developers and local communities?

Q13. What is the justification for requiring all proposals for residential development to contribute towards the Strategic Access Management and Monitoring Plan ('SAMM'), regardless of location?

Q14. What are the tariffs in Table 8 to Policy SP26 based on? Have they been considered as part of the viability evidence which supports the Plan?

Q15. Is Policy SP26 consistent with paragraph 204 of the Framework which states that planning obligations should only be sought where they are necessary to make the development acceptable in planning terms, directly related to the development and fairly and reasonably related in scale and kind?

Q16. How will Regulation 123 of the Community Infrastructure Levy Regulations ('CIL') (2010) apply where five or more separate planning applications provide funding towards the projects referred to in Policy SP26? Will Policy SP26 be effective in mitigating the in-combination effects of additional recreational pressure arising from new development in Thanet?

Q17. Has policy SP25 taken account of Dover District Council's *Thanet Coast SPA Mitigation Strategy (2012)* and ongoing visitor disturbance study at Pegwell Bay and Sandwich Bay? Are there any cross-boundary implications relevant to the policy?

Q18. Where relevant are the policies in the Plan consistent with the avoid, mitigate and compensate hierarchy in paragraph 118 of the Framework?

Issue 6 – Strategic Flood Risk Assessment ('SFRA')

Q1. Do any of the sites allocated for development in the Plan fall within Flood Zones 2 or 3? If so, are the allocations and policies consistent with paragraph 100 of the Framework which states that Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change?

Q2. How has the Council taken a sequential approach to identifying sites for new development?

Q3. What is the justification for requiring development proposals within 40m of a coastline or clifftop to demonstrate that it will not expose people or property to the risks of coastal erosion and flooding, or accelerate coastal erosion?

Q4. What affect (if any) has the Environment Agency's latest modelling for the North and East Kent Coast had on the allocations and policies in the Plan?

Issue 7 – Public Sector Equality Duty ('PSED')

Q1. In what way does the plan seek to ensure that due regard is had to the three aims expressed in s149 of the Equality Act 2010 in relation to those who have a relevant protected characteristic?

Matter 2 – Objectively Assessed Need and the Housing Requirement (Policy SP11)

Issue 1 – Housing Market Area ('HMA')

Q1. What is the justification for a Thanet HMA, rather than a wider 'East Kent' HMA?

Q2. What evidence supports the use of a HMA for Thanet, having particular regard to household migration and travel to work patterns? Is the degree of containment sufficient to justify this approach? Does it accord with national guidance in the PPG?

Q3. How will housing needs be met across the wider 'East Kent' HMA?

Issue 2 – Population and Household Projections

Q1. Table 12 in the *Updated Assessment of Objectively Assessed Housing Need* compares household growth in Thanet between 2011 and 2031. Using the 2012-based projections it states that there will be a growth of around 14,297 households, or 715 per year. Assuming a vacant and second home rate of 6.3%, 760 dwellings per annum ('dpa') would be needed to accommodate this level of growth (or **15,200** in total). By comparison, the 2014-based projections identify an increase of 15,397 households. Applying the same vacancy rate would equate to a need for 818 dpa (or **16,360** dwellings in total). What are the reasons for this increase?

Q2. How does this compare to the latest 2016-based household projections?

Q3. What is the justification for using a vacant and second home rate of 6.3%? What is this based on?

Q4. The SHMA Update includes a sensitivity analysis which considers migration trends over 10 and 14-year timeframes. How does this compare to the 2012 and 2014-based household projections? Are 10 and 14-year trends more likely to be representative of what will happen over the plan period than 5-year trends?

Q5. How have household formation rates changed in Thanet? Is there evidence to suggest that household formation has been supressed by affordability or constrained supply, especially amongst 25-34 and 35-44 age groups? Does the SHMA apply any adjustments to account for supressed household formation?

Q6. What is the justification for the 'rebased' scenario in the SHMA? Using the 2014-based projections it predicts an increase of 15,450 households over the plan period, equating to a need for **16,460** dwellings (or 821 dpa).

Issue 3 – London Migration

Q1. How has migration between London and Thanet varied prior to, during and after the latest recession? What does this demonstrate?

Q2. What are the reasons behind migration trends to and from London? What evidence is there to suggest that past-trends will continue over the plan period?

Q3. Taking into account answers to the questions above, what is the justification for applying an uplift to account for London migration?

Q4. Is the suggested uplift consistent with other development plans across the wider 'East Kent' HMA?

Issue 4 – Market Signals

Q1. The PPG[3] advises that household projections should be adjusted to reflect appropriate market signals, as well as other market indicators. How does the evidence demonstrate that Thanet is performing with regard to:

- Land prices;
- House prices;
- Rents;
- Affordability;
- Rates of development; and
- Overcrowding.

Q2. How has the position changed since preparation of the SHMA Update? Have factors such as affordability been improving or worsening?

Q3. Paragraph 2.15 of the SHMA Update states that a further upward adjustment is warranted to improve affordability and support younger households in forming. This has been done by returning household formation rates for those aged 25-34 back to 2001 levels over the period to 2025, which increases the overall housing need from 16,760 dwellings (838 dpa) to **17,140** dwellings (or 857 dpa). Is it appropriate to use adjustments to household formation rates as a mechanism for responding to worsening market signals?

Q4. What impact will this uplift have on affordability and is it appropriate? If not, what adjustments should be made to account for market signals and why?

Issue 5 - Housing Trajectory

Q1. What is the justification for the housing trajectory in Policy SP11? What is it based on and why does it propose a significantly higher housing target during the middle-to-end of the plan period?

Q2. Does the stepped trajectory reflect the type and size of sites proposed for new residential development in the Plan?

Issue 6 – Housing Requirement

Q1. Is the housing requirement justified and is it based on robust, up-to-date and available evidence? If not, what should the housing requirement be?

Q2. Policy SP11 states that provision is made for a 'total' of 17,140. Is this consistent with the evidence-base, or should the figure be referred to as a minimum?

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[3] Paragraph: 019 Reference ID: 2a-019-20140306

Matter 3 – Affordable Housing Need

Issue 1 – Definition of Affordable Housing

Q1. Does the Plan include a definition of affordable housing? If not, to be effective should one be included?

Issue 2 – Affordable Housing Need

Q1. What is the annual net need for affordable housing as defined by the SHMA? For clarity to decision-makers, developers and local communities should the need for affordable housing be clearly set out in the Plan?

Q2. Has the affordable housing need been correctly established, and is it based on up-to-date information?

Q3. How does it compare to the housing requirement?

Q4. What is the justification for requiring at least 30% affordable housing on qualifying sites? What is this based on, how was it calculated and what alternatives were considered?

Q5. Based on the requirements for qualifying developments to provide 30% affordable housing, how many affordable homes is the Plan expected to deliver?

Q6. How does this compare to the identified need?

Q7. How does this compare to previous performance? How many affordable homes have been provided as a percentage of total output over the past 5-10 years?

Q8. The PPG states that an increase to the total housing figures should be considered where it would help deliver the required number of affordable homes. Has an uplift to the housing requirement for this reason been considered? If so, where is this set out?

Issue 3 – Viability

Q1. The *Thanet District Council Local Plan and CIL Viability Assessment* indicates that for schemes on previously developed land, where development costs are typically higher than greenfield sites, the affordable housing target could be lowered to 20% (paragraph 3.12.3). With this in mind, what is the justification for a 30% target across all development types and locations? Is Policy SP20 justified?

Q2. How has the evidence-base considered the differences between bringing forward strategic and non-strategic sites? Does it justify a consistent approach to affordable housing across all sites, regardless of size?

Matter 4 – Spatial Strategy (Policies SP12, SP21, HO1, HO10, HO11 and HO18)

Issue 1 – Settlement Hierarchy and Housing Distribution

Q1. Does the Plan set out a hierarchy of settlements where new development will be directed towards? If so, is it clear to decision-makers, developers and local communities?

Q2. How have the main urban areas of Margate, Ramsgate, Broadstairs and Westwood been defined? Do they represent a single urban area where the majority of new development is concentrated?

Q3. Does the Plan seek to direct a certain percentage, or proportion of growth, to particular areas and/or settlements? If so, where is this set out and what is it based on?

Q4. How did the Council decide on the scale and level of growth attributed to Margate, Ramsgate, Broadstairs, Westwood and the Rural Settlements?

Q5. How did the Council consider the economic and other benefits of best and most versatile agricultural land in pursuing the growth options in the Plan?

Q6. Is the distribution of development consistent with the Framework's Core Planning Principles which, amongst other things, seek to actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable?

Q7. What alternative options were considered as part of the Plan's preparation and why were they discounted?

Q8. What is the rationale for pursuing growth on larger, strategic sites, rather than smaller site allocations to meet the housing requirement?

Q9. Is the spatial strategy justified? Does it represent the most appropriate strategy, when considered against the reasonable alternatives?

Issue 2 – Housing Development – Policies HO1 and SP12

Q1. What is the justification for requiring proposals on allocated housing sites to be consistent with the indicative phasing schedule in Appendix B? How will this be determined, and is it clear to decision-makers, developers and local communities what is expected of proposals for new development?

Q2. What is the justification for restricting proposals on non-allocated sites to only previously developed land? How would a decision-maker be expected to react to a proposal for residential development on a greenfield site within one of the main towns?

Q3. What is the justification for specifically referring to residential gardens under Policy HO1(3)? Does this apply to all residential gardens, regardless of location? Is this sufficiently clear to decision-makers, developers and local communities?

Q4. Is the final requirement of Policy HO1 consistent with the strategic site allocations, some of which seek to promote alternative uses as part of new mixed-use developments? Is the policy effective?

Q5. What is a housing implementation strategy referred to in paragraph 11.8 of the Plan? Is the purpose of this strategy clear? Who will be responsible for the strategy and what outcomes does it seek to achieve?

Q6. What is the justification for having separate criteria for housing developments over 10 units in Policy SP12?

Q7. Does the Plan provide sufficient support for self-build and custom housebuilding? Has a need been identified, and if so, how does the Plan seek to meet this need?

Q8. How will the Council ensure that developments make every reasonable effort to accommodate self-build needs as required by Policy SP12?

Q9. What is the justification for requiring a Statement of Social Impacts to be provided on developments of 50 or more dwellings? Is it clear to decision-makers, developers and local communities what is required?

Issue 3 – Cliftonville West and Margate Central – Policy HO10

Q1. What is the justification for requiring development proposals in Cliftonville West and Margate Central to increase the number of family homes?

Q2. Is it clear to decision-makers, developers and local communities what is required of proposals for new development? Is the policy effective?

Issue 4 – Housing at Rural Settlements – Policies HO11 and HO18

Q1. Policy HO11 permits housing development within *"the confines of the rural settlements…"*. Are the rural settlements defined in paragraph 11.11 of the Plan? Is this clear to decision-makers, developers and local communities?

Q2. What is the justification for development proposals in rural settlements to be compatible with the historic scale of growth of the settlement? How would this be determined? Is the policy effective?

Q3. For the purposes of Policy HO11(2) how will development *"more than minor in scale"* be determined? Is this sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

Q4. Is the text under Policy HO11 part of the policy, or supporting text? What is the justification for points (1) and (2)?

Q5. Is Policy HO11 consistent with paragraph 55 of the Framework? Will there be sufficient growth in the Rural Settlements to help support sustainable rural communities?

Q6. Is it clear to decision-makers, developers and local communities what settlements Policy HO18 applies to?

Q7. Is Policy HO18 consistent with paragraph 54 of the Framework which states that local planning authorities should consider whether allowing some market housing would facilitate the provision of significant additional affordable housing to meet local needs? Is the policy positively prepared and worded?

Q8. How often are the detailed parish surveys referred to in Policy HO18 carried out? Are they available for all rural settlements?

Issue 5 – Development in the Countryside – Policy SP21

Q1. How would a decision-maker determine if the need for a development overrides the need to protect the countryside for the purposes of Policy SP21? Is the policy effective?

Q2. Is Policy SP21 consistent with paragraph 55 of the Framework which allows for certain forms of development in the countryside, such as the need for rural workers to live at or near their place of work?

Matter 5 – Strategic Sites (Policies SP13-SP18 and HO2)

Issue 1 – Methodology

Q1. What was the process for identifying the residential site allocations, including their size, location and distribution? How were they chosen?

Q2. Was the process of allocating sites robust? Did it take into account sufficient factors?

Q3. How were site areas and dwelling capacities determined? Are the assumptions justified and based on available evidence?

Q4. For the strategic sites, how was the mix of uses determined?

Q5. How have the constraints of each site been taken into account and any necessary mitigation been considered as part of the process of allocating land for housing? In particular, how has the Council considered and assessed the impact of development on transport infrastructure, heritage assets and drainage? Where is this set out?

Q6. Where the delivery of sites is dependent upon new infrastructure is it clear who will make this provision and when? Where applicable have the additional costs been factored into an assessment of viability?

Q7. How has the Council taken into account the agricultural land classification when considering whether to allocate sites for housing? Has an assessment of each site been carried out?

Q8. How has the effect of development on the landscape character of the area been considered as part of the allocation process?

Q9. Are there any factors which indicate that a site(s) should not have been allocated for development? Are all the sites developable within the plan period?

Issue 2 – Manston Green Strategic Housing Site – Policy SP13

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 785 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q5. Is it sufficiently clear to developers, decision-makers and local communities when and how the proposed primary school will be delivered?

Q6. Have the costs associated with the open space and primary school been taken into account in considering the viability of the site?

Q7. What is the justification for restricting development to the northern part of the site? Is this justified?

Q8. How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q9. How will proposals be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q10. What consideration has been given to the standard of living accommodation for potential future occupants, having particular regard to the proximity of the site to Manston Airport?

Q11. How does the Plan ensure that any necessary infrastructure will be provided as part of proposals for the site?

Q12. Why, unlike the other strategic allocations, does the site not have an indicative phasing in Appendix B to the Plan?

Issue 3 – Birchington Strategic Housing Site – Policy SP14

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 1,600 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q5. Is it sufficiently clear to developers, decision-makers and local communities when and how the proposed primary school will be delivered?

Q6. Is it sufficiently clear to decision-makers, developers and local communities what is expected in relation to the provision of additional healthcare?

Q7. Have the costs associated with the open space, primary school and medical centre expansion been taken into account in considering the viability of the site? Is the site developable within the plan period?

Q8. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q9. What is the relationship with the Strategic Route safeguarded under Policy SP47? How will the Strategic Route be delivered, and is the delivery of the allocation dependant upon this new infrastructure?

Q10. How has the effect of the proposed development on air quality been taken into account? What effect will the proposal have, and what mitigation will be necessary?

Q11. How will proposals be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q12. How does the scale of proposed development relate to the size, role, function and character of Birchington?

Q13. Appendix B to the Plan estimates that 50 dwellings will be delivered on the site in 2019/20. What is this based on and is it a realistic expectation?

Issue 4 – Westwood Strategic Housing Site – Policy SP16

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 1,450 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 40 dwellings per hectare? Is this policy requirement justified? Why is a higher density justified on this site, compared to other strategic allocations?

Q4. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q5. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q6. Is it clear to decision-makers, developers or local communities when the access road will be provided, and by who?

Q7. How will proposals for the site be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q8. How does the scale of proposed development relate to the size, role, function and character of Westwood?

Q9. What is the justification for requiring development proposals to retain an undeveloped corridor as part of an extension to the Green Wedge to the east of the site? How will this be achieved?

Q10. Is it clear to decision-makers, developers and local communities what is required in respect of contributions towards education provision? What existing and proposed schools are within the catchment area of the site, and how will they be affected as a result of the development proposed?

Q11. What is the justification for safeguarding land for the expansion of Margate Cemetery under Policy CM03? Does the cemetery expansion land fall within, or outside the boundary of the strategic site allocation? Is it clear who will deliver the expansion to the cemetery, and when?

Q12. What consideration has been given to the standard of living accommodation for potential future occupants, having particular regard to the proximity of the site to the CEMEX Margate Concrete Plant and Margate Waste Recycling Centre?

Q13. What effect will the proposed development have on existing drainage infrastructure? Will additional infrastructure be required to accommodate the proposal, and if so, how will this be provided?

Q14. What effect will the proposed development have on existing healthcare provision in the area?

Q15. Appendix B to the Plan estimates that 50 dwellings will be delivered on the site in 2019/20. What is this based on and is it a realistic expectation?

Issue 5 – Westgate-on-Sea Strategic Housing Site – Policy SP15

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 2,000 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q5. Is it clear to decision-makers, developers and local communities what community facilities are required as part of the development?

Q6. Is it sufficiently clear to developers, decision-makers and local communities when and how the proposed primary school and medical centre will be delivered?

Q7. Have the costs associated with the open space, primary school and medical centre been taken into account in considering the viability of the site? Is the site developable within the plan period?

Q8. What is the justification for the provision of a new District Centre as part of proposals for the site?

Q9. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q10. What is the justification for requiring a Landscape and Visual Impact Assessment, but not for other strategic allocations?

Q11. How has the effect of the proposed development on air quality been taken into account? What effect will the proposal have, and what mitigation will be necessary?

Q12. How will proposals be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q13. How does the scale of proposed development relate to the size, role, function and character of Westgate-on-Sea?

Q14. What effect will the proposed development have on the setting of the Grade II* listed Dent-de-Lion Court?

Q15. Appendix B to the Plan estimates that 50 dwellings will be delivered on the site in 2019/20. What is this based on and is it a realistic expectation?

Issue 6 – Land fronting Nash and Haine Roads - Policy SP17

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Is it clear to decision-makers, developers and local communities how many dwellings are allocated on the site? Is the policy effective in this regard?

Q3. What is the justification for not specifying a maximum density, unlike other strategic housing allocations?

Q4. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q5. Is it sufficiently clear to developers, decision-makers and local communities when and how the proposed school and medical centre will be delivered?

Q6. Have the costs associated with the open space, primary school and medical centre been taken into account in considering the viability of the site? Is the site developable within the plan period?

Q7. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q8. How will proposals be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q9. How does the scale of proposed development relate to the size, role, function and character of the area?

Q10. What is the justification for requiring proposals to provide and maintain air quality information to inform the Council's ongoing air quality review and assessment programme?

Q11. What consideration has been given to the standard of living accommodation for potential future occupants, having particular regard to the proximity of the site to the MPL Recycling Centre?

Q12. Does the allocation form part of the sites listed in Appendix B to the Plan?

Issue 7 – Land at Manston Court Road/Haine Road - Policy SP18

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 1,200 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 30 dwellings per hectare? Is this policy requirement justified? Why is a lower density justified on this site, compared to other strategic allocations?

Q4. Is it clear to decision-makers, developers and local communities what is required of the masterplan and how this will integrate with development at the 'adjoining sites'? Is the policy effective?

Q5. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q6. Is it sufficiently clear to developers, decision-makers and local communities when and how the proposed school will be delivered?

Q7. Have the costs associated with the open space and secondary school been taken into account in considering the viability of the site? Is the site developable within the plan period?

Q8. What is the justification for requiring contributions to an internal spine road laid out in accordance with the requirements of the draft Transport Strategy? Is it clear to decision-makers, developers and local communities what is required? Is the policy justified and effective?

Q9. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q10. How will proposals for the site be expected to provide connections with existing public rights of way and cycle networks to promote the use more sustainable modes of transport?

Q11. How does the scale of proposed development relate to the size, role, function and character of the area?

Q12. What is the justification for requiring ecological surveys of breeding and wintering birds? What effect will the proposed development have on breeding and wintering birds? How has this been considered as part of the allocation process?

Q13. What is the current status regarding the submitted planning application for the site?

Q14. What consideration has been given to the standard of living accommodation for potential future occupants, having particular regard to the proximity of the site to Manston Airport?

Q15. Appendix B to the Plan estimates that 50 dwellings will be delivered on the site in 2019/20. What is this based on and is it a realistic expectation?

Issue 8 – Land North and South of Shottendane Road – Policy HO2

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 300 dwellings at land north of Shottendane Road and up to 250 dwellings on land south of Shottendane Road? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. Is it clear to decision-makers, developers and local communities what is required of the masterplan and development brief? Why will both these documents be required and how will they relate to one another? Is the policy effective?

Q5. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of? What are the costs of these improvements and have they been taken into account when assessing the viability of the allocation?

Q6. The masterplan for the northern site is expected to include a link road through the site to link Hartsdown Road and Shottendane Road. What is the justification for this? Has the cost of providing this infrastructure been included in the viability assessment of the site?

Q7. What is the justification for requiring 6.23 hectares of open space to be provided? Is it clear from the policy how the open space will be expected to be spread across the two sites? Is the policy justified and effective?

Q8. Is it clear to decision-makers, developers and local communities how off-site mitigation for the loss of ground nesting bird habitats will be identified and delivered? Is this policy effective?

Q9. Developments are required to incorporate and provide for improvements identified in the Thanet Transport Strategy. Is it clear to decision-makers, developers and local communities what specific improvements have been identified for the allocation and are these justified? Is the delivery of the site dependent on these improvements being delivered?

Q10. What is the justification for requiring improvements to Margate Cricket Club pitch and facilities? Has the cost of providing these improvements been included in the viability assessment of the site?

Q11. How has the effect of the proposed development on nearby heritage assets been taken into account? What impact will the allocation have on designated heritage assets? Is the policy justified?

Q12. What effect will the proposed development have on existing drainage infrastructure? Will additional infrastructure be required to accommodate the proposal, and if so, how will this be provided?

Q13. Appendix B to the Plan estimates that 30 dwellings will be delivered on the site in 2021/22. What is this based on and is it a realistic expectation?

Matter 6 – Non-Strategic Sites (Policies HO3-HO9)

Issue 1 – Land on west side of Old Haine Road, Ramsgate – Policy HO3

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 250 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. Is it clear to decision-makers, developers and local communities what is required of the masterplan and development brief? Why will both these documents be required and how will they relate to one another? Is the policy effective?

Q5. How has the effect of the proposed development on the local road network been considered? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of? What are the costs of these improvements and have they been considered when assessing the viability of the allocation?

Q6. What is the justification for requiring a pre-design archaeological evaluation? How has the effect of the proposed development on nearby heritage assets been considered?

Q7. What consideration has been given to the standard of living accommodation for potential future occupants, having regard to the proximity of the site to Manston Airport?

Q8. What is the justification for specifying that proposals should contribute towards provision of a new school, where required? What will be the cumulative impact of the proposed development on the capacity of local schools?

Q9. Appendix B to the Plan estimates that 20 dwellings will be delivered on the site in 2020/21. What is this based on and is it a realistic expectation?

Issue 2 – Land fronting Nash Road and Manston Road – Policy HO4

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 250 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. Is it clear to decision-makers, developers and local communities what is required of the masterplan and development brief? Why will both these documents be required and how will they relate to one another? Is the policy effective?

Q5. How has the effect of the proposed development on the local road network been considered? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway

improvements consist of? What are the costs of these improvements and have they been considered when assessing the viability of the allocation?

Q6. What is the justification for requiring a pre-design archaeological evaluation? How has the effect of the proposed development on nearby heritage assets been considered?

Q7. What liaison has taken place with service providers during the preparation of the Plan to inform the allocation? What evidence is available to show that upgrading capacity will be required and that this can be delivered in a timely manner?

Q8. Is it clear to decision-makers, developers and local communities how development proposals for the site will *"meet the needs of particular groups"*? Is the policy effective?

Q9. What is the justification for requiring sheltered and extra care housing as part of proposals for the site? What is this based on and is it justified?

Q10. Appendix B to the Plan estimates that 30 dwellings will be delivered on the site in 2019/20. What is this based on and is it a realistic expectation?

Issue 3 – Land south of Brook Avenue, Garlinge – Policy HO6

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 34 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. What is the justification for requiring development to be informed by a Transport Assessment and Archaeological evaluation? How has the effect of the proposed development on the local road network and heritage assets been considered? Is the policy requirement justified?

Issue 4 – Land at Haine Road and Spratling Street, Ramsgate – Policy HO7

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 85 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. Is it clear to decision-makers, developers and local communities what is required of the masterplan and development brief? Why will both these documents be required and how will they relate to one another? Is the policy effective?

Q5. How has the effect of the proposed development on the local road network been considered? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of? What are the costs of these improvements and have they been considered when assessing the viability of the allocation?

Q6. What liaison has taken place with service providers during the preparation of the Plan to inform the allocation? What evidence is available to show that upgrading capacity will be required and that this can be delivered in a timely manner?

Q7. Appendix B to the Plan estimates that 20 dwellings will be delivered on the site in 2020/21. What is this based on and is it a realistic expectation?

Issue 5 – Land south of Canterbury Road East, Ramsgate - Policy HO8

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 27 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. What is the justification for requiring a development brief to be provided?

Q5. What is the justification for requiring development to be informed by an archaeological and ecological evaluation? How has the effect of the proposed development on heritage assets and ecology been considered? Is the policy requirement justified?

Q6. What is the justification for requiring development to retain and enhance trees and hedgerows for their biodiversity interest? Why has this policy requirement not been included in other site allocations in the Plan?

Q7. Appendix B to the Plan estimates that 10 dwellings will be delivered on the site in 2021/22. What is this based on and is it a realistic expectation?

Issue 6 – Land at Melbourne Avenue, Ramsgate – Policy HO9

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. What is the justification for allocating the site for up to 49 dwellings? What is this based on and is it achievable?

Q3. What is the justification for specifying a maximum density of 35 dwellings per hectare? Is this policy requirement justified?

Q4. What is the justification for requiring development to be informed by a transport and ecological evaluation? How has the effect of the proposed development on the local road network and ecology been considered? Is the policy requirement justified?

Q5. Is it clear to decision-makers, developers and local communities how much, and what type of "amenity space" is required in addition to retaining The Copse?

Q6. How will the woodland be managed as a community asset? How and by whom will its management be coordinated and funded? Has the viability assessment of the site taken account of this cost?

Q7. Appendix B to the Plan estimates that 20 dwellings will be delivered on the site in 2021/22. What is this based on and is it a realistic expectation?

Matter 7 – Sites Allocated for Residential Development at Rural Settlements (Policies HO12-HO17)

Issue 1 – Land at Tothill Street, Minster – Policy HO12

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-makers, developers and local communities what scale of residential development is permitted?

Q3. What is the justification for requiring development to be informed by a transport assessment and archaeological evaluation? How has the effect of the proposed development on the local road network and heritage assets been considered? Is the policy requirement justified?

Q4. How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of? What are the costs of these improvements and have they been considered when assessing the viability of the allocation?

Q5. What is the justification for requiring land to be safeguarded within the site for the expansion of the existing cemetery, and for consultation to be carried out with Minster Parish Council? How will this affect the number of dwellings the site is expected to yield and the deliverability of the site?

Q6. What is the justification for requiring the provision of open space in accordance with Policy SP31?

Issue 2 – Land at Manor Road, Nicholas St. Wade – Policy HO13

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-makers, developers and local communities what scale of residential development is permitted?

Q3. How has the effect of the proposed development on the local road network been considered? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of? What are the costs of these improvements and have they been considered when assessing the viability of the allocation?

Q4. What is the justification for requiring the provision of open space in accordance with Policy SP31?

Issue 3 – Land at Walter's Hall Farm, Monkton – Policy HO14

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-

makers, developers and local communities what scale of residential development is permitted?

Q3. What is the justification for requiring development to be informed by an archaeological evaluation and to respect the setting of the Listed Building? Is it clear to decision-makers, developers and local communities which heritage asset(s) the policy refers to?

Q4. How has the effect of the proposed development on heritage assets been considered? Is the allocation justified?

Issue 4 – Land south side of A253, Cliffsend – Policy HO15

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-makers, developers and local communities what scale of residential development is permitted?

Q3. What is the justification for requiring development to be informed by a pre-design archaeological assessment? How has the effect of the proposed development on heritage assets been considered? Is the policy requirement justified?

Q4. What is the justification for requiring proposals for new development to explore and provide where possible sustainable connections to the proposed Parkway station? Is it sufficiently clear to decision-makers, developers and local communities what is meant by the term *"sustainable connections"*?

Q5. What will be the cost of providing these connections and how will they be funded? Has this cost been considered as part of the viability assessment for the site?

Issue 5 – Land north of Cottington Road, Cliffsend – Policy HO16

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-makers, developers and local communities what scale of residential development is permitted?

Q3. What is the justification for requiring development to be informed by an archaeological assessment including fieldwork, and include an assessment of development on the setting of St. Augustine's Cross? How has the effect of the proposed development on heritage assets been considered? Is the policy justified?

Q4. How has the effect of the proposed development on the local road network been considered? How will the site be accessed, and is it clear to decision-makers, developers and local communities what constitutes *"excessive traffic use"*? Is the policy justified and effective?

Q5. What is the justification for requiring proposals for new development to explore and provide where possible sustainable connections to the proposed Parkway station? Is it sufficiently clear to decision-makers, developers and local communities what is meant by the term *"sustainable connections"*?

Issue 6 – Land south of Cottington Road, Cliffsend – Policy HO17

Q1. How was the site boundary defined and what is it based on? Are there any ownership constraints likely to affect the deliverability of the site?

Q2. Unlike the strategic and non-strategic allocations, why does the policy not specify a dwelling yield or density for the site? Is it clear to decision-makers, developers and local communities what scale of residential development is permitted?

Q3. What is the justification for requiring development to be informed by an archaeological assessment including fieldwork, and include an assessment of development on the setting of St. Augustine's Cross? How has the effect of the proposed development on heritage assets been considered? Is the policy justified?

Q4. What is the justification for requiring proposals for new development to explore and provide where possible sustainable connections to the proposed Parkway station? Is it sufficiently clear to decision-makers, developers and local communities what is meant by the term *"sustainable connections"*?

Q5. What is the justification for requiring development proposals to include a flood risk assessment? Is it clear to decision-makers, developers and local communities what is required of proposals for new development?

Issue 7 – Additional Information

Q1. What is the status of the *"additional information"* provided underneath Policy HO17? Is the list intended to represent policy requirements? If so, why have the sites not been included as specific allocations in the Plan? Is the Plan justified and effective in this regard?

Matter 8 – Housing Land Supply

Issue 1 – Five-Year Housing Land Requirement

Q1. What is the basic five-year housing land requirement, what is it based on and how has it been calculated?

Q2. How does the five-year housing land requirement compare to previous rates of delivery?

Paragraph 47 of the Framework states that to boost significantly the supply of housing, local planning authorities should identify and update annually a deliverable five-year supply of housing, with an additional buffer of 5% (moved forward from later in the plan period) to ensure choice and competition in the market for land. Where there has been a record of persistent under delivery this should be increased to 20% to provide a realistic prospect of achieving the planned supply and to ensure choice and competition in the market for land.

Q3. Taking a longer-term view, how has the Council performed against previous annual housing requirements? Does this represent the 'persistent undersupply' defined by the Framework? In this context, should the buffer be 5% or 20%?

Q4. If a 20% buffer applies, should this be applied to the basic five-year requirement, or the five-year requirement and any undersupply?

Q5. If there has been an undersupply, should this be addressed within the next five years (the 'Sedgefield' method), or over the remainder of the plan period (the 'Liverpool' method)? Is the Council's approach consistent with the PPG which advises that local planning authorities should aim to deal with any undersupply within the first 5 years of the plan period where possible?[4]

Q6. Taking the above into account, what is the five-year housing land requirement?

Issue 2 – Supply Methodology

The PPG[5] states that planning permission or allocation in a development plan is not a prerequisite for a site being deliverable in terms of the five-year supply. Local planning authorities will need to provide clear evidence to support the deliverability of sites, ensuring that judgements on deliverability are clearly and transparently set out.

The PPG also advises that the size of sites will be an important factor in identifying whether a housing site is deliverable within five years. Plan makers should consider lead-in times and build-out rates to ensure a robust five-year housing land supply. Taking this into account:

<u>Sites with Planning Permission</u>

Q1. What evidence is there to indicate that the sites with planning permission will come forward as illustrated in the housing trajectory?

[4] Paragraph: 035 Reference ID: 3-035-20140306
[5] Paragraph: 031 Reference ID: 3-031-20140306

Q2. What lead-in times and build-out rates have been applied to sites with planning permission? What are they based on?

Q3. Have the same lead-in times and build-out rates been used for sites across the District, and for sites with outline and full planning permission? If so, is this appropriate and justified?

Q4. Are there any sites in the trajectory which have a resolution to grant planning permission subject to the completion of a planning obligation? If so, how has this been considered in determining deliverability?

Q5. How has the trajectory considered that some sites may not come forward due to unforeseen circumstances? Has a lapse-rate or allowance for non-deliverability been applied? If so, has it been applied to all sites?

Sites without Planning Permission

Q6. What evidence is there to indicate that the sites without planning permission will come forward as illustrated in the housing trajectory?

Q7. Have the same lead-in times and build-out rates been applied to sites without planning permission? How do they vary?

Issue 3 – Components of Supply

Q1. What evidence is there to support the housing trajectory for Birchington (Policy SP14)? Does this adequately reflect the time it will take to bring development forward and the necessary infrastructure requirements for the site?

Q2. What evidence is there to support the housing trajectory for Westgate-on-Sea (Policy SP15)? Does this adequately reflect the time it will take to bring development forward and the necessary infrastructure requirements for the site?

Q3. What evidence is there to support the housing trajectory for Westwood (Policy SP16)? Does this adequately reflect the time it will take to bring development forward and the necessary infrastructure requirements for the site?

Q4. How has the development of land fronting Nash Road and Haine Road (Policy SP17) been considered in the housing trajectory?

Q5. What evidence is there to support the housing trajectory for land at Manston Court (Policy SP18)? Does this adequately reflect the time it will take to bring development forward and the necessary infrastructure requirements for the site?

Issue 4 – Windfall Allowance

Paragraph 48 of the Framework states that local planning authorities may make an allowance for windfall sites in the five-year supply if they have compelling evidence that such sites have consistently become available in the local area and will continue to provide a reliable source of supply. Any allowance should be realistic having regard to the SHLAA, historic windfall delivery rates and expected future trends, and should not include residential gardens. Taking this into account:

Q1. What allowance has been made for windfall sites coming forward over the first five years, and thereafter throughout the plan period?

Q2. What is this based on and is it justified on appropriate available evidence?

Issue 5 – Future Supply

Paragraph 47 of the Framework states that local planning authorities should also identify a supply of specific, developable sites or broad locations for growth for years 6-10, and, where possible, years 11-15.

Q1. How has the Council arrived at the figures in the Housing Trajectory for years 6-10 and 11-15?

Q2. What factors were considered in arriving at the figures in the Housing Trajectory? Are they justified and based on appropriate available evidence?

Q3. Is there likely to be a sufficient supply of housing land throughout the lifetime of the Plan?

Issue 6 – Flexibility

Q1. What flexibility does the plan provide if some of the larger sites do not come forward in the timescales envisaged?

Q2. Is it necessary to have a review mechanism in the Plan to consider progress against these, and other sites, and to identify any appropriate steps to increase supply if required?

Matter 9 – Meeting Housing Needs (Policies SP19-SP20, QD04-QD05, HO20-HO26)

Issue 1 – Type and Size of Dwellings – Policy SP19

Q1. How does Plan address the need for different types of housing and the needs of different groups in the community? Is the Plan consistent with paragraph 50 of the Framework?

Q2. Is it clear to developers, decision-makers and local communities what the *"SHMA recommendations"* consist of for the purposes of Policy SP19?

Q3. Is Policy SP19 sufficiently flexible to react to changing circumstances over the plan period, and to reflect the different characteristics of sites, such as smaller, town centre developments?

Q4. What is the justification for encouraging proposals that incorporate a higher proportion of houses than recommended in the SHMA? Is Policy SP19 justified and consistent with the evidence base in this regard?

Q5. What is a dwelling house *"suited to modern living requirements"* for the purposes of Policy SP19? Is this sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

Q6. In what circumstances might there be conflict between the Local Plan and the Cliftonville DPD as expressed in Policy SP19?

Issue 2 – Provision of Affordable Housing – Policy SP20

Q1. What is the justification for requiring at least 30% of dwellings to be affordable on all qualifying sites? Is the requirement consistent with, and justified by, the evidence contained in the *Thanet District Council Local Plan and CIL Viability Assessment*?

Q2. What affect will the requirement for proposals to provide 30% affordable housing have on the deliverability of housing, especially for proposals on previously developed land?

Q3. Is it clear to decision-makers, developers and local communities under what circumstances a lower amount of affordable housing is acceptable?

Q4. What is the justification for the proposed affordable housing split in Policy SP20? What is this based on, and will it be appropriate for all qualifying development proposals across the District?

Issue 3 – Housing Standards – Policies QD04 and QD05

Q1. The PPG[6] states that local planning authorities have the option to set additional technical requirements exceeding the minimum standards required by Building Regulations in respect of access and water, and an optional nationally described space standard. In doing so local planning authorities will need to gather evidence to determine whether there is a need for additional standards in their area and justify setting appropriate policies in their Local Plans. Has this been carried out? What is the justification for the standards in Policies QD04 and QD05?

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[6] Ref ID 56-002-20160519

Q2. The PPG[7] also states that local planning authorities should consider the impact of using optional Building Regulation requirements and the nationally described space standard as part of their Local Plan viability assessment. Has this been carried out? Have the standards in Policies QD04 and QD05 been tested to ensure that new residential development will remain viable?

Q3. Is it clear to decision-makers, developers and local communities what proportion of affordable dwellings need to be wheelchair accessible? Is the policy effective in this regard?

Q4. Is Policy QD05 consistent with guidance contained in the PPG, which makes the distinction between wheelchair accessible dwellings (a home readily useable by a wheelchair user at the point of completion) and wheelchair adaptable dwellings (a home that can be easily adapted to meet the needs of a household including wheelchair users)?

Issue 4 – Accommodation for Gypsy and Travelling Communities – Policy HO22

Q1. The SHMA (paragraphs 8.75-8.77) refers to the *East Kent Gypsy, Traveller and Showpeople Accommodation Assessment* (2014) which concluded that that there was no need for any residential pitches. Does the assessment provide a robust and up-to-date assessment of need in the District that is consistent with national guidance and policy?

Q2. How has the situation changed in Thanet since publication of the East Kent Assessment? Has there been any increase in unauthorised developments? If so, what does this demonstrate?

Q3. Based on the 2014 Assessment, the Plan does not make any specific provision for Gypsy, Traveller or Travelling Showpeople accommodation. Is this appropriate and justified by the evidence? Will the Plan make suitable provision for accommodation to meet the need for gypsy and traveller communities?

Q4. Are the criteria for determining planning applications in Policy HO22 justified, clear and appropriate? Is the policy effective?

Issue 5 – Care and Supported Housing – Policy HO20

Q1. Is the reference to *"good quality accommodation"* in Policy HO20 sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

Issue 6 – Non Self-Contained Residential Accommodation - Policy HO21

Q1. What is the justification for the thresholds provided in Policy HO21? Is the policy supported by appropriate local evidence?

Issue 7 – Residential Use of Empty Property – Policy HO23

Q1. What is the justification for Policy HO23?

Q2. What are the reasons for only supporting the residential re-use of buildings in the urban areas and villages? Is the policy consistent with paragraph 55 of the Framework in this regard?

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[7] Ref ID 56-003-20150327

Issue 8 – Retention of Existing Housing Stock - Policy HO24

Q1. Does Policy HO24 seek to restrict proposals for the change of use from residential to tourist accommodation? Is this clear to decision-makers, developers and local communities?

Issue 9 – Ancillary Accommodation for a Family Member – Policy HO25

Q1. What is the justification for requiring ancillary residential accommodation to have a *"functional connection"* with the main dwelling and be in the same ownership?

Issue 10 – Fostering Homes – Policy HO26

Q1. What is the justification for Policy HO26? Which evidence-based documents support the restriction of foster homes in the Cliftonville West Ward?

Q2. What are the reasons for restricting foster homes in this location only?

Q3. Is it clear to decision-makers, developers and local communities what constitutes *"similar facilities"* for the purposes of Policy HO26?

Matter 10 – Economic Development (Policies SP02-SP04 and E01-E03)

Issue 1 – Economic Growth – Policy SP02

Q1. Is the target of 5,000 additional jobs justified? How has it been calculated, and how much of this will be achieved from development proposals in the Plan?

Q2. How does this compare to past performance?

Q3. How does the number of additional jobs planned for correlate to the housing requirement? Are the strategies for housing and economic development aligned?

Q4. The *Economic Development in Thanet (Employment Land Update and Economic Needs Assessment)* states that the past take-up of employment land averages 10,446 square metres per annum. How is this translated into a forecast for future employment land?

Q5. Is the use of past take-up rates robust, considering that it covers a post-recession period up to 2016?

Q6. The *Economic Development in Thanet (Employment Land Update and Economic Needs Assessment)* concludes that based on past trends and labour supply calculations, the land supply to be planned for should be 15 hectares. In contrast, Policy SP02 plans for 53.5 hectares of employment land. What is the justification for this difference?

Q7. What are the implications of this? If taken up, will there be enough housing to support the development of allocated sites? Will there be an appropriate balance between workers and homes?

Q8. What provision does the Plan make to support creative industries across Thanet? Is the Plan consistent with paragraph 21 of the Framework in this regard which seeks to plan positively for the location, promotion and expansion of clusters or networks of knowledge driven, creative or high technology industries?

Issue 2 – Land Allocated for Economic Development – SP03

Q1. How were the allocated sites identified? What factors were considered in deciding whether to allocate sites under Policy SP03?

Q2. Were any other locations considered as suitable alternatives?

Q3. How much land is available at each of the four allocated sites, and are they developable within the plan period?

Q4. Paragraph 6.8 of the *Economic Development in Thanet (Employment Land Update and Economic Needs Assessment)* concludes that Thanet Reach South should no longer be allocated for employment purposes. How does it differ from Thanet Reach North?

Q5. What is the justification for restricting development to Use Classes B1, B2 and B8 at Manston Business Park and Hedgend Industrial Estate, but having a more flexible approach elsewhere?

Q6. Is it clear to decision-makers, developers and local communities what uses will be permitted at Eurokent and the Thanet Reach Business Park? Is the policy effective in this regard?

Issue 3 – Retention of Existing Employment Sites – Policy E01

Q1. Is Policy E01 consistent with paragraph 22 of the Framework which states that planning policies should avoid the long-term protection of sites allocated for employment use where there is no reasonable prospect of a site being used for that purpose?

Q2. Is it clear to decision-makers, developers and local communities how proposals for alternative uses of land and buildings on the sites listed under Policy E01 will be considered?

Q3. What is the list of sites under Policy E01(2) based on?

Q4. How will decision-makers, developers and local communities consider development proposals which involve existing employment land and buildings not listed under Policy E01(2)?

Q5. What policies support proposals for economic development on non-allocated, windfall sites? Does the Plan include specific criteria for decision-makers, developers and local communities to follow?

Issue 4 – Home Working – Policy E02

Q1. In what instances might a proposal for home working require planning permission? Is it clear to decision-makers, developers and local communities when Policy E02 might apply?

Q2. Are the criteria sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

Issue 5 – Digital Infrastructure - Policy E03

Q1. Is it clear to decision-makers, developers and local communities what is required of Policy E03? Is the policy effective?

Q2. Is Policy E03 consistent with paragraphs 42-46 which seek to support the expansion of electronic communications networks, including telecommunications and high-speed broadband.

Issue 6 - Manston Business Park – Policy SP04

Q1. What is the justification for allocating over 40 hectares of land at Manston Business Park? Will there be a demand for the allocated land over the plan period? If so, what evidence supports this?

Q2. What is the justification for requiring development proposals at Manston Business Park to be accompanied by a Transport Assessment and Travel Plan? Is this appropriate for all development proposals, regardless of size?

Q3. In deciding to allocate the site for employment uses how have the cumulative effects of additional development on the local and strategic road network been considered?

Issue 7 – Manston Airport

Q1. What is the justification for including reference to Manston Airport alongside policies related to the allocation of employment land? Are paragraphs 1.38-1.45 intended to represent supporting text to Policy SP04?

Q2. What is the status regarding the proposed Nationally Significant Infrastructure Project? How does its timescales align with the Local Plan Examination?

Q3. What are the implications for the Plan should the Development Consent Order be approved?

Q4. What are the implications for the Plan should the Development Consent Order be refused?

Q5. If a Local Plan Review is required, is it clear to decision-makers, developers and local communities when this would happen? Is there a clear mechanism to ensure a timely review of the Plan, which currently refers to a 'minimum' period of 2 years?

Q6. Is it clear how a decision-maker would react to a proposal for new development at Manston Airport prior to a review of the Plan?

Q7. What is the justification for paragraph 1.44? If a Development Consent Order for aviation use is granted, what *"housing land supply provisions"* would need to be reviewed and why?

Q8. What are the implications of The Town and Country Planning (Manston Airport) Special Development Order 2019 No. 86 on the soundness of the submitted Local Plan and its strategy for the airport?

Matter 11 – Tourism (Policies E07-E14)

Issue 1 – Serviced Tourism Accommodation – Policy E07

Q1. How will decision-makers, developers and local communities determine whether proposals for tourist accommodation are *"well related to existing built development"*? Does this apply in the main built-up areas or across the District? Is the policy effective?

Q2. Is the Plan consistent with paragraph 28 of the Framework which, amongst other things, states that plans should support sustainable rural tourism and leisure developments that benefit businesses in rural areas?

Q3. What impacts does Policy E07(1) seek to avoid? Is the policy sufficiently clear? Is it effective?

Issue 2 – Self-Catering Accommodation – Policy E08

Q1. What is the justification for requiring proposals for self-catering accommodation to be well related to the primary and secondary road network? Is this requirement clear to decision-makers, developers and local communities? Is it effective?

Q2. What is the justification for requiring proposals to be capable of being extensively landscaped? Is this necessary for all development proposals, regardless of size or location?

Q3. What are the reasons for requiring new tourist accommodation to mitigate the impacts of recreational disturbance on nature conservation sites (Policy E07), but not new self-catering accommodation?

Issue 3 – Protecting Existing Tourist Accommodation – Policy E09

Q1. How has the threshold of 10 or more bedrooms been determined in Policy E09? What is it based on and is it justified?

Q2. How will decision-makers, developers and local communities determine when Policy E09 applies? What constitutes *"high quality"* tourist accommodation for this policy?

Q3. What is the justification for requiring evidence of occupancy rates over a period of 3 years, in addition to marketing, to demonstrate that the accommodation is not viable?

Issue 4 – Beaches – Policies E10, E11 and E12

Q1. What is the rationale and justification for identifying major holiday beaches (Policy E10) separately from intermediate beaches (Policy E11)?

Q2. Does the Plan provide enough detail to clarify to decision-makers, developers and local communities what type of development is permitted and where? Are Policies E10-E12 effective?

Q3. What is the justification for restricting new built facilities on undeveloped beaches (Policy E12)? Under what 'exceptional event' may development be considered acceptable? Is this sufficiently clear to decision-makers, developers and local communities?

Issue 5 – Language Schools – Policy E13

Q1. What is the justification for Policy E13? Will the criteria be effective in seeking to meet its aims and objectives?

Issue 6 – Quex Park – Policy E14

Q1. What is the justification for requiring development proposals at Quex Park to be accompanied by a transport assessment? Is this appropriate for all development proposals, regardless of size?

Q2. In considering a proposal for new development how would a decision-maker consider the setting of relevant heritage assets at Quex Park?

Matter 12 – Town and District Centres (Policies SP06-SP10 and E04-E06)

Issue 1 – Thanet's Town Centres - Policy SP06

Q1. What criteria have been used to determine the hierarchy of centres? Does this relate to the size and existing provision within settlements?

Q2. Is the hierarchy of centres justified and clear to decision-makers, developers and local communities? Are the town centre boundaries illustrated on the policies maps for Westwood, Margate, Ramsgate and Broadstairs?

Q3. Is the Plan consistent with paragraph 23 of the Framework which, amongst other things, states that Local Plans should define the extent of town centres and primary shopping areas?

Q4. Is Westwood identified as a centre at the top of the retail hierarchy? If so, what is the justification for this?

Q5. Is the retail strategy (set out in paragraph 2.10 of the Plan) to retain Thanet's market share of retail expenditure in the sub region, and not increase it, the most appropriate strategy for the area? Is it justified by appropriate available evidence?

Q6. What are the figures in Table 1 based on? Are the figures for convenience and comparison goods accurate and robust? Are the figures net or gross?

Q7. What is the justification for stating that the quantitative level of retail need should be regarded as a 'guide' rather than a 'target'? Does the Plan allocate a range of suitable sites to meet the scale and type of retail needs as required by paragraph 23 of the Framework? How does the Plan ensure that the needs for retail will be met in full and will not be compromised by limited site availability?

Q8. Does the Plan identify the need for other uses such as leisure, commercial, office, tourism, cultural, community and residential development needed in town centres? How will the need for such uses be met over the plan period, having regard to paragraph 23 of the Framework?

Issue 2 – Westwood - Policy SP07

Q1. What sites have been identified to meet the need for comparison retail goods at Westwood? How will the identified need be met over the plan period?

Q2. What is the justification for identifying Primary and Secondary retail frontages at Westwood? Do the frontages reflect the retail role, character and function of the centre at present?

Q3. What is the justification for requiring development proposals to secure the implementation of the Westwood Area SPD and Westwood Relief Scheme? What progress has been made in developing the SPD and details of the scheme? Should policy SP06 set out more detail as to the content (for example specific objectives or policies) that applications will be expected to comply with to ensure that the policy is clear and effective?

Q4. Is it clear to decision-makers, developers and local communities what uses will be permitted at Eurokent? Is the policy effective?

Q5. What is the justification for allocating the site for up to 550 dwellings and 5.45 hectares of land for business uses? What is this based on and is it achievable?

Q6. What is the justification for requiring development proposals to contribute towards the Local Employment and Training Fund? Is this appropriate for all proposals? Is it clear to decision-makers, developers and local communities what is required of proposals for new development? Is the policy justified and effective?

Q7. How has the mix of uses and minimum area of open space been established? Are they necessary, appropriate and justified?

Q8. How has the effect of the proposed development on the local road network been taken into account? How will the site be accessed, and is it clear to decision-makers, developers and local communities what the necessary highway improvements consist of?

Q9. What is the justification for requiring an archaeological assessment? How has the effect of the proposed development on nearby heritage assets been considered?

Q10. What is the justification for allocating land at Thanet Reach as part of a mixed-use development? Is the site deliverable?

Q11. Is it clear to decision-makers, developers and local communities how much residential development is permitted on the site? Is the policy effective?

Issue 3 – Margate - Policy SP08

Q1. What is the justification for resisting the loss of existing commercial premises in Margate Old Town? Is the policy justified, effective and consistent with national planning policy?

Q2. Is it clear to decision-makers, developers and local communities how the Council would consider whether a proposal for new development reduced the attractiveness of Dreamland or its leisure/tourism potential?

Q3. Should Policy SP08 refer to resilient design, taking account of Margate's coastal location and the need to consider climate change and flooding? Additionally, would a reference to the need for development essential for public safety in the Margate Seafront and Harbour Arm area be justified?

Q4. Does the Plan adequately define the extent and purpose of the 'Opportunity Sites'? Is it clear to decision-makers, developers and local communities what is required of proposals for new development in these areas?

Issue 4 – Ramsgate - Policy SP09

Q1. What is the justification for requiring development proposals to have regard to the emerging *Ramsgate Maritime Plan*? What is the current status of the Maritime Plan and is it clear to decision-makers, developers and local communities what is required of proposals for new development? Is the policy effective?

Q2. Should Policy SP08 refer to resilient design, taking account of Ramsgate's coastal location and the need to consider climate change and flooding?

Q3. What are the reasons for not referring to heritage considerations in Policy SP09, such as the Heritage Action Zone in partnership with Historic England? Is this referred to elsewhere within the Plan?

Issue 5 – Broadstairs - Policy SP10

Q1. What is the justification for resisting the loss of existing commercial premises along the Broadstairs Promenade and Beach Front? Is the policy justified, effective and consistent with national planning policy?

Q2. Should Policy SP08 refer to resilient design, taking account of Broadstairs' coastal location and the need to consider climate change and flooding?

Issue 6- Primary and Secondary Frontages - Policy E04

Q1. What criteria have been used to determine the primary and secondary frontages? Are they justified and clear to decision-makers, developers and local communities?

Q2. What is the justification for the extent of the secondary frontages in the coastal town centres?

Q3. What is the justification for allowing uses falling within Use Classes A1-A5 throughout primary frontages? Is this consistent with national planning policy?

Q4. What criteria will be used to determine whether a proposal within a secondary frontage would fragment or erode the frontage to a degree that compromises footfall or undermines the function of the centre? Is the policy sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

Issue 7- Sequential and Impact Tests – Policy E05

Q1. What are the thresholds in Policy E05 based on? Are they justified by appropriate available evidence?

Q2. Will it be clear to decision-makers, developers and local communities whether a development proposal is within the urban or rural Area?

Q3. Is Policy E05 consistent with paragraph 26 of the Framework in requiring impact assessments for proposals for main town centre uses?

Q4. Is it necessary, effective and justified to largely repeat the requirements of paragraph 26 of the Framework within Policy E05?

Issue 8- District and Local Centres - Policy E06

Q1. Is Policy E06 consistent with national planning policy in requiring development proposals to meet a local need?

Q2. What is the justification for restricting development proposals to no more than 1,000 square metres?

Matter 13 – Transport (Policies SP41-SP47 and TP01-TP10)

Issue 1 – Safe and Sustainable Transport – Policies SP41-SP44

Q1. Is Policy SP43 intended to apply to all proposals for new development, regardless of scale or location? Is the policy effective and consistent with national planning policy?

Q2. What is the justification for not including reference to electric vehicle charging points in Policy SP43? Is the policy consistent with paragraph 35 of the Framework in this regard?

Q3. What is the rationale for Policy SP44? Is it clear what is expected of decision-makers, developers and local communities?

Issue 2 – New Railway Station – Policy SP45

Q1. What is the justification for Policy SP45?

Q2. Is it clear to decision-makers, developers and local communities where the new station will be located?

Q3. Is the provision of a new railway station on land to the west of Ramsgate deliverable within the plan period?

Issue 3 – Strategic Road Network - Policies SP46-SP47

Q1. What is the rationale for Policy SP46? Is it clear what is expected of decision-makers, developers and local communities?

Q2. What is the status of the Thanet Transport Strategy?

Q3. What is the justification for safeguarding the routes set out in Policy SP47? Are these routes necessary for the implementation of the growth identified in the plan? If so, what evidence has been prepared to demonstrate that the routes are deliverable within the plan period? Who will be responsible for delivering the necessary highways infrastructure, especially where third-party land is required?

Q4. How have the costs associated with the highway's improvements been considered as part of the Plan's preparation?

Q5. Are the safeguarded transport routes shown accurately on the submission policies maps?

Q6. How will Regulation 123 of the CIL Regulations apply where five or more separate planning applications provide funding towards the projects referred to in Policies SP46-SP47? Will the new strategic road proposals be effective in mitigating the in-combination effects of additional transport movements and pressure arising from new development in Thanet?

Issue 4 – Transport Assessments and Travel Plans – Policy TP01

Q1. What is the justification for Policy TP01?

Q2. Is it clear to decision-makers, developers and local communities when transport assessments and travel plans will be required? Is the policy effective?

Issue 5 – Walking, Cycling and Public Transport – Policies TP02-TP04

Q1. What is the justification for having separate policies relating to cycling, walking and public transport? Are they consistent with the Framework's Core Planning Principles which seek to actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling?

Issue 6 – Parking Provision and Traffic Management- Policies TP05-TP10

Q1. What is the justification for safeguarding land at Vere Road, Broadstairs for use as coach parking?

Q2. Policy TP06 states that the Council will "refer to" guidance provided in the *Kent Design Review: Interim Guidance Note 3 – Residential Parking* and the *Kent Vehicle Parking Standards 2006 (Appendix C).* Is it clear to decision-makers, developers and local communities what is required of proposals for new development?

Q3. Are there circumstances other than those listed in Policy TP06 where a reduced level of provision may be acceptable?

Q4. Does Policy TP06 take adequate account of the need to provide disabled parking facilities? Is the Plan consistent with paragraph 35 of the Framework in this regard, which, amongst other things, states that Plans should consider the needs of people with disabilities by all modes of transport?

Q5. What is the justification for Policy TP08? Is the policy effective? How would a proposal for new development within a town centre meet the policy requirements, where opportunities for off-street servicing may be limited?

Q6. What is the justification for requiring new commercial development proposals to encourage at least 20% of customers at Westwood to arrive by means other than the private car in Policy TP09? What is the figure of 20% based on and how will it be measured? Is the policy effective?

Q7. Is Policy TP07 justified, positively prepared, and will the criteria be effective in considering proposals for new development on town centre public car parks?

Matter 14 – Community Infrastructure (Policies SP01, SP36-SP40 and CM01-CM04)

Issue 1 – Implementation – Policy SP01

Q1. What is the justification for requiring development proposals to comply with the provisions of the IDP in Policy SP01?

Issue 2 – Community Infrastructure – Policies SP36-SP40

Q1. What is the justification for allocating land as an extension to the QEQM Hospital under Policy SP37? What effect will this policy have on the Green Wedge in this location?

Q2. Is it clear to decision-makers, developers and local communities how proposals under Policy SP37 will *"involve the minimum take of fresh land"*? What is the justification for this policy requirement if the land is allocated for an expansion of the hospital?

Q3. Is Policy SP37 deliverable within the plan period? ***Does it adequately allow for the continued improvement, expansion, reconfiguration and consolidation of the hospital?***

Q4. Is it clear to decision-makers, developers and local communities where the new medical centre referred to in Policy SP38 will be provided? How will the medical centre be funded, who will provide it and is the centre deliverable within the plan period? Is Policy SP38 justified and effective?

Q5. Is it clear to decision-makers, developers and local communities where the new secondary school referred to in Policy SP40 will be provided? How will the new school at Westwood be funded, who will provide it and is the school deliverable within the plan period? Is Policy SP40 justified and effective?

Issue 3 – Provision of New Community Facilities – Policy CM01

Q1. Is Policy CM01 consistent with paragraph 70 of the Framework which, amongst other things, states that planning policies should plan positively for community facilities?

Issue 4 – Protection of Existing Community Facilities – Policy CM02

Q1. Is Policy CM02 consistent with paragraph 70 of the Framework which, amongst other things, states that planning policies should guard against the unnecessary loss of valued facilities and services, particularly where this would reduce the community's ability to meet its day-to-day needs?

Q2. What is the justification for requiring proposals for new development to meet criteria 1) to 3) inclusive?

Q3. What is the justification for providing additional requirements in the supporting text to Policy CM02? Is it clear what will be required of applicants for planning permission?

Issue 5 – Expansion of Margate and Minster Cemeteries – Policies CM03-CM04

Q1. What is the justification for Policies CM03 and CM04? How will the expansions be funded and who will provide them? Are the policies effective?

Matter 15 – Green Infrastructure and Open Space (Policies SP22-SP24, SP29-SP32 and GI04-GI07)

Issue 1 – Landscape Character – Policies SP22-SP23

Q1. What is the justification for the green wedges referred to in Policy SP22?

Q2. How were the green wedges identified on the Policies Map and what process was followed? What evidence-based documents were used to inform this process?

Q3. Are the green wedges justified, effective and consistent with national policy? Are there any significant factors that indicate that sites should not have been designated?

Q4. Is the approach in Policy SP22 to *"protect areas of open countryside"* consistent with national planning policy in the Framework?

Issue 2 – Landscaping and Green Infrastructure – Policies SP24 and GI06

Q1. What is the justification for listing types of Green Infrastructure in paragraph 4.36? Is this a policy requirement that proposals will be expected to provide? If so, should it be a specific policy requirement? Is the policy effective?

Q2. What is the justification for requiring a landscape survey under Policy GI06 for all development proposals that require a design and access statement?

Q3. What is the justification for requiring developers to demonstrate that adequate arrangements have been made to ensure the continued maintenance of landscaping? Is this necessary for all development proposals, and how have the costs associated with this requirement been taken into account?

Issue 3 – Protection of Open Space and Playing Fields – Policy SP29 and GI05

Q1. Are policies SP29 and GI05 consistent with the criteria set out in paragraph 74 of the Framework?

Issue 4 – Local Green Space – SP30

Q1. How were areas of Local Green Space identified on the Policies Map and what process was followed? What evidence-based documents were used to inform this process?

Q2. Are the Local Green Spaces consistent with paragraphs 76-77 of the Framework which state that such designations should only be used:

- Where the green space is in reasonably close proximity to the community it serves;
- Where the green area is demonstrably special to a local community and holds a particular local significance, for example because of its beauty, historic significance, recreational value (including as a playing field), tranquillity or richness of its wildlife; and
- Where the green area concerned is local in character and is not an extensive tract of land.

Issue 5 – Open Space, Parks, Gardens, Recreation Grounds and Allotments – Policies SP31-SP32 and GI04

Q1. What is the justification for requiring development proposals of 50 dwellings or more to provide natural and semi-natural green spaces in Policy SP31? What is the threshold based on? Will the policy requirement be achievable on all qualifying sites?

Q2. Policy SP31 requires proposals to meet the requirements in "Table 7" – where is this set out in the Plan?

Q3. What is the justification for Policy SP32? How will decision-makers determine whether the need to protect the allotments is outweighed by the overriding need for a development?

Q4. Subject to meeting the first part of Policy SP32, what is the justification for also requiring alternative provision to be made? What criteria would need to be considered in providing alternative provision nearby?

Q5. What are the standards in Policy GI04 based on? Are they justified and supported by appropriate available evidence?

Q6. Have the cost implications of Policy GI04 been considered as part of the Plan's preparation? What impact would the policy requirements have on the viability of new residential development?

Q7. What is the justification for requiring developers to fund the ongoing maintenance and management of amenity and play areas? Is this appropriate for all development proposals, regardless of type, scale or location?

Issue 6 – Jackey Bakers – Policy GI07

Q1. What is the justification for requiring ancillary development at Jackey Bakers to be justified, and subsidise the sports use?

Q2. Is it clear to decision-makers, developers and local communities what the policy expects of proposals for new development? Is the policy effective?

Matter 16 – Design, Heritage and the Rural Economy (Policies QD01-QD03, QD06-QD07, SP33-SP34, HE01-HE05, HO19 and E15-E19)

Issue 1 – Design – Policies QD01-QD03, QD06-QD07 and SP33

Q1. Is it clear to decision-makers, developers and local communities what constitutes the *"most recent government guidance"* for the purposes of Policy QD01? Is the policy effective?

Q2. Is it necessary and effective to have a policy requiring development to accord with Building Regulations?

Q3. What is the justification for requiring residential development on garden land to make a positive visual impact to an area in Policy QD02? Is this consistent with the requirements in Policy HO1?

Q4. Does Policy QD02 provide an appropriate policy framework to ensure that developments create safe environments where crime and disorder, and the fear of crime, do not undermine quality of life or community cohesion? As submitted is the policy consistent with paragraph 58 of the Framework?

Q5. Does the Plan make sufficient provision for inclusive design and accessible environments in accordance with paragraphs 57, 58, 61 and 69 of the Framework?

Q6. Policy QD03(3) requires the provision of private or shared external amenity/play space in new residential development. Is this suitably flexible to take account of circumstances where this may not be possible, such as the conversion of an existing building or where shared amenity space will be provided on site?

Q7. What is the justification for requiring bin storage facilities within 15 metres from where the collection vehicle will pass in Policy QD03(4)? Is the policy justified and effective?

Q8. What is the justification for requiring an independent design review for proposals under Policy SP33? Will it be sufficiently clear to decision-makers, developers and local communities when such a review will be required?

Issue 2 – Conservation of the Historic Environment – Policies SP34 and HE01-HE05

Q1. What does Policy SP34 require of proposals for new development?

Q2. Is Policy HE03 consistent with paragraph 135 of the Framework which states that the effect of an application on the significance of a non-designated heritage asset should be taken into account in determining planning applications. In weighing applications that affect directly or indirectly non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset?

Q3. Is Policy HE04 consistent with national planning policy, having particular regard to its approach to historic parks and gardens, whether or not they are included on the statutory list?

Issue 3 – The Rural Economy – Policies HO19 and E15-E19

Q1. Is it clear to decision-makers, developers and local communities what is required to demonstrate that agricultural units are 'viable' in Policy HO19? Is the policy effective?

Q2. Is Policy HO19 consistent with paragraph 55 of the Framework which refers to the essential need for a rural worker to live permanently at or near their place of work in the countryside?

Q3. What is the justification for requiring development proposals for economic development to be located in *"sustainable locations"* in Policy E15? How will decision-makers, developers and local communities determine what constitutes a sustainable location? Is the policy effective?

Q4. What is the justification for requiring development proposals to accord with criteria 1-6 in Policy E16?

Q5. What is the justification for restricting development proposals that would result in the *"irreversible loss"* of best and most versatile agricultural land in Policy E17?

Q6. Is Policy E17 consistent with paragraph 28 of the Framework which, amongst other things, states that local plans should promote the development and diversification of agricultural and other land-based rural businesses?

Q7. Is Policy E18 consistent with paragraph 112 of the Framework relating to the use of best and most versatile agricultural land?

Q8. Is Policy E19 consistent with paragraph 28 of the Framework which, amongst other things, states that local plans should support the sustainable growth and expansion of all types of business and enterprise in rural areas, both through conversion of existing buildings and well-designed new buildings?

Matter 17 – Biodiversity and Geodiversity (Policies SP25-SP28 and GI01-GI03)

Issue 1 – Biodiversity and Geodiversity Policies SP25-SP28 and GI01-GI03

Q1. Are Policies SP25-SP28 consistent with paragraph 113 of the Framework which states that local planning authorities should set criteria-based policies against which proposals for any development on or affecting protected wildlife or geodiversity sites or landscape areas will be judged?

Q2. Do Policies SP25-SP28 make distinctions between the hierarchy of international, national and locally designated so that protection is commensurate with their status and give appropriate weight to their importance and the contribution that they make to wider ecological networks?

Q3. Does the Plan include policies which plan for biodiversity at a landscape-scale, including across local authority boundaries as required by paragraph 117 of the Framework? Does the Plan identify and map components of ecological networks, including wildlife corridors and stepping stones that connect them?

Q4. Is it clear to decision-makers, developers and local communities how any habitat loss and/or mitigation will be determined to ensure that proposals for new development secure net gains in biodiversity?

Q5. Does Policy SP25 reference the correct Regulations?

Q6. Is it the wording of Policy SP27 clear as to whether the need for ecological surveys applies to all sites? Is the policy effective?

Q7. Is the information contained in diagram 1 (Chapter 12) regarding designated sites accurate?

Q8. Will Policy GI01 deliver real gains in biodiversity in the area over the plan period? Is the policy effective and consistent with national policy?

Q9. Unlike policy GI02, policy GI01 does not contain a specific reference to new developments including measures to enhance and improve connectivity to designated sites. Why is there a different approach to Nationally and Locally Designated Sites in this regard? Is the policy justified?

Q10. Unlike Policies GI01 and GI02, Policy GI03 does not include a reference to permitting development if the need outweighs the importance of the designated site. Why is the approach different? Is this policy justified?

Matter 18 – The Environment and Climate Change (Policies SP35, CC01-CC07 and SE01-SE08)

Issue 1 – Climate Change – Policy SP35

Q1. Is it clear to decision-makers, developers and local communities what is required of proposals for new development under Policy SP35? Is the policy effective and how does it relate to the more specific policies on climate change in Chapter 15 of the Plan?

Issue 2 – Flooding – Policies CC01-CC03

Q1. Is Policy CC01 consistent with paragraphs 100-102 of the Framework regarding when the Sequential and Exception tests should be required? Should the policy also take account of surface/groundwater flooding?

Q2. How does the Plan consider the multi-functional benefits of Sustainable Urban Drainage Systems ('SUDS'), such as the provision of amenity and biodiversity benefits?

Q3. What is the justification for the threshold distance of 40m in Policy CC03? Is it clear to decision-makers, developers and local communities when this policy applies? Will it be effective?

Q4. Does Policy CC03 ensure that new development proposals take account of natural habitats and how they might respond to coastal change?

Q5. Is it clear to decision-makers, developers and local communities when Flood Risk Assessments will be required? Should Policy CC01 also refer to sites over 1 hectare in size in Flood Zone 1?

Issue 3 – Renewable Energy – Policies CC04-CC07

Q1. What is the justification for requiring major new development proposals to include renewable energy or micro-generation equipment? Is it clear to decision-makers, developers and local communities what is expected of proposals for new development?

Q2. How does Policy CC04 take account of circumstances where the provision of renewable energy or micro-generation equipment may not be appropriate, feasible or viable?

Q3. What is the justification for requiring the provision of an Energy Statement in Policy CC05?

Q4. Is Policy CC06 consistent with national planning policy and guidance, and how will it ensure that new development proposals take account of any effects on the Thanet Coast SPA and Ramsar site in particular?

Q5. How will development proposals for wind turbines be considered under the policies contained in the Plan? Is the Plan consistent with national planning policy in this regard?

Q6. What is the justification for Policy CC07? Is clear to decision-makers, developers and local communities where the policy applies to?

Q7. Does Policy CC07 require applicants to consider impacts other than on sites of nature conservation value, such as heritage assets? Is the policy effective in this regard?

Issue 4 – Contamination and Pollution – SE01-SE08

Q1. Are policies SE01-SE03 consistent with paragraph 109 of the Framework which, amongst other things, states that the planning system should contribute to and enhance the natural and local environment by remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate?

Q2. How will Policy SE04 ensure that development proposals involving piled foundations take account of the risks of ground disturbance that may cause turbidity in the water supply, potentially resulting in contamination reaching groundwater beneath any sites impacted by contamination and/or landfill?

Q3. Is it necessary for Policy SE04 to refer to the provision of water supply or foul drainage in a timely manner to ensure that it is effective, and that new development is not unduly delayed?

Q4. Is it sufficiently clear to decision-makers, developers and local communities what is required to meet Policy SE05 with regard to promoting the use of sustainable low emission transport? Is the policy effective?

Q5. How have the cumulative effects of the development proposed in the Plan on air quality been considered as part of the evidence-base? Where necessary is it clear to decision-makers, developers and local communities what mitigation will be required?

Q6. Is it clear to decision-makers, developers and local communities where the Important Areas in the Noise Action Plan are located? Is Policy SE07 effective?

Q7. What constitutes a *"large development"* for the purposes of Policy SE08? As submitted is the policy effective?

Q8. What is the justification for referring to the Institute of Lighting Professionals Standards in Policy SE08? Is it clear to decision-makers, developers and local communities what is required of proposals for new development? Is the policy effective?

HEARING STATEMENT – THANET LOCAL PLAN EXAMINATION

Matter 10 (Economic Development) : Issue 7 – Manston Airport

On behalf of

Riveroak Strategic Partners Limited (RSP)

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Prepared by:

RPS

Angela Schembri
Planning Director

140 London Wall
London, EC2Y 5DN

Prepared for:

Riveroak Strategic Partners Limited (RSP)

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1 INTRODUCTION

1.1 This Hearing Statement has been prepared by RPS Consulting Services Limited (RPS) on behalf of RiverOak Strategic Partners Limited (RSP) in connection with the Thanet Local Plan Examination and Matter 10 Economic Development – Issue 7 : Manston Airport (Questions Q1 to Q8).

1.2 Manston Airport closed in May 2014. The airport is currently owned by Stone Hill Park Limited (SHP). RSP proposes to reopen Manston Airport as an air freight hub with associated business aviation and passenger services, creating in excess of 23,000 jobs within East Kent and the wider economy by the airport's 20th year of operation (expected to be in 2039).

1.3 RSP submitted a Development Consent Order (DCO) application to the Planning Inspectorate (PINS) on 17th July 2018. The DCO includes compulsory acquisition powers as RSP do not currently own the airport site. PINS formally accepted the DCO on 14th August 2018 (PINS reference TR020002) and it is currently the subject of Examination which commenced on 9th January 2019. The Examination of the DCO is expected to conclude on 9th July 2019. A copy of the DCO Examination Timetable is provided as Appendix 1.

APPENDIX 1

1.4 SHP have their own aspirations to redevelop the Manston Airport site for a new settlement which RSP believes is not needed; nor can it be implemented/delivered; nor is it viable. The SHP proposals are the subject of two separate and pending hybrid planning applications that have been submitted to Thanet District Council (TDC) (application references OL/TH/16/0550 and OL/TH/18/0660). The first application was submitted in May 2016 and the second application was submitted in May 2018. Both planning applications remain undetermined as they are both missing key environmental information. SHP's failure to progress their planning applications over a period of nearly three years puts into question the seriousness of their intentions.

1.5 RPS have acted on behalf of RSP as both planning consultants and Masterplanners on the Manston Airport DCO Project since 2016. During this time, RPS has submitted representations on behalf of RSP to inform the preparation of the new Thanet Local Plan. These representations have been made prior to the DCO Examination having commenced and are as follows:

- Response to Pre-Submission Regulation 19 Version of the Thanet Local Plan (August 2018) dated 4th October 2018
- Response to the Proposed Revisions to the draft Thanet Local Plan (Preferred Options) (January 2017) dated 17th March 2017

1.6 RSP strongly welcomes the decision by TDC no longer to allocate land at Manston Airport for a mixed-use settlement. RSP's position is that land at Manston Airport should be retained and protected for aviation uses only by policies in the new Thanet Local Plan and that until the outcome of the DCO is known (expected 9th January 2020), no other uses should be permitted at Manston Airport.

1.7 Regardless of if the DCO is granted or refused, the Local Plan will need to be reviewed to reflect the decision made. In its present state, the new Local Plan is not written in a way that sufficiently addresses the spatial planning and environmental implications of the airport reopening. Similarly,

and if the DCO is refused, the new Local Plan is not written in a way which makes it clear to interested parties, exactly how the future of the airport site will be dealt with or indeed, how decision-makers should react to any proposals for new development at the airport in planning terms.

1.8 RSP contends that a new policy should be added to the new Thanet Local Plan as follows:

> *"The area shown on the Policies Map as Manston Airport should be retained and protected as an airport and for related aviation uses. Non-aviation uses will not be permitted within this area. Permission will be granted for the further development of the airport and for related aviation buildings and uses provided satisfactory safeguards are in place to mitigate the impact of the operation of the airport on the environment including noise, air quality, flooding, surface access, visual impact and climate change."*

1.9 The essence of RSP's case is that:

i. Whilst the determination of the case for reopening Manston Airport is a matter entirely for the DCO process, it is appropriate to recognise that there is a strong case for so doing and this Local Plan Examination should proceed on that basis.

ii. By contrast, there is no demonstrated or demonstrable case to suggest that the housing which would be provided by the SHP scheme (or any other foreseeable residential redevelopment of Manston Airport) is either needed, desirable or viable.

iii. It is inappropriate for the Local Plan as currently drafted to leave what is, in effect, a policy vacuum with respect to Manston Airport. Should the Local Plan as currently drafted be adopted, any development proposal with respect to Manston Airport would be able to demonstrate that there are no relevant development plan policies within the meaning of paragraph 11 of the NPPF. As such, any such application would benefit from the "tilted planning balance" provided for by that paragraph, making the site very vulnerable to development which would cause the loss of a potential nationally significant piece of infrastructure, namely much-needed airport facilities. The local plan as currently drafted, therefore, does not even meet its own stated objection of maintaining the status quo whilst the DCO application is determined.

iv. Given that it is highly likely that the Local Plan, even if adopted, will in any event be reviewed within a very short period of time, it is appropriate to preserve for that short period the ability of the Manston Airport site to deliver a nationally important piece of infrastructure namely additional airport capacity in the south-east of England.

2 THE RSP CASE FOR MANSTON AIRPORT

2.1 The RSP case for reopening Manston Airport is contained in a series of documents that have been submitted as part of the Manston Airport DCO. These are provided with this statement to demonstrate that there is a reasonable prospect of the airport reopening and therefore, and until the outcome of the DCO is known, that the Manston Airport site should be safeguarded for airport use by policies in the new Thanet Local Plan. The relevant documents are as follows:

- Statement of Reasons July 2018 (document reference TR020002/APP/3.1) and especially Sections 4 (Need and Benefits) and 9 (Compelling Case in the Public Benefit)

APPENDIX 2

- Planning Statement July 2018 (document reference TR020002/APP/7.2)

APPENDIX 3

- Azimuth Report (Volumes I to IV) July 2018 (document reference TR020002/APP/7.4)

APPENDIX 4

2.2 There is a strong commercial case for reopening Manston Airport as planned by RSP. The London airports system is overcrowded and there is an urgent need for alternative facilities to serve the air freight market. Air freight is increasingly being bumped from the belly holds of passenger aircraft. In addition, this lack of air freight capacity means that goods bound to and from UK businesses and consumers are flown into mainland European airports and trucked across the English Channel. This adds unnecessary cost and delays to businesses and customers. The proposed development will deliver a focussed solution to address the demands of air cargo operators. Reopening Manston Airport would provide almost immediate relief to the pressing situation that is causing the UK economy to lose more than £2bn in trade every year (figures compiled by the Centre for Economics and Business Research (CEBR, 2016) for the Let Britain Fly campaign – see paragraph 2.1.5 of Volume I of the Azimuth Report in **Appendix 4**). The shortage of runway capacity across the South East airports remains unaddressed.

2.3 In comparison to its congested neighbours in the South East, (Heathrow, Gatwick and Stansted) Manston Airport will, with the right investment, have ample capacity and all the characteristics of an ideal freight-focused airport.

2.4 Manston Airport has an existing and lengthy runway; it is close to London but not part of the London airspace control zone; and has easy road access to the national motorway network, Channel Tunnel and mainland Europe. This, together with its ability to focus on providing a dedicated, rapid handling and turnaround service for air freight, makes Manston Airport both an attractive prospect for freight forwarders and cargo airlines and the strongest option available to Government to quickly and easily increase runway capacity in the South-East by making best use of existing runway infrastructure.

2.5 A revived Manston Airport would provide a realistic complement to the overcrowded London airports, reduce the volume of freight trucked through the Channel Tunnel to mainland European airports, improve the resilience of the UK's airport network, and boost economic growth and jobs in Kent. The impact of the UK leaving the European Union will only serve to make these challenges greater as border controls are reinforced and the logistics of trucking freight in and out of the UK become more complex and the solution that Manston provides more attractive.

2.6 In addition, there is evidence that the current absence of a specialist outsized cargo security clearing facility at other UK airports is slowing down the handling of air freight, again providing an opportunity for Manston Airport to provide a unique specialist service for air freight.

2.7 The UK has an urgent need to develop international trade and the proposed development would encourage future trade growth by helping to address the urgent need for additional airport capacity in the South-East of England. In addition:

- Development of the site as an airport is the only viable use for it
- The UK is losing market share to continental airports
- Manston is the most suitable site to develop a cargo-focussed airport in the UK
- East Kent is in desperate need of skilled employment and training. The proposal will create a total of 23,235 jobs by Year 20 of its operation (direct, indirect and catalytic jobs)
- A valuable and significant national asset will otherwise be lost
- The proposed development will provide the UK with modern air cargo customs facilities
- Manston will provide a valuable reliever function for the main London airports
- The landowner's plans for the site will never come to fruition
- The proposed development will bring substantial socio-economic benefits both locally and nationally
- There is strong support for the proposed development in the Government's policy on aviation and it is consistent with the NPPF and the requirements of other relevant planning policy
- The established use for the site is for airport uses. Key airport related infrastructure already exists and the runway in particular is in very good condition. The airport site continues to be protected for airport uses in the adopted Thanet Local Plan and these policies have been confirmed recently by a Planning Inspector to carry significant weight in the overall planning balance (see Appendix 4 of the RPS Planning Statement July 2018 which is provided as **Appendix 3** of this statement)
- Even in the longer term, and after the proposed opening of Heathrow's third runway and to 2050, Manston provides the only airport infrastructure in the South East that can provide the capacity needed to support the demand predicted
- Reopening Manston Airport will help deliver significant socio-economic benefits including economic prosperity and employment across Kent of an unprecedented scale. It will become a catalyst for much-needed growth especially for East Kent but across the UK. The proposed development offers the opportunity for Manston Airport to develop as a business and employment destination and to deliver significant socio-economic benefits. It could become 'one of the largest single generators of economic activity in the County' and is a genuine economic asset.
- Unlike the proposals to redevelop the airport for non-airport uses, there is considerable local support for the proposed development with the economic, employment and regeneration benefits being highlighted as key beneficial impacts. The considerable

support for the proposals including from the new leadership at Thanet District Council and adjoining authorities carries significant weight

- Reopening Manston Airport is very much in the public's interest. It is sustainable development
- There will not be any adverse effects after mitigation which would outweigh the benefits of the proposed development which include bringing the site back into beneficial use
- Connectivity is vital to economic regeneration and the development of Manston Airport would create a nationally significant logistics gateway, synergies with similar gateways at Dover and Folkestone (Channel Tunnel) resulting in Kent becoming the UK's primary trade corridor to Europe; a major county/sub regional employment cluster generating a substantial number of new jobs, a focal point for other related inward investment in East Kent, and a range of spin-off benefits to the County's economy including significant supply chain opportunities, enhanced potential to increase domestic and overseas visitor numbers, a strategically important and highly connected business location and a significant stimulus to the commercial property market and through that to the viability of other regeneration schemes being held back by low rental values
- Manston is an under-utilised infrastructure asset of significant scale, potential and importance that is strategically located in the primary trade corridor linking London and the South East to Europe. It is one of only half a dozen airports in the UK with a runway longer than 2,700m in commercial use.
- The London Airports System (defined as Heathrow, Gatwick, Stansted, Luton, London City Airport and Southend) is complex and in places highly congested (and in others likely to become so of the next decade), with supporting airspace which is constrained and in need of a major re-structure. Manston benefits from sitting outside that constrained airspace system, is completely un-constrained, with the ability to handle any kind of aircraft and with access to central London by rail with an hour and by truck to the M25 within 90 minutes

2.8 In light of the above, the new Thanet Local Plan should contain a specific policy covering the Manston Airport site and this policy should continue to safeguard land at Manston Airport for aviation uses. As such, this policy would be a continuation of saved Policy EC4 in the adopted Thanet Local Plan (2006). A policy safeguarding Manston Airport for aviation uses will be entirely consistent with national policy and in particular, the Government's Aviation Policy Framework (2013); the Airports NPS (June 2018) and the NPPF all of which fully recognises the major contribution made by the aviation sector to the national economy.

2.9 There needs to be a continued application of policy which safeguards the airport for aviation uses to prevent it from becoming anything other than an airport. The site will otherwise be left vulnerable to development proposals if no safeguarding policy is included. In accordance with paragraph 16(d) of the NPPF, a policy would make things perfectly clear for how TDC and others as decision makers should react to development proposals.

2.10 The evidence base that TDC are relying upon, namely the Avia Solutions Report (September 2016 and related update reports) is not adequate, up-to-date, relevant or reflective of market signals (paragraph 31 of the NPPF) for the reasons as set out in RSP's representations to the Proposed Revisions to the draft Thanet Local Plan (Preferred Options) January 2017 (RPS letter

dated 17th March 2017). These representations included a report from Northpoint Aviation Services called *"The shortcomings of the Avia Solutions Report and a Review of River Oak's Commercial Opportunities for an Airport Operation at Manston"* (March 2017). This report is re-appended to this statement for ease as Appendix 5 and demonstrates why the evidence from Avia Solutions Limited should not be relied upon in the preparation of the new Local Plan. The evidence that has been submitted by RSP as part of the Manston Airport DCO application, namely the Azimuth Report (Volumes I to IV) (July 2018)1 is a more reliable evidence base which demonstrates that aviation uses at Manston Airport are viable in the future and why there should be a policy in the new Thanet Local Plan that safeguards the airport for airport uses.

APPENDIX 5

2.11 In accepting the Manston Airport DCO, PINS have accepted that RSP's proposals for development are nationally significant infrastructure. In light of the above, a new policy should be included in the new Local Plan which safeguards land within the Manston airport boundary for aviation uses. This policy would remain in place until such time that a decision on the Manston Airport DCO prompts a review of the Local Plan and new policies are devised.

3 NO BASIS FOR ALLOCATING THE MANSTON AIRPORT SITE FOR ANY OTHER USE

3.1 TDC have not sought to allocate the Manston Airport site for any particular use in the new Local Plan so as not to prejudice the outcome of RSP's DCO. They are correct not to have done so, although there is a need for a positive policy to safeguard Manston Airport for aviation use. To allocate the site for non-airport uses before the RSP DCO is determined would be premature. Government policies support aviation growth in recognition of the benefits that this delivers which are essential to economic wellbeing. It is for the DCO Inspectors to decide whether they are able to support a proposal for aviation development and whether it supports the Government's aviation policy objectives.

3.2 In not allocating the Manston Airport site for any particular use, TDC has demonstrated that the land is not needed to meet land supplies for housing, employment or any other land uses as required over the Local Plan period to 2031. Appendix 1 of RSP's representations to the Pre-Submission Regulation 19 Version of the new Thanet Local Plan is a report by RPS called *"Thanet District Local Plan: Updated Review of Housing Supply and Housing Need"* (October 2018). This report specifically concludes that there is currently sufficient deliverable housing land capacity within Thanet District which is capable of delivering the Council's housing need for the plan period 2011-2031. Furthermore, TDC have allocated 53 hectares of employment land in the new Local Plan where only a requirement for 15 hectares has been identified. The Council could therefore consider the option to give more of this land over to housing if required. Consequently, the Manston Airport site is not needed to meet the Council's housing or employment land requirements.

3.3 Any decision to allocate the Manston Airport site for alternative, non-aviation related uses will need to be the subject of a Local Plan review in the event that the Manston Airport DCO is not granted and only once all the relevant evidence to substantiate an alternative approach has been collected, assessed and accepted.

3.4 Furthermore, the status of the hybrid planning applications currently before TDC suggest that any allocation for residential use (or a mixed-use development with a large residential component) would be inappropriate. The proposals presented in the hybrid planning applications represent a departure from the Development Plan and are unacceptable in planning terms for the following reasons:

- There is no demonstrated, or demonstrable, need for the housing being sought;
- Insufficient infrastructure exists and is not being sought at this isolated site to support such a significant increase in population, including road access, gas, electricity, water and sewerage services;
- There are environmental issues that have not been adequately dealt with. The Applicant has promised to submit an addendum to their Environmental Statement to include additional transport modelling data; updated ecological survey results and the results of further archaeological work but has failed to deliver this despite requests being made by TDC since August 2018;

- The applications have attracted several significant objections from statutory bodies, including the Ministry of Defence, who will not allow housing to be built near its equipment; and
- It is a high cost project in a low value area and could never be financially viable. A Viability Assessment in connection with the proposals has not been made available to the public to date.

4 QUESTIONS RAISED BY THE INSPECTORS ON MANSTON AIRPORT

Question 1 – What is the justification for including reference to Manston Airport alongside policies related to the allocation of employment land? Are paragraphs 1.38 to 1.45 intended to represent supporting text to Policy SP04

4.1 For the reasons set out in Section 2 of this statement, there needs to be a new policy (or policies) included in the new Local Plan which safeguards land within the Manston Airport boundary for aviation uses. This policy would remain in place until such time that a decision on the Manston Airport DCO prompts a review of the Local Plan and new policies are devised.

4.2 Manston Airport is not needed as an allocated employment site in the new Local Plan nor should it be presented in a section of the Local Plan that deals with employment. Paragraphs 1.38 to 1.45 are not supporting text to Policy SP04. A new policy safeguarding the airport needs to feature in the new Local Plan in its own right. It should not sit in Section 1 of the new Local Plan (Job Growth Strategy) as it does not fulfil this objective. There should simply be a short new section covering Manston Airport with an explanation of the current status of the site; an explanation of the Council's preferred strategy to safeguard the site until the outcome of the DCO is known and what the Council's strategy will be for the site once the DCO decision is known and the relevant policy (policies) that the Council needs to safeguard the airport for aviation uses to prevent it from becoming anything other than an airport. This approach will make things perfectly clear for how TDC and others as decision makers should react to development proposals for the airport.

Question 2 – What is the status regarding the proposed Nationally Significant Infrastructure Project? How does its timescales align with the Local Plan Examination?

4.3 A decision on the DCO is expected by 9th January 2020. The TDC Local Development Scheme 2018 (document reference CD7.1) states that the Local Plan is expected to be adopted in Summer 2019. This is out of date. TDC's submissions to the Manston Airport DCO have stated that adoption is more likely to happen by the end of 2019 therefore at a very similar time to a decision on the Manston Airport DCO.

4.4 There is significant overlap in terms of the matters concerning Manston Airport that will be considered at the DCO and Local Plan Examination processes. It is important that the matters are considered in the correct forum without prejudice to the outcome of either process.

4.5 RSP agree with TDC that the outcome of the Manston Airport DCO, whether it is granted or refused, will prompt a review of the Local Plan. Indeed, it is noted from the letter from The Rt Hon James Brokenshire MP (Secretary of State for Housing, Communities and Local Government) to Thanet DC dated 28th January 2019 in relation to the Local Plan Intervention (see Appendix 6) that the Secretary of State has in any event directed TDC to review their Local Plan within six months of adoption to "*ensure full and effective coverage of housing provision to give clarity to communities and developers about where homes should be built.*"

4.6 If the Local Plan is to be reviewed by Summer 2020 as anticipated, the review can also address the future of the Manston Airport site with the benefit of the RSP DCO decision.

Question 3 – What are the implications for the Local Plan should the DCO be approved

4.7 If the DCO is approved, a review of the Local Plan will be required as the current Plan does not include policies which assume and plan for this scenario. Paragraph 1.44 of the draft Thanet Local Plan rightly states that a review will be needed in relation to aviation and environmental matters. It also states that housing land supply provisions would need to be reviewed albeit that the RPS Employment and Housing Land Technical Report (March 2018) provided as Appendix 6 to the DCO Planning Statement (see **Appendix 3** of this statement) concludes that there is no need for new housing to support the new workforce as a result of a reopened Manston Airport.

4.8 New policies will need to be drafted to include, amongst other things:

- Definition of the airport boundary including on the Policies Map
- Details of what types of development will be permitted at the airport (both within the airport boundary) and close to it and what development will be prevented
- Airport safeguarding and control of development
- Controls over development at the airport (noise, visual impact, design etc,)
- Requirements for mitigation, pollution control and environmental protection
- Surface access and car parking requirements

4.9 It is common place, and also good planning policy practice, for Local Planning Authorities with aerodromes within their administrative area to include such policy provisions in their Local Plans. Indeed, the DfT/ODPM Circular 1/2003 - *Advice to local planning authorities on safeguarding aerodromes and military explosives storage areas* states in Annex 2 that Local Plans should include a policy stating that officially safeguarded areas have been established for a particular airport or technical site, and that certain planning applications will be the subject of consultation with the operator of that aerodrome or technical site and that there may be restrictions on the height or detailed design of buildings or on development which might create a bird hazard (as described in the Circular). The Circular further states that the outer boundary of safeguarded areas should be indicated on proposals maps accompanying Local Plans and that a plan should state why an area has been safeguarded.

4.10 There may also be a need to review the Local Plan's strategic objectives and policies in light of the positive role that the reopened airport will undoubtedly play in TDC's strategies for growth, economic development and regeneration.

4.11 TDC's employment land requirements may also need to be reviewed in response to an assessment of the likely impacts of reopening the airport.

4.12 The sites allocated in the Local Plan for development will need to be reviewed to ensure that any planned development could still be delivered viably in full recognition that the airport will be operational in accordance with the conditions of the DCO decision.

4.13 The Local Plan Review will also need to plan for/incorporate the infrastructure and transport requirements prompted by the DCO. RSP's proposals already fully mitigate against any impacts and commitments are included for improvements in this sense and for environmental improvements in general.

4.14 If the DCO is approved, there will need to be a substantial review of the Local Plan which would be tantamount to a wholescale review of the Local Plan given the strategic implications that reopening the airport would prompt.

4.15 Any review of the Local Plan will need to be conducted very quickly after the DCO decision has been received so that the Local Planning Authority has a policy framework that can deal with matters that will very quickly become relevant as the DCO scheme is implemented. RSP anticipate that the full reopening of the airport would therefore take place in Year 2 (2022) with the first full year of freight operations expected in Year 3 (2023). Passenger services are anticipated to start in Year 4 (2024).

4.16 The Local Plan review would need to be carried out in accordance with the requirements of paragraphs 16-34 of the NPPF 2019 and in particular, it should be shaped by early, proportionate and effective engagement between planmakers and communities, local organisations, businesses, infrastructure providers and operators and statutory consultees given the strategic considerations and cross-boundary issues that reopening Manston Airport would prompt (paragraphs 16 and 24 of the NPPF 2019). It also needs to be prepared and underpinned relevant and up-to-date evidence (paragraph 31 of the NPPF 2019).

Question 4 – What are the implications for the Local Plan should the DCO be refused

4.17 There will need to be a review of the Local Plan if the DCO is refused not least so that it is perfectly clear to decision-makers, how they should react to any proposals for development at Manston Airport and to potential developers, how their proposals are likely to be considered in planning policy terms.

4.18 If the DCO is refused because the need case for keeping the airport in aviation use is not accepted, then TDC will need to consider what the future of the airport will be in spatial planning terms and to address objectively assessed needs. This is unlikely to be a quick or easy decision and will need to be properly and robustly considered and assessed to ensure that any planned development can be viably delivered within the Plan period.

4.19 There cannot be any assumption made at this stage that the airport site could come forward for housing development. This scenario would need to be properly assessed based on full and up-to-date evidence. Just because TDC allocated the airport site for a new settlement in their 2017 version of the draft Local Plan doesn't mean that it automatically qualifies as a suitable housing site now. Indeed, SHP's experience of promoting a new settlement at the airport site through the submission of two planning applications has demonstrated that this option is not straightforward.

4.20 Until a decision is made about whether the site should be allocated and for what purpose, the Local Plan review will need to include policies about how future development at the airport will be guided and this will need to address the very real prospect that development may not be able to come forward in the next Local Plan period.

4.21 As with the response to Question 3 above, the Local Plan review will need to be prepared in accordance with the requirements of the NPPF 2019 and shaped by early, proportionate and effective engagement between plan-makers and communities, local organisations, businesses, infrastructure providers and operators and statutory consultees. Redeveloping Manston Airport will give rise to cross-boundary issues given its close proximity to Dover District and its status as a strategic site.

Question 5 – If a Local Plan Review is required, is it clear to decision-makers, developers and local communities when this would happen? Is there a clear mechanism to ensure a timely review of the Plan, which currently refers to a 'minimum' period of 2 years?

4.22 The letter from The Rt Hon James Brokenshire MP (Secretary of State for Housing, Communities and Local Government) to Thanet DC dated 28th January 2019 in relation to the Local Plan Intervention (see **Appendix 6**) has directed TDC to review their Local Plan within six months of adoption to *"ensure full and effective coverage of housing provision to give clarity to communities and developers about where homes should be built."* This needs to be included in the new Local Plan. The DCO decision will be known within six months of the currently planned adoption of the new Thanet Local Plan (by June 2020) so the review can include measures to reflect the outcome.

Question 6 – Is it clear how a decision-maker would react to a proposal for new development at Manston Airport prior to a review of the Plan?

4.23 No, it is not clear, and this is precisely why RSP are insisting that there needs to be a continued application of policy which safeguards the airport for aviation uses to prevent it from becoming anything other than an airport until at least the outcome of the Manston Airport DCO is known. The site will otherwise be left vulnerable to development proposals if no safeguarding policy is included particularly as the Local Plan as currently drafted would ensure a situation *"where there are no relevant development plan policies"* thus triggering the application of the tilted planning balance in favour of any application, pursuant to paragraph 11 of the NPPF. In accordance with paragraph 16(d) of the NPPF, a policy would make things perfectly clear for how TDC and others as decision makers should react to development proposals.

4.24 The Manston Airport DCO project has been accepted as a Nationally Significant Infrastructure Project (NSIP). Whilst this confirms that the proposal would deliver significant infrastructure that would be in the national interest if permitted, and by inference, that there can be a reasonable prospect of the airport reopening, this does not carry sufficient weight in the planning balance. Consequently, and until such time that a decision on the DCO is made, clear and unambiguous policies on Manston Airport need to be included in the Local Plan to avoid any uncertainty and these policies should safeguard the site for aviation uses.

Question 7 – What is the justification for paragraph 1.44? If a Development Consent Order for aviation use is granted, what "housing land supply provisions" would need to be reviewed and why?

4.25 In paragraph 4.2.6 of the TDC Local Impact Report (February 2019)[1] to the DCO examination, the Council states that *"the implications of the job creation purported from this project would significantly affect the OAN for housing within the East Kent region. The impact is a likely significant increase in housing requirements in Thanet. This may result in indirect effects, such as additional loss of countryside through increased housing developments and significant new infrastructure demands."* However, TDC has not provided any evidence to the DCO examination, or the Local Plan examination to substantiate this claim including as justification for requiring any Local Plan review to consider housing land supply provisions in the event that the DCO is granted as set out in paragraph 1.44.

4.26 If the DCO is granted, TDC would need to carry out a full assessment to enable them to properly consider whether the jobs created by a reopening of the airport would prompt any need for additional housing and if so, the Local Plan review will need to properly plan for this. As set out in the response to Question 3 (see above), RSP's evidence to the DCO examination is that there is no need for new housing to support the new workforce as a result of a reopened Manston Airport (see RPS Employment and Housing Land Technical Report (March 2018) provided as Appendix 6 to the DCO Planning Statement (see **Appendix 3** of this statement).

Question 8 – What are the implications of The Town and Country Planning (Manston Airport) Special Development Order 2019 No. 86 on the soundness of the submitted Local Plan and its strategy for the airport?

4.27 The 2019 Order augments the Town and Country Planning (Operation Stack) Special Development Order 2015. Operation Stack allows part of the runway at Manston Airport to be used for non-aviation uses, namely the stationing of goods and vehicles, the use of the control tower as a co-ordination centre and the erection of temporary structures. To date, it has not been used for that purpose. The 2019 Order grants temporary planning permission for development at Manston Airport to facilitate 'Operation Stack' until the end of 31st December 2020 and immediately thereafter, the land reverts to its previous lawful use (as an airport). The 2019 Order does not impact on RSP's planned programme for the reopening of Manston Airport and in the event that the DCO is granted, including compulsory acquisition powers, RSP are committed to honouring the requirements of the 2019 Order.

4.28 'Operation Stack' is a short-term, temporary measure of expediency to alleviate a specific traffic congestion problem until a longer solution is found. It does not grant permanent planning permission and certainly should not be viewed as granting planning permission for non-aviation uses at the airport. This was the conclusion of the Planning Inspector (Matthew C J Nunn) in his July 2017 decision on the appeals by Lothian Shelf (718) Limited which proposed non-aviation uses at Manston Airport (see paragraphs 45 and 46 of the appeal decision which is provided as

[1] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR020002/TR020002-003135-Thanet%20Disctrict%20Council%20-%20Local%20Impact%20Report%20Manston%20Airport.pdf

Appendix 4 of the RPS Planning Statement (July 2018) in support of the Manston Airport DCO – **Appendix 3** of this statement).

4.29 The draft Local Plan is silent on the 2019 Order. This is an omission and the 2019 Order should be referenced to fulfil the soundness test of 'being positively prepared' or informed by agreements with other authorities.

4.30 TDC's strategy for the airport is not to allocate it for any specific purpose. To make the plan 'sound' the Manston Airport site does not need to be allocated for 'Operation Stack' in the Local Plan but policies in the Local Plan do need to be included to safeguard the Manston Airport site from inappropriate, non-airport related development that may prevent it from being used for the purposes intended in the 2019 Order prior to 31st December 2020, and thereafter, by uses that would prevent it from being used for its lawful use which is as an airport.

APPENDIX 5 : LOCAL PLANNING POLICIES – SAVED POLICIES FROM THE 2006 ADOPTED THANET DISTRICT LOCAL PLAN AND EMERGING POLICIES IN THE NEW THANET DISTRICT LOCAL PLAN (2015 AND 2017 CONSULTATION VERSIONS)

Relevant Saved Policies from the 2006 adopted Thanet District Local Plan and the Emerging Policies from the draft new Thanet District Local Plan (2015 and 2017 Consultation Drafts)

Chapter	Subject	Policy Number	Policy
Thanet Local Plan 2006 Saved Policies			
2	Economic Development and Regeneration	Policy EC2	**Kent International Airport** Proposals that would support the development, expansion and diversification of Kent International Airport will only be permitted subject to the following requirements: 1. Demonstrable compliance with the terms of the current agreement under Section 106 of the Town and Country Planning Act 1990 or subsequent equivalent legislation; 2. New built development is to be designed to minimise visual impact on the open landscape of the central island. particular attention must be given to roofscape and to minimising the mass of the buildings at the skyline when viewed from the south; 3. Appropriate landscaping schemes, to be designed and implemented as an integral part of the development: 4. Any application for development for the purpose of increasing aircraft movements in the air or on the ground, auxiliary power or engine testing, must be supported by an assessment of the cumulative noise impact and the effectiveness of mitigation measures to be implemented in order to minimise pollution and disturbance. the acceptability of proposals will be judged in relation to any identified and cumulative noise impact, the effectiveness of mitigation and the social and economic benefits of the proposals; 5. An air quality assessment in compliance with Policy EP5, to demonstrate that the development will not lead to a harmful deterioration in air quality. permission will not be given for development that would result in national air quality objectives being exceeded; 6. Development will not be permitted within the airport complex to the south of the airside development site identified in Policy EC4, unless it has been demonstrated that the development is necessary for the purpose of air traffic management; 7. Any new development which would generate significant surface traffic must meet requirements for surface travel demand in compliance with Policy EC3. 8. It must be demonstrated that new development cannot contaminate groundwater sources or that appropriate mitigation measures will be incorporated in the development to prevent contamination.

2	Economic Development and Regeneration	Policy EC4	**Airside Development Area** Land at the airport, as identified on the proposals map, is reserved for airside development. Development proposals will require specific justification to demonstrate that an airside location is essential to the development proposed. Development will be required to retain sufficient land to permit access by aircraft of up to 65m (217ft) wingspan to all parts of the site.
2	Economic Development and Regeneration	Policy EC5	**Land at, and East of, the Airport Terminal** Until such time as a new airport terminal is built, land at, and east of, the existing airport terminal is identified on the proposals map for airport terminal-related purposes. Uses will be restricted to those which directly support or complement the operational requirements of the existing airport terminal. Should a new terminal be built, other airport-related development will be permitted on this allocated site. Planning conditions or planning agreements will be applied to limit any development granted planning consent to uses conforming to this policy.
2	Economic Development and Regeneration	Policy EC6	**Fire Training School/Mod Complex** If the current use of the fire training school or adjoining land ceases, the local planning authority will support the development of airport or airport-related uses, which would assist in the expansion of the airport. These could include: 1. educational/training uses (such as fire training); 2. hotels; 3. car parking; or 4. uses falling within use Classes A2 and B1, with an airport orientation.
5	Transportation	Policy TR3	**Provision of Transport Infrastructure** The District and County Councils will ensure, by means of a legal agreement that proper provision is made for transport infrastructure that is necessary and relevant to the development to be permitted. Proposals for transport infrastructure will be assessed in terms of their impact on capacity and safety of the transport network together with their social and economic impacts.

5	Transportation	Policy TR12	**Cycling** In order to promote increased use of cycling: a) The council will seek the provision at the earliest opportunity, of a network of cycle routes. Planning permission will not be granted for any development, which would prejudice the implementation of proposed cycle routes; b) The council will seek the incorporation of facilities for cyclists into the design of new and improved roads, junction improvements and traffic management proposals; c) Substantial development generating travel demand will be required to provide convenient and secure cycle-parking and changing facilities. Proposals to provide such facilities as part of development proposals in town centres and at transport interchanges, schools and places of employment will be permitted; and d) In new residential development facilities for the secure parking and storage of cycles should be provided or, in exceptional circumstances where not provided, the design should facilitate the provision in future.
5	Transportation	Policy TR15	**Green Travel Plans** Development proposals likely to generate significant travel demand and/or traffic movement will be required to demonstrate, through green travel plans, specific measures to encourage and facilitate use of walking, cycling and public transport in preference to private car travel. The Council will seek to approve measures, which will assist implementation of green travel plans and school travel plans.
5	Transportation	Policy TR16	**Car Parking Provision** a) Proposals for development will be required to make satisfactory provision for the parking of vehicles (including, where appropriate, service vehicles). b) Proposals seeking car parking provision above the standards set out in Appendix G will not be permitted. c) In conservation areas where provision of parking in line with this policy would be detrimental to the character of the conservation area or have an adverse effect on the setting of a listed building or ancient monument then exceptions may be made. d) Within the town centre areas of Ramsgate, Margate and Broadstairs (as defined on the proposals map), new development proposals will not be required or expected to provide on-site car parking spaces. On site non-operational parking for a2/b1 use will be resisted.

6	Design	Policy D1	**Design Principles** 1. All new development is required to provide high quality and inclusive design, sustainability, layout and materials. 2. A new development proposal will only be permitted if it: a) respects or enhances the character or appearance of the surrounding area, particularly in scale, massing, rhythm, and use of materials appropriate to the locality; b) is compatible with neighbouring buildings and spaces and does not lead to unacceptable loss of amenity through overlooking, noise or vibration, light pollution, overshadowing, loss of natural light, or sense of enclosure; c) incorporates where practicable a high degree of permeability for pedestrians and cyclists and also considers access for public transport; d) incorporates provision for disabled access; e) retains open spaces, gaps in development, mature trees, other vegetation and any other features that contribute to biodiversity and the quality of the local environment; f) incorporates new landscaping as an integral part (as set out in Policy D2); g) incorporates, where appropriate, wildlife habitats, wildlife corridors and initiatives for their long term management; h) incorporates measures to prevent crime and disorder, promotes public safety and security and the perception of public safety and security; i) incorporates, where practical and appropriate, high quality integrated public art which is relevant to the site and locality; j) provides safe and satisfactory means of pedestrian and, where provided, vehicle access; k) provides for clothes drying facilities and refuse disposal or dustbin storage; and l) incorporates sustainable drainage systems.
6	Design	Policy D2	**Landscaping** The following elements will be required as part of landscaping proposals for any new development: 1. The enhancement of the development site in its setting; 2. The retention (and protection during site works) of as many of the existing trees, hedges and other habitat features on site as possible; 3. On sites of one hectare or more, the setting aside of 10% of the development site for the planting of native tree species, either within or at the boundary of the development site; 4. The maximising of nature conservation opportunities where development is proposed in proximity to existing open space or wildlife habitats, and

			5. Where both appropriate and possible, the provision of landscaping in advance of new development to facilitate the assimilation of new development into the landscape. The District Council will require to be satisfied that the developer has made adequate arrangements to ensure continued maintenance of landscaping, and may seek to secure arrangements for this purpose by entering into a planning agreement.
7	Heritage	Policy HE11	**Archaeological Assessment** In order to determine planning applications, the district council may require the developer/applicant to provide additional information, in the form of an assessment of the archaeological or historic importance of the site in question and the likely impact of development. In certain cases such assessment may involve fieldwork or an evaluation excavation. Where the developer/applicant is not prepared to arrange such an assessment voluntarily, the district council will use its powers to direct that such information be supplied. Planning permission will be refused without adequate assessment of the archaeological implications.
7	Heritage	Policy HE12	**Archaeological Sites and Preservation** Archaeological sites will be preserved and protected. On those archaeological sites where permanent preservation is not warranted, planning permission will only be granted if arrangements have been made by the developer to ensure that time and resources are available to allow satisfactory archaeological investigation and recording by an approved archaeological body to take place, in advance of and during development. No work shall take place until the specification and programme of work for archaeological investigation, including its relationship to the programme of development, has been submitted and approved.
10	Countryside and Coast	Policy CC1	**Development in the Countryside** The Thanet countryside is defined as those areas of the district outside the identified urban and village confines. Within the countryside, new development will not be permitted unless there is a need for the development that overrides the need to protect the countryside.
10	Countryside and Coast	Policy CC2	**Landscape Character Areas** Within the landscape character areas identified on the proposals map, the following policy principles will be applied: 1. At Pegwell Bay priority will be given to the conservation and enhancement of the natural beauty of the landscape over other planning considerations; 2. In the former Wantsum channel area, new development will not normally be permitted; 3. In the Wantsum channel north shore area, development will only be permitted that would not damage the setting of the Wantsum channel, and long views of Pegwell Bay, the Wantsum channel, the adjacent marshes and the sea;

			4. On the central chalk plateau, a number of sites are identified for various development purposes. where development is permitted by other policies in this plan, particular care should be taken to avoid skyline intrusion and the loss or interruption of long views of the coast and the sea; 5. At Quex Park, new development proposals should respect the historic character of the parkland; and 6. At the urban coast, development that does not reflect the traditional seafront architecture of the area, maintain existing open spaces and long sweeping views of the coastline will not be permitted. Development proposals that conflict with the above principles will only be permitted where it can be demonstrated that they are essential for the economic or social well-being of the area. In the event of a real and specific threat to the landscape character of these areas from permitted development, the use of article 4 directions will be considered, and secretary of state approval for the direction sought.
12	Nature Conservation	Policy NC3	**Local Wildlife Sites** Development which would be damaging to the following sites of nature conservation interest as defined on the proposals map, or any sites so designated in the future, either in the long term or the short term, will not be permitted: 1. Monkton Chalk Pit; 2. St. Peter's Churchyard; 3. North Foreland and golf course roughs; 4. Minster Station environs; 5. Ash levels (part); 6. St. Nicolas at Wade Churchyard; 7. St. Mary Magdalene Churchyard Monkton; and 8. Ramsgate Cemetery. Exceptionally, where a strategic need is identified, at least an equivalent area of corresponding habitat will be expected to be created, at the developer's expense, at a suitable location in the district, and well related to other existing habitats.
13	Environmental Protection	Policy EP5	**Local Air Quality Monitoring** Proposals for new development that would result in the national air-quality objectives being exceeded will not be permitted. Development proposals that might lead to such an exceedance, or to a significant deterioration in local air quality resulting in unacceptable effects on human health, local amenity or the natural environment, will require the submission of an air quality assessment, which should address: 1. the existing background levels of air quality; 2. the cumulative effect of further emissions;

<table>
<tr><td></td><td></td><td></td><td>3. The feasibility of any measures of mitigation that would prevent the national air quality objectives being exceeded, or would reduce the extent of air quality deterioration.</td></tr>
<tr><td>13</td><td>Environmental Protection</td><td>Policy EP7</td><td>Aircraft Noise
Applications for noise sensitive development or redevelopment on sites likely to be affected by aircraft noise will be determined in relation to the latest accepted prediction of existing and foreseeable ground noise measurement of aircraft noise.
Applications for residential development will be determined in accordance with the following noise exposure categories.
<table>
<tr><th>NEC</th><th colspan="2">Predicted aircraft noise levels (dbl aeq.0700-23.00)</th></tr>
<tr><td>a</td><td><57</td><td>Noise will not be a determining factor</td></tr>
<tr><td>b</td><td>57-63</td><td>Noise will be taken into account in determining applications, and where appropriate, conditions will be imposed to ensure an adequate level of protection against noise (Policy EP8 refers).</td></tr>
<tr><td>c</td><td>63-72</td><td>Planning permission will not be granted except where the site lies within the confines of existing substantially built-up area. Where residential development is exceptionally granted, conditions will be imposed to ensure an adequate level of protection against noise (Policy EP8 refers).</td></tr>
<tr><td>d</td><td>>72</td><td>Residential development will not be permitted.</td></tr>
</table>
Applications for non-residential development including schools, hospitals and other uses considered sensitive to noise will not be permitted in areas expected to be subject to aircraft noise levels exceeding 60 db (a) unless the applicant is able to demonstrate that no alternative site is available. Proposals will be expected to demonstrate adequate levels of sound insulation where appropriate in relation to the particular use.</td></tr>
<tr><td>13</td><td>Environmental Protection</td><td>Policy EP8</td><td>Aircraft Noise and Residential Development
When planning consent is granted for residential development on any land expected to be subject to a level of aircraft noise of above 57db(a)**, such consent will be subject to provision of a specified level of insulation to achieve a minimum level of sound attenuation in accordance with the following criteria:
<table>
<tr><th>NEC</th><th colspan="2">Predicted aircraft minimum noise levels attenuation required (db(a) (frequency range 100-3150 hz)</th></tr>
<tr><td>a</td><td><57</td><td>No attenuation measures required</td></tr>
<tr><td>b</td><td>57-63</td><td>20db</td></tr>
<tr><td>c</td><td>63-72</td><td>30db</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>** LAeq 57dB 07.00-23.00</td></tr>
<tr><td>13</td><td>Environmental Protection</td><td>Policy EP9</td><td>Light Pollution
Development that includes the provision of new outdoor lighting should be designed to minimise light glare, light trespass, spillage and sky glow so as to preserve residential amenity, the character of the surroundings and prevent disturbance to identified wildlife areas.
Proposals that are unacceptable in these respects, or which exceed the following maximum limits, will not be permitted.
<table>
<tr><th colspan="8">Obtrusive light limitations for exterior lighting installations</th></tr>
<tr><td>Environmental zones</td><td>Sky glow</td><td colspan="2">Light into windows ev[lux]</td><td colspan="2">Source intensity I[kcd]</td><td colspan="2">Building luminance (before curfew)</td></tr>
<tr><td></td><td>upward light ratio [max %]</td><td>before curfew</td><td>after curfew</td><td>before curfew</td><td>after curfew</td><td>av. I (cd/m^2)</td><td>max. I (cd/m^2)</td></tr>
<tr><td>E1</td><td>0</td><td>2</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>E2</td><td>2.5</td><td>5</td><td>1</td><td>20</td><td>0.5</td><td>5</td><td>10</td></tr>
<tr><td>E3</td><td>5.0</td><td>10</td><td>2</td><td>30</td><td>1.0</td><td>10</td><td>60</td></tr>
<tr><td>E4</td><td>15.0</td><td>25</td><td>5</td><td>50</td><td>2.5</td><td>25</td><td>150</td></tr>
</table></td></tr>
<tr><td>13</td><td>Environmental Protection</td><td>Policy EP13</td><td>Groundwater Protection Zones
If a proposed development in the groundwater protection zones identified on the proposals map would have the potential to result in a risk of contamination of groundwater sources, it will not be permitted unless adequate mitigation measures can be incorporated to prevent such contamination taking place.</td></tr>
<tr><td>14</td><td>Community Facilities</td><td>Policy CF2</td><td>Development Contributions
Where a proposed development would directly result in the need to provide new or upgraded community facilities (including transport infrastructure, educational or recreational facilities or affordable housing), the local planning authority will negotiate with the applicant for a contribution towards the cost of such provision, which is fairly and reasonably related in scale and in kind to the proposed development. A planning obligation to secure the contribution will normally be sought.</td></tr>
</table>

Draft Thanet Local Plan 2031 Preferred Options Consultation (January 2015)			
	Local Plan Strategy	Policy SP01	**National Planning Policy Framework – Presumption in favour of sustainable development** When considering development proposals the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. It will always work 18 proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area. Planning applications that accord with the policies in this Local Plan (and, where relevant, with polices in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise. Where there are no policies relevant to the application or relevant policies are out of date at the time of making the decision then the Council will grant permission unless material considerations indicate otherwise taking into account whether: • Any adverse impacts of granting permission would significantly and demonstrably outweigh the benefits, when assessed against the policies in the National Planning Policy Framework taken as a whole; or • Specific policies in that Framework indicate that development should be restricted.
	Strategic Priorities and Objectives	Strategic Priority 1	Create additional employment and training opportunities, to strengthen and diversify the local economy and improve local earning power and employability.
	Strategic Priorities and Objectives	Strategic Priority 5	Deliver the infrastructure required to support existing communities and new development, including an efficient and effective transport system.
4	Environment Strategy	Policy SP20	**Development in the Countryside** Development in the countryside outside of the urban and village confines, as identified in the Thanet Local Plan 2006, and not otherwise allocated for development, will not be permitted unless there is a need for the development that overrides the need to protect the countryside and any adverse environmental effects can be avoided or fully mitigated.
4	Environment Strategy	Policy SP22	**Protection and Enhancement of Thanet's Historic Landscapes** Development proposals should demonstrate that their location, scale, design and materials will protect, conserve and, where possible, enhance: 1) Thanet's local distinctiveness including historical, biodiversity and cultural character, 2) gaps between Thanet's towns and villages, 3) visually sensitive skylines and seascapes, Within the landscape character areas identified, the following policy principles will be applied: 1) At Pegwell Bay, priority will be given to the conservation and enhancement of the natural beauty of the landscape over other planning considerations;

			2) In the former Wantsum Channel area, new development will not normally be permitted; 3) In the Wantsum Channel North Shore Area, development will only be permitted that would provide opportunities for enhancement and would not damage the setting of the Wantsum Channel, and long views of Pegwell Bay, the Wantsum Channel, the adjacent marshes and the sea; 4) On the Central Chalk Plateau, a number of sites are identified for various development purposes. Where development is permitted by other policies in this plan, particular care should be taken to avoid skyline intrusion and the loss or interruption of long views of the coast and the sea, and proposals should demonstrate how the development will take advantage of and engage with these views; 5) At Quex Park, new development proposals should respect the historic character of the parkland and gardens; and 6) At the Urban Coast, development that does not respect the traditional seafront architecture of the area, maintain existing open spaces and long sweeping views of the coastline will not be permitted. Development proposals that conflict with the above principles will only be permitted where it can be demonstrated that they are essential for the economic or social well-being of the area or for reasons where the need for the development outweighs the detriment to the landscape. The developer may be required to submit a Landscape and Visual Impact Assessment with any development proposals likely to have a significant landscape impact
4	Environment Strategy	Policy SP23	**Green Infrastructure** Thanet's green infrastructure network is an integral part of the design of all major development. Opportunities to improve Thanet's green infrastructure network by protecting and enhancing existing green infrastructure assets and the connections between them, should be included early in the design process for major developments. Development should make a positive contribution to Thanet's green infrastructure network by: • Creating new wildlife and biodiversity habitats • Providing and managing new accessible open space • Mitigating against the loss of any farmland bird habitats • Providing private gardens and play space; and/or • Contributing towards the enhancement of Thanet's Biodiversity Opportunity Areas or the enhancement of the Green Wedges Investment and developer contributions should be directed to improve and expand green infrastructure and provide connecting links where opportunities exist.

4	Environment Strategy	Policy SP25	**Protection of the European Sites, Sites of Special Scientific Interest and National Nature Reserve** Development that would have a detrimental impact on the European Sites, Sites of Special Scientific Interest or National Nature Reserve will not be permitted. Planning permission may only be granted when it can be demonstrated that any harm to internationally and nationally designated sites resulting from that development will be suitably mitigated. Proposals for residential development must include an assessment of significant effects and measures to mitigate against the effects of potential increased recreational pressure on protected sites. Proposals for major residential developments must include provision of open space suitable for dog walking and general recreation, in accordance with Policy SP23. In developing these measures, regard must be had to the SPA Mitigation Strategy which requires a financial contribution towards wardening, and applicants must demonstrate clearly how they are meeting the strategy and how they will ensure that development will mitigate against any increase in recreational pressure on designated sites.
4	Environment Strategy	Policy SP26	**Protection of Open Space** Built development or change of use will not be permitted on areas of open space identified as part of Thanet's green infrastructure network (including Public Rights of Way) unless: 1) It is for an open recreation or tourism uses and is of appropriate scale and design for its setting. Any related built development should be kept to the minimum necessary to support the open use, and be sensitively located. 2) There is an overriding need for development that outweighs the need to protect open space and cannot be located elsewhere, in which case provision of alternative open space of an equivalent size must be made elsewhere. New development that is permitted by virtue of this policy should make a positive contribution to the area in terms of siting, design, scale and use of materials. Built development in any areas designated as Local Green Spaces will only be permitted if the proposal meets the exception criteria set out in the National Planning Policy Framework.
4	Environment Strategy	Policy SP28	**Quality Development** New development will be of a high quality inclusive design. Developers will be required to seek an independent Design Review for development proposals on sites with a prominent visual impact, or which are of national significance.
4	Environment Strategy	Policy SP29	**Conservation and Enhancement of Thanet's Historic Environment** The Council will support, value and have regard to the significance of Heritage Assets by: 1) protecting the historic environment from inappropriate development, 2) encouraging new uses where they bring listed buildings back into use, encouraging their survival and maintenance without compromising the conservation of the building,

			3) seeking the provision of appropriate research for all applications relating to the historic environment on key sites as identified through the Heritage Strategy, 4) facilitating the review of Conservation Areas and the opportunities for new designations, 5) recognising other local assets through Local Lists, 6) offering help, advice and information about the historic environment by providing guidance to stakeholders, producing new guidance leaflets, reviewing existing guidance leaflets and promoting events which make the historic environment accessible to all, 7) agreeing Article 4 Directions which will be introduced and reviewed as appropriate, 8) supporting development that is of high quality design and supports sustainable development. All reviews and designations will be carried out in consultation with the public in order to bring a shared understanding of why asset and areas are being designated.
4	Environment Strategy	Policy SP30	**Climate Change** New development must take account of: • Adapting to climate change by minimising vulnerability, providing resilience to the impacts of climate change and complying with the Government's Zero Carbon Policy • Mitigating against climate change by reducing emissions
5	Community Strategy	Policy SP32	**Community Infrastructure** Development will only be permitted when provision is made to ensure delivery of relevant and sufficient community and utility infrastructure. Where appropriate, development will be expected to contribute to the provision of new, improved, upgraded or replacement infrastructure and facilities.
6	Transport Strategy	Policy SP34	**Safe and Sustainable Travel** The Council will work with developers, transport service providers, and the local community to manage travel demand, by promoting and facilitating walking, cycling and use of public transport as safe and convenient means of transport. Development applications will be expected to take account of the need to promote safe and sustainable travel. New developments must provide safe and attractive cycling and walking opportunities to reduce the need to travel by car.
6	Transport Strategy	Policy SP35	**Accessible Location** Development generating a significant number of trips will be expected to be located where a range of services are or will be conveniently accessible on foot, by cycle or public transport. The Council will seek to approve proposals to cluster or co-locate services at centres accessible to local communities by public transport and on foot.

6	Transport Strategy	Policy SP36	**Transport Infrastructure** Development proposals will be assessed in terms of the type and level of travel demand likely to be generated. Development will be permitted only at such time as proper provision is made to ensure delivery of relevant transport infrastructure. Where appropriate, development will be expected to contribute to the provision, extension or improvement, of walking and cycling routes and facilities and to highway improvements. Subject to individual assessments, schemes may be required to provide or contribute to: • Capacity improvements/connections to the cycle network • Provision of pedestrian links with public transport routes/interchanges • Improvements to passenger waiting facilities • Facilities for display of approach time information at bus stops along identified quality bus corridors • Improvement and expansion of public transport services • Improvements to the road network in line with schemes identified through the Transport Strategy.
6	Transport Strategy	Policy SP39	**New Rail Station** Planning permission will be granted for a new railway station at a suitable location on land west of Ramsgate alongside the existing railway line. Landwest of Cliffsend (shown on Map 15) is safeguarded for this purpose. Proposals will be required to specifically demonstrate all of the following: 1) Satisfactory vehicular access arrangements from East Kent Access 2) Suitable level of car parking 3) Integration with wider public transport services 4) Mitigation of any noise impacts on sensitive receptors 5) Compatibility with the landscape character of its location 6) Located to minimise the loss of best and most versatile agricultural land
12	Green Infrastructure	Policy GI01	**Locally Designated Wildlife Sites** Development which would have a detrimental impact on locally designated wildlife sites will not be permitted unless suitable mitigation can be provided either on or off site within Thanet. Exceptionally, where a strategic need for a proposed development is identified which outweighs the importance of the locally designated sites and cannot be located elsewhere, an equivalent area of habitat will be created elsewhere at a suitable location well related to other existing habitats. Wherever possible and appropriate, new developments will include measures to enhance and connect locally designated wildlife sites.

12	Green Infrastructure	Policy GI03	**Protected Species and other Significant Species** On sites where protected species or farmland birds may be present, the Council will require a Protected Species survey to be carried out alongside any development proposals. Any mitigation necessary should be carried out in line with Natural England's Standing Advice.
12	Green Infrastructure	Policy GI06	**Landscaping and Green Infrastructure** When a development proposal requires a design and access statement, it will include a landscape survey. The landscape survey should describe the current landscape features on the application site, and demonstrate how the proposed development will provide landscaping and green infrastructure to enhance the setting of the development, where possible and appropriate, to: • Create an attractive environment for users and occupiers • Establish a sense of enclosure with hedges and trees • Soften hard building lines and the impact of new buildings • Provide screening from noise and sun • Create new wildlife corridors and stepping stones • Create new wildlife habitats and improve biodiversity The Council will require to be satisfied that the developer has made adequate arrangements to ensure continued maintenance of landscaping, and may seek to secure arrangements for this purpose by entering into a planning agreement.
13	Quality Development	Policy QD01	**General Design Principles** The primary planning aim in all new development is to promote or reinforce the local character of the area and provide high quality and inclusive design and be sustainable in all other respects. Development must: 1) Relate to the surrounding development, form and layout and strengthen links to the adjacent areas. 2) Be well designed, respect and enhance the character, context and identity of its location; particularly in scale, massing, rhythm and use of materials appropriate to the locality. 3) Be of a density, layout, scale, mass and design appropriate to the development itself and compatible with neighbouring buildings and spaces. 4) Incorporate a high degree of permeability for pedestrians and cyclists, consider access for public transport and provide safe and satisfactory means of pedestrian and vehicle access including provision for disabled access. 5) Improve people's quality of life by creating safe and accessible environments, and promoting public safety and security. Residential development on garden land will be permitted if it will make a positive visual contribution to the area, the intrinsic value of the site as an open space is not considered worthy of retention, and will not

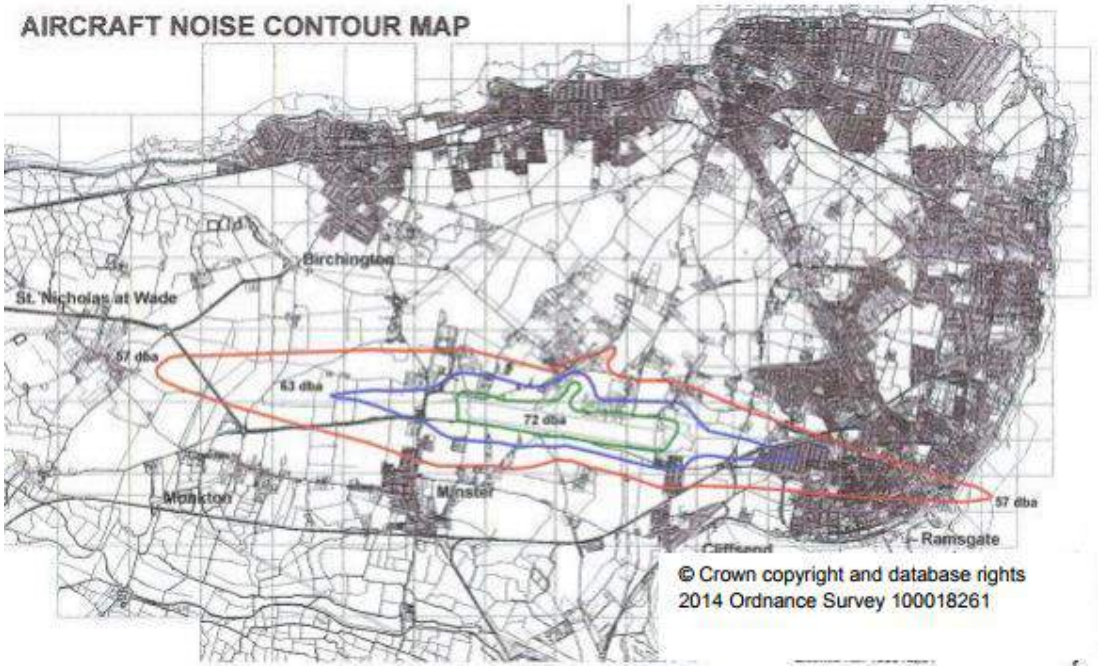
			conflict with any other requirements of other design policies. External spaces, landscape, public realm, and boundary treatments must be designed as an integral part of new development proposals and coordinated with adjacent sites and phases. Development will be supported where it is demonstrated that: 6) Existing features including trees, natural habitats, boundary treatments and historic street furniture and/or surfaces that positively contribute to the quality and character of an area are should be retained and protected where appropriate. 7) An integrated approach is taken to surface water management as part of the overall design. 8) A coordinated approach is taken to the design and siting of street furniture, boundary treatments, lighting, signage and public art. 9) Trees and other planting are incorporated, appropriate to both the scale of buildings and the space available.
13	Quality Development	Policy HE01	**Archaeology** The Council will promote the identification, recording, protection and enhancement of archaeological sites, monuments and historic landscape features, and will seek to encourage and develop their educational, recreational and tourist potential through management and interpretation Developers should submit information with the planning application that allows an assessment of the impact of the proposal on the significance of the heritage asset. Where appropriate the Council may require the developer to provide additional information in the form of a desk-based or field assessment. Planning permission will be refused without adequate assessment of the archaeological implications of the proposal. Development proposals adversely affecting the integrity or setting of Scheduled Monuments or other heritage assets of comparable significance will normally be refused. Where the case for development which would affect an archaeological site is accepted by the Council, preservation in situ of archaeological remains will normally be sought. Where this is not possible or not justified, appropriate provision for investigation and recording will be required. The fieldwork should define: (a) The character, significance, extent and condition of any archaeological deposits or structures within the application site; (b) The likely impact of the proposed development on these features; (c) The means of mitigating the effect of the proposed development. Recording should be carried out by an appropriately qualified archaeologist or archaeological contractor and may take place in advance of and during development. No work shall take place until a specification for the archaeological work has been submitted and approved by the Council. Arrangements must also be in place for any necessary post-excavation assessment, analysis and publication of the results, and deposition of the archive in a suitable, accessible repository.

		Policy HE03	**Local Heritage Assets** The Council supports the retention of local heritage assets, including buildings, structures, features and gardens of local interest. Local Heritage assets will be identified in a Local List as part of the Heritage Strategy. Once adopted where permission is required, proposals will be permitted where they retain the significance, appearance, local distinctiveness, character or setting of a local heritage asset.
15	Climate Change	Policy CC01	**Fluvial and Tidal Flooding** The sequential test and exception test as set out in the NPPF will be applied to applications for development within identified flood risk areas. Development proposals in these areas will need a Flood Risk Assessment to be carried out by the developer.
15	Climate Change	Policy CC02	**Surface Water Management** New development will be expected to manage surface water resulting from the development using sustainable drainage systems (SUDS) wherever possible. SUDS design should be considered as an integral part of the masterplanning and design process for new development. Proposals for SUDS at sites within the Groundwater Source Protection Zone as shown on Map 19, or sites near the Groundwater Source Protection Zone, must demonstrate that the methods used will not cause detriment to the quality of the groundwater. Sites identified as a Tidally Sensitive Area (as identified in surface water management plans) will need to incorporate Sustainable Drainage Methods and a maintenance schedule where appropriate, at the design stage of a planning application, and a Flood Risk Assessment will be required before planning permission can be granted.
15	Climate Change	Policy CC04	**Sustainable Design** All new buildings and conversions of existing buildings must be designed to reduce emissions of greenhouse gases and function in a changing climate. All developments will be required to: 1) achieve a high standard of energy efficiency in line with most recent government guidance; 2) make the best use of solar energy passive heating and cooling, natural light, natural ventilation and landscaping. All new buildings and conversions of existing buildings must be designed to use resources sustainably. This includes, but is not limited to: 3) re-using existing buildings and vacant floors wherever possible; 4) designing buildings flexibly from the outset to allow a wide variety of possible uses; 5) using sustainable materials wherever possible and making the most sustainable use of other materials; 6) minimising waste and promoting recycling, during both construction and occupation.

			New developments must provide safe and attractive cycling and walking opportunities to reduce the need to travel by car.
16	Safe and Healthy Environment	Policy SE01	**Potentially Polluting Development** Development with potential to pollute will be permitted only where: 1) Applicable statutory pollution controls and siting will effectively and adequately minimise impact upon land use and the environment including the effects on health, the natural environment or general amenity resulting from the release of pollutants to water, land or air or from noise, dust, vibration, light, odour or heat; and In determining individual proposals, regard will be paid to: 2) The economic and wider social need for the development; and 3) The visual impact of measure needed to comply with any statutory environmental quality standards or objectives. Permission for development which is sensitive to pollution will be permitted only if it is sufficiently separated from any existing or potential source of pollution as to reduce pollution impact upon health, the natural environment or general amenity to an acceptable level, and adequate safeguarding and mitigation on residential amenity.
		Policy SE03	**Contaminated Land** Development proposals that would enable contaminated sites to be brought into beneficial use will normally be permitted, so long as the sites can be rendered suitable for the proposed end use in terms of the impact on human health, public safety and the environment, including underlying groundwater resources. Development on land known or suspected to be contaminated or likely to be adversely affected by such contamination will only be permitted where: 1) An appropriate site investigation and assessment (agreed by the Council) has been carried out as part of the application to establish whether contamination is present and to identify any remedial measures necessary to ensure that the site is suitable for the proposed end use; 2) The proposed remedial measures would be acceptable in planning terms and would provide effective safeguards against contamination hazards during the development and subsequent occupation of the site. Planning conditions will be attached to any consent to ensure that remedial measures are fully implemented. In the case of sites where contamination is only considered to be a possible risk, a site investigation will be required by condition. Sites where contamination is believed to have been removed or where the full site history is unknown should not be able to be considered as contaminated land

		Policy SE04	**Groundwater Protection** Proposals for development within the Groundwater Source Protection Zones identified on Map 19 will only be permitted if there is no risk of contamination to groundwater sources. If a risk is identified, development will only be permitted if adequate mitigation measures can be implemented. Proposals for Sustainable Drainage systems involving infiltration must be assessed and discussed with the Environment Agency to determine their suitability in terms of the impact of any drainage into the groundwater aquifer.
		Policy SE05	**Air Quality** All major development schemes should promote a shift to the use of sustainable low emission transport to minimise the impact of vehicle emissions on air quality, particularly within the designated Urban Air Quality Management Area. Development will be located where it is accessible to support the use of public transport, walking and cycling. Development proposals that might lead to a significant deterioration in air quality or an exceedence of air quality national objectives or to a worsening of air quality within the urban Air Quality Management Area will require the submission of an Air Quality Assessment, which should address: 1) The cumulative effect of further emissions; 2) The proposed measures of mitigation through good design and offsetting measures that would prevent the National Air Quality Objectives being exceeded or reduce the extent of the air quality deterioration. These will be of particular importance within the urban AQMA, associated areas and areas of lower air quality. Proposals that fail to demonstrate these will not be permitted.
		Policy SE06	**Noise Pollution** In areas where noise levels are relatively high, permission will be granted for noise-sensitive development only where adequate mitigation is provided, and the impact of the noise can be reduced to acceptable levels. Development proposals that generate significant levels of noise must be accompanied by a scheme to mitigate such effects, bearing in mind the nature of surrounding uses. Proposals that would have an unacceptable impact on noise-sensitive areas or uses will not be permitted.
		Policy SE08	**Aircraft Noise** Applications for noise sensitive development or redevelopment on sites likely to be affected by aircraft noise will be determined in relation to the latest accepted prediction of existing and foreseeable ground noise measurement of aircraft noise. Applications for residential development will be determined in accordance with the following noise exposure categories:

Map 20 - Aircraft Noise Contour Map



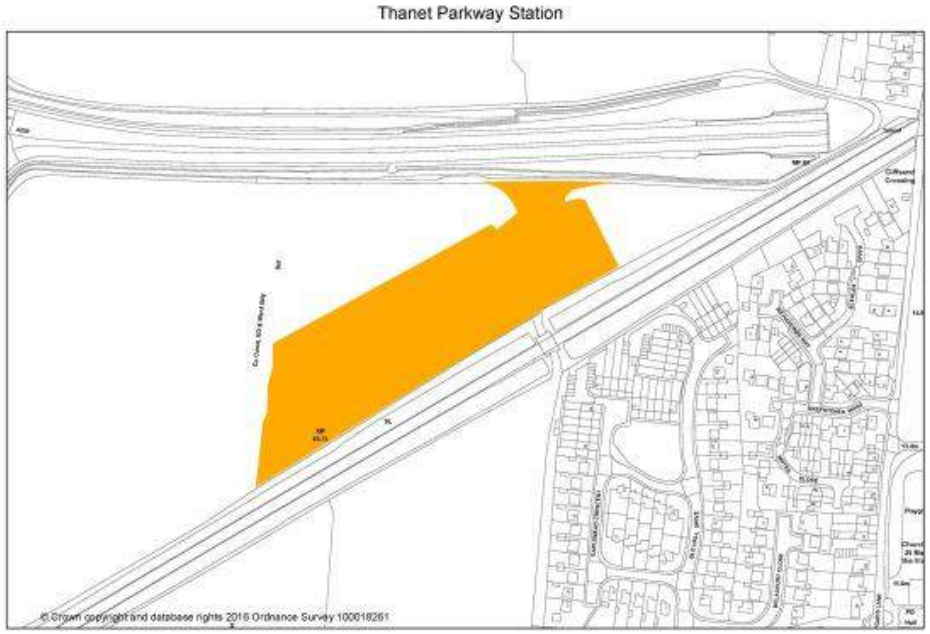
Nec	Predicted aircraft noise levels (dbl aeq.0700-23.00)	
A	<57	Noise will not be a determining factor
B	57-63	Noise will be taken into account in determining applications, and where appropriate, conditions will be imposed to ensure an adequate level of protection against noise.
C	63-72	Planning permission will not be granted except where the site lies within the confines of existing substantially built-up area. Exceptionally, where residential development is granted, conditions will be imposed to ensure an adequate level of protection against noise.
D	>72	Residential development will not be permitted.

<table>
<tr><td></td><td></td><td>Policy SE09</td><td>Aircraft Noise and Residential Development
When planning consent is granted for residential development on any land expected to be subject to a level of aircraft noise of above 57db(a)**, such consent will be subject to provision of a specified level of insulation to achieve a minimum level of sound attenuation in accordance with the following criteria:
<table><tr><th>NEC</th><th colspan="2">Predicted Aircraft Minimum Noise Levels Attenuation required (dB(A) (frequency range 100-3150 Hz)</th></tr><tr><td>A</td><td><57</td><td>No attenuation measures required</td></tr><tr><td>B</td><td>57-63</td><td>20dB</td></tr><tr><td>C</td><td>63-72</td><td>30dB</td></tr></table>** LAeq 57dB 07.00-23.00</td></tr>
<tr><td></td><td></td><td>Policy SE10</td><td>Light Pollution
Development proposals that include the provision of new outdoor lighting should be designed to minimise light glare, light trespass, spillage and sky glow in order to preserve residential amenity, the character of the surroundings and prevent disturbance to wildlife. A Landscape and Visual Impact Assessment will be required for proposed developments that fall in to the E1 category. Proposals that exceed the Institute of Lighting Professionals standards will not be permitted.</td></tr>
<tr><td>18</td><td>Transport</td><td>Policy TP01</td><td>Transport Assessments and Travel Plans
Development proposals which the Council considers would have significant transport implications shall be supported by a Transport Assessment and where applicable a Travel Plan. These should show how multi-modal access travel options will be achieved, and how transport infrastructure needs arising from the expected demand will be provided.</td></tr>
<tr><td>18</td><td>Transport</td><td>Policy TP02</td><td>Walking
New development will be expected to be designed so as to facilitate safe and convenient movement by pedestrians including people with limited mobility, elderly people and people with young children. The Council will seek to approve proposals to provide and enhance safe and convenient walking routes including specifically connection to and between public transport stops, railway stations, town centres, residential areas, schools and other public buildings.</td></tr>
<tr><td>18</td><td>Transport</td><td>Policy TP03</td><td>Cycling
The Council will seek the provision at the earliest opportunity of a network of cycle routes. Development that would prejudice the safety of existing or implementation of proposed cycle routes will not be permitted. New development will be expected to consider the need for the safety of cyclists and incorporate facilities for cyclists into the design of new and improved roads, junction improvements and traffic management proposals. Substantial development generating travel demand will be expected to provide convenient cycle parking and changing facilities. New residential development will be expected to provide secure facilities for the parking and storage of cycles.</td></tr>
</table>

18	Transport	Policy TP04	**Public Transport** Development proposals will be expected to take account of the need to facilitate use of public transport. The Council will seek to approve proposals consisting of or incorporating: 1) improvement of passenger and waiting facilities 2) measures to improve personal security 3) improved accessibility for people with mobility limitations 4) bus/rail interchange facilities 5) secure cycle storage
18	Transport	Policy TP06	**Car Parking** Proposals for development will be expected to make satisfactory provision for the parking of vehicles. Suitable levels of provision will be considered in relation to individual proposals taking account of the type of development, location, accessibility, availability of opportunities for public transport, likely accumulation of car parking, design considerations and having regard to the guidance referred to below: 1) In considering the level of parking provision in respect of proposals for residential development (use class C3), the Council will refer to the guidance provided in Kent Design Review: Interim Guidance Note 3 - Residential Parking. 2) In considering the level of parking provision in respect of proposals for other development, the Council will refer to the indicative guidance in Appendix E. Where the level of provision implied in the above guidance would be detrimental to the character of a conservation area or adversely affect the setting of a listed building or ancient monument then a reduced level of provision may be accepted. Within the town centres of Margate, Ramsgate and Broadstairs (as defined on maps 27, 28 and 29) new development proposals will not be required or expected to provide onsite car parking spaces. Where feasible such proposals
18	Transport	Policy TP08	**Freight and Service Delivery** New development proposals will be expected to demonstrate adequate off street servicing.

Proposed Revisions to the Local Plans (Preferred Options) (2017)			
2	Former Airport Site	Policy SP05	**Former Airport Site** Land is allocated for a mixed use settlement at the site of the former Manston Airport as defined on the policies map. The site has the capacity to deliver at least 2,500 new dwellings, and up to 85,000sqm employment and leisure floorspace. The overarching principle of development of this settlement is the creation of a single sustainable settlement that can be easily served by public transport and with good, easily walkable access to central community services and other facilities. Contributions will be required to meet the following provisions and proposals will be judged and permitted only in accordance with a development brief and comprehensive masterplan for the whole site detailing: • How the requirements of the Transport Strategy will be met including the upgrade of Manston Court Road and improvements to Spitfire junction. • The relationship to the Parkway Station and Ramsgate Port including a southern bypass of Manston village and a direct link from the site to the A299 roundabout linking with the southbound dual carriageway. • A travel plan to include a public transport strategy linking the site to existing services, demonstration of how the site links with and relates to neighbouring settlements; • Key routes for traffic-calming measures • Coherent phasing and evidence of deliverability • A business plan to demonstrate how the employment will be delivered, and how it will relate and link to Manston Business Park • The provision of a District Centre to meet the retail need of the development, fit within the retail hierarchy and serve the appropriate catchment, as well as provision of complementary uses such as community business space and leisure uses/recreational facilities. • Provision of community facilities as outlined in the Infrastructure delivery plan (IDP) including a primary school facility at 4 forms of entry, and a Doctors Surgery A Landscape and Visual Impact Assessment to address • the visual sensitivity of the site focussing on retention of open space and protecting wide open landscape and strategic views; • how new built development will be designed to minimise visual impact on the open landscape of the central island. Particular attention must be given to roofscape for the purposes of minimising the mass of the buildings at the skyline when viewed from the south.

			• Design and Heritage statements to include: • An appropriate landscaping scheme, to be designed and implemented as an integral part of the development. • Provision of 31.77 Ha open space in accordance with Table 7 as required by Policy GI04, and integrated green infrastructure to include walking, cycling and equestrian routes and facilities • A buffer between the development and Manston Village. Settlement separation between the villages of Manston, Minster, Cliffsend and Acol and Thanet Urban Area • Pre design archaeological assessment • Links to the sites heritage to support tourism in Thanet, including consideration of proposals that would permit a limited element of aviation use • Detail as to how the runway will be incorporated into the development scheme and what functions it will serve. • Provision of surface water management/sustainable drainage schemes that will not contaminate groundwater sources, and any proposed initiatives that will improve the condition of the groundwater Development proposals must: • Provide an appropriate mix of dwellings to meet the requirements of Policy SP18 • Provide affordable housing to meet the requirements of Policy SP19 (nb. Policy SP19 is being amended to request affordable housing for more than 10 units) • Provide one electric car charging point for every 10 parking spaces provided • Consider accommodating any self-build requirements included in the self-build register • Contribute towards the Strategic Access Management and Monitoring scheme to meet the requirements of SP25 • Include an assessment of the sites functionality as a roosting or feeding resource for the interest features of the Thanet Coast and Sandwich Bay SPA Protection Area, including areas within 400m of the development sites boundary, and provide mitigation where necessary • Retain existing boundary features where possible • Provide a connection to the sewerage system at the nearest point of adequate capacity, in collaboration with the service provider • Allow future access to the existing water supply infrastructure for maintenance and upsizing purposes • Provide for the installation of digital infrastructure • Provide a Statement of Social Impacts addressing any needs for community facilities identified in the Infrastructure Delivery Plan

7	Thanet Parkway Station	SP39 and Map 15	The proposed location of the Thanet Parkway Station site has been revised, the wording for Policy SP39 remains unchanged. 
8	New Strategic Routes Policy	New Strategic Routes Policy	**Strategic Policy - Strategic Routes** The following areas, as shown on the Policies Map, are safeguarded for the provision of key road schemes and junction improvements, to support the implementation of the Thanet Transport Strategy, including land at: 1. B2050 Manston Road (from Manston Manston Court Road to Spitfire Junction) 2. B2190 Spitfire Way (from Spitfire Junction to Columbus Avenue Junction)

Thanet District Council

Matter Statement

Matter 10 – Economic Development (Policies SP02-SP04 and E01-E03)

Issue 1 – Economic Growth – Policy SP02

Q1. Is the target of 5,000 additional jobs justified? How has it been calculated, and how much of this will be achieved from development proposals in the Plan?

This was calculated by Experian in the Economic and Employment Assessment from 2012. This report looked at what sectors of the economy were likely to grow over the plan period using BRES information. The report put forward three growth scenarios:

- Risk based - 1,200 jobs
- Baseline - 3,100 jobs
- Policy On - 5,100 jobs

These different scenarios were assessed through the SA and were subject to consultation. The Council selected a level between baseline and policy on along with an element of growth expected from the airport site (assumed 240). More information on the methodology for calculation can be found the in the Economic development in Thanet (Employment Land Update and Economic Needs Assessment) July 2018 (EDIT) (CD2.2), the Economic and Employment Assessment 2012 (CD2.6) and in the Employment Topic Paper 2013 (CD2.7).

Comparing this alongside Labour supply methods (two different methods suggested 5,800 (KCC) and 4,800 (GL Hearn)) led to the conclusion that the amount of jobs planned for was about right.

The Experian report tells us there has been growth in low carbon goods and services, renewable energy, advanced manufacturing and service businesses. These sectors are likely to deliver job growth over the plan period and and sufficient employment land is allocated to accommodate this.

However only 30% of predicted future job growth is expected to be located the B sectors traditionally found on business parks and therefore an element of flexibility is needed on our employment land. This is reflected in the Plan.

Tourism is expected to grow over the plan period and is facilitated by the policies in Chapter 9 Tourism.

Evidence suggests home working is particularly high in Thanet and therefore Policy E02 seeks to encourage this.

The Job growth strategy section of the plan starting on page 17 explains which sectors of the economy are likely to grow and how the plan is responding to this. The Plan was written and allocations made to ensure that there was adequate land and flexibility to achieve the 5,000 jobs.

Q2. How does this compare to past performance?

The BRES figure for total employees in 2011 was 39,700 and in 2017 This had increased to 42,000 meaning that 2,700 of the 5000 jobs have already been delivered.

The Council only has BRES information which dates back to 2009. It showed total employees for Thanet was 39,300. However, according to the “In Employment” figures produced by ONS, in December 2004 the figure was 56,000 falling to 49,000 in December 2011 rising again to 61,800 in September 2018 (the latest figure). These figures should be treated with caution as they include

individuals on government supported training and employment programmes, and those doing unpaid family work.

Q3. How does the number of additional jobs planned for correlate to the housing requirement under Policy SP11? Are the strategies for housing and economic development aligned?

According to the Update Assessment of Objectively Assessed Housing Need 2017:

[The new OAN of 17,140 dwellings] would support workforce growth of between 6,050 (based on employment rates remaining static) to 9,700 (with increasing numbers of older persons in the workforce based on later retirement) over the plan period. Economic forecasting is an inexact science, but forecasts show growth of between 1,200 – 5,100 additional jobs. Taking account of commuting dynamics and the potential for some people to hold down more than one job, this would require an increase in the resident workforce of up to 5,600 over the plan period.

There is, therefore, headroom in both the housing land supply and the employment land supply to accommodate the higher jobs figure and, therefore, the housing land and economic development strategies are aligned.

Q4. The Economic Development in Thanet (Employment Land Update and Economic Needs Assessment) states that the past take-up of employment land averages 10,446 square metres per annum. How is this translated into a forecast for future employment land?

The average employment land take up over a 10 year period between 2006 (year of adoption of the current Thanet Local Plan) and 2016 (year of calculation) was 10,446sqm. This yearly average was then multiplied by the number of remaining years in the plan period (15 years) giving floorspace requirements to the end of the plan period based on past take up rates of 156,990sqm or 15.7ha. See Table on page 32 of the EDIT (CD2.2) for a break down of the use classes.

Q5. Is the use of past take-up rates robust, considering that it covers a post recession period up to 2016?

It is acknowledged that the past take up calculation covers a period of national recession; however, looking at past take up rates is only one of the methods of forecasting future employment land requirements. The EDIT report also looked at labour demand and labour supply to assess need for employment land. Labour demand came out with a figure of between 3ha and 15ha (closer to 15 based on the preferred option selected), the labour demand technique came up with a range approximately between 12ha and 15ha and the past take up methodology came up with a figure of 15.7ha of employment land. The three techniques were then compared to establish the most appropriate floorspace figure by cross checking and therefore validating the figure. It was considered that the figure of 15ha was the employment land figure to plan for.

This reflects the methodology suggested in the national Planning Policy Guidance.

Q6. The Economic Development in Thanet (Employment Land Update and Economic Needs Assessment) concludes that based on past trends and labour supply calculations, the land supply to be planned for should be 15 hectares. In contrast, Policy SP02 plans for 53.5 hectares of employment land. What is the justification for this difference?

It is acknowledged that the amount of land represents an oversupply of employment land, the justification for which is outlined in the EDIT report on page 53.

Q7. What are the implications of this? If taken up, will there be enough housing to support the development of allocated sites? Will there be an appropriate balance between workers and homes?

Thanet's employment oversupply largely comes from Manston Business Park which has approximately 40ha of land remaining undeveloped. The eastern part of the site isn't currently serviced with utilities and this needs to be overcome to unlock development. Given the constraints the site is expected to be delivered over a number of years spanning beyond the plan period and therefore it is considered the number of homes will be sufficient. We don't expect the oversupply to be fully built out within the plan period.

In addition and as outlined in the answer to Question 3 of this matter there is headroom in the housing land supply to accommodate a higher jobs figure.

Q8. What provision does the Plan make to support creative industries across Thanet? Is the Plan consistent with paragraph 21 of the Framework in this regard which seeks to plan positively for the location, promotion and expansion of clusters or networks of knowledge driven, creative or high technology industries?

The plan references the Economic Growth Strategy (November 2016) which identifies a number of transformational initiatives to focus on in order to deliver employment growth. 'Cultivating the creative industries across Thanet' is one of these initiatives listed in the Job Growth Strategy section of the Local Plan on page 19. Creative industries can be accommodated in Thanet's town centres including in within Margate Old Town, which is a primary location for creative industries, Margate Seafront and Harbour Arm, Ramsgate Waterfront and Royal Harbour and Broadstairs Promenade and Beach Front as well as the opportunity areas. Cultural and creative industries can also be accommodated on our flexible employment sites and high technology industries can accommodated on all of Thanet's employment sites. It is considered that this is consistent with paragraph 21 of the NPPF.

Issue 2 – Land Allocated for Economic Development – SP03

Q1. How were the four allocated sites identified? What factors were considered in deciding whether to allocate sites under Policy SP03?

The sustainability appraisal tested a number of options for the allocating employment land. The options of selecting sites from our current supply, providing a buffer, allowing flexibility and applying policy protection scored best.

Following on from this, the existing allocated sites were rescored for their suitability, availability and achievability along a similar line to that in the Employment Land Survey 2010 and further to this their compatibility with the allocation strategy was considered and a recommendation given as to whether this should form part of the supply. This is documented within the EDIT report (CD2.2)

Q2. Were any other locations considered as suitable alternatives?

The sustainability appraisal tested a number of spatial options for delivering the employment land requirement. These were use of existing supply of allocated sites, a variety of sites across the

District, a single site/cluster and allowing for other uses on our employment sites. It concluded that selecting sites from the current allocated supply and allowing other uses on employment sites was the most sustainable option.

Given Thanet's employment land oversupply paragraph 22 of the NPPF the onus was on deallocating unsuitable sites and reallocating, where appropriate, for housing.

The Employment Land Review 2010 recommended a number of new sites for allocation but these were not taken forward for allocation given the conclusions of the sustainability appraisal and the National Planning Policy Framework.

Q3. How much land is available at each of the four allocated sites, and are they developable within the plan period?

The table below is adapted from the one supplied in response to the Initial questions and shows remaining land available at each site less extant permissions. This provides some insight into deliverability of sites.

Site	Total Site Area (ha)	Remaining Employment Allocation (ha)	Amount of land covered by extant planning consents at January 2019	Available land less extant consents
Manston Business Park	75.2	42.53	13,393sqm 1.34ha	41.19
Eurokent	38.6	5.45	5.45ha	0
Thanet Reach	9.74	3.7	0	3.7
Hedgend	2.46	1.61	0	1.61
TOTAL	126	53.29	6.79ha	46.5ha

It is considered that all but Manston Business Park (MBP) are developable within the plan period. Manston Business Park due to its size and infrastructure issues is likely to be developed beyond the horizon of this Local Plan. That said it is notable that a further 5,468sqm on MBP is the subject of current planning applications.

Q4. Paragraph 6.8 of the Economic Development in Thanet (Employment Land Update and Economic Needs Assessment) concludes that Thanet Reach South should no longer be allocated for employment purposes. How does this differ from Thanet Reach North?

Thanet Reach North is already partially developed with some business units and the Christ Church University campus. There was also a previous application from East Kent College for a further education college campus on the site although this has expired. The southern section of the Thanet Reach site (south of Millennium Way) is undeveloped and was considered that this could contribute to the Housing Land Supply. It was considered that the northern part of the site given its existing character has the potential for small business units and is in a sustainable edge of town centre location. The Council is currently exploring the business potential of the site by requesting marketing information from the owners of the site as part of pre application advice.

Q5. What is the justification for restricting development to Use Classes B1, B2 and B8 at Manston Business Park and Hedgend Industrial Estate, but having a more flexible approach elsewhere?

Introducing flexible uses to employment sites can bring about conflict particularly if the use generates regular car visits. It is important that traditional employment uses are not compromised by incompatible flexible uses that could lead to statutory noise and nuisance complaints or highway safety issues.

It was considered that the sites closer to town centres and centres of population such as Thanet Reach and Eurokent were more suitable for flexible uses. The more remote sites such as Manston Business Park and Hedgend containing traditional employment uses are less compatible with flexible uses.

Q6. Is it clear to decision-makers, developers and local communities what uses will be permitted at Eurokent and the Thanet Reach Business Park? Is the policy effective in this regard?

The Policy states what uses will be allowed on each site.

It may be helpful to include the wording of paragraph 7.3 (supporting text from Policy E01) under Policy SP03 to explain flexible uses.

Flexible uses include leisure, tourism and other town centre uses which, due to scale and format cannot be accommodated within town centres. They also include uses known as sui generis which do not fall into a category in the Use Classes Order. These include uses such as car showrooms and crèches.

Issue 3 – Retention of Existing Employment Sites – Policy E01

Q1. Is Policy E01 consistent with paragraph 22 of the Framework which states that planning policies should avoid the long term protection of sites allocated for employment use where there is no reasonable prospect of a site being used for that purpose?

Yes, in accordance with the NPPF the Council undertook a thorough review of all allocated employment sites. As part of this process employment land amounting to 31.59ha was deallocated and many of the sites were reallocated as housing sites. This is documented in the EDIT (CD2.2)

The Council will continue to review this regularly.

Q2. Is it clear to decision-makers, developers and local communities how proposals for alternative uses of land and buildings on the sites listed under Policy E01 will be considered?

The policy is intended to retain the sites listed for employment uses and where specified flexible employment generating uses. Flexible uses are limited to specific sites which due to their character are more suited to accommodating flexible uses. However, the policy seeks to ensure that development is compatible with neighbouring uses. For example a leisure use that attracts a large

volume of traffic would not be compatible adjacent to a warehouse/distribution use with regular HGV movements.

Q3. What is the list of sites under Policy E01(2) based on?

These were all sites from the current employment land supply. An assessment of employment sectors and growth potential was carried out by Experian and based on this sites were reassessed as to whether they contributed to the allocation strategy. As part of this process approximately 30 hectares of employment land has been deallocated with much of this reallocated for housing land.

Q4. How will decision-makers, developers and local communities consider development proposals which involve existing employment land and buildings not listed under Policy E01(2)?

Proposals which involve employment land or buildings not listed will be judged upon their merits and policies within the plan. In accordance with paragraph 22 of the NPPF there will be no in principle objection to a change of use away from employment.

Exceptional employment generating development not located on allocated sites will be supported by Policy SP02 which supports employment generating development.

Q5. What policies support proposals for economic development on non allocated, windfall sites? Does the Plan include specific criteria for decision makers, developers and local communities to follow?

Paragraphs 1.22 to 1.25 outlines the Plan's employment aspirations and expresses a commitment to supporting employment generating development.

Policy SP02 is supportive of new employment generating development in the town centres, new tourism development in general, and new economic development in the rural area. Strategic Priority 1 of the Plan is to create additional employment and training opportunities, to strengthen and diversify the local economy and improve local earning power and employability.

Policy E02 supports home working. Policies E04 and E05 guides development in and on the edge of town centres. Chapters 9 and 10 cover new economic development relating to tourism and in the rural area. New economic development not related to any of the areas will be dealt with on their merits using the policies in the plan such as in the design chapter.

The fourth paragraph of the policy does not read well. The following modification is proposed for the Inspectors' consideration.

Delete paragraph 4 of Policy SP02 and replace with:
"Thanet's town centres are priority areas for regeneration. Employment generating development, including tourism and cultural diversification, will be encouraged.

Issue 4 – Home Working – Policy E02

Q1. In what instances might a proposal for home working require planning permission? Is it clear to decision-makers, developers and local communities when Policy E02 might apply?

It is acknowledged that persons who work from home may often do so without occasioning a material change of use. The policy aims to be supportive of home working as it has been shown to be important to Thanet's economy and is, therefore, supportive of a change of use if such a

change requires permission. The policy will apply, therefore, when the home working is at a scale that requires planning permission

Q2. Are the criteria sufficiently clear to decision-makers, developers and local communities? Is the policy effective?

The aim of the policy is to support home working proposals whilst ensuring that any potential impact is acceptable. It is considered that it is clear from the criteria what impacts the policy seeks to avoid.

Issue 5 – Digital Infrastructure - Policy E03

Q1. Is it clear to decision-makers, developers and local communities what is required of Policy E03? Is the policy effective?

This primarily refers to broadband connections but can include mobile telecommunications and other network infrastructure.

Policy E03 is designed to be supportive of digital infrastructure proposals subject to their impact on listed buildings and conservation areas. Kent County Council were concerned about conservation areas and listed buildings detracting from the importance of delivering digital infrastructure. In order to recognise this, the Council proposes to add some supporting text to the policy emphasising the importance of striking a balance between the importance of digital infrastructure and the conservation of heritage assets.

The following wording is suggested for the Inspectors' consideration:
The Council strongly supports the installation of digital infrastructure and considers that an appropriate balance needs to be struck when considering impacts on heritage assets, conservation areas and historic landscapes.

Q2. Is Policy E03 consistent with paragraphs 42-46 which seek to support the expansion of electronic communications networks, including telecommunications and high-speed broadband.

Yes the policy seeks to support high quality communications infrastructure. Policy QD07 deals specifically with telecommunications and reflects the NPPF.

Issue 6 - Manston Business Park – Policy SP04

Q1. What is the justification for having a separate policy for Manston Business Park, but not the other employment allocations in the Plan?

Manston Business Park is Thanet's flagship inward investment site and at 75 hectares in its entirety is considerably larger than the other employment allocations. Manston Business Park is in a highly visual location in a rural location in the centre of the District and located on the major road network. It is considered that the green infrastructure and soft landscaping elements of the policy do not apply to the other employment allocations due to their size and locations

Natural England were concerned about the impact on the rural character and asked that the policy reflect its rural location in their representation to the draft Preferred Options Plan in 2015.

Q2. What is the justification for allocating over 40 hectares of land at Manston Business Park? Will there be a demand for the allocated land over the plan period? If so, what evidence supports this?

Manston Business Park is the primary site for inward investment as it is centrally located adjacent to dual carriageway access to the M25, the former airport site and the Port of Ramsgate. The site is owned by East Kent Opportunities which is a joint venture between Kent County Council and Thanet District Council to bring forward economic growth and regeneration demonstrating a commitment to delivery. Manston Business park as a whole is 75.2 ha with approximately 42.53ha remaining undeveloped. Delivery of this large strategic site is considered to be beyond the horizon the of current emerging Local Plan especially as the eastern part of the site isn't currently serviced with utilities. Given the constraints the site is expected to be delivered over a number of years spanning beyond the plan period. The site is currently showing very positive signs of delivery and it is considered it would not constitute positive planning to deallocate the remaining parts of the site.

The economic needs assessment, allocation strategy and justification for the amount of land allocated can be found in the Economic Development in Thanet (Employment Land Update and Economic Needs Assessment) July 2018.

Q3. What is the justification for requiring development proposals at Manston Business Park to be accompanied by a Transport Assessment and Travel Plan? Is this appropriate for all development proposals, regardless of size?

The requirement for a cross reference to TP01 came about as a response to a representation from the then Highways Agency to the draft Preferred Options Plan in 2015. TP01 does apply to all development proposals regardless of their size.

Q4. In deciding to allocate the site for employment uses how have the cumulative effects of additional development on the local and strategic road network been considered?

The Transport Strategy mitigates against the cumulative impacts of additional development on the local and strategic road network. In particular and for Manston Business Park an extension of Columbus Avenue is proposed to link up with the inner circuit to alleviate impacts on the Spitfire junction and Acol village.

Issue 7 – Manston Airport – Policy SP04

Q1. What is the justification for including reference to Manston Airport alongside policies related to the allocation of employment land. Are paragraphs 1.38-1.45 intended to represent supporting text to Policy SP04?

The wording preceding Policy SP04 reflects the strategic location of the site both in relation to the primary road network and also the airport site. Whatever development occurs on the former Manston Airport site it is likely to have an effect on Manston Business Park.

The wording following Policy SP04 entitled “Manston Airport” 1.38 – 1.45 explains the Council’s approach to dealing with any future development on the site and replaces the supporting text to policy SP05 which related to the airport site.

Q2. What is the status regarding the proposed Nationally Significant Infrastructure Project? How does its timescales align with the Local Plan Examination?

The Local Plan Examination and NSIP are two separate processes and do not sit on the same days allowing people to participate in both.

Further NSIP hearings are due to take place on 18th to 22nd March 2019; and 4th to 7th June 2019 with the close of the examination scheduled for 9th July 2019.

The Planning Inspectorate must prepare a report on the application to the relevant Secretary of State, including a recommendation, within three months of the close of the six month Examination stage. The relevant Secretary of State then has a further three months to make the decision on whether to grant or refuse development consent.

Thanet Local Plan's examination hearings are due to run between 2nd-18th April and 21st-31st May 2019.

The Local Plan is sufficiently flexible to respond to the two possible outcomes from the Development Consent Order process with regard to the timescales in terms of policy/allocations.

Q3. What are the implications for the Plan should the Development Consent Order be approved?

If approved the Council will need to carry out an immediate partial review to ensure relevant aviation, environmental and housing land supply policies are adopted.

Due to the Secretary of States intervention measures the Plan is now subject to immediate review.

Q4. What are the implications for the Plan should the Development Consent Order be refused?

Paragraph 1.45 says that the Council will need to consider the best use for the site in the next Local Plan review after a minimum of two years.

Due to the Secretary of States intervention measures the Plan is now subject to immediate review.

Q5. If a Local Plan Review is required, is it clear to decision-makers, developers and local communities when this would happen? Is there a clear mechanism to ensure a timely review of the Plan if required?

If the DCO is made a partial review will be triggered immediately to include relevant aviation, environmental and housing land supply policies in the plan. If the DCO is not granted or does not proceed the plan will need to be reviewed after a minimum of 2 years.

Due to the Secretary of States intervention measures the Plan is now subject to immediate review.

Q6 Is it clear how a decision-maker would react to a proposal for new development at Manston Airport prior to a review of the Plan?

Pending a review of the Plan any application would be decided on its merits and in accordance with the plan as a whole once adopted. This would take into account the requirements of the NPPF 2018.

Q7. What is the justification for paragraph 1.44? If a Development Consent Order for aviation use is granted, what "housing land supply provisions" would need to be reviewed and why?

The Council raised concerns about the potential housing impacts arising from the job figures stated in the application (relevant representation submitted to PINS in October 2018 CD 2.8).

The report submitted by the applicants (RPS "Employment and Housing Land Technical Report" March 2018) indicates that no additional housing is required to support the new workforce up to 2031 (para 5.9).

However, this conclusion appears to be based on the capacity of housing sites submitted as part of the Strategic Housing Land Availability Assessment (SHLAA) process (Table 4.4), rather than sites actually allocated in the draft Local Plan (Table 4.6).

This suggests that additional housing sites would need to be allocated for the period of the draft Local Plan to 2031, and therefore a review of the housing land position would be required if the DCO is granted.

Q8. What are the implications of The Town and Country Planning (Manston Airport) Special Development Order 2019 No. 86 on the soundness of the submitted Local Plan and its strategy for the airport?

Question of whether cumulative effects of this have been considered in combination with our plan. We have not had sight of an HRA.

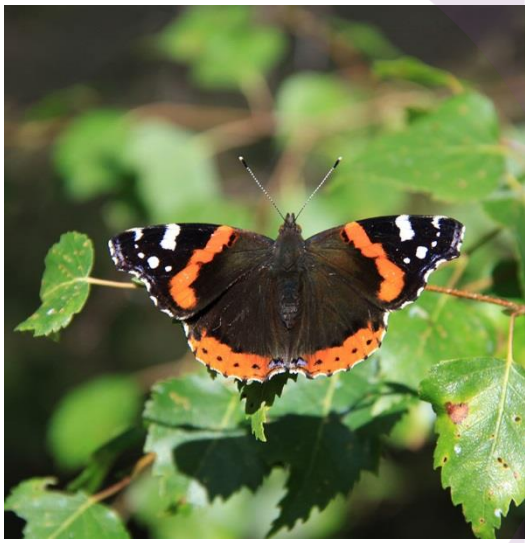
The Council is of the view that the Special Development Order for the Airport (2019 No. 86) is a temporary measure (ends December 2020) which is only likely to be activated in exceptional circumstances. This being the case, while there may be occasional traffic disruption associated with this activity, it does not prejudice the soundness of the overall Local Plan strategy, or the Council's position regarding the Airport, as set out in the draft Local Plan.

Appendix Ec.2.3

RiverOak Strategic Partners Limited

Manston Airport Development Consent Order

Winter Bird Surveys Report 2018-19



Wood Environment & Infrastructure Solutions UK Limited – May 2019

Report for

RiverOak Strategic Partners

Main contributors

Mike Raven

Issued by

[redacted]

Mike Raven

Approved by

[redacted]

Mark Linsley

Wood

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1. Introduction

1.1.1 Wood Environment and Infrastructure Solutions UK Limited (Wood) were commissioned by RiverOak Strategic Partners (RiverOak) to undertake a programme of winter bird surveys in 2018/19 for the proposed re-opening of Manston Airport in Kent (the proposed development). The purpose of this work is to provide supplementary information to support the DCO examination process on the level and type of use by qualifying species of the Thanet Coast and Sandwich Bay SPA and Ramsar site (and their constituent SSSIs) in the area surrounding the Order Limits for the proposed development (see **Appendix A** for details of the qualifying species for the statutory designated sites), and **Appendix B** for a full list of the species and their scientific name referred to in this report. The location of the Order Limits in relation to the statutory designated sites of ornithological importance is shown on **Figure 1.1**.

1.1.2 The survey programme has been designed to provide information to respond to the Relevant Representations (RRs) and other comments made by consultees, including Natural England (NE), RSPB (Royal Society for the Protection of Birds) and Kent Wildlife Trust (KWT), regarding Environmental Statement Chapter 7 Biodiversity (APP-033).

1.1.3 These surveys were undertaken to provide information to address the following consultee comments:

- The need to provide further, more site and population specific information on how golden plover, turnstone, grey plover, sanderling and ringed plover react to existing levels and types of disturbance (NE);
- The need to undertake nocturnal surveys to assess the level of use of farmland surrounding the Order Limits by golden plover at night (RSPB);
- The need to assess the effects of disturbance on golden plover up to 2km from the Order Limits (RSPB);
- The need to provide two seasons worth of data to base the assessment on (KWT and RSPB); and
- The need to provide information on the specific flight paths of golden plover over the Order Limits to assess the impact of disturbance on the SPA (KWT).

1.1.4 This report presents the methodology used and results of a suite of surveys undertaken from December 2018 to March 2019, as follows:

- Functional Habitat Survey, including;
  - Daytime (Winter bird) Walkover Survey; and
  - Nocturnal Walkover Survey;
  - Flight Line Survey.
- Pegwell Bay Surveys, including:
  - Waterbird Distribution Survey; and
  - Turnstone Survey.

1.1.5 The Pegwell Bay noise monitoring and waterbird disturbance survey are reported separately.

1.2 Background and Purpose of the Surveys

Functional Habitat Surveys

Day time and Nocturnal Walkover Surveys

1.2.1 There is the potential for the proposed development to have an adverse impact on golden plover using farmland close to the airport (deemed as functionally linked habitat to the Thanet Coast and Sandwich Bay SPA/ Ramsar site), due to noise and visual disturbance from aircraft in flight, and from bird scaring activities conducted at or in close vicinity of the airport runway.

1.2.2 NE (2016) defines functional linkage as "*the role or 'function' that land or sea beyond the boundary of a European site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such land is therefore 'linked' to the European site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status*."

1.2.3 Chapter 7 of the ES [APP-033] on Biodiversity details winter bird surveys undertaken in farmland out with and within approximately 1km of the airport boundary, once-monthly from September 2016 to March 2017 inclusive. The primary purpose of this survey was to obtain data on the level and type of use by golden plover during the day and at night, though other target and notable species were also recorded.

1.2.4 The numbers of golden plover occurring each winter on the functionally linked farmland adjacent to the Order Limits will be determined both by weather conditions in the UK and abroad, as well as the extent of suitable foraging habitat (primarily winter cereals, but also cereal stubbles, bare/ploughed land and permanent grassland.

Flight Line Survey

1.2.5 There is the potential for the proposed airport to present a barrier to the movement of golden plover between their foraging and roosting areas in Pegwell Bay and the functional habitat surrounding the airport. This barrier effect has the potential to result in birds having to travel further to their foraging and resting areas, resulting in a reduction of energy intake and/or an increase in energy expenditure leading to a reduction in survival or productivity rates. In response to this and KWT's comment, information has been collected on the flight movements of golden plover in the local area in relation to the Order Limits. The flight line surveys undertaken in winter 2019 will ascertain the level of flight activity over the Order Limits, and between the Pegwell Bay roost site and the Order Limits. The survey results will be used to support the assessment conclusion for barrier effects (in ES Chapter 7) and help to further identify potential foraging areas for golden plover.

Pegwell Bay Surveys

1.2.6 In view of Natural England's concerns about the effects of noise from aircraft flights on golden plover (and other target species) in Pegwell Bay, and the need to collect more site-specific information on how the key bird species respond to existing levels and types of disturbance, a suite of further surveys have been undertaken in Pegwell Bay in winter 2018/2019.

Waterbird Distribution Survey

1.2.7 A repeat of the Pegwell Bay Waterbird Distribution Survey has been carried out, in which a second winter of distribution data has been collected for species that form the qualifying interest of the

Thanet Coast and Sandwich Bay SPA/Ramsar site (golden plover and turnstone) and additional species that form the cited interest of the Sandwich Bay to Hacklinge Marshes SSSI (grey plover, sanderling and ringed plover).

Turnstone Survey

1.2.8 Turnstone are known to roost in important numbers in terms of the SPA along the northern shoreline of Pegwell Bay, this being the closest part of the Bay to the proposed aircraft flight path. In view of this, a targeted survey for turnstone has been undertaken in winter 2018/19 across a wider survey area (than that undertaken as part of the Pegwell Bay Waterbird Distribution Survey in winter 2016/17), extending east to Ramsgate Harbour.

2. Methodology

2.1.1 The surveys focussed on recorded the following target species that form the qualifying interest of the Thanet Coast and Sandwich Bay SPA/Ramsar site (golden plover and turnstone) and additional species that form the cited interest of the Sandwich Bay to Hacklinge Marshes SSSI (grey plover, sanderling and ringed plover).

2.2 Functional Habitat Survey

Daytime Walkover Survey

2.2.1 In order to collect further data on usage of the survey area by golden plover during the day, a Daytime Walkover Survey was undertaken from January to March 2019 inclusive that employed broadly the same methodology as that used for the 2016/17 survey (see Appendix 7.5 in ES Chapter 7. However, the survey intensity was increased from one to two visits per month, with each visit taking up to two days to complete. The primary aim of the survey was to search for golden plover using farmland and grassland in the day within the survey area, though all other species were recorded.

2.2.2 The survey area for the 2019 survey was extended from that used in 2016/17 (all farmland within 1km of the airport boundary) to include all farmland within the 1km of the Order Limits (excluding the route of the outfall to Pegwell Bay) as well as farmland 1km either side of the proposed aircraft flight path extending to approximately 4km to the west of the airport runway. As in 2016/17, land within the airport boundary was surveyed from its perimeter, though the airport itself remains unsuitable for golden plover due to the 'long grass' management regime being employed.

2.2.3 Within the survey area, the surveyor walked along publicly accessible tracks, roads and footpaths and counted any golden plover in each field from suitably placed vantage points with binoculars and a telescope. Each field/ plot of land within the survey area was given a unique 'Field Identification Number'. During the survey, any golden plover seen/heard were recorded with details of this field number, as well as the crop/ habitat type they were utilising, the numbers involved, their activity (foraging, loafing[1] or roosting), date, time and weather conditions. All other notable species[2] and/or potentially important congregations of other species were also recorded. **Figure 2.1** shows the survey area with field identification numbers.

Nocturnal Walkover Survey

2.2.4 In order to collect data on the usage of the survey area by golden plover at night, a Nocturnal Walkover Survey was carried out, involved twice-monthly visits from January to March 2019 inclusive, with each visit taking two nights to complete, undertaken by two surveyors working together. During each visit, the surveyors walked slowly along pre-determined transects (located along quiet country roads and public footpaths) and any golden plover recorded. All other species were also recorded and the same details as for the Daytime Walkover Survey were noted. The transect routes were chosen to cover a sample of the most potentially suitable areas of habitat for golden plover, focussing on fields of winter cereal but also including fields containing bare/

[1] Resting, active but alert

[2] Notable species: all species of water bird, birds of prey, species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), Annex I of the Birds Directive, species of principal importance listed on Section 41 of the Natural Environment and Rural Communities Act 2006 and BoCC red-listed species in Eaton *et al.* (2015).

ploughed land, cereal stubble and oilseed rape. Birds were detected by scanning fields using high-specification night vision equipment (FLIR BHS-XR Handheld Thermal Imaging Camera) and high-powered lamps. The location of the nocturnal survey transects are shown on **Figure 2.2**.

2.3 Flight Line Survey

2.3.1 In order to collect data on the level of flight activity of target species across the Order Limits, a single day of flight line survey was undertaken in December 2018 followed by twice-monthly surveys completed from January to March 2019 inclusive.

2.3.2 During each survey day, two surveyors completed three two-hour watches from three separate pairs of vantage points (VPs) positioned around the Order Limits. The locations of the VPs were determined during an initial survey setup visit in December and were located to ensure that flights of key species would be detectable over the Order Limits and between the airport boundary and Pegwell Bay.

2.3.3 During each two-hour watch, the flights lines of any golden plover (and other target species) were drawn onto maps, and details of the flights recorded on a separate data sheet, including a flight number unique for that watch, the number of birds involved, flight direction, date and time. The location of the seven VPs in relation to the Order Limits is shown on **Figure 2.3**.

2.4 Pegwell Bay Surveys

The Pegwell Bay Surveys included two main elements, described below.

Pegwell Bay Waterbird Distribution Survey

2.4.1 Survey to collect data on the distribution and numbers of target species in Pegwell Bay involved a single distribution survey visit in December 2018 followed by twice-monthly survey visits from January to March 2019 inclusive, with further twice-monthly survey visits planned for April and May 2019 (the results of which are not included in this interim report).

2.4.2 During each survey visit, the distribution, numbers and activity of the target species in Pegwell Bay were recorded at hourly intervals over a six-hour period by two surveyors working from two VPs (North and South respectively). The location, number and activity of the birds was recorded onto maps showing a 200 x 200m grid (based on the National Grid). Where possible, each six-hour survey was undertaken over a period that included a high tide. The location of the 200 x 200m grid and VPs are shown on **Figure 2.4**.

Turnstone Survey

2.4.3 In order to collect further data on the numbers of turnstone utilising the Pegwell Bay area, a single turnstone survey visit was undertaken in December 2018 followed by twice-monthly survey visits from January to March 2019 inclusive. The survey area included all suitable intertidal and other coastal habitats for turnstone within the northern half of Pegwell Bay and approximately within 1km of the proposed flight path for aircraft to the east of the Order Limits, including areas out with the SPA, such as Ramsgate Harbour. Each survey visit was undertaken over a five-hour period that included a high tide. During the survey, the surveyor scanned potentially appropriate turnstone habitat from suitable vantage points and recorded the location, numbers and activity of any turnstone located. The Ramsgate Harbour area was also walked and the locations of any turnstone recorded onto maps. The survey area is shown on **Figure 2.5**.

2.5 Survey Limitations

2.5.1 For the nocturnal walkover survey, due to access constraints, it was not possible to access all areas of farmland within a distance whereby all individual golden plover would be detected. In view of this, a sampling approach to the survey methods was employed, whereby the transects used for the nocturnal walkover survey covered fields that provided the most suitable habitat for foraging golden plover. The transect routes focussed on fields of winter cereal but also covered fields containing bare/ ploughed land, cereal stubbles and oilseed rape. It was considered that the data obtained from the nocturnal walkover surveys provided robust information on the levels of use by golden plover in the fields within the survey area.

3. Results

3.1 Functional Habitat Survey

Daytime Walkover Survey

3.1.1 Twice-monthly survey visits were undertaken in January, February and March 2019 (each taking two days to complete), the details of which (times, dates and weather conditions) are provided in **Table C.1** in **Appendix C**.

3.1.2 During the surveys, the following records of golden plover were noted:

- One record of four golden plover flushed from Field 50 (which contained winter cereal) on the northern perimeter of the survey area, approximately 1km north of the Order Limits and 2km north of the airport runway, on 24 January (see **Figure 3.1**).
- Two further records of golden plover were noted, including a flock of 200 birds circling high (more than 200m in altitude) over Field 8 (~1.6km west of the Order Limits and airport runway), also on 24 January, and;
- 12 birds flying east over Fields 32 and 34 (~200-500m south of the Order Limits and airport runway) on 5 February.

3.1.3 Full details of the records are provided in **Table D.1 in Appendix D**.

Nocturnal Walkover Survey

3.1.4 Twice-monthly survey visits were undertaken in January, February and March 2019 (each taking up to two nights to complete), the details of which (times, dates and weather conditions) are provided in **Table C.2 in Appendix C**.

3.1.5 The following records of golden plover were recorded during the six survey visits:

- Two birds flushed on 31 January from Field 8 (~1.6km west of the Order Limits and airport runway), which contained oilseed rape, and
- A single bird heard[3] calling on 31 January over Field 20 (adjacent to the west of the Order Limits and airport runway), also on 31 January (see **Figure 3.2**).

3.1.6 Full details of the records are provided in **Table D.2 in Appendix D**.

3.2 Flight Line Survey

3.2.1 A single survey was undertaken in December 2018 followed by twice-monthly survey visits completed in January, February and March 2019[4], the details of which (times, dates and weather conditions) are provided in **Table C.3 in Appendix C**.

3.2.2 During the surveys, a total of 23 flights of golden plover (of which eight crossed within the Order Limits) and one flight of grey plover (over the mudflats and saltmarsh in Pegwell Bay) were

[3] Though the precise number of birds could not be confirmed, the surveyor considered that the record related to a single calling bird, or at most, 2-3 individuals.

[4] The final survey was undertaken over a two period on 25-26 March by a single observer.

recorded. Results from the survey provided no indication of regular flights of golden plover between Pegwell Bay or farmland south of the airport and farmland to the north and west (and thus over the Order Limits). Much of the flight activity by golden plover was concentrated 500-1,500m south of the airport boundary. The were no records of golden plover taking off or landing within the Order Limits. However, the flight lines indicate that a flock of up to eight golden plover on 22 January and 38 on 29 January were foraging in fields to the south of Thorne Farm (approximately 700-1,200m south of the Order Limits), though the precise location of the birds could not be determined as the area was obscured by buildings and trees from the VP locations from which they were observed.

3.2.3 The flight lines for both golden plover (GP) and grey plover (GV) are shown on **Figure 3.3**, and full details of the records provided in **Table D.3 in Appendix D**. Those flights lines considered to potentially have involved golden plover alighting from or landing in fields within the survey area for the FHS are highlighted in bold, though the survey data cannot confirm this due to the presence of trees and buildings obscuring the view. These records likely relate to a single flock of birds seen on each survey date, with all or part of the flock being disturbed on several occasions during the survey day rather than involving separate (discrete) flocks of golden plover.

3.3 Pegwell Bay Surveys

Pegwell Bay Waterbird Distribution Survey

3.3.1 A single survey was undertaken in December 2018 followed by twice-monthly survey visits completed in January, February and March 2019, the details of which (times, dates and weather conditions) are provided in **Table C.4 in Appendix C**.

3.3.2 **Table 3.1** presents the peak number of each target species within the survey area recorded on each survey visit, with full details of all records provided in **Table D.4 in Appendix D**. The peak number of each target species in each 200m grid square is shown in **Figures 3.4a-d** for golden plover, turnstone, sanderling and grey plover respectively. No ringed plover were noted during the surveys.

Table 3.1 Peak number of target species in the survey area during each survey visit

Species	6 Dec	21 Jan	30 Jan	7 Feb	25 Feb	5 Mar	25 Mar
Golden plover	780	0	2	6	0	0	0
Turnstone	0	17	4	7	3	0	0
Grey plover	184	173	164	72	24	1	11
Sanderling	50	41	20	2	0	45	0

3.3.3 **Table 3.2** shows the sum of counts for each target species during each one-hour period in relation to high tide during the seven survey visits. For all the target species recorded, the highest numbers were recorded on a falling tide (i.e. after the high tide).

Table 3.2 Total number of each target species during each 1-hour tidal period

Tidal period	Golden plover	Turnstone	Sanderling	Grey plover
-6 to -5		1	2	
-5 to -4		3	27	
-4 to -3		2	20	
-3 to -2			3	6
-2 to -1	2	7	2	4
-1 to 0	406	24	102	32
0 to +1	460	17	172	32
+1 to +2	495	17	167	60
+2 to +3	92		592	125
+3 to +4	780	1	223	14
+4 to +5	555	1	8	7
+5 to +6		4	2	

Golden Plover

3.3.4 A peak count of 780 (roosting and loafing) golden plover was present on the mudflats (in 1km grid squares 3, 6 and 7) on 6 December 2018 during the period from high tide until five hours after, on a falling tide (see Figure 3.4a). The roosting flock was initially seen at high tide on the sand banks in the south of Pegwell Bay (200m grid square 7U). As the water began to recede, the flock dispersed north onto the mudflats in 1km grid square 6 and then 3. No counts of golden plover exceeding six birds were recorded on the subsequent surveys in January, February and March 2019.

Turnstone

3.3.5 The distribution of turnstone recorded during the survey was restricted to the northern fringes of Pegwell Bay (see Figure 3.4b) with none noted on the 6 December 2018 or 5 March 2019 visits. The peak count was of a flock of 17 birds roosting on rocks off the Coastguard Cottages in 200m grid square 7U at high tide on 21 January. This flock dispersed from the area approximately one hour after high tide. Counts of turnstone did not exceed seven birds on subsequent visits, with occurrence being sporadic and infrequent in Pegwell Bay.

Sanderling

3.3.6 Flocks of sanderling were observed feeding on the shoreline in Pegwell Bay throughout much of the tidal cycle, though the highest numbers were noted on a falling tide. Peak counts of 50 foraging birds were seen in 200m grid square 4P on 6 December with 45 foraging in 6N (on the edge of the sandbanks in the south of the Bay) on 5 March (see Figure 3.4c). No roosting birds were observed.

Grey Plover

3.3.7 Grey Plover were widely distributed across Pegwell Bay during the surveys, with the highest counts involving 140 birds roosting on the edge of the sandbanks in the south of the Bay (in 200m grid square 7U) on 6 December, and 110 birds foraging on mudflats on the edge of the helipad (in square 1V) on 30 January (see Figure 3.4d). The most frequently used roost site was on the edge of the sandbanks in 1km grid square 7, though a flock of up to 21 birds was roosting on the mudflats in 200m squares 3i and 3O on 25 February.

Turnstone Survey

3.3.8 A single survey was undertaken in December 2018 followed by twice-monthly survey visits completed in January, February and March 2019. The details (times, dates and weather conditions) of these surveys are provided in **Table C.5 in Appendix C**.

3.3.9 Results from the turnstone survey are presented in **Table 3.6**, with full details of the records in **Table D.5 in Appendix D**. **Figure 3.5** shows the peak count of turnstone in each of the locations where the species was recorded during the surveys.

Table 3.6 Peak counts of turnstone

Location	Peak (Mean)	04-Dec	22-Jan	25-Jan	04-Feb	19-Feb	05-Mar	19-Mar
Coastguard Cottages	4 (1)	0	0	4	1	0	0	0
Pegwell Bay (NW)	5 (1)	0	4	0	1	5	0	0
Pegwell Bay (west)	1 (0)	0	0	0	1	0	0	0
Ramsgate Harbour	19 (14)	8	15	16	7	17	15	19
West Cliff	7 (2)	0	0	6	0	0	0	7

3.3.10 The peak count of turnstone was of a total of 19 birds foraging in Ramsgate Harbour on 19 March. Ramsgate Harbour was the only location within the survey area to hold turnstone on a regular basis (on all seven visits), with birds foraging on sea-weed covered rocks and hard-standing areas (walls, walkways etc). Very few flocks of roosting turnstone were noted but did include nine birds in Ramsgate Harbour on 5 March and seven on groynes below West Cliff on 19 March. Foraging birds were seen on two survey visits on the rocks adjacent to the disused helipad in the north-west of Pegwell Bay including: four birds on 22 January and five on 19 February. The records from Coastguard Cottages and West Cliff were of birds foraging on the beach, mudflats and rocks below these locations.

4. Conclusions

4.1 Functional Habitat Survey

4.1.1 The functional habitat surveys undertaken in winter 2016/17 (ES Appendix 7.5; APP-045) showed that the farmland immediately surrounding the Order Limits is not used on a regular basis by potentially important numbers of foraging or resting golden plover. Over the seven-month survey period, golden plover were recorded primarily in very low numbers other than a flock of 530 birds in a single month. The findings of the desk study (ES Appendix 7.2 [APP-045]) also revealed little use by golden plover of the farmland surrounding the airport.

4.1.2 Results from the daytime and nocturnal walkover surveys undertaken from December 2018 to March 2019 provided only two records of golden plover on farmland, with both records involving low numbers (one and two birds respectively). There were four other records of flying birds, again involving small numbers, although included a flock of 200, which, due to their height, were likely not using the farmland adjacent the Site.

4.1.3 The results of the flight line surveys were broadly comparable with those from the daytime and nocturnal walkover surveys, with most of the golden plover flight activity concentrated at least 700m to the south of the airport boundary and with low levels of use of the fields within 1km of the Order Limits.

4.1.4 In conclusion, results from the 2018/19 functional habitat surveys support the conclusions presented in the ES Chapter 7 [APP-033] and the RIAA, Appendix 7.1 [APP-045]. These stated that for golden plover there would either be no adverse or negligible effects on the integrity of the SPA for both the construction and operational phases due to barrier effects or habitat loss due to disturbance/ displacement as a result of noise and vibration.

4.2 Pegwell Bay Surveys including the Waterbird Distribution and Turnstone Surveys

Golden Plover

4.2.1 Results from the 2018/19 Pegwell Bay Survey were similar to those obtained during the 2016/17 survey as used to support the assessments in Chapter 7 of the ES and the RIAA. For golden plover, there were similarities in distribution (compare Figure 3.4a with Figure 4.4 of ES Chapter 7 Appendix 7.5 [APP-045]) and behaviour, with birds roosting or loafing and not using the survey area for foraging. Another similarity between the 2016/17 and 2018/19 surveys is that the highest numbers of birds were recorded early in the winter period (in November 2016 and in December 2016 and 2018). In 2019 however, there were no counts of golden plover exceeding six birds in January or February, compared to three counts in February 2017 that exceeded 100 birds, with the highest of 500 birds.

4.2.2 These results support the conclusions presented in the ES and the RIAA. The main golden plover roost site on Pegwell Bay is located more than 1km from the airport site and thus the prediction still holds that this would not be adversely affected by construction works for the Proposed Development.

Turnstone

4.2.3 Similarly to 2016/17, the current surveys show the importance of the northern shoreline of Pegwell Bay to turnstone. In 2016/17, this shoreline was the only area regularly used for roosting. The current surveys also show this, with the peak count of 17 roosting birds in January 2019 recorded a little further east than the earlier surveys. Monthly counts of birds between the two sets of surveys were not too dissimilar, with low (less than 17) numbers of turnstone. Turnstone was not recorded during the Pegwell Bay distribution surveys in March 2019, compared to comparatively high counts (of 20 and 28 birds) in March 2017. However, during the dedicated turnstone surveys undertaken in 2019, similar numbers (15 and 19 birds) were noted further west in Ramsgate Harbour (outside the SPA) on the two March survey visits. Compared with 2016/17, the current surveys showed that the distribution of turnstone was focused more on the northern shore of Pegwell Bay, particularly at Ramsgate Harbour.

Sanderling

4.2.4 In 2016/17, low numbers of sanderling were recorded at scattered locations across Pegwell Bay, on three of the six survey dates (in December, January and February) with a peak count of 16 birds in January. In 2018/19, as previously, all records were of foraging birds along the shoreline with no observations of roosting. Higher numbers of sanderling were however, recorded during the 2018/19 surveys, with peak counts of 50, 41 and 45 in December, January and March respectively. Sanderling were scattered across the Bay as previously with greater use made of the southern part of the survey area.

Grey Plover

4.2.5 Higher numbers of grey plover were recorded during the Pegwell Bay surveys undertaken in winter 2018/19 than in 2016/17. During the 2016/17 survey, grey plover was recorded in low numbers and only in October, November and January, with peak counts in those months of 22, 13 and 35 birds respectively. In 2018/19, grey plover was recorded on each survey visit from December to March inclusive, with peak counts in December and January of 184 and 164 respectively. Thereafter, numbers reduced with a peak count of 72 birds on 7 February dropping to one and then 11 birds on 5 and 25 March respectively.

5. References

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Appendix A
Details of qualifying ornithological features

Table A.1 Statutory designated sites of ornithological importance

Site name and designation	Site interest/qualification features	Distance and (direction) from Order Limits
Thanet Coast and Sandwich Bay Ramsar	The Ramsar site (covering 2,169ha) is designated for supporting internationally important numbers of non-breeding turnstone (under Ramsar Criterion 6).	0m (South-east)
Thanet Coast and Sandwich Bay SPA	The SPA (covering 1,838ha) is designated for populations of European importance of turnstone (non-breeding); golden plover (non-breeding) and little tern (breeding).	0m (South-east)
Sandwich Bay to Hacklinge Marshes SSSI	The SSSI (covering 1,790ha) contains the most important sand dune system and sandy coastal grassland in South East England. Notified features include: non-breeding populations of golden plover, grey plover, ringed plover and sanderling, and the assemblage of breeding birds within areas of lowland open waters and their margins.	0m (South-east)
Thanet Coast SSSI	The SSSI (covering 817ha) is notified for its coastal habitats and the plant and invertebrate communities they support; geological features and breeding and non-breeding bird populations. Non-breeding populations of golden plover, grey plover, ringed plover and sanderling; breeding little tern; and the variety of passage bird species all form notified features of the SSSI.	~4,300m (East)

Appendix B Species names and survey codes

Species code	Species English name	Species scientific name
SH	Sparrowhawk	*Accipiter nisus*
K.	Kestrel	*Falco tinnunculus*
PE	Peregrine	*Falco peregrinus*
RP	Ringed plover	*Charadrius hiaticula*
GP	Golden plover	*Pluvialis apricaria*
GV	Grey plover	*Pluvialis squatarola*
L.	Lapwing	*Vanellus vanellus*
SS	Sanderling	*Calidris alba*
RK	Redshank	*Tringa totanus*
TT	Turnstone	*Arenaria interpres*
AF	Little tern	*Sternula albifrons*
RN	Raven	*Corvus corax*

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Appendix C
Survey visit details

Table C.1 Daytime Walkover Survey, Visit Details

Visit Number	Date	Start time	End time	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temperature range (°C)	Precipitation
1	23-Jan-19	10:00	14:45	8	NW	3	Starting Fair (500m-1km), clearing to <5km (very good) after an hour	2 - 3	Beginning with intermittent rain
1	24-Jan-19	10:00	15:00	7	WSW	2	Very good (<5km)	0 - 3	Intermittent light rain
2	30-Jan-19	10:15	14:18	3	SW	2	Very good (<5km)	3 - 6	None
2	31-Jan-19	10:24	14:20	2	E	3	Very good (<5km)	0 - 2	None
3	05-Feb-19	09:30	14:30	8	SW	1	Very good (<5km)	4 - 6	None (very light drizzle at time)
3	07-Feb-19	10:00	16:10	1	SW	5	Very good (<5km)	10 - 12	None
4	26-Feb-19	09:15	14:15	0	N	1	Very good (<5km)	10 - 13	None
4	27-Feb-19	09:15	14:15	0	SW	1	Very good (<5km)	10 - 17	None
5	12-Mar-19	08:30	13:30	8	SW	4	Good - Between 2-3km	9 - 10	Light drizzle/mostly dry
5	13-Mar-19	08:30	13:30	2	SWW	6	Very good (>5km)	7 - 8	None

6	26-Mar-19	08:00	13:30	1	W	1	Very Good (<5km)	7	None	
6	27-Mar-19	08:30	13:30	8	W	1	Very Good (<5km)	9-11	None	

Table C.2 Nocturnal Walkover Survey, Visit Details

Visit Number	Date	Start time	End time	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	Moon state
1	23-Jan-19	17:15	20:00	8	NW	1	Very good (>5km in daylight)	2	None	Moon State 95%
1	24-Jan-19	18:00	20:00	2-6	WSW	2	Very good (>5km in daylight)	5	None	Moon State 85%
2	30-Jan-19	18:05	19:40	0	SW	2	Very good (>5km in daylight)	2	None	Moon State 25%
2	31-Jan-19	18:00	20:15	0	SE	3	Very good (>5km in daylight)	0 - 1	None	Moon State 17%
3	07-Feb-19	18:00	23:00	1	SW	3	Very good (>5km in daylight)	6 - 10	None	Moon State 6%
4	26-Feb-19	18:30	20:10	1	SEE	2	Clear (>5km in daylight)	5 - 7	None	Waning crescent 47%
4	27-Feb-19	18:30	21:10	0	SW	2	Clear (>5km in daylight)	7 - 13	None	Waxing crescent 40%
5	12-Mar-19	18:50	20:10	1	SW	2-3	Clear (>5km in daylight)	4	None	Waxing crescent 30%
5	13-Mar-19	18:25	20:05	8	SW	3	Clear (>5km in daylight)	9 - 10	None	Waxing crescent 40%
6	26-Mar-19	20:15	21:38	8	W	1	Clear (>5km in daylight)	8-10	None	Waning gibbous- 67%
6	27-Mar-19	20:00	22:23	8	SW	1	Clear (>5km in daylight)	9-10	None	Waning gibbous- 67%

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Table C.3 Flight Line Survey, Visit Details

Visit Number	Date	Start time	End time	VP	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	High tide time
1	05-Dec-18	08:00	10:00	4	8	S	2	Very good (>3 km)	10 - 12	Occasional light drizzle	09:58
1	05-Dec-18	10:07	12:07	2	8	S	2	Very good (>3 km)	10 - 12	Occasional light drizzle	09:58
1	05-Dec-18	12:12	14:12	3	8	S	2	Very good (>3 km)	10 - 12	Occasional light drizzle	09:58
2	22-Jan-19	08:00	10:00	2	5-6	W	3	Very good (>3 km)	4 - 6	None	11:56
2	22-Jan-19	08:15	10:15	6	5-6	W	1	Very good (>3 km)	4 - 6	None	11:56
2	22-Jan-19	10:05	12:05	3	1-3	W	3	Very good (>3 km)	4 - 6	None	11:56
2	22-Jan-19	10:30	12:30	7	1-3	W	1	Very good (>3 km)	4 - 6	None	11:56
2	22-Jan-19	12:10	14:10	4	1-4	W	3	Very good (>3 km)	5 - 7	None	11:56
2	22-Jan-19	13:00	15:00	5	1-4	W	1	Very good (>3 km)	5 - 7	None	11:56
3	29-Jan-19	08:00	10:00	1	4-7	SE	0	Very good (>3 km)	-1 to 0	None	05:37
3	29-Jan-19	08:00	10:00	4	4-7	SE	2	Very good (>3 km)	-1 to 0	None	05:37
3	29-Jan-19	10:15	12:15	2	5-8	SE	1 - 3	Very good (>3 km)	0 - 5	None	05:37
3	29-Jan-19	10:15	12:15	5	5-8	SE	2	Very good (>3 km)	0 - 5	None	05:37
3	29-Jan-19	12:30	14:30	3	7-8	SE	4	Very good (>3 km)	4 - 5	None	05:37

Visit Number	Date	Start time	End time	VP	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	High tide time
3	29-Jan-19	12:30	14:30	6	7-8	SE	3	Very good (>3 km)	4 - 5	None	05:37
4	08-Feb-19	08:00	10:00	3	8	SW	4-7	Good (1 - 3 km)	8 - 9	Light rain between 08:25-09:00	13:20
4	08-Feb-19	08:15	10:15	5	8	SW	4-7	Good (1 - 3 km)	8 - 9	Light rain between 08:25-09:00	13:20
4	08-Feb-19	10:05	12:05	4	7-8	SW	4-7	Good (500m - 1.5 km)	7 - 9	Heavy rain	13:20
4	08-Feb-19	10:30	12:30	7	7-8	SW	4-7	Good (500m - 1.5 km)	7 - 9	Heavy rain	13:20
4	08-Feb-19	12:15	14:15	2	7-8	SW	4-7	Good (1 - 3 km)	9	Heavy rain	13:20
4	08-Feb-19	12:45	14:45	6	7-8	SW	4-7	Good (1 - 3 km)	9	Heavy rain	13:20
5	26-Feb-19	08:30	10:30	5	0	S	1	Very good (>3 km)	10 - 14	None	16:32
5	26-Feb-19	08:45	10:45	2	0	S	1	Very good (>3 km)	10 - 14	None	16:32
5	26-Feb-19	10:45	12:45	6	0	S	1	Very good (>3 km)	14 - 16	None	16:32
5	26-Feb-19	10:50	12:50	3	0	S	1	Very good (>3 km)	14 - 16	None	16:32
5	26-Feb-19	12:50	14:50	4	0	S	1	Very good (>3 km)	16 - 18	None	16:32
5	26-Feb-19	13:15	15:15	7	0	S	1	Very good (>3 km)	16 - 18	None	16:32
6	06-Mar-19	08:15	10:15	4	8	S	2	Very good (>3 km)	7 - 10	Light drizzle	11:36

Visit Number	Date	Start time	End time	VP	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	High tide time
6	06-Mar-19	08:15	10:15	2	8	S	5	Very good (>3 km)	7 - 10	Light drizzle	11:36
6	06-Mar-19	10:30	12:30	5	8	S	6	Very good (>3 km)	7 - 10	Light drizzle	11:36
6	06-Mar-19	10:30	12:30	3	8	S	5-6	2-3km	7 - 10	Light drizzle	11:36
6	06-Mar-19	12:45	14:45	6	8	S	6	Very good (>3 km)	7 - 10	Light drizzle	11:36
6	06-Mar-19	12:45	14:45	1	8	S	5	Very good (>3 km)	7 - 10	Light drizzle	11:36
7	26-Mar-19	10:45	12:45	5	3	W	3	Very good (>3 km)	8	None	14:42
7	26-Mar-19	12:50	14:50	6	3	W	3	Very good (>3 km)	11	None	14:42
7	26-Mar-19	08:20	10:20	7	0	W	3	Very good (>3 km)	12	None	14:42
7	27-Mar-19	12:35	14:35	1	8	NW	2	Very good (>3 km)	12	None	15:30
7	27-Mar-19	08:20	10:20	2	8	NW	2	Very good (>3 km)	9	None	15:30
7	27-Mar-19	10:25	12:25	3	8	NW	2	Very good (>3 km)	11	None	15:30

Table C.4 Pegwell Bay Waterbird Distribution, Visit Details

Visit Number	Date	Start time	End time	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	High tide time

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1	06-Dec-18	08:42	14:42	6-8	SSW	3-5	Very good (>3km)	10 - 12	None	10:42
2	21-Jan-19	09:30	15:30	0-1	N	0-1	Very good (>3km)	0 to 6	None	10:54
3	30-Jan-19	08:30	14:30	2-3	W	1-2	Very good (>3km)	-1 to 2	None	06:39
4	07-Feb-19	10:00	16:00	1-2	SW	4-7	Very good (>3km)	6 – 8	None	12:57
5	25-Feb-19	10:30	16:30	0	SE	0-1	Very good (>3km)	5 - 12	None	15:30
6	07-Mar-19	08:15	14:15	1	SW	3	Very good (>3km)	7 - 14	None	11:36
7	25-Mar-19	11:30	17:30	2-5	NW	3	Very good (>3km)	9 - 13	None	14:20

Table C.5 Turnstone Survey, Visit Details

Visit Number	Date	Start time	End time	Cloud (Oktas)	Wind direction	Wind force (Beaufort Scale)	Visibility	Temp. range (°C)	Precipitation	High tide time
1	04-Dec-18	08:00	13:00	0-4	SW	1	Very good (>3km)	3 - 8	None	09:03
2	22-Jan-19	09:30	14:30	1-4	W	1	Very good (>3km)	4 - 5	None	12:11
3	25-Jan-19	09:30	14:30	8	NW	2	Moderate (1-2km)	1 - 5	Light drizzle	14:22
4	04-Feb-19	09:00	14:00	8	NW	4	Very good (>3km)	4 - 6	Light intermittent drizzle	11:37
5	19-Feb-19	09:00	14:30	0	W	2	3km	7	None	11:12
6	05-Mar-19	10:00	15:00	2	W	3-4	Very good (>3km)	8 - 10	None	10:46
7	19-Mar-19	09:00	14:00	4	SSW	3	Very Good (>3km)	13	None	10:15

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Appendix D
Survey results

Table D.1 Functional Habitat Surveys: Daytime Walkover Survey, Records of Golden Plover

Species code	Date	Time	Number of birds	Field ID	Additional notes
GP	24-Jan-19	12:44	200	8	Flock circling high (>200m), then lost sight of flock in low cloud
GP	24-Jan-19	13:37	4	50	Flushed from winter cereal
GP	05-Feb-19	13:10	12	32/34	Flying east

Table D.2 Functional Habitat Surveys: Nocturnal Walkover Survey, Records of Golden Plover

Species code	Date	Time	Transect No.	Field ID	Number of birds	Additional notes
GP	31-Jan-19	19:22	N2	8	2	Flushed by surveyors, then flying & calling
GP	31-Jan-19	19:49	N1	20	1	Heard calling over Field 20, flying south

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Table D.3 Flight Line Survey, Records of Target Species[5]

Species code	Date	Time	VP	Flight ID[6]	Number of birds	Flight height (m)	Flight within Order Limits	Flight within FHS survey area	Additional notes on species activity and flight direction
GP	22-Jan-19	09:03	2	3	37	100	No	No	Flew west to east, then lost from view
GP	22-Jan-19	09:10	6	9	1	15	Yes	Yes	Flying low over the Order Limits
GP	22-Jan-19	09:43	6	10	1	20	Yes	Yes	Flew over Order Limits, then lost from view behind scrub
GP	22-Jan-19	10:34	3	4	1	50	No	No	Appeared to land in fields near Stonelees (approx. National Grid Reference [NGR] TR 336 628) with lapwing
GP	22-Jan-19	10:35	3	5	12	50	No	No	Landed in fields on Minster Marshes to forage
GP	22-Jan-19	11:22	3	6	32	100	No	No	Flew in from Sandwich Bay and landed on Minster Marshes to forage
GP	**22-Jan-19**	**11:46**	**3**	**7**	**13**	**<50**	**Yes**	**Yes**	**Birds appeared to fly up from fields near Thorne Farm (Approx. NGR TR335 645) and then NW over Order Limits**
GP	**22-Jan-19**	**11:46**	**3**	**8**	**36**	**50 - 100**	**No**	**Yes**	**Birds appeared to fly from south of Thorne Farm, and land with other golden plover and lapwing to forage**
GP	22-Jan-19	12:10	4	1	14	<50	Yes	Yes	Attempted to land, turned and flew north over the Order Limits
GP	22-Jan-19	12:11	4	2	3	<50	No	Yes	Flew up from St Augustine's Golf Course area and landed on a field nearby to forage

[5] Those flights lines considered to potentially have involved golden plover alighting from or landing in fields within the survey area for the FHS are highlighted in bold.
[6] Unique flight ID number, as shown in a circle at the starting point of each flight line on Figure 3.3

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Species code	Date	Time	VP	Flight ID[6]	Number of birds	Flight height (m)	Flight within Order Limits	Flight within FHS survey area	Additional notes on species activity and flight direction
GP	22-Jan-19	12:17	7	11	14	40	Yes	Yes	Flying over the Order Limits, then lost from view behind buildings
GP	29-Jan-19	08:32	4	14	172	50	Yes	Yes	Four flocks flew south, high over Order Limits
GP	29-Jan-19	08:35	4	15	2	20	Yes	Yes	Flew south, high over Order Limits
GP	**29-Jan-19**	**08:49**	**4**	**16**	**1**	**30 - 0**	**No**	**Yes**	**Landed to forage in fields south of Thorne Farm**
GP	**29-Jan-19**	**09:25**	**4**	**17**	**5**	**0 - 10**	**No**	**Yes**	**Flushed by dog walkers and returned to land to forage**
GP	**29-Jan-19**	**10:46**	**5**	**18**	**7**	**0 - 30**	**No**	**Yes**	**Appeared to fly up with curlew and land to the south of A256/A299**
GP	**29-Jan-19**	**11:08**	**5**	**19**	**7**	**0 - 30**	**No**	**Yes**	**Birds appeared to fly up from south of Thorne Farm, then moved east a short distance and landed again**
GP	**29-Jan-19**	**13:29**	**3**	**12**	**38**	**0 - 70**	**Yes**	**Yes**	**Dropping onto field south of Thorne Farm**
GP	**29-Jan-19**	**14:25**	**3**	**13**	**30**	**100**	**Yes**	**Yes**	**Birds appeared to fly up from field to the SE of Thorne Farm, then circled over Order Limits**
GP	08-Feb-19	08:59	5	20	200	80	No	No	Edge of visibility in mist. Flew off Pegwell Bay gaining height quickly heading southwest
GP	08-Feb-19	09:12	3	22	180	30	No	No	Lost to view, landing near Minster Marshes
GP	08-Feb-19	09:18	5	21	40	40	No	No	Flew in from west to land on Pegwell Bay mudflats
GP	26-Feb-19	11:19	6	23	9	30 -10	No	Yes	Lost from view behind hedgerow to the east of the Order Limits
GV	06-Mar-19	10:56	5	24	17	10-50	No	No	Circling over Pegwell Bay, then landed on its south edge

Table D.4 Pegwell Bay Waterbird Distribution Survey, Records of Target Species

Date	Count No. (1-6)	Count start time	VP	Species code	Number of birds	200m Grid ID	Activity	Tidal state (in relation to high tide)[7]
06-Dec-18	1	08:42	S	GP	1	6D	Loafing	-2 to -1
06-Dec-18	2	09:42	N	GP	400	7U	Roosting	-1 to 0
06-Dec-18	2	09:42	N	GV	100	7U	Roosting	-1 to 0
06-Dec-18	3	10:42	N	GP	360	7U	Roosting	0 to +1
06-Dec-18	3	10:42	N	GV	140	7U	Roosting	0 to +1
06-Dec-18	3	10:42	S	GP	100	7U	Flushed	0 to +1
06-Dec-18	4	11:42	N	GP	300	7U	Roosting	+1 to +2
06-Dec-18	4	11:42	N	GV	100	7U	Roosting	+1 to +2
06-Dec-18	4	11:42	S	GP	195	6M	Loafing	+1 to +2
06-Dec-18	5	12:42	N	GP	90	7U	Roosting	+2 to +3
06-Dec-18	5	12:42	N	GV	8	1W	Foraging	+2 to +3
06-Dec-18	5	12:42	N	GV	36	4U	Foraging	+2 to +3
06-Dec-18	5	12:42	N	GV	140	7U	Roosting	+2 to +3
06-Dec-18	5	12:42	N	SS	50	4P	Foraging	+2 to +3
06-Dec-18	6	13:42	N	GP	140	6H	Roosting	+3 to +4
06-Dec-18	6	13:42	N	SS	7	4F	Foraging	+3 to +4
06-Dec-18	6	13:42	S	GP	640	3M	Loafing	+3 to +4
06-Dec-18	7	14:42	N	GP	140	6H	Roosting	+4 to +5
06-Dec-18	7	14:42	N	SS	7	4G	Foraging	+4 to +5
06-Dec-18	7	14:42	S	GP	200	3M	Loafing	+4 to +5
06-Dec-18	7	14:42	S	GP	215	3I	Loafing	+4 to +5

[7] The period in which the count was undertaken in relation to high tide (for example, +1 to +2 is 1-2 hours after high tide)

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Date	Count No. (1-6)	Count start time	VP	Species code	Number of birds	200m Grid ID	Activity	Tidal state (in relation to high tide)[7]
21-Jan-19	1	09:30	S	GV	1	3R	Loafing	-2 to -1
21-Jan-19	2	10:30	N	TT	17	2U	Roosting	-1 to 0
21-Jan-19	2	10:30	S	GV	1	3M	Loafing	-1 to 0
21-Jan-19	3	11:30	N	GV	10	1Q	Loafing	0 to +1
21-Jan-19	3	11:30	N	TT	17	2U	Roosting	0 to +1
21-Jan-19	3	11:30	S	GV	1	3M	Loafing	0 to +1
21-Jan-19	4	12:30	N	GV	6	1Q	Foraging	+1 to +2
21-Jan-19	4	12:30	N	TT	17	1S	In flight	+1 to +2
21-Jan-19	4	12:30	S	GV	1	3M	Loafing	+1 to +2
21-Jan-19	4	12:30	S	GV	60	6H	Landed	+1 to +2
21-Jan-19	4	12:30	S	SS	3	3N	Flushed	+1 to +2
21-Jan-19	5	13:30	N	GV	1	1Q	In flight	+2 to +3
21-Jan-19	5	13:30	N	GV	10	6O	Foraging	+2 to +3
21-Jan-19	5	13:30	S	GV	83	4K	Landed	+2 to +3
21-Jan-19	5	13:30	S	GV	17	6C	Loafing	+2 to +3
21-Jan-19	5	13:30	S	GV	62	6H	Foraging	+2 to +3
21-Jan-19	5	13:30	S	SS	35	3O	Foraging	+2 to +3
21-Jan-19	5	13:30	S	SS	2	6H	Foraging	+2 to +3
21-Jan-19	5	13:30	S	SS	4	6N	Foraging	+2 to +3
21-Jan-19	6	14:30	N	GV	2	4N	Roosting	+3 to +4
21-Jan-19	6	14:30	N	GV	1	1R	Foraging	+3 to +4
21-Jan-19	6	14:30	N	GV	1	1Q	Foraging	+3 to +4
21-Jan-19	6	14:30	N	GV	55	7I	Roosting	+3 to +4
21-Jan-19	6	14:30	N	SS	6	2U	Foraging	+3 to +4

Date	Count No. (1-6)	Count start time	VP	Species code	Number of birds	200m Grid ID	Activity	Tidal state (in relation to high tide)[7]
21-Jan-19	7	15:30	N	GV	8	7D	Roosting	+4 to +5
30-Jan-19	1	08:30	N	GV	2	1X	Foraging	+2 to +3
30-Jan-19	1	08:30	N	GV	16	4A	Foraging	+2 to +3
30-Jan-19	1	08:30	N	GV	22	4G	Foraging	+2 to +3
30-Jan-19	1	08:30	N	GV	6	4D	Foraging	+2 to +3
30-Jan-19	1	08:30	N	GV	19	4G	Foraging	+2 to +3
30-Jan-19	1	08:30	S	GP	2	6C	Loafing	+2 to +3
30-Jan-19	1	08:30	S	GV	80	3S	Foraging	+2 to +3
30-Jan-19	1	08:30	S	GV	2	3W	Foraging	+2 to +3
30-Jan-19	1	08:30	S	GV	16	6C	Foraging	+2 to +3
30-Jan-19	1	08:30	S	SS	15	3S	Foraging	+2 to +3
30-Jan-19	1	08:30	S	SS	5	3W	Foraging	+2 to +3
30-Jan-19	2	09:30	N	GV	110	1V	Foraging	+3 to +4
30-Jan-19	2	09:30	N	GV	12	1W	Foraging	+3 to +4
30-Jan-19	2	09:30	N	GV	10	4C	Foraging	+3 to +4
30-Jan-19	2	09:30	N	TT	1	1U	Foraging	+3 to +4
30-Jan-19	2	09:30	S	GV	32	3X	Foraging	+3 to +4
30-Jan-19	2	09:30	S	SS	1	4K	Foraging	+3 to +4
30-Jan-19	3	10:30	N	TT	1	1U	Foraging	+4 to +5
30-Jan-19	4	11:30	N	GV	2	1Q	Foraging	+5 to +6
30-Jan-19	4	11:30	N	TT	4	1U	Foraging	+5 to +6
30-Jan-19	5	12:30	N	GV	2	1Q	Foraging	-6 to -5
30-Jan-19	5	12:30	N	TT	1	1U	Foraging	-6 to -5
30-Jan-19	6	13:30	N	GV	2	1Q	Loafing	-5 to -4

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Date	Count No. (1-6)	Count start time	VP	Species code	Number of birds	200m Grid ID	Activity	Tidal state (in relation to high tide)[7]
30-Jan-19	6	13:30	N	GV	1	1R	Foraging	-5 to -4
07-Feb-19	1	10:50	N	TT	7	5D	In flight	-2 to -1
07-Feb-19	1	10:50	S	GP	1	3M	Landed	-2 to -1
07-Feb-19	2	11:50	N	GP	6	6B	Roosting	-1 to 0
07-Feb-19	2	11:50	N	TT	7	2V	Foraging	-1 to 0
07-Feb-19	3	12:50	S	CA	260	5X	In flight	0 to +1
07-Feb-19	3	12:50	S	OC	26	5S	Foraging	0 to +1
07-Feb-19	4	13:50	S	SS	1	6M	Foraging	+1 to +2
07-Feb-19	5	14:50	S	GV	15	4N	Foraging	+2 to +3
07-Feb-19	5	14:50	S	GV	1	4X	Loafing	+2 to +3
07-Feb-19	5	14:50	S	GV	1	4S	Loafing	+2 to +3
07-Feb-19	5	14:50	S	GV	1	4R	Foraging	+2 to +3
07-Feb-19	5	14:50	S	GV	3	4J	Foraging	+2 to +3
07-Feb-19	5	14:50	S	GV	51	4O	Foraging	+2 to +3
07-Feb-19	5	14:50	S	SS	1	4M	Foraging	+2 to +3
07-Feb-19	5	14:50	S	SS	1	4N	Foraging	+2 to +3
25-Feb-19	1	10:30	N	GV	2	1V	Foraging	-5 to -4
25-Feb-19	1	10:30	N	TT	3	2W	Foraging	-5 to -4
25-Feb-19	1	10:30	S	GV	21	3I	Roosting	-5 to -4
25-Feb-19	1	10:30	S	GV	1	6D	Roosting	-5 to -4
25-Feb-19	2	11:30	N	GV	4	1V	Foraging	-4 to -3
25-Feb-19	2	11:30	N	TT	2	2W	Foraging	-4 to -3
25-Feb-19	2	11:30	S	GV	16	3O	Roosting	-4 to -3
25-Feb-19	3	12:30	N	GV	3	1V	Foraging	-3 to -2

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Date	Count No. (1-6)	Count start time	VP	Species code	Number of birds	200m Grid ID	Activity	Tidal state (in relation to high tide)[7]
25-Feb-19	6	15:30	S	GV	21	3I	Roosting	0 to +1
05-Mar-19	2	09:15	S	SS	6	3Y	Foraging	-3 to -2
05-Mar-19	3	10:15	N	GV	1	1V	Flushed	-2 to -1
05-Mar-19	4	11:15	N	GV	1	1V	Flushed	-1 to 0
05-Mar-19	4	11:15	S	SS	21	6N	Foraging	-1 to 0
05-Mar-19	5	12:15	S	SS	21	6N	Foraging	0 to +1
05-Mar-19	6	13:15	S	SS	45	6N	Foraging	+1 to +2
25-Mar-19	2	12:30	S	GV	4	3M	Roosting	-2 to -1
25-Mar-19	3	13:30	S	GV	7	3I	Roosting	-1 to 0
25-Mar-19	3	13:30	S	GV	4	3M	Roosting	-1 to 0
25-Mar-19	4	14:30	S	GV	11	3I	Roosting	0 to +1
25-Mar-19	5	15:30	S	GV	11	3I	Roosting	+1 to +2
25-Mar-19	6	16:30	S	GV	4	3I	Roosting	+2 to +3
25-Mar-19	6	16:30	S	GV	7	3M	Roosting	+2 to +3
25-Mar-19	6	16:30	N	GV	1	1Q	Foraging	+2 to +3

Table D.5 Turnstone Survey, Records of Turnstone

Species code	Date	Observation time	High tide time	Number of birds	Habitat	Activity	Location	Further notes[8]
TT	04-Dec-18	11:30	09:03	3	Rocks	Foraging	Ramsgate Harbour	On rocks
TT	04-Dec-18	11:35	09:03	3	Hard-standing	Foraging	Ramsgate Harbour	On a wall
TT	04-Dec-18	11:40	09:03	2	Hard-standing	Foraging	Ramsgate Harbour	On a wall
TT	22-Jan-19	10:01	12:11	1	Gravel/Sand	Foraging	Pegwell Bay (NW)	200m grid square 1U, immediately north of outfall
TT	22-Jan-19	11:40	12:11	1	Hard-standing	Foraging	Ramsgate Harbour	Stone ramp
TT	22-Jan-19	11:41	12:11	2	Hard-standing	Foraging	Ramsgate Harbour	Stone wall
TT	22-Jan-19	11:46	12:11	1	Hard-standing	Foraging	Ramsgate Harbour	Stone embankment
TT	22-Jan-19	11:47	12:11	4	Hard-standing	Foraging	Ramsgate Harbour	Stone jetty
TT	22-Jan-19	12:00	12:11	5	Hard-standing	Foraging	Ramsgate Harbour	Tarmac
TT	22-Jan-19	12:15	12:11	2	Sandy beach	Foraging	Ramsgate Harbour	Beach east of Ramsgate Harbour
TT	22-Jan-19	14:20	12:11	3	Rocks	Foraging	Pegwell Bay (NW)	200m grid square 1U, immediately north of outfall
TT	25-Jan-19	11:02	14:22	1		Commuting	Ramsgate Harbour	Flying west over Ramsgate Harbour
TT	25-Jan-19	11:06	14:22	11	Rocks /Mudflats	Foraging	Ramsgate Harbour	West Pier

[8] Please refer to Figure 2.4 for the location of the 200m grid squares

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Species code	Date	Observation time	High tide time	Number of birds	Habitat	Activity	Location	Further notes[8]
TT	25-Jan-19	11:20	14:22	3	Rocks /Mudflats	Foraging	Ramsgate Harbour	West Pier
TT	25-Jan-19	11:22	14:22	1	Rocks /Mudflats	Foraging	West Cliff	200m grid square 5E/ West cliffs
TT	25-Jan-19	11:32	14:22	1	Rocks /Mudflats	Foraging	West Cliff	200m grid square 5E/ West cliffs
TT	25-Jan-19	11:47	14:22	4	Rocks /Mudflats	Foraging	West Cliff	200m grid square 2Y/ West cliffs
TT	25-Jan-19	12:41	14:22	1	Hard-standing	Landed	Ramsgate Harbour	Royal Harbour
TT	25-Jan-19	13:56	14:22	2	Rocks	Foraging	Coastguard Cottages	200m grid square 2U
TT	25-Jan-19	14:13	14:22	2	Rocks	Foraging	Coastguard Cottages	200m grid square 2U
TT	04-Feb-19	09:12	11:37	1	Hard-standing	Foraging	Ramsgate Harbour	Ramsgate Port/Harbour
TT	04-Feb-19	09:15	11:37	5	Hard-standing	Foraging	Ramsgate Harbour	Ramsgate Port/Harbour
TT	04-Feb-19	09:23	11:37	1	Hard-standing	Foraging	Ramsgate Harbour	Ramsgate Port/Harbour
TT	04-Feb-19	11:31	11:37	1	Rocks	Foraging	Coastguard Cottages	200m grid square 1Y
TT	04-Feb-19	12:20	11:37	1	Rocks	Foraging	Helipad	200m grid square 4A
TT	04-Feb-19	13:30	11:37	1		Commuting	Pegwell Bay (west)	200m grid square 3S
TT	19-Feb-19	09:37	11:12	2	Sandy beach	Foraging	Ramsgate Port	Port beach
TT	19-Feb-19	09:57	11:12	7	Hard-standing	Foraging	Ramsgate Harbour	West Pier

Species code	Date	Observation time	High tide time	Number of birds	Habitat	Activity	Location	Further notes[8]
TT	19-Feb-19	10:17	11:12	2	Hard-standing	Foraging	Ramsgate Harbour	East harbour
TT	19-Feb-19	10:20	11:12	6	Hard-standing	Foraging	Ramsgate Harbour	East harbour
TT	19-Feb-19	11:38	11:12	5	Rocks	Foraging	Pegwell Bay (NW)	
TT	05-Mar-19	11:29	10:46	9	Hard-standing	Roosting	Ramsgate Harbour	
TT	05-Mar-19	11:41	10:46	1	Hard-standing	Foraging	Ramsgate Harbour	Ramsgate Harbour- north
TT	05-Mar-19	11:41	10:46	4	Hard-standing	Foraging	Ramsgate Harbour	
TT	05-Mar-19	12:07	10:46	1	Hard-standing	Loafing	Ramsgate Harbour	Just south of Ramsgate Harbour
TT	19-Mar-19	10:53	10:15	4	Groyne	Roosting	West Cliff	West of Ramsgate Harbour
TT	19-Mar-19	10:56	10:15	3	Groyne	Roosting	West Cliff	West of Ramsgate Harbour
TT	19-Mar-19	11:34	10:15	1	Rocks	Foraging	Ramsgate Harbour	Below harbour wall
TT	19-Mar-19	12:02	10:15	5	Hard-standing	Foraging	Ramsgate Harbour	Harbour walls
TT	19-Mar-19	12:05	10:15	2	Hard-standing	Foraging	Ramsgate Harbour	Harbour walls
TT	19-Mar-19	12:19	10:15	11	Hard-standing	Foraging	Ramsgate Harbour	

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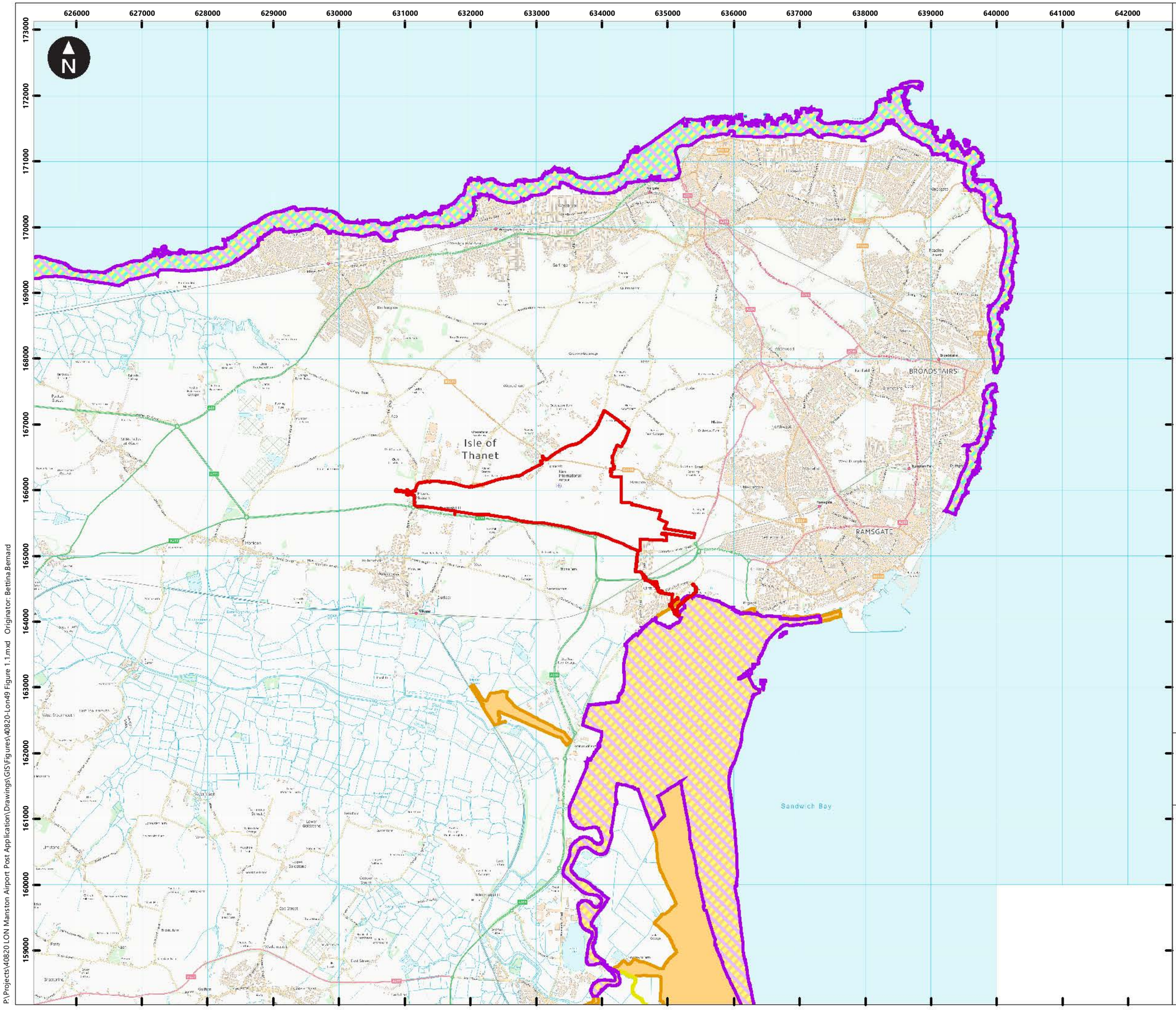
Appendix E

Figures



Key

- Order Limits
- Thanet Coast and Sandwich Bay Ramsar Site
- Thanet Coast and Sandwich Bay SPA
- Sandwich Bay to Hacklinge Marshes SSSI
- Thanet Coast SSSI

0 1,000 2,000 3,000 m

Scale at A3: 1:55,000

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Manston Winter Bird Report 2018/19

Figure 1.1
Location of the Order Limits in relation to Statutory designated sites of ornithological importance

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon49 Figure 1.1.mxd Originator: Bettina.Bernard

626000 627000 628000 629000 630000 631000 632000 633000 634000 635000 636000 637000 638000 639000 640000 641000 642000

173000 172000 171000 170000 169000 168000 167000 166000 165000 164000 163000 162000 161000 160000 159000

N

MARGATE

BROADSTAIRS

RAMSGATE

Isle of Thanet

Sandwich Bay

Key

Order Limits

Survey Area

Functional habitat survey field numbers

0 1,000 2,000 3,000 m

Scale at A3: 1:55,000

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Figure 2.1
Daytime Field Survey: Survey Area and Field Identification Numbers

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon50 Figure 2.1.mxd Originator: Bettina.Bernard

626000 627000 628000 629000 630000 631000 632000 633000 634000 635000 636000 637000 638000 639000 640000 641000 642000

173000 172000 171000 170000 169000 168000 167000 166000 165000 164000 163000 162000 161000 160000 159000

N

MARGATE

BROADSTAIRS

RAMSGATE

Isle of Thanet

N1

N2

N3

N4

N5

N6

Sandwich Bay

Key

Order Limits

Survey Area

Nocturnal transect routes

0 1,000 2,000 3,000 m

Scale at A3: 1:55,000

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Figure 2.2
Nocturnal Walkover Survey: Survey Transects

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wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon51 Figure 2.2.mxd Originator: Bettina.Bernard

630000 631000 632000 633000 634000 635000 636000 637000

169000 168000 167000 166000 165000 164000 163000

VP1 VP2 VP3 VP4 VP5 VP6 VP7

Isle of Thanet

THANET DISTRICT

ACOL CP · WESTGATE-ON-SEA CP · MANSTON CP · MINSTER CP · CLIFFSEND CP

Acol · Northwood · Manston · Newington · Minster · Durlock · Sevenscore · Chilton · Pegwell · Stonelees

Quex Park · Woodchurch · Minster Marshes · Pegwell Bay · Sandwich & Pegwell Bay National Nature Reserve

Airport (Disused) · Ebbsfleet Traditional site of the Landings of the Saxons (449) and of St Augustine (597)

River Stour · Minster Stream · Wantsum Channel · Sandwich Road · Manston Road · Margate Hill · Park Road · Woodchurch Road · Chapel Bottom · Fleete Road · Haine Road · Manston Court Road · Canterbury Road West · Cottington Road · Thorne Hill · Grinsell Hill · Brook Lane · Marsh Farm Road · Ebbsfleet Lane · Sparling Street · Preston Road · Vincent Road · Woodchurch Road · Shottendane Road · Crispe Road · Plumstone Road · Seamark Road · Minster Road · Acol Hill · Chalk Hill · Thanet Coastal Path · England Coast Path

Key

- Order Limits
- Viewpoint

0 250 500 750 1,000 1,250 1,500 m

Scale at A3: 1:25,000

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Figure 2.3
Flight Line Survey: Location of View Points

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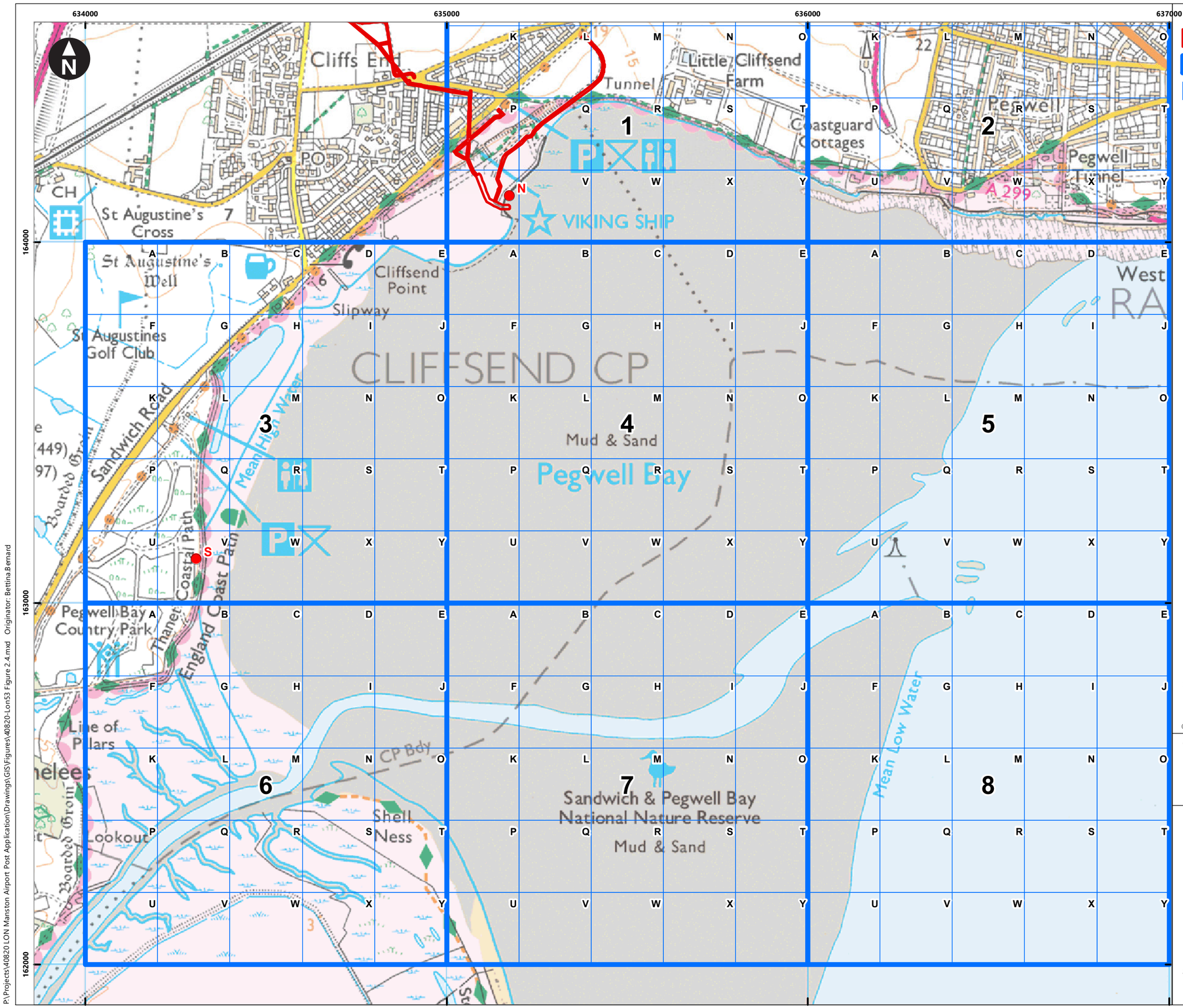
P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon52 Figure 2.3.mxd Originator: Bettina.Bernard



Key

- Order Limits
- 1km grid
- 200m grid
- Pegwell Bay surveys, VP locations

0 100 200 300 400 500 600 m

Scale at A3: 1:10,000

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Figure 2.4
Pegwell Bay Waterbird Distribution Survey: Location of Survey Grid and View Points

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wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon53 Figure 2.4.mxd Originator: Bettina Bernard

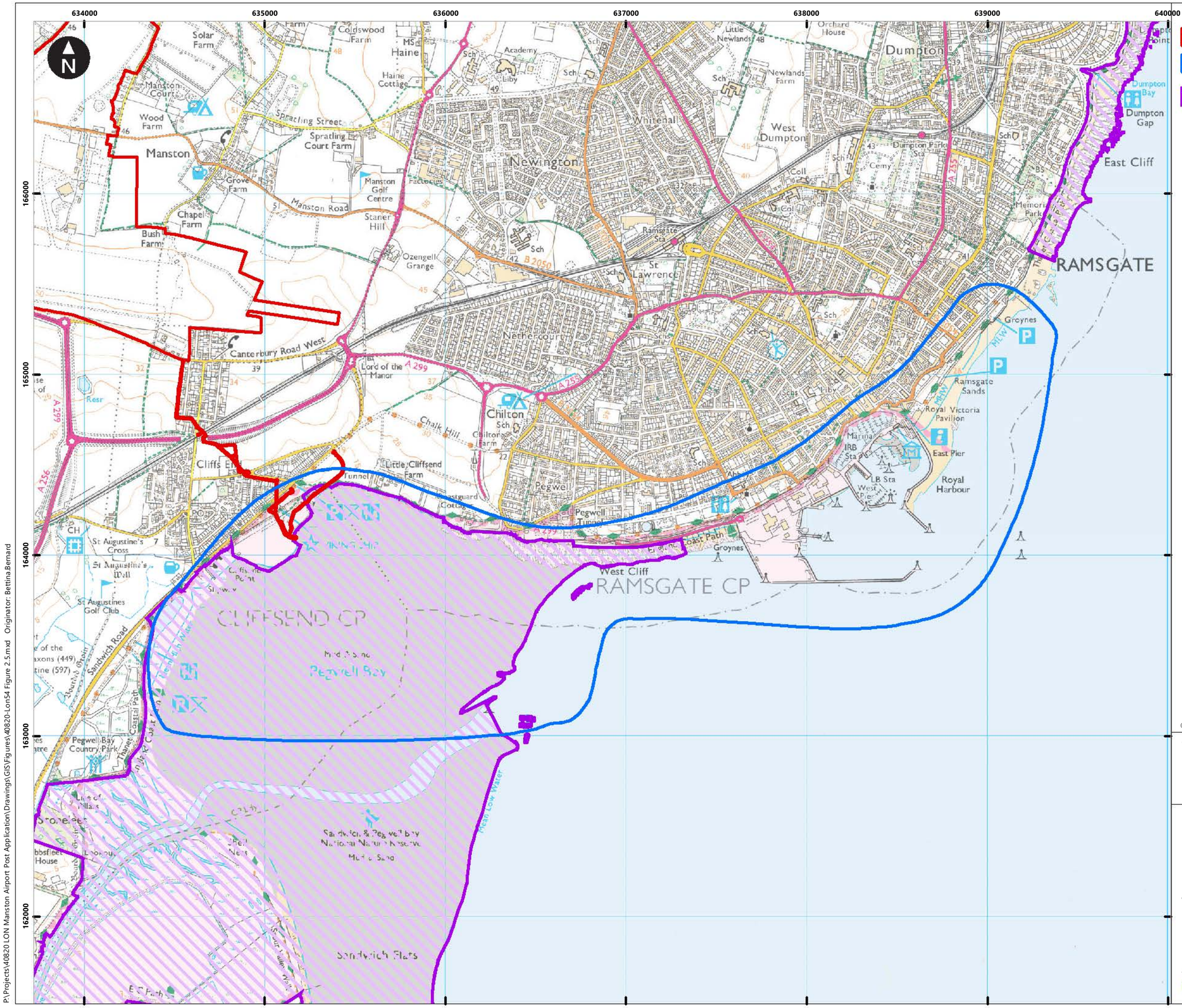

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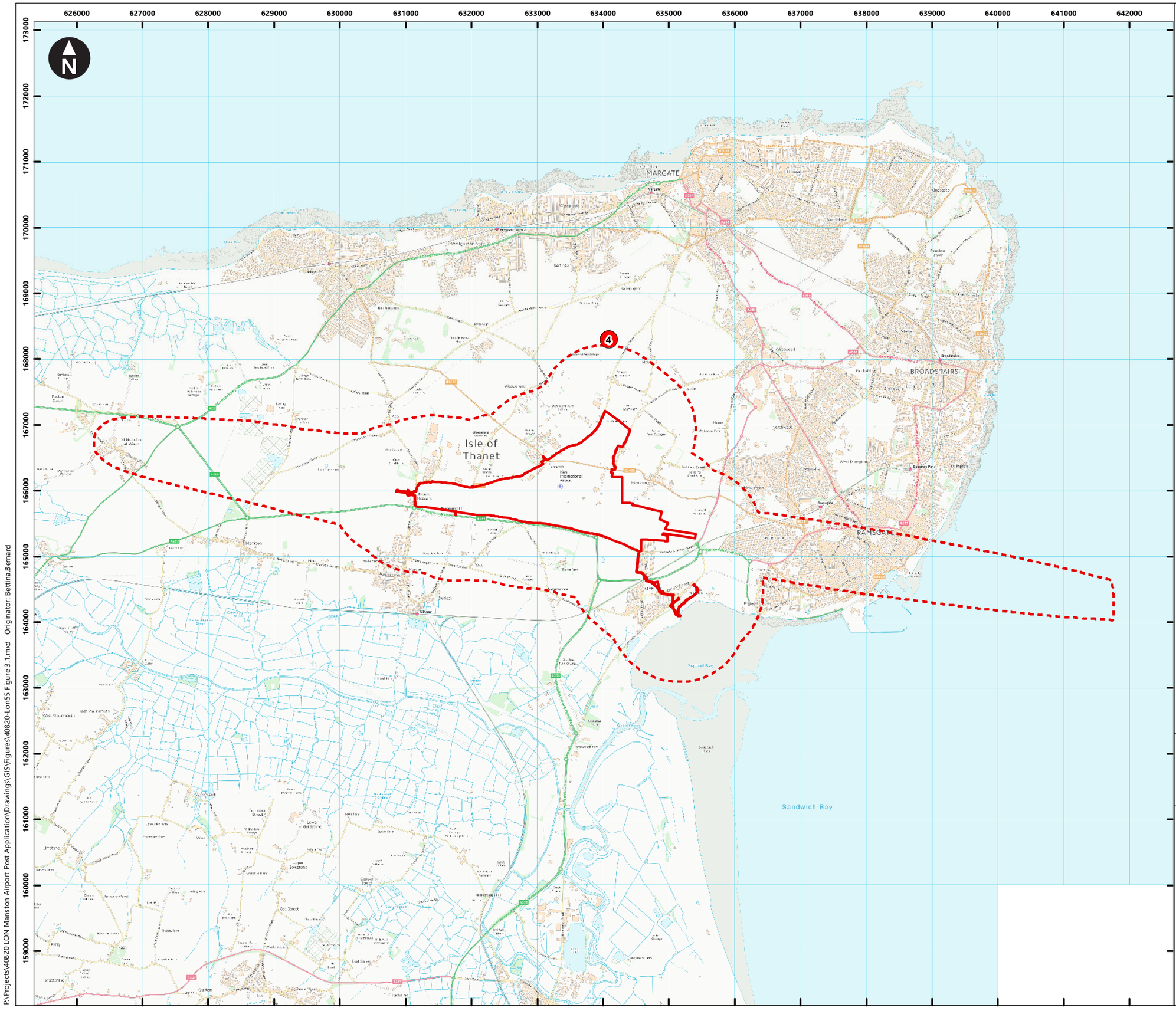
Figure 2.5
Turnstone Survey: Survey Area

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon54 Figure 2.5.mxd Originator: Bettina Bernard



Key

Order Limits

Survey Area

Golden Plover Peak Count

1 - 20 birds

0 1,000 2,000 3,000 m

Scale at A3: 1:55,000

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Figure 3.1
Daytime Field Survey: Peak Numbers of Golden Plover in each Field

April 2019

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P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon55 Figure 3.1.mxd Originator: Bettina.Bernard

626000 627000 628000 629000 630000 631000 632000 633000 634000 635000 636000 637000 638000 639000 640000 641000 642000

173000 172000 171000 170000 169000 168000 167000 166000 165000 164000 163000 162000 161000 160000 159000

N

MARGATE

BROADSTAIRS

RAMSGATE

Isle of Thanet

Sandwich Bay

N1

N2

N3

N4

N5

N6

1

2

Key

Order Limits

Survey Area

Nocturnal transect routes

Golden Plover Peak Count

1 - 20 birds

0 1,000 2,000 3,000 m

Scale at A3: 1:55,000

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Manston Winter Bird Report 2018/19

Figure 3.2
Nocturnal Walkover Survey: Peak Numbers of Golden Plover in each Field

April 2019

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P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon56 Figure 3.2.mxd Originator: Bettina.Bernard

630000 631000 632000 633000 634000 635000

167000 166000 165000 164000 163000 162000

Key

- Order Limits
- Viewpoint
- Golden plover
- Grey plover
- 1 — Unique Flight ID number
- 13 — Number of birds

0 250 500 750 1,000 m

Scale at A3: 1:20,000

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Manston Winter Bird Report 2018/19

Figure 3.3
Flight lines of target species

April 2019

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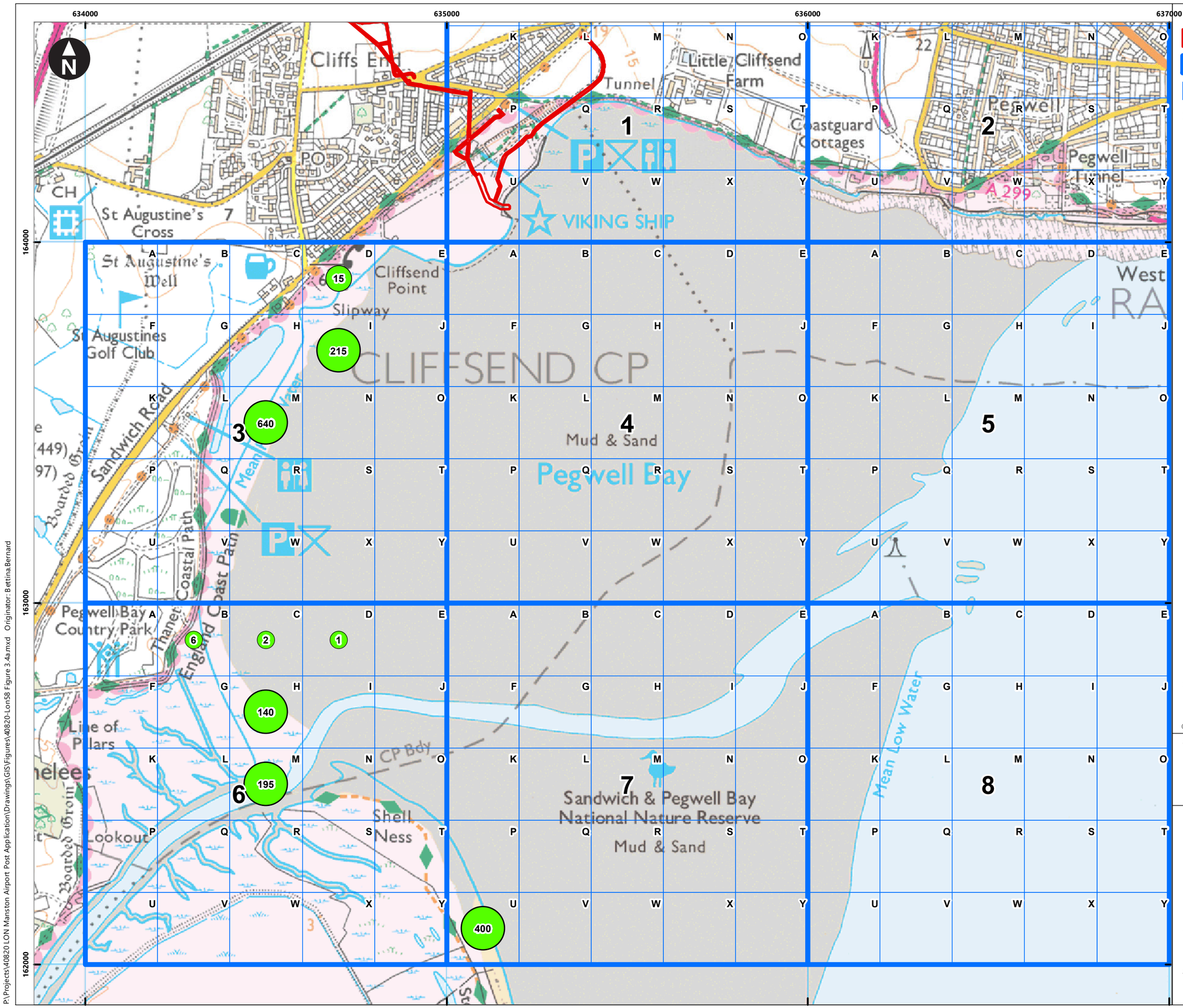
P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon57 Figure 3.3.mxd Originator: Bettina.Bernard


634000
635000
636000
637000
164000
163000
162000
Key
Order Limits
1km grid
200m grid
Golden Plover Peak Count
1-9 individuals
10-49 individuals
50-99 individuals
100+ individuals
Cliffs End
Little Cliffsend Farm
Tunnel
Coastguard Cottages
Pegwell
Pegwell Tunnel
A 299
PO
CH
St Augustine's Cross
VIKING SHIP
St Augustine's Well
Cliffsend Point
Slipway
West
RA
St Augustines Golf Club
CLIFFSEND CP
Sandwich Road
Mean Water
Mud & Sand
Pegwell Bay
Pegwell Bay Country Park
Thanet Coastal Path
England Coast Path
Line of Pillars
CP Bdy
Shell Ness
Lookout
Sandwich & Pegwell Bay National Nature Reserve
Mud & Sand
Mean Low Water
1
2
3
4
5
6
7
8
15
215
640
6
2
1
140
195
400
0 100 200 300 400 500 600 m
Scale at A3: 1:10,000
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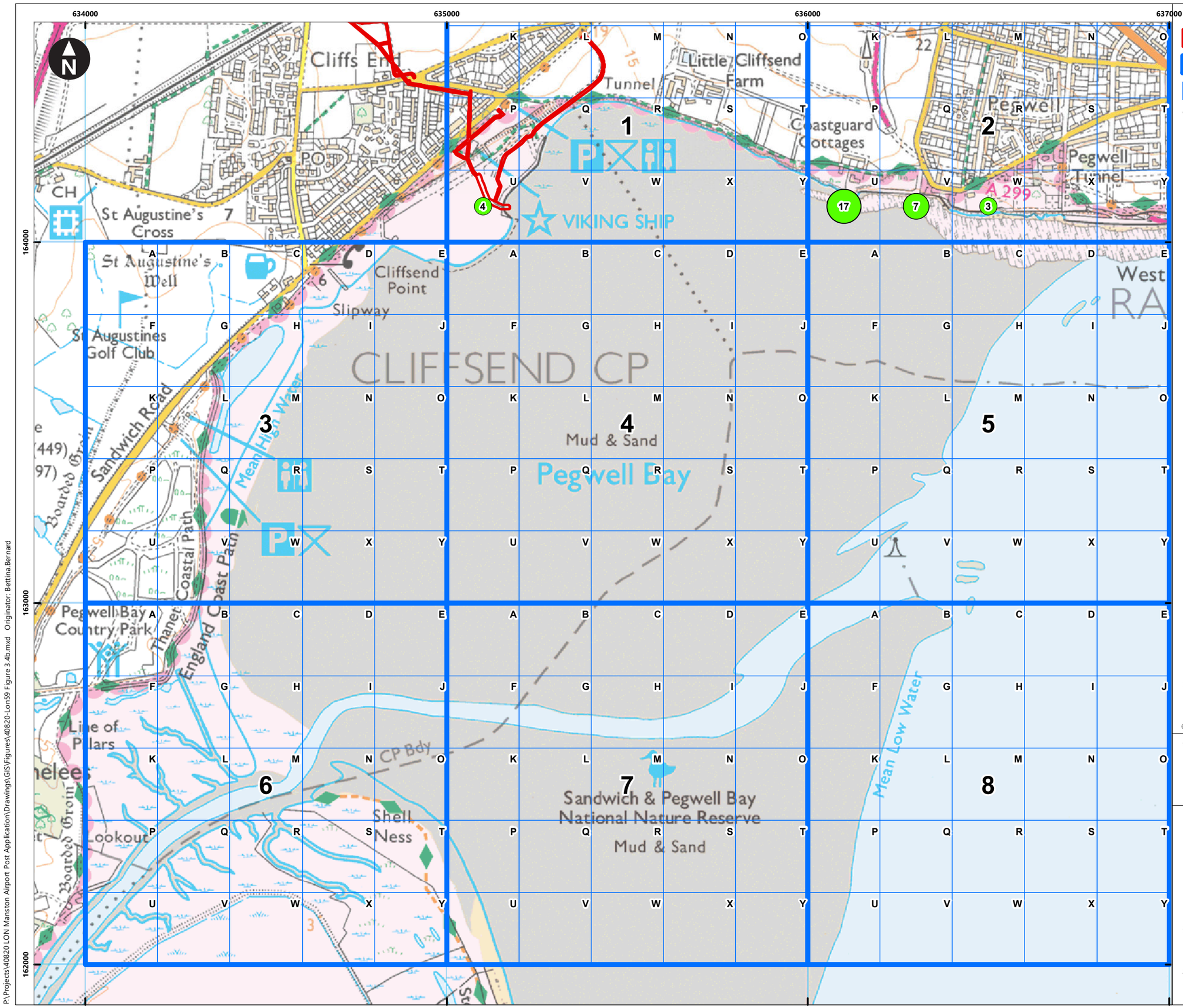
Client
RSP
Manston Airport DCO
Manston Winter Bird Report 2018/19
Figure 3.4a
Pegwell Bay Waterbird Distribution Survey: Peak Numbers of Golden Plover in each 200m Grid Square
April 2019
wood.
P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon58 Figure 3.4a.mxd Originator: Bettina.Bernard



Key

- Order Limits
- 1km grid
- 200m grid

Turnstone Peak Count

- 1-4 individuals
- 5-9 individuals
- 10+ individuals

0 100 200 300 400 500 600 m

Scale at A3: 1:10,000

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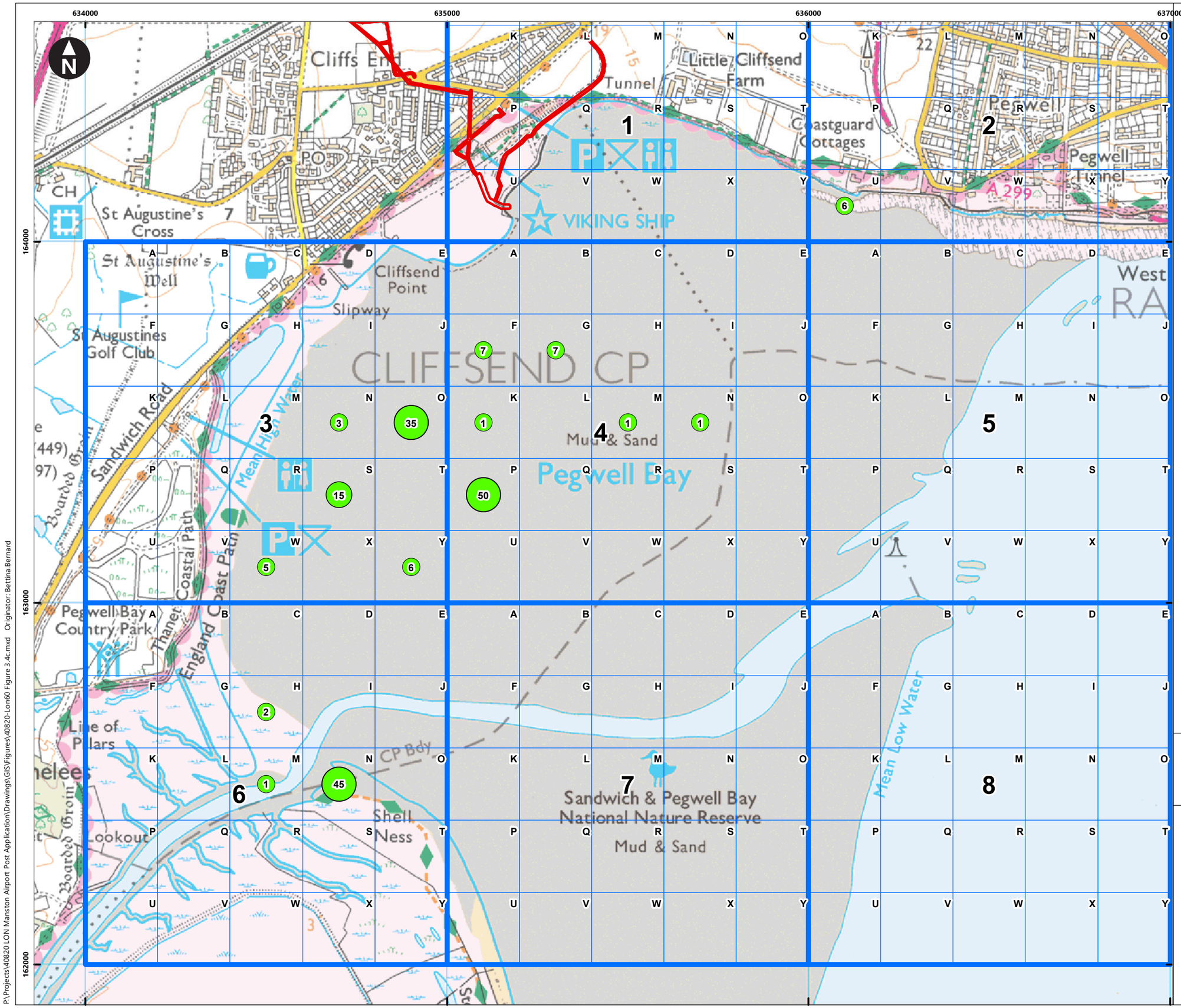
Figure 3.4b
Pegwell Bay Waterbird Distribution Survey: Peak Numbers of Turnstone in each 200m Grid Square

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon59 Figure 3.4b.mxd Originator: Bettina.Bernard



Key

- Order Limits
- 1km grid
- 200m grid

Sanderling Peak Count

- 1-9 individuals
- 10-24 individuals
- 25+ individuals

0 100 200 300 400 500 600 m

Scale at A3: 1:10,000

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Client

RSP

Manston Airport DCO
Manston Winter Bird Report 2018/19

Figure 3.4c
Pegwell Bay Waterbird Distribution Survey: Peak Numbers of Sanderling in each 200m Grid Square

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon60 Figure 3.4c.mxd Originator: Bettina.Bernard

634000 635000 636000 637000

164000 163000 162000

Key

Order Limits

1km grid

200m grid

Grey Plover Peak Count

1-9 individuals

10-49 individuals

50-99 individuals

100+ individuals

0 100 200 300 400 500 600 m

Scale at A3: 1:10,000

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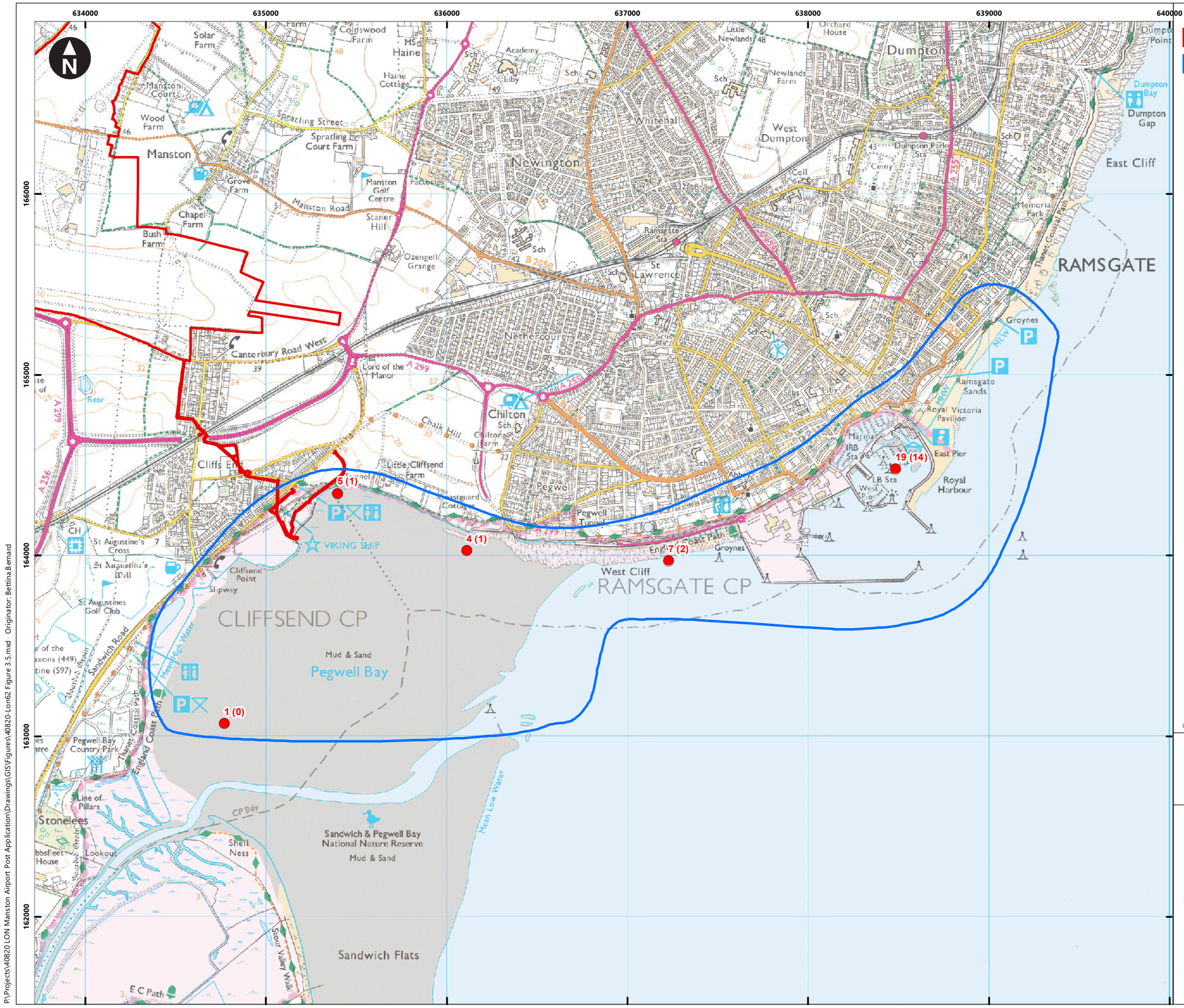
Manston Airport DCO
Manston Winter Bird Report 2018/19

Figure 3.4d
Pegwell Bay Waterbird Distribution Survey: Peak Numbers of Grey Plover in each 200m Grid Square

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon61 Figure 3.4d.mxd Originator: Bettina.Bernard



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RSP

Manston Airport DCO
Manston Winter Bird Report 2018/19

Figure 3.5
Turnstone Survey: Peak (and mean) Numbers of Turnstone at each Location

April 2019

wood.

P:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon62 Figure 3.5.mxd Originator: Bettina Bernard

Appendix Ec.2.5

Waterbird Disturbance Mitigation Toolkit
Informing Estuarine Planning & Construction Projects

University of Hull
Institute of Estuarine and Coastal Studies

Produced by the Institute of Estuarine & Coastal Studies (IECS) University of Hull, 2013

TIDE
Tidal River Development

Authors:
N Cutts
K Hemingway & J Spencer
Version 3.2, March 2013
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Funded by:

The Interreg IVB North Sea Region Programme
Investing in the future by working together for a sustainable and competitive region

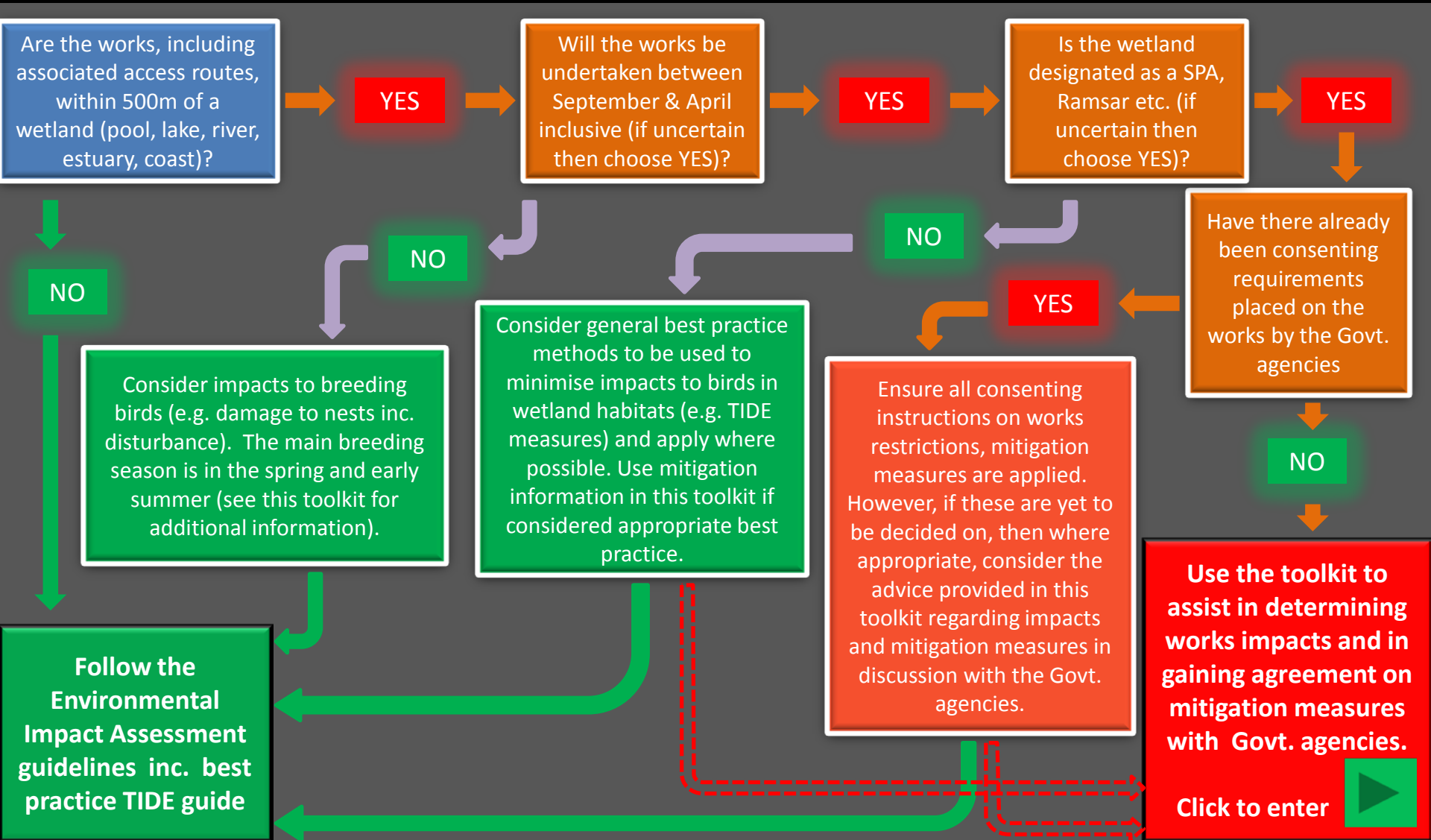
Environment Agency

The authors are solely responsible for the content of this toolkit. Material included herein does not represent the opinion of the European Community, and the European Community is not responsible for any use that might be made of it.

In what situation would the Waterbird Disturbance Mitigation Toolkit be of value to me?

Click Here to Enter

This flow chart describes the basic context for situations where the Waterbird Disturbance Mitigation Toolkit will be of value. It is designed for use by works planners & site managers to initially assess whether impacts to migrating and wintering waterbirds are likely to arise from a proposed project, and to identify additional information requirements to meet consenting needs. It can also be of value during operations to gauge the level of impact from works operations.



Toolkit Description & Context
Background - Birds
Background - Disturbance
Noise Disturbance
Visual Disturbance
Disturbance Summary
Seasonality
References
Species Accounts
Brent Goose *Branta bernicla*
Shelduck *Tadorna tadorna*
Mallard *Anas platyrhynchos*
Oystercatcher *Haematopus ostralegus*
Ringed Plover *Charadrius hiaticula*
Golden Plover *Pluvialis apricaria*
Grey Plover *Pluvialis squatarola*
Lapwing *Vanellus vanellus*
Knot *Calidris canutus*
Sanderling *Calidris alba*
Dunlin *Calidris alpina*
Black-tailed Godwit *Limosa limosa*
Bar-tailed Godwit *Limosa lapponica*
Curlew *Numenius arquata*
Redshank *Tringa totanus*
Turnstone *Arenaria interpres*

Toolkit Contents & Navigation

Click on the 'buttons' on the left to go to individual pages or use the arrows at the bottom of page to navigate sequentially (top right to get back to the first page.

Species Account colour on the ‘buttons’ to the left indicates the sensitivity of individual species to works disturbance (**green** less sensitive, **red** more sensitive).

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What is the Waterbird Disturbance Mitigation Toolkit?

This toolkit has been developed to assist flood protection managers and ports developers in relation to waterfowl disturbance impacts arising from construction works within or adjacent to Natura 2000 sites (e.g. Special Protection Areas and Ramsar Sites). In addition, it is hoped that the toolkit can be used by planners when considering development plans in estuaries and coasts with a high conservation value for waterbirds. Importantly, this tool is not designed to replace traditional methods of environmental assessment and monitoring, but to provide an initial high level guidance in the identification of possible construction:waterfowl disturbance issues and assist in the development of appropriate mitigation methods where practicable. The toolkit can be used in conjunction with the Bird Disturbance Mitigation Android App which is available from Google Play.

Disturbance can occur from both visual and aural stimuli, and whilst there is a paucity of avifaunal response data for both sources of disturbance, it is our experience that in particular, data relating to noise stimuli responses are extremely poor. Probably as a result of this poor evidence base, consenting of construction activity adjacent to wetland sites of waterbird importance appears to be particularly precautionary, and this necessarily can constrain operations in some situations (e.g. works timings).

It is therefore the aim of this toolkit to better characterise construction sourced disturbance effects to waterbirds on estuaries, and in particular, the effects of generated noise, in order to provide both works management with a clear route to determine high level disturbance issues, and consenting bodies with sufficient information to reduce the level of 'precaution' applied to the planning process. It is also hoped that the toolkit will provide information on a suite of actions for universal management and mitigation methods to be employed regardless of such work's location.

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Considerations Within the Toolkit

From disturbance response monitoring at a number of flood defence improvement sites on estuaries, as well as other construction projects and potentially 'disturbing' operations, it is our observation that noise stimuli rarely cause waterbird disturbance before associated visual stimuli have an effect. Visual disturbance, although complex at a detailed level, has however been studied (and reported) more extensively, so that response thresholds for this form of stimuli are available for a number of species and disturbing activities. Noise in its own right can, of course, have a direct impact in some situations, although as a disturbance stimuli, *noise* (or *sound pressure level)* is a complex parameter to characterise.

Different species of bird have different tolerance thresholds to noise disturbance (and visual disturbance) and therefore construction works and other operations impact upon different species in differing ways. Furthermore, birds are liable to habituation (e.g. they usually become more tolerant with increased exposure time to regular activities) to both aural and visual disturbance stimuli. This is of importance, as different types of noise have different likely effects, and at its most simplistic, ongoing background or regular noise is likely to be more readily assimilated by waterfowl than sudden irregular noise events at a similar decibel level. As such, 'loud' works in a generally 'loud' environment may cause little actual ongoing disturbance (as birds are already tolerant or *habituated*), whilst quieter works in a quiet environment may potentially have a greater disturbance effect in some instances.

It is therefore important to emphasise that the development context is an important consideration in assessing disturbance potential, reflecting both the existing environmental considerations, as well as the sensitivity & importance of the waterbirds in the area and the likely construction activities.

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Context of the Toolkit

This toolkit has been developed using a combination of literature review information and field observation, tailored specifically for the purpose of defining disturbance impacts to avifauna from construction-type operations on or adjacent to intertidal areas.

However, paucity of published data on the subject means that large amounts of information used within the toolkit are from direct observation of flood protection works in the UK, and as such information may require updating as further research is carried out.

The toolkit is presented as a number of pages each providing information on aspects of bird disturbance, the basic ecology and tolerances common waterbirds found in estuarine and coastal habitats and mitigation measures.

Noise tolerances for each species are presented as thresholds which should not be exceeded when measured **at the bird (receptor)**. Also included for ease of use is a chart for key bird species, providing response levels at set distances and noise thresholds, allowing an assessment to be made by managers of the likely disturbance effect based on the known location of plant in relation to main bird areas.

This is a live document and thus open to revision when more evidence becomes available through further research or externally published papers.

Background - Birds

The toolkit provides information on disturbance effects from a range of construction works to commonly encountered waterbirds on estuaries and other wetlands (for which we have observed behavioural responses). The term *waterbird* includes species of geese, ducks and waders, with detailed information provided within this tool for 1 species of goose, 2 species of duck, and 13 species of wader. These birds make up common elements of estuarine and coastal avifauna, although there are many other species that may be encountered. On this page we will deal with basic ecology and identification of these birds. Hover over the button to get basic text on the species. Later in the tool the individual Species Account sheets have a photograph of a typical individual as well as sensitivity information and mitigation measures. Colour-coding of the buttons reflects species sensitivity.

Bar-tailed Godwit	Dunlin	Lapwing	Ringed Plover
Black-tailed Godwit	Golden Plover	Mallard	Sanderling
Brent Goose	Grey Plover	Oystercatcher	Shelduck
Curlew	Knot	Redshank	Turnstone

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Types of Waterbird Disturbance Stimuli

Different types of disturbance stimuli are characterised by different avifaunal reactions. Furthermore, the level of reaction is not uniform to certain types of activity and is not always intuitive. Generic guidelines at present are precautionary for consenting requirements and employ an approach distance to 300m and a low noise threshold figure of **55dB** (possibly based on research by Wintermans in 1991 which recorded no effect of shooting on roosting waders where noise levels did not exceed 55dB e.g. a level where no effect occurred rather than a threshold where effect commenced).

A 70dB noise threshold has however been developed over a period of years, based on published data as well as findings from primary observations (e.g. Cutts & Allen, 1999; Cutts , Phelps & Burdon, 2008 and Cutts & Hemingway 2010). It is considered that the threshold works as a general rule but is relatively simplistic as it does not take into account the type of stimuli or the species of bird involved. Whilst 'rules of thumb' can be applied, development specific details required to improve predictions.

Although in many instances, the larger the visual stimuli the greater the disturbance response, counter-intuitively this is not always the case and a large plant undertaking vigorous work may cause less disturbance than a single worker walking along the floodbank, particularly if walking onto the intertidal zone. A single sudden sound will generally cause more disturbance than a constant or regular noise regardless of noise level, e.g. a dropped piece of scaffold at 65dB will cause a greater disturbance reaction than ongoing vibration piling at 80dB. Habituation to a stimuli will also usually entail a reduction in the level of reaction - this applies to both visual and noise related disturbance. An exception to this is if multiple stimuli occur at the same time e.g. walkers, works and planes. In this case an effect called facilitation may occur, where a greater reaction than expected is observed.

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General Waterbird Disturbance Levels Stimuli

Generic waterbird responses to disturbance from a range of activities including construction work have been collated and summarised by IECS over time (e.g. Cutts, Phelps & Burdon, 2008), based on a range of research papers, but in particular, those included in Davidson & Rothwell 1993. The table below is based on the collation of these data together with author observations of construction studies on the Humber Estuary and produced in Cutts & Allen, 1999.

Personnel and plant on mudflat:	High (and should be restricted at all times)
Third party on mudflat:	High (but difficult to restrict)
Personnel and plant on seaward toe and face:	High to Moderate
Intermittent plant and personnel on crest:	High to Moderate
Third party on bank:	High to Moderate
Irregular piling noise (above 70db):	High to Moderate
Long-term plant and personnel on crest:	Moderate
Regular piling noise (above 70db):	Moderate
Irregular noise (50db - 70db):	Moderate
Regular noise (50db - 70db):	Moderate to Low
Occasional movement of crane:	Moderate to Low
Noise below 50db:	Low
Long-term plant only on crest:	Low
Activity behind flood bank (inland):	Low

Noise Disturbance Effect on Waterbirds

Noise (sound pressure level; SPL) is a complex parameter usually measured in decibels (dB), but with a range of other metrics associated with this. Points to consider in monitoring and assessing noise are:

Noise levels are described on a logarithmic rather than linear scale, so that a doubling of the decibel figure does not entail a doubling of loudness; two or more noise sources are not directly additive in loudness effect; without a distance from source figure, a noise level is not of great value, except as an indicator of response threshold (e.g. a noise of 70dB at the receptor can either originate from a source of c. 90dB around 10m away, or a noise source of 120dB if 300m distant). Threshold response figures quoted in this report are for SPL at the **receptor** (bird) unless otherwise stated.

High Noise Level Effects

Noise disturbance is typified by regular responses to stimuli with birds moving away from the works to areas which are less disturbed (within noise tolerances). Most birds will show a degree of response to noise stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed. For auditory disturbance to qualify as a high level, it must constitute a sudden noise event of over 60dB (at the bird, not at source) or a more prolonged noise of over 72dB. Included at the bottom of this worksheet is a graphic, showing how noise at source relates to noise at the receptor (using standard decay formulae) and categorising this as high, moderate or low impact.

Moderate and Low Noise Level Effects are described on the next page

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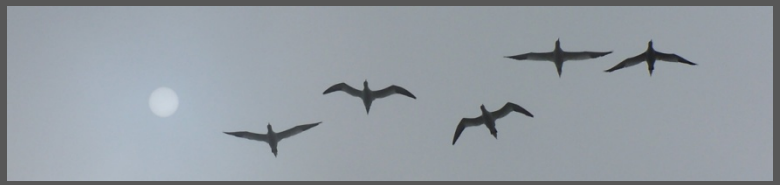
Noise Disturbance Effects on Waterbirds

Moderate Noise Level Effects

Moderate noise disturbance is typified as high level noise which has occurred over long periods so that birds become habituated to it or lower level noise which causes some disturbance to birds. This encompasses occasional noise events above 55dB, regular noise 60-72dB and long-term regular noise above 72dB, where birds have become habituated. There is cross-over in moderate and high level noise thresholds although the lower band can be assumed unless the species is particularly sensitive. Those species that are particularly sensitive are Brent Goose, Curlew & Redshank. Birds that may be more sensitive than average include Shelduck & Bar-tailed Godwit (Smit & Visser, 1993).

Low Noise Level Effects

Low level noise is classed as that which is unlikely to cause response in birds using a fronting intertidal area. As such noises of less than 55dB at the bird are included in this category. These effects are likely to be masked by background inputs in all but the least disturbed areas and thus would not disturb the birds close by. Noise between 55-72dB in some highly disturbed areas e.g. industrial or urban areas and adjacent to roads, may feature a low level of disturbance provided the noise level was regular as birds will to often habituate to a constant noise level.



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Noise Disturbance effects on Waterbirds

Based on the observed responses of waterbirds (primarily Mallard and Redshank) to various noise stimuli, it has been possible to derive an overview table utilisation the standard distance decay rates for noise. As such, it is possible to calculate the likely disturbance effect for a noise level and distance of receptor from source. E.g. plant generating 100dB(A) at around source will provide a likely 'acceptable' receptor dose of 70dB(A) at c. 20m distance, and a source of 90dB(A) would be below the impact threshold at c. 10m.

Metres from Source	dB(A)										
0.67	120	110	100	95	90	85	80	75	70	65	60
1.33	114	104	94	89	84	79	74	69	64	59	54
2.67	108	98	88	83	78	73	68	63	58	53	48
5.33	102	92	82	77	72	67	62	57	52	47	42
10.67	96	86	76	71	66	61	56	51	46	41	36
20.67	90	80	70	65	60	55	50	45	40	35	30
42.67	84	74	64	59	54	49	44	39	34	29	24
85.33	78	68	58	53	48	43	38	33	28	23	
170.67	72	62	52	47	42	37	32	27	22		
341.33	66	56	46	41	36	31	26	21			
682.66	60	50	40	35	30	25	20				
1365.32	54	44	34	49	24						

Acceptable 'dose' levels (e.g. to 70dB(A) are shaded green with dark green unlikely to have any affect whilst the pale green might occasionally induce a low level behavioural response such as a heads-up; yellow to orange shading is where a response is likely but mitigation may be effective in reducing the disturbance risk; pale red where mitigation is necessary and might be of value, but with a remaining risk of effect; dark red where a flight response is almost certain to occur and would be increasingly difficult to mitigate through Simple screening etc and may require the cessation of works during high sensitivity periods. However, the level of effect will change slightly on a site per site basis due to differing ambient noise levels at a location. A useful noise calculator resource can be found at: http://www.masenv.co.uk/noisecalculator

Visual Disturbance Effects on Waterbirds

As noted earlier in this tool, whilst visual disturbance effects on waterbirds have been more frequently studied, empirical information on threshold variability remains poor. However, In most instances a visual stimuli will create a disturbance effect before any associated noise starts to have an effect e.g. a flight response might be expected by many species if approached to within c. 100-150m across a mudflat, whereas for such an affect to occur through noise alone, then this would require a SPL of c. 120-130dB to be generated at source (around the threshold of pain).

High Level Visual Disturbance

This is typified by regular reactions to visual stimuli with birds moving away from the works (source) to areas which are less disturbed. Most birds will show a degree of response to stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed. Visual stimuli reaches high levels of disturbance extremely easily with workers operating outside of equipment, fast movement, large plant and close proximity to the birds (especially encroachment on mudflats) contributing to this level of disturbance.

Moderate Level Visual Disturbance

Typified as either high level disturbance which has occurred over long periods so that birds become habituated to it or less intrusive works which still cause a degree of disturbance. This describes visual stimuli such as works or third parties on the flood bank. Habituation occurs less with workers on the flood bank or foreshore working outside machinery. If a worker leaves plant it usually increases the disturbance level to high. There is a cross-over in the moderate and high level thresholds, although unless a species is particularly sensitive or it is a new activity then the lower band can be assumed.

Low Level Visual effects are described on the next page

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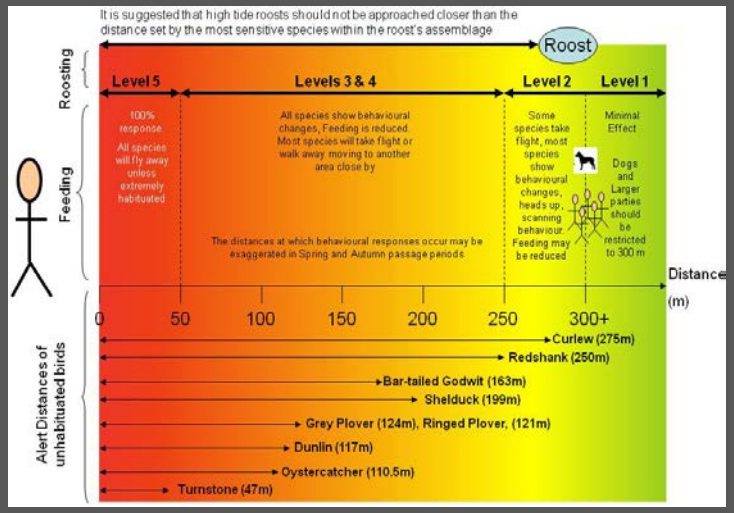
Visual Disturbance Effects on Waterbirds

Low level Visual Disturbance

This is stimuli that is unlikely to cause a response in birds using an adjacent wetland. Most works would not qualify as low-level impact unless they were out of sight of the birds and any disturbance then would be considered noise-related disturbance (there remain overflight issues for some species whereby flights to and from inland feeding and roost sites can mean that behind bank works have an effect). Long-term works inc. plant on a floodbank are also considered to be low impact. This type of work would initially qualify as moderate disturbance but with the absence of workers on the floodbank, birds would quickly become habituated. If workers were to appear alongside plant this would immediately increase the disturbance to moderate.

Click on the image below to enlarge

Taken from Cutts *et al*, 2009



To the left is a schematic summarising basic visual disturbance thresholds for general activities, key species and function. It indicates that for some species, behavioural responses during feeding may commence at around 300m distance (e.g. Curlew), whilst for others, a range of 150m to 100m is the response threshold (e.g. Dunlin). For roost sites, a generic response threshold radius of c. 300m has been derived, based around the approach distance for the most sensitive species. This because when disturbance occurs at a roost site, there is often a mass flight response or 'spook' , where all species vacate an area at the first movement of an individual bird, regardless of respective species sensitivity thresholds).

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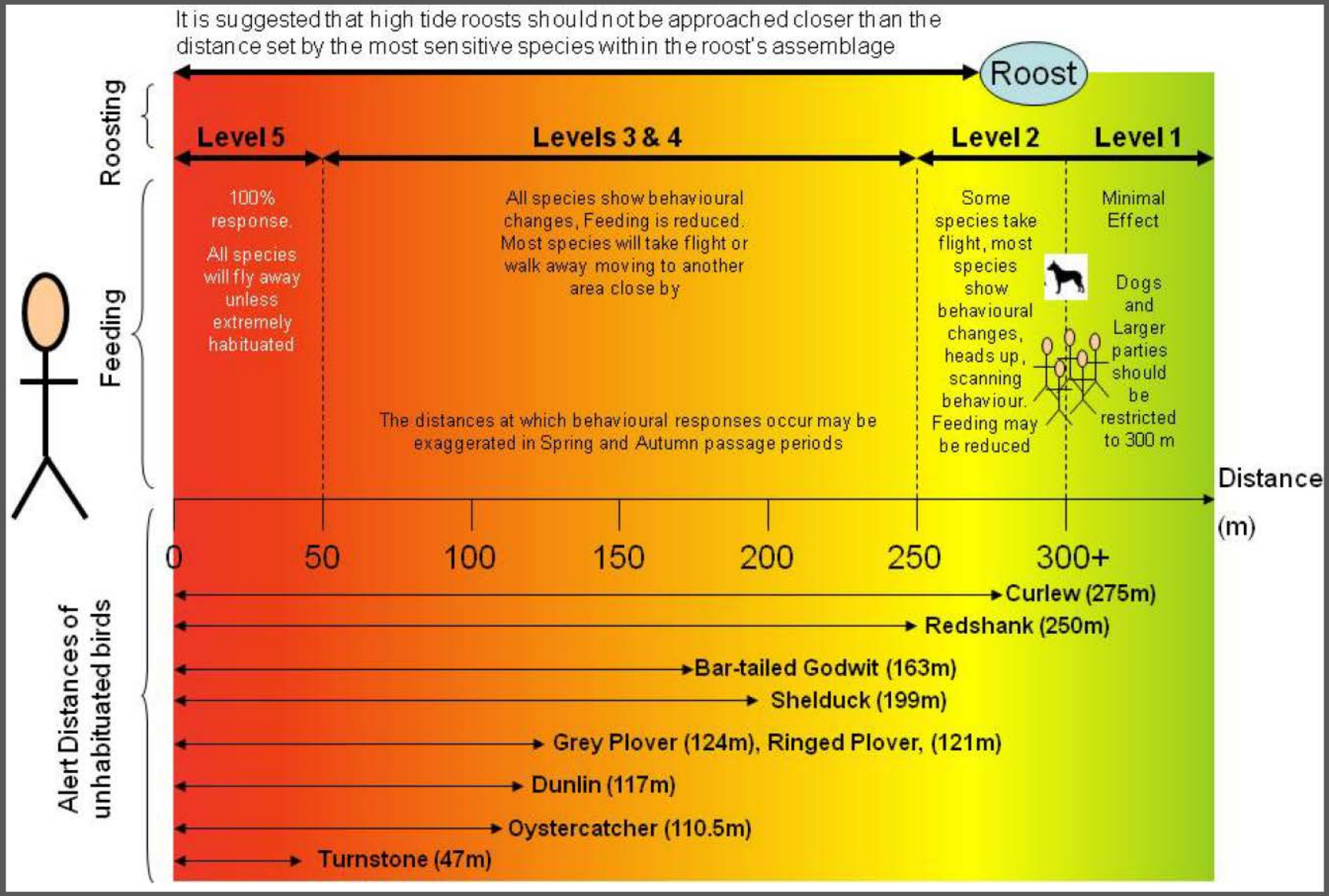
Visual Disturbance on Waterbirds: Summary Effects



Waterbird Disturbance Activity Effects Characterisation

High Level Disturbance Stimuli

- **Sudden single noise of over 60dB (at the bird)** e.g. single or initial pile impact, dropping of piles on hard surface in undisturbed environment.
- **Continuous/repetitive noise over 72dB (at the bird)** e.g. ongoing percussive or Movax vibro-piling (depending on receptor distance).
- **Close proximity of activities to birds** e.g. works or works access undertaken less than 100m from bird activity
- **Works on foreshore.** Potentially substantially greater level of impact compared to similar works on bank crest. Some habituation possible.
- **Workers operating outside of plant** e.g. single operative working on the bank may have a greater impact than an operational excavator or other plant.
- **Workers vacating plant** e.g. when an operator vacates an excavator or other plant, then disturbance levels can increase.
- **Works access** e.g. access by operators along bank crest to and from plant can have a greater disturbance effect than the plant operation.
- **Large/fast moving machinery** e.g. slow moving vehicles can have a lower impact than fast. However vehicles stopping can cause a flight response.
- **3rd parties accessing along the foreshore.** Often difficult to account for and manage, but restriction to public access can be effective mitigation.

Moderate Disturbance Stimuli

- **Sudden noises of 55-60dB (at the bird)** e.g. as above (55-60dB can be moderate or high depending on context).
- **Continuous/repetitive noises 60-72dB (at the bird)** e.g. as above.
- **High level disturbance activities that have reduced impact due to habituation**. As above, but if ongoing , habituation can occur reducing impact.
- **Slow moving/small plant.** Plant movement can cause disturbance at any speed. However vehicles coming to a halt can on occasion increase response.

Low Level Disturbance Stimuli

- **Noise of less than 55dB (at bird)**. This is often below background levels in estuaries.
- **Noise of 55-72dB in a highly disturbed environment** e.g. with background ambient noise levels of >60dB.
- **Moderate level disturbances that have reduced impact due to habituation**. As above but with regular occurrence increasing habituation.
- **Works that are out of sight of birds and create a low level noise** e.g. behind bank - but overflying birds may respond and locate away from works.
- **High level works where the birds are always over 500m away (before start up)**. This may be reduced to a 300m radius with habituation.
- **Moderate level works where the birds are over 300m away (before start up).** Potential for further slight range reduction with habituation (c. 250m)

It is emphasised that the above are only 'rules of thumb' and will often require additional detailed assessment on a site per site basis, reflecting a range of modifying parameters such as species assemblage detail, time of year, intertidal morphology, flood protection bank details, adjacent habitat, background activity etc. This information is designed for initial high level planning not detailed impact assessment.

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Back to High Noise | Back to Moderate & Low Noise | Back to High & Moderate Visuals | Back to Low Visuals

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Seasonality of Disturbance Sensitivity

Timing of works has the potential to reduce impact levels substantially, including the reduction in disturbance effects. However, the efficacy of timing in achieving this will depend on the species (and associated habitats) in proximity to the planned works. This toolkit primarily considers the effects of disturbance to waterbirds on estuaries, and these birds are most numerous during the autumn, winter and spring.

However, although most waterbirds will vacate estuaries during the summer, this absence is relatively short, as some species migrate through estuaries to northern breeding grounds during the late spring, with northern European estuaries generally cleared latest, whilst failed and non-breeders can move back through estuaries on return migration during late summer, with arrivals at northern sites being earliest. As such, the 'summer period' of 'no waterfowl' is effectively only very short, although in terms of numbers, September through to April inclusive features the greatest sensitivity.

Seasonal Waterbird Sensitivity Summary by Functional Group

Broad monthly sensitivity of waterbird groups in relation to construction works

Broad Functional Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Feeding Wildfowl	H	H	H	M	M	L	L	L	M	M	H	H
Roosting Wildfowl	H	M	M	M	L	L	L	M	H	M	H	H
Small Feeding Waders	H	M	H	H	M	0	0	M	M	H	H	H
Large Feeding Waders	H	M	H	M	L	0	0	M	H	H	H	H
Roosting Waders	H	M	L	L	L	0	0	M	H	H	H	H
General Sensitivity	H	H	H	H	M	L	L	M	H	H	H	H

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Seasonality of Disturbance Sensitivity

This disturbance toolkit concentrates on impacts to non-breeding birds. However, these too require some consideration. The breeding season can be considered to run from March to July for most species and during this time many of the species mentioned in the toolkit are absent from estuaries as they breed in the high Arctic (e.g. Turnstone & Sanderling), on upland moors (e.g. Dunlin & Golden Plover) or on wet meadows away from estuaries (e.g. Black-tailed Godwit, Curlew & Redshank). Only Oystercatcher, Shelduck and Ringed Plover breed on the foreshore and its surrounds although Curlew, Lapwing and Redshank may breed in relative proximity to estuaries.

In the UK, birds which are showing signs of breeding MUST be considered under the WCA, 1981.

In addition, differing habitats will vary in their main sensitivity periods, based around function e.g. mudflats are most important during the winter for wintering waterbirds, but reedbed and wet grassland are generally more important during the spring and summer for breeding birds (inc. passerine species). A broad characterisation of monthly sensitivities of key aquatic habitats based on all birds (including non SPA species) are given below. However, this is a high level approach and individual sites may have variations on these sensitivity weightings that should be taken into e.g. assemblage, habitat & location.

Wetland Habitat Seasonal Sensitivity Summary

Broad monthly sensitivity of wetland habitats (for birds) in relation to disturbance and damage/loss

Broad Habitat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mudflat	H	H	H	H	M	L	L	M	H	H	H	H
Saltmarsh	H	H	L	M	M	M	M	L	M	H	H	H
Reedbed	M	L	M	H	H	H	H	M	M	L	M	M
Open Water	H	M	M	H	H	H	L	L	L	M	H	H
Wet Grassland	M	L	M	H	H	M	L	L	M	M	M	M
Scrub	L	L	M	H	H	M	L	L	L	L	M	M

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Selected References

A summary of findings from research papers is provided in Cutts & Hemingway 2012. A selection of the most useful texts of the subject are provided below:

Cayford, J., 1993. Wader disturbance: a theoretical overview. Wader Study Bulletin, 68, pp. 3-5.

Cutts, N.D., Phelps, A., & Burdon, D., 2009. Construction and waterfowl: Defining sensitivity, response, impacts and guidance. Report to Humber INCA. Institute of Estuarine & Coastal Studies, University of Hull.

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Goss-Custard, J.D., Triplet, P., Sueur, F., & West, A.D., 2006. Critical thresholds of disturbance by people and raptors in wading birds. Biological Conservation, 127, pp. 88-97.

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Species Accounts – Disturbance

The identification, ecology and sensitivity of the following species are addressed in detail on the following **Species Accounts** pages in taxonomic order. These species are considered to be some of those most commonly encountered on estuaries and for which disturbance sensitivity can be addressed. Navigation to each **Species Account** can be made by clicking on the links below (given in taxonomic order & coloured for individual disturbance sensitivity). International name is in brackets.

(Branta) Brent Goose *Branta bernicla*	(Common) Shelduck *Tadorna tadorna*	Mallard *Anas platyrhynchos*	(Eurasian) Oystercatcher *Haematopus ostralegus*
(Common) Ringed Plover *Charadrius hiaticula*	(Eurasian) Golden Plover *Pluvialis apricaria*	Grey Plover *Pluvialis squatarola*	(Northern) Lapwing *Vanellus vanellus*
(Red) Knot *Calidris canutus*	Sanderling *Calidris alba*	Dunlin *Calidris alpina*	Black-tailed Godwit *Limosa limosa*
Bar-tailed Godwit *Limosa lapponica*	(Eurasian) Curlew *Numenius arquata*	(Common) Redshank *Tringa totanus*	(Ruddy) Turnstone *Arenaria interpres*

Brent (Brant) Goose (*Branta bernicla*)

Disturbance Potential: **High Sensitivity**

Brent Geese are a species highly sensitive to noise disturbance and they react in a variable manner to visual disturbance (Smit & Visser, 1993). From this study they were found to react to up to 92% of aircraft passes although this declined to 64% with habituation. Although there is an element of visual disturbance with aircraft, often the noise is the greater stimuli, especially when the aircraft fly high. The sensitivity of Brent Geese also varies depending on their activity, especially to visual disturbance. When foraging they tolerate disturbance relatively nearby with an average proximity to disturbance threshold of 105m for first reaction. When roosting or loafing the birds are far more sensitive, with the range for first reaction increasing to 205m, nearly doubling in distance the effective range. This is likely to be due to increased vigilance at roost. Further to this it has been shown that during wildfowling seasons, in areas where Brent Geese are a quarry species, the range at which they will react to potential disturbance stimuli increases further to 350m indicating a dynamic response to potential disturbance activities based around a number of parameters.

Advice & Mitigation:

Brent Geese are extremely sensitive to moderate and high level visual disturbance. If geese are within 400m of works then consideration should be given to mitigation including the commencement of works and efforts should be made to avoid high level disturbance at such time if possible.

Brent Geese are very sensitive to noise stimuli but due to their wary nature and liability to flush, the minimum approach distance can be expected to be no less than 100m. At this distance using the noise response works noise required to create high level disturbance would be 110-115dB at source and thus not particularly prohibitive. This increases to 120-125dB at 300m.

Due to their sensitivity to disturbance Brent Geese are unlikely to be found in areas with high levels of general disturbance (not works disturbance). If there are geese in a moderately or highly disturbed area expect them to be more sensitive than in an area of low level normal disturbance and try to adjust accordingly.

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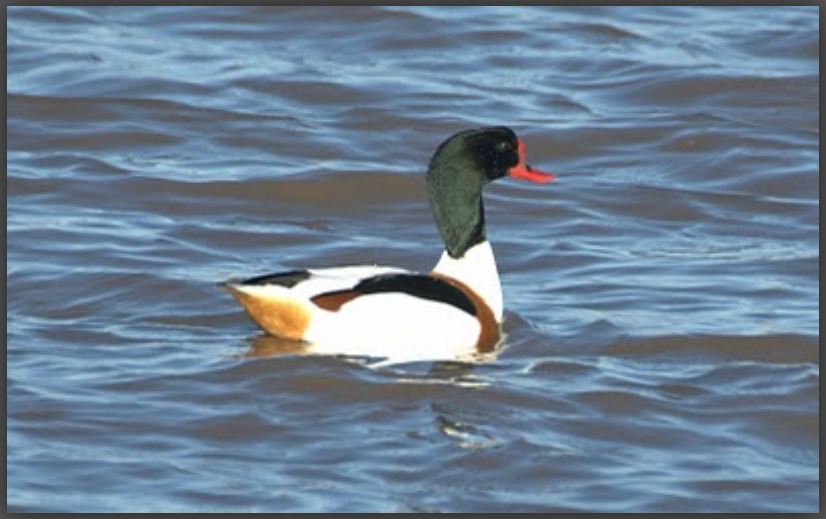
Shelduck (*Tadorna tadorna*)

Disturbance Potential: **High Sensitivity**



Shelduck are generally a wary species and are highly sensitive to visual disturbance. Typically they approach construction works no closer than 300m and are affected by visual disturbance up to 500m away from source. Aural disturbance occurs from 72dB upward. However, the species is subject to a high degree of habituation and further exposure to sounds of the same or greater level can lead to no response to stimuli. No response has been recorded for noise levels as high as 88dB but this is likely to be an extreme 'no response' level and caution should be exercised at receptor levels over 70dB. Observation of disturbance responses from flood protection works has suggested that Shelduck react to noise in approximately 30% of exposure events to sudden noise above 60dB or any noise above 70dB.

Advice & Mitigation:

Shelduck are extremely sensitive to moderate and high level visual disturbance. Ducks that are closer than 500m to activity should be given consideration when commencing works and efforts should be made to avoid activities with a potential high level of disturbance at such time if possible.

Shelduck are quite sensitive to noise stimuli but due to their wary nature and liability to flush, the minimum approach distance can be expected to be no less than 150m. At this distance using the noise effects table, works noise required to create a high level of disturbance at this range would be 115-120dB at source and thus not particularly prohibitive unless undertaking pilling. This would increase to 125-130dB at 500m.

Due to their sensitivity to disturbance Shelduck are unlikely to be found in areas with high levels of general disturbance (not works disturbance). If there are ducks in a moderately or highly disturbed areas, then expect them to be more sensitive to disturbance events than in an area of low level normal disturbance and attempt to adjust works accordingly.

Mallard (*Anas platyrhynchos*)

Disturbance Potential: **Moderate Sensitivity**

Mallard are a relatively tolerant species and will habituate rapidly to activity. In undisturbed areas Mallard will flush at moderate range (up to 500m) but in more disturbed habitats (and where they often come into human contact), such as a typical estuary, this figure is reduced to between 25-300m dependent upon the stimuli (with people causing the most extreme reaction). Stationary objects can be assumed to make lesser impacts than those that move as it has been shown that slow moving and stationary boats cause a lesser displacement of Mallard than fast moving boats. However tolerances may vary seasonally and be reduced during the wildfowling season. There is very little information on the effects of noise disturbance on Mallard but direct disturbance observation of piling recorded 2 incidents of Mallards reacting to noise (heads-up response) at levels of 69dB and 71dB although higher noise generation instances c. 80dB had no observed response to loafing and foraging birds in a moderately 'noisy' tidal freshwater site on a busy navigation. Some individual Mallard were also observed foraging around equipment pontoons whilst works were ongoing, indicating habituation.

Advice & Mitigation:

Mallard are relatively tolerant of moderate and high level visual disturbance. However, birds that are closer than 200m should be considered at the commencement of works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Mallard are not thought to be particularly sensitive to noise stimuli but there is little evidence for this other than through our direct observation and as such a standard approach should be employed with noise up to 72dB acceptable at the bird, but with caution above 55dB (60dB in a highly disturbed area). As Mallard will forage up to within 50m of plant, this means that a source noise threshold of 105-110dB would be applicable but with caution above 87-92dB. They are quite resilient to works but will be displaced by walkers/workers on the mudflat and possibly on the floodbank. Mallard are likely to be present in lower densities in highly disturbed areas, and those that are present are likely to be highly stressed, so if birds are closer than 200m to works, then high level disturbance should be avoided if possible, especially workers operating away from plant.

Oystercatcher (*Haematopus ostralegus*)

Disturbance Potential: **Moderate Sensitivity**

Oystercatchers are relatively tolerant of disturbance stimuli and will habituate rapidly to ongoing activity. In undisturbed areas they will flush at great range (up to 500m) but in more disturbed locations such as a typical estuary, this figure reduces to between 25-200m dependent upon the stimuli (with people causing the most extreme reaction). Agricultural vehicles average a 60m threshold before they are seen to react (and a fair assumption would be that the figure for construction plant would be similar). Stationary people and plant can be assumed to create a lesser impact than those that are mobile, as it has been shown that bait diggers cause a lesser displacement of Oystercatchers than walkers (although again habituation may be a factor in this). There is very little information on the effects of noise disturbance on Oystercatchers, but direct observation at a highly disturbed site (ambient noise level of 60dB) saw a reaction to only 9% of events with a degree of habituation assumed. Prior to the commencement of the works, Oystercatcher were observed foraging close to the works, but once activity commenced, birds foraged at 200m+ range with occasional birds venturing to within a radius of 100m from the activity.

Advice & Mitigation:

Oystercatcher are relatively tolerant of moderate and high level visual disturbance. Birds that are closer than 200m to a potential disturbance source should be considered when commencing works and efforts should be made to avoid high level disturbance events at such a time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Oystercatcher are not thought to be particularly sensitive to noise stimuli but there is little evidence for this, so as such a standard approach should be applied, with noise up to 72dB acceptable at the bird but with caution used at levels of above 55dB (60dB in a highly disturbed area). As Oystercatcher will forage up to within 50m of plant, this means that a source noise threshold of 105-110dB may be possible but applied with caution at levels above 87-92dB. They are quite resilient to works but will be displaced by walkers/workers on the mudflat and possibly on the floodbank. Oystercatchers are likely to be present in lower densities in highly disturbed areas and those that are present are likely to be highly stressed, so if birds are closer than 200m to works, then high level disturbance activities should be avoided if possible, especially by workers operating on the frontage, away from plant.

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Ringed Plover (*Charadrius hiaticula*)

Disturbance Potential: **Low Sensitivity; extremely tolerant with habituation**

Ringed Plover are thought to be an extremely tolerant species that habituates to anthropogenic activities rapidly. They are also tolerant of people, allowing approach as close as 30-50m before flushing when confronted with a lone walker on the mudflat. There is no published evidence with regard the Ringed Plover's reaction to noise or construction works but it is likely that again they have a high threshold to such activities given their general high tolerance. Observation of disturbance impacts suggest response to construction activity is consistent with wider disturbance tolerances reported from earlier research, with birds approaching works to within 20m on occasion. However, at distances within 50m from a disturbance source they would readily flush, only to land nearby and continue foraging almost immediately. At distances of over 100m from activity birds rarely showed any sign of disturbance and appeared often unperturbed when other species in their vicinity were reacting. Ringed Plovers were observed to not react to any noise stimuli, despite exposure to noise levels up to 88dB from aircraft flying overhead.

Advice & Mitigation:

Ringed Plover are very tolerant of moderate and high level visual disturbance. Birds that are closer than 50m to works should however, be given consideration when commencing works and efforts should be made to avoid high level disturbance at such time if possible especially, if it includes workers on the mudflat/fronting intertidal zone.

Ringed Plover would appear not to be very sensitive to noise stimuli and to habituate rapidly, especially in conjunction with visual stimuli. A noise level of up to 75dB is considered acceptable at the bird, but with caution given above 60dB levels (65dB in a highly disturbed area). They will forage extremely close to plant (<50m), and a source noise threshold of 107-112dB can be tolerated but with caution at levels above 93-98dB. If birds are primarily using an area closer than 50m to works, then it is likely that additional mitigation will be necessary. They are resilient to works activities and unlikely to be readily displaced by walkers/workers unless on close approach. Only potentially highly disturbing activities should be avoided when birds are using an area within 50m of works.

Golden Plover (*Pluvialis apricaria*)

Disturbance Potential: **Moderate Sensitivity**; Annex 1 of the EU Birds Directive

Typically they are birds of upland in summer and agricultural land in winter. They can be present on intertidal mudflats in very large numbers during the autumn and winter, where they primarily roost (often in association with Lapwing (*Vanellus vanellus*), and can similarly use inland fields, often adjacent to estuaries as additional roost areas when mudflats are covered by the tide. As with the Lapwing, there has been very little research undertaken on the reaction and tolerance of Golden Plover to disturbance in their wintering areas, either from noise or visual stimuli, and unfortunately the species was not present during field studies at works sites during the IECS data collection process. A precautionary 'standard' approach is therefore required.

Advice & Mitigation:

Reasonably tolerant of moderate level visual disturbance, but birds that are closer than 200m to potential activities should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone. Of particular note is the potential for inland roosts, often in arable fields adjacent to estuarine/riverine locations. A similar disturbance distance threshold should be considered therefore in terms of inland usage works, although flocks will use fields adjacent to industrial plant where visual and aural stimuli can be readily habituated to.

Golden Plover are moderately sensitive to noise stimuli but with little direct evidence, a precautionary approach assumes tolerance of noise up to 72dB being acceptable at the bird but with caution at levels above 55 dB (60dB in a highly disturbed area). As Golden Plover will roost to within 300m of plant this means that a source noise threshold of 120-125dB may be acceptable, but with caution above 107-112dB. If birds approach closer than 300m additional mitigation should be put in place. As the species often flies between the intertidal and adjacent terrestrial habitat to roost and feed, the presence of activity behind (landward) of flood defences can also have an influence on behaviour (even when out of sight to birds using the intertidal zone), with limited data suggesting that differential site take up occurs where works are present with flocks moving to adjacent (possibly sub-optimal) areas to roost.

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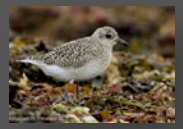

Grey Plover (*Pluvialis squatarola*)

Disturbance Potential: **Moderate Sensitivity**

Limited data suggest that Grey Plover are a relatively disturbance tolerant species, although the ability of Grey Plover to habituate to works is unknown. They are surprisingly tolerant of people, allowing approach as close as 50-100m before flushing when confronted with a lone walker on the mudflat, even when roosting. However, despite this 'tolerance', Grey Plover may abandon highly disturbed areas in favour of quieter areas to forage and roost and the threshold linkages for this or undetermined. It is also largely unclear how tolerant the Grey Plover is to noise disturbance, and unfortunately there were no Grey Plover observed near the various disturbance monitoring sites. As such, the limited evidence require a precautionary approach in setting likely response thresholds for the species to works.

Advice & Mitigation:

Grey Plover are tolerant of moderate and high level visual disturbance, however, birds that are closer than 200m to works should be considered prior to commencement of the activity, and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Grey Plover are probably moderately sensitive to noise stimuli but due to their wary nature, the minimum approach distance can be expected to be no less than 150m. At this distance using the noise:distance table, the sound level required to create a high level disturbance impact would be 115-120dB at source and thus not particularly prohibitive and this would increase to 125-130dB at 500m from source.

Grey Plover are resilient to flushing by works but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. Grey Plover are likely to be absent in highly disturbed areas and those that are present are likely to be highly stressed, so if birds are closer than 200m to works, then high level disturbance activity should be avoided if possible.

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Lapwing (*Vanellus vanellus*)

Disturbance Potential: **Moderate Sensitivity**

Typically the Lapwing is a bird of the uplands in summer and agricultural land in winter. However they do use the intertidal zone to roost (often with Golden Plover, *Pluvialis apricaria)* and can be encountered in large numbers at such sites, which are often habitually utilised. There is very little research on the reactions of Lapwing to disturbance in their wintering areas, either in response to noise or visual stimuli. Due to this paucity of information, a standard approach is considered appropriate, with additional information used, where possible, from the disturbance effects work being carried out by IECS. Unfortunately Lapwing were not encountered from the study, but a small number of records were collected from earlier work suggesting no response to visual disturbance at c. 300-400m. Previous *ad hoc* observations suggest that Lapwing do not react particularly strongly to disturbance when at roost, but information is limited and can only support a relatively conservative position on disturbance potential.

Advice & Mitigation:

Lapwing are reasonably tolerant of moderate level visual disturbance stimuli. However, birds that are closer than 300m to planned activities should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on a mudflat. Of particular note however, is their potential for inland roosting, often in arable fields adjacent to estuarine/riverine locations. A similar disturbance distance threshold should be considered therefore in terms of inland usage and the location of works should be considered in the context of potential field usage by the species.

Lapwings are thought to be only moderately sensitive to noise stimuli but there is little evidence to support this, and so a standard 'precautionary' approach should be applied, with noise of up to 72dB acceptable at the bird but with caution given for noise levels in excess of 55dB (60dB in a highly disturbed area). As Lapwing will roost to within 200m of plant, this means that a source noise threshold of 115-120dB can be applied, but with caution above 87-92dB. If birds approach closer than 200m, then appropriate mitigation should be put in place.

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Knot (*Calidris canuta*)

Disturbance Potential: **High Sensitivity to Noise Disturbance**; **Tolerant of Visual Disturbance**

Despite a paucity of published disturbance response research data, Knot appear to be a relatively tolerant species that habituates to works rapidly. They are also surprisingly tolerant of people but despite this tolerance of visual disturbance, they are highly disturbed by overflying aircraft which combine visual stimuli with noise and a resemblance to raptors (predators). This sort of reaction may be a result of facilitation - a number of different stimuli occurring simultaneously causing a greater reaction than expected. Knot would also seem to be highly sensitive to noise disturbance, moving away from stimuli readily, and from a study on the Dee estuary it would appear that such displacement can have significant impacts on Knot at a population level. Direct observation of disturbance responses from flood works saw Knot responding in a similar way to that described from the limited existing research, with birds reacting to walkers at <75m when roosting. Birds were occasionally flushed or showed disturbed behaviour to truck movements which encompass a number of differing stimuli - noise, large size - although reactions were restricted to within 100m. Knot were seen to react to aircraft overhead at a noise level of 88dB (heads-up).

Advice & Mitigation:

Knot are tolerant of moderate and high level visual disturbance events. Birds that are closer than 100m should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Knot are conversely quite sensitive to noise stimuli, especially in conjunction with visual stimuli, and as such a noise of up to 70dB is acceptable at the bird but with caution required at levels above 55 dB (60dB in a highly disturbed area). As Knot will forage close to plant (<50m) and to workers (>75m), this means that a source noise threshold of 100-105dB can be applied with caution required above 87-92dB. Knot are resilient to works activity in general, but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. Knot are likely to be present in lower densities in highly disturbed areas and those that are present are likely to be stressed, so if birds are closer than 75m to potential works, then disturbance should be avoided, especially by workers operating away from plant.

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Sanderling (*Calidris alba*)

Disturbance Potential: **Low Sensitivity; extremely tolerant with habituation**

Sanderling are thought to be an extremely tolerant species that rapidly habituates to anthropogenic activity. They are also tolerant of people, allowing approach as close as 6-50m before flushing when confronted with a lone walker on the mudflat. There is no published information regarding their reaction to noise or construction works, but it is likely that as with other 'tolerant' species, they have a relatively high threshold to construction work activity and associated noise. Observation of disturbance responses identified Sanderling response behaviour to be consistent with that described from existing research, with birds tolerating an approach distance of less than 20m before reacting. This was observed in a highly disturbed area, with much public use of the foreshore and thus some degree of existing habituation would be expected. Of the 88 potential disturbance events observed from the study, only 6 caused reaction, of which none were seen to be caused by the works and with walkers (and dog walkers in particular) causing the greatest reactions. There was no evidence of reactions to noise measured to 90dB from piling operations.

Advice & Mitigation:

Sanderling are tolerant of moderate and high level visual disturbance. However, birds that are closer than 50m to the works should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible especially if it includes workers on the mudflat/fronting intertidal zone.

Sanderling are not very sensitive to noise stimuli and habituate rapidly, especially in conjunction with visual stimuli. A noise of up to 75dB is considered acceptable at the bird but with caution at levels above 60dB (65dB in a highly disturbed area). As Sanderling will forage close to plant (<100m) this means that a source noise threshold of 112-117dB could be applied for close feeding individuals, but with caution above 97-102dB. If birds are closer than 100m then mitigation should be applied, but for birds present at some distance from the works, then a tolerance to c. 120db works might be expected. Sanderling are resilient to works and are unlikely to be displaced by walkers/workers. As such, highly disturbing activities should be avoided only where birds are within 75m if possible.

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Dunlin (*Calidris alpina*)

Disturbance Potential: **Low Sensitivity**; subspecies *schinzii* Annex 1 of the EU Birds Directive

Dunlin are a relatively tolerant species that habituates to various works. They are also surprisingly tolerant of people, allowing approach as close as 50-90m before flushing when confronted with a lone walker on the mudflat. When foraging, they are often initially disturbed by activity start-up, with a flight response, but will then forage back towards the works, approaching to within 25m on occasion, before sometimes 'spooking' and moving away again, to repeat the process. Despite this general tolerance of visual disturbance they can be disturbed by overflying aircraft which combine visual stimuli with noise and have a resemblance to raptor predators. This sort of reaction may be a result of facilitation - a number of different stimuli occurring simultaneously causing a greater reaction than expected. Dunlin are moderately sensitive to noise disturbance, moving away from highly disturbing stimuli. Direct observation of disturbance events found that Dunlin exhibited a similar pattern to that identified from previous research, with birds occasionally reacting to works. Birds were occasionally flushed or showed disturbed behaviour to truck movements however, in some instances birds would forage within 20m of the works with habituation. Despite this Dunlin can be displaced from up to a 300m range by regular high level stimuli and were seen to react to aircraft overhead at a noise level at receptor of 88dB (heads-up).

Advice & Mitigation:

Dunlin are very tolerant of moderate and high level visual disturbance. Birds that are closer than 75m should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Dunlin are not particularly sensitive to noise stimuli and as such a noise level of 72dB measured at the bird is acceptable but with caution above 60dB. Dunlin will forage extremely closely to plant (<50m) and >75m from worker. This means that a source noise threshold of 102-107dB can be applied but with caution above 92dB. Dunlin are resilient to works but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. Dunlin are likely to be present in lower densities in highly disturbed areas and those that are present are likely to be highly stressed, so if birds are regularly present closer than 75m to the potential works, then high level disturbance events should be avoided if possible, especially for workers away from plant.

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Black-tailed Godwit (*Limosa limosa*)

Disturbance Potential: **Moderate Sensitivity**

Black-tailed Godwit are an under-studied species with regard disturbance impacts, both from noise and visual sources. Gill *et al*. (2001) suggest that the species is tolerant of disturbance but little detail on how this affects birds below the population level is described. Given that it is suggested that the Black-tailed Godwit is a robust species with regard disturbance, it is suggested that a standard approach should be used until further evidence is available. No Black-tailed Godwit were observed during the recent disturbance data collection work by IECS, but from previous work on the Humber, they were observed to be tolerant of general works including Movax pilling at a range of c. 150m, and on one occasion were observed moving towards a noise source whilst tideline foraging, with a noise level at receptor (pilling) of 70dB. A flight response by a small flock was also noted at a range of c. 250m relating to crane jib operation moving a load above the skyline over the flood defences.

Advice & Mitigation:

Given the paucity of information, Black-tailed Godwit are considered tolerant of moderate visual disturbance. However, birds that are closer than 250m to activity should be considered when commencing works and efforts should be made to avoid high level disturbance at such a time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

They are considered moderately sensitive to noise stimuli and can be expected to approach works to within 100m. At this distance using noise response data, the source level required to create high level disturbance would be 110-115dB and possibly greater (based on limited observed response information) thus not particularly prohibitive. Moderate disturbance at this distance would be caused by source noise of 92dB plus, but this is considered precautionary given data deficiencies. Due to these issues, information on how close Black-tailed Godwit will forage in relation to works is uncertain, and as such, if they approach closer than 100m then caution should be exercised. They are resilient to flushing by works but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. They may be absent in highly disturbed areas and those that are present are more likely to be stressed, so if birds are closer than 100m to works, then high level disturbance should be avoided if possible.

Bar-tailed Godwit (*Limosa lapponica*)

Disturbance Potential: **Moderate Sensitivity**; Annex 1 of the EU Birds Directive

Bar-tailed Godwit are a relatively disturbance tolerant species that habituates to works rapidly. They are also surprisingly tolerant of people, allowing an approach range of as close as 40-100m before flushing when confronted with a lone walker on the mudflat. However, despite this tolerance, Bar-tailed Godwits rapidly abandon highly disturbed areas in favour of quieter areas to forage and roost. research has indicated that Bar-tailed Godwit are moderately affected by auditory stimuli, reacting to 38% of overflying planes in one study. Direct observation of disturbance responses by the species to flood defence works supported the evidence with regard reactions to visual stimuli. Only a single negative reaction, caused by a third party, was noted at a moderately disturbed site, whilst during the same study, 140 potential disturbance events were tolerated by the birds, including several aircraft passes recorded at between 69-72dB. However, despite seemingly being unaffected by the works, the species did not forage within 200m of the activity, despite foraging activity being actively pursued beyond this range, suggesting that they had actively vacated the area close to the works, this being consistent with previous research findings.

Advice & Mitigation:

Bar-tailed Godwit are tolerant of moderate and high level visual disturbance stimuli. However, birds that are closer than 200m should be considered when commencing works and efforts should be made to avoid high level disturbance events at such time if possible especially if it includes workers on the mudflat/fronting intertidal zone.

Bar-tailed Godwit are moderately sensitive to noise stimuli, but due to their wary nature the minimum approach distance can be expected to be no less than 150m. At this distance, using works noise response levels, sound levels required to create a high level disturbance would be 115-120dB at source and thus not particularly prohibitive. This increases to a 125-130dB source tolerance at a range of 500m.

Bar-tailed Godwit are resilient to flushing by works but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. Bar-tailed Godwits are likely to be absent in highly disturbed areas and those that are present are likely to be highly stressed, so if birds are closer than 200m, high level disturbance stimuli should be avoided if possible.

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Curlew (*Numenius arquata*)

Disturbance Potential: **Moderate Sensitivity**

Research evidence indicates that Curlew are an extremely wary species that does not habituate to works rapidly and are also particularly intolerant of people, allowing approach to a range of 120-300m before flushing when confronted with a lone walker on the mudflat. This figure may rise to 550m in a disturbed environment when facilitation effects occur and Curlew are also highly reactive to aircraft, research showing disturbed behaviour for 42-86% of aircraft over-flights. However, from the recent programme assessing disturbance responses from flood defence works, this intolerance was not evidenced to the same degree. Observation of two moderately disturbed sites, one with highly disturbing works and one with moderately disturbing works both had Curlew foraging regularly within 100m. No reactions were observed to machinery operation or aircraft passing overhead. Earlier monitoring of impacts identified a general intolerance of the species to the presence of people on flood banks (in vehicle was OK).

Advice & Mitigation:

Curlew are considered to be wary of moderate and high level visual disturbance. Birds that are closer than 300m should be considered when commencing works and efforts should be made to avoid high level disturbance at such a time if possible, especially if it includes workers on the mudflat/fronting intertidal zone. Similarly, whilst they may tolerate vehicle movements, once a person gets out of a vehicle then flight can occur.

Curlew are moderately sensitive to noise stimuli but due to their wary nature the minimum approach distance can be expected to be no less than 100m. At this distance using the noise response table, noise required to create high level disturbance would be 107-112dB at source and thus not particularly prohibitive, and increasing to 117-122dB at 300m. If birds should approach closer than 100m, then highly disturbing activities should be avoided if possible.

If the works are in a highly disturbed area with aircraft and disturbance from the public then expect Curlew to be particularly wary and adjust accordingly. Curlew may well be displaced by the works in these areas so extra care should be shown.

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Redshank (*Tringa totanus*)

Disturbance Potential: **High Sensitivity to Noise Disturbance**; **Tolerant of Visual Disturbance**

Redshank are a relatively tolerant species that habituates to works rapidly. They are also surprisingly tolerant of people, allowing approach as close as 70-115m before flushing when confronted with a lone walker on the mudflat. Despite this tolerance of visual disturbance, they are highly disturbed by overflying aircraft which have a resemblance to raptors. They are also highly sensitive to noise disturbance, moving away from stimuli readily. Observation of works impacts on Redshank identified a broadly similar tolerance range to that of existing research, with birds reacting to workman at <75m. Redshank were seen to react to aircraft overhead at noise levels of 72dB (heads-up) and 88dB (flushed) but it is unlikely that there was a visual component to this response, as the flight altitude was high.

Advice & Mitigation:

Redshank are very tolerant of moderate and even high level visual disturbance stimuli. However, birds that are closer than 100m of works should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

Redshank are conversely particularly sensitive to noise stimuli, especially in conjunction with visual stimuli. As such a noise of up to 70dB is acceptable at the bird but with caution above 55dB (60dB in a highly disturbed area). As Redshank will forage extremely close to plant (<50m) and >75m to workers, this means that a source noise threshold of 100-105dB should be applied, with caution above 87-92dB.

Redshank are resilient to works but may be displaced by walkers/workers on the mudflat and possibly on the floodbank. They are likely to be present in lower densities in highly disturbed areas and those that are present are likely to be highly stressed, so if birds are closer than 75m from a works source, high level disturbance should be avoided if possible, especially by workers operating away from plant.

Turnstone (*Arenaria interpres*)

Disturbance Potential: **Low Sensitivity; extremely tolerant with habituation**

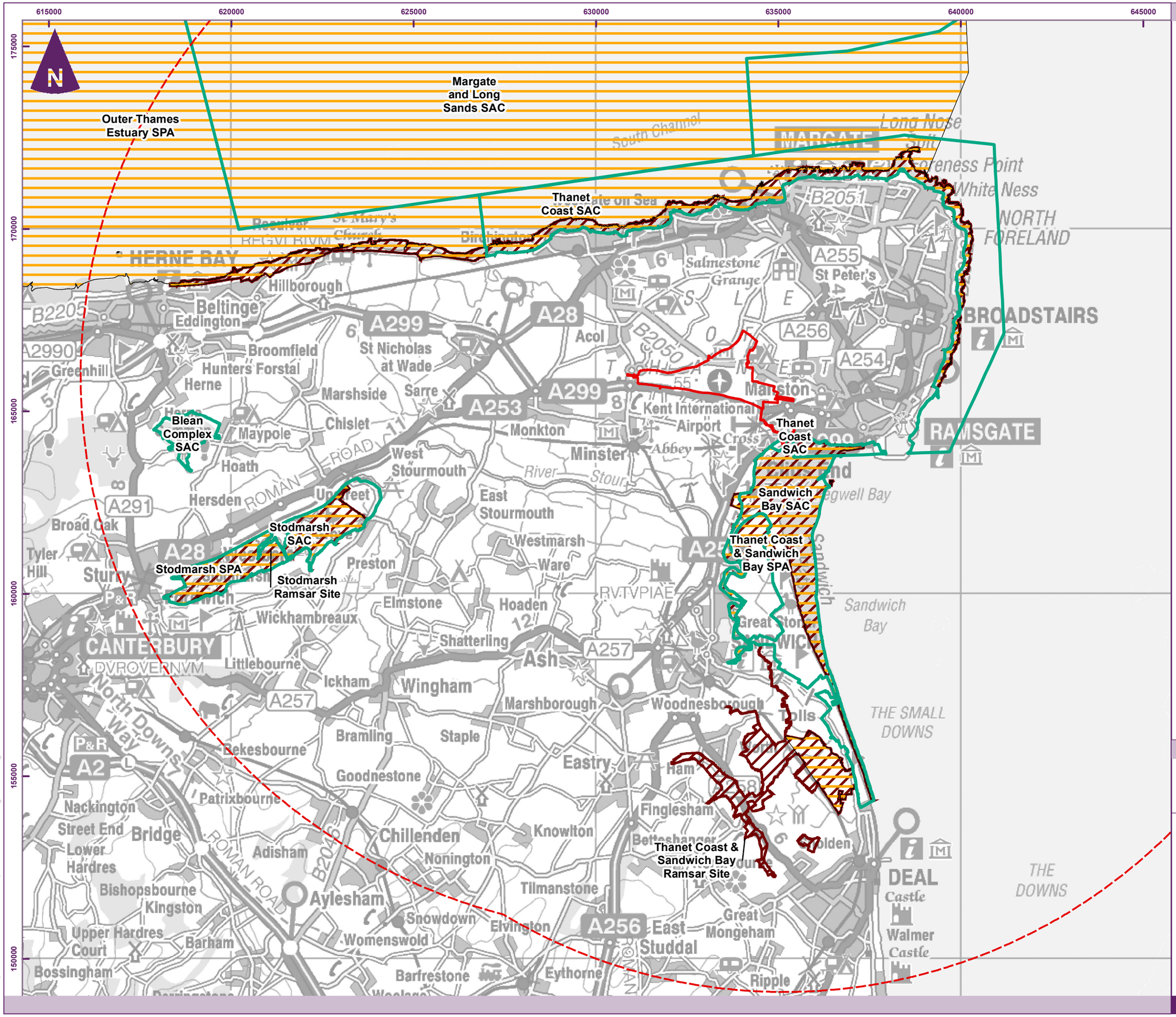
Turnstone are thought to be an extremely tolerant species that habituates rapidly. They are tolerant of people, allowing approach as close as 30-50m before flushing when confronted with a lone walker on the mudflat (and will feed closely around people on harbours etc). There is no published evidence with regard their reaction to noise or works, but it is likely that again they have a high threshold to noise and works. Direct observation of disturbance effects from works found Turnstone responses to be consistent with the expected high tolerance, with birds allowing approach to works to within 10m before reacting. This was in a highly disturbed area with much public use of the foreshore and of 127 potential disturbance events observed, only 19 caused reaction of which only 3 were caused by the works with trucks flushing Turnstones at between 15-100m. Walkers (and dog walkers in particular) caused the greatest reactions. There was no evidence of reactions to noise, which reached levels above 90dB due to piling.

Advice & Mitigation:

Turnstone are very tolerant of moderate and high level visual disturbance, although birds that are closer than 50m proximity should be considered when commencing works and efforts should be made to avoid high level disturbance at such time if possible, especially if it includes workers on the mudflat/fronting intertidal zone.

They are not very sensitive to noise stimuli and habituate rapidly, especially in conjunction with visual stimuli. A noise of up to 75dB appears acceptable at the bird, but with caution suggested for levels above 60dB (65dB in a highly disturbed area). They will forage extremely close to plant (<50m and often within 10m), which means that a source noise threshold of 107-112dB can be applied with caution possible above 93-98dB. However, high noise levels at source (c. 120db) are probably acceptable for birds foraging at distance, but if birds are regularly foraging closer than 50m, then this should be mitigated for. They are resilient to works and are unlikely to be displaced by walkers/workers. As such highly disturbing activities should be avoided if birds are within 50m if possible.

Appendix Ec.2.6



Key

- Order Limits
- 15km buffer
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar site

0 1 2 3 4 5 6 km

Scale at A3: 1:100,000

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Figure 3.1
Statutory designated sites within 15km of the Order Limits

March 2018 38199-Lon412.mxd parkj

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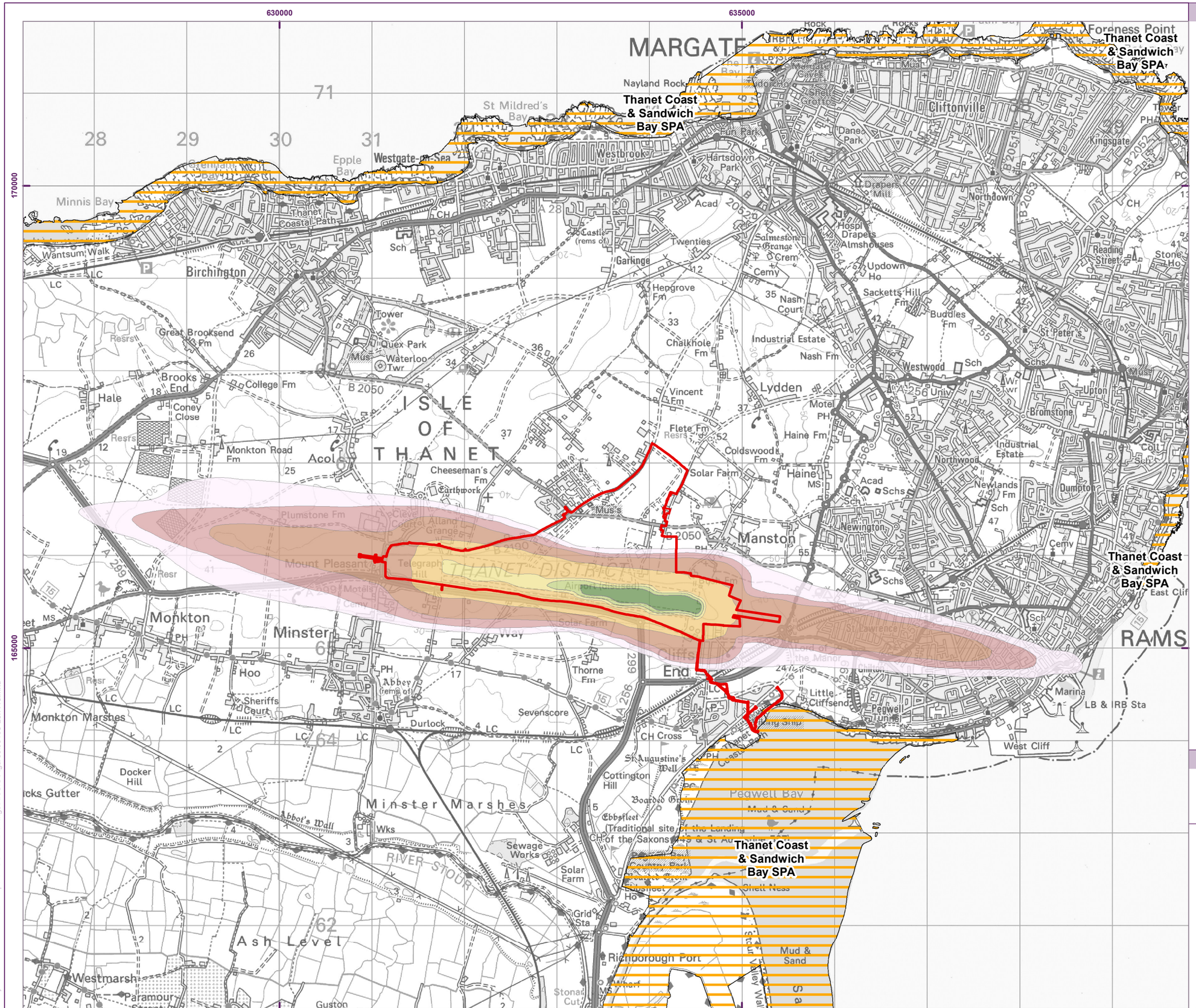

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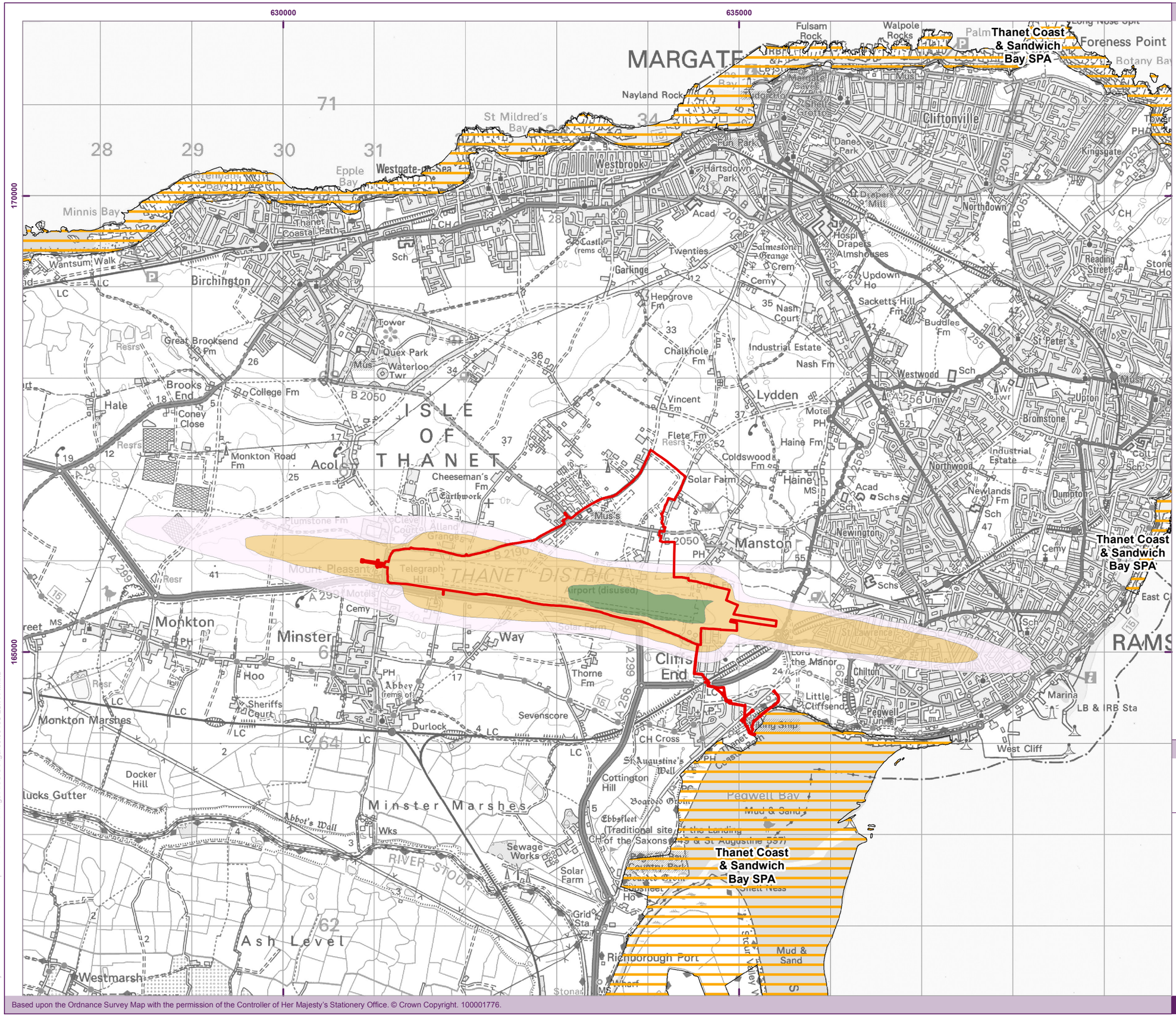

Key

- Order Limits
- Special Protection Area (SPA)

Average number of events per day

- 5 - 9
- 2 - 4
- 1

0 0.5 1 1.5 2 km

Scale at A3: 1:40,000

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Figure 4.1b
Night-time noise levels at or above 80dB LAmax

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625000 630000 635000 640000

170000 165000 160000

Key

Order Limits

Special Protection Area (SPA)

Average number of events per day

>200

100-199

50-99

20-49

10-19

Thanet Coast & Sandwich Bay SPA

Thanet Coast & Sandwich Bay SPA

Thanet Coast & Sandwich Bay SPA

0 0.5 1 1.5 2 2.5 3 km

Scale at A3: 1:50,000

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Figure 4.2a
Daytime noise levels at or above 70dB LAmax

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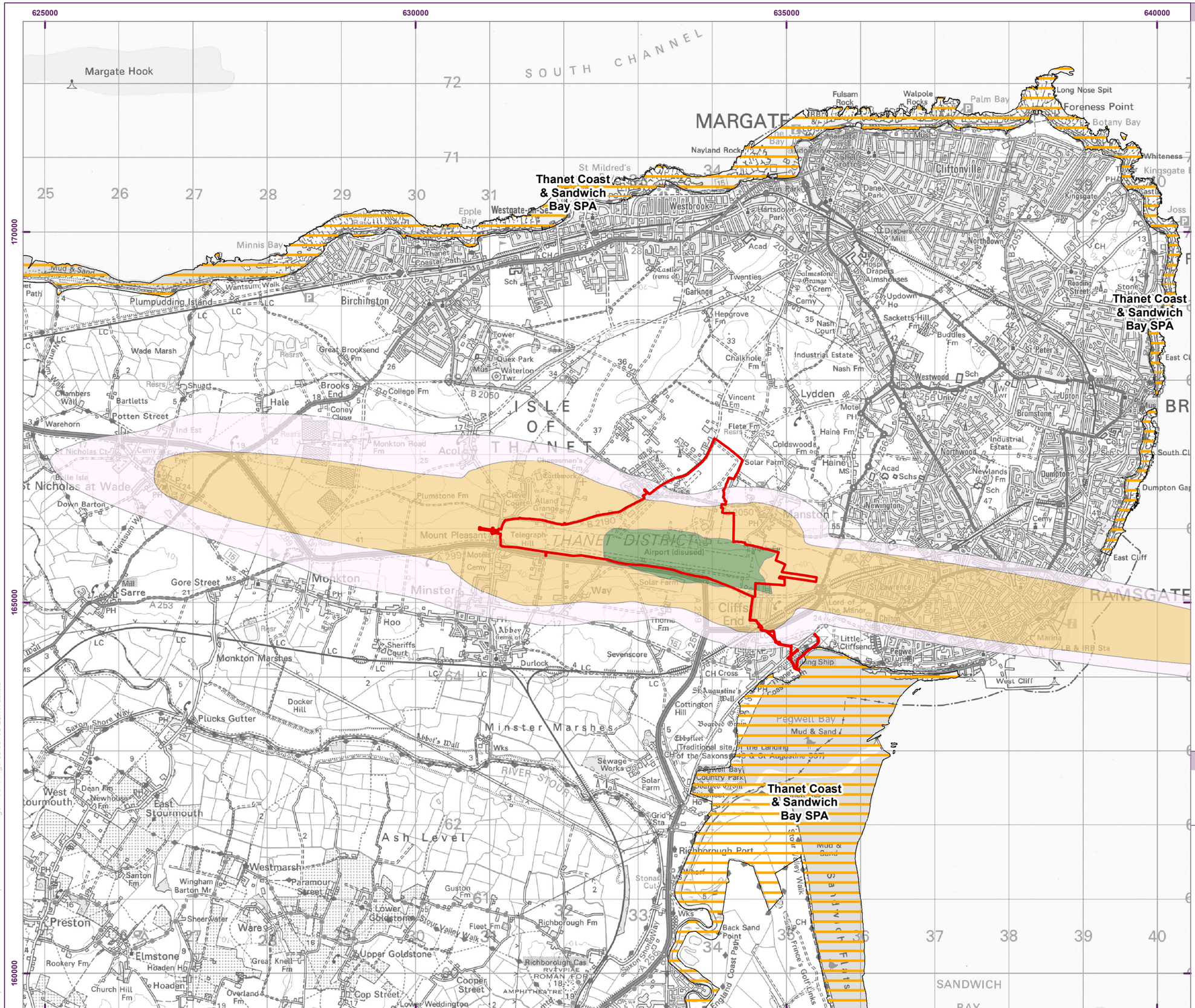

Key

- Order Limits
- Special Protection Area (SPA)

Average number of events per night

- 5-9
- 2-4
- 1

0 0.5 1 1.5 2 2.5 3 km

Scale at A3: 1:50,000

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Figure 4.2b
Nght-time noise levels at or above 70dB LAmax

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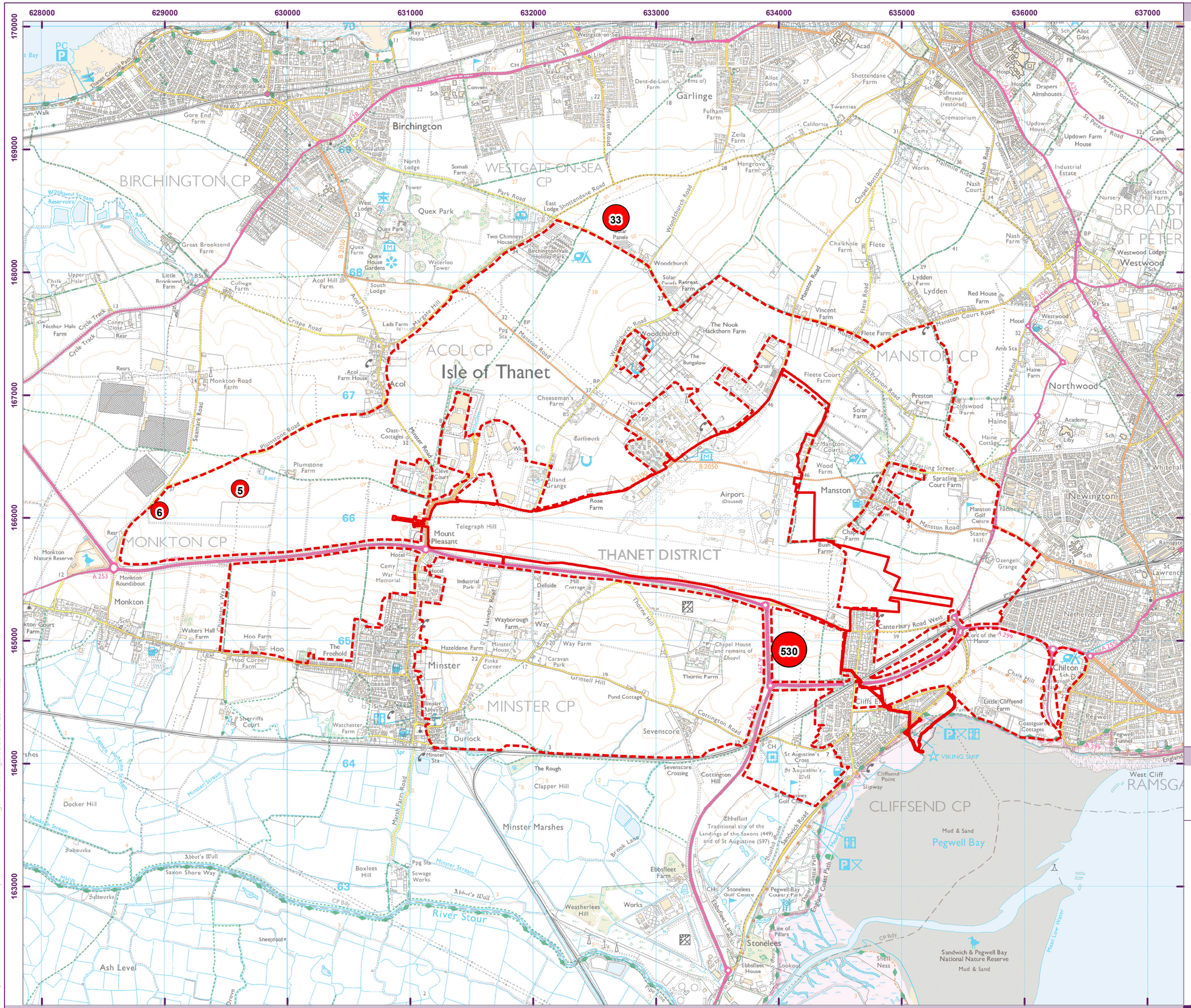

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Figure 4.3
Functional Habitat Survey 2016/17: peak counts of Golden Plover

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file: H:\Projects\38199 LON Manston Airport DCO EIA\Drawings\ArcGIS\Figures\38199-Lon417.mxd

633000 634000 635000 636000 637000

165000 164000 163000 162000

N

Canterbury Road West
Lord of the Manor
A 299
Nethercourt
A 253
B 2054
Chilton Sch
Chilton Farm
Chalk Hill
Chapel House and remains of Chapel
Thorne Farm
Resr
A 256
Cottington Road
Cliffs End
Little Cliffsend Farm
Tunnel
Coastguard Cottages
Pegwell
Pegwell Tunnel
Abbey
Sch
England Coast Path
Groynes
West Cliff
RAMSGATE CP
VIKING SHIP
CH
St Augustine's Cross
St Augustine's Well
Sevenscore Crossing
Cottington Hill
Cliffsend Point
Slipway
St Augustines Golf Club
CLIFFSEND CP
Ebbsfleet
Traditional site of the Landings of the Saxons (449) and of St Augustine (597)
Sandwich Road
Bourded Groin
Mean High Water
Mud & Sand
Pegwell Bay
Ebbsfleet Farm
Stonelees Golf Centre
Pegwell Bay Country Park
Thanet Coastal Path
England Coast Path
Ebbsfleet Lane
Line of Pillars
Stonelees
CP Bdy
Sandwich & Pegwell Bay National Nature Reserve
Mud & Sand
Mean Low Water
Ebbsfleet House
Lookout
Shell Ness
Stour Valley Walk
Richborough Port
Sandwich Flats
E C Path

3
710
454
119
850
500

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Golden Plover Peak Count

- 1-20 individuals
- 21-99 individuals
- 100+ individuals

0 250 500 750 m

Scale at A3: 1:15,000

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Figure 4.4
Pegwell Bay Distribution Survey 2016/17: peak counts of Golden Plover in each 500m grid square

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file: H:\Projects\38199 LON Manston Airport DCO EIA\Drawings\ArcGIS\Figures\38199-Lon418.mxd

615000 620000 625000 630000 635000

170000 165000 160000 155000

Herne Bay HERNE BAY MARGATE Isle of Thanet RAMSGATE Sandwich Bay CANTERBURY SANDWICH DEAL

392 48 53 690 402 400 1030 327 610 483 80 242

22 21 20 19 16 15 18 17 11 13 12 14 10 7 6 4 9 8 5 3 2 1

Key

- Order Limits
- Survey areas
- 1 - 10
- 11 - 25
- 26 - 100
- 101 - 250
- 251+

0 1 2 3 4 5 km

Scale at A3: 1:85,000

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Figure 4.5
Henderson & Sutherland (2017): peak counts of golden plover

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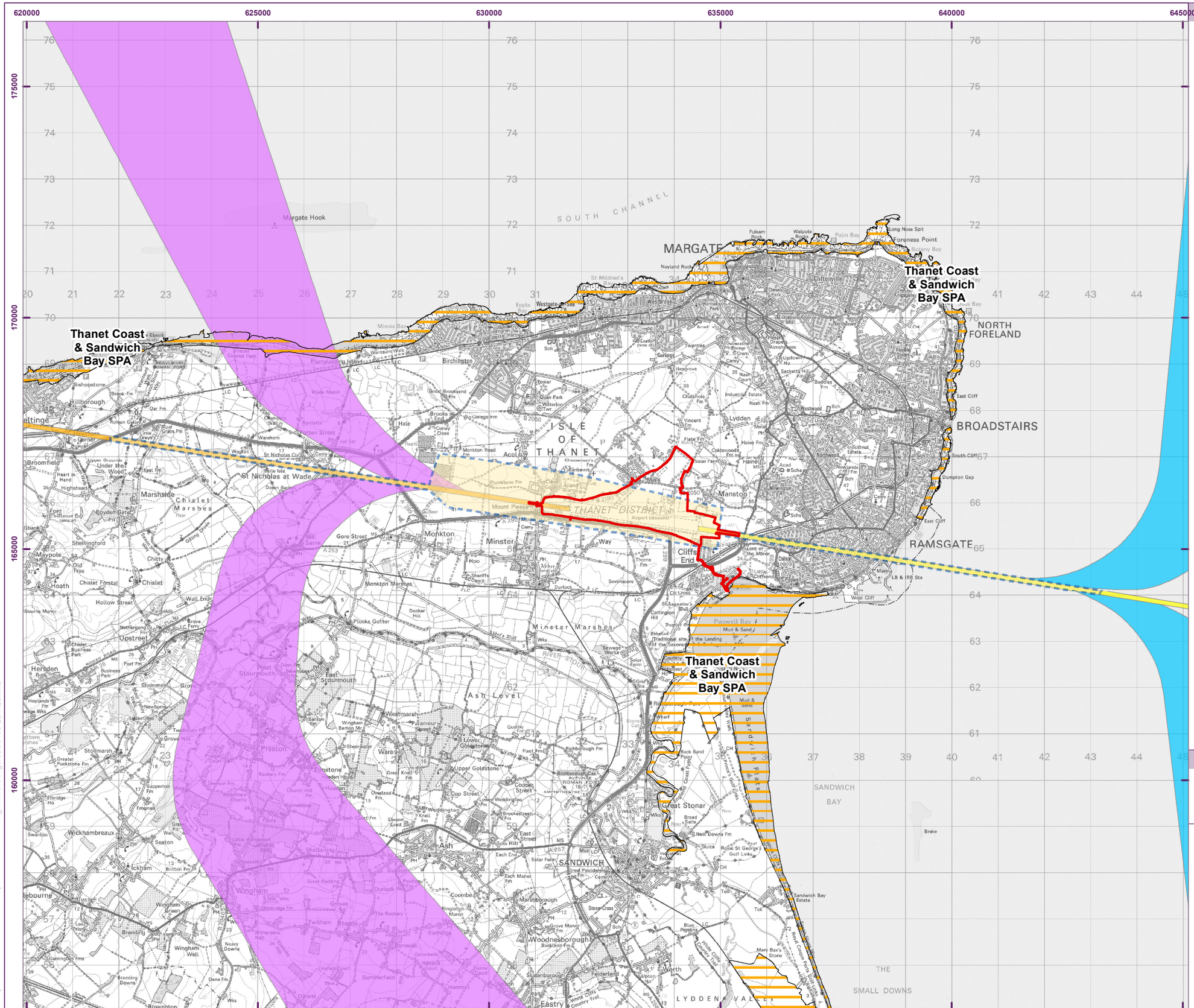

Key

- Order Limits
- Flight paths below 500m
- Special Protection Area (SPA)
- Approaches from the East
- Approaches from the West
- Departures to the East
- Departures to the West

0 1 2 3 4 km

Scale at A3: 1:80,000

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Figure 4.6
Proposed flight lines of aircraft under 500m in altitude

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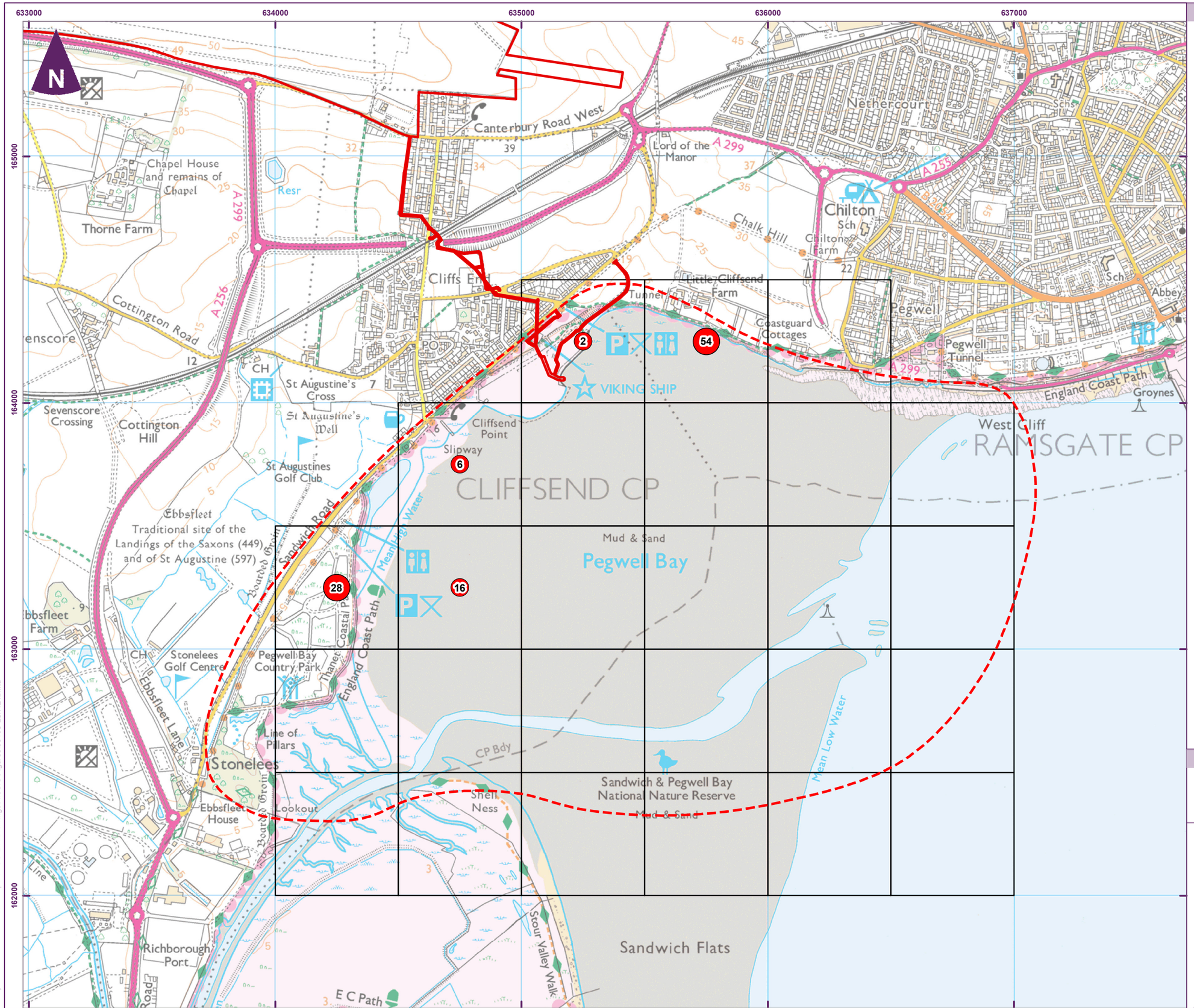

Key

- Order Limits
- Survey area
- 500 x 500 m recording grid

Turnstone Peak Count

- 1 - 20 individuals
- 21 - 99 individuals
- 100+ individuals

0 250 500 750 m

Scale at A3: 1:15,000

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Figure 4.7
Pegwell Bay Distribution Survey 2016/17: peak counts of Turnstone in each 500m grid square

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March 2018 38199-Lon421.mxd parkj

file: H:\Projects\38199 LON Manston Airport DCO EIA\Drawings\ArcGIS\Figures\38199-Lon421.mxd

625000 630000 635000 640000

165000 160000 155000

Key

- Order Limits
- Special Area of Conservation (SAC) - Sandwich Bay
- Priority Habitat - Coastal sand dunes

Sandwich Bay SAC

ISLE OF THANET

THANET DISTRICT

NORTH FORELAND

BROADSTAIRS

RAMSGATE

SANDWICH BAY

THE SMALL DOWNS

LYDDEN VALLEY

Minster Marshes

Ash Level

Sandwich Flats

Pegwell Bay

0 1,000 2,000 3,000 m

Scale at A3: 1:60,000

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Figure 4.8
Sandwich Bay SAC - extent of Priority Habitat, Coastal Sand Dunes

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Appendix Ec.2.8

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Technical note: Manston Airport DCO
Quantification of Net Gain

1. Introduction

1.1.1 Within the Examining Authority's Second Written Questions, Ec. 2.8 states:

"At Deadline 3 the Applicant noted the compensatory habitat had been designed to deliver biodiversity net gain, however this is not quantified".

"Quantify the net gain".

1.1.2 Given the reported difficulties in obtaining access to the site it is not possible to confirm the condition and presence of all of the habitats on the Application Site. For the purposes of the ES, a highly conservative worst-case scenario was adopted in order to ensure that sufficient mitigation could be secured through the DCO application process. The net gain calculation presented here is based on that worst-case scenario.

1.1.3 It should be noted that a it remains the view of the applicant that it is highly unlikely that the scenario presented in the ES will occur in practice. This view is supported by surveys carried out by the site owners (Stone Hill Park) subsequent to the DCO Application being lodged.

1.1.4 In the event that less mitigation is required than that anticipated in the worst-case scenario, the net gain calculation presented here will change.

1.1.5 In order to secure a reasonable net gain from the development, the DCO now commits the applicant to providing a minimum net gain of 10 Biodiversity Units.

1.1.6 Net gain is calculated using the Biodiversity Impact Assessment (BIA) metric. This is a transparent metric used to calculate the biodiversity value of habitats and hedgerows for an application site before and after development. It is a proxy measure to determine if the development will result in an on-site habitat biodiversity net loss or gain.

1.1.7 The BIA metric is for habitats only and does not consider any gain/loss in terms of protected or important species.

1.1.8 The metric assigns a score for the habitat types and areas present. In addition, it takes into account habitat distinctiveness, and risk factors. The risks factors include the time taken for created habitats, under appropriate management, to reach target condition and difficulty in habitat creation/restoration. The time to target condition with corresponding factor score is based upon eight categories:

- 3 years: factor 1.1;
- 5 years: factor 1.2;
- 10 years: factor 1.4;
- 15 years: factor 1.7;
- 20 years: factor 2.0;
- 25 years: factor 2.4;

- 30 years: factor 2.8; and
- 32+ years: factor 3.0.

1.1.9 The difficulty in creation/restoration are accorded the following scores and factors depending upon habitat:

- Very high: factor 10;
- High: factor 3;
- Medium: factor 1.5; and
- Low: factor 1.

1.1.10 The BIA metric is quantified using a BIA Calculator. The BIA Calculator develops a Habitat Impact Score, a Habitat Mitigation Score and a Habitat Biodiversity Impact Score. The Habitat Impact Score is subtracted from the Habitat Mitigation Score to give the Habitat Biodiversity Impact Score. This is the impact to habitat biodiversity as a result of the development.

1.1.11 It is understood that Kent County Council does not have a readily available calculator, the analysis has been undertaken using the BIA Calculator v19.1, developed for Warwickshire, Coventry and Solihull (WCS)[1]. The WCS sub-region was one of the six pilot areas for the Biodiversity offsetting schemes set up by Defra, Natural England the relevant local authorities in 2012/13. Now all planning authorities in the sub-region require all major and minor scale developments to have undertaken a BIA to determine the likely biodiversity impact of the development, but this is becoming a more widespread requirement across the country. It was therefore considered appropriate to use this tool here.

1.1.12 Using the BIA Calculator, if the score is positive the box will turn green and means a habitat biodiversity net gain. If the score is negative the box will turn red and means a habitat biodiversity net loss.

2. Approach

2.1.1 The information required to complete the BIA is:

- Habitat type;
- Habitat condition;
- Area or length of each habitat, hedgerow or linear feature;
- Impact from development, both direct (onsite) and indirect (offsite); and
- Onsite biodiversity mitigation/enhancement measures.

2.1.2 The identities and extents of each habitat present within the Manston Airport Development Consent Order (DCO) limits (the site), and also the Biodiversity Area (BA), were measured from the relevant Phase 1 habitat plans presented within **Chapter 7** of the Environmental Statement [APP-033] (**Figure 7.3** for Phase 1 habitat plan of the site and **Figure 2.1** in **Appendix 7.13** (Mitigation and Habitat Creation Plan) [APP-044]). This information is presented on the Habitat Impact Assessment (HIA) Calculator sheet for the site (see **Appendix A**) and for the BA on the HIA Calculator sheet for the BA site (see **Appendix B**). Habitat types and extents present post-

[1] Warwickshire County Council (2019) Biodiversity offsetting activities, [online]. Available at: www.warwickshire.gov.uk/biodiversityoffsetting [Accessed 30/04/19].

development were taken from the development Masterplan and the proposals presented in the Mitigation and Habitat Creation Plan (**Figure 2.2**) [APP-044], which permitted calculation of habitat areas retained/lost/created for entry onto the relevant HIA sheets.

2.1.3 Additionally, **Figure 7.3** of the Environmental Statement [APP-040] indicates two types of grassland surrounding the runway: semi-improved neutral grassland and poor semi-improved grassland. Semi-improved neutral grassland is the more diverse grassland type (and therefore attracts more biodiversity units in the calculator). It is intended to enhance the remaining areas of poor semi-improved grassland around the runway to achieve semi-improved neutral grassland. The proposed mechanism will be through reduced or no use of herbicides on the developed site whilst retaining the long grass policy (LGP) and maintaining an aerodrome unsuitable for hazardous wildlife (bird) species. Herbicides are typically used for weed treatment and any weed infestation will be treated with spot spraying of herbicide or topping (removing the flowering part of the plant that might attract wildlife through cutting).

2.1.4 In respect of habitat condition, there are three categories: good, moderate, and poor. Good condition is reserved for habitats of the highest quality and therefore all existing habitats in the HIA Calculator have been scored on the basis of a moderate condition. This is a conservative and precautionary approach as, given the past uses of the site and current DfT activity on the site which are likely to have further degraded the site, some of these habitats are likely to be in a poor condition status.

2.1.5 As noted above, limited access has been available to the site has fallen outside of key habitat survey periods it has not been possible to verify the quality of habitats and it is therefore recognised that uncertainty remains in the calculation of net gain presented in this note. It will be possible to verify habitat condition with access for survey at an appropriate time of year and when that occurs, it is possible that the calculation will change.

3. Discussion of Score

3.1.1 One of the reasons that is was necessary to consider habitat creation in the form of a Biodiversity Area was that a net loss of habitat was predicted within the main Airport site. The conservative worst-case assumption is that without mitigation the Proposed Development would result in a net loss of 72.46 biodiversity units, almost entirely as a result of direct impacts on grassland.

3.1.2 Given the need to confirm the worst-case scenario and the uncertainty regarding whether the whole of the biodiversity area will be necessary, the Applicant commits to providing a minimum of 10 additional biodiversity units over and above the net loss on the site. The net loss on the site will be confirmed following the making of the DCO once access is available to carry out the necessary surveys. Even if there is determined to be no net loss, the Applicant will still provide 10 Biodiversity Units at the BA.

3.1.3 Additionally, it should be noted that the net gain/loss calculation is based entirely upon habitats and does not consider fauna. For example, the net gain score does not include the site provision of 14 bat boxes for maternity, hibernation and transitional roost provision in addition to the roost provision for the BA (detailed in **Appendix 7.13** [APP-044]). In their 2018 application Stone Hill Park (SHP) detail that only five buildings were used as summer day or night-time roosts for small numbers of two species (common pipistrelle and brown long-eared bat) with two (perhaps three) buildings identified as hibernation sites for brown long-eared bats (see paragraph 10.4.20, WSP. 2018. Environmental Statement Volume 1: Main Text and Figures: Stone Hill Park OL/TH/18-0660). The mitigation and compensation provision for species will increase the gain, albeit not in a quantifiable way.

[redacted]

Mark Linsley

Approved by

[redacted]

Andy Brooks

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Appendix Ec.2.9

Received - 31 May 2018
Planning Applications Group

AECOM

Environmental Statement

Thanet Parkway Station

Appendix 8-B: Wintering Bird Report

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Thanet Parkway Station: Wintering Bird Report

Prepared for Kent County Council

January 2017

Quality information

Prepared by	Checked by	Approved by
AK Assistant Ecologist GradCIEEM	GD Senior Ecologist MCIEEM	JR Associate Ecologist MCIEEM

Revision History

Revision	Revision date	Details	Authorized	Name	Position
Draft	March 2015	Draft			
Final	January 2017	Updated to include recent desk study data	JR		Associate Ecologist

Prepared for:

Kent County Council

Prepared by:

AECOM Infrastructure & Environment UK Limited
Midpoint
Alençon Link
Basingstoke
Hampshire RG21 7PP
UK

T: +44(0)1256 310200
aecom.com

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Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

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Executive Summary

Kent County Council proposes to build a new two-platform station, car park and associated infrastructure (the 'proposed development') on the existing rail line between Ashford and Ramsgate, within the administrative area of Thanet District Council . AECOM was commissioned by Kent County Council in January 2015 to carry out a wintering bird survey of the site proposed for the new Thanet Parkway Station in Cliffsend (hereafter referred to as the "survey site").

The survey site was subject to a Phase 1 ecology survey in January 2015 (updated August 2015 and September 2016) and the habitats within the survey site boundary were determined to be predominantly arable with a belt of mature trees along the railway embankment. It was considered that the habitats present had potential to support wintering bird species, including golden plover (*Pluvialis apricaria*), a species for which the nearby Thanet Coast and Sandwich Bay Special Protection Area (SPA) 700 m south of the survey site has been partly designated, according to its original citation.

The aim of the survey was to record species and numbers of birds within the survey site and to determine all activity related to the habitats present within, or likely to be affected by the proposed development. The results are intended to inform the need for further surveys, if required, and provide information on any potential ecological constraints and opportunities.

A total of 23 species were recorded during the three winter bird surveys using features of the survey site or flying over the survey site. In general low numbers of birds were recorded using the survey site, with wood pigeon (*Columba palumbus*) being the most abundant species recorded across all three surveys.

Linnet was the only species of conservation significance that was recorded utilising the survey site (25th February – 22 individuals). Removal of arable land within the survey site will not be likely to significantly affect this species due to the fields north and west of the survey site containing sufficient quantities of suitable habitat.

Thanet Coast & Sandwich Bay SPA and Ramsar site is partly designated for wintering golden plover. This species was not recorded during the surveys and it was determined that the habitat parcel size and crop rotation features of the survey site would lead to the survey site being unsuitable to support golden plover. Desk study data (reported in the Phase 1 report) indicated that golden plover have been found in arable fields to the north west of the survey site, where more suitable habitat parcels exist in terms of size and open aspect; it is considered that based on current habitat conditions on site, development would not adversely affect golden plover.

The survey site currently has low value for wintering birds. Options could be explored as part of the landscaping of the site to incorporate planting of value to biodiversity, including bird species.

1. Introduction

Kent County Council proposes to build a new two-platform station, car park and associated infrastructure including access (the 'proposed development') on the existing rail line between Ashford and Ramsgate, within the administrative area of Thanet District Council.

AECOM was commissioned by Kent County Council in January 2015 to carry out a wintering bird survey of the site proposed for the new Thanet Parkway Station in Cliffsend, Kent. At the time the wintering bird survey was undertaken the planning application boundary had not been fully defined. Therefore, surveys were undertaken in the wider "survey site" (shown by the blue line boundary in Figure 1). This report therefore refers to the survey site.

Scope of Works

The survey site, with a central grid reference of TR341645, is a triangular piece of land between two major roads (A229 and A256) and a railway line on the edge of the small town of Cliffsend.

The survey site was subject to a Phase 1 ecology survey in January 2015 (updated August 2015 and September 2016) and the habitats within the survey site boundary were determined to be predominantly arable with a belt of mature trees along the railway embankment. It was considered that the habitats present had potential to support wintering bird species, including golden plover (*Pluvialis apricaria*), a species for which the nearby Thanet Coast and Sandwich Bay Special Protection Area (SPA) 700 m south of the survey site has been partly designated, according to its original citation.

The aim of the survey was to record species and numbers of birds within the survey site and to map all activity related to the habitats present within, or likely to be affected by the proposed development. The results are intended to inform the need for further surveys, if required, and provide information on any potential ecological constraints and opportunities.

2. Wildlife Legislation and Guidance

Legislation

Annex 1 species are Species listed on Annex 1 of EC Directive 2009/147/EC on the Conservation of Wild Birds[1], requiring the UK Government to take special measures, including the designation of Special Protection Areas (SPA), to ensure the survival and reproduction of these species throughout their area of distribution.

The UK is bound by the terms of the EC Habitats Directive, the EC Birds Directive and the Ramsar Convention. Under Article 6 (3) of the Habitats Directive (implemented in the UK under the Conservation of Habitats and Species Regulations 2010 (as amended) an appropriate assessment is required if the 'plan or project' is likely to have a significant effect on a European site, either alone or in combination with other projects.

As the search area includes internationally and nationally designated sites based on its biodiversity importance the proposed scheme is likely to have an impact on these designations. Discussions will be undertaken with Natural England regarding screening for an appropriate assessment for the proposed development.

The legislative provisions for the protection of wild birds in the UK are contained primarily within Sections 1-7 of the Wildlife and Countryside Act 1981[2] (as amended) (W&CA). Under the W&CA, a wild bird is defined as any bird of a species that is resident in or is a visitor to (in a wild state) the European Territory of any member state.

The W&CA makes it an offence to:

- kill, injure or take any wild bird;
- take, damage or destroy the nest of any wild bird while it is being built or in use; and
- take or destroy the eggs of any wild bird.

Special penalties exist for offences related to species listed on Schedule 1, for which there are additional offences of disturbing these birds and / or their dependent young at their nests.

Guidance

The Natural Environment and Rural Communities Act 2006

The Natural Environment and Rural Communities Act[3] (NERC) came into force on 1st October 2006. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with Natural England, as required by the Act.

The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the NERC Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

There are 49 bird species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the UK Biodiversity Action Plan (UK BAP) and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF
[2] http://www.legislation.gov.uk/ukpga/1981/69
[3] http://publications.naturalengland.org.uk/publication/4958719460769792

Species of Conservation Concern

Species listed on the Royal Society for the Protection of Birds (RSPB) Birds of Conservation Concern (BoCC)[4] Red List species are those that have declined in numbers by at least 50% over the last 25 years, those that have shown an historical population decline between 1800 and 1995 and species that are of global conservation concern. The species on the Red List are of the most urgent conservation concern.

Amber-listed species include those that have shown a moderate decline in numbers (25%-49%) over the last 25 years and those with total populations of less than 300 breeding pairs. Also included are those species which represent a significant proportion (greater than 20%) of the European breeding or wintering population, those for which at least 50% of the British population is limited to 10 sites or less, and those of unfavourable conservation status in Europe.

The remaining species are placed on the Green list, indicating that they are of low conservation priority. These species still receive full protection through the provisions of the Wildlife and Countryside Act. Certain introduced non – native species such as Canada goose (*Branta canadensis*) are not listed and for the purposes of this report are classed as having no conservation status in the UK.

These lists confer no legal status. However, they are useful when assessing the significance of predicted impacts and determining the level of mitigation that may be required when birds are affected by development or any other activity. Furthermore, inclusion on the Red List is a factor in determining the species for which national or local Biodiversity Action Plans (BAPs) are developed.

[4] Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D. and Gregory, R. (2015) Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108: 708-746. Available online at https://www.britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf

3. Methodology

Desk Study

As part of the Extended Phase 1 Habitat survey, a desk study to identify protected and/or notable species, including birds, present on, or within 2km of the survey site, was undertaken in January 2015 and updated in January 2017. Records were sought from Kent and Medway Biological Records Centre, and records of protected and/or notable bird species since 2007 were listed in the Thanet Parkway Extended Phase 1 Habitat Survey and Bat Roost Assessment Report (2017)[5].

Field Survey

Three wintering bird survey visits were commissioned in early 2015 and undertaken by an ornithologist between February and March 2015 inclusive (Table 1). The surveys follow an adaptation of the British Trust for Ornithology's (BTO) Winter Farmland Bird Survey methodology.

Surveys were undertaken in suitable weather conditions (Table 1) of good visibility and avoiding heavy rain and/or strong winds, fog or heavy snow, when bird behaviour may be atypical, or when surveying may be impractical.

A survey transect was devised that allowed observation of all major areas of habitat within and adjacent to the proposed areas of activity. All birds present were identified by sight and/or call and recorded using standard BTO species codes[6].

Recommendations presented in Section 4 were informed by the conservation status of recorded birds, which was assessed against the following criteria:

EC Birds Directive 2009 Annex 1, (Table 1, ECB1);

Wildlife and Countryside Act 1981 (As Amended) Schedule 1, (Table 1, WCA1); and

Natural Environment and Rural Communities Act (2006) Section 41.

Table 1. Survey Conditions Record

Date	Time	Temperature (°C)	Weather	Wind Speed
11/02/2015	12:15 – 13:00	5	Cloudy and calm	0
26/02/2015	10:15 – 11:00	12	Cloudy	3 SW
10/03/2015	12:30 – 13:15	12	Sunny	3 NE

[5] AECOM, January 2017. Thanet Parkway Railway Station – Extended Phase 1 Habitat and Bat Roosting Assessment Report.
[6] http://www.bto.org/sites/default/files/u16/downloads/forms_instructions/bto_bird_species_codes.pdf

4. Results

Desk Study

The Extended Phase 1 report desk study (survey site and 2km buffer) identified the following species that would be potentially present as protected or notable wintering birds within the search area.

Table 2. Protected and/or notable bird species records from desk study

Common Name	Latin Name	Conservation status
Skylark	*Alauda arvensis*	NERCS41; Red listed
Turnstone	*Arenaria interpres*	Amber listed
Linnet	*Carduelis cannabina*	NERCS41; Red listed
Yellowhammer	*Emberiza citrinella*	NERCS41; Amber listed
Snipe	*Gallinago gallinago*	Amber listed
Jack Snipe	*Lymnocryptes minimus*	Amber listed
Spotted flycatcher	*Muscicapa striata*	NERCS41; Red listed
Curlew	*Numenius arquata*	NERCS41; Red Listed
House sparrow	*Passer domesticus*	NERCS41; Red listed
Tree sparrow	*Passer montanus*	NERCS41; Red listed
Grey partridge	*Perdix perdix*	NERCS41; Red listed
Golden plover	*Pluvialis apricaria*	Birds Dir; Amber listed
Dunnock	*Prunella modularis*	NERCS41; Amber listed
Bullfinch	*Pryrhula prryhula*	NERCS41; Red listed
Little Tern	*Sterna albifrons*	Birds Dir; W&CA; Amber listed
Starling	*Sturnus vulgaris*	NERCS41; Red listed
Song thrush	*Turdus philomelos*	NERCS41; Red listed

Field Survey

A total of 23 species were recorded during the three winter bird surveys using features of the survey site or flying over the survey site (see Appendix A). In general low numbers of birds were recorded using the survey site, with wood pigeon (*Columba palumbus*) being the most abundant species recorded across all three surveys.

EC Directive on the Conservation of Wild Birds 2009 (09/147/EC) Annex 1

There were no EC Directive on the Conservation of Wild Birds 2009 (09/147/EC) Annex 1 species recorded during the winter bird surveys.

Wildlife and Countryside Act 1981 (as amended) Schedule 1

There were no Wildlife and Countryside Act 1981 (as amended) Schedule 1 species recorded during the winter bird surveys.

Natural Environment and Rural Communities Act (2006) Section 41

Linnet (*Carduelis cannabina*) was the only species listed under Section 41 of the NERC Act that was recorded using the survey site during the surveys. Twenty-two linnets were recorded within the fields along the northern boundary of the survey site on the 25th February. Species are recorded under Section 41 of the NERC Act due to a steep decline in breeding numbers.

Three further NERC species were recorded during the winter bird surveys. Dunnock (*Prunella modularis*) was recorded once on 25th February 2015 just outside of the south

western boundary of the survey site. Herring gull (*Larus argentatus*) was also recorded on the 25th February with four individuals flying over the north eastern corner of the survey site. Skylark (*Alauda arvensis*) was recorded singing in the fields to the north west and north of the survey site during the surveys on the 25th February and 10th March.

Birds of Conservation Concern (2009) Red and Amber Lists

Three species recorded during the surveys are listed on the Birds of Conservation Concern (BOCC) Red List. Herring gull is listed on the BOCC Red list due to long-term severe non-breeding population declines of more than 50% since 1969. The UK also hosts an internationally important proportion (over 20%) of the European non-breeding herring gull population. Skylark and linnet are listed due to moderate declines in their breeding population of between 25% and 50%.

Four species recorded during the surveys are listed on the BOCC Amber list; black-headed gull (*Chroicocephalus ridibundus*), meadow pipit (*Anthus pratensis*), mistle thrush (*Turdus viscivorus*), and dunnock. None of these species were found to be utilising the survey site footprint. Four black-headed gulls were recorded flying over the eastern boundary of the survey site during the 25th February survey. Meadow pipits were recorded on the 25th February and the 10th March 2015; five within a field to the west of the survey site and one flying directly over the survey site. Mistle thrush was also recorded on the 25th February survey outside of the survey site to the south west.

Black-headed gull is listed on the BOCC Amber list due to moderate non-breeding population declines of more between 25% and 50%. The UK also hosts an internationally important proportion (over 20%) of the European non-breeding black-headed gull population. Dunnock, mistle thrush and meadow pipit are all listed due to moderate declines in their breeding populations of between 25% and 50%.

5. Discussions and Recommendations

Linnet was the only species of conservation significance that was recorded utilising the survey site (25th February – 22 individuals). Removal of arable land within the survey site will not be likely to significantly affect this species due to the fields north and west of the survey site containing sufficient quantities of suitable habitat.

Thanet Coast & Sandwich Bay SPA and Ramsar site is partly designated for wintering golden plover. This species was not recorded during the surveys and it was determined that the habitat parcel size and crop rotation features of the survey site would lead to the survey site being unsuitable to support golden plover. The survey site is relatively small and enclosed compared to surrounding habitats, and dominated by vegetable crops, as opposed to short grass/ cereal vegetation or tilled/ploughed earth more favoured by this species. Desk study data (reported in the Phase 1 report) indicated that golden plover have been found in arable fields to the north west of the survey site, where more suitable habitat parcels exist in terms of size and open aspect; it is considered that based on current habitat conditions on site, the proposed development would not adversely affect golden plover.

The survey site currently has low value for wintering birds. Options could be explored as part of the landscaping of the site to incorporate planting of value to biodiversity, including bird species.

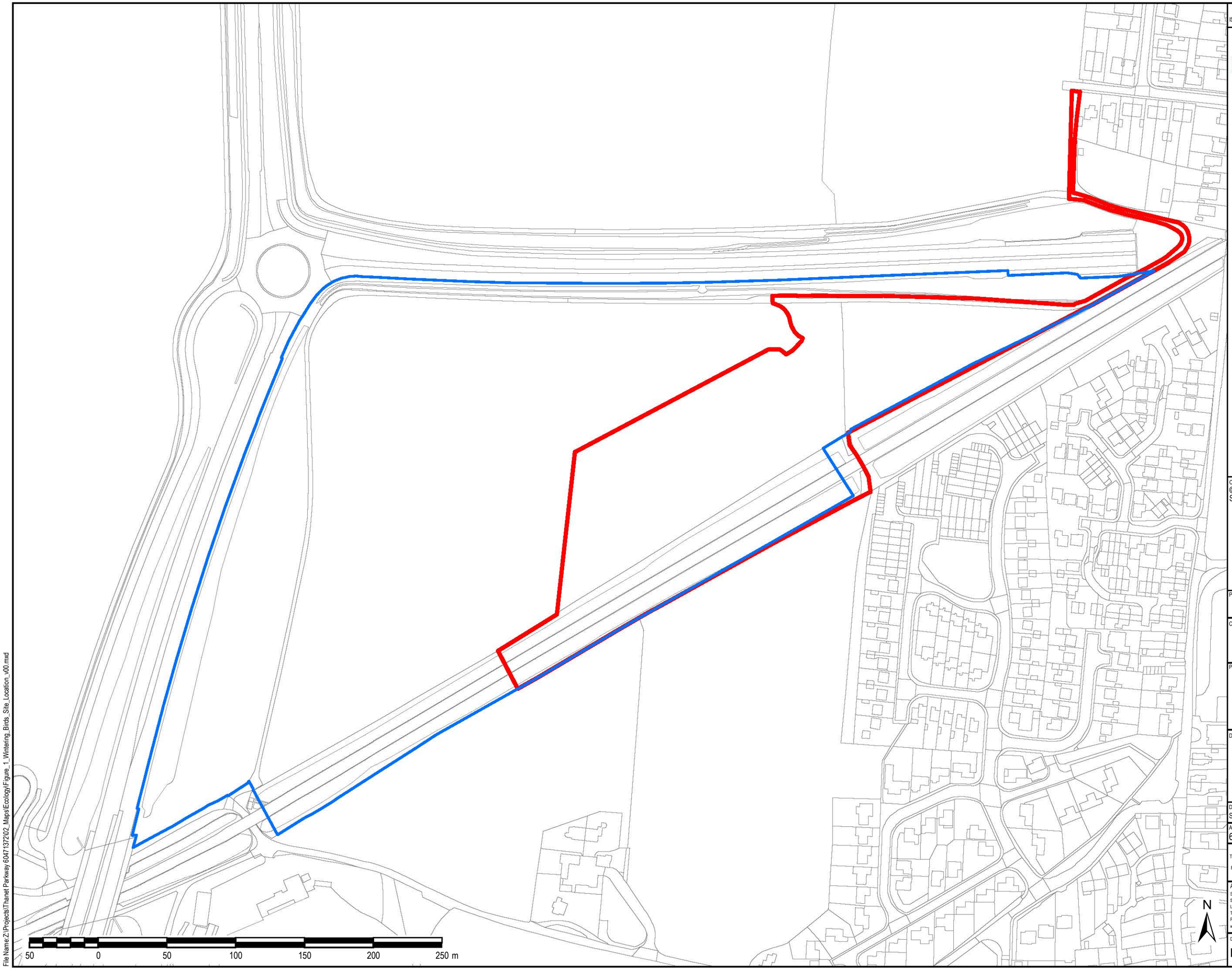
Appendix A Wintering Bird Results

Table 3. Winter Bird Results

Species (Code)	Numbers on 11th February 2014 () = birds flying over	Numbers on 25th February 2015 () = birds flying over	Numbers on 10th March 2015 () = birds flying over	Birds using survey site footprint?	Conservation status
Blackbird (B.)	2	2	0	Yes	Green listed
Black-headed gull (BH)	0	(4)	0	Yes	Amber listed
Blue tit (BT)	0	4	2	Yes	Green listed
Carrion crow (C.)	3	3	(2)	Yes	Green listed
Dunnock (D.)	0	1	0	No	NERCS41; Amber listed
Goldfinch (GO)	1	0	1	Yes	Green listed
Herring gull (HG)	0	(4)	0	No	NERCS41; Red listed
Pied wagtail (PW)	0	6	0	Yes	Green listed
Robin (R.)	0	0	2	No	Green listed
Wood pigeon (WP)	100	1 (4)	153 (35)	Yes	Green listed
Skylark (S.)	0	1	2	No	NERCS41; Red listed
Meadow pipit (MP)	0	5	(1)	No	Amber listed
Goldcrest (GC)	0	1	0	Yes	Green listed
Great tit (GT)	0	1	1	Yes	Green listed
Magpie (MG)	0	2	1	Yes	Green listed
Mistle thrush (M.)	0	1	0	No	Amber listed
Buzzard (BZ)	1	1	0	Yes	Green listed
Chaffinch (CH)	1	1	0	Yes	Green listed
Linnet (LI)	0	22	0	Yes	NERCS41; Red listed
Ring-necked Parakeet (RI)	2	4	2	Yes	None
Jay (J.)	1	0	0	Yes	Green listed
Stonechat (SC)	2	0	0	Yes	Green listed
Greenfinch (GR)	0	0	1	No	Green listed

Winter Bird Results Key

Abbreviation	
Birds Dir	Annex 1 of the EC Directive on the Conservation of Wild Birds 1979 (79/409/EEC)
W&CA	Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)
NERCS41	Section 41 of the Natural Environment and Rural Communities Act (2006)
Red listed	Birds of Conservation Concern (2009) Red Listed Species
Amber listed	Birds of Conservation Concern (2009) Amber Listed Species
Green listed	Birds of Conservation Concern (2009) Green Listed Species
None	No Conservation Status – Introduced/Non-native species.



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Purpose of Issue
FINAL

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Project Title
THANET PARKWAY

Drawing Title
SITE LOCATION AND SURVEY AREA

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AECOM
St. George's House
5 St. George's Road, Wimbledon
London, SW19 4DR
Telephone +44 (20) 7963 9800
Fax +44 (20) 7963 9801
www.aecom.com

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Environmental Statement

Thanet Parkway Station

Appendix 8-D: Report to Inform Habitats Regulation Assessment Screening – Thanet Parkway Station

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Report to Inform Habitats Regulation Assessment Screening

Thanet Parkway Railway Station

CO04300667 HRA/02

December 2017

Document Control Sheet

Project Name:	[redacted]
Project Number:	CO04300667
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Rev 0	Name: Kate Hunt Signature: [redacted] Date: 28/10/2017	Name: Helen Craig Signature: [redacted] Date: 1/11/17	Name: Jen Taylor Signature: [redacted] Date: 2/11/17
Rev 1 Addressing client comments	Name: Helen Craig Signature: [redacted] Date: 30/11/17	Name: Jen Taylor Signature: [redacted] Date: 8/12/17	Name: Jen Taylor Signature: [redacted] Date: 8/12/17
Rev 2 Addressing additional client comments	Name: Helen Craig Signature: [redacted] Date: 11/12/17	Name: Jen Taylor Signature: [redacted] Date: 11/12/17	Name: Jen Taylor Signature: [redacted] Date: 11/12/17
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:

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1 Introduction

1.1 Overview

Amey have been commissioned by Kent County Council (KCC) to produce a report to inform a Habitats Regulations Assessment (HRA) of the proposed Thanet Parkway Railway station located to the west of Cliffs End in Kent. Kent County Council proposes to build a new two-platform station, car park and associated infrastructure on the existing rail line between Ashford, Canterbury and Ramsgate. The station would be to support potential new development at Discovery Park Enterprise Zone, Manston Business Park, EuroKent Business Park and the former Manston Airport site (all of which are located within 3 miles of the proposed station location) as well as improving commuter services for Thanet residents. The site location is provided in Figure 1 in Appendix A.

1.2 Scope of this report

This report draws together existing baseline information regarding the proposed development and the European designated sites within a 10km radius of the development site, with the potential to be affected by the development. The scope of this report is to summarise key points and provide information for Kent County Council (as the Competent Authority) to undertake a Habitats Regulations Assessment for the Thanet Parkway development.

1.3 Legislation

European sites are the network of protected sites developed under the European Commission Habitats Directive (Directive 92/43/EEC) (also referred to as Natura 2000 sites), which requires the establishment of designated Special Areas of Conservation (SAC) for habitats and species (except birds) and the Birds Directive (79/409/EEC) which similarly requires the establishment of Special Protection Areas (SPAs) for birds.

The Habitats Directive is transcribed into UK legislation by the Conservation of Habitats and Species Regulations 2017, under this a Habitats Regulations Assessment is required where a likely significant effect on the European site is predicted.

1.4 The project

The development site is located at Ordnance Survey grid reference TR341645, on the A229 Hengist Way, by the mainline railway on the edge of the small town of Cliffs End. Existing railway stations are located at Minster and Ramsgate (approximately 3km west and east respectively) and within walking distance of Pegwell Bay. Thanet Parkway is proposed as a 'park and rail' station to predominantly serve the commuters of Thanet. The project will entail a new two platform railway station, access road, car parking facilities and pedestrian/ cycle connectivity to integrate the station with local developments nearby. The option of a new footpath is also under consideration to connect the existing public right of way to the end of Clive Road. KCC are aiming to submit a planning application in early 2018.

1.5 European Sites

In order to determine which Natura 2000 sites have potential to be affected by the proposed project, the HRA Handbook[1] recommends the use of zone of influences on a site by site basis. Given the scale of the project the zone of influence is taken to be the footprint of the scheme with a 10km buffer. It is considered that there would be no likely significant effects beyond this zone of influence. Discussions with Kent County Council highlighted the requirement to consider recreational effects on coastal site SPAs. This buffer was considered appropriate because the findings from a visitor survey undertaken in 2014 for the Thanet District Council Strategic Access Management and Monitoring Plan (SAMM), found that 90% of regular visitors to Thanet Coast and Sandwich Bay SPA originated within a 7.2km zone of influence from the site.[2]

A desk top study using the MAGIC database[3] was used to determine the presence of Natura 2000 sites within this zone of influence. From this it was determined that the following five sites have potential to be affected (one of which is under consideration as a SAC), three of which are located approximately 650m south-east of the development site:

- Thanet Coast and Sandwich Bay Special Protection Area (SPA) (650m east);
- Thanet Coast and Sandwich Bay Ramsar (650m east);
- Sandwich Bay SAC (650m east);
- Thanet Coast Special Area of Conservation (SAC) (840m east);

- Margate and Long Sands Site of Community Importance (SCI) and proposed SAC (9.8km north east).

Details of the European sites within 10km are provided in Table 1 below[4].

Table 1: European sites within 10km

Natura 2000 Sites	Description & Qualifying Features
Sandwich Bay SAC, UK0013077	Sandwich Bay SAC was designated in 2005 and covers an area of 1137ha and is part of the North East Kent European Marine Site. **Qualifying features** Annex I habitats that are a primary reason for selection of this site 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) 2170 Dunes with *Salix repens ssp.* argentea *Salicion arenariae* Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 2190 Humid dune slacks
Thanet Coast SAC, UK0013107	Thanet Coast SAC was designated in 2005 and covers an area of 2815ha. It is important for its reefs and submerged or partially submerged sea caves. **Qualifying features** Annex I habitats that are a primary reason for selection of this site 1170 Reefs Thanet Coast represents approximately 20% of the UK resource of this type and 12% of the EU resource. Thanet remains the sole known location for some algal species. 8330 Submerged or partially submerged sea caves Thanet Coast provides the second most extensive representation of chalk caves in the UK. Specialised algal and lichen communities containing species such as *Pseudendoclonium submarinum* and *Lyngbya spp.*, are present which have never been recorded elsewhere.
Margate and Long Sands SCI & pSAC, UK0030371	Margate and Long Sands SAC covers an area of 64876ha and is under consideration as a SAC. It is important for its sandbanks which are slightly covered by sea water all the time. **Qualifying features** Annex I habitats that are a primary reason for selection of this site 1110 Sandbanks which are slightly covered by sea water all the time This site is being put forward for designation on the basis of the presence of its Annex I interest feature but it also supports the reef-forming ross worm (*Sabellaria spinulosa*), which when formed as a reef qualifies as an Annex I habitat (biogenic reef).

Natura 2000 Sites	Description & Qualifying Features
Thanet Coast and Sandwich Bay SPA, UK9012071	Thanet Coast and Sandwich Bay SPA (UK9012071) was designated in 1994 and covers a documented area of 1870.16ha. The site is coastal comprising a long stretch of rocky shore, adjoining areas of estuary, sand dune, maritime grassland, saltmarsh and grazing marsh. **Qualifying features** The site qualifies under Article 4.1 by regularly supporting little tern *Sterna albifrons* during the breeding season and overwintering golden plover *Pluvialis apricaria*. The site qualifies under Article 4.2 by supporting overwintering ruddy turnstone *Arenaria interpres.*
Thanet Coast and Sandwich Bay Ramsar	A coastal site consisting of a long stretch of rocky shore, adjoining areas of estuary, sand dune, maritime grassland, saltmarsh and grazing marsh. It is coincident with the boundary of the Thanet Coast and Sandwich Bay SPA. **Qualifying features** The site qualifies under Ramsar Criterion 2 by supporting 15 British Red Data Book wetland invertebrates. The site qualifies under Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying species with peak counts in winter are ruddy turnstone *Arenaria interpres*.

Conservation objectives

1.5.1 Thanet Coast SAC and Sandwich Bay SAC

These two sites have the same conservation objectives which are:

To ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the favourable conservation status of its qualifying features by maintaining or restoring;

- The extent and distribution of qualifying natural habitats.
- The structure and function (including typical species) of qualifying natural habitats.
- The supporting processes on which the qualifying natural habitats rely.

1.5.2 Thanet Coast and Sandwich Bay SPA

To ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features.
- The structure and function of the habitats of qualifying features.

- The supporting processes on which the habitats of the qualifying features rely.
- The populations of each of the qualifying features.
- The distribution of the qualifying features within the site.

1.5.3 Thanet Coast and Sandwich Bay Ramsar

There are no specific conservation objectives for the Ramsar site, but they are likely to be similar as those for the SPA, to maintain features in favourable condition.

1.5.4 Margate and Long Sands SCI/pSAC

To ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its qualifying features by maintaining or restoring;

- the extent and distribution of qualifying natural habitats
- the structure and function (including typical species) of qualifying natural habitats, and
- the supporting processes on which the qualifying natural habitats rely.

2 Test of Likely Significance

2.1 Potential Effect Pathways

There is the potential for effect pathways to lead to effects on the qualifying species of the Thanet Coast and Sandwich SPA and Ramsar sites from the proposed rail station. These potential effect pathways may arise from the added facility of the rail station allowing an increase in visitor numbers to Pegwell Bay and the designated sites during the summer months. The construction of the rail station will result in the loss of arable land, which has potential to be used by foraging golden plover during the winter months. The provision of a footpath from north of the A299 to Clive Road may also result in disturbance during construction and operation if qualifying species of birds are found to utilise this area of the site. These potential pathways have been considered further in section 2.2 below.

2.2 Baseline Information

2.2.1 Ecology

An Ecological Impact Assessment (EcIA) was undertaken in 2015 (updated 2017) by AECOM[5]. The study included an Extended Phase 1 Habitat survey and surveys for wintering birds, undertaken in 2015. Within the survey site boundary habitats were determined to be predominantly arable with the potential to support wintering bird species, including golden plover (*Pluvialis apricaria*), a qualifying species for the nearby Thanet Coast and Sandwich Bay SPA and Ramsar site. No golden plover were recorded during the 2015 surveys. The habitat size and crop rotation features of the survey site suggested it was unsuitable for golden plover. Data records from the desk study undertaken by AECOM revealed the presence of golden plover in arable fields to the north west of the site, where more suitable habitat in terms of size and open aspect is present. It was considered that based on current habitat conditions on site, the development would not adversely affect golden plover or local bird populations[6].

2.2.2 Visitor information

Discussions with KCC highlighted the need to consider recreational impacts on the coastal designated sites and previous visitor studies were reviewed. Pegwell Country Park is an important access point to the coast and received around 69,000 visitors in 2014.[7] The country park lies immediately adjacent to Thanet Coast and Sandwich Bay SPA and Ramsar sites. The whole of Thanet District falls within approximately a 6km

radius of the SPA with 75% of visitors to the SPA sites originating from beyond this radius. The main current threat to the integrity of these sites has been identified as the disturbance of feeding and roosting waders, notably overwintering turnstones, by recreational activities (dog walking in particular).[8]

Various visitor surveys have been undertaken including the Thanet Coast and Sandwich Bay SPA Visitor Survey (2014) for Canterbury City Council[9]. This survey found the main influencing factor determining the choice of site for visitors was that it was close to home which was of particular prevalence amongst dog walkers who comprised 76% of all regular visitors to the SPA.[10] Other surveys undertaken in 2011 and 2012 by KCC found 75% of all visitors originated from between 7.6km and 15.2km of Pegwell Bay Country Park with 54% of visitors originating from Cliffs End, Ramsgate and Broadstairs. Most visitors (60%) were accompanied by a dog[10]. A high level of regular visitation was found, with 57% of visitors to Pegwell Bay Country Park visiting once a week or more[9]. Visitor Surveys conducted at Pegwell and Sandwich Bay in 2011/2012 and 2012 by Dover District Council demonstrated Ramsgate being the main origin of visitors to Pegwell Bay further supporting that visitor pressure is primarily from those already within Thanet. 90% of visitors were found to come from home of which 65% travelled by car and 32% on foot.[2] This would suggest that the existing visitor pressure is derived from residential areas in Thanet and not from the existing rail access in the area.

Car parking for visitors is currently free of charge in the residential areas of Cliffs End along with existing parking on the coast. Proposed car parking at Thanet Parkway by KCC, as part of the development would be charged and visitors are likely to continue to utilise free parking in the area when visiting Pegwell Bay. It is recommended that signage clearly stating that parking at the Thanet Parkway station is for rail users only are placed at the station and that no information boards relating to Pegwell Bay are placed in the station.

2.3 Screening

Based on existing baseline ecological and visitor survey findings any significant impacts on the SACs are considered to be negligible on the basis that there will be no effect pathways to the marine environment.

The provision of the station will result in the loss of a section of arable farmland that has potential to support foraging golden plover over the winter. However, given that the ecology surveys for the scheme did not identify any golden plover in the area, it is considered likely that the site is not an important foraging area for them, or used frequently. The ecological surveys also didn't find any evidence of the other qualifying features, namely little tern or turnstone in the site area. The habitat is likely to be largely unsuitable for these species as they are usually found in coastal habitats. In addition, given that the site for the station is located near a rail line, main roads and housing developments, the existing level of disturbance from noise and human activity is considered likely to act as a deterrent to large numbers of birds utilising the site. The arable fields are also likely to be continually disturbed through farm operations and are considered largely unsuitable for golden plover, as the fields lie fallow over winter. It is therefore assessed that the loss of the arable land will not significantly affect the SPA bird populations.

With respect to the proposed footpath along Clive Road there is some evidence that the area along the field boundary is already used by pedestrians, resulting in an existing level of disturbance. The provision of a formalised path is not considered likely to adversely change the existing conditions.

There is potential for indirect disturbance effects on the qualifying species of the Thanet Coast and Sandwich SPA and Ramsar sites through a potential increase in visitor numbers during the summer months. Based on the information obtained from the visitor surveys, it is reasonable to assume that the provision of the new station will not result in an increase in people visiting the sites as a result of the station as it will primarily serve commuters and local residents. It is not considered likely that the station will result in a significant effect on the SPA bird populations.

2.4 In-combination effects

Planning applications have been submitted to Thanet District Council for housing developments in close proximity to the proposed Thanet Parkway station. These are:

- OL/TH/17/0150 Outline application for the erection of up to 23 dwellings including access with all other matters reserved at land adjacent to Oakland Court, Cottington Road, Cliffsend, Ramsgate, Kent (located approximately 440m from Thanet Parkway station site).

- OL/TH/17/0151 Outline application for the erection of up to 41 dwellings including access with all other matters reserved at land north of Cottington Road and east of Lavender Lane, Ramsgate, Kent (located approximately 160m from the Thanet Parkway station site).
- OL/TH/17/0152 Outline application for the erection of up to 65 dwellings including access with all other matters reserved at land east of 40 Canterbury Road West, Ramsgate, Kent (located approximately 200m from Thanet Parkway station site).

All of these planning applications, if approved, will result in the loss of arable land around the station area. The ecological surveys carried out for these developments found no evidence of golden plover utilising the sites and as with the site for the station, the fields are considered largely unsuitable for golden plover. The sites are subject to existing disturbance from adjacent housing and the fields are likely to be left bare over winter, thereby providing limited foraging habitat. Although the report considers golden plover throughout given the potential to find them in the arable fields, all the wintering birds associated with the SPA have been considered with respect to potential impacts.

It is assessed that there will be no significant in-combination effects on the SPA bird populations from loss of habitat.

As these applications are for housing developments, the developer will be expected to contribute to the Thanet Coast and Sandwich Bay Strategic Access Management and Monitoring Plan. It is therefore expected that any visitor pressure from the additional housing can be managed and there will be no likely significant effect on the SPA bird populations from increased disturbance.

3 Conclusion

The findings of visitor surveys at Pegwell Bay have identified that existing visitor pressure is derived from residential areas in Thanet and not from the existing rail access in the area. As the same rail services to stop at Thanet Parkway would carry on to Ramsgate and around the Thanet loop, Thanet Parkway is not considered to improve access to other designated sites within the study area. No additional tourist facilities would be provided at Cliffs End to encourage visitors. The proposed new station would be located approximately 500m from Sandwich Road which provides access to Pegwell Bay. Although the station would be within walking distance of Pegwell Bay visitor surveys have shown that the majority of visitors travel by car with over 60% coming to walk their dog. Local residents of Cliffs End are also likely to be frequent visitors and 32% were found to come on foot. It is therefore unlikely that there would be a sudden shift to visitors bringing their dog to Pegwell Bay by rail as opposed to the existing arrangements and the rail station would primarily be used by local residents for commuting or visiting other towns such as Ramsgate. There is however, the possibility of visitors accessing the site from Thanet Parkway when travelling between existing towns along the railway during the summer months.

The proposed new footpath location is along the edge of the arable field and there is some evidence that this is already walked, suggesting that there is already likely to be some degree of existing disturbance. The arable field was considered unsuitable to support golden plover (a designated feature of the SPA), due to the existing crop regime with the field left bare over winter. It is recommended that once KCC have ownership of the land, the land is managed to prevent birds from utilising the fields before construction commences.

This report has drawn on existing information from ecological and visitor surveys to identify baseline conditions and the possible impact pathways on the designated sites and their qualifying features. A full HRA screening assessment was not undertaken within the scope of this report which aimed to provide necessary background information to enable a HRA assessment to be undertaken by KCC. A brief screening assessment based on the information in this report indicates that no significant impacts are likely to arise on the designated sites or their qualifying features.

4 References

1. Tyldesley, D & Associates.(2017) Essential guidance for the assessment of plans and projects under the UK Habitats Regulations. The Habitat Regulations Handbook http://www.dtapublications.co.uk/
2. V Hyland Associates Ltd & Blackwood Bayne Ltd. (2016). Strategic Access Management and Monitoring Plan In respect of the Thanet section of the Thanet Coast and Sandwich Bay SPA Main Report. Final Report v1.0 April 2016
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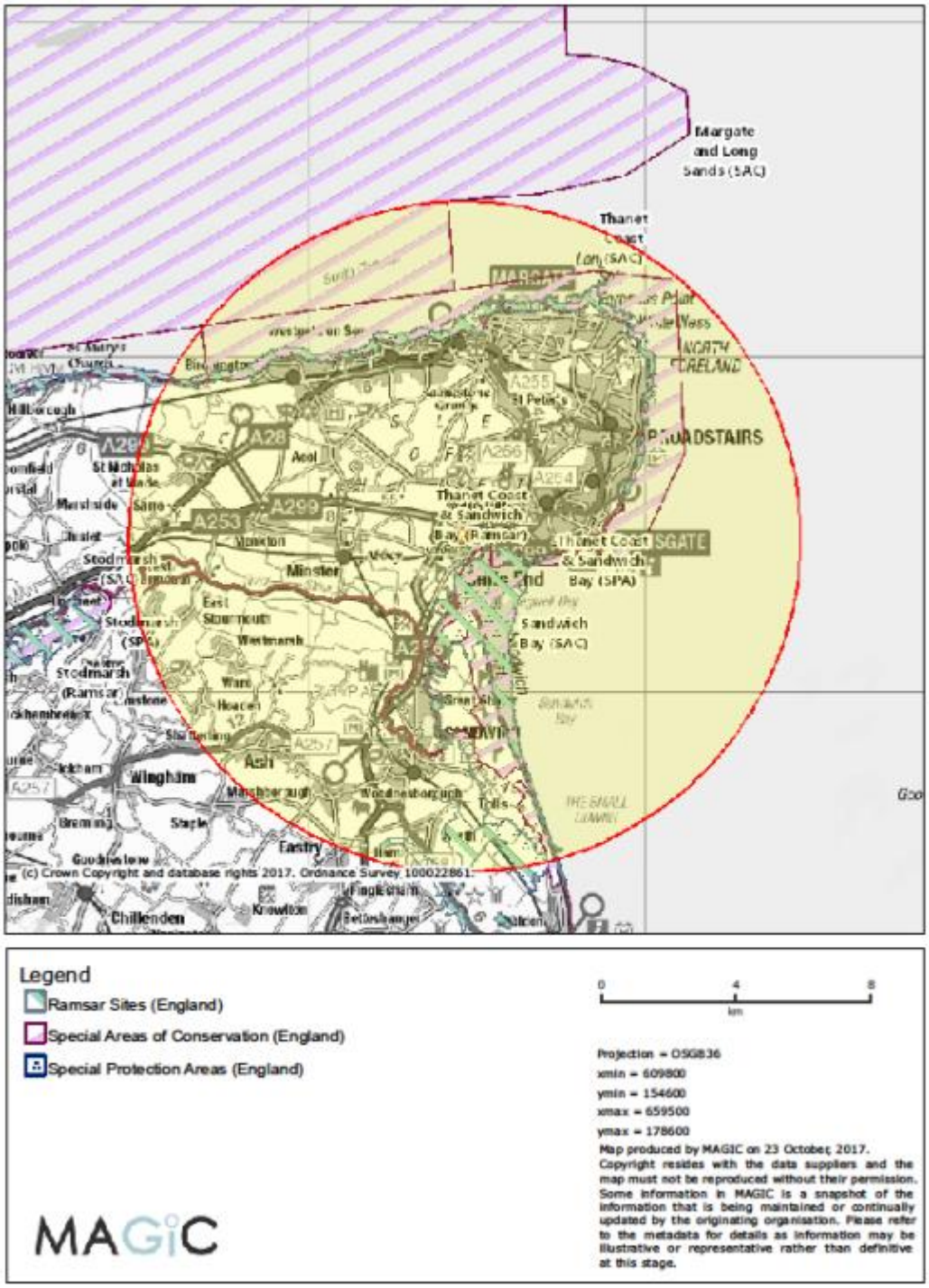
5. AECOM (2017) Thanet Parkway Station: Appendix C Chapter A EcIA
6. AECOM (2017) Thanet Parkway Station: Winter Bird Report
7. Kent County Council (2016).
8. Habitats Regulations Assessment (HRA)Section 3.3.1 Recreational Pressure ref Thanet District Council Local Plan Preferred Options - Information to support an assessment under Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) - AMEC Environment & Infrastructure UK Limited (January 2015)
9. Fearnley, H, Liley, D and Floyd L. (2014). Thanet Coast and Sandwich Bay SPA Visitor Survey. Unpublished report for Canterbury City Council
10. Swandale, T.,Waite, A. (October 2012), Pegwell Bay, Kent: Bird Disturbance Study 2010-2011.

5 Appendices

Figure 1 – Proposed site plan

Figure 2 – Designated sites in 10km



Appendix Ec.2.10

GOV.UK

Guidance

Sites of special scientific interest: managing your land

When you need consent for a proposed operation or management change on land in a SSSI and how to apply.

Published 24 April 2013
Last updated 17 August 2018 — see all updates

From:
Natural England (https://www.gov.uk/government/organisations/natural-england)

Applies to:
England

Contents

- Achieving favourable condition
- Check if your land is within a SSSI
- Manage SSSI land effectively
- Check if you need consent
- Get free or charged advice from Natural England
- Apply for charged advice
- Get consent to carry out operations on your land
- What to include when you request consent
- Decisions on consent applications
- How Natural England makes a decision
- How to appeal against a decision
- SSSI condition and assessment
- Condition improvement process
- Enforcement
- New SSSI notifications
- Changes and de-notification
- Contact

For land you own or occupy, Natural England can select all or part of it for protection. Natural England will do this when it believes the site has features of special interest, such as its:

- wildlife
- geology

- landform

Natural England will 'notify' (or designate) the land as a site of special scientific interest (SSSI). The section: 'New SSSI notifications' tells you more about the designation process and your rights.

This guide tells you what rules you must follow when you manage land you own or occupy within a SSSI. If you do not own or occupy the land and you plan an activity on it, you must work with the owner or occupier. For example, if you're a third party event organiser.

There's separate SSSI guidance for public bodies (https://www.gov.uk/guidance/sites-of-special-scientific-interest-public-body-responsibilities).

Achieving favourable condition

Natural England's objective is to achieve 'favourable condition' status for all SSSIs. Favourable condition means that the SSSI's habitats and features are in a healthy state and are being conserved by appropriate management.

Natural England will assess whether proposals to carry out operations within a SSSI have a positive or negative effect on the condition of a site.

See 'SSSI condition and assessment' for details of how Natural England classifies the condition of SSSIs.

Check if your land is within a SSSI

All SSSIs in England are registered on the Land Charges register. If you're buying land, your conveyancing search will check if it's notified as a SSSI. You can also use the Magic map system to check if your land or land you're buying is within a SSSI (http://www.magic.gov.uk/MagicMap.aspx?chosenLayers=sssiPIndex,sssiIndex,backdropDIndex,backdropIndex,europeIndex,vmlBWIndex,25kBWIndex,50kBWIndex,250kBWIndex,miniscaleBWIndex,baseIndex&box=-187122:5095:1034155:705095&useDefaultbackgroundMapping=false).

1. Click on the '+' symbol below the on-screen compass to zoom in on the detail.
2. Drag the map to your location using your mouse or mouse pad.
3. Click on the 'i' identify tool in the toolbar at the top of the screen.
4. Using the crosshair, click on the map to find out the name of the SSSI.

Change of ownership

You must tell Natural England within 28 days about changes to the ownership or occupation of SSSI land, including if:

- you sell your land
- you lease it to another person
- someone else gets the right to use the land (known as 'an easement')

Manage SSSI land effectively

You must manage land within a SSSI effectively and appropriately to conserve the special features of the site, such as:

- grazing animals at particular times of the year
- managing woodland
- controlling water levels

- managing scrub on species-rich grassland

You must check if you need consent before you start work to:

- carry out management tasks
- change an existing management regime

Check if you need consent

There are certain things you cannot do on SSSI land without consulting Natural England and getting consent first. For example, you might want to change the way you manage woodland or change a grazing regime.

Each SSSI has a list of activities, known as 'operations', which need Natural England's consent.

Find out about your land within a SSSI

Use the designated sites system (DSS) (http://designatedsites.naturalengland.org.uk/SiteSearch.aspx) to search for a SSSI to:

- get the list of 'operations requiring Natural England's consent' (the ORNEC list) - you can download a list for each SSSI
- get a map of the site's boundary
- find out who's the main contact for the site - this is 'your SSSI adviser'
- find out why the site was designated
- get Natural England's 'views about management' report for its steer on how to manage land effectively
- find out the condition of the site

You must get written consent from Natural England if you intend to carry out a listed operation within the boundary of the SSSI. Read the section: 'Get consent to carry out operations' for guidance on how to do this.

If you do not have Natural England's permission you could:

- get an unlimited fine if you - or you allow someone else to - carry out a listed operation
- have to pay to repair any damage to the site

When operations do not need consent

You do not need consent for:

- emergency work, for example to protect livestock during a flood (you must tell Natural England as soon as possible afterwards)
- operations with permission from a public body or local authority (they must have consulted Natural England (https://www.gov.uk/guidance/local-planning-authorities-get-environmental-advice) before they granted permission)
- an operation which is not on the ORNEC list for that site

Get free or charged advice from Natural England

Get advice from Natural England before submitting your proposal. This is likely to reduce delays to Natural England's consent process.

Free advice

You can get free advice from Natural England:

- to check if your proposal will significantly affect a SSSI
- on what you should include with your proposal
- about routine and repeated operations on the SSSI, including routine agricultural activities
- on their views about management of your site to reach favourable or recovering condition
- about management measures specific to your site's notified features
- on potential sources of funding
- about the law on protecting the SSSI

In all cases you'll get an initial free consultation from Natural England.

Pay for advice

You can pay for additional advice from Natural England if what you want to do is more complicated. Natural England can:

- help you review your survey results
- advise on your mitigation strategies to reduce damage to the environment
- advise on drafting your consent application
- help if you need advice quickly (in less than 28 working days)
- help if you need complex advice to meet a defined deadline

Contact your SSSI adviser as soon as possible if you need advice quickly.

You're likely to benefit most from Natural England's advice if you seek it before you submit your request for consent.

How much you might pay depends on:

- the amount of advice you need from Natural England and how complex your proposal is
- whether or not a Natural England adviser needs to visit your site
- how quickly you need advice

If you want advice on how to reduce damage to protected sites or species, you'll pay £110 per hour.

If you want a meeting, you'll pay:

- £500 per adviser for a 90 minute meeting: at your site, a Natural England office or using a conference call
- £110 per hour per adviser for each additional hour

If you want an adviser to travel to your site, you'll pay the adviser's:

- travel costs at 45p per mile
- public transport, tolls and expenses over and above the mileage at cost
- travel time as part of the hourly rate

Fast-track services

To get advice on non-complex cases in less than 28 working days, you'll need to pay £500 for the simple fast-track service.

To get advice for more complex cases to your defined deadline, you'll need to pay £110 per hour per adviser for the bespoke fast-track service.

Apply for charged advice

Complete the consent advice request form (https://www.gov.uk/government/publications/sites-of-special-scientific-interest-consent-advice-request-form). You need to email the form to either of the following contacts:

- your Natural England SSSI adviser for them to discuss your proposal with you
- consultations@naturalengland.org.uk

Read Natural England's terms and conditions for paid-for services (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/563134/General-and-Special-Terms-DAS-S28E.pdf) (PDF, 144KB, 17 pages) .

Get consent to carry out operations on your land

You must get permission to carry out the listed operations on your land in a SSSI.

1. Discuss your proposal with your Natural England SSSI adviser - you can search the DSS (http://designatedsites.naturalengland.org.uk/SiteSearch.aspx) to find out who the SSSI's main contact is. (Contact Natural England if you're unsure.)
2. Fill in the form to request permission (https://www.gov.uk/government/publications/request-permission-for-works-or-an-activity-on-an-sssi) - see the section 'What to include when you request consent' for more guidance.
3. Email your completed form to consultations@naturalengland.org.uk or post it to Natural England.

If you apply to the Forestry Commission for a felling licence (https://www.forestry.gov.uk/forestry/infd-6dfk86) within a SSSI, you must consult Natural England. You'll need Natural England's consent for operations that are not described in the felling licence, such as where vehicles cross the SSSI to get to the tree felling location.

Read the guidance on 'Obtaining consent for work in Sites of Special Scientific Interest (SSSI)' (https://www.forestry.gov.uk/forestry/INFD-92QEY7) on the Forestry Commission website.

You must:

- complete the 'Supplementary notice of operations' form (https://www.forestry.gov.uk/pdf/SSSI-Supplementary-Notice-of-Operations.doc/%24FILE/SSSI-Supplementary-Notice-of-Operations.doc)
- complete your felling licence application (https://www.forestry.gov.uk/pdf/GuidanceFellingLicenceApplicationv2.1-10May2018.pdf/%24FILE/GuidanceFellingLicenceApplicationv2.1-10May2018.pdf)
- send both forms to the relevant administrative hub (https://www.gov.uk/government/organisations/forestry-commission/about/access-and-opening) of Forestry Commission England

This allows the Forestry Commission to get Natural England's consent for you.

What to include when you request consent

Include the following details in your proposal:

- the name of the SSSI
- your name and address
- a description of what you intend to do and how
- approximate start and end dates for the operations
- the location of the proposed operation (send a map with notes if you can)

You should include as much relevant information with your proposal, such as:

- what vehicles will need access to the site, the routes they'll take and ground pressure they'll exert (particularly across fens and bogs)
- how you'll remove any spoil from the site

- the origin and chemical nature of materials you'll bring onto the site

Natural England can ask you for more information if there's a lack of detail and it cannot reach a decision on consent.

Decisions on consent applications

For eligible applications, you'll get one of the following decisions once Natural England has assessed your application:

- consent granted without conditions (for example for operations that are necessary for achieving favourable condition
- consent granted with conditions, such as requiring you to carry out operations in a certain way or at a certain time to avoid damage
- consent refused for any operations that would damage notified features

Withdrawal or modified consent

Natural England can withdraw or modify an existing consent if new surveys on the site show it's declining from operations previously given consent. This is usually for exceptional cases only.

How Natural England makes a decision

Natural England decides whether to grant consent by assessing the scale and intensity of the proposed operation on the site's notified features. It will assess the level at which the site can sustain the proposed operations without causing significant negative effects. This is known as the site's 'carrying capacity'.

Where possible, Natural England will work with you to improve your proposal to avoid:

- damage to the site
- getting consent with conditions attached
- refusal of consent

You may need to pay for advice if your proposal is complex. Natural England will tell you if you need this service.

> It's an offence to carry out a listed operation without Natural England's consent or to ignore the conditions of a consent.
>
> Read the section on getting free or charged advice from Natural England before you apply for consent. This will help you submit an eligible application.

Decision process

Natural England will acknowledge receipt of your application within 10 working days. Your application must be complete for it to be eligible for Natural England to consider it. See: 'What to include when you request consent'.

If your application is straightforward, Natural England will try to give you a decision within 28 working days. Natural England can take up to 4 months to make its decision. It will tell you when you're likely to get a decision if:

- your case is complex

- it’s going to take longer than 28 working days

If you do not receive a consent decision within 4 months, you should take this as a refusal of consent.

If you need advice quicker than 28 working days, you can pay for the fast-track advice service. This service is subject to Natural England’s discretion.

How to appeal against a decision

You have the right to appeal to the Department for Environment, Food and Rural Affairs (Defra) if:

- Natural England refuses permission for operations
- you disagree with the conditions applied to the consent
- Natural England withdraws or modifies previous consent
- you do not get a consent decision within 4 months

You have 2 months to appeal. Read the guidance on the appeals process. (https://www.gov.uk/guidance/sites-of-special-scientific-interest-appeal-a-refusal-or-change-of-consent) You may be able to resolve the problem without a formal appeal by speaking to your SSSI adviser.

SSSI condition and assessment

Natural England categorises the condition of SSSIs as one of the following:

- favourable - habitats and features are in a healthy state and are being conserved by appropriate management
- unfavourable (recovering condition) - if current management measures are sustained the site will recover over time
- unfavourable (no change) or unfavourable (declining condition) - special features are not being conserved or are being lost, so without appropriate management the site will never reach a favourable or recovering condition
- part destroyed or destroyed - there has been fundamental damage, where special features have been permanently lost and favourable condition can’t be achieved

Site visits and condition assessments

Natural England may visit your SSSI to check on its general condition. Natural England or expert contractors will carry out condition assessments if:

- Natural England thinks it’s necessary
- the condition of the site may change

For most sites they’ll do this at least once every 6 years. They may visit more often if a special feature:

- can only be assessed at a specific time of year
- is likely to change quickly, such as grassland

For sites where changes are expected to be slow, such as woodland, they may do a condition assessment once every 10 years.

Natural England will request your permission before visiting. It may use its power of entry if it believes the site is being damaged.

At other times, Natural England can enter the site without your permission but will only do this if:

- you've been notified of the visit
- you've not allowed access

For assessment, Natural England divides SSSIs into smaller units and assesses them against:

- a list of the features for which the site was designated
- related targets

You can see the SSSI targets on the 'favourable condition table' by searching for your site on the DSS (http://designatedsites.naturalengland.org.uk/SiteSearch.aspx). You'll find the favourable condition table underneath the site summary box.

Example

If one of the special features of your site is a rare plant species, the assessment is likely to include a measure of population size and distribution within the unit. Similarly, if a particular habitat is a feature, Natural England will measure its extent, structure and species composition.

After the assessment, Natural England will contact you to discuss:

- the condition of the site
- any changes in management you need to make if it's not in favourable or recovering condition

Natural England usually publishes summaries of condition assessments within 6 weeks. You can see these on the DSS (http://designatedsites.naturalengland.org.uk/SiteSearch.aspx).

1. Search for your SSSI.
2. Click on 'View details'.
3. In the Summary box, click on 'View units' in the right hand column.
4. Click on 'View map' on the right hand side to see the area on a map.

Condition improvement process

Natural England can take 3 steps to help you improve the favourable condition of the SSSI if it has declined.

1. Management agreement

Natural England will advise you on, and try to agree with you, the work that's needed to protect and improve the condition of the site. You can achieve most management objectives on SSSIs with a Countryside Stewardship grant (https://www.gov.uk/countryside-stewardship-grants), which you might be eligible for.

2. Management scheme

A management scheme is a statement of measures necessary to conserve or restore features of your land. Natural England can put a management scheme in place if the features of special interest on your SSSI are deteriorating from neglect or poor management.

Where a management scheme has been put in place, Natural England may ask you to apply for a Countryside Stewardship grant (https://www.gov.uk/countryside-stewardship-grants).

Decline resulting from wilful or reckless damage to the site is treated differently and is subject to enforcement measures.

If you think the management scheme is unreasonable or that someone else should be responsible for the work, contact your SSSI adviser and explain why.

3. Management notice

If you do not carry out works set out in a management scheme, Natural England can issue a management notice. This will state that you must carry out some or all of the works set out in the management scheme.

You'll be breaking the law if you get a management notice, but do not carry out the work within 2 months of Natural England's deadline.

If you do not carry out the work, Natural England could:

- prosecute you, which may result in you getting an unlimited fine
- enter your land and carry out the work - you'll have to pay for the work
- get a compulsory purchase order to force you to sell your land to them (as a last resort)

You can appeal to Defra against a management notice (https://www.gov.uk/guidance/sites-of-special-scientific-interest-appeal-a-management-notice). You have 2 months to appeal.

You may be able to resolve the problem without a formal appeal by speaking to your SSSI adviser.

Enforcement

Natural England will take enforcement action (https://www.gov.uk/guidance/enforcement-laws-advice-on-protecting-the-natural-environment-in-england) on you or others who:

- intentionally or recklessly damage the SSSI
- destroy any of the features of special interest
- disturb wildlife for which the site was notified
- carry out listed operations without consent

Where possible, Natural England will work with you to avoid legal proceedings. Read the section on enforcement undertakings (https://www.gov.uk/guidance/enforcement-laws-advice-on-protecting-the-natural-environment-in-england#enforcement-undertakings) to find out more. Natural England will use enforcement measures as a last resort.

New SSSI notifications

Natural England identifies and protects SSSIs in England under the Wildlife and Countryside Act 1981 (as amended).

Natural England will select and notify an area as a new SSSI when it believes the land's wildlife, geology or landform is of special interest. When land becomes an SSSI, it does not give the public the right to access your land. Natural England will 'notify' (or designate) the land as a site of special scientific interest (SSSI).

Find out how Natural England uses its statutory power (http://publications.naturalengland.org.uk/publication/6597120400293888?category=3769710) to protect SSSIs.

Sites are selected using the:

- guidelines for selection of biological SSSIs (http://jncc.defra.gov.uk/page-2303)
- Geological Conservation Review (http://jncc.defra.gov.uk/page-2947)

Natural England will write to you and tell you if it believes your land has special conservation value. Natural England is likely to call you to discuss this before sending a notification letter.

The letter will explain the legal implications of the notification by including:

- the reasons for designation
- a statement of Natural England's views on the management of the SSSI
- a list of operations requiring Natural England's consent
- a map showing the SSSI
- your legal responsibilities
- how to give your opinions or object to the designation

The letter will give you details of an adviser who can help you. They'll be able to explain:

- what the designation means for you
- what help is available to help you manage your land, such as applying for a grant scheme (https://www.gov.uk/topic/farming-food-grants-payments/rural-grants-payments)

Natural England must also tell:

- the local planning authority
- the Secretary of State for Environment, Food and Rural Affairs
- public bodies, such as the Environment Agency, water and sewerage companies and internal drainage boards

Further information on notifying SSSIs can be found on Natural England's designations programme for areas, sites and trails (https://www.gov.uk/government/publications/natural-england-designations-programme-for-areas-sites-and-trails).

Give your opinion or object to a new notification

You have 4 months to write to Natural England to tell them what you think or to object to the designation of your land as an SSSI.

The Natural England board (https://www.gov.uk/government/organisations/natural-england/about/our-governance#natural-england-board) decides whether to confirm or withdraw a notification. It has a 4-month consultation period to look at the objections and issues raised.

The Secretary of State for the Environment, Food and Rural Affairs appoints members of the board. They are independent of Natural England staff and the executive board.

Changes and de-notification

If the special interest of the SSSI is not adequately protected by the existing notification, Natural England can:

- extend an existing SSSI if nearby land is also of special interest
- add features of special interest to an SSSI record if they're found on the land
- update the list of operations for which you'll need Natural England's consent
- withdraw the designation of an SSSI, known as 'de-notification'

Natural England will consult with you in a similar way as a new notification if it makes a change to an existing notification.

Natural England will only de-notify a SSSI in exceptional cases. For example, if the site's special interest is lost and cannot be restored as a result of:

- natural causes
- granting planning permission for development

It’s an offence to deliberately or recklessly damage the special features of an SSSI. Sites that have been illegally damaged, or suffered from neglect, will not be de-notified.

You have the opportunity to repair the damage using the enforcement undertaking (https://www.gov.uk/guidance/enforcement-laws-advice-on-protecting-the-natural-environment-in-england#enforcement-undertakings) process.

Contact

Speak to your SSSI adviser or contact the enquiries team if you need help.

Natural England Enquiries
County Hall
Spetchley Road
Worcester
WR5 2NP

Email enquiries@naturalengland.org.uk.

Telephone 0300 060 3900.

Opening times: 8:30am to 5pm, Monday to Friday (excluding public holidays).

Find out about call charges at www.gov.uk/call-charges (https://www.gov.uk/call-charges).

Published 24 April 2013
Last updated 17 August 2018 + show all updates

1. 17 August 2018 Improved the wording in the 'Decisions on applications for consent' section to make it clear when you'll get a response.
2. 1 November 2016 Added section 'Obtain free or charged advice from Natural England' following the introduction of a chargeable advice service for protected sites consents.
3. 30 September 2016 Revised section: 'New SSSI designations'.
4. 24 April 2013 First published.

Related content

Detailed guidance

- Sites of special scientific interest: appeal a refusal or change of consent (https://www.gov.uk/guidance/sites-of-special-scientific-interest-appeal-a-refusal-or-change-of-consent)
- Sites of special scientific interest: public body responsibilities (https://www.gov.uk/guidance/sites-of-special-scientific-interest-public-body-responsibilities)
- Sites of special scientific interest: appeal a management notice (https://www.gov.uk/guidance/sites-of-special-scientific-interest-appeal-a-management-notice)

Explore the topic

- Land management (https://www.gov.uk/topic/environmental-management/land-management)
- Protected sites and species (https://www.gov.uk/topic/planning-development/protected-sites-species)

Warwickshire, Coventry & Solihull - Habitat Impact Assessment Calculator

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Automatic Condition setting
	Result

Local Planning Authority:	Other
Site name:	Manston Airport DCO Site
Planning application reference number:	
Assessor:	
Date:	24/04/2019

Please fill in both tables

Please do not edit the formulae or structure
To condense the form for display hide vacant rows, do not delete them
If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services 01926 418060

	Existing habitats on site Please enter all habitats within the site boundary		**Habitat distinctiveness**		**Habitat condition**		**Habitat Biodiversity Value** — **Habitats to be retained with no change within development**		**Habitats to be retained and enhanced within development**		**Habitats to be lost within development**		
T. Note	code	Phase 1 habitat description	*Habitat area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*	*Area (ha)*	*Existing value*	*Area (ha)*	*Existing value*	*Area (ha)*	*Existing value*	***Comment***
		Direct Impacts and retained habitats			A		B	C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
B	A21	Woodland: Dense continuous scrub	0.30	Medium-Low	3	Moderate	2	0.00				0.30	**1.80**	
	A22	Woodland: Scattered scrub	0.33	Medium	4	Moderate	2	0.00				0.33	**2.64**	
	B22	Grassland: Semi-improved neutral grassland	75.70	Medium	4	Moderate	2	65.20	521.60			10.50	**84.00**	
	B6	Grassland: Poor semi-improved grassland	118.66	Medium-Low	3	Moderate	1			48.66	145.98	70.00	**210.00**	
	J12	Grassland: Amenity grassland	0.53	Low	2	Moderate	2	0.53	2.12					
	C31	Other: Tall ruderal	0.67	Medium-Low	3	Moderate	2	0.00				0.67	**4.02**	
	J13	Other: Ephemeral/short perennial	0.68	Low	2	Moderate	2	0.00				0.68	**2.72**	
	n/a	Built Environment: Buildings/hardstanding	106.50	none	0	Moderate	1	106.50	0.00					
	J4	Other: Bare ground	0.13	Low	2	Moderate	2	0.00				0.13	**0.52**	
	A3	Woodland: Scattered trees	0.10	Medium	4	Moderate	2	0.00				0.10	**0.80**	
			Total	303.60				Total	172.23	523.72	48.66	145.98	82.71	306.50 J
													∑D + ∑F + ∑H	
												Site habitat biodiversity value	976.20	

Before/after impact	**Indirect Negative Impacts** Including off site habitats	K	Value of loss from indirect impacts K x A x B = Li, Lii	Li - Lii
Before				
After				
Before				
After				
Before				
After				
Before				
After				
Before				
After				
	Total	0.00		0.00 M
				HIS = J + M
			Habitat Impact Score (HIS)	**306.50**

	Proposed habitats on site (Onsite mitigation)			Target habitats distinctiveness		Target habitat condition			Time till target condition		Difficulty of creation / restoration		*Habitat biodiversity value*	
T. Note	code	Phase 1 habitat description	*Area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*		*Time (years)*	*Score*	*Difficulty*	*Score*		***Comment***
		Habitat Creation	N		O		P			Q		R	(N x O x P) / Q / R	
	A3	Woodland: Scattered trees	0.50	Medium	4	Good	3		15 years	1.7	Low	1	**3.53**	Scattered trees within eastern part of northern grass
	n/a	Built Environment: Buildings/hardstanding	80.50	none	0	Moderate	2		3 Years	1.1	Low	1	**0.00**	
	n/a	Built Environment: Gardens (lawn and planting)	1.71	Low	2	Good	3		3 Years	1.1	Low	1	**9.33**	
		Total	**82.71**											
		Habitat Enhancement						Existing value S (= F)					((NxOxP)-S)/Q/R	
B	B22	Grassland: Semi-improved neutral grassland	48.66	Medium	4	Moderate	2	**145.98**	3 Years	1.1	Low	1	**221.18**	
		Total	**48.66**								Trading down correction value		0.00	
											Habitat Mitigation Score (HMS)		**234.04**	
													HBIS = HMS - HIS	
											Habitat Biodiversity Impact Score		**-72.46**	Loss
											Percentage of biodiversity impact loss		23.64	

	Loss	Gain	Impact
Woodland Habitat	5.24	3.53	**-1.71**
Grassland Habitat	294.00	221.18	**-72.82**
Wetland Habitat	0.00	0.00	**0.00**
Other Habitat (including Built Environment)	7.26	9.33	**2.07**
Total	306.50	234.04	**-72.46**
		Trading down	**0.00**
			-72.46

Warwickshire, Coventry & Solihull - Hedge Impact Assessment Calculator

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Result

This sheet calculates the impacts to hedges and lines of trees in and around the site.

These units are not transferrable as compensation for either the Habitat or Connectivity Impact Assessment scores

Please fill in both tables

Please do not edit the formulae or structure
To condense the form for display hide vacant rows, do not delete them
If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services

T. Note	code	Existing Hedgerow features on site: Hedgerow habitat description	Feature length (km)	Hedgerow distinctiveness: Distinctiveness	Score	Hedgerow condition assessments: A1	A2	B1	B2	C1	C2	D1	D2	Condition Score	Hedgerow Biodiversity Value: Hedgerow features to be retained with no change within development: Length (km)	Existing value	Hedgerow features to be retained and enhanced within development: Length (km)	Existing value	Hedgerow features to be lost within development: Length (km)	Existing value	Comment
		Direct Impacts and retained features			A										C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
	n/a	Hedges: non_species rich hedge	0.95	Low	2	Fail	Fail	Fail	Pass	Pass	Pass	Pass	Pass	2			0.95	3.80			
		Total	0.95											Totals	0.00	0.00	0.95	3.80	0.00	0.00	J
																				∑D + ∑F + ∑H	
																		Site Hedge Biodiversity Value		3.80	

Before/after impact	Indirect Negative Impacts	K	Value of loss from indirect impacts: K x A x B = Li, Lii	Li - Lii	Comment
Before					
After					
Before					
After					
Before					
After					
Before					
After					
Before					
After					
	Total	0.00		0.00 M	HIS = J + M
				Hedge Impact Score (HIS)	0.00

T. Note	code	Proposed hedge features on site (Onsite mitigation): Phase 1 habitat description	Length (km)	Target hedge distinctiveness: Distinctiveness	Score	Hedgerow condition assessments: A1	A2	B1	B2	C1	C2	D1	D2	Condition Score	Time till target condition: Time (years)	Score	Difficulty of creation / restoration: Difficulty	Score	Linear biodiversity value	Comment
		Hedgerow Creation	N		O											Q		R	(N x O x P) / Q / R	
		Total	0.00																	
		Hedgerow Enhancement												Existing value S (= F)					((N x O x P) - S) / Q / R	
		Total	0.00	ERROR - Total length of features enhancement must equal total length of features to be enhanced above														Trading down correction value		0.00	
																		Hedge Mitigation Score (HMS)		0.00	
																			HBIS = HMS - HBIS	
																		Hedge Biodiversity Impact Score		0.00	
																		Percentage of linear impact loss			

KEY	
	No action required
	Action required
	Drop-down menu
	Calculation
	Automatic lookup
	Overall Gain
	Overall Loss

Warwickshire Coventry and Solihull - Connectivity Impact Assessment [optional]

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Result

Connectivity Features
This sheet gives and indication as to whether the development will enhance connectivity thorugh or around the site.

These units are not transferrable as compensation for either the Habitat or Hedgerow Impact Assessment scores.

Please fill in both tables

Please do not edit the formulae or structure
To condense the form for display hide vacant rows, do not delete them
If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services

Connectivity Biodiversity Value

T. Note	code	Existing Connectivity features on site: Phase 1 habitat description	Feature length (km)	Connectivity distinctiveness: Distinctiveness	Score	Connectivity condition: Condition	Score	Connectivity features to be retained with no change within development: Length (km)	Existing value	Connectivity features to be retained and enhanced within development: Length (km)	Existing value	Connectivity features to be lost within development: Length (km)	Existing value	Comment
		Direct Impacts and retained features			A		B	C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
		Total	0.00				Total	0.00	0.00	0.00	0.00	0.00	0.00 J	
													∑D + ∑F + ∑H	
												Site Connectivity Biodiversity Value	0.00	
		Indirect Negative Impacts						Value of loss from indirect impacts						
Before/after impact			K					K x A x B = Li, Lii	Li - Lii					
	Before													
	After													
	Before													
	After													
	Before													
	After													
	Before													
	After													
	Before													
	After													
		Total	0.00						0.00 M				CIS = J + M	
												Connectivity Impact Score (CIS)	**0.00**	

T. Note	code	Proposed linear features on site (Onsite mitigation): Phase 1 habitat description	Length (km)	Target Connectivity distinctiveness: Distinctiveness	Score	Target Connectivity condition: Condition	Score		Time till target condition: Time (years)	Score	Difficulty of creation / restoration: Difficulty	Score	*Connectivity biodiversity value*	Comment
		Connectivity Creation	N		O		P			Q		R	(N x O x P) / Q / R	
		Total	0.00											
		Connectivity Enhancement						Existing value S (= F)					((N x O x P) - S) / Q / R	
		Total	0.00									Trading down correction value	0.00	
												Connectivity Mitigation Score (CMS)	0.00	
													CBIS = CMS - CIS	
												Connectivity Biodiversity Impact Score	**0.00**	
												Percentage of linear impact loss		

Phase 1 Habitat Type	Phase 1 Habitat Codes	Distinctiveness		Difficulty of creation		Preset Time to Target Condition (Moderate)	Preset Time to Target Condition (Good)	Difficulty of restoration		Preset Time to Target Condition (Moderate)	Preset Time to Target Condition (Good)	UK Priority Habitat /Habitat of Principal Importance	LBAP Priority Habitat	NVC	Habitat Definition	Notes	Condition Assessment	Habitat creation/restoration timescales
Built Environment: Buildings/hardstanding	n/a	none	0	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat				Classify as poor condition	
Built Environment: Gardens (lawn and planting)	n/a	Low	1	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat				Classify as poor condition	0-5 years
Woodland: Broad-leaved semi-natural woodland	A111	High	6	n/a	-	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland mixed deciduous woodland	Woodland	W8,W10, W16	Include all stands which do not obviously originate from planting. Both ancient and more recent stands are included. Woodland where more than 30% is planted should be classified as plantation. However, matu plantations (more than about 120 years old) of locally native species where there are semi-natural woodland ground flora and shrub communities should be classified as semi-natural (NCC, 1990). See Phase 1 Survey Handbook for definition of woodland types included in semi-natural category.		Use FEP T08 condition assessment	Planted native woodlands will be about 120 years old before they can be considered semi-natural and should be composed of locally native species and have semi-natural woodland ground flora and shrub communities (Phase 1 Survey Handbook, NCC 1990) therefore cannot be created on timescales used in BIA. Timescales for the restoration of existing semi-natural woodland will depend on reasons for unfavourable condition. Timescales for restoration will depend on reasons for unfavourable condition (see condition assessment) and management required to improve condition.
Woodland: Broad-leaved plantation	A112	Medium	4	Medium	1.5	32+ years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	Some forms of W8, W10, W16 or non NVC	Obviously planted woodland with no more than 10% of the canopy mad up of conifer trees (NCC, 1990). See Phase 1 Survey Handbook for exceptions. The category includes recent stands (i.e less than about 12 years) planted with locally native trees. The phase 1 handbook does not define a minimum size but the National Inventory of Woodland and Trees defines woodland as having a minimum area of 0.5ha and a minimum width of 20m.		Use T08 even though this habitat does not meet strict FEP definition for use with T08.	It is likely to take more than 100 years before the planted woodlands approach good condition e.g. with an age and structural diversity including canopy, understory and field layer that supports plants, insect, mammal and bird species typical of native woodlands. For these reasons, aim for moderate condition in 32+ years. The minimum woodland size for Countryside Stewardship woodland creation grants is 0.1 hectares and must have a minimum width of 20 metres.
Woodland: Coniferous semi-natural woodland	A121	Medium	4	n/a	-	n/a	n/a	Low	1	n/a	n/a	Native pine woodlands (Scotland only). Yew stands are incluad in the lowland beech and yew woodland plan and upland mixed ashwood plan.	n/a	W13, W18		This woodland type s not found in Warwickshire.	Use T08 even though this habitat does not meet strict FEP definition for use with T08.	n/a
Woodland: Coniferous plantation	A122	Low	2	Medium	1.5	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Some forms of W10, W16 or non NVC	Obviously planted woodland with no more than 10% of the canopy mad up of broadleaved trees (NCC, 1990). See Phase 1 Survey Handbook for exceptions. Typical trees species include larch (*Larix* spp), pine (*Pinus* spp) and spruce (*Picea* spp).		Classify as poor condition	n/a
Woodland: Mixed semi-natural woodland	A131	Medium	4	n/a	-	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland mixed deciduous woodland	Woodland		Woods that do not obviously originate from planting (see Phase 1 Survey Handbook for exceptions) with a canopy made up of between ten and ninety percent of either broadleaved and coniferous trees (NCC 1990).		Use FEP T08 condition assessment	
Woodland: Mixed plantation	A132	Low	2	Medium	1.5	32+years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Obviously planted with 10-90% of either broadleaved or conifer trees in the canopy (NCC, 1990). See Phase 1 Survey Handbook for exceptions.		Use T08 even though this habitat does not meet strict FEP definition for use with T08.	It is likely to take more than 100 years before the planted woodlands approach good condition e.g. with an age and structural diversity including canopy, understory and field layer that supports plants, insect, mammal and bird species typical of native woodlands. Target condition should be moderate in 32+ years.
Woodland: Wet woodland	n/a	High	6	Medium	1.5	32+years	n/a	Medium	1.5	W_in_P	W_in_P	Wet woodland	Woodland	W1 - W7	Wet woodlands are found on poorly drained or seasonally wet soils. They are commonly found on floodplains, alongside rivers and stream, on fens and in damper areas of other woodland types. Alder, birch and willows are usually the dominant tree species.	Wet woodland is scarce in the County.	Use FEP T08 condition assessment	
Woodland: Dense continuous scrub	A21	Medium-Low	3	Low	1	10 years	15 years	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W21-24	A block of scrub is dominated by the shrub species less than five metres tall. It may have a few scattered trees but there will be no recognisable canopy. To be dense or continuous, the scrub cover must be thirty percent or more. This includes stands of bramble, dog Rose and gorse (*Ulex europaeus*) and also stands of mature hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*) or grey willow (Salix cinerea) even if they are greater than 5m tall. (NCC, 1990).	Scrub is often part of mosaic with other habitats. Its conservation value can be variable, and is often seen as of low value due to low botanical species diversity. However, it can be of high value in its own right as well as providing suitable habitat for some of the county's important species of invertebrates, mammals and birds.	Use condition assessment V05 for scrub, even if the scrub does not meet the FEP definition of high environmental value scrub.	Scrub of high conservation value contains a range of shrub species (at least 3) with mixed age structure, has a complex vertical and horizontal structure i.e. variation in physical structure, age range and spacing, has many clearings and glades giving a high boundary/area ratio, a well developed edge with ungrazed tall herbs, and supports a range of rare/local invertebrates. Scrub typically matures in 15 years (RSPB), so it should be possible to create good quality scrub in 15 years with suitable management e.g. rotational cutting that achieves the above conditions.
Woodland: Scattered scrub	A22	Medium	4	Low	1	10 years	15 years	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W21-24	As above but scrub cover is less than thirty percent.	Scattered scrub occurs in association with other semi-natural habitats, frequently occurring as a mosaic with grassland or early successional communities, and often having occasional scattered trees. The presence of scattered scrub can add to a sites ecological interest. Where scrub is part of a habitat mosaic, for example with grassland, the habitat with the higher distinctiveness score should automatically be entered in the BIA.	Use condition assessment V05 for scrub, even if the scrub does not meet the FEP definition of high environmental value scrub.	Scrub of high conservation value contains a range of shrub species (at least 3) with mixed age structure, has a complex vertical and horizontal structure i.e. variation in physical structure, age range and spacing, has many clearings and glades giving a high boundary/area ratio, a well developed edge with ungrazed tall herbs, and supports a range of rare/local invertebrates. Scrub typically matures in 15 years (RSPB), so it should be possible to create good quality scrub in 15 years with suitable management e.g. rotational cutting that achieves the above conditions.
Woodland: Scattered trees	A3	Medium	4	Low	1	32+ years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Habiat that is neither woodland or scrub, but have trees present. Tree cover must be less than thirty percent. However, most examples of planted trees over amenity grassland should be included in this category even where tree cover exceeds 30%	The area calculation should be the whole land parcel on which the scrub/trees are planted and not just the cover the individual trees/shrubs. Where a parcel of land has more than one habitat e.g. scattert trees on grassland, the habitat with the higher distinctiveness score should be entered.	No FEP condition assessment. See next column for important attributes.	The ecological value of scattered trees will depend on the tree species (species such as oak, birch, hawthorn and willows are most valuable), age (large, mature trees have higher value), location (the proximity of other habitats that add habitat, species and structural diversity), the presence of features such as decay, loose bark, dense ivy cover etc. It takes decades for these features to develop.
Woodland: Broad-leaved parkland	A31	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Wood-pasture and parkland	Old parkland & veteran trees	Range of NVC types	This category is for Wood Pasture and Parkland Priority Habitat/Habitat of Principle Importance only. Wood-pasture and parkland is not defined by any particular type(s) of vegetation, NVC types, or Phase 1 habitat types. Instead they are mosaic habitats valued for their trees, especially veteran and ancient trees, and the plants and animals that they support (LBAP).	This habitat is typical of large estates with a history of traditional management e.g. grazing by cattle or deer, but can also be found in cemeteries and churchyards. Such sites can often be important due to the presence of large numbers of mature trees and can also have historic, cultural and landscape importance.	Use FEP T03 condition assessment	Timecales for restoration will depend on reasons for current condition and management required to improve condition. Reasons for unfavourable condition may include e.g. loss of old trees (disease, root damage, soil compaction, felling) lack of replacement trees, lack of standing and fallen deadwood (removed for safety reasons, over-tidying), inappropriate management e.g. intensive grazing levels.
Woodland: Coniferous parkland	A32	Medium	4	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	n/a		Parklands with introduced exotic trees such as cedar (Cedrus spp).			
Woodland: Recently felled woodland	A4	Low	2	n/a	-	n/a	n/a	n/a	-	n/a	n/a	Not a priority habitat	Not a priority habitat		Only include areas where future land use is uncertain, e.g., if it is not clear whether they are to be replanted.		Classify as poor condition	n/a
Woodland: Orchard	A5	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Traditional orchard	Orchards	Range of NVC types	This category is for Traditional Orchards Priority Habitat/Habitats of Principal Importance only. Intensively managed orchards are not included. Tradition orchards are defined as groups of fruit and nut trees planted on vigorous rootstocks at low densities in permanent grassland and managed in a low intensity way. The minumum size of a traditional orchard is defined as at least five trees with crown edges less than 20m apart. Orchards are a mosaic habitat containing fruit trees, deadwood, pasture or meadow, scrub, hedgerows, ponds etc. Prime examples support a diversity of vascular plants, bryophytes, lichens, fungi, vertebrates and invertebrates including BAP species, nationally rare and scarce species.		Use FEP T15 or PTES (Peoples Trust for Endangered Species) condition assessment (see PTES/NE Project Report NECR077)	The PTES condition assessment has 3 condition categories: excellent (established, mixed ages of tree, grazed, standing and fallen deadwood), goodffair (includes newly planted or young orchards that are mown, they lack good deadwood habitat and the mature trees that can provide it naturally), poor (gappy, no new trees, scrubbed over trees damaged). Newly planted orchards can therefore be in moderate (i.e PTES good/fair) condition in 5-10 years provided associated habitats e.g. wildflower grassland, hedges, scrub, deadwood logpiles etc are incorporated. It will take a lot longer to achieve good condition i.e. trees of varying age, standing and fallen deadwood etc. See PTES website and Natural Englands Technical information notes (TIN12 to 21) for advice on planting, species and varities, wildlife, location, rootstocks etc), also Countryside Stewardship, Creation of traditional orchards option BE5.
Grassland: Unimproved acidic grassland	B11	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland dry acid grassland	Acid grassland	U1-U4	Lowland acid grassland typically occurs on nutrient poor, free-draining soils of low pH (<5.5). Acid grasslands are characteristically species poor with typical species that include fine-leaved grasses such as common bent, sheep's fescue, mat-grass and wavy hair-grass and forbs such as heath bedstraw, tormentil and sheep's sorrel. Although species-poor compared to other semi-natural grasslands, it contains important communities with species that are rare in the region.	Lowland acid grasslands are very rare in Warwickshire sub region. The HBA (2012) recorded a total resource of 72.7ha (2.4ha unimproved and 70.3ha semi-improved). It is mainly associated with heathland, woodland or post-industrial sites. They are largely confined to the acid glacial soils in the north of the County of the Midlands Plateau Natural Area where they persist as fragments.	Use FEP G05 condition assessment	Unimproved grasslands cannot be recreated, at least not on timescales used in the BIA metric. It is possible to create BAP quality grasslands that resemble old unimproved grasslands but these classified as semi-improved - see below.
Grassland: Semi-improved acidic grassland	B12	Medium-High	5	Medium	1.5	15 years	W_in_P	Low	1	W_in_P	W_in_P	Lowland dry acid grassland	Acid Grassland	U1-U4	Improvement reduces the acid character of the grassland and semi-improved acid grasslands will contain a mesotrophic species element (such as white clover, yarrow, common mouse-ear, perennial rye-grass, Yorkshire fog) but in practice, it can be difficult to separate unimproved and semi-improved grasslands.	See above	Use FEP G05 condition assessment	A review of agri-environment schemes (5 sites) found it is possible to create/restore lowland dry acid grassland PH within 10-20 years. One site created (20 years ago) on a field of free draining sand has a well established U1c grassland in good condition. The 4 restored sites were in moderate (3 sites) or good (1 site) condition over timescales of 10-20 years by reinstatement of management e.g. grazing, tree/shrub clearance. See attached guidance for details.
Grassland: Unimproved neutral grassland	B21	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland meadow	Neutral grassland	MG4, MG5, MG8	Unimproved neutral grasslands are found on neutral clays and alluvial soils which have not been subject to alteration through the use of fertilizers, slurry and herbicides. They are the product of a long history of traditional management such as hay making (meadows) or low intensity grazing (pastures) over many decades. Species diversity is often high (but where neglected can be rank) and can include rare or scarce plants such as green-winged orchid, dyer's greenweed, pepper saxifrage and adder's tongue fern. They also support a diverse fauna, especially invertebrate species.	True unimproved grassland is now very rare in the sub region. The HBA recorded 17aha in 2017. SSSIs account for 73ha (40%) of this total. Outside of SSSIs remnant unimproved grasslands are generally small and highly fragmented, found on nature reserves, small 'hobby' farms, churchyards, traditional orchards, woodland rides, churchyards, as fragments of remnant old grassland that have escaped intensification e.g. within or on the edge of urban areas. Many of these are designated as Local Wildlife Sites.	Use FEP G06 condition assessment	Studies (see attached guidance) give timescale trajectories of many decades for the recreation of unimproved neutral grassland. It is possible to create grasslands that superficially resemble species-rich grasslands (see below) but these will not have the natural vegetation patterns, full range of plant species and undisturbed soil fuana and flora of unimproved grasslands.
Grassland: Semi-improved neutral grassland	B22	Medium	4	Medium	1.5	15 years	W_in_P	Low	1	15 years	W_in_P	Lowland meadow	Neutral grassland	MG1, MG6, MG4, MG5	Semi-improved neutral grasslands have been subject to some form of agricultural improvement such as fertilizer application, use of herbicide, intensive grazing or drainage but are typically not subject to regular reseeding (improved grasslands). Semi-improved grasslands cover a very broad range of grassland quality from almost unimproved (species-rich) to species-poor semi-improved grassland that is just slightly more species-rich than agriculturally improved grassland.	Species-rich semi-improved grassland is more widespread in the sub region than unimproved grassland but still scarce. Species diversity will be lower than unimproved grasslands but still of high botanical diversity supporting grassland communities that resemble MG5 or MG4 grassland with species such as common knapweed, lady's bedstraw, yellow rattle, common bird's-foot-trefoil, meadow vetchling, oxeye daisy and great burnet but often at lower frequencies than seen in unimproved meadows. Rarer species associated with true unimproved grasslands will also tend to be absent.	Use FEP G06 condition assessment	Evidence from agri-environment schemes (Wilson et al - see attached guidance) show that it is possible to create/restore lowland meadow PH of moderate to good quality typically in 8-15 years. Careful site selection (e.g. low soil nutrient levels) and suitable management (e.g. cutting and grazing) are important. Low frequency of positive indicator species was the primary reason for grasslands failing to achieve good status. It is possible therefore to create/restore lowland meadow PH to good condition in 10 years on high potential sites (see FEP manual Keys 1 and 2c). On low potential sites, moderate condition in 15 years is a more realistic target.

	Grassland: Unimproved calcareous grassland	B31	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland calcareous grassland	Calcareous grassland	CG2, CG5	Calcareous grassland supports a range of plant communities in which lime-tolerant (calcicolous) plants are characteristic. Typical forb species include common centaury, yellow-wort, kidney vetch and dwarf thistle and grasses such as sheep's fescue, tor-Grass, upright brome, crested hair-grass and meadow oat-grass.	Calcareous grassland is very rare in the sub-region, largely confined to the south and east of Warwickshire within the Cotswolds and Feldon areas (and with limited areas in the south of the Arden). The majority has a relatively recent origin, falling within old or partially worked quarries, where disturbance has ceased some time ago. Further more important examples occur in cuttings. A little exists within agricultural settings (often on steeper ground that has been left out of improvement schemes) and along some road verges and railway or canal cuttings (Warwickshire LBAP). The latest figures from Habitat Biodiversity Audit (HBA, 2012) give the total area of calcareous grassland in Warwickshire,Coventry and Solihull to be 118 ha (39ha unimproved and 83ha semi-improved). A large part of this resource is included within designated sites (SSSIs and LWSs)	Use FEP G04 condition assessment	Studies suggest timescale trajectories of 60-100 years for the restoration of ancient calcareous grasslands (see attached guidance).
	Grassland: Semi-improved calcareous grassland	B32	Medium-High	5	Medium	1.5	15 years	W_in_P	Low	1	15 years	W_in_P	Lowland calcareous grassland	Calcareous grassland	CG2, CG5	Semi-improved calcareous grasslands that have been improved by the addition of some fertiliser will contain some mesotrophic species such as white clover, yarrow, Yorkshire fog, cock's-foot and crested dog's-tail.		Use FEP G04 condition assessment	A review of agri-environment schemes (Wilson et al) found it is possible to create/restore lowland calcareous grassland PH in 8-15 years. However, low soil nutrient levels and suitable grazing management are important. Of 15 sites studied, 10 were in good condition and 5 were in moderate condition.
	Grassland: Poor semi-improved grassland	B6	Medium-Low	3	Medium	1.5	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Some examples of MG6	This consists of semi-improved grassland which is more improved, poorer in species diversity, and more resembles species-poor neutral grassland irrespective of the underlying soil type. However, it is noticeably less improved and more species rich than improved grassland (NCC, 1990). Typical species including Yorkshire fog, meadow foxtail, cock's-foot, red fescue, ribwort plantain and meadow buttercup.		Classify as poor condition	n/a
	Grassland: Improved grassland	B4	Low	2	n/a	-	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	MG6a, MG7	Improved grasslands are dominated by a limited range of grasses, particularly perennial rye-grass and have a very low forb diversity characteristically dominated by white clover.	It is the commonest grassland type in the County.	Classify as poor condition	n/a
	Grassland: Marsh / Marshy grassland	B5	High	6	High	3	15 years	W_in_P	Medium	1.5	W_in_P	W_in_P	Coastal and floodplain grazing marsh Purple moor-grass and rush pasture Lowland meadow		MG8-10, MG12, M22-28	This is a diffuse category covering certain Molinia grasslands, grasslands with a high proportion of Juncus species, Carex species or Filipendula ulmaria, and wet meadows and pastures supporting communities of species such as Caltha palustris or Valeriana species, where broadleaved herbs predominate over grasses.		Use FEP G07 condition assessment	A review of agri-environment schemes (by Wilson et al - see attached guidance looked at three wet grassland schemes - one creation, two restoration. One site created on arable land (previously a fen) by raising water levels and natural regeneration from seedbank, was purple moor grass & rush pasture PH in moderate condition after 12 years. The restored sites (scrub clearance and/or grazing) had achieved good condition after 2 & 11 years.
	Grassland: Dry heath / Acidic grassland mosaic	D5	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowland heathland Lowland dry acid grassland	Lowland heathland		This represents a common mixture of dry heath and acid grassland.Lowland heathland is typified by the presence of low growing shrubs such as heather (*Calluna vulgaris*), dwarf gorse (*Ulex minor*) and cross-leaved heath (*Erica tetralix*).	Heathland is very rare in the County. The HBA (2012) has recorded 7.76ha of dry heath/acid grassland mosaic. They are mainly associated with common land and woodland on the acid glacial soils in the north of the county.	Use FEP M03 & G05	
	Grassland: Set-aside / Arable field margins	J113	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Arable field margins	Arable field margins		Arable field margins are herbaceous strips or blocks around arable fields that are managed specifically to provide benefits for wildlife (see UK BAP_2008 for definition of margin types that are included and those that are excluded). They are valued for supporting scarce/rare arable plants as well as invertebrates and nesting and feeding birds.		Use FEP species features, including SP02 uncommon vascular plants.	
	Grassland: Amenity grassland	J12	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Various grassland forms but mostly MG6, MG7	This comprises intensively managed and regularly mown grasslands, typical of lawns, playing fields, golf course fairways and many urban 'savannah' parks, in which perennial rye grass, with or without white clover, often predominates. The sward composition will depend on the original seed mixture used and on the age of the community. Herbs such as daisy, greater plantain and dandelion may be present. If the amenity grassland has a sward rich in herbs, it may be possible to classify it as semi-improved acidic, neutral or calcareous grassland, as appropriate. In such cases, the area concerned should be mapped as the specific grassland type and its amenity use target noted (NCC, 1990).		Classify as poor condition	n/a
	Wetland: Standing water	G1	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Ponds	Ponds		Standing water includes lakes, reservoirs, pools, flooded gravel pits, ponds, water-filled ditches and canals.	Typical floating and submerged plant species include Duckweed (Lemna spp.), Canadian pondweed (Elodea canadensis), Hornwort (Ceratophyllum spp.), amphibious bistort (Persicaria amphibia) and yellow water-lily (Nuphar lutea). Standing water bodies are important for a vast range of plants and animals, including several protected species such as great crested newt.	Use FEP W07 condition assessment	Ponds colonise rapidly with plants, invertebrates and ampibians and can take just a few years to be of high wildlife value. However, the value of ponds is affected by the water quality (e.g. elevated nutrient levels), pollution risk e.g. road-runoff, presence of stream inflows, location (ponds in urban and arable areas tend to be of poorer quality). Good quality ponds tend to occur in close proximity to other ponds or wetland habitats and where they are buffered by semi-natural habitat. These factors should be taken into account when deciding on target condition.
	Wetland: Running water	G2	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Rivers & streams	Rivers & streams		Running water comprises rivers and streams (but not canals, which are classed as Standing Water).	The habitat quality of watercourses can vary widely, with many adversely affected by human activities, such as channel straightening and pollution. However there are also many that have significant wildlife value, providing habitat for a range of plants and animals including protected species such water vole and otter.	No FEP condition assessment. See next column	Good quality watercourses will have a divesity of natural channel features typical of lowland watercourses. These include a variety of flow patterns (riffles, runs, glides, pools and marginal dead water), a variety of channel features (side bars, point bars, silt deposits and islands), meanders and associated erosion/deposition features and natural variation of bankside habitats.
	Wetland: Reedbed	F1	High	6	low	1	W_in_P	W_in_P	low	1	W_in_P	W_in_P	Reedbeds	Reedbeds		Reed beds are wetlands dominated by, but not necessarily composed purely of, stands of the common reed (Phragmites australis). They can include areas of reed which are both wet and dry at their base but usually the water table is at or above ground level for much of the year (LBAP). Usually part of a mosaic with open water and ditches, wet grassland, wet woodland etc. They usually require management e.g. grazing, cutting, scrub control to maintain a mosaic of vegetation at different stages of growth.	Reed beds are not common or extensive in the sub-region, being mainly associated with sand and gravel extraction within certain river valleys (e.g. the Tame and Avon), some water-filled limestone quarries, a few mining subsidence pools and formal lakes in country house estates, and occasionally as narrow fringes of reed along rivers, canals and ditches. There are dozens of small reed beds, though large ones are few in number and probably only account for 25-30ha.	Use FEP W08 condition assessment	Newly created reed bed can establish very rapidly ie within a few growing seasons (RSPB). However, reedbed habitat quality can vary greatly depending on size, degree of wetness and dryness, scrub cover, soil type, water quality and management. These factors should be taken into account when making decisions about target condition.
	Wetland: Sphagnum Bog	E11	High	6	Very High	10	n/a	n/a	High	3	n/a	n/a	Blanket bog Lowland raised bog	n/a	M1-3, M17-20		Habitat not found in Warwickshire	n/a	n/a
	Wetland: Acid/neutral flush	E21	High	6	High	3	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowlansd fens	Fen & swamp		These typically support species-poor vegetation consisting of a Sphagnum carpet overlain by Carex or Juncus species. Characteristic moss species include Sphagnum recurvum, S. palustre and S. auriculatum. Overlying vegetation may consist of small Carex species (Carex echinata, C. nigra or C cura), Carex rostrata, Juncus acutiflorus, J. effusus, J. squarrosus, or Eriophorum angustifolium.	Extremely rare in the County e.g. Coleshill and Bannerly Pools SSSI	Use FEP W04 condition assessment	n/a
	Wetland: Basin Mire	E32	High	6	High	3	n/a	n/a	Medium	1.5	n/a	n/a	Lowland fens	n/a	Various mire communities	Basin mire is a topogenous fen, fed by ground water or streams. It develops in a waterlogged basin and does not contain much open water. The vegetation may be dominated by Sphagnum species, together with Carex rostrata and ericoids, or by tall swamp plants such as Phragmites australis, Schoenoplectus (Scirpus) lacustris and Typha species	Habitat not found in Warwickshire	n/a	n/a
	Wetland: Swamp	F1	High	6	High	3	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowland fens	Fen & swamp		Swamp contains tall emergent vegetation typical of the transitior between open water and exposed land. Swamps are generally in standing water for a large part of the year. Swamp vegetation includes both mixed and single-species stands include reedmace (Typha spp.), common reed (Phragmites australis), reed canary-grass (Phalaris arundinacea), reed sweet-grass (Glyceria maxima) and tall sedge species (Carex spp.).	The Phase 1 category includes reedbed (see above) as well as fen and swamp.	Use FEP W04 condition assessment	
	Wetland: Inundation vegetation	F22	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Fen & swamp	MG11, MG13, OV28-36	Inundation vegetation covers areas that are periodically inundated. The species community is generally open and inherently unstable. Typical species present may include the following: knot grass (Polygonum) species, bulbous rush (Juncus bulbosus), beggartick and bur-marigold (Bidens) species, creeping bent grass (Agrostis stolonifera), marsh foxtail (Alopecurus geniculatus), as well as many ruderal species (NCC 1990).			
	Other: Arable	J11	Low	2	n/a	-	n/a	n/a	n/a	-	n/a	n/a	Not a priority habitat	Not a priority habitat		This includes arable cropland, horticultural land (for example nurserie vegetable plots, flower beds), freshly-ploughed land and recently reseeded grassland, such as rye grass and ryeclover leys, often managed for silage (NCC, 1990).		Classify as poor condition	0-5 years
	Other: Continuous bracken	C11	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W25	Areas dominated by Pteridium aquilinum (NCC, 1990).		Bracken should be classed as poor condition unless it meets the FEP definition of high environmental value bracken in which case its condition should be assessed against V05".	
	Other: Tall ruderal	C31	Medium-Low	3	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	OV24-27	This category comprises stands of tall perennial or biennial dicotyledons, usually more than 25cm high, of species such as rosebay willowherb and common nettle (NCC, 1990). It is often found as a habitat-edge community and in urban areas is frequently found on post industrial sites/waste ground.		Classify as poor condition, unless it meets the criteria LWS selection.	
	Other: Non-ruderal	C32	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Non-wooded stands of species such as Oreopteris limbosperma, Athyrium felix-femina, Dryopteris species or Luzula sylvatica should be included in this category (NCC, 1990).		Classify as poor condition	
	Other: Ephemeral/short perennial	J13	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Short, patchy plant associations typical of derelict urban sites, quarries and railway ballast. The vegetation typically lacks a clear dominant species, but consists of a mixture of low-growing plants, often less than 25 cm high, such as greater plantain, creeping buttercup, white clover, black medick, coltsfoot, oxeye daisy and ragwort species, or of taller species such as Sisymbrium or Melilot species (NCC, 1990).		Classify as poor condition	
	Other: Allotments	J112	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Allotments		All allotments included		Classify as poor condition	
	Other: Quarry	I21	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Quarries & gravel pits		Excavations such as gravel, sand or chalk pits and stone quarries should be included in this category.		Classify as poor condition	n/a
	Other: Spoil	I22	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		Includes abandoned industrial areas and tips of waste material such as coal mine spoil and slag.		Classify as poor condition	n/a

Other: Refuse tip	I24	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		Rubbish tips, worked landfill sites		Classify as poor condition	n/a
Other: Introduced shrub	J14	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		This is vegetation dominated by shrub species that are not locally native, whether planted or selfsown. Common introduced shrubs include species of box, dog wood, laurel, privet, Rhododendron and snowberry. Formal beds of shrubs such as of Hypericum calycinum, Cotoneaster, heaths and dwarf conifers should be included here.		Classify as poor condition	0-5 years
Other: Bare ground	J4	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat					n/a
Other: Vertical face (correction factor)	n/a	none	0	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living Wall	n/a	Medium-Low	3	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Extensive	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Semi-intensive	n/a	Medium-Low	3	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Intensive	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Brown	n/a	Medium-Low	3	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Mosaic	n/a	Medium	4	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Linear features																		
Hedges: Intact hedge	J21	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Native species rich intact hedge	J211	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Hedge with trees	J23	Medium-High	5	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Native species rich hedge with trees	J231	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Defunct hedge	J22	Low	2	n/a	-	W_in_P	W_in_P	n/a	-	W_in_P	W_in_P							
Hedges: Linear scrub	A21	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Linear trees	A3	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Introduced shrub	J14	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Standing water	G1	High	6	Medium	2	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Running water	G2	High	6	Medium	2	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Dry ditch	J26	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Fence	J24	None	0	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Wall	J25	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Dry stone wall	J25	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Inland cliff	I1	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Earth bank	J28	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living wall	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							

Habitats for creation Phase 1 Habitat Descriptions
Built Environment: Buildings/hardstanding
Built Environment: Gardens (lawn and planting)
Woodland: Broad-leaved plantation
Woodland: Coniferous plantation
Woodland: Mixed plantation
Woodland: Wet woodland
Woodland: Dense continuous scrub
Woodland: Scattered scrub
Woodland: Scattered trees
Woodland: Coniferous parkland
Woodland: Orchard
Grassland: Semi-improved acidic grassland
Grassland: Semi-improved neutral grassland
Grassland: Semi-improved calcareous grassland
Grassland: Marsh / Marshy grassland
Grassland: Dry heath / Acidic grassland mosaic
Grassland: Set-aside / Arable field margins
Grassland: Amenity grassland
Wetland: Standing water
Wetland: Running water
Wetland: Reedbed
Wetland: Sphagnum Bog
Wetland: Acid/neutral flush
Wetland: Basin Mire
Wetland: Swamp
Wetland: Inundation vegetation
Other: Continuous bracken
Other: Tall ruderal
Other: Non-ruderal
Other: Ephemeral/short perennial
Other: Allotments
Other: Quarry
Other: Spoil
Other: Refuse tip
Other: Introduced shrub
Other: Bare ground
Other: Living Wall
Other: Living roof - Extensive
Other: Living roof - Semi-intensive
Other: Living roof - Intensive
Other: Living roof - Brown
Other: Living roof Mosaic

Habitats for restoration Phase 1 Habitat Descriptions
Woodland: Broad-leaved semi-natural woodland
Woodland: Broad-leaved plantation
Woodland: Coniferous semi-natural woodland
Woodland: Coniferous plantation
Woodland: Mixed semi-natural woodland
Woodland: Mixed plantation
Woodland: Wet woodland
Woodland: Dense continuous scrub
Woodland: Scattered scrub
Woodland: Scattered trees
Woodland: Broad-leaved parkland
Woodland: Coniferous parkland
Woodland: Orchard
Grassland: Unimproved acidic grassland
Grassland: Semi-improved acidic grassland
Grassland: Unimproved neutral grassland
Grassland: Semi-improved neutral grassland
Grassland: Unimproved calcareous grassland
Grassland: Semi-improved calcareous grassland
Grassland: Marsh / Marshy grassland
Grassland: Dry heath / Acidic grassland mosaic
Grassland: Set-aside / Arable field margins
Wetland: Standing water
Wetland: Running water
Wetland: Reedbed
Wetland: Sphagnum Bog
Wetland: Acid/neutral flush
Wetland: Basin Mire
Wetland: Swamp
Wetland: Inundation vegetation
Other: Continuous bracken
Other: Tall ruderal
Other: Non-ruderal
Other: Ephemeral/short perennial
Other: Allotments
Other: Bare ground
Other: Living roof - Extensive
Other: Living roof - Semi-intensive
Other: Living roof - Intensive
Other: Living roof - Brown
Other: Living roof Mosaic
Other: Living Wall

Linear	Linear
Hedges: Intact hedge	Hedges: Intact hedge
Hedges: Native species rich intact hedge	Hedges: Native species rich intact hedge
Hedges: Hedge with trees	Hedges: Hedge with trees
Hedges: Native species rich hedge with trees	Hedges: Native species rich hedge with trees
Hedges: Linear scrub	Hedges: Linear scrub
Hedges: Linear trees	Hedges: Linear trees
Hedges: Introduced shrub	Ditches: Standing water
Ditches: Standing water	Ditches: Running water
Ditches: Running water	Ditches: Dry ditch
Ditches: Dry ditch	Boundaries: Dry stone wall
Boundaries: Fence	Other: Inland cliff
Boundaries: Wall	Other: Earth bank
Boundaries: Dry stone wall	Other: Living wall
Other: Inland cliff	
Other: Earth bank	
Other: Green wal	

Distinctiveness	
High	6
Medium-High	5
Medium	4
Medium-Low	3
Low	2
none	0

Condition	
Good	3
Moderate	2
Poor	1

Time	
3 years	1.1
5 years	1.2
10 years	1.4
15 years	1.7
20 years	2
25 years	2.4
30 years	2.8
32+ years	3

Difficulty	
Very high	10
High	3
Medium	1.5
Low	1
n/a	0

VALUE

			303.60	306.50	Woodland					Grassland					Wetland					Other (including Built Gardens)					Built Environment				
		Distinctiveness	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	
A21	Woodland: Dense continuous scrub	Medium-Low	0.30	1.80				1.80																					
A22	Woodland: Scattered scrub	Medium	0.33	2.64			2.64																						
B22	Grassland: Semi-improved neutral grassland	Medium	75.70	84.00								84.00																	
B6	Grassland: Poor semi-improved grassland	Medium-Low	118.66	210.00									210.00																
J12	Grassland: Amenity grassland	Low	0.53																										
C31	Other: Tall ruderal	Medium-Low	0.67	4.02																			4.02						
J13	Other: Ephemeral/short perennial	Low	0.68	2.72																				2.72					
n/a	Built Environment: Buildings/hardstanding	none	106.50																										
J4	Other: Bare ground	Low	0.13	0.52																				0.52					
A3	Woodland: Scattered trees	Medium	0.10	0.80			0.80																						
	0		0.00																										
	0		0.00																										
	0		0.00																										
	0		0.00																										
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	0		0.00																										
	0		0.00																										
	0		0.00																										
					0.00	**0.00**	**3.44**	**1.80**	**0.00**	**0.00**	**0.00**	**84.00**	**210.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.02**	**3.24**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	306.50

Indirect Impacts				High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
0		0.00																									
0	0	0.00																									
0	0	0.00																									
0	0	0.00																									
0	0	0.00																									
				0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

				Woodland					Grassland					Wetland					Other					Built Environment				
Creation	Distinctiveness	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
Woodland: Scattered trees	Medium	0.50	3.53			3.53																					
Built Environment: Buildings/hardstanding	none	80.50	0.00																								
Built Environment: Gardens (lawn and planting)	Low	1.71	9.33																								9.33
0		0.00																									
0		0.00																									
0		0.00																									
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0		0.00																									
				0.00	**0.00**	**3.53**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.33**

				Woodland					Grassland					Wetland					Other					Built Environmment				
Enhnacement	Distinctivenes	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
Grassland: Semi-improved neutral grassland	Medium	48.66	221.18								221.18																	
0		0.00																									
0		0.00																									
0		0.00																									
0		0.00																									
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0		0.00																									
				0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**221.18**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	Loss	Gain		%		
Offset Requirements	306.50	234.04	-72.46	-81.79		
Woodland	5.24	3.53	-1.71	2.09%	2.36%	7.23
Grassland	294.00	221.18	-72.82	89.03%	100.50%	308.02
Wetland	0.00	0.00	0.00		0.00%	0.00
Other	7.26	0.00	-7.26	8.88%	10.02%	30.71
Built Environment	0.00	9.33	9.33			

		Distinctiveness	Area	Value	P_Intensive crops	P_Traditional crops	P_Livestock	P_Wild foods	P_Fresh water	P_Energy	P_Timber	P_Medical	**Provisioning**	R_Pollination	R_Pest control	R_Species	R_Climate	R_Air quality	R_Flood protection	R_Water purification	R_Soil Erosion	**Regulating**	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	**Cultural**
			303.60	306.50																							
A21	Woodland: Dense continuous scrub	Medium-Low	0.30	1.80	0.00	0.00	0.75	0.00	0.00	0.90	0.60	0.15	**0.30**	1.35	1.05	1.20	1.20	0.90	0.90	0.90	0.90	**1.05**	0.60	0.60	0.60	0.90	**0.68**
A22	Woodland: Scattered scrub	Medium	0.33	2.64	0.00	0.00	0.83	0.00	0.00	0.99	0.66	0.17	**0.33**	1.49	1.16	1.32	1.32	0.99	0.99	0.99	0.99	**1.16**	0.66	0.66	0.66	0.99	**0.74**
B22	Grassland: Semi-improved neutral grassland	Medium	75.70	84.00	0.00	0.00	227.10	37.85	0.00	0.00	0.00	0.00	**33.12**	378.50	302.80	378.50	227.10	227.10	227.10	227.10	302.80	**283.88**	302.80	302.80	227.10	302.80	**283.88**
B6	Grassland: Poor semi-improved grassland	Medium-Low	118.66	210.00	0.00	94.93	474.64	35.60	0.00	0.00	0.00	0.00	**75.65**	355.98	296.65	355.98	237.32	237.32	296.65	272.92	391.58	**305.55**	296.65	296.65	237.32	296.65	**281.82**
J12	Grassland: Amenity grassland	Low	0.53		0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	**0.07**	0.53	0.53	0.53	0.53	0.53	1.06	1.06	1.33	**0.76**	1.33	0.53	0.53	0.27	**0.66**
C31	Other: Tall ruderal	Medium-Low	0.67	4.02	0.00	0.00	1.01	0.34	0.34	0.00	0.00	0.34	**0.25**	3.35	2.68	2.68	2.01	1.68	1.34	1.68	2.01	**2.18**	1.01	1.34	1.01	1.68	**1.26**
J13	Other: Ephemeral/short perennial	Low	0.68	2.72	0.00	0.00	1.02	0.34	0.34	0.00	0.00	0.34	**0.26**	3.40	2.72	2.72	2.04	1.70	1.36	1.70	2.04	**2.21**	1.02	1.36	1.02	1.70	**1.28**
n/a	Built Environment: Buildings/hardstanding	none	106.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
J4	Other: Bare ground	Low	0.13	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
A3	Woodland: Scattered trees	Medium	0.10	0.80	0.05	0.00	0.05	0.03	0.05	0.00	0.23	0.00	**0.05**	0.10	0.20	0.23	0.25	0.25	0.30	0.30	0.33	**0.25**	0.38	0.30	0.30	0.25	**0.31**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
					0.05	94.93	705.92	74.15	0.73	1.89	1.49	0.99	**110.02**	744.70	607.79	743.16	471.77	470.47	529.70	506.64	701.97	**597.02**	604.44	604.24	468.54	605.23	**570.61**

	Indirect Impacts				P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh wa	P_Energy	P_Timber	P_Medical	**Provisioning**	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	**Regulating**	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	**Cultural**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Creation	Distinctiveness	Area	Value	P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh wa	P_Energy	P_Timber	P_Medical	**Provisioning**	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	**Regulating**	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	**Cultural**
A3	Woodland: Scattered trees	Medium	0.50	3.53	0.25	0.00	0.25	0.15	0.25	0.00	1.15	0.00	**0.26**	0.50	1.00	1.15	1.25	1.25	1.50	1.50	1.65	**1.23**	1.90	1.50	1.50	1.25	**1.54**
n/a	Built Environment: Buildings/hardstanding	none	80.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
n/a	Built Environment: Gardens (lawn and planting)	Low	1.71	9.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	2.57	1.71	2.57	0.86	1.71	1.71	0.86	1.71	**1.71**	5.13	3.42	2.57	1.71	**3.21**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
					0.25	0.00	0.25	0.15	0.25	0.00	1.15	0.00	0.26	3.07	2.71	3.72	2.11	2.96	3.21	2.36	3.36	2.94	7.03	4.92	4.07	2.96	4.74

	Enhnacement	Distinctivenes	Value		P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh wa	P_Energy	P_Timber	P_Medical	**Provisioning**	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	**Regulating**	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	**Cultural**
B22	Grassland: Semi-improved neutral grassland	Medium	48.66	221.18	0.00	0.00	145.98	24.33	0.00	0.00	0.00	0.00	**21.29**	243.30	194.64	243.30	145.98	145.98	145.98	145.98	194.64	**182.48**	194.64	194.64	145.98	194.64	**182.48**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
					0.00	0.00	145.98	24.33	0.00	0.00	0.00	0.00	21.29	243.30	194.64	243.30	145.98	145.98	145.98	145.98	194.64	182.48	194.64	194.64	145.98	194.64	182.48

Ecosystem Service	Exiting	After	gain/loss	P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh wa	P_Energy	P_Timber	P_Medical	**Provisioning**	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	**Regulating**	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	**Cultural**
Provisioning	110.02	21.55	-88.47	0.05	94.93	705.92	74.15	0.73	1.89	1.49	0.99	110.02	744.70	607.79	743.16	471.77	470.47	529.70	506.64	701.97	597.02	604.44	604.24	468.54	605.23	570.61
Regulating	597.02	185.41	-411.61	0.25	0.00	146.23	24.48	0.25	0.00	1.15	0.00	21.55	246.37	197.35	247.02	148.09	148.94	149.19	148.34	198.00	185.41	201.67	199.56	150.05	197.60	187.22
Cultural	570.61	187.22	-383.39	0.20	-94.93	-559.69	-49.67	-0.48	-1.89	-0.34	-0.99	-88.47	-498.33	-410.44	-496.15	-323.69	-321.53	-380.51	-358.31	-503.97	-411.61	-402.77	-404.68	-318.49	-407.63	-383.39

HABCODE	DESCRIPTION	INFERENCE	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	R_Pollination	R_Pest control	R_Species	R_Climate	R_Air quality	R_Flood protection	R_Water purification	R_Soil Erosion	P_Intensive crops	P_Traditional crops	P_Livestock	P_Wild foods	P_Fresh water	P_Energy	P_Timber	P_Medical	Provisioning	Regulating	Cultural	P_Food
A111	Woodland: Broad-leaved semi-natural woodland	Median Stakeholder value	5	5	5	4.5	5	4	5	5	5	4.5	4	5	0	0	0.5	0	1	0	4	0	1.1	4.7	4.9	0.2
A112	Woodland: Broad-leaved plantation	Median Stakeholder value	4.5	4	3	3	3.5	3	3.5	4	4	4	4	4	0	1	0	0.5	1	0	4.5	0	1.3	3.8	3.6	0.3
A121	Woodland: Coniferous semi-natural woodland	Set to mean of Semi-natural BL (A111) & coniferous plantation (A122)	3	2.5	1.5	3	2	2	2	2.5	3	3	2.5	3.5	0	0	0.5	0.5	0.5	4	5	0	1.2	2.6	2.5	0.2
A122	Woodland: Coniferous plantation	Median Stakeholder value	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A131	Woodland: Mixed semi-natural woodland	Set to average (A111 + A121)	4.5	4.4	4.1	4.1	4.3	3.5	4.3	4.4	4.5	4.1	3.6	4.6	0	0	0.5	0.1	0.9	1	4.3	0	1.1	4.2	4.3	0.2
A132	Woodland: Mixed plantation	Set to average (A112 + A122)	3.8	3.3	2.3	3	2.8	2.5	2.8	3.3	3.5	3.5	3.3	3.8	0	0.5	0.3	0.5	0.8	2	4.8	0	1.3	3.2	3.1	0.3
A21	Woodland: Dense continuous scrub	Median Stakeholder value	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A22	Woodland: Scattered scrub	Set to A22	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A31	Woodland: Broad-leaved parkland	Set to J12 for cultural; average (J12 + A112) for others (J12 = amenity; A112 = broadleaf plantation)	3.8	3	3	2.5	1	2	2.3	2.5	2.5	3	3	3.3	0	0.5	0.5	0.3	0.5	0	2.3	0	0.8	2.4	3.1	0.3
A3	Woodland: Scattered trees	same as A31	3.8	3	3	2.5	1	2	2.3	2.5	2.5	3	3	3.3	0	0.5	0.5	0.3	0.5	0	2.3	0	0.8	2.4	3.1	0.3
A32	Woodland: Coniferous parkland	Set to J12 for cultural; average (J12 + A122) for others (J12 = amenity; A122 = Conifer plantation)	2.8	1.8	1.3	1.8	1	1.5	1.5	1.8	2	2.5	2.3	3	0	0	0.8	0.3	0.3	2	2.5	0	0.7	1.9	1.9	0.3
A4	Woodland: Recently felled woodland	Set to J4 (bare ground) with reduced habitat (3-->1) and soil-related variables set to those ofA132 (mixed plantation)	1	1	0	0.5	1	1	1	0	0	1	3.3	0	0	0	0	0	0.8	0	0	0	0.2	0.9	0.6	0
A5	Woodland: Orchard	Set to A112 with modified food provision (A112 = BL plantation)	4.5	4	3	3	3.5	3	3.5	4	4	4	4	4	0	3	0	0.5	1	0	4.5	0	1.7	3.8	3.6	1
A6	Woodland: Wet woodland	CT Added	5	4	2	2	2.5	2.5	5	5	4	5	5	5	0	2	1	1	2	3	2	1	1.4	4.3	3.3	0
B11	Grassland: Unimproved acidic grassland	Median Stakeholder value	3.5	4.5	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0.5	0.6	3.8	3.8	1
B12	Grassland: Semi-improved acidic grassland	Set to B11	3.5	4.5	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0.5	0.6	3.8	3.8	1
B21	Grassland: Unimproved neutral grassland	Median Stakeholder value	4	4	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0	0.6	3.8	3.8	1
B22	Grassland: Semi-improved neutral grassland	Set to B21	4	4	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0	0.6	3.8	3.8	1
B31	Grassland: Unimproved calcareous grassland	Median Stakeholder value	3.5	4.5	3	4	5	4	5	3	3	3	2.5	4	0	0	3	0.5	0	0	0	0	0.6	3.7	3.8	1
B32	Grassland: Semi-improved calcareous grassland	Set to B31	3.5	4.5	3	4	5	4	5	3	3	3	2.5	4	0	0	3	0.5	0	0	0	0	0.6	3.7	3.8	1
B4	Grassland: Improved grassland	Median Stakeholder value	1	1	1	1	1	1	1	1	1	2	1.5	2.5	1.5	0	5	0	0	0	0	0	1.3	1.4	1	2.2
B5	Grassland: Marsh / Marshy grassland	Median Stakeholder value	3	4	3	4	5	3.5	5	3	3	4	4	4	0	0	3.5	0.5	1	0	0	0.5	0.9	3.9	3.5	1.2
B6	Grassland: Poor semi-improved grassland	Set to mean of B4 and B22 (IG and Neutral grassland)	2.5	2.5	2	2.5	3	2.5	3	2	2	2.5	2.3	3.3	0.8	0	4	0.3	0	0	0	0	1	2.6	2.4	1.6
C11	Other: Continuous bracken	Set to C31	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
C31	Other: Tall ruderal	Median Stakeholder value	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
C32	Other: Non-ruderal	Set to C31	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
D5	Grassland: Dry heath / Acidic grassland mosaic	Median Stakeholder value	3	4.5	4	4	5	3.5	5	3.5	3	3	3	3.5	0	0	2.5	0.5	0	0	0	0.5	0.5	3.7	3.9	0.8
E11	Wetland: Sphagnum Bog	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
E21	Wetland: Acid/neutral flush	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1	0	0	0.5	0.5	3.9	3.3	0.5
E32	Wetland: Basin Mire	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
F1	Wetland: Swamp	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
F22	Wetland: Inundation vegetation	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1	0	0	0.5	0.5	3.9	3.3	0.5
G1	Wetland: Standing water	Median Stakeholder value	4	5	5	4	2.5	2	5	2.5	2	2.5	3.5	0.5	0	0	1	1.5	5	0	0	0.5	1.2	2.6	4.5	0.3
G2	Wetland: Running water	Set to G1 (sthanding water)	4	5	5	4	2.5	2	5	2.5	2	2.5	3.5	0.5	0	0	1	1.5	5	0	0	0.5	1.2	2.6	4.5	0.3
I21	Other: Quarry	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
I22	Other: Spoil	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
I24	Other: Refuse tip	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
J11	Other: Arable	Median Stakeholder value	1	1	0.5	1	1	1	0.5	1.5	1	1	1	1	5	4	1	0	0	0	0	1	2	1	0.9	3.3
J112	Other: Allotments	Set to J12 (amenity) with increased food provision, reduced arable and more intellectual /spiritual interactions	2	1	2	2	1	1	1	1	1	2	2	2.5	0	4	0	0	0	0	0	0	0.8	1.4	1.8	1.3
J113	Grassland: Set-aside / Arable field margins	CT Added	1	1	1	1	5	5	4	4	2.5	3	4	4	0	1	1	1	0	1	0	0	0.4	3.9	1	0
J12	Grassland: Amenity grassland	Median Stakeholder value	2.5	1	1	0.5	1	1	1	1	1	2	2	2.5	0	0	1	0	0	0	0	0	0.2	1.4	1.3	0.3
J13	Other: Ephemeral/short perennial	set to C31 (tall ruderal)	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
J14	Other: Introduced shrub	set to C31 (tall ruderal)	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
J4	Other: Bare ground	Median Stakeholder value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
URB	Built Environment: Buildings/hardstanding	Median Stakeholder value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B51	Wetland: Reedbed	Set to B5 - WCC set	3	4	3	4	5	3.5	5	3	3	4	4	4	0	0	3.5	0.5	1	0	0	0.5	0.9	3.9	3.5	1.2
n/a	Built Environment: Gardens (lawn and planting)	- WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0	0	1.9	1	0
n/a	Other: Vertical face (correction factor)	- WCC set																								0
n/a	Other: Living Wall	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Extensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Semi-intensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Intensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Brown	same as garden WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
	Other: Living roof - Mosaic	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0

Warwickshire, Coventry & Solihull - Habitat Impact Assessment Calculator

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Automatic Condition setting
	Result

Local Planning Authority:	Other
Site name:	Biodiversity Area (for Manston Airport)
Planning application reference number:	
Assessor:	
Date:	25/04/2019

Please fill in both tables

Please do not edit the formulae or structure

To condense the form for display hide vacant rows, do not delete them

If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services 01926 418060

		Existing habitats on site Please enter all habitats within the site boundary		**Habitat distinctiveness**		**Habitat condition**		**Habitat Biodiversity Value** — **Habitats to be retained with no change within development**		**Habitats to be retained and enhanced within development**		**Habitats to be lost within development**		
T. Note	code	Phase 1 habitat description	*Habitat area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*	*Area (ha)*	*Existing value*	*Area (ha)*	*Existing value*	*Area (ha)*	*Existing value*	***Comment***
		Direct Impacts and retained habitats			A		B	C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
B	J113	Grassland: Set-aside / Arable field margins	0.21	High	6	Poor	1	0.00				0.21	**1.26**	
	J11	Other: Arable	35.49	Low	2	Moderate	1	0.00				35.49	**70.98**	
		Total	35.70				Total	0.00	0.00	0.00	0.00	35.70	72.24	J
													∑D + ∑F + ∑H	
											Site habitat biodiversity value		72.24	

Before/after impact		**Indirect Negative Impacts** Including off site habitats	K					Value of loss from indirect impacts K x A x B = Li, Lii	Li - Lii		
	Before										
	After										
	Before										
	After										
	Before										
	After										
	Before										
	After										
	Before										
	After										
		Total	0.00						0.00	M	
											HIS = J + M
										Habitat Impact Score (HIS)	**72.24**

CAUTION - Destruction of habitats of high distinctiveness, e.g. lowland meadow or ancient woodland, may be against local policy. Has the mitigation hierarchy been followed, can impact to these habitats be avoided? Any unavoidable loss of habitats of high distinctiveness must be replaced like-for-like.

		Proposed habitats on site (Onsite mitigation)		Target habitats distinctiveness		Target habitat condition			Time till target condition		Difficulty of creation / restoration		*Habitat biodiversity value*	
T. Note	code	Phase 1 habitat description	*Area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*		*Time (years)*	*Score*	*Difficulty*	*Score*		*Comment*
		Habitat Creation	N		O		P			Q		R	(N x O x P) / Q / R	
	A112	Woodland: Broad-leaved plantation	0.50	Medium	4	Good	3		15 years	1.7	Medium	1.5	**2.35**	
	A22	Woodland: Scattered scrub	0.20	Medium	4	Good	3		3 Years	1.1	Low	1	**2.18**	
	B22	Grassland: Semi-improved neutral grassland	31.10	Medium	4	Good	3		3 Years	1.1	Medium	1.5	**226.18**	
	F22	Wetland: Inundation vegetation	0.20	High	6	Good	3		3 Years	1.1	Low	1	**3.27**	Target condition created in year 1
	J13	Other: Ephemeral/short perennial	3.00	Low	2	Good	3		3 Years	1.1	Low	1	**16.36**	Target condition created in year 1
	J4	Other: Bare ground	0.65	Low	2	Good	3		3 Years	1.1	Low	1	**3.55**	Target condition created in year 1
	n/a	Built Environment: Buildings/hardstanding	0.05	none	0	Good	3		3 Years	1.1	Low	1	**0.00**	This represents the bat barn and bat bunker. Target condition created in year 1
		Total	**35.70**											
		Habitat Enhancement						Existing value S (= F)					((NxOxP)-S)/Q/R	
B														
		Total	**0.00**								Trading down correction value		0.00	
											Habitat Mitigation Score (HMS)		**253.89**	
													HBIS = HMS - HIS	
											Habitat Biodiversity Impact Score		**181.65**	Gain
											Percentage of biodiversity impact loss			

	Loss	Gain	Impact
Woodland Habitat	0.00	4.53	**4.53**
Grassland Habitat	1.26	226.18	**224.92**
Wetland Habitat	0.00	3.27	**3.27**
Other Habitat (including Built Environment)	70.98	19.91	**-51.07**
Total	72.24	253.89	**181.65**
		Trading down	**0.00**
			181.65

Warwickshire, Coventry & Solihull - Hedge Impact Assessment Calculator

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Result

This sheet calculates the impacts to hedges and lines of trees in and around the site.

These units are not transferrable as compensation for either the Habitat or Connectivity Impact Assessment scores

Please fill in both tables

Please do not edit the formulae or structure
To condense the form for display hide vacant rows, do not delete them
If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services

T. Note	code	Existing Hedgerow features on site: Hedgerow habitat description	Feature length (km)	Hedgerow distinctiveness: Distinctiveness	Score	A1	A2	B1	B2	C1	C2	D1	D2	Condition Score	Hedgerow Biodiversity Value: Hedgerow features to be retained with no change within development: Length (km)	Existing value	Hedgerow features to be retained and enhanced within development: Length (km)	Existing value	Hedgerow features to be lost within development: Length (km)	Existing value	Comment
		Direct Impacts and retained features			A										C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
	n/a	Hedges: species rich hedge	0.43	Medium	4	Pass	Pass	Pass	Fail	Fail	Fail	Pass	Fail	2			0.43	3.44			
		Total	0.43											Totals	0.00	0.00	0.43	3.44	0.00	0.00	J
																				∑D + ∑F + ∑H	
																		Site Hedge Biodiversity Value		3.44	
		Indirect Negative Impacts													Value of loss from indirect impacts						
	Before/after impact		K												K x A x B = Li, Lii	Li - Lii					
	Before																				
	After																				
	Before																				
	After																				
	Before																				
	After																				
	Before																				
	After																				
	Before																				
	After																				
		Total	0.00													0.00	M			HIS = J + M	
																		Hedge Impact Score (HIS)		0.00	

T. Note	code	Proposed hedge features on site (Onsite mitigation): Phase 1 habitat description	Length (km)	Target hedge distinctiveness: Distinctiveness	Score	A1	A2	B1	B2	C1	C2	D1	D2	Condition Score	Time till target condition: Time (years)	Score	Difficulty of creation / restoration: Difficulty	Score	Linear biodiversity value	Comment
		Hedgerow Creation	N		O											Q		R	(N x O x P) / Q / R	
	n/a	Hedges: species rich hedge with earth bank	2.40	High	6	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	3	10 years	1.4	Low	1	30.86	
		Total	2.40																	
		Hedgerow Enhancement													Existing value S (= F)				((N x O x P) - S) / Q / R	
		Total	0.00	ERROR - Total length of features enhancement must equal total length of features to be enhanced above																
																		Trading down correction value		0.00	
																		Hedge Mitigation Score (HMS)		30.86	
																			HBIS = HMS - HBIS	
																		Hedge Biodiversity Impact Score	30.86	Gain	
																		Percentage of linear impact loss			

KEY	
	No action required
	Action required
	Drop-down menu
	Calculation
	Automatic lookup
	Overall Gain
	Overall Loss

Warwickshire Coventry and Solihull - Connectivity Impact Assessment [optional]

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Result

Connectivity Features
This sheet gives and indication as to whether the development will enhance connectivity thorugh or around the site.

These units are not transferrable as compensation for either the Habitat or Hedgerow Impact Assessment scores.

Please fill in both tables

Please do not edit the formulae or structure
To condense the form for display hide vacant rows, do not delete them
If additional rows are required, or to provide feedback on the calculator please contact WCC Ecological Services

									Connectivity Biodiversity Value					
	Existing Connectivity features on site			Connectivity distinctiveness		Connectivity condition		Connectivity features to be retained with no change within development		Connectivity features to be retained and enhanced within development		Connectivity features to be lost within development		
T. Note	code	Phase 1 habitat description	Feature length (km)	Distinctiveness	Score	Condition	Score	Length (km)	Existing value	Length (km)	Existing value	Length (km)	Existing value	Comment
		Direct Impacts and retained features			A		B	C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
	J22	Hedges: Defunct hedge	0.43	Low	2	Moderate	2			0.43	**1.72**			
		Total	0.43				Total	0.00	0.00	0.43	1.72	0.00	0.00 J	
													∑D + ∑F + ∑H	
											Site Connectivity Biodiversity Value		1.72	
		Indirect Negative Impacts						Value of loss from indirect impacts						
	Before/after impact		K					K x A x B = Li, Lii	Li - Lii					
	Before													
	After													
	Before													
	After													
	Before													
	After													
	Before													
	After													
	Before													
	After													
		Total	0.00						0.00 M				CIS = J + M	
												Connectivity Impact Score (CIS)	0.00	

		Proposed linear features on site (Onsite mitigation)		Target Connectivity distinctiveness		Target Connectivity condition			Time till target condition		Difficulty of creation / restoration		*Connectivity biodiversity value*	
T. Note	code	Phase 1 habitat description	*Length (km)*	*Distinctiveness*	*Score*	*Condition*	*Score*		*Time (years)*	*Score*	*Difficulty*	*Score*	(N x O x P) / Q / R	**Comment**
		Connectivity Creation	N		O		P			Q		R		
		Total	0.00											
		Connectivity Enhancement						Existing value S (= F)					((N x O x P) - S) / Q / R	
		Total	0.00	ERROR - Total length of features enhancement must equal total length of features to be enhanced above								Trading down correction value		
												Connectivity Mitigation Score (CMS)		
													CBIS = CMS - CIS	
												Connectivity Biodiversity Impact Score		
												Percentage of linear impact loss		

Phase 1 Habitat Type	Phase 1 Habitat Codes	Distinctiveness		Difficulty of creation		Preset Time to Target Condition (Moderate)	Preset Time to Target Condition (Good)	Difficulty of restoration		Preset Time to Target Condition (Moderate)	Preset Time to Target Condition (Good)	UK Priority Habitat /Habitat of Principal Importance	LBAP Priority Habitat	NVC	Habitat Definition	Notes	Condition Assessment	Habitat creation/restoration timescales
Built Environment: Buildings/hardstanding	n/a	none	0	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat				Classify as poor condition	
Built Environment: Gardens (lawn and planting)	n/a	Low	1	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat				Classify as poor condition	0-5 years
Woodland: Broad-leaved semi-natural woodland	A111	High	6	n/a	-	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland mixed deciduous woodland	Woodland	W8,W10, W16	Include all stands which do not obviously originate from planting. Both ancient and more recent stands are included. Woodland where more than 30% is planted should be classified as plantation. However, matu plantations (more than about 120 years old) of locally native species where there are semi-natural woodland ground flora and shrub communities should be classified as semi-natural (NCC, 1990). See Phase 1 Survey Handbook for definition of woodland types included in semi-natural category.		Use FEP T08 condition assessment	Planted native woodlands will be about 120 years old before they can be considered semi-natural and should be composed of locally native species and have semi-natural woodland ground flora and shrub communities (Phase 1 Survey Handbook, NCC 1990) therefore cannot be created on timescales used in BIA. Timescales for the restoration of existing semi-natural woodland will depend on reasons for unfavourable condition. Timescales for restoration will depend on reasons for unfavourable condition (see condition assessment) and management required to improve condition.
Woodland: Broad-leaved plantation	A112	Medium	4	Medium	1.5	32+ years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	Some forms of W8, W10, W16 or non NVC	Obviously planted woodland with no more than 10% of the canopy mad up of conifer trees (NCC, 1990). See Phase 1 Survey Handbook for exceptions. The category includes recent stands (i.e less than about 12 years) planted with locally native trees. The phase 1 handbook does not define a minimum size but the National Inventory of Woodland and Trees defines woodland as having a minimum area of 0.5ha and a minimum width of 20m.		Use T08 even though this habitat does not meet strict FEP definition for use with T08.	It is likely to take more than 100 years before the planted woodlands approach good condition e.g. with an age and structural diversity including canopy, understory and field layer that supports plants, insect, mammal and bird species typical of native woodlands. For these reasons, aim for moderate condition in 32+ years. The minimum woodland size for Countryside Stewardship woodland creation grants is 0.1 hectares and must have a minimum width of 20 metres.
Woodland: Coniferous semi-natural woodland	A121	Medium	4	n/a	-	n/a	n/a	Low	1	n/a	n/a	Native pine woodlands (Scotland only). Yew stands are incluad in the lowland beech and yew woodland plan and upland mixed ashwood plan.	n/a	W13, W18		This woodland type s not found in Warwickshire.	Use T08 even though this habitat does not meet strict FEP definition for use with T08.	n/a
Woodland: Coniferous plantation	A122	Low	2	Medium	1.5	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Some forms of W10, W16 or non NVC	Obviously planted woodland with no more than 10% of the canopy mad up of broadleaved trees (NCC, 1990). See Phase 1 Survey Handbook for exceptions. Typical trees species include larch (*Larix* spp), pine (*Pinus* spp) and spruce (*Picea* spp).		Classify as poor condition	n/a
Woodland: Mixed semi-natural woodland	A131	Medium	4	n/a	-	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland mixed deciduous woodland	Woodland		Woods that do not obviously originate from planting (see Phase 1 Survey Handbook for exceptions) with a canopy made up of between ten and ninety percent of either broadleaved and coniferous trees (NCC 1990).		Use FEP T08 condition assessment	
Woodland: Mixed plantation	A132	Low	2	Medium	1.5	32+years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Obviously planted with 10-90% of either broadleaved or conifer trees in the canopy (NCC, 1990). See Phase 1 Survey Handbook for exceptions.		Use T08 even though this habitat does not meet strict FEP definition for use with T08.	It is likely to take more than 100 years before the planted woodlands approach good condition e.g. with an age and structural diversity including canopy, understory and field layer that supports plants, insect, mammal and bird species typical of native woodlands. Target condition should be moderate in 32+ years.
Woodland: Wet woodland	n/a	High	6	Medium	1.5	32+years	n/a	Medium	1.5	W_in_P	W_in_P	Wet woodland	Woodland	W1 - W7	Wet woodlands are found on poorly drained or seasonally wet soils. They are commonly found on floodplains, alongside rivers and stream, on fens and in damper areas of other woodland types. Alder, birch and willows are usually the dominant tree species.	Wet woodland is scarce in the County.	Use FEP T08 condition assessment	
Woodland: Dense continuous scrub	A21	Medium-Low	3	Low	1	10 years	15 years	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W21-24	A block of scrub is dominated by the shrub species less than five metres tall. It may have a few scattered trees but there will be no recognisable canopy. To be dense or continuous, the scrub cover must be thirty percent or more. This includes stands of bramble, dog Rose and gorse (*Ulex europaeus*) and also stands of mature hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*) or grey willow (Salix cinerea) even if they are greater than 5m tall. (NCC, 1990).	Scrub is often part of mosaic with other habitats. Its conservation value can be variable, and is often seen as of low value due to low botanical species diversity. However, it can be of high value in its own right as well as providing suitable habitat for some of the county's important species of invertebrates, mammals and birds.	Use condition assessment V05 for scrub, even if the scrub does not meet the FEP definition of high environmental value scrub.	Scrub of high conservation value contains a range of shrub species (at least 3) with mixed age structure, has a complex vertical and horizontal structure i.e. variation in physical structure, age range and spacing, has many clearings and glades giving a high boundary/area ratio, a well developed edge with ungrazed tall herbs, and supports a range of rare/local invertebrates. Scrub typically matures in 15 years (RSPB), so it should be possible to create good quality scrub in 15 years with suitable management e.g. rotational cutting that achieves the above conditions.
Woodland: Scattered scrub	A22	Medium	4	Low	1	10 years	15 years	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W21-24	As above but scrub cover is less than thirty percent.	Scattered scrub occurs in association with other semi-natural habitats, frequently occurring as a mosaic with grassland or early successional communities, and often having occasional scattered trees. The presence of scattered scrub can add to a sites ecological interest. Where scrub is part of a habitat mosaic, for example with grassland, the habitat with the higher distinctiveness score should automatically be entered in the BIA.	Use condition assessment V05 for scrub, even if the scrub does not meet the FEP definition of high environmental value scrub.	Scrub of high conservation value contains a range of shrub species (at least 3) with mixed age structure, has a complex vertical and horizontal structure i.e. variation in physical structure, age range and spacing, has many clearings and glades giving a high boundary/area ratio, a well developed edge with ungrazed tall herbs, and supports a range of rare/local invertebrates. Scrub typically matures in 15 years (RSPB), so it should be possible to create good quality scrub in 15 years with suitable management e.g. rotational cutting that achieves the above conditions.
Woodland: Scattered trees	A3	Medium	4	Low	1	32+ years	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Habiat that is neither woodland or scrub, but have trees present. Tree cover must be less than thirty percent. However, most examples of planted trees over amenity grassland should be included in this category even where tree cover exceeds 30%	The area calculation should be the whole land parcel on which the scrub/trees are planted and not just the cover the individual trees/shrubs. Where a parcel of land has more than one habitat e.g. scattert trees on grassland, the habitat with the higher distinctiveness score should be entered.	No FEP condition assessment. See next column for important attributes.	The ecological value of scattered trees will depend on the tree species (species such as oak, birch, hawthorn and willows are most valuable), age (large, mature trees have higher value), location (the proximity of other habitats that add habitat, species and structural diversity), the presence of features such as decay, loose bark, dense ivy cover etc. It takes decades for these features to develop.
Woodland: Broad-leaved parkland	A31	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Wood-pasture and parkland	Old parkland & veteran trees	Range of NVC types	This category is for Wood Pasture and Parkland Priority Habitat/Habitat of Principle Importance only. Wood-pasture and parkland is not defined by any particular type(s) of vegetation, NVC types, or Phase 1 habitat types. Instead they are mosaic habitats valued for their trees, especially veteran and ancient trees, and the plants and animals that they support (LBAP).	This habitat is typical of large estates with a history of traditional management e.g. grazing by cattle or deer, but can also be found in cemeteries and churchyards. Such sites can often be important due to the presence of large numbers of mature trees and can also have historic, cultural and landscape importance.	Use FEP T03 condition assessment	Timecales for restoration will depend on reasons for current condition and management required to improve condition. Reasons for unfavourable condition may include e.g. loss of old trees (disease, root damage, soil compaction, felling) lack of replacement trees, lack of standing and fallen deadwood (removed for safety reasons, over-tidying), inappropriate management e.g. intensive grazing levels.
Woodland: Coniferous parkland	A32	Medium	4	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Not a priority habitat	n/a		Parklands with introduced exotic trees such as cedar (Cedrus spp).			
Woodland: Recently felled woodland	A4	Low	2	n/a	-	n/a	n/a	n/a	-	n/a	n/a	Not a priority habitat	Not a priority habitat		Only include areas where future land use is uncertain, e.g., if it is not clear whether they are to be replanted.		Classify as poor condition	n/a
Woodland: Orchard	A5	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Traditional orchard	Orchards	Range of NVC types	This category is for Traditional Orchards Priority Habitat/Habitats of Principal Importance only. Intensively managed orchards are not included. Tradition orchards are defined as groups of fruit and nut trees planted on vigorous rootstocks at low densities in permanent grassland and managed in a low intensity way. The minumum size of a traditional orchard is defined as at least five trees with crown edges less than 20m apart. Orchards are a mosaic habitat containing fruit trees, deadwood, pasture or meadow, scrub, hedgerows, ponds etc. Prime examples support a diversity of vascular plants, bryophytes, lichens, fungi, vertebrates and invertebrates including BAP species, nationally rare and scarce species.		Use FEP T15 or PTES (Peoples Trust for Endangered Species) condition assessment (see PTES/NE Project Report NECR077)	The PTES condition assessment has 3 condition categories: excellent (established, mixed ages of tree, grazed, standing and fallen deadwood), goodffair (includes newly planted or young orchards that are mown, they lack good deadwood habitat and the mature trees that can provide it naturally), poor (gappy, no new trees, scrubbed over trees damaged). Newly planted orchards can therefore be in moderate (i.e PTES good/fair) condition in 5-10 years provided associated habitats e.g. wildflower grassland, hedges, scrub, deadwood logpiles etc are incorporated. It will take a lot longer to achieve good condition i.e. trees of varying age, standing and fallen deadwood etc. See PTES website and Natural Englands Technical information notes (TIN12 to 21) for advice on planting, species and varities, wildlife, location, rootstocks etc), also Countryside Stewardship, Creation of traditional orchards option BE5.
Grassland: Unimproved acidic grassland	B11	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland dry acid grassland	Acid grassland	U1-U4	Lowland acid grassland typically occurs on nutrient poor, free-draining soils of low pH (<5.5). Acid grasslands are characteristically species poor with typical species that include fine-leaved grasses such as common bent, sheep's fescue, mat-grass and wavy hair-grass and forbs such as heath bedstraw, tormentil and sheep's sorrel. Although species-poor compared to other semi-natural grasslands, it contains important communities with species that are rare in the region.	Lowland acid grasslands are very rare in Warwickshire sub region. The HBA (2012) recorded a total resource of 72.7ha (2.4ha unimproved and 70.3ha semi-improved). It is mainly associated with heathland, woodland or post-industrial sites. They are largely confined to the acid glacial soils in the north of the County of the Midlands Plateau Natural Area where they persist as fragments.	Use FEP G05 condition assessment	Unimproved grasslands cannot be recreated, at least not on timescales used in the BIA metric. It is possible to create BAP quality grasslands that resemble old unimproved grasslands but these classified as semi-improved - see below.
Grassland: Semi-improved acidic grassland	B12	Medium-High	5	Medium	1.5	15 years	W_in_P	Low	1	W_in_P	W_in_P	Lowland dry acid grassland	Acid Grassland	U1-U4	Improvement reduces the acid character of the grassland and semi-improved acid grasslands will contain a mesotrophic species element (such as white clover, yarrow, common mouse-ear, perennial rye-grass, Yorkshire fog) but in practice, it can be difficult to separate unimproved and semi-improved grasslands.	See above	Use FEP G05 condition assessment	A review of agri-environment schemes (5 sites) found it is possible to create/restore lowland dry acid grassland PH within 10-20 years. One site created (20 years ago) on a field of free draining sand has a well established U1c grassland in good condition. The 4 restored sites were in moderate (3 sites) or good (1 site) condition over timescales of 10-20 years by reinstatement of management e.g. grazing, tree/shrub clearance. See attached guidance for details.
Grassland: Unimproved neutral grassland	B21	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland meadow	Neutral grassland	MG4, MG5, MG8	Unimproved neutral grasslands are found on neutral clays and alluvial soils which have not been subject to alteration through the use of fertilizers, slurry and herbicides. They are the product of a long history of traditional management such as hay making (meadows) or low intensity grazing (pastures) over many decades. Species diversity is often high (but where neglected can be rank) and can include rare or scarce plants such as green-winged orchid, dyer's greenweed, pepper saxifrage and adder's tongue fern. They also support a diverse fauna, especially invertebrate species.	True unimproved grassland is now very rare in the sub region. The HBA recorded 17aha in 2017. SSSIs account for 73ha (40%) of this total. Outside of SSSIs remnant unimproved grasslands are generally small and highly fragmented, found on nature reserves, small 'hobby' farms, churchyards, traditional orchards, woodland rides, churchyards, as fragments of remnant old grassland that have escaped intensification e.g. within or on the edge of urban areas. Many of these are designated as Local Wildlife Sites.	Use FEP G06 condition assessment	Studies (see attached guidance) give timescale trajectories of many decades for the recreation of unimproved neutral grassland. It is possible to create grasslands that superficially resemble species-rich grasslands (see below) but these will not have the natural vegetation patterns, full range of plant species and undisturbed soil fuana and flora of unimproved grasslands.
Grassland: Semi-improved neutral grassland	B22	Medium	4	Medium	1.5	15 years	W_in_P	Low	1	15 years	W_in_P	Lowland meadow	Neutral grassland	MG1, MG6, MG4, MG5	Semi-improved neutral grasslands have been subject to some form of agricultural improvement such as fertilizer application, use of herbicide, intensive grazing or drainage but are typically not subject to regular reseeding (improved grasslands). Semi-improved grasslands cover a very broad range of grassland quality from almost unimproved (species-rich) to species-poor semi-improved grassland that is just slightly more species-rich than agriculturally improved grassland.	Species-rich semi-improved grassland is more widespread in the sub region than unimproved grassland but still scarce. Species diversity will be lower than unimproved grasslands but still of high botanical diversity supporting grassland communities that resemble MG5 or MG4 grassland with species such as common knapweed, lady's bedstraw, yellow rattle, common bird's-foot-trefoil, meadow vetchling, oxeye daisy and great burnet but often at lower frequencies than seen in unimproved meadows. Rarer species associated with true unimproved grasslands will also tend to be absent.	Use FEP G06 condition assessment	Evidence from agri-environment schemes (Wilson et al - see attached guidance) show that it is possible to create/restore lowland meadow PH of moderate to good quality typically in 8-15 years. Careful site selection (e.g. low soil nutrient levels) and suitable management (e.g. cutting and grazing) are important. Low frequency of positive indicator species was the primary reason for grasslands failing to achieve good status. It is possible therefore to create/restore lowland meadow PH to good condition in 10 years on high potential sites (see FEP manual Keys 1 and 2c). On low potential sites, moderate condition in 15 years is a more realistic target.

	Grassland: Unimproved calcareous grassland	B31	High	6	Medium	1.5	n/a	n/a	Low	1	W_in_P	W_in_P	Lowland calcareous grassland	Calcareous grassland	CG2, CG5	Calcareous grassland supports a range of plant communities in which lime-tolerant (calcicolous) plants are characteristic. Typical forb species include common centaury, yellow-wort, kidney vetch and dwarf thistle and grasses such as sheep's fescue, tor-Grass, upright brome, crested hair-grass and meadow oat-grass.	Calcareous grassland is very rare in the sub-region, largely confined to the south and east of Warwickshire within the Cotswolds and Feldon areas (and with limited areas in the south of the Arden). The majority has a relatively recent origin, falling within old or partially worked quarries, where disturbance has ceased some time ago. Further more important examples occur in cuttings. A little exists within agricultural settings (often on steeper ground that has been left out of improvement schemes) and along some road verges and railway or canal cuttings (Warwickshire LBAP). The latest figures from Habitat Biodiversity Audit (HBA, 2012) give the total area of calcareous grassland in Warwickshire,Coventry and Solihull to be 118 ha (39ha unimproved and 83ha semi-improved). A large part of this resource is included within designated sites (SSSIs and LWSs)	Use FEP G04 condition assessment	Studies suggest timescale trajectories of 60-100 years for the restoration of ancient calcareous grasslands (see attached guidance).
	Grassland: Semi-improved calcareous grassland	B32	Medium-High	5	Medium	1.5	15 years	W_in_P	Low	1	15 years	W_in_P	Lowland calcareous grassland	Calcareous grassland	CG2, CG5	Semi-improved calcareous grasslands that have been improved by the addition of some fertiliser will contain some mesotrophic species such as white clover, yarrow, Yorkshire fog, cock's-foot and crested dog's-tail.		Use FEP G04 condition assessment	A review of agri-environment schemes (Wilson et al) found it is possible to create/restore lowland calcareous grassland PH in 8-15 years. However, low soil nutrient levels and suitable grazing management are important. Of 15 sites studied, 10 were in good condition and 5 were in moderate condition.
	Grassland: Poor semi-improved grassland	B6	Medium-Low	3	Medium	1.5	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Some examples of MG6	This consists of semi-improved grassland which is more improved, poorer in species diversity, and more resembles species-poor neutral grassland irrespective of the underlying soil type. However, it is noticeably less improved and more species rich than improved grassland (NCC, 1990). Typical species including Yorkshire fog, meadow foxtail, cock's-foot, red fescue, ribwort plantain and meadow buttercup.		Classify as poor condition	n/a
	Grassland: Improved grassland	B4	Low	2	n/a	-	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	MG6a, MG7	Improved grasslands are dominated by a limited range of grasses, particularly perennial rye-grass and have a very low forb diversity characteristically dominated by white clover.	It is the commonest grassland type in the County.	Classify as poor condition	n/a
	Grassland: Marsh / Marshy grassland	B5	High	6	High	3	15 years	W_in_P	Medium	1.5	W_in_P	W_in_P	Coastal and floodplain grazing marsh Purple moor-grass and rush pasture Lowland meadow		MG8-10, MG12, M22-28	This is a diffuse category covering certain Molinia grasslands, grasslands with a high proportion of Juncus species, Carex species or Filipendula ulmaria, and wet meadows and pastures supporting communities of species such as Caltha palustris or Valeriana species, where broadleaved herbs predominate over grasses.		Use FEP G07 condition assessment	A review of agri-environment schemes (by Wilson et al - see attached guidance looked at three wet grassland schemes - one creation, two restoration. One site created on arable land (previously a fen) by raising water levels and natural regeneration from seedbank, was purple moor grass & rush pasture PH in moderate condition after 12 years. The restored sites (scrub clearance and/or grazing) had achieved good condition after 2 & 11 years.
	Grassland: Dry heath / Acidic grassland mosaic	D5	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowland heathland Lowland dry acid grassland	Lowland heathland		This represents a common mixture of dry heath and acid grassland.Lowland heathland is typified by the presence of low growing shrubs such as heather (*Calluna vulgaris*), dwarf gorse (*Ulex minor*) and cross-leaved heath (*Erica tetralix*).	Heathland is very rare in the County. The HBA (2012) has recorded 7.76ha of dry heath/acid grassland mosaic. They are mainly associated with common land and woodland on the acid glacial soils in the north of the county.	Use FEP M03 & G05	
	Grassland: Set-aside / Arable field margins	J113	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Arable field margins	Arable field margins		Arable field margins are herbaceous strips or blocks around arable fields that are managed specifically to provide benefits for wildlife (see UK BAP_2008 for definition of margin types that are included and those that are excluded). They are valued for supporting scarce/rare arable plants as well as invertebrates and nesting and feeding birds.		Use FEP species features, including SP02 uncommon vascular plants.	
	Grassland: Amenity grassland	J12	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat	Various grassland forms but mostly MG6, MG7	This comprises intensively managed and regularly mown grasslands, typical of lawns, playing fields, golf course fairways and many urban 'savannah' parks, in which perennial rye grass, with or without white clover, often predominates. The sward composition will depend on the original seed mixture used and on the age of the community. Herbs such as daisy, greater plantain and dandelion may be present. If the amenity grassland has a sward rich in herbs, it may be possible to classify it as semi-improved acidic, neutral or calcareous grassland, as appropriate. In such cases, the area concerned should be mapped as the specific grassland type and its amenity use target noted (NCC, 1990).		Classify as poor condition	n/a
	Wetland: Standing water	G1	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Ponds	Ponds		Standing water includes lakes, reservoirs, pools, flooded gravel pits, ponds, water-filled ditches and canals.	Typical floating and submerged plant species include Duckweed (Lemna spp.), Canadian pondweed (Elodea canadensis), Hornwort (Ceratophyllum spp.), amphibious bistort (Persicaria amphibia) and yellow water-lily (Nuphar lutea). Standing water bodies are important for a vast range of plants and animals, including several protected species such as great crested newt.	Use FEP W07 condition assessment	Ponds colonise rapidly with plants, invertebrates and ampibians and can take just a few years to be of high wildlife value. However, the value of ponds is affected by the water quality (e.g. elevated nutrient levels), pollution risk e.g. road-runoff, presence of stream inflows, location (ponds in urban and arable areas tend to be of poorer quality). Good quality ponds tend to occur in close proximity to other ponds or wetland habitats and where they are buffered by semi-natural habitat. These factors should be taken into account when deciding on target condition.
	Wetland: Running water	G2	High	6	Medium	1.5	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Rivers & streams	Rivers & streams		Running water comprises rivers and streams (but not canals, which are classed as Standing Water).	The habitat quality of watercourses can vary widely, with many adversely affected by human activities, such as channel straightening and pollution. However there are also many that have significant wildlife value, providing habitat for a range of plants and animals including protected species such water vole and otter.	No FEP condition assessment. See next column	Good quality watercourses will have a divesity of natural channel features typical of lowland watercourses. These include a variety of flow patterns (riffles, runs, glides, pools and marginal dead water), a variety of channel features (side bars, point bars, silt deposits and islands), meanders and associated erosion/deposition features and natural variation of bankside habitats.
	Wetland: Reedbed	F1	High	6	low	1	W_in_P	W_in_P	low	1	W_in_P	W_in_P	Reedbeds	Reedbeds		Reed beds are wetlands dominated by, but not necessarily composed purely of, stands of the common reed (Phragmites australis). They can include areas of reed which are both wet and dry at their base but usually the water table is at or above ground level for much of the year (LBAP). Usually part of a mosaic with open water and ditches, wet grassland, wet woodland etc. They usually require management e.g. grazing, cutting, scrub control to maintain a mosaic of vegetation at different stages of growth.	Reed beds are not common or extensive in the sub-region, being mainly associated with sand and gravel extraction within certain river valleys (e.g. the Tame and Avon), some water-filled limestone quarries, a few mining subsidence pools and formal lakes in country house estates, and occasionally as narrow fringes of reed along rivers, canals and ditches. There are dozens of small reed beds, though large ones are few in number and probably only account for 25-30ha.	Use FEP W08 condition assessment	Newly created reed bed can establish very rapidly ie within a few growing seasons (RSPB). However, reedbed habitat quality can vary greatly depending on size, degree of wetness and dryness, scrub cover, soil type, water quality and management. These factors should be taken into account when making decisions about target condition.
	Wetland: Sphagnum Bog	E11	High	6	Very High	10	n/a	n/a	High	3	n/a	n/a	Blanket bog Lowland raised bog	n/a	M1-3, M17-20		Habitat not found in Warwickshire	n/a	n/a
	Wetland: Acid/neutral flush	E21	High	6	High	3	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowlansd fens	Fen & swamp		These typically support species-poor vegetation consisting of a Sphagnum carpet overlain by Carex or Juncus species. Characteristic moss species include Sphagnum recurvum, S. palustre and S. auriculatum. Overlying vegetation may consist of small Carex species (Carex echinata, C. nigra or C cura), Carex rostrata, Juncus acutiflorus, J. effusus, J. squarrosus, or Eriophorum angustifolium.	Extremely rare in the County e.g. Coleshill and Bannerly Pools SSSI	Use FEP W04 condition assessment	n/a
	Wetland: Basin Mire	E32	High	6	High	3	n/a	n/a	Medium	1.5	n/a	n/a	Lowland fens	n/a	Various mire communities	Basin mire is a topogenous fen, fed by ground water or streams. It develops in a waterlogged basin and does not contain much open water. The vegetation may be dominated by Sphagnum species, together with Carex rostrata and ericoids, or by tall swamp plants such as Phragmites australis, Schoenoplectus (Scirpus) lacustris and Typha species	Habitat not found in Warwickshire	n/a	n/a
	Wetland: Swamp	F1	High	6	High	3	W_in_P	W_in_P	Medium	1.5	W_in_P	W_in_P	Lowland fens	Fen & swamp		Swamp contains tall emergent vegetation typical of the transitior between open water and exposed land. Swamps are generally in standing water for a large part of the year. Swamp vegetation includes both mixed and single-species stands include reedmace (Typha spp.), common reed (Phragmites australis), reed canary-grass (Phalaris arundinacea), reed sweet-grass (Glyceria maxima) and tall sedge species (Carex spp.).	The Phase 1 category includes reedbed (see above) as well as fen and swamp.	Use FEP W04 condition assessment	
	Wetland: Inundation vegetation	F22	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Fen & swamp	MG11, MG13, OV28-36	Inundation vegetation covers areas that are periodically inundated. The species community is generally open and inherently unstable. Typical species present may include the following: knot grass (Polygonum) species, bulbous rush (Juncus bulbosus), beggartick and bur-marigold (Bidens) species, creeping bent grass (Agrostis stolonifera), marsh foxtail (Alopecurus geniculatus), as well as many ruderal species (NCC 1990).			
	Other: Arable	J11	Low	2	n/a	-	n/a	n/a	n/a	-	n/a	n/a	Not a priority habitat	Not a priority habitat		This includes arable cropland, horticultural land (for example nurserie vegetable plots, flower beds), freshly-ploughed land and recently reseeded grassland, such as rye grass and ryeclover leys, often managed for silage (NCC, 1990).		Classify as poor condition	0-5 years
	Other: Continuous bracken	C11	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	W25	Areas dominated by Pteridium aquilinum (NCC, 1990).		Bracken should be classed as poor condition unless it meets the FEP definition of high environmental value bracken in which case its condition should be assessed against V05".	
	Other: Tall ruderal	C31	Medium-Low	3	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat	OV24-27	This category comprises stands of tall perennial or biennial dicotyledons, usually more than 25cm high, of species such as rosebay willowherb and common nettle (NCC, 1990). It is often found as a habitat-edge community and in urban areas is frequently found on post industrial sites/waste ground.		Classify as poor condition, unless it meets the criteria LWS selection.	
	Other: Non-ruderal	C32	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Non-wooded stands of species such as Oreopteris limbosperma, Athyrium felix-femina, Dryopteris species or Luzula sylvatica should be included in this category (NCC, 1990).		Classify as poor condition	
	Other: Ephemeral/short perennial	J13	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P	Not a priority habitat	Not a priority habitat		Short, patchy plant associations typical of derelict urban sites, quarries and railway ballast. The vegetation typically lacks a clear dominant species, but consists of a mixture of low-growing plants, often less than 25 cm high, such as greater plantain, creeping buttercup, white clover, black medick, coltsfoot, oxeye daisy and ragwort species, or of taller species such as Sisymbrium or Melilot species (NCC, 1990).		Classify as poor condition	
	Other: Allotments	J112	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Allotments		All allotments included		Classify as poor condition	
	Other: Quarry	I21	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Quarries & gravel pits		Excavations such as gravel, sand or chalk pits and stone quarries should be included in this category.		Classify as poor condition	n/a
	Other: Spoil	I22	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		Includes abandoned industrial areas and tips of waste material such as coal mine spoil and slag.		Classify as poor condition	n/a

Other: Refuse tip	I24	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		Rubbish tips, worked landfill sites		Classify as poor condition	n/a
Other: Introduced shrub	J14	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat		This is vegetation dominated by shrub species that are not locally native, whether planted or selfsown. Common introduced shrubs include species of box, dog wood, laurel, privet, Rhododendron and snowberry. Formal beds of shrubs such as of Hypericum calycinum, Cotoneaster, heaths and dwarf conifers should be included here.		Classify as poor condition	0-5 years
Other: Bare ground	J4	Low	2	Low	1	n/a	n/a	Low	1	n/a	n/a	Not a priority habitat	Not a priority habitat					n/a
Other: Vertical face (correction factor)	n/a	none	0	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living Wall	n/a	Medium-Low	3	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Extensive	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Semi-intensive	n/a	Medium-Low	3	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Intensive	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Brown	n/a	Medium-Low	3	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living roof - Mosaic	n/a	Medium	4	Medium	1.5	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Linear features																		
Hedges: Intact hedge	J21	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Native species rich intact hedge	J211	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Hedge with trees	J23	Medium-High	5	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Native species rich hedge with trees	J231	High	6	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Defunct hedge	J22	Low	2	n/a	-	W_in_P	W_in_P	n/a	-	W_in_P	W_in_P							
Hedges: Linear scrub	A21	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Linear trees	A3	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Hedges: Introduced shrub	J14	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Standing water	G1	High	6	Medium	2	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Running water	G2	High	6	Medium	2	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Ditches: Dry ditch	J26	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Fence	J24	None	0	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Wall	J25	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Boundaries: Dry stone wall	J25	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Inland cliff	I1	Medium	4	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Earth bank	J28	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							
Other: Living wall	n/a	Low	2	Low	1	W_in_P	W_in_P	Low	1	W_in_P	W_in_P							

Habitats for creation Phase 1 Habitat Descriptions
Built Environment: Buildings/hardstanding
Built Environment: Gardens (lawn and planting)
Woodland: Broad-leaved plantation
Woodland: Coniferous plantation
Woodland: Mixed plantation
Woodland: Wet woodland
Woodland: Dense continuous scrub
Woodland: Scattered scrub
Woodland: Scattered trees
Woodland: Coniferous parkland
Woodland: Orchard
Grassland: Semi-improved acidic grassland
Grassland: Semi-improved neutral grassland
Grassland: Semi-improved calcareous grassland
Grassland: Marsh / Marshy grassland
Grassland: Dry heath / Acidic grassland mosaic
Grassland: Set-aside / Arable field margins
Grassland: Amenity grassland
Wetland: Standing water
Wetland: Running water
Wetland: Reedbed
Wetland: Sphagnum Bog
Wetland: Acid/neutral flush
Wetland: Basin Mire
Wetland: Swamp
Wetland: Inundation vegetation
Other: Continuous bracken
Other: Tall ruderal
Other: Non-ruderal
Other: Ephemeral/short perennial
Other: Allotments
Other: Quarry
Other: Spoil
Other: Refuse tip
Other: Introduced shrub
Other: Bare ground
Other: Living Wall
Other: Living roof - Extensive
Other: Living roof - Semi-intensive
Other: Living roof - Intensive
Other: Living roof - Brown
Other: Living roof Mosaic

Habitats for restoration Phase 1 Habitat Descriptions
Woodland: Broad-leaved semi-natural woodland
Woodland: Broad-leaved plantation
Woodland: Coniferous semi-natural woodland
Woodland: Coniferous plantation
Woodland: Mixed semi-natural woodland
Woodland: Mixed plantation
Woodland: Wet woodland
Woodland: Dense continuous scrub
Woodland: Scattered scrub
Woodland: Scattered trees
Woodland: Broad-leaved parkland
Woodland: Coniferous parkland
Woodland: Orchard
Grassland: Unimproved acidic grassland
Grassland: Semi-improved acidic grassland
Grassland: Unimproved neutral grassland
Grassland: Semi-improved neutral grassland
Grassland: Unimproved calcareous grassland
Grassland: Semi-improved calcareous grassland
Grassland: Marsh / Marshy grassland
Grassland: Dry heath / Acidic grassland mosaic
Grassland: Set-aside / Arable field margins
Wetland: Standing water
Wetland: Running water
Wetland: Reedbed
Wetland: Sphagnum Bog
Wetland: Acid/neutral flush
Wetland: Basin Mire
Wetland: Swamp
Wetland: Inundation vegetation
Other: Continuous bracken
Other: Tall ruderal
Other: Non-ruderal
Other: Ephemeral/short perennial
Other: Allotments
Other: Bare ground
Other: Living roof - Extensive
Other: Living roof - Semi-intensive
Other: Living roof - Intensive
Other: Living roof - Brown
Other: Living roof Mosaic
Other: Living Wall

Linear	Linear
Hedges: Intact hedge	Hedges: Intact hedge
Hedges: Native species rich intact hedge	Hedges: Native species rich intact hedge
Hedges: Hedge with trees	Hedges: Hedge with trees
Hedges: Native species rich hedge with trees	Hedges: Native species rich hedge with trees
Hedges: Linear scrub	Hedges: Linear scrub
Hedges: Linear trees	Hedges: Linear trees
Hedges: Introduced shrub	Ditches: Standing water
Ditches: Standing water	Ditches: Running water
Ditches: Running water	Ditches: Dry ditch
Ditches: Dry ditch	Boundaries: Dry stone wall
Boundaries: Fence	Other: Inland cliff
Boundaries: Wall	Other: Earth bank
Boundaries: Dry stone wall	Other: Living wall
Other: Inland cliff	
Other: Earth bank	
Other: Green wal	

Distinctiveness	
High	6
Medium-High	5
Medium	4
Medium-Low	3
Low	2
none	0

Condition	
Good	3
Moderate	2
Poor	1

Time	
3 years	1.1
5 years	1.2
10 years	1.4
15 years	1.7
20 years	2
25 years	2.4
30 years	2.8
32+ years	3

Difficulty	
Very high	10
High	3
Medium	1.5
Low	1
n/a	0

VALUE

			35.70	72.24	Woodland					Grassland					Wetland					Other (including Built Gardens)					Built Environment				
		Distinctiveness	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
J113	Grassland: Set-aside / Arable field margins	High	0.21	1.26						1.26																			
J11	Other: Arable	Low	35.49	70.98																				70.98					
	0		0.00																										
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	0		0.00																										
					0.00	**0.00**	**0.00**	**0.00**	**0.00**	**1.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.98**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

73.50

Indirect Impacts				High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
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				0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

				Woodland					Grasslanc					Wetland					Other					Built Environment				
Creation	Distinctiveness	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
Woodland: Broad-leaved plantation	Medium	0.50	2.35			2.35																						
Woodland: Scattered scrub	Medium	0.20	2.18			2.18																						
Grassland: Semi-improved neutral grassland	Medium	31.10	226.18								226.18																	
Wetland: Inundation vegetation	High	0.20	3.27											3.27														
Other: Ephemeral/short perennial	Low	3.00	16.36																				16.36					
Other: Bare ground	Low	0.65	3.55																				3.55					
Built Environment: Buildings/hardstanding	none	0.05	0.00																									
0		0.00																										
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0		0.00																										
				0.00	**0.00**	**4.53**	**0.00**	**0.00**	**0.00**	**0.00**	**226.18**	**0.00**	**0.00**	**3.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.91**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

				Woodland					Grasslanc					Wetland					Other					Built Environmment				
Enhnacement	Distinctivenes	Area	Value	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low	High	Medium-High	Medium	Medium-Low	Low
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				0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	Loss	Gain		%		
Offset Requirements	72.24	253.89	181.65	-51.07		
Woodland	0.00	4.53	4.53		2.49%	1.80
Grassland	1.26	226.18	224.92		123.82%	89.45
Wetland	0.00	3.27	3.27		1.80%	1.30
Other	70.98	19.91	-51.07	100.00%	-28.11%	-20.31
Built Environment	0.00	0.00	0.00			

		Distinctiveness	Area	Value	P_Intensive crops	P_Traditional crops	P_Livestock	P_Wild foods	P_Fresh water	P_Energy	P_Timber	P_Medical	Provisioning	R_Pollination	R_Pest control	R_Species	R_Climate	R_Air quality	R_Flood protection	R_Water purification	R_Soil Erosion	Regulating	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	Cultural
			35.70	72.24																							
J113	Grassland: Set-aside / Arable field margins	High	0.21	1.26	0.21	0.00	0.21	0.21	0.00	0.21	0.00	0.00	0.11	1.05	1.05	0.84	0.84	0.53	0.63	0.84	0.84	0.83	0.21	0.21	0.21	0.21	0.21
J11	Other: Arable	Low	35.49	70.98	141.96	177.45	35.49	0.00	0.00	0.00	0.00	35.49	48.80	35.49	35.49	17.75	53.24	35.49	35.49	35.49	35.49	35.49	35.49	35.49	17.75	35.49	31.05
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					142.17	177.45	35.70	0.21	0.00	0.21	0.00	35.49	48.90	36.54	36.54	18.59	54.08	36.02	36.12	36.33	36.33	36.32	35.70	35.70	17.96	35.70	31.26

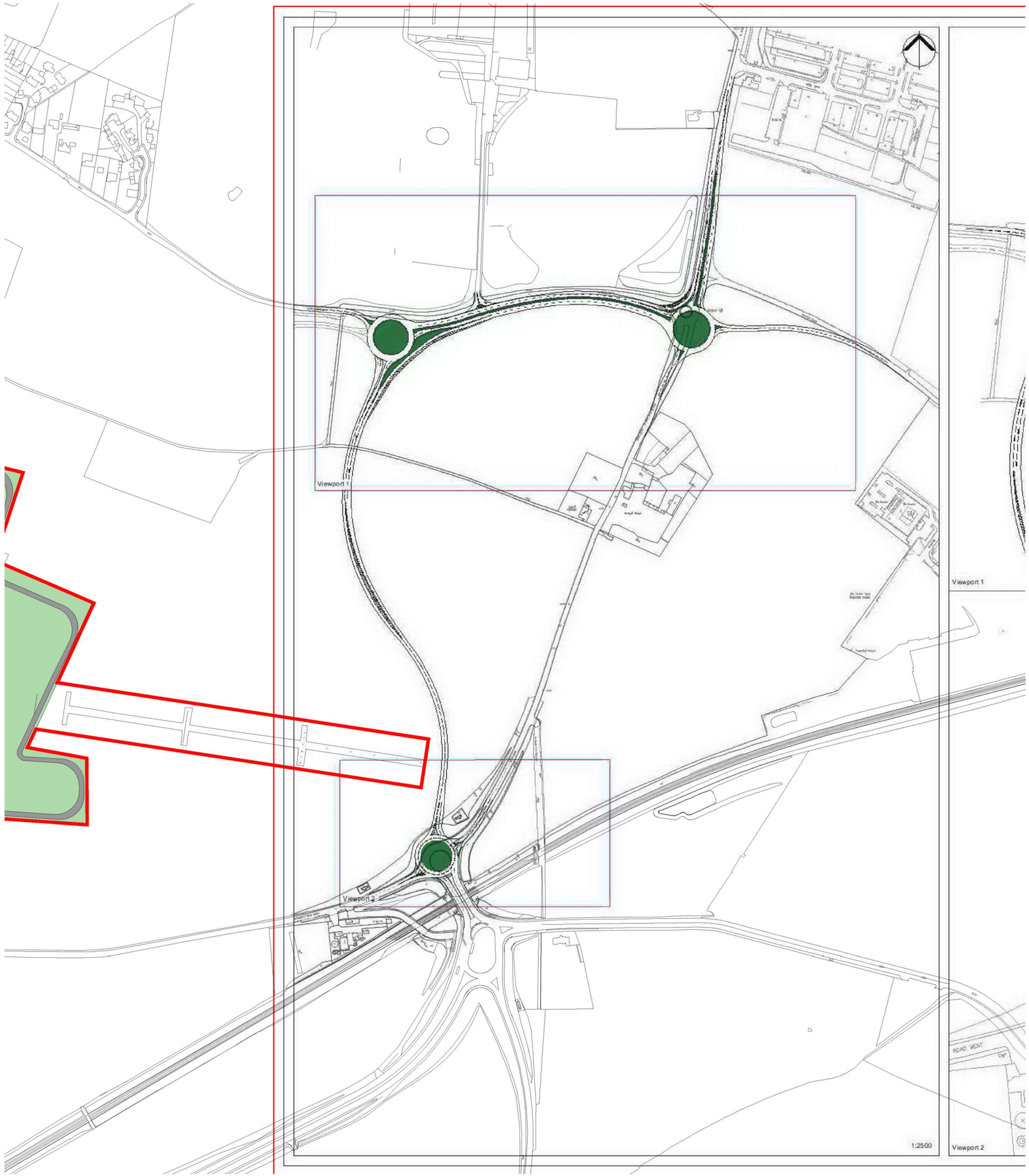
	Indirect Impacts				P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh w	P_Energy	P_Timber	P_Medical	Provisioning	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	Regulating	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	Cultural
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0	0	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Creation	Distinctiveness	Area	Value	P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh w	P_Energy	P_Timber	P_Medical	Provisioning	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	Regulating	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	Cultural
A112	Woodland: Broad-leaved plantation	Medium	0.50	2.35	0.50	0.00	0.00	0.25	0.50	0.00	2.25	0.00	0.44	1.75	1.50	1.75	2.00	2.00	2.00	2.00	2.00	1.88	2.25	2.00	1.50	1.50	1.81
A22	Woodland: Scattered scrub	Medium	0.20	2.18	0.00	0.00	0.50	0.00	0.00	0.60	0.40	0.10	0.20	0.90	0.70	0.80	0.80	0.60	0.60	0.60	0.60	0.70	0.40	0.40	0.40	0.60	0.45
B22	Grassland: Semi-improved neutral grassland	Medium	31.10	226.18	0.00	0.00	93.30	15.55	0.00	0.00	0.00	0.00	13.61	155.50	124.40	155.50	93.30	93.30	93.30	93.30	124.40	116.63	124.40	124.40	93.30	124.40	116.63
F22	Wetland: Inundation vegetation	High	0.20	3.27	0.00	0.00	0.30	0.10	0.20	0.00	0.00	0.10	0.09	0.80	0.70	1.00	0.70	0.60	0.80	0.80	0.80	0.78	0.40	0.80	0.60	0.80	0.65
J13	Other: Ephemeral/short perennial	Low	3.00	16.36	0.00	0.00	4.50	1.50	1.50	0.00	0.00	1.50	1.13	15.00	12.00	12.00	9.00	7.50	6.00	7.50	9.00	9.75	4.50	6.00	4.50	7.50	5.63
J4	Other: Bare ground	Low	0.65	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n/a	Built Environment: Buildings/hardstanding	none	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					0.50	0.00	98.60	17.40	2.20	0.60	2.65	1.70	15.46	173.95	139.30	171.05	105.80	104.00	102.70	104.20	136.80	129.73	131.95	133.60	100.30	134.80	125.16

Enhnacement	Distinctivenes	Value		P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh w	P_Energy	P_Timber	P_Medical	Provisioning	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	Regulating	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	Cultural
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ecosystem Service	Exiting	After	gain/loss	P_Intensiv	P_Traditior	P_Livestoc	P_Wild foo	P_Fresh w	P_Energy	P_Timber	P_Medical	Provisioning	R_Pollination	R_Pest contro	R_Species	R_Climate	R_Air quality	R_Flood prote	R_Water purifi	R_Soil Erosior	Regulating	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	Cultural
Provisioning	48.90	15.46	-33.45	142.17	177.45	35.70	0.21	0.00	0.21	0.00	35.49	48.90	36.54	36.54	18.59	54.08	36.02	36.12	36.33	36.33	36.32	35.70	35.70	17.96	35.70	31.26
Regulating	36.32	129.73	93.41	0.50	0.00	98.60	17.40	2.20	0.60	2.65	1.70	15.46	173.95	139.30	171.05	105.80	104.00	102.70	104.20	136.80	129.73	131.95	133.60	100.30	134.80	125.16
Cultural	31.26	125.16	93.90	-141.67	-177.45	62.90	17.19	2.20	0.39	2.65	-33.79	-33.45	137.41	102.76	152.47	51.73	67.99	66.58	67.87	100.47	93.41	96.25	97.90	82.35	99.10	93.90

HABCODE	DESCRIPTION	INFERENCE	C_Physical	C_Aesthetic	C_Spiritual	C_Intellectural	R_Pollination	R_Pest control	R_Species	R_Climate	R_Air quality	R_Flood protection	R_Water purification	R_Soil Erosion	P_Intensive crops	P_Traditional crops	P_Livestock	P_Wild foods	P_Fresh water	P_Energy	P_Timber	P_Medical	Provisioning	Regulating	Cultural	P_Food
A111	Woodland: Broad-leaved semi-natural woodland	Median Stakeholder value	5	5	5	4.5	5	4	5	5	5	4.5	4	5	0	0	0.5	0	1	0	4	0	1.1	4.7	4.9	0.2
A112	Woodland: Broad-leaved plantation	Median Stakeholder value	4.5	4	3	3	3.5	3	3.5	4	4	4	4	4	0	1	0	0.5	1	0	4.5	0	1.3	3.8	3.6	0.3
A121	Woodland: Coniferous semi-natural woodland	Set to mean of Semi-natural BL (A111) & coniferous plantation (A122)	3	2.5	1.5	3	2	2	2	2.5	3	3	2.5	3.5	0	0	0.5	0.5	0.5	4	5	0	1.2	2.6	2.5	0.2
A122	Woodland: Coniferous plantation	Median Stakeholder value	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A131	Woodland: Mixed semi-natural woodland	Set to average (A111 + A121)	4.5	4.4	4.1	4.1	4.3	3.5	4.3	4.4	4.5	4.1	3.6	4.6	0	0	0.5	0.1	0.9	1	4.3	0	1.1	4.2	4.3	0.2
A132	Woodland: Mixed plantation	Set to average (A112 + A122)	3.8	3.3	2.3	3	2.8	2.5	2.8	3.3	3.5	3.5	3.3	3.8	0	0.5	0.3	0.5	0.8	2	4.8	0	1.3	3.2	3.1	0.3
A21	Woodland: Dense continuous scrub	Median Stakeholder value	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A22	Woodland: Scattered scrub	Set to A22	2	2	2	3	4.5	3.5	4	4	3	3	3	3	0	0	2.5	0	0	3	2	0.5	0.9	3.5	2.3	0.8
A31	Woodland: Broad-leaved parkland	Set to J12 for cultural; average (J12 + A112) for others (J12 = amenity; A112 = broadleaf plantation)	3.8	3	3	2.5	1	2	2.3	2.5	2.5	3	3	3.3	0	0.5	0.5	0.3	0.5	0	2.3	0	0.8	2.4	3.1	0.3
A3	Woodland: Scattered trees	same as A31	3.8	3	3	2.5	1	2	2.3	2.5	2.5	3	3	3.3	0	0.5	0.5	0.3	0.5	0	2.3	0	0.8	2.4	3.1	0.3
A32	Woodland: Coniferous parkland	Set to J12 for cultural; average (J12 + A122) for others (J12 = amenity; A122 = Conifer plantation)	2.8	1.8	1.3	1.8	1	1.5	1.5	1.8	2	2.5	2.3	3	0	0	0.8	0.3	0.3	2	2.5	0	0.7	1.9	1.9	0.3
A4	Woodland: Recently felled woodland	Set to J4 (bare ground) with reduced habitat (3-->1) and soil-related variables set to those ofA132 (mixed plantation)	1	1	0	0.5	1	1	1	0	0	1	3.3	0	0	0	0	0	0.8	0	0	0	0.2	0.9	0.6	0
A5	Woodland: Orchard	Set to A112 with modified food provision (A112 = BL plantation)	4.5	4	3	3	3.5	3	3.5	4	4	4	4	4	0	3	0	0.5	1	0	4.5	0	1.7	3.8	3.6	1
A6	Woodland: Wet woodland	CT Added	5	4	2	2	2.5	2.5	5	5	4	5	5	5	0	2	1	1	2	3	2	1	1.4	4.3	3.3	0
B11	Grassland: Unimproved acidic grassland	Median Stakeholder value	3.5	4.5	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0.5	0.6	3.8	3.8	1
B12	Grassland: Semi-improved acidic grassland	Set to B11	3.5	4.5	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0.5	0.6	3.8	3.8	1
B21	Grassland: Unimproved neutral grassland	Median Stakeholder value	4	4	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0	0.6	3.8	3.8	1
B22	Grassland: Semi-improved neutral grassland	Set to B21	4	4	3	4	5	4	5	3	3	3	3	4	0	0	3	0.5	0	0	0	0	0.6	3.8	3.8	1
B31	Grassland: Unimproved calcareous grassland	Median Stakeholder value	3.5	4.5	3	4	5	4	5	3	3	3	2.5	4	0	0	3	0.5	0	0	0	0	0.6	3.7	3.8	1
B32	Grassland: Semi-improved calcareous grassland	Set to B31	3.5	4.5	3	4	5	4	5	3	3	3	2.5	4	0	0	3	0.5	0	0	0	0	0.6	3.7	3.8	1
B4	Grassland: Improved grassland	Median Stakeholder value	1	1	1	1	1	1	1	1	1	2	1.5	2.5	1.5	0	5	0	0	0	0	0	1.3	1.4	1	2.2
B5	Grassland: Marsh / Marshy grassland	Median Stakeholder value	3	4	3	4	5	3.5	5	3	3	4	4	4	0	0	3.5	0.5	1	0	0	0.5	0.9	3.9	3.5	1.2
B6	Grassland: Poor semi-improved grassland	Set to mean of B4 and B22 (IG and Neutral grassland)	2.5	2.5	2	2.5	3	2.5	3	2	2	2.5	2.3	3.3	0.8	0	4	0.3	0	0	0	0	1	2.6	2.4	1.6
C11	Other: Continuous bracken	Set to C31	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
C31	Other: Tall ruderal	Median Stakeholder value	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
C32	Other: Non-ruderal	Set to C31	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
D5	Grassland: Dry heath / Acidic grassland mosaic	Median Stakeholder value	3	4.5	4	4	5	3.5	5	3.5	3	3	3	3.5	0	0	2.5	0.5	0	0	0	0.5	0.5	3.7	3.9	0.8
E11	Wetland: Sphagnum Bog	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
E21	Wetland: Acid/neutral flush	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1	0	0	0.5	0.5	3.9	3.3	0.5
E32	Wetland: Basin Mire	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
F1	Wetland: Swamp	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1.5	0	0	0.5	0.6	3.9	3.3	0.5
F22	Wetland: Inundation vegetation	Set to B5 with some expert modification (Pam) to reflect differences	2	4	3	4	4	3.5	5	3.5	3	4	4	4	0	0	1.5	0.5	1	0	0	0.5	0.5	3.9	3.3	0.5
G1	Wetland: Standing water	Median Stakeholder value	4	5	5	4	2.5	2	5	2.5	2	2.5	3.5	0.5	0	0	1	1.5	5	0	0	0.5	1.2	2.6	4.5	0.3
G2	Wetland: Running water	Set to G1 (sthanding water)	4	5	5	4	2.5	2	5	2.5	2	2.5	3.5	0.5	0	0	1	1.5	5	0	0	0.5	1.2	2.6	4.5	0.3
I21	Other: Quarry	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
I22	Other: Spoil	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
I24	Other: Refuse tip	Set to J4 (bare ground)	1	1	0	0.5	1	1	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.9	0.6	0
J11	Other: Arable	Median Stakeholder value	1	1	0.5	1	1	1	0.5	1.5	1	1	1	1	5	4	1	0	0	0	0	1	2	1	0.9	3.3
J112	Other: Allotments	Set to J12 (amenity) with increased food provision, reduced arable and more intellectual /spiritual interactions	2	1	2	2	1	1	1	1	1	2	2	2.5	0	4	0	0	0	0	0	0	0.8	1.4	1.8	1.3
J113	Grassland: Set-aside / Arable field margins	CT Added	1	1	1	1	5	5	4	4	2.5	3	4	4	0	1	1	1	0	1	0	0	0.4	3.9	1	0
J12	Grassland: Amenity grassland	Median Stakeholder value	2.5	1	1	0.5	1	1	1	1	1	2	2	2.5	0	0	1	0	0	0	0	0	0.2	1.4	1.3	0.3
J13	Other: Ephemeral/short perennial	set to C31 (tall ruderal)	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
J14	Other: Introduced shrub	set to C31 (tall ruderal)	1.5	2	1.5	2.5	5	4	4	3	2.5	2	2.5	3	0	0	1.5	0.5	0.5	0	0	0.5	0.4	3.3	1.9	0.5
J4	Other: Bare ground	Median Stakeholder value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
URB	Built Environment: Buildings/hardstanding	Median Stakeholder value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B51	Wetland: Reedbed	Set to B5 - WCC set	3	4	3	4	5	3.5	5	3	3	4	4	4	0	0	3.5	0.5	1	0	0	0.5	0.9	3.9	3.5	1.2
n/a	Built Environment: Gardens (lawn and planting)	- WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0	0	1.9	1	0
n/a	Other: Vertical face (correction factor)	- WCC set																								0
n/a	Other: Living Wall	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Extensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Semi-intensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Intensive	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
n/a	Other: Living roof - Brown	same as garden WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0
	Other: Living roof - Mosaic	same as garden - WCC set	3	2	1.5	1	1.5	1	1.5	0.5	1	1	0.5	1	0	0	0	0	0	0	0	0				0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BIRCHAM DYSON BELL

[redacted]
Director
Stone Hill Park Ltd
Baldwins Wynyard Park House
Wynyard Avenue
Wynyard
TS22 5TB

Your Ref

Our Ref
ADW/166055.0003
Date
21 March 2018

By Email

Dear Madam

Proposed Manston Airport Development Consent Order

Thank you for your letter of 15 March, which gives us the opportunity to clarify several aspects of our clients' project and seek clarification from you in turn.

Negotiations

The history of negotiating the acquisition of your company's land is as follows. Our clients' predecessor company, RiverOak Investment Corporation LLC, made an offer to you in June 2016 that was refused. When RiverOak Strategic Partners Ltd ('RiverOak') carried out a statutory consultation on their proposals in June-July 2017, Stone Hill Park Ltd ('SHP') replied to state in terms 'the current landowner does not intend to sell the land', which suggested to us that negotiation would not be welcomed. On 9 February 2018, we nevertheless wrote to all landowners any of whose land is proposed to be acquired (with whom we were not already negotiating) with an offer to negotiate an agreed acquisition via CBRE, and it is that letter to which you are responding. You seem not to be aware that in recent days, Mr [redacted] of RiverOak has been in active discussion with your co-director Mr [redacted] about the potential acquisition of the site, and further that Mr [redacted] had telephone and text communications with [redacted] om July to October last year. It is therefore not correct that RiverOak 'has so far made no attempt to acquire SHP's land by voluntary agreement'.

Effect of voluntary acquisition

You seem to believe that if SHP's land were to be acquired (or a lease entered into) then no application for a Development Consent Order (DCO) would be necessary. That is to misunderstand the triggers for a DCO, which are based on the increase in capability of the airport that RiverOak's proposals would create, and not on the acquisition of land and rights. Even if all necessary land and rights were to be acquired by agreement, a DCO would still be necessary.

50 Broadway London
SW1H 0BL United Kingdom
DX 2317 Victoria
T +44 (0)20 7227 7000
F +44 (0)20 7222 3480
W www.bdb-law.co.uk

Lexcel

Bircham Dyson Bell is the trading name of Bircham Dyson Bell LLP which is a limited liability partnership registered in England and Wales with registered number OC320798. Its registered office and principal place of business is 50 Broadway, London SW1H 0BL where a list of members' names is available for inspection. Bircham Dyson Bell LLP is authorised and regulated by the Solicitors Regulation Authority and is a member of Lexwork International, an association of independent law firms. We use the word partner to refer exclusively to a member of Bircham Dyson Bell LLP.

Furthermore, although SHP owns the majority of the land that is needed for the project, there are several other landowners whose interests must be acquired, and acquiring SHP's land by agreement would not avoid the need for compulsory acquisition completely.

RiverOak's intentions

Your letter suggests bad faith on the part of our clients, in that you allege they do not intend to build their project but wish to acquire the site for residential development. We reject those claims as utterly without foundation or credibility. If RiverOak were so intent on developing the site for housing, why did they successfully pursue and defeat your planning appeal to change some buildings on the site away from airport use? Why have they spent so much time and effort in securing the rejection of the local plan amendments that would have seen housing as a possible use for the site? There is nothing to suggest anything but RiverOak's dogged pursuit of an airport project for the entire period of their involvement.

SHP's intentions

On the other hand, there is little evidence that SHP are actively pursuing their plans for the site. Having submitted a planning application on 31 May 2016, you have made no progress on it since. You did submit a second planning application in October 2017 and repeatedly talk of a third, but the documentation underpinning all of these applications remains incomplete.

The prospect of changing the use of the site away from airport use, tenuous as it was, is now close to zero. You therefore have no prospect of getting planning permission for the site, never mind securing viable development in this location. We are advised that the market value of the land in the absence of the airport project has fallen and any 'hope value' which pertains is remote, being only a small premium on agricultural value.

Lease proposal

RiverOak nevertheless remain willing to acquire SHP's land by agreement, and a lease might be one possible way of achieving this. However, the (currently unspecified) cost of the lease would have to be close to the value of acquiring the land outright in the absence of the DCO project, and any encumbrances attached to the lease would have to allow the development of the site unhindered and equivalent to owning the freehold. For example, restrictions on night flights are something that RiverOak will propose in its application, will be examined closely as part of the DCO examination and will be decided by the Secretary of State for Transport. There is no point in placing conflicting restrictions in any lease and to do so would be unacceptable to RiverOak.

The closer a lease arrangement was to freehold acquisition, and therefore the more acceptable it would be to RiverOak and its investors to allow it to develop the site as an airport pursuant to a DCO, the less value the reversion would be to SHP and therefore the less point there would be in retaining an interest. Outright acquisition by agreement would therefore be the obvious preference for both parties if you are genuinely interested in allowing the airport to be developed by RiverOak.

If in the light of the above points you are still interested in negotiating a sale by agreement, then our clients would be willing to meet to discuss its terms. Please let us know.

BIRCHAM DYSON BELL

Finally, we are sending a copy of this letter to Pinsent Masons as your lawyers but if they are no longer instructed, please advise.

Yours faithfully

[redacted]

Bircham Dyson Bell LLP

[redacted]

Department for Transport

Department for Transport
Great Minster House
33 Horseferry Road
London
SW1P 4DR

Tel: 0300 330 3000
Website: www.gov.uk/dft

FAO: Angus Walker
BDB Pitmans
50 Broadway
London
SW1H 0BL

anguswalker@bdbpitmans.com

26 April 2019

Dear Mr Walker,

Application (reference TR020002) by RiverOak Strategic Partners ("the Applicant") for an Order Granting Development Consent for the upgrade and reopening of Manston Airport ("the Application")

I am writing in response to your letter dated 18 December 2018 to Mr Dave Candlish, Head of the National Transport Casework Team. I acknowledge that some time has passed since the Department received your letter. I have now had an opportunity to consider the draft development consent order (DCO) in further detail and the role of the Secretary of State as the proposed discharging authority in relation to its Requirements.

I note the reasons for the Applicant's choice of the Secretary of State for Transport as the certifying or approving body in relation to the Requirements. However, I have concerns with this proposal for the reasons set out in this letter and consider that there are several items which must be considered:

- Section 120 of the Planning Act 2008 provides that an order granting development consent may impose requirements, and, pursuant to section 120(2)(b), such requirements can include obtaining "the approval of the

Secretary of State or any other person".

- Section 19 of PINS Advice Note Fifteen: Drafting Development Consent Orders provides further guidance regarding discharging requirements and states as follows:

"19.1 … In many cases, the relevant planning authority for the area(s) within which the development is situated, is likely to be the relevant 'person' from which to obtain such approvals. For clarity, such Requirements should generally be drafted to identify the planning authority or authorities by name.
…
19.3 If an applicant proposes that the approval of matters be required from a discharging authority other than the relevant planning authority, the Applicant should consult with that discharging authority ahead of submitting the application and consider whether it has the required resources and expertise to perform that function."

Therefore, the default position under established practice is that the Secretary of State will be the decision-maker in respect of the Application, but the discharging authority will be the relevant planning authority.

Good practice point 3 in the Advice Note adds that:

"Applicants are also encouraged to confirm in the Explanatory Memorandum that the discharging authority has been consulted about and is willing to assume a discharging role."

I note that the Applicant did not consult the Secretary of State as to his willingness to assume a discharging role prior to the submission of the Application. The letter of 18 December 2018 does not amount to a consultation in substance, and was provided to the Department late in the day – prior to examination and not to application.

Whilst I acknowledge that the Secretary of State has been appointed as the discharging authority in relation to several highways Orders, for example in relation

to the A14, the M4 Smart Motorway, A19 / A184 Testo's Junction, there have been specific reasons to justify the departure from the general approach set out in the PINS advice note.

This approach has been justified to and accepted by the Department to ensure that: where the applicant for a DCO is Highways England, that agency does not discharge the requirements of what is effectively its own DCO; to enable an applicant to engage with a single consenting entity in circumstances in which it is implementing a linear scheme which crosses a number of local authority boundaries, removing the need for obtaining multiple discharges from each relevant planning authority; and in situations where the effects of discharging the Requirement would not be felt within the boundary of any local authority e.g. offshore activities.

In the absence of any reasons for departing from the general approach, the most appropriate person to assume the discharging role for the purposes of the Application remains the relevant planning authority. There are no previous DCOs in the aviation sector which conflict with this general approach.

Following review of the proposed Requirements contained in the draft DCO, as matters stand, I remain to be convinced that the relevant planning authority does not benefit from the necessary local knowledge and expertise, particularly for example, in relation to matters of landscaping and traffic management. Therefore, the default position remains that the relevant planning authority would be best placed to perform the role of discharging authority in keeping with Paragraphs 19.1 and 19.3 of PINS Advice Note Fifteen. Thanet District Council's view of the position has been confirmed by their representations made to date, that they, as the relevant planning authority, ought to discharge the requirements.

To adopt a different approach would require the Secretary of State to deviate from established policy and practice, and he does not consider it appropriate to seek to make new policy or set new precedent in relation to airports development.

I note that the Examining Authority has raised questions in relation to the inclusion of the Secretary of State as discharging authority in its second written questions and

requests for information (ExQ2) issued on 5 April 2019. I ask that you take account of this letter and these representations in the preparation of your response to this question and suggest that it would be appropriate for you to draw this letter to the attention of the Examining Authority.

To ensure that the Examining Authority is as well informed as possible in relation to the various options, I suggest that you clearly set out for the Examining Authority the alternatives to the inclusion of the Secretary of State as discharging authority and the reasons in favour of and against those approaches.

This letter is sent without prejudice to the Secretary of State's determination of the principle of the Application or to the content or form of any development consent order made pursuant to the Application.

Yours sincerely,

Jack Goodwin
Deputy Director, Environment, Strategy and Legal Defence,
Heathrow Expansion & Aviation and Maritime Analysis

BDB PITMANS

Jack Goodwin
Deputy Director, Strategy and Legal Defence, Heathrow Expansion
& Aviation and Maritime Analysis
Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR

Your Ref

Our Ref
ADW/166055.0003

Date
2 May 2019

Dear Mr Goodwin

Application (reference TR020002) by RiverOak Strategic Partners ("the Applicant") for an Order Granting Development Consent for the upgrade and reopening of Manston Airport ("the Application")

Thank you for your letter of 26 April; I respond to its contents as follows.

My client accepts that you were not consulted before the application was made, as recommended in current Planning Inspectorate advice; however, that version of the advice note was published after the Manston Airport application was made, and the previous version did not contain the recommendation to consult. It said "If an applicant proposes that the approval of matters be required from a person other than the relevant LPA, the applicant should consider whether that person has the capacity and expertise to perform that function." In any event, it is still possible to amend the DCO in line with any agreed position. I ask you to reconsider your position based on the following and request that you reply as soon as possible so that any adjustments can be made to the DCO.

The reasons you give for the Secretary of State discharging Highways England DCOs are not made out. First, this is not because otherwise Highways England would be discharging them itself, since, as you say, the default position is that the local planning authority would discharge them, not Highways England. Furthermore, before Highways England came into being in 2015, the Secretary of State was the discharging body for Highways Agency DCOs even though the Secretary of State was also the promoter of the project, so the requirements were then discharged by the same person as the promoter of the project.

On the second reason, even when Highways England projects do not cross local authority boundaries the Secretary of State is still the discharging authority. On the third reason, I do not understand the point about offshore activities as no highways projects involve those; however the effects of Manston Airport becoming operational would be felt outside not just Thanet District Council's area (Herne Bay,

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under the flightpath to the west, is in Canterbury City Council's area, and Dover District Council, although supportive, has expressed concerns about the visual impact of the project) but also any local authority area as the airport is surrounded by sea on three sides. Indeed our client has had to settle a statement of common ground with the promoters of the Thanet Offshore Windfarm Extension DCO because of the airport's potential offshore effects. The approval of the airport masterplan and detailed design could have an effect on surrounding windfarms depending on the radar installed, for example, and therefore involves specialist airport considerations.

Further, you give the reason that no previous aviation sector DCO conflicts with the approach of the local planning authority discharging requirements, but this is the first aviation sector DCO - so there is also no previous aviation DCO which adopts the approach of the local planning authority discharging requirements either. Indeed, as I hope I made clear in my letter, that as the first aviation sector DCO, the decision on discharging requirements for this DCO will set a precedent for other aviation DCOs, including the third runway at Heathrow. Does the Department for Transport really want the London Borough of Hillingdon, a recent challenger to the Airports National Policy Statement, to be responsible for a whole series of precommencement conditions before Heathrow expansion could go ahead? The argument in your letter about precedent would become appropriate in that case just as it is not appropriate in this one.

The Secretary of State would therefore not be diverging from established policy and practice, as there is no established policy and practice, and to establish it now will make it difficult to diverge from in the future.

Yours sincerely

[redacted]

Angus Walker
Partner
For and on behalf of BDB Pitmans LLP
T +44 (0)20 7783 3441
M +44 (0)7973 254187
E anguswalker@bdbpitmans.com

STRUCTURE CHART M.I.O. INVESTMENTS LIMITED

HLX Nominees Limited

Nick Rothwell

Rico Seitz

Gerhard Huesler

60%

17%

17%

6%

Anthony Freudmann

Niall Lawlor

George Yerrall

Riveroak Investments (UK) Limited
11959684

Riveroak Manston Limited (UK)
10286975

90%

10%<-

Riveroak Strategic Partners Limited (UK)
10269461

Creditor

M.I.O. Investments Limited (Belize)
162208

Riveroak AL Limited
10269458

Riveroak Fuels Limited
11535715

Riveroak Operations Limited (UK)
10311804
VAT# 268 396 551
Corp Tax #623 54849 13651 A

Riveroak MSE Limited
11720590

Lease Approach Lights

CALDER & CO
CHARTERED ACCOUNTANTS

PARTNERS

P K S EWEN D J GALLAGHER
D J LYON I ROSMARIN
T BADIANI J J DAVIS

16 CHARLES II STREET
LONDON SW1Y 4NW

TEL: 020 7839 6655
FAX: 020 7839 6016
EMAIL: info@calders.net
www.calders.net

Our Ref: R199J/JD

2 May 2019

Dear Sirs,

You have requested that we provide clarification of the group structure and company status of the various entities in the Riveroak Group.

We have enclosed a group structure diagram which shows the various companies and their position within the group from the information we currently hold in the statutory records. In addition, we set out below the accounts status of each company as currently shown at Companies House.

Company	Year End	Last Filed Accounts	Status
Riveroak Investments (UK) Limited	30 April	N/A	New Co
Riveroak Manston Limited	31 July	31 July 2018	Investment Holding Company
Riveroak Strategic Partners Limited	31 July	31 July 2018	Investment Holding Company
Riveroak AL Limited	31 July	31 July 2018	Trading
Riveroak Operations Limited	31 August	31 August 2017	Trading
Riveroak Fuels Limited	31 August	N/A	New Co
Riveroak MSE Limited	31 December	N/A	New Co

Riveroak Investments (UK) Limited, Riveroak Manston Limited and Riveroak Strategic Partners Limited are holding companies within the group structure and currently hold investments, by way of shares, in the trading group entities. These companies have not been classified as dormant companies due to the holding of investments. However, the profit and loss accounts of these entities do not contain any transactions.

The 2018 accounts of Riveroak Operations Limited are due for filing by 31st May 2019 and are currently in the process of being finalised before submission.

Cont'd/...2

REGISTERED TO CARRY ON AUDIT WORK IN THE UK AND IRELAND AND REGULATED FOR A RANGE OF INVESTMENT BUSINESS ACTIVITIES BY THE INSTITUTE OF CHARTERED ACCOUNTANTS IN ENGLAND AND WALES

Accounting * Audit * Business Start Up * Company Secretarial * Due Diligence * Inheritance Tax * Non-domiciles * Payroll * Personal & Corporate Tax * Tax Returns * Trusts & Estates * VAT

On 16th October 2018, Riveroak Fuels Limited acquired land and buildings on the North side of Canterbury Road West, Manston, Ramsgate for £2.3m. This asset will be shown in the company's first accounts which will be prepared for the period from incorporation to 31st August 2019.

Yours faithfully,

Calders

CALDER & CO

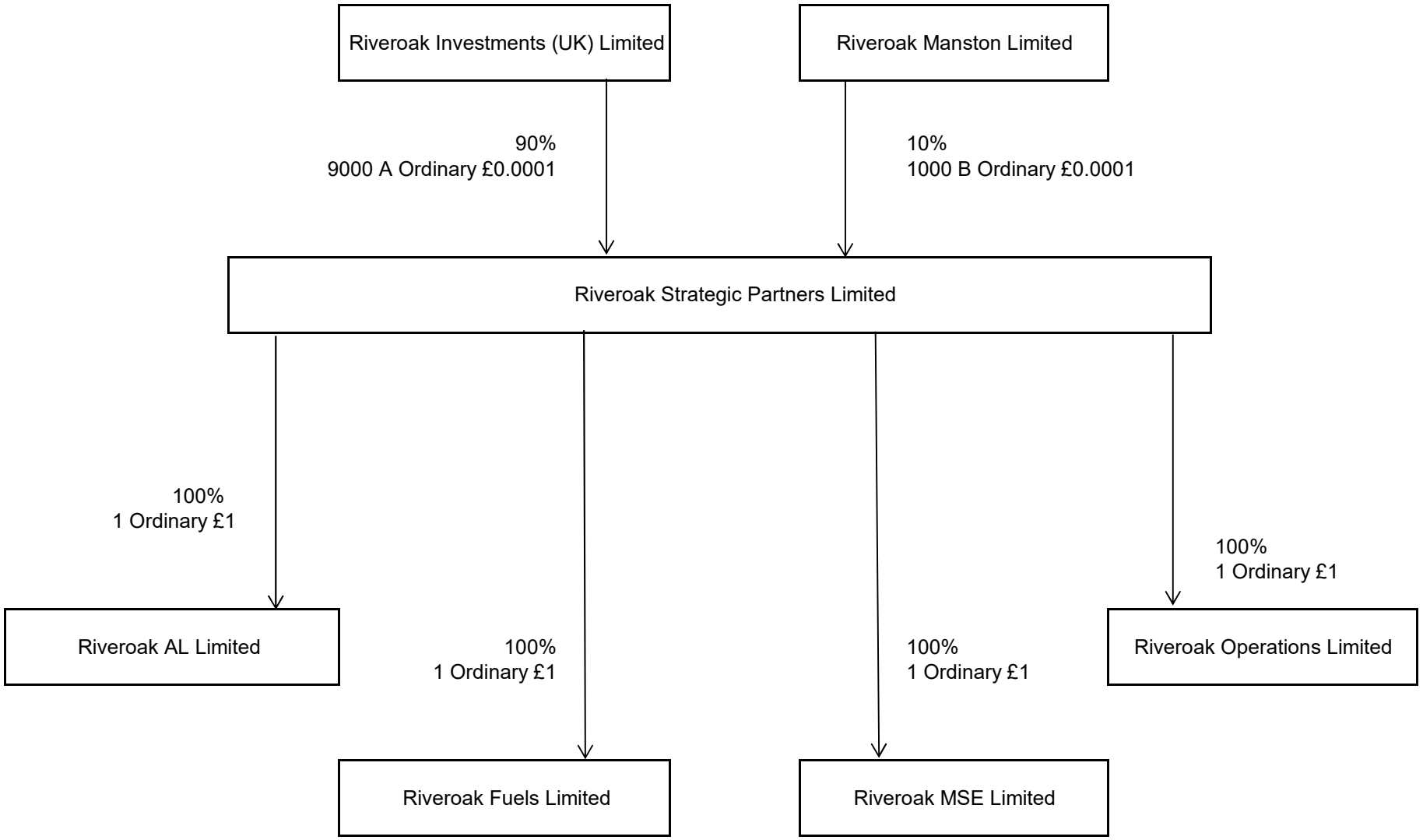
The Directors
Riveroak Strategic Partners Limited
50 Broadway
London
SW1H 0BL

By email

REGISTERED TO CARRY ON AUDIT WORK IN THE UK AND IRELAND AND REGULATED FOR A RANGE OF INVESTMENT BUSINESS ACTIVITIES BY THE INSTITUTE OF CHARTERED ACCOUNTANTS IN ENGLAND AND WALES

Accounting * Audit * Business Start Up * Company Secretarial * Due Diligence * Inheritance Tax * Non-domiciles * Payroll * Personal & Corporate Tax * Tax Returns * Trusts & Estates * VAT

RiverOak Group Structue



Registered Number 10286975

RIVEROAK MANSTON LIMITED

Dormant Accounts

31 July 2018

RIVEROAK MANSTON LIMITED **Registered Number 10286975**

Balance Sheet as at 31 July 2018

	2018	2017
	£	£
Called up share capital not paid	4	4
Net assets	**4**	**4**
Issued share capital		
4 Ordinary Shares of £ 1 each	4	4
Total Shareholder funds	**4**	**4**

STATEMENTS

a. For the year ending 31 July 2018 the company was entitled to exemption under section 480 of the Companies Act 2006 relating to dormant companies.
b. The members have not required the company to obtain an audit in accordance with section 476 of the Companies Act 2006.
c. The directors acknowledge their responsibilities for complying with the requirements of the Act with respect to accounting records and the preparation of accounts.
d. These accounts have been prepared in accordance with the provisions applicable to companies subject to the small companies regime.

Approved by the Board on 15 April 2019

And signed on their behalf by:
Anthony Freudmann, Director

This document was delivered using electronic communications and authenticated in accordance with the registrar's rules relating to electronic form, authentication and manner of delivery under section 1072 of the Companies Act 2006.

Registered Number 10269461

RIVEROAK STRATEGIC PARTNERS LIMITED

Dormant Accounts

31 July 2018

RIVEROAK STRATEGIC PARTNERS LIMITED **Registered Number 10269461**

Balance Sheet as at 31 July 2018

	2018	2017
	£	£
Called up share capital not paid	1.00	1.00
Net assets	**1.00**	**1.00**
Issued share capital		
9000 A Ordinary Shares of £ 0.0001 each	0.90	0.90
1000 B Ordinary Shares of £ 0.0001 each	0.10	0.10
Total Shareholder funds	**1.00**	**1.00**

STATEMENTS

a. For the year ending 31 July 2018 the company was entitled to exemption under section 480 of the Companies Act 2006 relating to dormant companies.
b. The members have not required the company to obtain an audit in accordance with section 476 of the Companies Act 2006.
c. The directors acknowledge their responsibilities for complying with the requirements of the Act with respect to accounting records and the preparation of accounts.
d. These accounts have been prepared in accordance with the provisions applicable to companies subject to the small companies regime.

Approved by the Board on 15 April 2019

And signed on their behalf by:
Anthony Freudmann, Director

This document was delivered using electronic communications and authenticated in accordance with the registrar's rules relating to electronic form, authentication and manner of delivery under section 1072 of the Companies Act 2006.

Registered number: 10269458

RIVEROAK AL LIMITED

UNAUDITED

FINANCIAL STATEMENTS

INFORMATION FOR FILING WITH THE REGISTRAR

FOR THE YEAR ENDED 31 JULY 2018

WEDNESDAY

A83JOL8A

A19 17/04/2019 #272

COMPANIES HOUSE

RIVEROAK AL LIMITED
REGISTERED NUMBER: 10269458

STATEMENT OF FINANCIAL POSITION
AS AT 31 JULY 2018

	Note		2018 £		*2017 £*
Current assets					
Debtors: amounts falling due within one year	4	1		*1*	
		1		*1*	
Creditors: amounts falling due within one year	5	(78,360)		*(46,380)*	
Net current liabilities			(78,359)		*(46,379)*
Total assets less current liabilities			(78,359)		*(46,379)*
Net liabilities			(78,359)		*(46,379)*
Capital and reserves					
Called up share capital	6		1		*1*
Profit and loss account	7		(78,360)		*(46,380)*
			(78,359)		*(46,379)*

The directors consider that the Company is entitled to exemption from audit under section 477 of the Companies Act 2006 and members have not required the Company to obtain an audit for the year in question in accordance with section 476 of Companies Act 2006.

The directors acknowledge their responsibilities for complying with the requirements of the Companies Act 2006 with respect to accounting records and the preparation of financial statements.

The financial statements have been prepared in accordance with the provisions applicable to companies subject to the small companies regime and in accordance with the provisions of FRS 102 Section 1A - small entities.

The financial statements have been delivered in accordance with the provisions applicable to companies subject to the small companies regime.

The Company has opted not to file the statement of income and retained earnings in accordance with provisions applicable to companies subject to the small companies' regime.

The financial statements were approved and authorised for issue by the board and were signed on its behalf on 12 April 2019

[redacted]

A Freudmann
Director

The notes on pages 2 to 4 form part of these financial statements.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 JULY 2018

1. Accounting policies

1.1 Basis of preparation of financial statements

The financial statements have been prepared under the historical cost convention unless otherwise specified within these accounting policies and in accordance with Section 1A of Financial Reporting Standard 102, the Financial Reporting Standard applicable in the UK and the Republic of Ireland and the Companies Act 2006.

The following principal accounting policies have been applied:

1.2 Operating leases: the Company as lessee

Rentals paid under operating leases are charged to the Statement of income and retained earnings on a straight line basis over the lease term.

1.3 Debtors

Short term debtors are measured at transaction price, less any impairment. Loans receivable are measured initially at fair value, net of transaction costs, and are measured subsequently at amortised cost using the effective interest method, less any impairment.

1.4 Creditors

Short term creditors are measured at the transaction price. Other financial liabilities, including bank loans, are measured initially at fair value, net of transaction costs, and are measured subsequently at amortised cost using the effective interest method.

1.5 Financial instruments

The Company only enters into basic financial instrument transactions that result in the recognition of financial assets and liabilities like trade and other debtors and creditors, loans from banks and other third parties, loans to related parties and investments in non-puttable ordinary shares.

2. Judgments in applying accounting policies and key sources of estimation uncertainty

In the application of the company's accounting policies management is required to make judgements, estimates and assumptions about the carrying value of assets and liabilities that are not readily ascertainable from other sources. The estimates and underlying assumptions are based on historical experience and other factors that are considered to be relevant. Actual outcomes may differ from these estimates.

The estimates and underlying assumptions are reviewed on a continuing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised.

The key areas of estimation uncertainty that have a significant effect on the amounts recognised in the financial statements are described below:

Prepayments & Accrued Expenditure

The company includes a provision for invoices which are yet to be received from and amounts paid in advance to suppliers. These provisions are estimated based upon the expected values of the invoices which are issued and services received following the period end.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 JULY 2018

3. Employees

The average monthly number of employees, including directors, during the year was 3 *(2017 - 3)*.

4. Debtors

	2018 £	*2017* *£*
Amounts owed by group undertakings	1	*1*
	1	*1*

5. Creditors: Amounts falling due within one year

	2018 £	*2017* *£*
Amounts owed to group undertakings	76,560	*45,480*
Accruals and deferred income	1,800	*900*
	78,360	*46,380*

6. Share capital

	2018 £	*2017* *£*
Allotted, called up and fully paid		
1 *(2017 - 1)* Ordinary share of £1.00	1	*1*

7. Reserves

Profit and loss account

The profit and loss reserve is fully distributable.

8. Related party transactions

At the year end, a balance of £76,560 (2017 - £45,480) was owing to Riveroak Operations Limited, a fellow subsidiary.

9. Controlling party

The company's parent undertaking is Riveroak Strategic Partners Limited, which owns 100% of the issued share capital. The ultimate controlling party is MIO Investments Limited, a 90% shareholder in the parent undertaking.

COMPLETION STATEMENT

Seller:	N.A. Jenkins-Graham, T.J. Cardy-Jenkins, A.N. Jenkins and J. Jenkins and D.A. Phillips & Co Limited
Buyer:	Riveroak Fuels Limited
Property:	Jentex Site, Canterbury Road West, Cliffsend, Ramsgate, Kent, CT12 5DU
Exchange:	26 July 2018
Completion:	12 September 2018
BDB Ref:	[redacted]

Purchase Price		£2,300,000
LESS		
Deposit already paid		(£300,000)
PLUS		
SDLT	£116,500	
Search Validation insurance	£295.00	
Chancel Repair Liability insurance	£480.00	
Land Registry Fees (Title K315361)	£455.00	
Land Registry Fees (Title K935532)	£455.00	£118,185.00
Balance required to complete		**£2,118,185.00**

Barclays Bank Plc
Canary Wharf, 1 Churchill Place, London, E14 5HP
Bircham Dyson Bell LLP Client STG
Sort code: [redacted]
A/c number: [redacted]
IBAN - [redacted]
Ref: [redacted]

N.B. Payment of £240,000 re historic planning costs to be made to AJFO directly

Independent Limited Assurance Report

To: the Directors of Riveroak Strategic Partners Limited

Date: 29th April 2019

We have been engaged by Riveroak Strategic Partners Limited to undertake a limited assurance engagement in respect of the period ended 31 March 2019, on the financial records of Riveroak Operations Limited as described below.

Management's Responsibilities

Management is responsible for the preparation and presentation of the financial information, current as at the date of our report. Management is also responsible for establishing and maintaining appropriate internal control and record keeping systems from which the reported information is derived.

Our Responsibility

Our responsibility in relation to the Report is to perform a limited assurance engagement and to express a conclusion based on the work performed. We conducted our engagement in accordance with International Standard on Assurance Engagements (ISAE) 3000 (Revised) Assurance Engagements other than Audits or Reviews of Historical Financial Information, issued by the International Auditing and Assurance Standards Board.

Assurance Approach

We planned and performed our work to obtain all of the evidence and information we considered necessary in order to form our conclusion as set out below. A limited assurance engagement consists of applying analytical and other evidence gathering procedures, as appropriate. Our procedures included:

- Reconciling the Profit and Loss expenditure to bank payments, taking into account Trade Creditors, VAT and payments relating to Balance Sheet items.
- Reviewing the money received to establish the source of income.
- Comparing the money received to the profit and loss expenditure.

The extent of evidence gathering procedures performed in a limited assurance engagement is less than that for a reasonable assurance engagement, and therefore a lower level of assurance is obtained.

Cont'd/…2

DRAFT

Our assurance report is provided solely to the Directors of Riveroak Strategic Partners Limited in accordance with the terms of our engagement. Our work has been undertaken so that we might report to the Directors of Riveroak Strategic Partners Limited on those matters that we have been engaged to report upon in this assurance report, and for no other purpose. We do not accept nor assume responsibility to anyone other than the Directors of Riveroak Strategic Partners Limited for our work, for this assurance report, or for the conclusion we have reached.

Independence and Competence

In conducting our engagement, we have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants. The engagement was conducted by a multidisciplinary team which included professionals with suitable skills and experience in both assurance and in the applicable subject matter.

Our Conclusion

Based on the procedures performed, we have confirmed that to date Riveroak Operations Limited has committed and expensed funds of £12.8m in the pursuance of the Riveroak group of companies' project in relation to Manston airport in Kent.

DRAFT

Calder & Co

Independent Limited Assurance Report

To: the Directors of Riveroak Strategic Partners Limited

Date: 29th April 2019

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Assurance Approach

We planned and performed our work to obtain all of the evidence and information we considered necessary in order to form our conclusion as set out below. A limited assurance engagement consists of applying analytical and other evidence gathering procedures, as appropriate. Our procedures included:

- Reconciling the Profit and Loss expenditure to bank payments, taking into account Trade Creditors, VAT and payments relating to Balance Sheet items.
- Reviewing the money received to establish the source of income.
- Comparing the money received to the profit and loss expenditure.

The extent of evidence gathering procedures performed in a limited assurance engagement is less than that for a reasonable assurance engagement, and therefore a lower level of assurance is obtained.

Cont'd/…2

DRAFT

Our assurance report is provided solely to the Directors of Riveroak Strategic Partners Limited in accordance with the terms of our engagement. Our work has been undertaken so that we might report to the Directors of Riveroak Strategic Partners Limited on those matters that we have been engaged to report upon in this assurance report, and for no other purpose. We do not accept nor assume responsibility to anyone other than the Directors of Riveroak Strategic Partners Limited for our work, for this assurance report, or for the conclusion we have reached.

Independence and Competence

In conducting our engagement, we have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants. The engagement was conducted by a multidisciplinary team which included professionals with suitable skills and experience in both assurance and in the applicable subject matter.

Our Conclusion

Based on the procedures performed, we have confirmed that to date Riveroak Operations Limited has committed and expensed funds of £12.8m in the pursuance of the Riveroak group of companies' project in relation to Manston airport in Kent.

DRAFT

Calder & Co

THIS DEED is dated 2016

BETWEEN

(1) **ANTHONY FREUDMANN** of [redacted] (**Mr Freudmann**); and

(2) **RIVEROAK STRATEGIC PARTNERS LIMITED** a company incorporated and registered in England and Wales with company number 10269461 whose registered office is at 50 Broadway, London SW1H 0BL (the **Company**).

BACKGROUND

(A) Mr Freudmann is the holder of an account with [redacted] (such account, together with any and all monies or rights from time to time derived from or contained in it, the **Account**).

(B) Mr Freudmann wishes to declare a trust in favour of the Company over the Account.

IT IS HEREBY AGREED

1. DECLARATION OF TRUST

1.1 Mr Freudmann hereby declares that he holds the Account as nominee and on trust for the Company.

1.2 Mr Freudmann declares that he has no beneficial interest in the Account.

2. UNDERTAKINGS

2.1. Mr Freudmann undertakes to:

2.1.1. exercise, as the Company may from time to time direct (but not otherwise), all rights, powers and privileges attaching to the Account or otherwise vested in him as registered holder of the Account;

2.1.2. provide immediate access to the Company to the Account and all information relating to it at all times;

2.1.3. promptly notify the Company of any notice, letter or other document received by Mr Freudmann in his capacity as registered holder of the Account;

2.1.4. deal with the Account (and, for the avoidance of doubt, all monies and rights derived from it) immediately and in accordance with any instructions given to him by the Company; and

2.1.5. indemnify the Company in respect of all costs, losses and expenses it incurs as a result of this arrangement, any breach of it or any enforcement of its rights.

3. POWER OF ATTORNEY

3.1. Mr Freudmann appoints the Company as his attorney with full power and authority on his behalf and in his name to deal with the Account on such terms as the Company in its absolute discretion sees fit and, for such purpose, to do all such acts and things and execute all such deeds and other documents as the Company in its absolute discretion sees fit.

3.2. The Company may delegate (by its board of directors, by resolution or otherwise) one or more of the powers conferred on it by this power of attorney to any person or firm.

3.3. This power of attorney shall be irrevocable, save with the consent of the Company or pursuant to clause 4.2.3, is given by way of security to secure the performance of the obligations owed by Mr Freudmann to the Company under this deed and may be relied upon by any third party to it on the basis that the Company and Mr Freudmann shall ratify any act taken in reliance upon it.

4. DURATION

4.1. This agreement shall continue until:

4.1.1. the Company or RiverOak Operations Limited (incorporated and registered in England and Wales with company number 10311804) (**ROOL**) sets up a bank account in its own name; and

4.1.2. the entire balance to the credit of the Account is transferred to the Company's or ROOL's bank account(s),

whereupon this agreement shall terminate.

4.2. Upon termination of this agreement:

4.2.1. the Account shall cease to be held on trust;

4.2.2. all obligations hereunder shall cease (without prejudice to any rights accrued prior to such termination); and

4.2.3. the power of attorney at clause 3 shall automatically be revoked.

5. GOVERNING LAW AND JURISDICTION

5.1. This deed and any disputes or claims (including non-contractual disputes or claims) arising out of or in connection with it or its subject matter or formation shall be governed by and construed in accordance with the law of England and Wales.

5.2. Mr Freudmann and the Company agree that the courts of England and Wales shall have exclusive jurisdiction to settle any dispute or claim (including non-contractual disputes and claims) arising out of or in connection with this deed or its subject matter or formation.

This document has been executed as a deed and is delivered and takes effect on the date stated at the beginning of it.

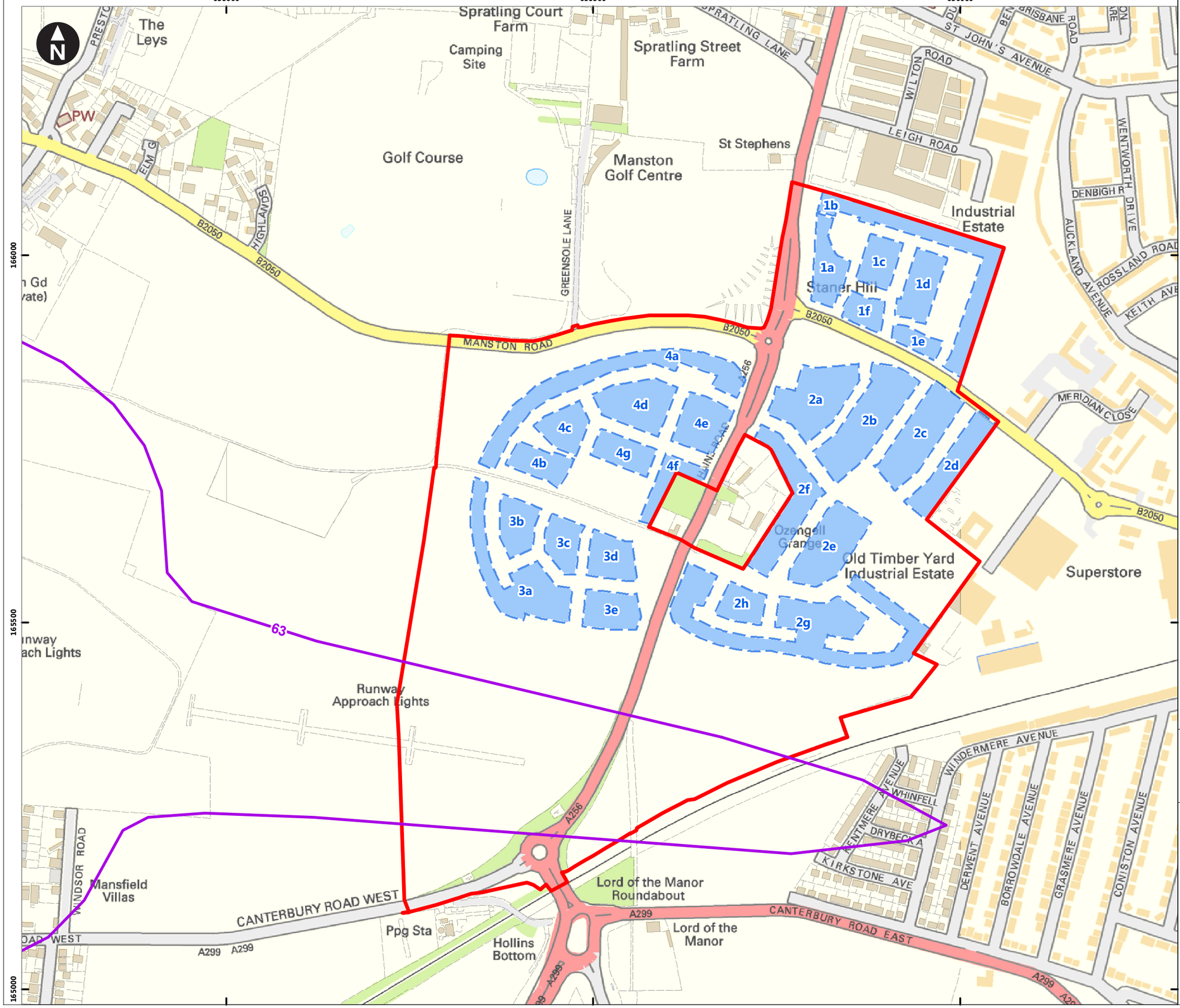
EXECUTED as a DEED by ANTHONY FREUDMANN)
)
) .....
) Anthony Freudmann
)
in the presence of:) .....
Witness

Witness name: [redacted]
Witness address:
Witness occupation:

EXECUTED as a DEED by RIVEROAK STRATEGIC PARTNERS LIMITED) Director

in the presence of: ...
Witness

Witness name: [redacted]
Witness address: [redacted]
Witness occupation: [redacted]



Key

- Manston Green Development
- Residential dwelling block
- 63 dB SOAEL

0 100 200 300 m

Scale at A3: 1:5,000

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Client

RSP

Manston Airport DCO

Noise impact at the Manston Green Development - year of forecast maximum capacity

April 2019

wood.

H:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon114.mxd Originator: jacqui.parkin

BELIZE

APOSTILLE

(Convention de La Haye du 5 Octubre 1961)

COUNTRY: **BELIZE**

1. **THIS PUBLIC DOCUMENT:** **CERTIFICATE OF INCORPORATION – *M.I.O. INVESTMENTS LIMITED***
2. **HAS BEEN SIGNED BY:** **SANTIAGO GONZALEZ**
3. **ACTING AS:** **DEPUTY REGISTRAR OF INTERNATIONAL BUSINESS COMPANIES REGISTRY**
4. **BEARING THE SEAL/STAMP OF:** **INTERNATIONAL BUSINESS COMPANIES REGISTRY**

CERTIFIED

5. **AT:** BELIZE 6. **ON:** 30. 6. 2016
7. **BY:** EDMUND O. PENNIL
8. **UNDER NO.:** 10819/2016
9. **SEAL:**
10. **SIGNATURE:**

[redacted]

DEPUTY REGISTRAR GENERAL

BELIZE CITY, BELIZE

THE INTERNATIONAL BUSINESS COMPANIES ACT
Chapter 270 of the Laws of Belize, Revised Edition 2000

Certificate of Incorporation

The undersigned, Registrar of International Business Companies, HEREBY

C E R T I F I E S, pursuant to Section 14(3) of The International Business Companies Act, that

all the requirements of said Act in respect of incorporation have been complied with.

M.I.O. Investments Limited *No.* **162,208**

is incorporated in Belize City, Belize as an International Business Company

this **30th** *day of* **June** *, two thousand* **sixteen**

G I V E N under my hand and Seal in Belize City, Belize.

[redacted]

DEPUTY REGISTRAR OF INTERNATIONAL
BUSINESS COMPANIES

Date of Appointment	Full Name (And any Former Names or Alias)	Nationality and ID/PPT No.	Residential Address (or Registered Office Address)	Business Occupation or Other Directorship	Date of Ceasing to Act
30.06.2016	HLX Directors Limited Date of Incorporation 20.11.2014	BVI / 1850359	263 Main Street, Road Town, Tortola, BVI	Director	

M.I.O. INVESTMENTS LIMITED
Registration number: 162208

REGISTER OF DIRECTORS

BELIZE

APOSTILLE

(Convention de La Haye du 5 Octubre 1961)

COUNTRY: BELIZE

1. THIS PUBLIC DOCUMENT: CERTIFICATE OF NOTARY

2. HAS BEEN SIGNED BY: EMIL M. ARGUELLES

3. ACTING AS: NOTARY PUBLIC

4. BEARING THE SEAL/STAMP OF: NOTARY PUBLIC

CERTIFIED

5. AT BELIZE 6. ON 5.7.2018

7. BY EDMUND O. PENNIL

UNDER NO. 11118/2018

SEAL: 10. SIGNATURE:

[redacted]

DEPUTY REGISTRAR GENERAL

BELIZE, A.D. 2016

CERTIFICATE OF NOTARY

TO ALL TO WHOM these presents shall come, I, **EMIL M. ARGUELLES**, duly authorized Notary Public of Belize **HEREBY CERTIFY** that the document hereunto annexed being a **Memorandum and Articles of Association** for **M.I.O. Investments Limited,** has been certified by A.J.K. Corporate Services (Belize) Limited as Registered Agent and is a true copy of its original.

IN FAITH AND TESTIMONY WHEREOF I have hereunto set my hand and seal of office at Suite 401, The Matalon, Coney Drive, Belize City, Belize, this 5th day of July, 2016.

[redacted]

EMIL M. ARGUELLES
Notary Public of Belize
Unlimited Commission

I. B. C. NO. 162,208

BELIZE

THE INTERNATIONAL BUSINESS COMPANIES ACT
Chapter 270 of the Laws of Belize, Revised Edition 2000

MEMORANDUM
AND ARTICLES OF ASSOCIATION
OF

M.I.O. Investments Limited

INCORPORATED THE 30TH JUNE, 2016

REGISTERED OFFICE AND REGISTERED AGENT
A.J.K. CORPORATE SERVICES (BELIZE) LIMITED
Blake Building, Suite 306
Corner of Eyre & Hutson Street, P.O. Box 2670
Belize City, Belize

BELIZE

THE INTERNATIONAL BUSINESS COMPANIES ACT

Chapter 270 of the Laws of Belize, Revised Edition 2000

MEMORANDUM OF ASSOCIATION

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1. NAME

The name of the Company is **M.I.O. Investments Limited.**

2. REGISTERED OFFICE

The Registered Office of the Company will be at Blake Building, Suite 306, Corner of Eyre & Hutson Street, P.O. Box 2670, Belize City, Belize, or such other place within Belize as the Company may from time to time by a resolution of directors determine.

3. REGISTERED AGENT

The Registered Agent of the Company will be A.J.K. CORPORATE SERVICES (BELIZE) LIMITED of Blake Building, Suite 306, Corner of Eyre & Hutson Street, P.O. Box 2670, Belize City, Belize, or such other qualified person in Belize as the Company may from time to time by a resolution of directors determine.

4. GENERAL OBJECTS AND POWERS

The objects of the Company is to engage in any act or activity that is not prohibited under any Law being in force in Belize including, but not limited to, the following :

4.1 The purchase, sale, transfer, disposal, dealing, finance, barter, ownership, administration, giving or taking in loan, commission, mortgage, security, lease, use, usufruct, or receivership of any kind of property, whether real or personal, stocks or rights, and make and accept all kinds of deals, contracts, operations, businesses and transactions of lawful commerce .

4.2 For such purposes the Company shall have, in addition to the powers conferred by the Law, the following:

(1) to sue and to be sued in lawsuit;
(2) to adopt and use a corporate seal and alter it at pleasure;
(3) to acquire, construct, purchase, hold, use and convey real and personal property of every kind, and make and accept pledge, mortgage, leases, liens and encumbrances of every kind;
(4) to appoint officers and agents;
(5) to enter into contracts of all kinds;
(6) to issue By-laws not inconsistent with the laws in force, for the management, regulation and government of its business and properties, for the transfer of shares, the calling and holding of meetings of shareholders and directors, and for any lawful purpose;
(7) to carry on its business and exercise its powers in foreign countries;
(8) to agree on its dissolution in accordance with the law, either by its own will or for any other cause;
(9) to open and manage bank accounts in Belize or abroad;
(10) to borrow money and contract debts in connection with its business or for any lawful purpose;
(11) to issue bonds, notes, bills of exchange, and other obligations (which may or may not be convertible into stock of the Company) payable at a specific time or times or payable upon the happening of a specific event, whether secured by mortgage, pledge or otherwise, or unsecured, for money borrowed or in payment for property purchased or acquired or for any other lawful purpose;

(12) to guarantee, acquire, purchase, hold, sell, assign, transfer, mortgage, pledge or otherwise dispose of or deal in shares of the capital stock or bonds, or other obligations issued by other companies or any municipality, province, state or government;

(13) to do whatever may be necessary for the accomplishment of the purposes enumerated in the Memorandum of Association or any amendment thereof of necessary or incidental to the protection and benefit of the Company and, in general, to carry on any lawful business whether or not such business is similar in nature to the purpose set forth in this Memorandum of Association or in any amendment thereof;

(14) to settle the Company assets or property of the Company and to settle the Company's assets or property or any part thereof in trust .

5. EXCLUSIONS

5.1 The Company is not authorised and may not :

(1) carry on business with persons resident in Belize;

(2) own an interest in real property situated in Belize, other than a lease referred to in paragraph (5) of sub clause 5.2;

(3) carry on banking business unless it is licensed under an enactment authorising it to carry on such business;

(4) carry on business as an insurer or reinsurance company, insurance agent or insurance broker, unless it is licensed under an enactment authorizing it to carry on that business;

(5) carry on the business of providing the registered office or the registered agent for companies incorporated in Belize.

5.2 In compliance with paragraph (1) of sub clause 5.1, the Company shall not be treated as carrying on business with persons resident in Belize if :

(1) it makes or maintains deposits with a person carrying on business within Belize;

(2) it makes or maintains professional contact with solicitors, barristers, accountants, book-keepers trust companies, administration companies, investment advisers or other similar persons carrying on business within Belize;

(3) it prepares or maintains books and records within Belize;

(4) it celebrates within Belize meetings of its directors or members;

(5) it maintains a lease of property for use as an office from which to communicate with members of where books and records of the Company are prepared or maintained;

(6) it maintains shares, debt obligations or other securities in a company incorporated under the International Business Companies Act; or,

(7) shares, debt obligations or other securities in the Company are owned by any other company incorporated under the International Business Companies Act .

6. SHARE CAPITAL

6.1 Shares in the Company shall be issued in the currency of the United States of America .

6.2 The authorised capital of the Company is **Ten Thousand US Dollar (USD $10,000.00)** divided into **10,000 shares of One US Dollar (USD 1.00)** par value each.

6.3 The shares shall be divided into such number of classes and series as the directors shall by resolution from time to time determine and until so divided shall comprise one class and series .

6.4 The designations, powers, preferences, rights, qualifications, limitations and restrictions of each class and series of shares that the Company is authorised to issue shall be fixed by resolution of directors, but the directors shall not allocate different rights as to voting, dividends, redemption or distributions on liquidation unless the Memorandum of Association shall have been amended to create separate classes of shares and all the aforesaid rights as to voting, dividends, redemption and distributions shall be identical in each separate class.

6.5 If at any time the authorised capital is divided into different classes or series of shares, the rights attached to any class or series (unless otherwise provided by the terms of issue of the shares of that class or series) may, whether or not the Company is being wound up, be varied with the consent in writing of the holders of not less than three-fourths of the issued shares of that class or series and of the holders of not less than three-fourths of the issued shares of any other class or series of shares which may be affected by such variation.

6.6 The rights conferred upon the holders of the shares of any class issued with preferred or other rights shall not, unless otherwise expressly provided by the terms of issue of the shares of that class, be deemed to be varied by the creation or issue of further shares ranking pari passu therewith .

6.7 The Company may issue all or part of its authorised shares either as registered shares or as shares to bearer. Shares issued as registered shares may be exchanged for shares issued to bearer. Shares issued to bearer may be exchanged for registered shares .

6.8 Where shares are issued to bearer, the bearer, identified for this purpose by the number of the share certificate, shall be requested to provide the Company with the name and address of an agent for service of any notice, information or written statement required to be given to members, and service upon such agent shall constitute service upon the bearer of such shares until such time as a new name and address for service is provided to the Company. In the absence of such name and address being provided it shall be sufficient for the purposes of service for the Company to publish the notice, information or written statement in one or more newspapers published or circulated in Belize and in such other place, if any, as the Company shall from time to time by a resolution of directors or a resolution of members determine. The directors of the Company must give sufficient notice of meetings to members holding shares issued to bearer to allow a reasonable opportunity for them to secure or exercise the right or privilege, other than the right or privilege to vote, that is the subject of the notice. What amounts to sufficient notice is a matter of fact to be determined after having regard to all the circumstances.

6.9 Registered shares in the Company may be transferred subject to the prior or subsequent approval of the Company as evidenced by a resolution of directors or by a resolution of members .

7. AMENDMENTS

The Company may amend this Memorandum of Association by a resolution of its members or directors .

We, A.J.K. CORPORATE SERVICES (BELIZE) LIMITED of, Blake Building, Suite 306, Corner of Eyre & Hutson Street, P.O. Box 2670, Belize City, Belize, for the purpose of incorporating an International Business Company under the laws of Belize hereby subscribe our name to this Memorandum of Association on this **30th June, 2016** in the presence of the undersigned witness .

[redacted]

Shirleen White
Belize City, Belize

[redacted]

A.J.K. CORPORATE SERVICES (BELIZE) LIMITED,
Blake Building, Suite 306, Corner of Eyre & Hutson Street,
P.O. Box 2670, Belize City, Belize

[redacted]

BELIZE
THE INTERNATIONAL BUSINESS COMPANIES ACT
Chapter 270 of the Laws of Belize, Revised Edition 2000

ARTICLES OF ASSOCIATION

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1. INTERPRETATION

In these Articles, if not inconsistent with the subject of context, the following words and expressions shall bear the meanings set below them .

Capital: The sum of the aggregate par value of all outstanding shares with par value of the Company and shares with par value held by the Company as treasury shares plus :

(1) the aggregate of the amounts designated as capital of all outstanding shares without par value of the Company and shares without par value held by the Company as treasury shares; and,

(2) the amounts as are from time to time transferred from surplus to capital by a resolution of directors.

Member: A person who holds shares in the Company.

Person: An individual, a corporation, a trust, the estate of a deceased individual, a partnership or an unincorporated association of persons.

Resolution oF Directors: A resolution approved at a duly constituted meeting of directors of the Company or of a committee of directors of the Company by the affirmative vote of a simple majority of the directors present who voted and did not abstain where the meeting was called on proper notice, or, if on short notice, if those directors not present have waived notice; or a resolution consented to in writing by all directors or by all members of the committee, as the case may be .

Resolution of Members:

(1) A resolution approved at a duly constituted meeting of the members of the Company by the affirmative vote of: (i) a simple majority of the votes of the shares which were present at the meeting and were voted and not abstained, or (ii) such larger majority as specified in these Articles, or (iii) a simple majority of the votes of each class or series of shares which were

present at the meeting and entitled to vote thereon as a class or series and were voted and not abstained and of a simple majority of the votes of the remaining shares entitled to vote thereon which were present at the meeting and were voted and not abstained; or,

(2) a resolution consented to in writing by, (i) an absolute majority of the votes of shares entitled to vote thereon or, (ii) an absolute majority of the votes of each class or series of shares entitled to vote thereon as a class or series and of an absolute majority of the votes of the remaining shares entitled to vote thereon.

Securities: Shares and debt obligations of every kind, options, warrants and rights to acquire shares or debt obligations .

Surplus: The excess, if any, at the time of the determination, of the total assets of the Company over the sum of its total liabilities, as shown in its books of account, plus the Company's capital .

The Memorandum: The Memorandum of Association of the Company as originally framed or as from time to time amended.

The Act: The International Business Companies Act, Chapter 270, of the Laws of Belize, Revised Edition, 2000.

The Seal: The Common Seal of the Company.

These Articles: These Articles of Association as originally framed or as from time to time amended .

Treasury Shares: Shares of the Company that were previously issued but were repurchased, redeemed or otherwise acquired by the Company and not cancelled .

Registered Shares: Shares in the Company that are issued as registered shares, and that are issued in the name or names of the holder(s) indicated on the certificate(s).

Court: The Supreme Court of Belize or a Judge thereof.

"Written" or any term of like import includes words typewritten, printed, painted, engraved, lithographed, photographed, or represented or reproduced by any mode of representing or reproducing words in a visible form, including telex, telegram, cable or other form of writing produced by electronic communication .

Save as aforesaid any words or expressions defined in the Act shall bear the same meaning in these Articles .

Whenever the singular or plural number, or the masculine, feminine or neuter gender is used in these Articles, it shall equally, where the context admits, include the others .

A reference in these Articles to voting in relation to shares shall be construed as a reference to voting by members holding the shares except that it is the votes allocated to the shares that shall be counted and not the number of members who actually voted and a reference to shares being present at a meeting shall be given a corresponding construction .

A reference to money in these Articles is a reference to the currency of the United States of America unless otherwise stated.

2. REGISTERED SHARES

2.1 The Company shall issue to every member holding registered shares in the Company a certificate signed by a director or officer of the Company and under the Seal specifying the share or shares held by him and the signature of the director or officer and the Seal may be facsimiles .

2.2 Any member receiving a share certificate for registered shares shall indemnify and hold the Company and its directors and officers harmless from any loss or liability which it or they may incur by reason of the wrongful or fraudulent use of representation made by any person by virtue of the possession thereof. If a share certificate for registered shares is worn out or lost, it may be renewed on production of the worn out certificate or on satisfactory proof of its loss together with such indemnity as may be required by a resolution of directors .

2.3 If several persons are registered as joint holders of any shares, any one of such persons may be given an effectual receipt for any dividend payable in respect of such shares .

2.4 Subject to any limitations or provisions to the contrary in its Memorandum and Articles of Association,

the Company may purchase, redeem or otherwise acquire and hold its own shares, but only out of surplus or in exchange for newly issued shares of equal value .

2.5 The Company may not purchase, redeem or otherwise acquire and hold its own shares, without the consent of the member whose shares are to be purchased, redeemed or otherwise acquired, unless it is permitted in the Memorandum and Articles of Association or by restrictions in the share certificates .

3. BEARER SHARES

3.1 Subject to a request for the issue of bearer shares and to the payment of the appropriate consideration for the shares to be issued, the Company may, to the extent authorised by the Memorandum, issue bearer shares to, and at the expense of, such person as shall be specified in the request. The Company may also upon receiving a request in writing accompanied by the share certificate for the shares in question, exchange registered shares for bearer shares or may exchange bearer shares for registered shares. Such request served on the Company by the holder of bearer shares shall specify the name and address of the person to be registered and unless the request is delivered in person by the bearer shall be authenticated as hereinafter provided. Such request served on the Company by the holder of bearer shares shall also be accompanied by any coupons or talons which at the date of such delivery have not become due for payments of dividends or any other distribution by the Company to the holders of such shares. Following such exchange the share certificate relating to the exchanged shares shall be delivered as directed by the member requesting the exchange .

3.2 Bearer share certificates shall be under the Seal and shall carry an identifying number and state that the bearer is entitled to the shares therein specified, and may provide by coupons, talon, or otherwise for the payment of dividends or other monies on the shares included therein to the address to which the bearer shares were originally sent .

3.3 Subject to the provisions of the Act and of these Articles the bearer of a bearer share certificate shall be deemed to be a member of the Company and shall be entitled to the same rights and privileges as he would have had if his name had been included in the share register of the Company as the holder of the shares .

3.4 Subject to any specific provisions in these Articles, in order to exercise his rights as a member of the Company, the bearer of a bearer share certificate shall produce the bearer share certificate as evidence of his membership of the Company. Without prejudice to the generality of the foregoing, the following rights may be exercised in the following manner :

(1) for the purpose of exercising his voting rights at a meeting, the bearer of a bearer share certificate shall produce such certificate to the chairman of the meeting;

(2) for the purpose of exercising his vote on a resolution in writing, the bearer of a bearer share certificate shall cause his signature to any such resolution to be authenticated as hereinafter set forth;

(3) for the purpose of requisitioning a meeting of members, the bearer of a bearer share certificate shall address his requisition to the directors and his signature thereon shall be duly authenticated as hereinafter provided; and

(4) for the purpose of receiving dividends, the bearer of the bearer share certificate shall present at such places as may be designated by the directors any coupons or talons issued for such purpose, or shall present the bearer share certificate to any paying agent authorised to pay dividends .

3.5 The signature of the bearer of a bearer share certificate shall be deemed to be duly authenticated if the bearer of the bearer share certificate shall produce such certificate to a notary public or a bank manager or a director or officer of the Company (herein referred to as an "authorised person" and if the authorised person shall endorse the document bearing such signature with a statement

(1) identifying the bearer share certificate produced to him by number and date and specifying the number of shares and the class of shares (if appropriate) comprised therein;

(2) confirming that the signature of the bearer of the bearer share certificate was subscribed in his presence and that if the bearer is representing a body corporate he has so acknowledged and has produced satisfactory evidence thereof;

(3) specifying the capacity in which he is qualified as an authorised person and, if a notary public, affixing his seal thereto, or, if a bank manager, attaching an identifying stamp of the bank of which he is a manager.

3.6 Notwithstanding any other provisions of these Articles, at any time, the bearer of a bearer share

certificate may deliver the certificate for such shares into the custody of the Company at its registered office, whereupon the Company shall issue a receipt therefore under the Seal signed by a director or officer identifying by name and address the person delivering such certificate and specifying the date and number of bearer share certificates so deposited and the number of shares comprised therein. Any such receipt may be used by the person named therein for the purpose of exercising the rights vested in the shares represented by the bearer share certificate so deposited including the right to appoint a proxy. Any bearer share certificate so deposited shall be returned to the person named in the receipt or his personal representative if such person be dead and thereupon the receipt issued therefore shall be of no further effect whatsoever and shall be returned to the Company for cancellation or, if it has been lost or mislaid, such indemnity as may be required by resolution of directors shall be given to the Company .

3.7 The bearer of a bearer share certificate shall for all purposes be deemed to be the owner of the shares comprised in such certificate and in no circumstances shall the Company or the Chairman of any meeting of members or the Company's registrars or any director or officer of the Company or any authorised person be obliged to inquire into the circumstance whereby a bearer share certificate came into the hands of the bearer thereof, or to question the validity or authenticity of any action taken by the bearer of a bearer share certificate whose signature has been authenticated as provided herein .

3.8 If the bearer of a bearer share certificate shall be a corporation, then all the rights exercisable by virtue of such shareholding may be exercised by an individual duly authorised to represent the corporation but unless such individual shall acknowledge that he is representing a corporation and shall produce upon request satisfactory evidence that he is duly authorised to represent the corporation, the individual shall for all purposes hereof be regarded as the holder of the shares in any bearer share certificate held by him.

3.9 The directors may provide for payment of dividends to the holders of bearer shares by coupons or talons and in such event the coupons or talons shall be in such form and payable at such time and in such place or places as the directors shall resolve. The Company shall be entitled to recognize the absolute right of the bearer of any coupon or talon issued as aforesaid to payment of the dividend to which it relates and delivery of the coupon or talon to the Company or its agents shall constitute in all respects a good discharge of the Company in respect of such dividend .

3.10 If any bearer share certificate, coupon or talon be worn out or defaced, the directors may, upon the surrender hereof for cancellation, issue a new one in its stead, and if any bearer share certificate, coupon or talon be lost or destroyed, the directors may upon the loss or destruction being established to their satisfaction, and upon such indemnity being given to the Company as it shall by resolution of directors determine, issue a new bearer share certificate in its stead, and in either case on payment of such sum as the Company may from time to time by resolution of directors require. In case of loss or destruction the person to whom such new bearer share certificate, coupon or talon is issued shall also bear and pay to the Company all expenses incidental to the investigation by the Company of the evidence of such loss or destruction and to such indemnity .

4. SHARES, AUTHORISED CAPITAL AND CAPITAL

4.1 Subject to the provisions of these Articles and any resolution of members the unissued shares of the Company shall be at the disposal of the directors who may without prejudice to any rights previously conferred on the holders of any existing shares or class or series of shares, offer, allot, grant options over or otherwise dispose of the shares to such persons, at such times and upon such terms and conditions as the Company may by resolution of directors determine .

(1) The Memorandum or Articles, or an agreement for the subscription of shares may contain provisions for the forfeiture of shares for which payment is not made pursuant to a promissory note or other written binding obligation for payment of a debt .

(2) Any provision in the Memorandum or Articles, or in an agreement for the subscription of shares providing for the forfeiture of shares, shall contain a requirement that written notice specifying a date for payment to be made, be served on the member who defaults in making payment, pursuant to a promissory note or other written binding obligation to pay a debt .

(3) The written notice referred to in subsection 4.1 paragraph (2) shall name a further date not earlier than the expiration of 14 days from the date of service of the notice on or before which the payment required by the notice is to be made and shall contain a statement that in the event of non-payment at or before the time named in the notice the shares, or any of them, in respect of which payment is not made will be subject to forfeiture .

(4) Where a notice has been issued under this section and the requirements of the notice have not been complied with, the directors may, at any time before tender of payment, by resolution of directors forfeit and cancel the shares to which the notice relates .

(5) The Company is under no obligation to refund any monies to the member whose shares have been cancelled pursuant to subsection 4.1 of paragraph (4) and that member shall be discharged from any further obligation to the Company.

4.2 Shares in the Company shall be issued for money, services rendered, personal property, an estate in real property, a promissory note or other binding obligation to contribute money or property, or any combination of the foregoing as shall be determined by a resolution of directors.

4.3 Shares in the Company may be issued for such amount of consideration as the directors may from time to time by resolution of directors determine, except that in the case of shares with par value, the amount shall not be less than the par value and in the absence of fraud the decision of the directors as to the value of the consideration received by the Company in respect of the issue is conclusive unless a question of law is involved. The consideration in respect of the shares constitutes capital to the extent of the par value and the excess constitutes surplus.

4.4 A share issued by the Company upon conversion of, or in exchange for, another share or a debt obligation or other security in the Company, shall be treated for all purposes as having been issued for money equal to the consideration received or deemed to have been received by the Company in respect of the other share, debt obligation or security.

4.5 Treasury shares may be disposed of by the Company on such terms and conditions (not otherwise inconsistent with these Articles) as the Company may by resolution of directors determine.

4.6 The Company may issue fractions of a share and a fractional share shall have the same corresponding fractional liabilities, limitations, preferences, privileges, qualifications, restrictions, rights and other attributes of a whole share of the same class or series of shares.

4.7 Upon the issue by the Company of a share without par value, the consideration in respect of the share constitutes capital to the extent designated by the directors and the excess constitutes surplus, except that the directors must designate as capital an amount of the consideration that is at least equal to the amount that the share is entitled to as a preference, if any, in the assets of the Company upon liquidation of the Company.

4.8 The Company may, by resolution of its shareholders, purchase, redeem or otherwise acquire and hold its own shares but no purchase, redemption or other acquisition which shall constitute a reduction in capital shall be made except in compliance with Regulations 7.4 and 7.5.

4.9 A determination by the directors under the preceding Article is not required where shares are purchased, redeemed or otherwise acquired:

(1) pursuant to a right of a member to have his shares redeemed or to have his shares exchanged for money or other property of the Company;
(2) in exchange for newly issued shares in the Company;
(3) by virtue of the provisions of Section 79 of the Act;
(4) pursuant to an order of the Court.

4.10 Shares that the Company purchases, redeems or otherwise acquires pursuant to Regulation 4.8 may be cancelled or held as treasury shares unless the shares are purchased, redeemed or otherwise acquired out of capital and would otherwise infringe upon the requirements of Regulations 7.4 and 7.5, or to the extent that such shares are in excess of 80 percent of the issued shares of the Company, in which case they shall be cancelled but they shall be available for reissue. Upon the cancellation of a share, the amount included as capital of the Company with respect to that share shall be deducted from the capital of the Company.

4.11 Where shares in the Company are held by the Company as treasury shares or are held by another company of which the Company holds, directly or indirectly, shares having more than 50 percent of the votes in the election of directors of the other company, such shares of the Company are not entitled to vote or to have dividends paid thereon and shall not be treated as outstanding for any purpose except for purposes of determining the capital of the Company.

5. TRANSFER OF SHARES

5.1 Subject to any limitations in the Memorandum, registered shares in the Company may be transferred by a written instrument of transfer signed by the transferor and containing the name and address of the transferee, but in the absence of such written instrument of transfer the directors may accept such evidence of a transfer of shares as they consider appropriate.

5.2 The Company shall not be required to treat a transferee of a registered share in the Company as a member until the transferee's name has been entered in the register of members .

5.3 Subject to any limitations in the Memorandum, the Company must on the application of the transferor or transferee of a registered share in the Company enter in the share register the name of the transferee of the share save that the registration of transfers may be suspended and the share register closed at such times and for such periods as the Company may from time to time by resolution of directors determine provided always that such registration shall not be suspended and the share register closed for more than 60 days in any period of 12 months.

6. TRANSMISSION OF SHARES

6.1 The executor or administrator of a deceased member, the guardian of an incompetent member or the trustee of a bankrupt member shall be the only person recognized by the Company as having any title to his share but they shall not be entitled to exercise any rights as a member of the Company until they have proceeded as set forth in the next following two regulations .

6.2 Any person becoming entitled by operation of law or otherwise to a share or shares in consequence of the death, incompetence or bankruptcy of any member may be registered as a member upon such evidence being produced as may reasonably be required by the directors. An application by any such person to be registered as a member shall be deemed to be a transfer of shares of the deceased, incompetent or bankrupt member and the directors shall treat it as such.

6.3 Any person who has become entitled to a share or shares in consequence of the death, incompetence or bankruptcy of any member may, instead of being registered himself, request in writing that some person to be named by him be registered as the transferee of such share or shares and such request shall likewise be treated as if it were a transfer.

6.4 What amounts to incompetence on the part of a person is a matter to be determined by the court having regard to all the relevant evidence and the circumstances of the case .

7. REDUCTION OR INCREASE IN AUTHORISED CAPITAL OR CAPITAL

7.1 The Company may, by a resolution of members or directors, amend the Memorandum to increase or reduce its authorised capital and in connection therewith the Company may in respect of any unissued shares increase or reduce the number of shares, increase or reduce the par value of any shares or effect any combination of the foregoing.

7.2 The Company may amend the Memorandum to :

(1) divide the shares, including issued shares, of a class or series into a larger number of shares of the same class or series; or

(2) combine the shares, including issued shares, of a class or series into smaller number of shares of the same class or series; provided however, that where shares are divided or combined under (1) and (2) of Regulation 7.2, the aggregate par value of the new shares must be equal to the aggregate par value of the original shares.

7.3 The capital of the Company may, by a resolution of members or directors, be increased by transferring an amount of the surplus of the Company to capital, and, subject to the provisions of Regulations 7.4 and 7.5, the capital of the Company may be reduced by transferring an amount of the capital of the Company to surplus .

7.4 No reduction of the capital shall be effected that reduce, the capital of the Company to an amount that immediately after the reduction is less than the aggregate par value of all outstanding shares with par value and all shares with par value held by the Company as treasury shares and the aggregate of the amounts designated as capital of all outstanding shares without par value and all shares without par value held by the Company as treasury shares that are entitled to a preference, if any, in the assets of the Company upon liquidation of the Company.

7.5 No reduction of capital shall be effected unless the members or directors determine that immediately after the reduction the Company will be able to satisfy its liabilities as they become due in the ordinary course of its business and that the realisable value of the assets of the Company will not be less than its total liabilities, other than deferred taxes, as shown in the books of the Company and its remaining capital, and, in the absence of fraud, the decision of the directors as to the realisable value of the assets of the Company is conclusive, unless a question of law is involved .

7.6 Where the Company reduces its capital the Company may :

(1) return to its members any amount received by the Company upon the issue of any of its shares ;

(2) purchase, redeem or otherwise acquire its shares out of capital; or

(3) cancel any capital that is lost or not represented by assets having a realisable value .

8. MEETINGS AND CONSENTS OF MEMBERS

8.1 The directors of the Company may convene meetings of the members of the Company at such times and in such manner and places within or outside Belize as the directors consider necessary or desirable .

8.2 Upon the written request of members holding 10 percent or more of the outstanding voting shares in the Company the directors shall convene a meeting of members .

8.3 The directors shall give not less than 7 days notice of meetings of members to those persons whose names on the date the notice is given appears as members in the share register of the Company .

8.4 A meeting of members held in contravention of the requirement in Regulation 8.3 is valid if:

(1) members holding not less than 90 percent of the total number of shares entitled to vote on all matters to be considered at the meeting, or 90 percent of the votes of each class or series of shares where members are entitled to vote thereon as a class or series together with not less than a 90 percent majority of the remaining votes, have agreed to shorter notice of the meeting; or,

(2) all members holding shares entitled to vote on all or any matters to be considered at the meeting have waived notice of the meeting and for this purpose presence at the meeting shall be deemed to constitute waiver.

8.5 The inadvertent failure of the directors to give notice of a meeting to a member, or the fact that a member has not received notice, does not invalidate the meeting .

8.6 A member may be represented at a meeting of members by a proxy who may speak and vote on behalf of the member.

8.7 The instrument appointing a proxy shall be produced at the place appointed for the meeting before the time for holding the meeting at which the person named in such instrument proposes to vote .

8.8 An instrument appointing a proxy shall be in substantially the following form or such other form as the Chairman of the Meeting shall accept as properly evidencing the wishes of the member appointing the proxy. Only members who are individuals may appoint proxies .

(Name of Company)

I/We .....being a member of the above Company with ..... shares, HEREBY APPOINT ..... of ..... or failing him ..... of ..... to be my/our proxy to vote for me/us at the meeting of members to be held on the.....day of..... , 20...., and at any adjournment thereof.

(Any restrictions on voting to be inserted here)

Signed this day of..... .....

.....

Member

8.9 The following shall apply in respect of joint ownership of shares :

(1) if two or more persons hold shares jointly each of them may be present in person or by proxy at a meeting of members and may speak as a member;

(2) if only one of the joint owners is present in person or by proxy he may vote on behalf of all joint owners; and,

(3) if two or more of the joint owners are present in person or by proxy they must vote as one .

8.10 A member shall be deemed to be present at a meeting of members if he participates by telephone or other electronic means and all members participating in the meeting are able to hear each other.

8.11 A meeting of members is duly constituted if, at the commencement of the meeting, there are present in person or by proxy not less than 50 percent of the votes of the shares or class or series of shares entitled to vote on resolution of members to be considered at the meeting. If a quorum be present, notwithstanding the fact that such quorum may be represented by only one person, then, such person may resolve any matter and a certificate signed by such person accompanied where such person be a proxy by a copy of the proxy form shall constitute a valid resolution of members.

8.12 If within two hours from the time appointed for the meeting a quorum is not present, the meeting, if convened upon the requisition of members, shall be dissolved; in any other case it shall stand adjourned to the next business day at the same time and place or to such other time and place as the directors may determine, and if at the adjourned meeting there are present within an hour from the time appointed for the meeting in person or by proxy not less than one third of the votes of the shares or each class or series of shares entitled to vote on the resolutions to be considered by the meeting, those present shall constitute a quorum but otherwise the meeting shall be dissolved.

8.13 At every meeting of members, the Chairman of the Board of Directors shall preside as chairman of the meeting. If there is no Chairman of the Board of Directors or if the Chairman of the Board of Directors is not present at the meeting, the members present shall choose someone of their number to be the chairman. If the members are unable to choose a chairman for any reason, then the person representing the greatest number of voting shares present in person or by prescribed form of proxy at the meeting shall preside as chairman failing which the oldest individual member or representative of a member present shall take the chair.

8.14 The Chairman may, with the consent of the meeting, adjourn any meeting from time to time, and from place to place, but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place.

8.15 At any meeting of the members the chairman shall be responsible for deciding in such manner as he shall consider appropriate whether any resolution has been carried or not and the result of his decision shall be announced to the meeting and recorded in the minutes thereof. If the chairman shall have any doubt as to the outcome of any resolution put to the vote, he shall cause a poll to be taken of all votes cast upon such resolution, but if the chairman shall fail to take a poll, then, any member present in person or by proxy who disputes the announcement by the chairman of the result of any vote may immediately following such announcement demand that a poll be taken and the chairman shall thereupon cause a poll to be taken. If a poll is taken at any meeting, the result thereof shall be duly recorded in the minutes of that meeting by the chairman.

8.16 Any person other than an individual shall be regarded as one member and subject to Regulation 8.17 the right of any individual to speak for or represent such member shall be determined by the law of the jurisdiction where, and by the documents by which, the person is constituted or derives its existence. In case of doubt, the directors may in good faith seek legal advice from any qualified person and unless and until a court of competent jurisdiction shall otherwise rule, the directors may rely and act upon such advice without incurring any liability to any member.

8.17 Any person other than an individual which is a member of the Company may by resolution of its directors or other governing body authorise such person as it thinks fit to act as its representative at any meeting of the Company or of any class of members of the Company, and the person so authorised shall be entitled to exercise the same powers on behalf of the person which he represents as that person could exercise if it were an individual member of the Company.

8.18 The chairman of any meeting at which a vote is cast by proxy or on behalf of any person other than an individual may call for a notarially certified copy of such proxy or authority which shall be produced within 7 days of being so requested or the votes cast by such proxy or on behalf of such person shall be disregarded.

8.19 The directors of the Company may attend and speak at any meeting of members of the Company and at any separate meeting of the holders of any class or series of shares in the Company.

8.20 An action that may be taken by the members at a meeting may also be taken by a resolution of members consented to in writing or by telex, telegram, cable, telecopier, or other written electronic communication, without the need for any notice, but if any resolution of members is adopted otherwise

than by the unanimous written consent of all members, a copy of such resolution shall forthwith be sent to all members not consenting to such resolution .

9. DIRECTORS

9.1 The first directors of the Company shall be elected by the subscribers to the Memorandum; and thereafter, the directors shall be elected by the members or the existing directors for such terms as the members or directors determine.

9.2 The minimum number of directors shall be one and the maximum number shall be nine .

9.3 Each director shall hold office for the term, if any, fixed by resolution of members or until his earlier death, resignation or removal.

9.4 A director may be removed from office, with or without cause, by a resolution of members .

9.5 A director may resign his office by giving written notice of his resignation to the Company and the resignation shall have effect from the date the notice is received by the Company or from such later date as may be specified in the notice.

9.6 A vacancy in the Board of Directors may be filled by a resolution of members or by a resolution of a majority of the remaining directors.

9.7 With the prior or subsequent approval by a resolution of members, the directors may, by a resolution of directors, fix the emoluments of directors with respect to services to be rendered in any capacity to the Company.

9.8 A director shall not require a share qualification, and may be an individual or a company.

9.9 A director by writing under his hand deposited at the Registered Office of the Company, may from time to time appoint another director or any other person to be his alternate. Every such alternate shall be entitled to be given notice of meeting of the directors and to attend and vote as a director at any such meeting at which the director appointing him is not personally present and generally at such meeting to have and exercise all the powers, rights, duties and authorities of the director appointing him. Every such alternate shall be deemed to be an officer of the Company and shall not be deemed to be an agent of the director appointing him. If undue delay or difficulty would be occasioned by giving notice to a director of a resolution of which his approval is sought in accordance with Regulation 8, his alternate (if any) shall be entitled to signify approval of the same on behalf of that director. A director by writing under his hand deposited at the Registered Office of the Company may at any time revoke the appointment of an alternate appointed by him. If a director shall die or cease to hold the office of director, the appointment of his alternate shall thereupon cease and terminate.

10. POWERS OF DIRECTORS

10.1 The business and affairs of the Company shall be managed by the directors who may pay all expenses incurred preliminary to and in connection with the formation and registration of the Company and may exercise all such powers of the Company as are not by the Act or by the Memorandum or these Articles required to be exercised by the members of the Company, subject to any delegation of such powers as may be authorised by these Articles and to such requirements as may be prescribed by a resolution of members; but no requirements made by a resolution of members shall prevail if it be inconsistent with these Articles nor shall such requirement invalidate any prior act of the directors which would have been valid if such requirement had not been made.

10.2 The directors may by a resolution of directors, appoint any person, including a person who is a director, to be an officer or agent of the Company.

10.3 Every officer or agent of the Company has such powers and authority of the directors, including the power and authority to affix the Seal, as are set forth in these Articles, or in the resolution of directors appointing the officer or agent, except that no officer or agent has any power or authority with respect to the matters requiring a resolution of directors under the Act.

10.4 Any director which is a body corporate may appoint any person as its duly authorised representative for the purpose of representing it at meetings of the Board of Directors or with respect to unanimous written consents.

10.5 The continuing directors may act notwithstanding any vacancy in their body, save that if their number is reduced below the number fixed by or pursuant to these Articles as the necessary quorum for a meeting of directors, the continuing directors or director may act only for the purpose of appointing directors to fill any vacancy that has arisen or summoning a meeting of members .

10.6 All cheques, promissory notes, drafts, bills of exchange and other negotiable instruments and all receipts for monies paid to the Company, shall be signed, drawn, accepted, endorsed, or otherwise executed, as the case may be, in such manner as shall from time to time be determined by resolution of directors .

10.7 The Company may from time to time and at any time by resolution of directors appoint any company, firm or person or body of persons, whether nominated directly or indirectly by the directors, to be the attorney or attorneys of the Company for such purposes and with such powers, authorities and discretions (not exceeding those vested in or exercisable by the directors under these Regulations) and for such period and subject to such conditions as they may think fit, and any such powers of attorney may contain such provisions for the protection and convenience of persons dealing with any such attorney as the directors may think fit and may also authorise any such attorney to delegate all or any of the powers, authorities and discretions vested in him .

11. PROCEEDINGS OF DIRECTORS

11.1 The directors of the Company or any committee thereof may meet at such times and in such manner and places within or outside Belize as the directors may determine to be necessary or desirable .

11.2 A director shall be deemed to be present at a meeting of directors if he participates by telephone or other electronic means and all directors participating in the meeting are able to hear each other .

11.3 A director shall be given not less than 5 days notice of meetings of directors, but a meeting of directors held without 5 days notice having been given to all directors shall be valid if all the directors entitled to vote at the meeting who do not attend, waive notice of the meeting. The inadvertent failure to give notice of a meeting to a director or the fact that a director has not received the notice does not invalidate the meeting .

11.4 A director may by a written instrument appoint an alternate who need not to be a director and an alternate is entitled to attend meetings in the absence of the director who appointed him and vote or consent in place of the director.

11.5 A meeting of directors is duly constituted for all purposes if at the commencement of the meeting there are present in person or by alternate not less than one half of the total number of directors, unless there are only two directors in which case the quorum shall be two .

11.6 If the Company shall have only one director the provisions herein contained for meetings of the directors shall not apply but such sole director shall have full power to represent and act for the Company in all matters as are not by the Act or the Memorandum or these Articles required to be exercised by the members of the Company and in lieu of minutes of a meeting shall record in writing and sign a note or memorandum of all matters requiring a resolution of directors. Such a note or memorandum shall constitute sufficient evidence of such resolution for all purposes.

11.7 At every meeting of the directors the Chairman of the Board of Directors shall preside as chairman of the meeting. If there is no Chairman of the Board of Directors or if the Chairman of the Board of Directors is not present at the meeting the Vice Chairman of the Board of Directors shall preside. If there is no Vice Chairman of the Board of Directors or if the Vice Chairman of the Board of Directors is not present at the meeting the directors present shall choose someone of their number to be chairman of the meeting .

11.8 The emoluments of all officers shall be fixed by resolution of directors .

11.9 The directors shall cause the following corporate records to be kept:

(1) minutes of all meetings of directors, members, committees of directors, committees of officers and committees of members;

(2) copies of all resolutions consented to by directors, members, committees of directors, committees of officers and committees of members; and,

(3) such other accounts and records as the directors by resolution of directors consider necessary or desirable in order to reflect the financial position of the Company.

11.10 The books, records and minutes shall be kept at the registered office of the Company or at such other

place as the directors determine.

11.11 The Company may keep a register of directors containing the names and addresses of the directors of the Company, the date on which each director is appointed as a director of the Company, and the date on which each person named as a director ceased to be a director of the Company. If the Company keeps a register of directors referred to in this Regulation, a copy of such register shall be kept at the registered office of the Company.

11.12 The directors may, by a resolution of directors, designate one or more committees, each consisting of one or more directors.

11.13 Each committee of directors has such powers and authorities of the directors, including the power and authority to affix the Seal as are set forth in the resolution of directors establishing the committee, except that no committee has any power or authority either to amend the Memorandum or these Articles or with respect to the matters requiring a resolution of directors under Regulations 9.6, 9.7, and 10.2.

11.14 The meetings and proceedings of each committee of directors consisting of two or more directors shall be governed mutatis mutandis by the provisions of these Articles regulating the proceedings of directors so far as the same are not superseded by any provisions in the resolution establishing the committee .

12. OFFICERS

12.1 The Company may by resolution of directors appoint officers of the Company at such times as shall be considered necessary or expedient. Such officers may consist of a Chairman of the Board of Directors, a Vice Chairman of the Board of Directors, President and one or more Vice Presidents, Secretaries and Treasurers and such other officers as may from time to time be deemed desirable. Any number of offices may be held by the same person.

12.2 The officers shall perform such duties as shall be prescribed at the time of their appointment subject to any modification in such duties as may be prescribed thereafter by resolution of directors or resolution of members, but in the absence of any specific allocation of duties it shall be the responsibility of the Chairman of the Board of Directors to preside at meetings of directors and members, the Vice Chairman to act in the absence of the Chairman, the President to manage the day to day affairs of the Company, the Vice Presidents to act in order of seniority in the absence of the President but otherwise to perform such duties as may be delegated to them by the President, the Secretaries to maintain the share register, minute books and records (other than financial records) of the Company and to ensure compliance with all procedural requirements imposed on the Company by applicable law and the Treasurer to be responsible for the financial affairs of the Company.

12.3 The emoluments of all officers shall be fixed by resolution of directors .

12.4 The officers of the Company shall hold office until their successors are duly elected and qualified, but any officer elected or appointed by the directors may be removed at any time, with or without cause, by resolution of directors. Any vacancy occurring in any office of the Company may be filled by resolution of directors .

13. INDEMNIFICATION

13.1 Subject to Regulation 13.2, the Company shall indemnify against all expenses, including legal fees, and against all judgments, fines and amounts paid in settlement and reasonably incurred in connection with legal, administrative or investigative proceedings any person who :

(1) is or was a party or is threatened to be made a party to any threatened, pending or completed proceedings, whether civil, criminal, administrative or investigative, by reason of the fact that the person is or was a director, an officer or a liquidator of the Company; or,

(2) is or was, at the request of the Company, serving as a director, officer or liquidator of, or in any other capacity is or was acting for another company or a partnership, joint venture, trust or other enterprise .

13.2 Regulation 13.1 only applies to a person referred to in that Regulation if the person acted honestly and in good faith with a view to the best interests of the Company and, in the case of criminal proceedings, the person had no reasonable cause to believe that his conduct was unlawful .

13.3 The decision of the directors as to whether the person acted honestly and in good faith and with a view to

the best interests of the Company and as to whether the person had no reasonable cause to believe that his conduct was unlawful is, in the absence of fraud, sufficient for the purposes of this Regulation 13, unless a question of law is involved .

13.4 The termination of any proceedings by any judgment, order, settlement, conviction or the entering of a nolle prosequi does not, by itself, create a presumption that the person did not act honestly and in good faith and with a view to the best interests of the Company or that the person had reasonable cause to believe that his conduct was unlawful .

13.5 If a person referred to in Regulation 13.1 has been successful in defense of any proceedings referred to in that Regulation, the person is entitled to be indemnified against all expenses, including legal fees, and against all judgments, fines and amounts paid in settlement and reasonably incurred by the person in connection with the proceedings.

13.6 The Company may purchase and maintain insurance in relation to any person who is or was a director, an officer or a liquidator of the Company, or who at the request of the Company is or was serving as a director, an officer or a liquidator of, or in any other capacity is or was acting for another company or a partnership, joint venture, trust or other enterprise, against any liability asserted against the person and incurred by the person in that capacity, whether or not the Company has or would have had the power to indemnify the person against the liability under Regulation 13.1.

14. SEAL

The directors shall provide for the safe custody of the Seal. The Seal when affixed to any written instrument shall be witnessed by a director or any other person so authorised from time to time by resolution of directors. The directors may provide for a facsimile of the Seal and of the signature of any director or authorised person which may be reproduced by printing or other means on any instrument and it shall have the same force and validity as if the Seal had been affixed to such instrument and the same had been signed as hereinbefore described.

15. DIVIDENDS

15.1 The Company may by a resolution of directors declare and pay dividends in money, shares, or other property, but dividends shall only be declared and paid out of surplus. In the event that dividends are paid in specie the directors shall have responsibility for establishing and recording in the resolution of directors authorising the dividends, a fair and proper value for the assets to be so distributed .

15.2 The directors may from time to time pay to the members such interim dividends as appear to the directors to be justified by the profits of the Company.

15.3 The directors may, before declaring any dividend, set aside out of the profits of the Company such sum as they think proper as a reserve fund, and may invest the sum so set apart as a reserve fund upon such securities as they may select .

15.4 No dividend shall be declared and paid unless the directors determine that immediately after the payment of the dividend the Company will be able to satisfy its liabilities as they become due in the ordinary course of its business and the realisable value of the assets of the Company will not be less than the sum of its total liabilities, other than deferred taxes, as shown in its books of account, and its capital. In the absence of fraud, the decision of the directors as to the realisable value of the assets of the Company is conclusive, unless a question of law is involved .

15.5 Notice of any dividend that may have been declared shall be given to each member in manner hereinafter mentioned and all dividends unclaimed for three years after having been declared may be forfeited by resolution of directors for the benefit of the Company.

15.6 No dividend shall bear interest as against the Company and no dividend shall be paid on shares described in Regulation 4.10.

15.7 A share issued as a dividend by the Company shall be treated for all purposes as having been issued for money equal to the surplus that is transferred to capital upon the issue of the share .

15.8 In the case of a dividend of authorised but unissued shares with par value, an amount equal to the aggregate par value of the shares shall be transferred from surplus to capital at the time of the distribution .

15.9 In the case of a dividend of authorised but unissued shares without par value, the amount designated by the directors shall be transferred from surplus to capital at the time of the distributions, except that the directors must designate as capital an amount that is at least equal to the amount that the shares are entitled to as a preference, if any, in the assets of the Company upon liquidation of the Company .

15.10 A division of the issued and outstanding shares of a class or series of shares into a larger number of shares of the same class or series having a proportionately smaller par value does not constitute a dividend of shares .

16. BOOKS AND RECORDS

16.1 The Company shall keep such accounts and records as the directors consider necessary or desirable in order to reflect the financial position of the Company.

16.2 The Company shall keep minutes of all meetings of directors, members, committees of directors, committees of officers and committees of members, and copies of all resolutions consented to by the directors, members, committees of directors, committees of officers and committees of members .

16.3 The books, records and minutes required by Regulations 18.1 and 18.2 shall be kept either in its original or a copy thereof, at the Registered Office of the Company or at such other place as the directors may determine, and shall be open to the inspection of the directors at all times .

16.4 The directors shall from time to time determine whether and to what extent and at what times and places and under what conditions of regulations the books, records and minutes of the Company or any of them shall be open to the inspection of members not being directors and, no member (not being a director) shall have any right of inspecting any book, record, minute or document of the Company except as conferred by Law or authorised by resolution of the directors .

17. ACCOUNTS

The Company shall keep such accounts and records as the directors consider necessary or desirable in order to reflect the financial position of the Company.

18. AUDIT

18.1 The Company may by resolution of members call for the accounts to be examined by auditors .

18.2 The first auditors shall be appointed by resolution of directors; subsequent auditors shall be appointed by a resolution of members.

18.3 The auditors may be members of the Company but no director or other officer shall be eligible to be an auditor of the Company during his continuance in office .

18.4 The remuneration of the auditors of the Company :

(1) in the case of auditors appointed by the directors, may be fixed by resolution of directors.

(2) subject to the foregoing, shall be fixed by resolution of members or in such manner as the Company may by resolution of members determine .

18.5 The auditors shall examine each profit and loss account and balance sheet required to be served on every member of the Company or laid before a meeting of the members of the Company and shall state in a written report whether or not:

(1) in their opinion the profit and loss account and balance sheet give a true and fair view respectively of the profit and loss for the period covered by the accounts, and of the state of affairs of the Company at the end of that period;

(2) all the information and explanations required by the auditors have been obtained .

18.6 The report of the auditors shall be annexed to the accounts and shall be read at the meeting of members at which the accounts are laid before the Company or shall be served on the members .

18.7 Every auditor of the Company shall have a right of access at all times to the books of account and vouchers of the Company, and shall be entitled to require from the directors and officers of the Company such information and explanations as he thinks necessary for the performance of the duties of the auditors .

18.8 The auditors of the Company shall be entitled to receive notice of, and to attend any meetings of members of the Company at which the Company's profit and loss account and balance sheet are to be presented .

19. NOTICES

19.1 Any notice, information or written statement to be given by the Company to members must be served in the case of members holding registered shares by mail addressed to each member at the address shown in the share register and in the case of members holding shares issued to bearer, in the manner provided in the Memorandum.

19.2 Any summons, notice, order, document, process, information or written statement to be served on the Company may be served by leaving it, or by sending it by registered mail addressed to the Company, at its registered office, or by leaving it with, or by sending it by registered mail to the registered agent of the Company.

19.3 Service of any summons, notice, order, document, process, information or written statement to be served on the Company may be proven by showing that the summons, notice, order, document, process, information or written statement was mailed in such time as to admit to its being delivered in the normal course of delivery within the period prescribed for service and was correctly addressed and the postage was prepaid .

20. VOLUNTARY WINDING UP AND DISSOLUTION

The Company may voluntarily commence to wind up and dissolve by a resolution of members but if the Company has never issued shares, it may voluntarily commence to wind up and dissolve by resolution of directors.

21. CONTINUATION

21.1 The Company may by resolution of members or by resolution passed unanimously by all directors of the Company continue as a company incorporated under the laws of a Jurisdiction outside Belize in the manner provided under those laws.

21.2 The Registered Agent, duly authorised by the Company members, may submit to the Registrar, an Affidavit expressing an interest as to continue the Company in another Jurisdiction, upon registration of this request, the Registrar will strike off the Company, issuing a certificate of discontinuance in Belize .

22. AMENDMENTS

These Articles may only be altered, repealed or replaced by resolution of the members of the Company .

We, A.J.K. CORPORATE SERVICES (BELIZE) LIMITED of, Blake Building, Suite 306, Corner of Eyre & Hutson Street, P.O. Box 2670, Belize City, Belize, for the purpose of incorporating an International Business Company under the laws of Belize hereby subscribe our name to these Articles of Association on this 30th June, 2016 in the presence of the undersigned witness .

[redacted]

[redacted]

A.J.K. CORPORATE SERVICES (BELIZE) LIMITED,
Blake Building, Suite 306, Corner of Eyre & Hutson Street,
P.O. Box 2670, Belize City, Belize

To Whom It May Concern:

This letter is supplemental to our previous letter, which was executed on 29 March 2019 (although the letter itself was undated).

As a reminder, we act for X, Y and Z ("**the Individuals**") and have done so for over 5 years. We advise the Individuals on their personal tax affairs in the UK (amongst other things). We also assisted them in obtaining Advance Assurance in respect of the investments made in to RiverOak Strategic Partners Limited.

We have been asked by the Individuals to answer a number of questions on the document headed "Manston Airport DCO- Responses to ExA's Second Written Questions". Please see our responses below:

Ref No.	Respondent	Question	Applicant's Response
F.2.15	The Applicant	Would the Opinion of HMRC remain valid if the nature of the loan has changed?	The loans have been made by the Individuals to MIO Investments ("**MIO**") which is a non-UK company. The investment which is subject to the BIR claim is the investment made by MIO Investments in to RiverOak Strategic Partners ("**RSP**"), the UK company. MIO falls within the definition of a "Relevant Person" for each of the Individuals. For the purposes of the BIR conditions and UK tax law generally, an investment made by a Relevant Person in relation to the Individual is treated as being made by the Individual himself. MIO is simply a vehicle through which the Individuals have made the ultimate investment in to RSP, which is the "target company". The full facts were disclosed to HMRC and in giving the Advanced Assurance, HMRC were made aware of the loans from the Individuals to MIO and the onward loans from MIO to RSP. The status of the loans has not changed in the interim and will not do so under any restructuring (i.e. MIO remains the creditor of RSP and the shareholders of MIO remain the same, as do the shareholder loans made by the Individuals).
F.2.16	The Applicant	Given these statements, justify your statement that "the loans to MIO Investments had been subject to due diligence by HMRC"	As above, the critical part of the transaction for the giving of the relief is the investment in RSP. In addition, as the point of the relief is to encourage investment in to the UK, the priority is to ensure that the companies owned by RSP are trading within the prescribed timescales. That said, and as explained above, HMRC are aware that the investment in to RSP was made by the Individuals through MIO, which is a "Relevant Person" in relation to each of them. The wording from the HMRC letters (which is

			quoted in the Question) is standard wording used in letters giving Clearance or Advanced Assurance. It simply makes the point that HMRC has given its view based on the information provided to it and that it reserves the right to deny relief should the facts be different to those presented. Foot Anstey LLP, tax advisers to the Individuals, provided significant and accurate information to HMRC in making the application (including the full identity of the Individuals and the fact that they intended to bring foreign income and gains to the UK through MIO). The information was asked for in a number of letters from HMRC and all requests from HMRC were complied with.
F.2.17	The Applicant	In respect of each of the three investors, on the statement by HMRC that it does "have reservations about the...company's likely trading position": 1 Has the claim been made? 2. Have white notes entries been made on the tax returns for the three investors? 3. Has HMRC opened formal enquiries into any of the three investors?	A claim for BIR for each investment in to RSP (via MIO) has to be made in each Individual's tax return for the relevant tax year. The first investment was made in December 2016 and numerous investments have since been made. Foot Anstey LLP do not complete the tax returns for the Individuals but understand that all claims have been made and corrective returns submitted in some cases to ensure the relief is properly claimed (within the permitted correction periods). RSP will be an "eligible stakeholder company" which is a company which exists to invest in eligible trading companies, as defined in legislation. In this instance, there are a number of eligible trading companies into which RSP has made investments. Three of the four companies are trading and commenced these trading activities within the prescribed timescales. The fourth (Riveroak MSE Limited) is a new company into which investment has recently been made. The requirement is that for investments made before 6 April 2017, each subsidiary had a period of 2 years in which to commence trading. For investments made after this date, the period in which trading has to commence is 5 years (HMRC recognising that the original 2 year limit was unduly restrictive). The 3 eligible trading companies referred to above have commenced trading within the prescribed timescales. It is fully intended that Riveroak MSE Limited will trade within 5 years of investment, as required. The first claim for BIR was made in the tax return for the tax year 2016/17 which was submitted in January 2018. The white space entries will therefore be made in the tax return for 2018/19 which will need to be submitted by the end of January 2020. The white notes will confirm to HMRC the trading activities being undertaken by the group companies under RSP.

			For two of the Individuals no formal enquiry has been opened with regard to the use of BIR funds for any of their UK projects or businesses. One of the Individuals has had an enquiry into the use of funds being bought to the UK for BIR purposes, however, this was not for any funds in regard to this airport project. It was for another UK business of the Individual and all questions were answered and details given to the satisfaction of HMRC and the enquiry was closed. The status of the enquiry was to ensure that all funds were utilised for specific BIR conditions.

[redacted]

Deborah Carrivick

Partner, Foot Anstey LLP
Dated 03 May 2019

Independent Limited Assurance Report

To: the Directors of Riveroak Strategic Partners Limited

Date: 29th April 2019

We have been engaged by Riveroak Strategic Partners Limited to undertake a limited assurance engagement in respect of the period ended 31 March 2019, on the financial records of Riveroak Operations Limited as described below.

Management's Responsibilities

Management is responsible for the preparation and presentation of the financial information, current as at the date of our report. Management is also responsible for establishing and maintaining appropriate internal control and record keeping systems from which the reported information is derived.

Our Responsibility

Our responsibility in relation to the Report is to perform a limited assurance engagement and to express a conclusion based on the work performed. We conducted our engagement in accordance with International Standard on Assurance Engagements (ISAE) 3000 (Revised) Assurance Engagements other than Audits or Reviews of Historical Financial Information, issued by the International Auditing and Assurance Standards Board.

Assurance Approach

We planned and performed our work to obtain all of the evidence and information we considered necessary in order to form our conclusion as set out below. A limited assurance engagement consists of applying analytical and other evidence gathering procedures, as appropriate. Our procedures included:

- Reconciling the Profit and Loss expenditure to bank payments, taking into account Trade Creditors, VAT and payments relating to Balance Sheet items.
- Reviewing the money received to establish the source of income.
- Comparing the money received to the profit and loss expenditure.

The extent of evidence gathering procedures performed in a limited assurance engagement is less than that for a reasonable assurance engagement, and therefore a lower level of assurance is obtained.

Cont'd/…2

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Our assurance report is provided solely to the Directors of Riveroak Strategic Partners Limited in accordance with the terms of our engagement. Our work has been undertaken so that we might report to the Directors of Riveroak Strategic Partners Limited on those matters that we have been engaged to report upon in this assurance report, and for no other purpose. We do not accept nor assume responsibility to anyone other than the Directors of Riveroak Strategic Partners Limited for our work, for this assurance report, or for the conclusion we have reached.

Independence and Competence

In conducting our engagement, we have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants. The engagement was conducted by a multidisciplinary team which included professionals with suitable skills and experience in both assurance and in the applicable subject matter.

Our Conclusion

Based on the procedures performed, we have confirmed that to date Riveroak Operations Limited has committed and expensed funds of £12.8m in the pursuance of the Riveroak group of companies' project in relation to Manston airport in Kent.

DRAFT

Calder & Co

State Of Delaware

Entity Details

4/18/2019 11:46:02AM

File Number:	3028870	Incorporation Date / Formation Date:	4/12/1999
Entity Name:	RIVEROAK INVESTMENT CORP., LLC		
Entity Kind:	Limited Liability Company	Entity Type:	General
Residency:	Domestic	State:	DELAWARE
Status:	Good Standing	Status Date:	4/12/1999

Registered Agent Information

Name:	THE CORPORATION TRUST COMPANY		
Address:	CORPORATION TRUST CENTER 1209 ORANGE ST		
City:	WILMINGTON	Country:	
State:	DE	Postal Code:	19801
Phone:	302-658-7581		

RIVEROAK
INVESTMENT CORP., LLC

February 18, 2015

The Honorable Cllr. Iris Johnston, Leader
Thanet District Council
Cllr. Ms. Iris Johnston, Leader
P.O. Box 9, Cecil Street,
Margate, Kent, CT9 1XZ

PERSONAL & CONFIDENTIAL

Dear Mrs. Johnston:

I write this letter to assist in clarifying the roles of our various RiverOak entities with regard to the potential CPO and eventual ownership of Manston Airport. The most important message I can deliver as you read this is that prior to the signing of a partnership and indemnity agreement with the Thanet District Council, we will create a UK-based and registered company to go through the CPO process and take ownership if awarded. This entity will also hold the CAA license and any other licenses that are required by the UK government.

RiverOak Aviation Associates, LLC ("RAA") is a Delaware limited liability corporation. We choose Delaware for many of our entities because the Chancellery Court in Delaware is very efficient in dealing with corporate disputes. It is not a tax haven as some in the UK have surmised, and in fact does not have any tax avoidance schemes of which I am aware. Further, RAA is registered with the United States Internal Revenue Service (Identification number 47-1346107). RAA was formed solely to be able to take in investor capital dedicated to the CPO process and the purchase of Manston. To have established RAA in the UK would have exposed our investors and ourselves to an additional layer of tax in the UK for something we do not know is real until we have an agreement with Thanet. However, we still needed to create an entity because it is illegal in the United States to commingle funds with any of our other entities as each has a specific investment objective and criteria. RAA will eventually invest all of its capital in the UK entity that will be formed. RAA has no employees and is externally managed by RiverOak Investment Corp., LLC ("ROIC"), our flagship entity. This is how all of our entities are managed.

RiverOak Investment Corp., LLC is also a Delaware limited liability corporation and has its own registration with the United States Internal Revenue Service. Both Mr. Yerrall and I are directors of ROIC and are the major shareholders in the company. As has been previously stated, I am also a Board member, audit committee chair, and shareholder of Brookfield Property Partners, LP, the world's largest real estate asset manager.

Mrs. Johnston, we have no reason to be secretive except as we are required by law with regard to the identity of our investors, all of whom, as you know, have passed the scrutiny of the Know-Your-Client regulations both in the UK and the US. Unlike the current owners of the airport who are using known tax havens such as the Cayman Islands and Jersey in the Channel Islands, and a myriad of entities to obfuscate and obscure the real ownership, we have every intention of being good corporate citizens in the UK, Kent County and Thanet.

With very best regards,

[redacted]

Stephen DeNardo
Chief Executive Officer

One Atlantic Street • Stamford • CT 06901
Phone: 203.325.8009 Fax: 203.325.8588
www.riveroakic.com

Appendix HE.2.1

Historic England

The Setting of Heritage Assets

Historic Environment Good Practice Advice in Planning Note 3 (Second Edition)

Summary

This document sets out guidance, against the background of the National Planning Policy Framework (NPPF) and the related guidance given in the Planning Practice Guide (PPG), on managing change within the settings of heritage assets, including archaeological remains and historic buildings, sites, areas, and landscapes.

It gives general advice on understanding setting, and how it may contribute to the significance of heritage assets and allow that significance to be appreciated, as well as advice on how views contribute to setting. The suggested staged approach to taking decisions on setting can also be used to assess the contribution of views to the significance of heritage assets. The guidance has been written for local planning authorities and those proposing change to heritage assets.

It replaces The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 – 1st edition, 2015 and Seeing the History in the View: A Method for assessing Heritage Significance within Views (English Heritage, 2011).

It is one of three related Good Practice Advice (GPA) Notes, along with *GPA1 The Historic Environment in Local Plans* and *GPA2 Managing Significance in Decision-Taking in the Historic Environment*.

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HistoricEngland.org.uk/advice/planning/planning-system/

Front cover: York Water Gate, Victoria Embankment Gardens, City Of Westminster, Greater London.
Built for the Duke of Buckingham in 1626 to provide access to the Thames. View from south east.

This document was produced by Historic England in collaboration with the Historic Environment Forum, and with the particular assistance of:

Association of Local Government Archaeological Officers

British Property Federation

Council for British Archaeology

Chartered Institute for Archaeologists

Country Land and Business Association

Civic Voice

Heritage Alliance

Historic Houses Association

Historic Towns Forum

Institute of Historic Building Conservation

National Trust

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Introduction

1 The purpose of this Historic England Good Practice Advice note is to provide information on good practice to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy in the National Planning Policy Framework (NPPF) and the related guidance in the national Planning Practice Guide (PPG). It should be read in conjunction with Good Practice Advice notes 1 (The Historic Environment in Local Plans) and 2 (Managing Significance in Decision-Taking in the Historic Environment). This good practice advice acknowledges the primacy of the NPPF and PPG, supporting the implementation of national policy, but does not constitute a statement of Government policy itself, nor does it seek to prescribe a single methodology or particular data sources. Alternative approaches may be equally acceptable, provided they are demonstrably compliant with legislation, national policies and objectives. This guidance, *Good Practice Advice 3 – The Setting of Heritage Assets* (2nd edition, 2017) supersedes *Good Practice Advice 3 – The Setting of Heritage Assets* (1st edition, 2015) and *Seeing the History in the View: A Method for assessing Heritage Significance within Views* (English Heritage, 2011).

2 The advice in this document, in accordance with the NPPF, emphasises that the information required in support of applications for planning permission and listed building consent should be no more than is necessary to reach an informed decision, and that activities to conserve or invest need to be proportionate to the significance of the heritage assets affected and the impact on the significance of those heritage assets. At the same time those taking decisions need enough information to understand the issues.

3 This note gives assistance concerning the assessment of the setting of heritage assets, given:

- the statutory obligation on decision-makers to have special regard to the desirability of preserving listed buildings and their settings, and
- the policy objectives in the NPPF and the PPG establishing the twin roles of setting (see boxes below): it can contribute to the significance of a heritage asset, and it can allow that significance to be appreciated. When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the heritage asset's conservation, including sustaining significance (NPPF, paragraph 132).

4 This note therefore starts by giving general advice on understanding setting and how it may contribute to the significance of heritage assets, before adding advice on how views play a part in setting; it ends by suggesting a staged approach to taking decisions on the level of the contribution which setting and related views make to the significance of heritage assets (Part 2, paragraphs 17–42).

5 Consideration of the contribution of setting to the significance of heritage assets, and how it can enable that significance to be appreciated, will almost always include the consideration of views. The staged approach to taking decisions on setting given here can also be used to assess the contribution of a view, or views, to the significance of heritage assets and the ability to appreciate that significance.

6 Views, however, can of course be valued for reasons other than their contribution to heritage significance. They may, for example, be related to the appreciation of the wider landscape, where there may be little or no association with heritage assets. Landscape character and visual amenity are also related planning considerations. The assessment and management of views in

the planning process may therefore be partly or wholly separate from any consideration of the significance of heritage assets. This advice therefore directs readers elsewhere for approaches to landscape and visual impact assessment and amenity valuation (paragraphs 15 and 16).

Part 1: Settings and Views

NPPF Glossary: Setting of a heritage asset

The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral (NPPF, Annex 2: Glossary).

PPG: What is the setting of a heritage asset and how should it be taken into account?

The "setting of a heritage asset" is defined in the Glossary of the National Planning Policy Framework.

A thorough assessment of the impact on setting needs to take into account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it.

Setting is the surroundings in which an asset is experienced, and may therefore be more extensive than its curtilage. All heritage assets have a setting, irrespective of the form in which they survive and whether they are designated or not.

The extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset will play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration from other land uses in the vicinity, and by our understanding of the historic relationship between places. For example, buildings that are in close proximity but are not visible from each other may have a historic or aesthetic connection that amplifies the experience of the significance of each.

The contribution that setting makes to the significance of the heritage asset does not depend on there being public rights or an ability to access or experience that setting. This will vary over time and according to circumstance.

When assessing any application for development which may affect the setting of a heritage asset, local planning authorities may need to consider the implications of cumulative change. They may also need to consider the fact that developments which materially detract from the asset's significance may also damage its economic viability now, or in the future, thereby threatening its on-going conservation (PPG, paragraph: 013, reference ID: 18a-013-20140306).

Difference between setting and curtilage, character, context and landscape

7 Setting is separate from the concepts of curtilage, character and context:

- Curtilage is a legal term describing an area around a building and, for listed structures, the extent of curtilage is defined by consideration of ownership, both past and present, functional association and layout. The setting of a heritage asset will include, but generally be more extensive than, its curtilage (if it has one) (see Identification and Designation of Heritage Assets: Listed Buildings in the Historic England *Heritage Protection Guide*).

- The historic character of a place is the group of qualities derived from its past uses that make it distinctive. This may include: its associations with people, now and through time; its visual aspects; and the features, materials, and spaces associated with its history, including its original configuration and subsequent losses and changes. Character is a broad concept, often used in relation to entire historic areas and landscapes, to which heritage assets and their settings may contribute.

- The context of a heritage asset is a non-statutory term used to describe any relationship between it and other heritage assets, which is relevant to its significance, including cultural, intellectual, spatial or functional. Contextual relationships apply irrespective of distance, sometimes extending well beyond what might be considered an asset's setting, and can include the relationship of one heritage asset to another of the same period or function, or with the same designer or architect. A range of additional meanings is available for the term 'context', for example in relation to archaeological context and to the context of new developments, as well as customary usages. Setting may include associative relationships that are sometimes referred to as 'contextual'.

- To avoid uncertainty in discussion of setting, a landscape is 'an area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors' (Glossary, *Guidelines for Landscape and Visual Impact Assessment*, 3rd edition, published by the Landscape Institute and the Institute of Environmental Management and Assessment, p 157, based on the definition in the European Landscape Convention, European Treaty Series – No. 176, Florence, 20.x.2000, p 2).

The extent of setting

8 The NPPF makes it clear that the extent of the setting of a heritage asset 'is not fixed and may change as the asset and its surroundings evolve' (NPPF, Annex 2: Glossary). All of the following matters may affect considerations of the extent of setting:

- While setting can be mapped in the context of an individual application or proposal, it cannot be definitively and permanently described for all time as a spatially bounded area or as lying within a set distance of a heritage asset. This is because the surroundings of a heritage asset will change over time, and because new information on heritage assets may alter what might previously have been understood to comprise their setting and the values placed on that setting and therefore the significance of the heritage asset.

- Extensive heritage assets, such as historic parks and gardens, landscapes and townscapes, can include many heritage assets, historic associations between them and their nested and overlapping settings, as well as having a setting of their own. A conservation area is likely to include the settings of listed buildings and have its own setting, as will the hamlet, village or urban area in which it is situated (explicitly recognised in green belt designations).

The Courts have held that it is legitimate in appropriate circumstances to include within a conservation area the setting of buildings that form the heart of that area (R v Canterbury City Council ex parte David Halford, February 1992; CO/2794/1991). And NPPF paragraph 80, for example, makes it clear that historic towns are regarded as having a setting.

- Consideration of setting in urban areas, given the potential numbers and proximity of heritage assets, often overlaps with considerations both of townscape/urban design and of the character and appearance of conservation areas. Conflict between impacts on setting and other aspects of a proposal can be avoided or mitigated by working collaboratively and openly with interested parties at an early stage.

Setting and the significance of heritage assets

9 Setting is not itself a heritage asset, nor a heritage designation, although land comprising a setting may itself be designated (see below Designed settings). Its importance lies in what it contributes to the significance of the heritage asset or to the ability to appreciate that significance. The following paragraphs examine some more general considerations relating to setting and significance.

The setting of World Heritage Sites may be protected as 'buffer zones' – see PPG, paragraph: 033 Reference ID: 2a-033-20140306.

- Change over time
  Settings of heritage assets change over time. Understanding this history of change will help to determine how further development within the asset's setting is likely to affect the contribution made by setting to the significance of the heritage asset. Settings of heritage assets which closely resemble the setting at the time the asset was constructed or formed are likely to contribute particularly strongly to significance but settings which have changed may also themselves enhance significance, for instance where townscape character has been shaped by cycles of change over the long term. Settings may also have suffered negative impact from inappropriate past developments and may be enhanced by the removal of the inappropriate structure(s).

- Cumulative change
  Where the significance of a heritage asset has been compromised in the past by unsympathetic development affecting its setting, to accord with NPPF policies consideration still needs to be given to whether additional change will further detract from, or can enhance, the significance of the asset. Negative change could include severing the last link between an asset and its original setting; positive change could include the restoration of a building's original designed landscape or the removal of structures impairing key views of it (see also paragraph 40 for screening of intrusive developments).

- Access and setting
  Because the contribution of setting to significance does not depend on public rights or ability to access it, significance is not dependent on numbers of people visiting it; this would downplay such qualitative issues as the importance of quiet and tranquillity as an attribute of setting, constraints on access such as remoteness or challenging terrain, and the importance of the setting to a local community who may be few in number. The potential for

appreciation of the asset's significance may increase once it is interpreted or mediated in some way, or if access to currently inaccessible land becomes possible.

- **Buried assets and setting**

  Heritage assets that comprise only buried remains may not be readily appreciated by a casual observer. They nonetheless retain a presence in the landscape and, like other heritage assets, may have a setting. These points apply equally, in some rare cases, to designated heritage assets such as scheduled monuments or Protected Wreck Sites that are periodically, partly or wholly submerged, eg in the intertidal zone on the foreshore.

  - The location and setting of historic battles, otherwise with no visible traces, may include important strategic views, routes by which opposing forces approached each other and a topography and landscape features that played a part in the outcome.

  - Buried archaeological remains may also be appreciated in historic street or boundary patterns, in relation to their surrounding topography or other heritage assets or through the long-term continuity in the use of the land that surrounds them. While the form of survival of an asset may influence the degree to which its setting contributes to significance and the weight placed on it, it does not necessarily follow that the contribution is nullified if the asset is obscured or not readily visible.

- **Designed settings**

  Many heritage assets have settings that have been designed to enhance their presence and visual interest or to create experiences of drama or surprise. In these special circumstances, these designed settings may be regarded as heritage assets in their own right, for instance the designed landscape around a country house. Furthermore they may, themselves, have a wider setting: a park may form the immediate surroundings of a great house, while having its own setting that includes lines-of-sight to more distant heritage assets or natural features beyond the park boundary. Given that the designated area is often restricted to the 'core' elements, such as a formal park, it is important that the extended and remote elements of the design are included in the evaluation of the setting of a designed landscape. Reference is sometimes made to the 'immediate', 'wider' and 'extended' setting of heritage assets, but the terms should not be regarded as having any particular formal meaning. While many day-to-day cases will be concerned with development in the vicinity of an asset, development further afield may also affect significance, particularly where it is large-scale, prominent or intrusive. The setting of a historic park or garden, for instance, may include land beyond its boundary which adds to its significance but which need not be confined to land visible from the site, nor necessarily the same as the site's visual boundary. It can include:

  - land which is not part of the park or garden but which is associated with it by being adjacent and visible from it

  - land which is not part of the site but which is adjacent and associated with it because it makes an important contribution to the historic character of the site in some other way than by being visible from it, and

  - land which is a detached part of the site and makes an important contribution to its historic character either by being visible from it or in some other way, perhaps by historical association

- **Setting and urban design**

  As mentioned above (paragraph 8, The extent of setting), the numbers and proximity of heritage assets in urban areas mean that the protection and enhancement of setting is intimately linked to townscape and urban

design considerations. These include the degree of conscious design or fortuitous beauty and the consequent visual harmony or congruity of development, and often relates to townscape attributes such as enclosure, definition of streets and spaces and spatial qualities as well as lighting, trees, and verges, or the treatments of boundaries or street surfaces.

See *Managing Significance in Decision–Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning 2* (2015) and *Conservation Area Designation, Appraisal and Management: Historic England Advice Note 1* (2016).

- Setting and economic viability

Sustainable development under the NPPF can have important positive impacts on heritage assets and their settings, for example by bringing an abandoned building back into use or giving a heritage asset further life. However, the economic viability of a heritage asset can be reduced if the contribution made by its setting is diminished by badly designed or insensitively located development. For instance, a new road scheme affecting the setting of a heritage asset, while in some cases increasing the public's ability or inclination to visit and/or use it, thereby boosting its economic viability and enhancing the options for the marketing or adaptive re-use of a building, may in other cases have the opposite effect.

Views and setting

10 The contribution of setting to the significance of a heritage asset is often expressed by reference to views, a purely visual impression of an asset or place which can be static or dynamic, long, short or of lateral spread, and include a variety of views of, from, across, or including that asset.

11 Views which contribute more to understanding the significance of a heritage asset include:

- those where the composition within the view was a fundamental aspect of the design or function of the heritage asset
- those where town- or village-scape reveals views with unplanned or unintended beauty
- those with historical associations, including viewing points and the topography of battlefields
- those with cultural associations, including landscapes known historically for their picturesque and landscape beauty, those which became subjects for paintings of the English landscape tradition, and those views which have otherwise become historically cherished and protected
- those where relationships between the asset and other heritage assets or natural features or phenomena such as solar or lunar events are particularly relevant

12 Assets, whether contemporaneous or otherwise, which were intended to be seen from one another for aesthetic, functional, ceremonial or religious reasons include:

- military and defensive sites
- telegraphs or beacons
- prehistoric funerary and ceremonial sites
- historic parks and gardens with deliberate links to other designed landscapes and remote 'eye-catching' features or 'borrowed' landmarks beyond the park boundary

13 Views may be identified and protected by local planning policies and guidance for the part they play in shaping our appreciation and understanding of England's historic environment, whether in rural or urban areas and whether designed to be seen as a unity or

as the cumulative result of a long process of development. This does not mean that additional views or other elements or attributes of setting do not merit consideration. Such views include:

- views identified as part of the plan-making process, such as those identified in the *London View Management Framework* (LVMF, Mayor of London 2010) and *Oxford City Council's View Cones* (2005) and *Assessment of the Oxford View Cones* (2015 Report)
- views identified in character area appraisals or in management plans, for example of World Heritage Sites
- important designed views from, to and within historic parks and gardens that have been identified as part of the evidence base for development plans, and
- views that are identified by local planning authorities when assessing development proposals

Where complex issues involving views come into play in the assessment of such views – whether for the purposes of providing a baseline for plan-making or for development management – a formal views analysis may be merited.

Landscape Assessment and Amenity

14 Analysis of setting is different from landscape assessment. While landscapes include everything within them, the entirety of very extensive settings may not contribute equally to the significance of a heritage asset, if at all. Careful analysis is therefore required to assess whether one heritage asset at a considerable distance from another, though intervisible with it – a church spire, for instance – is a major component of the setting, rather than just an incidental element within the wider landscape.

15 Assessment and management of both setting and views are related to consideration of the wider landscape, which is outside the scope of this advice note. Additional advice on views is available in *Guidelines for Landscape and Visual Impact Assessment*, 3rd edition, published by the Landscape Institute and the Institute of Environmental Management and Assessment (in partnership with Historic England).

> Being tall structures, church towers and spires are often widely visible across land- and townscapes but, where development does not impact on the significance of heritage assets visible in a wider setting or where not allowing significance to be appreciated, they are unlikely to be affected by small-scale development, unless that development competes with them, as tower blocks and wind turbines may. Even then, such an impact is more likely to be on the landscape values of the tower or spire rather than the heritage values, unless the development impacts on its significance, for instance by impacting on a designed or associative view.

16 Similarly, setting is different from general amenity. Views out from heritage assets that neither contribute to significance nor allow appreciation of significance are a matter of amenity rather than of setting.

Part 2: Setting and Views – A Staged Approach to Proportionate Decision-Taking

17 All heritage assets have significance, some of which have particular significance and are designated. The contribution made by their setting to their significance also varies. Although many settings may be enhanced by development, not all settings have the same capacity to accommodate change without harm to the significance of the heritage asset or the ability to appreciate it. This capacity may vary between designated assets of the same grade or of the same type or according to the nature of the change. It can also depend on the location of the asset: an elevated or overlooked location; a riverbank, coastal or island location; or a location within an extensive tract of flat land may increase the sensitivity of the setting (ie the capacity of

the setting to accommodate change without harm to the heritage asset's significance) or of views of the asset. This requires the implications of development affecting the setting of heritage assets to be considered on a case-by-case basis.

18 Conserving or enhancing heritage assets by taking their settings into account need not prevent change; indeed change may be positive, for instance where the setting has been compromised by poor development. Many places coincide with the setting of a heritage asset and are subject to some degree of change over time. NPPF policies, together with the guidance on their implementation in the Planning Policy Guidance (PPG), provide the framework for the consideration of change affecting the setting of undesignated and designated heritage assets as part of the decision-taking process (NPPF, paragraphs 131-135 and 137).

19 Amongst the Government's planning policies for the historic environment is that conservation decisions are based on a proportionate assessment of the particular significance of any heritage asset that may be affected by a proposal, including by development affecting the setting of a heritage asset. Historic England recommends the following broad approach to assessment, undertaken as a series of steps that apply proportionately to the complexity of the case, from straightforward to complex:

Step 1: Identify which heritage assets and their settings are affected

Step 2: Assess the degree to which these settings make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated

Step 3: Assess the effects of the proposed development, whether beneficial or harmful, on that significance or on the ability to appreciate it

Step 4: Explore ways to maximise enhancement and avoid or minimise harm

Step 5: Make and document the decision and monitor outcomes

Each of these steps is considered in more detail below.

For further information on Strategic Environmental Assessment and Environmental Impact Assessment, see *Sustainability Appraisal and Strategic Environmental Assessment: Historic England Advice Note 8* (2016).

Development proposals involving the setting of single and less significant assets and straightforward effects on setting may best be handled through a simple check-list approach and can usefully take the form of a short narrative statement for each assessment stage, supported by adequate plans and drawings, etc.

Cases involving more significant assets, multiple assets, or changes considered likely to have a major effect on significance will require a more detailed approach to analysis, often taking place within the framework of Environmental Impact Assessment procedures. Each of the stages may involve detailed assessment techniques and complex forms of analysis such as viewshed analyses, sensitivity matrices and scoring systems. Whilst these may assist analysis to some degree, as setting and views are matters of qualitative and expert judgement, they cannot provide a systematic answer. Historic England recommends that, when submitted as part of a Design and Access Statement, Environmental Statement or evidence to a public Inquiry, technical analyses of this type should be seen primarily as material supporting a clearly expressed and non-technical narrative argument that sets out 'what matters and why' in terms of the heritage significance and setting of the assets affected, together with the effects of the development upon them.

Step 1: Identify which heritage assets and their settings are affected

20 The setting of a heritage asset is 'the surroundings in which a heritage asset is experienced' (NPPF, Annex 2: Glossary). Where that experience is capable of being affected by a proposed development (in any way) then the proposed development can be said to affect the setting of that asset. The starting point of the analysis is to identify those heritage assets likely to be affected by the development proposal.

21 It is important that, at the pre-application or scoping stage, the local authority, having due regard to the need for proportionality:

- indicates whether it considers a proposed development has the potential to affect the setting of (a) particular heritage asset(s), or
- specifies an 'area of search' around the proposed development within which it is reasonable to consider setting effects, or
- advises the applicant to consider approaches such as a 'Zone of Visual Influence' or 'Zone of Theoretical Visibility' in relation to the proposed development in order to better identify heritage assets and settings that may be affected

A 'Zone of Visual Influence' defines the areas from which a development may potentially be totally or partially visible by reference to surrounding topography. However, such analysis does not take into account any landscape artefacts such as trees, woodland, or buildings, and for this reason a 'Zone of Theoretical Visibility' which includes these factors is to be preferred.

22 For developments that are not likely to be prominent or intrusive, the assessment of effects on setting may often be limited to the immediate surroundings, while taking account of the possibility that setting may change as a result of the removal of impermanent landscape or townscape features, such as hoardings or planting.

23 The area of assessment for a large or prominent development, such as a tall building in an urban environment or a wind turbine in the countryside or offshore, can often extend for a distance of several kilometres. In these circumstances, while a proposed development may affect the setting of numerous heritage assets, it may not impact on them all equally, as some will be more sensitive to change affecting their setting than others. Local planning authorities are encouraged to work with applicants in order to minimise the need for detailed analysis of very large numbers of heritage assets. They may give advice at the pre-application stage (or the scoping stage of an Environmental Statement) on those heritage assets, or categories of heritage asset, that they consider most sensitive as well as on the level of analysis they consider proportionate for different assets or types of asset.

24 Where spatially extensive assessments relating to large numbers of heritage assets are required, Historic England recommends that local planning authorities give consideration to the practicalities and reasonableness of requiring assessors to access privately owned land. In these circumstances, they should also address the extent to which assessors can reasonably be expected to gather and represent community interests and opinions on changes affecting settings.

25 Where the development proposal affects views which may be particularly helpful in allowing the significance of an asset to be appreciated and which are therefore part of the setting, it is often necessary to identify viewing points for assessment. An explanation why a particular viewing point has been selected will be needed. Sometimes a heritage asset is best appreciated while moving (for example, in a designed landscape, where its three-dimensional

formal qualities are an essential part of its significance). These, such as the changing views of the Tyne bridges viewed from the banks of the River Tyne or of the Tower of London from the south bank of the River Thames in London, are often termed 'kinetic' views.

Step 2: Assess the degree to which these settings and views make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated

26 The second stage of any analysis is to assess whether the setting of an affected heritage asset makes a contribution to its significance and the extent and/or nature of that contribution; both setting, and views which form part of the way a setting is experienced, may be assessed additionally for the degree to which they allow significance to be appreciated. We recommend that this assessment should first address the key attributes of the heritage asset itself and then consider:

- the physical surroundings of the asset, including its relationship with other heritage assets
- the asset's intangible associations with its surroundings, and patterns of use
- the contribution made by noises, smells, etc to significance, and
- the way views allow the significance of the asset to be appreciated

27 The box below provides a (non-exhaustive) checklist of the potential attributes of a setting that it may be appropriate to consider in order to define its contribution to the asset's heritage values and significance. Only a limited selection of the attributes listed will be of particular relevance to an asset. A sound assessment process will identify these at an early stage, focus on them, and be as clear as possible what emphasis attaches to them. In doing so, it will generally be useful to consider, insofar as is possible, the way these attributes have contributed to the significance of the asset in the past (particularly when it was first built, constructed or laid out), the implications of change over time, and their contribution in the present.

A handy way of visualising the contribution of setting to the significance of heritage assets may be diagrammatically to map past and present relationships between a heritage asset and its surroundings, weighting the mapped connections to demonstrate the relative contribution of the relationship to the significance of the asset or the ability to appreciate the significance. By setting out the relationships and considering the level of their contribution to significance, it is possible to gauge impact more transparently and more consistently.

Change can also have the effect of strengthening relationships, for example by removing visual impediments such that significance is better revealed; mapping thereby provides one mechanism for identifying opportunities for enhancement.

28 The local authority Historic Environment Record is an important source of information to support this assessment and, in most cases, will be able to provide information on the wider landscape context of the heritage asset as well as on the asset itself. Landscape Character Assessments, Historic Landscape Character Assessments, Conservation Area Appraisals, the Register of Parks and Gardens and the Parks & Gardens UK database are also important sources in this regard.

29 This assessment of the contribution to significance made by setting will provide the baseline for establishing the effects of a proposed development on significance, as set out in 'Step 3' below. It will, therefore, be focused on the need to support decision-taking in respect of the proposed development. A similar approach to

assessment may also inform the production of a strategic, management or conservation plan in advance of any specific development proposal, although the assessment of significance required for studies of this type will address the setting of the heritage asset 'in the round', rather than focusing on a particular development site.

30 An assessment of the contribution to significance of a view does not depend alone on the significance of the heritage assets in the view but on the way the view allows that significance to be appreciated. The view may be part of a landscape, townscape or other design intended to allow a particular attribute of the asset to be enjoyed, such as its reflection in a body of water. Heritage assets (sometimes of different periods) may have been deliberately linked by the creation of views which were designed to have a particular effect, adding meanings through visual cross-references. Composite or fortuitous views which are the cumulative result of a long history of development, particularly in towns and cities, may become cherished and may be celebrated in artistic representations. The ability to experience

Assessment Step 2 Checklist

The starting point for this stage of the assessment is to consider the significance of the heritage asset itself and then establish the contribution made by its setting. The following is a (non-exhaustive) check-list of potential attributes of a setting that may help to elucidate its contribution to significance. It may be the case that only a limited selection of the attributes listed is likely to be particularly important in terms of any single asset.

The asset's physical surroundings

- Topography
- Aspect
- Other heritage assets (including buildings, structures, landscapes, areas or archaeological remains)
- Definition, scale and 'grain' of surrounding streetscape, landscape and spaces
- Formal design eg hierarchy, layout
- Orientation and aspect
- Historic materials and surfaces
- Green space, trees and vegetation
- Openness, enclosure and boundaries
- Functional relationships and communications
- History and degree of change over time

Experience of the asset

- Surrounding landscape or townscape character
- Views from, towards, through, across and including the asset
- Intentional intervisibility with other historic and natural features
- Visual dominance, prominence or role as focal point
- Noise, vibration and other nuisances
- Tranquillity, remoteness, 'wildness'
- Busyness, bustle, movement and activity
- Scents and smells
- Diurnal changes
- Sense of enclosure, seclusion, intimacy or privacy
- Land use
- Accessibility, permeability and patterns of movement
- Degree of interpretation or promotion to the public
- Rarity of comparable survivals of setting
- Cultural associations
- Celebrated artistic representations
- Traditions

these same views today can illuminate the design principles and taste of our predecessors.

31 The impact of seasonal and day/night changes on a view or views needs to be considered, including other changes that may mean that a view at a particular point in time may not be representative of the experience over longer periods. Does summer foliage hide an asset that is visible in winter? Does artificial external lighting at night emphasise some aspects of an asset and leave others in the dark.

Step 3: Assess the effects of the proposed development, whether beneficial or harmful, on the significance or on the ability to appreciate it

32 The third stage of any analysis is to identify the effects a development may have on setting(s) and to evaluate the resultant degree of harm or benefit to the significance of the heritage asset(s). In some circumstances, this evaluation may need to extend to cumulative and complex impacts which may have as great an effect on heritage assets as large-scale development and which may not solely be visual.

33 The wide range of circumstances in which setting may be affected and the range of heritage assets that may be involved precludes a single approach for assessing effects. Different approaches will be required for different circumstances. In general, however, the assessment should address the attributes of the proposed development in terms of its:

- location and siting
- form and appearance
- wider effects
- permanence

34 The box (see below) provides a more detailed list of attributes of the development proposal that it may be appropriate to consider during the assessment process. This list is not intended to be exhaustive and not all attributes will apply to a particular development proposal. Depending on the level of detail considered proportionate to the purpose of the assessment, it would normally be appropriate to make a selection from the list, identifying those particular attributes of the development requiring further consideration and considering what emphasis attaches to each. The key attributes chosen for consideration can be used as a simple check-list, supported by a short explanation, as part of a Design and Access Statement, or may provide the basis for a more complex assessment process that might sometimes draw on quantitative approaches to assist analysis.

35 In particular, it would be helpful for local planning authorities to consider at an early stage whether development affecting the setting of a heritage asset can be broadly categorised as having the potential to enhance or harm the significance of the asset through the principle of development alone; through the scale, prominence, proximity or placement of development; or through its detailed design. Determining whether the assessment will focus on spatial, landscape and views analysis, on the application of urban design considerations, or on a combination of these approaches will clarify for the applicant the breadth and balance of professional expertise required for its successful delivery.

36 Cumulative assessment is required under the EU Directive on EIA. Its purpose is to identify impacts that are the result of introducing the development into the view in combination with other existing and proposed developments. The combined impact may not simply be the sum of the impacts of individual developments; it may be more, or less.

Assessment Step 3 Checklist

The following is a (non-exhaustive) check-list of the potential attributes of a development affecting setting that may help to elucidate its implications for the significance of the heritage asset. It may be that only a limited selection of these is likely to be particularly important in terms of any particular development.

Location and siting of development

- Proximity to asset
- Position in relation to relevant topography and watercourses
- Position in relation to key views to, from and across
- Orientation
- Degree to which location will physically or visually isolate asset

Form and appearance of development

- Prominence, dominance, or conspicuousness
- Competition with or distraction from the asset
- Dimensions, scale and massing
- Proportions
- Visual permeability (extent to which it can be seen through), reflectivity
- Materials (texture, colour, reflectiveness, etc)
- Architectural and landscape style and/or design
- Introduction of movement or activity
- Diurnal or seasonal change

Wider effects of the development

- Change to built surroundings and spaces
- Change to skyline, silhouette
- Noise, odour, vibration, dust, etc
- Lighting effects and 'light spill'
- Change to general character (eg urbanising or industrialising)
- Changes to public access, use or amenity
- Changes to land use, land cover, tree cover
- Changes to communications/accessibility/ permeability, including traffic, road junctions and car-parking, etc
- Changes to ownership arrangements (fragmentation/permitted development/etc)
- Economic viability

Permanence of the development

- Anticipated lifetime/temporariness
- Recurrence
- Reversibility

Step 4: Explore ways to maximise enhancement and avoid or minimise harm

37 Maximum advantage can be secured if any effects on the significance of a heritage asset arising from development likely to affect its setting are considered from the project's inception. Early assessment of setting may provide a basis for agreeing the scope and form of development, reducing the potential for disagreement and challenge later in the process.

38 Enhancement (see NPPF, paragraph 137) may be achieved by actions including:

- removing or re-modelling an intrusive building or feature
- replacement of a detrimental feature by a new and more harmonious one
- restoring or revealing a lost historic feature or view
- introducing a wholly new feature that adds to the public appreciation of the asset
- introducing new views (including glimpses or better framed views) that add to the public experience of the asset, or
- improving public access to, or interpretation of, the asset including its setting

39 Options for reducing the harm arising from development may include the repositioning of a development or its elements, changes to its design, the creation of effective long-term visual or acoustic screening, or management measures secured by planning conditions or legal agreements. For some developments affecting setting, the design of a development may not be capable of sufficient adjustment to avoid or significantly reduce the harm, for example where impacts are caused by fundamental issues such as the proximity, location, scale, prominence or noisiness of a development. In other cases, good design may reduce or remove the harm, or provide enhancement. Here the design quality may be an important consideration in determining the balance of harm and benefit.

40 Where attributes of a development affecting setting may cause some harm to significance and cannot be adjusted, screening may have a part to play in reducing harm. As screening can only mitigate negative impacts, rather than removing impacts or providing enhancement, it ought never to be regarded as a substitute for well-designed developments within the setting of heritage assets. Screening may have as intrusive an effect on the setting as the development it seeks to mitigate, so where it is necessary, it too merits careful design. This should take account of local landscape character and seasonal and diurnal effects, such as changes to foliage and lighting. The permanence or longevity of screening in relation to the effect on the setting also requires consideration. Ephemeral features, such as hoardings, may be removed or changed during the duration of the development, as may woodland or hedgerows, unless they enjoy statutory protection. Management measures secured by legal agreements may be helpful in securing the long-term effect of screening.

Step 5: Make and document the decision and monitor outcomes

41 It is good practice to document each stage of the decision-making process in a non-technical and proportionate way, accessible to non-specialists. This should set out clearly how the setting of each heritage asset affected contributes to its significance or to the appreciation of its significance, as well as what the anticipated effect of the development will be, including of any mitigation proposals. Despite the wide range of possible variables, normally this analysis should focus on a limited number of key attributes of the asset, its setting and the proposed development, in order to avoid undue complexity. Such assessment work is a potentially valuable resource and should be logged in the local Historic Environment Record.

42 The true effect of a development on setting may be difficult to establish from plans, drawings and visualisations. It may be helpful to review the success of a scheme and to identify any 'lessons learned' once a development affecting setting has been implemented that was intended to enhance, or was considered unlikely to detract from, the significance of a heritage asset. This will be particularly useful where similar developments are anticipated in the future.

Contact Historic England

East Midlands
2nd Floor, Windsor House
Cliftonville
Northampton NN1 5BE
Tel: 01604 735460
Email: eastmidlands@HistoricEngland.org.uk

East of England
Brooklands
24 Brooklands Avenue
Cambridge CB2 8BU
Tel: 01223 582749
Email: eastofengland@HistoricEngland.org.uk

Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth PO4 9LD
Tel: 023 9285 6704
Email: fort.cumberland@HistoricEngland.org.uk

London
Fourth Floor
Cannon Bridge House
25 Dowgate Hill
London EC4R 2YA
Tel: 020 7973 3700
Email: london@HistoricEngland.org.uk

North East
Bessie Surtees House
41-44 Sandhill
Newcastle Upon Tyne NE1 3JF
Tel: 0191 269 1255
Email: northeast@HistoricEngland.org.uk

North West
3rd Floor, Canada House
3 Chepstow Street
Manchester M1 5FW
Tel: 0161 242 1416
Email: northwest@HistoricEngland.org.uk

South East
Eastgate Court
195-205 High Street
Guildford GU1 3EH
Tel: 01483 252020
Email: southeast@HistoricEngland.org.uk

South West
29 Queen Square
Bristol BS1 4ND
Tel: 0117 975 1308
Email: southwest@HistoricEngland.org.uk

Swindon
The Engine House
Fire Fly Avenue
Swindon SN2 2EH
Tel: 01793 445050
Email: swindon@HistoricEngland.org.uk

West Midlands
The Axis
10 Holliday Street
Birmingham B1 1TG
Tel: 0121 625 6870
Email: westmidlands@HistoricEngland.org.uk

Yorkshire
37 Tanner Row
York YO1 6WP
Tel: 01904 601948
Email: yorkshire@HistoricEngland.org.uk

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08 July 2014

TEMPLE
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25 Years of Cotswold Archaeology

Report for – English Heritage

Aviation Noise Metric - Research on the Potential Noise Impacts on the Historic Environment by Proposals for Airport Expansion in England, Project No. 6865

Final Report

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Report for: **Helen Marrison**

English Heritage

Main Contributors: **Dani Fiumicelli**

John Fisk

Simon Perry

Rob Sutton

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1.0 Executive Summary

The Airports Commission are currently appraising proposals regarding the future expansion of airport capacity in the South East of England, all of which could lead to changes in aviation noise. This could lead to adverse or beneficial effects on the fabric of heritage assets, the users of the assets and on the setting of heritage assets; all of which could lead to changes in the significance of heritage assets.

Temple Group Ltd (Temple) in partnership with Cotswold Archaeology have therefore been commissioned by English Heritage to develop a methodology to analyse the noise impacts of airport expansion on the surrounding historic environment.

The project includes a literature search and scrutiny of existing methods for the assessment of noise impacts on heritage assets. Additionally the report includes analysis of existing sources of aviation noise information and the specific data published by the Airports Commission to accompany their interim report published in December 2013.

The study identifies that noise impacts on the structure of heritage assets is very unlikely; although resonance induced vibration might intensify the impacts on persons using the asset. The study highlights that existing means of assessing aviation noise can be used to assess the impact on the physical structure of heritage assets and on persons living or working at heritage assets; but there are no established methods for assessing the impact of noise on the setting of heritage assets. The report therefore focuses on this aspect of the study.

The output of the project is a methodology for assessing the impact of aviation noise on the setting of heritage assets that could potentially form part of the Airports Commission's appraisal of their shortlisted proposals for airport expansion. The methodology can be summarised as follows:

1. Use airport noise contours and noise information to identify the spatial scope of the study based on defined absolute levels or changes in noise levels.
2. Use Geographic Information System (GIS) databases to locate heritage assets within the spatial scope of the study.
3. Screen the identified heritage assets into a non-noise sensitive and four noise sensitive categories.
4. Overlay the noise information on the GIS layer with the identified noise sensitive heritage assets.
5. Screen out those heritage assets where a noise impact is unlikely due to the absolute noise levels or change in noise levels not being sufficient to have an adverse effect.
6. Undertake a detailed site specific assessment of the noise impacts on the remaining noise sensitive heritage assets where the absolute noise levels or change in noise levels has been identified as potentially sufficient to have an adverse effect. This detailed appraisal will take into account factors including the following:
    a. The nature, character and level of existing ambient noise levels,
    b. The type of noise sensitive category the asset falls within,
    c. How frequently and for how long the aviation noise is likely to occur,
    d. How high is the absolute level of aviation noise or how big a change in aviation noise is expected,
7. The outcome of the method is an appraisal of whether the impacts of aviation noise or any changes in aviation noise are likely to be beneficial, neutral, or cause substantial harm or less than substantial harm to the setting of heritage assets.

The report includes case studies of the use of the methodology, and describes the assumptions used and the limitations of report. Recommendations are also made for further work that will improve the understanding, assessment and mitigation of aviation noise impacts on heritage assets.

2.0 Introduction

In December 2013 the Airports Commission published a number of shortlisted proposals in regard to the future expansion of airport capacity in the South East of England, which could lead to changes in the intensity and distribution of aviation noise. Potentially this might lead to adverse or beneficial noise impacts on heritage assets, due to effects on the fabric of the buildings; effects on the users of the assets and effects on the setting of the asset; all of which could lead to changes in the significance of heritage assets.

The issue of development pressure on heritage assets is identified in the National Heritage Protection Plan as Activity 2A1 which states:

"Many of England's historic settlements, both urban and rural, are undergoing considerable change. Pace of urban redevelopment and reorganisation of housing provision strategies will have significant impact on heritage. Action will seek to facilitate strategic resource planning and engagement with partners and stakeholders in those places which are (1) undergoing most change, (2) most sensitive to change, and (3) least resourced to manage change. Research on the degree of likely change through planning applications, master planning and other activities, linked to the spatial distribution of heritage assets in those areas, will be used to develop methodologies and tools for guiding sustainable change and minimising negative impacts."

The glossary to the National Planning Policy Framework (NPPF) defines the setting of a heritage asset as:

" The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral."

The glossary to the NPPF also defines Significance (for heritage policy) as:

" The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting."

Clearly, changes to aviation noise affecting a heritage asset have the potential to influence its setting and therefore the significance of the asset; either adversely when noise increases or beneficially when noise decreases. Thereby giving rise to the need for this project. There already exist a number of recognised methods and metrics for assessing the impacts of aviation noise on the health, quality of life and well-being of persons; but nothing similar exists in regard to the setting of heritage assets. Temple Group Ltd (Temple) in partnership with Cotswold Archaeology have therefore been commissioned by English Heritage to develop a methodology to analyse the noise impacts of airport expansion on the surrounding historic environment.

The project includes a literature search and scrutiny of existing methods for the assessment of noise impacts on heritage assets; along with analysis of existing sources of aviation noise information and the specific data published by the Airports Commission to accompany their interim report published in December 2013.

The intended output of the project is a methodology that could potentially form part of the Airports Commission's appraisal of their shortlisted proposals for airport expansion.

3.0 Literature review

The literature review described below covers, firstly how the influence of sound and noise on heritage assets is accounted for in existing national policy and in impact assessment. An overview is given of how airport noise effects are generally assessed and the criteria which are usually applied to determine whether adverse impacts and effects are likely to occur to sensitive receptors. Following on from this an overview is given of the proposed noise assessment as part of the airports commission's appraisal.

There are three potential ways in which a heritage asset may be impacted by noise, these are illustrated below and discussed further in the literature review:

1. Disrupting the fabric of the heritage asset i.e. physical damage;

2. Disturbing persons using the heritage asset;

3. Altering the character and setting of a heritage asset so that its significance is appreciably affected.

Lastly, the concepts of tranquillity and soundscape are discussed as tranquillity can be important to appreciate certain types of heritage asset and research in these areas is helpful to understanding how acoustic and non-acoustic factors may be used to describe and evaluate the noise environment of a location, this can include both qualitative and quantitative factors.

The literature search has used the following resources, including books, journals, articles, databases and internet articles:

- The Institute of Acoustics Library
- Bristol University Library
- http://academic.research.microsoft.com/
- http://scholar.google.co.uk/

3.1 Heritage Policy and Noise

No national planning policies or guidance documents discuss specifically the contribution of sound to the significance of heritage assets or the potential harm that noise could cause; although the potential for noise to harm setting is recognised in English Heritage's guidelines for "The Setting of Heritage Assets" and case law[1] recognises that non-physical or indirect harm can be caused to setting. However, a large corpus of literature exists relating to impact assessment and heritage assets, and ways of defining concepts such as 'sense of place', 'setting' and 'significance'. Heritage guidance has increasingly moved away from simple quantitative assessment (number of specifically designated assets impacted) to a more intelligent, qualitative understanding of what matters, to whom, and why and how that will be affected, and whether it matters.

[1] E.g. Bedford Borough Council v Secretary of State for Communities and Local Government & NUON UK Ltd Second [2013] EWHC 2847 (Admin)

There is no doubt that absence of noise[2] and the presence of sound contribute to the sense of place or setting of many heritage assets, whether through accident or design. For example, churchyards, burial mounds, ruined buildings can all have a very distinct sense of place which is at least partially the result of the absence, or at least recession, of the invasive sounds of day-to-day modern life.

Consequently, it is considered that there is scope for discussion of noise and sound impacts upon heritage within the existing legal framework enshrined in the NPPF and other documents. **Appendix 1** expands on relevant sections of the existing heritage policy guidance and discusses how these are applicable to sound and noise issues.

3.2 Impact assessment considering noise and heritage

A web based search was carried out to identify heritage impact assessments which included an aspect of noise assessment, specifically of aircraft noise, using the resources described above.

This has produced no specific aviation noise heritage impact assessments. Heritage or Cultural Heritage is not an uncommon topic in Environmental Statements (ESs) for a range of developments; and a minority of these ESs include consideration of noise impacts on heritage assets. However, none of the schemes identified used detailed noise level information or more precisely developed specific noise level criteria as part of their assessment. They tend to use the absence of anthropogenic, i.e. man-made, noise in the baseline or it's presence in the with development scenario as a simple pass or fail test to the significance of noise impacts on heritage assets.

Specifically in regard to large scale infrastructure projects, examples of relatively recent assessments that considered noise impacts on heritage assets include those for the HS2 London to West Midlands Appraisal of Sustainability and Environmental Statement, and the Generation 1 proposals for increasing the number of flights at Stansted airport.

The search revealed that there is precedent for noise impacts on heritage assets to have a substantial role in decision making regarding development proposals in a minority of cases. For example in 1997 the secretary of state refused permission for an increase in flight numbers and changes to Liverpool airport, largely on the basis of noise impacts on listed buildings outside the airport perimeter (Speke Hall) and even within the airport perimeter (the disused control tower and 2 listed hangars).

3.3 Aircraft Noise Impact Assessment

Aircraft noise impact assessment in the UK generally focuses on the impact on people. This focuses on the potential for annoyance due to noise at dwellings, inside in habitable rooms and outside in gardens etc. There is also the potential for sleep disturbance due to high levels of aircraft noise in bedrooms. Recent studies have also linked aircraft noise to impacts on children's cognitive development and direct health effects such a ischaemic heart disease.

In general, aviation noise impact assessment follows the procedure of identifying noise sensitive receptors; predicting the noise level from aircraft at the receptor; and assessing whether the impact

[2] Noise is often defined as "unwanted sound".

leads to a significant effect, such as those described above, either by looking at the potential change in noise level or whether the predicted noise level exceeds a defined threshold.

3.3.1 Airport Noise Prediction

In the UK, two noise models are used to predict airport airborne noise, ANCON (Aircraft Noise Contour model) developed by the Civil Aviation Authority and INM (Integrated Noise Model) from the United States Federal Aviation Authority. Both models use physical characteristics of the airport and information on the numbers and types of aircraft that use the airport to predict noise levels at specific receptors and at points on a grid of varying dimensions. Noise contours can be plotted using the results of the predictions made using these models. Noise contours are lines on a map indicating regions of equal predicted noise level, similarly to height contours which indicate areas of equal height in a landscape.

Noise modelling means calculating noise exposure rather than measuring it. Calculating some aircraft noise characteristics from purely theoretical scientific principles is feasible, but it would be far too complex and computationally intensive for application in the routine production of noise contours. Instead, relatively simple mathematical tools combined with empirical data about the generation and propagation of aircraft noise from a large body of measured data is used.

Airport noise modelling methodology usually comprises three main phases. Firstly, aircraft operations data regarding the number of air traffic movements (ATMs) and types of aircraft that use the airport is obtained e.g. from Air traffic Control (ATC); and used to determine the annual average summer day traffic for the day and night calculation periods. Secondly, flight tracks and associated lateral dispersions are derived from ATC radar information for each departure and arrival route, again for each of the time periods. Thirdly, average flight profiles of height, speed and thrust were generated from the ATC radar data for the noise dominant aircraft types, for departures and arrivals, also for each of the time periods. Flight profiles for the less noise significant types, which would have had little or no effect on the contours are typically aggregated into single or several representative aircraft types.

The International Civil Aviation Organisation (ICAO) and the European Civil Aviation Commision both provide guidance and standards for airport noise modelling with the aim of promoting uniformity so that authorities can be confident in the modelling process and apply the same degree of stringency in accepting the output of compliant systems for assessment procedures. The UK Department of Transport and the Civil Aviation Authority both recognise and contribute to the ICAO and ECAC guidance as the UK is a founder member of both bodies and is a signature to the international treaties covering the environmental impacts of aviation.

Airport Noise Model Methodologies

The fundamental elements of the noise modelling system are illustrated in figure 1 below. The noise model may be thought of as a “black box” which operates on input data describing the scenario - the airport and its air traffic - to produce an output in the form of sound levels of specified noise metrics at discrete points (usually on a calculation grid). These values are the inputs to a post-processor which performs further analysis such as contour generation.

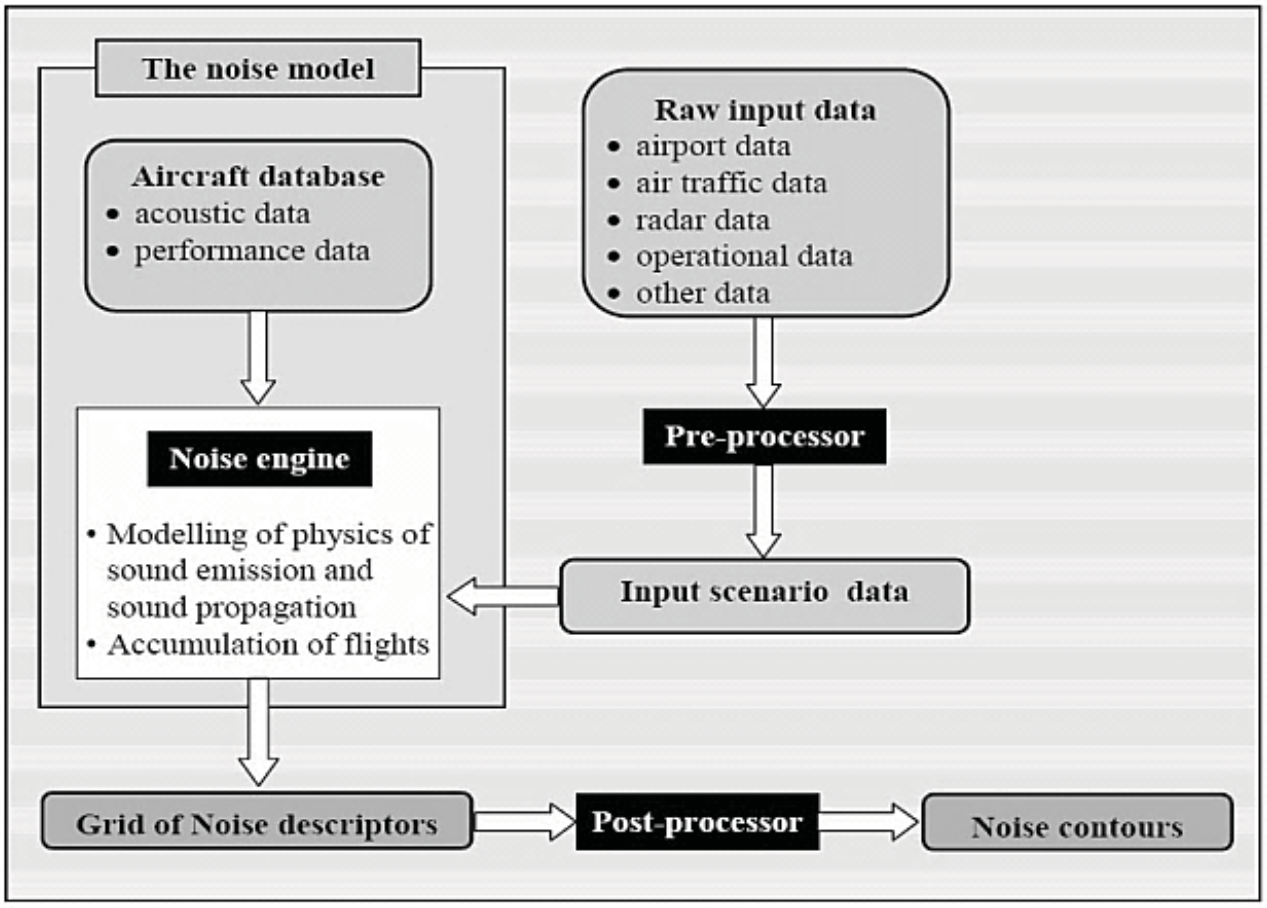


Figure 1- Elements of an Airport Noise Modelling System

Source: ECAC.CEAC Doc 29, 3rd Ed, Vol 1.

Air traffic is broken down into aircraft types or categories with different noise and performance characteristics which are stored in the aircraft database. To minimise computation, individual aircraft types having very similar noise and performance characteristics can be grouped into representative categories. Existing models use between about 10 and 200 categories. However grouping is not necessary if individual flight path information (e.g. from radar track keeping) and adequate noise data are available.

Airport Noise Modelling Approaches

The different ways of approaching along-path integration divide noise modelling algorithms into the three different types:

- Closest Point of Approach (CPA)
- Segmentation
- Simulation

CPA models were developed before the widespread adoption of time-integrated noise metrics to calculate noise descriptors. Their algorithms were relatively simple, being based on the assumption that, for given source characteristics, the peak noise level L_{max} depends only on the shortest distance between aircraft and receiver (i.e. time integration was not required). Although they have

been adapted to handle integration based descriptors e.g. L_{eq}, they have been largely superseded by segmentation algorithms.

Segmentation algorithms are developments of CPA-algorithms which calculate the separate contributions to a time integrate noise metric from all noise-significant flight path segments. All segments are straight; i.e. circular segments are described by a series of chords. However, for segmentation models, assumptions on the directional characteristics of aircraft sound radiation have to be introduced.

A simulation model describes the real flight path of an aircraft by a series of discrete points in space which are passed by the aircraft after successive small intervals of time. (This is similar to a segmentation model with small segment lengths) The noise level-time-history at any specific observer location is then constructed by calculating the sound radiated towards it from each flight path point. With this method any noise metric can be derived. Two disadvantages of simulation modelling are heavy demands on computer processing power and time, and the need for very detailed acoustic input data, including information on the 3-D directional characteristics of the source noise, perhaps as a function of frequency of sound (spectral directivity data) and flight configuration. Such data are currently not available in the quantities needed for day-to-day aircraft noise modelling at different airports.

Thus segmentation models currently represent best practice for general aircraft noise calculation. They provide a reasonable compromise between the requirements on input data and the quality and accuracy of the output produced by the computation algorithm. Moreover, comprehensive databases for such models have been assembled over many years for a large number of different aircraft types.

3.3.2 Aviation Noise Assessment Criteria

Following the recommendations of the Wilson Committee report[3] on noise in 1963, the descriptor chosen for predicting and monitoring aircraft noise at Heathrow Airport was the Noise and Number Index, NNI, which is based upon the Perceived Noise Level, in PNL dB, of an aircraft type; and the number of that type operating into and out of the airport.

After a survey in 1967[4], the Number was defined as the number of aircraft exceeding 80 PN dB during the 12-hour period from 06:00 to 18:00 GMT (07:00 to 19:00 BST) averaged over the summer period from mid-June to mid-September. Consequently, NNI was a long-term average over the summer period. Meteorological conditions and airport operation may cause the short-term noise exposure at particular points over shorter intervals to be different than in this specified period, but use of this period has become a standard approach in assessment of noise impacts from airports.

Given information about aircraft types and a timetable of arrivals and departures, it is possible to predict NNI levels around an airport. Maps showing contours at 5 NNI intervals from 35 NNI upwards were produced for the major airports.

The Wilson Report found that:

[3] Wilson committee report on the problem of noise (1963)

[4] Survey in 1967

- 35 NNI relates to low levels of community annoyance
- 45 NNI to moderate levels of community annoyance; and
- 55 NNI to high levels of community annoyance.

It is important to understand that the above relates to "community annoyance" i.e. the response of a population, and that within the group exposed to aircraft noise at these levels there will be a wide variability in individual subjective response. For example some individuals would be annoyed at NNI of less than 30, and others might not be annoyed at NNI of 55 or over.

However, continued use of the NNI went against the international trend to use $L_{Aeq,t}$ and there were problems in establishing compliance, as NNI cannot be measured directly and has to be calculated from the relatively complex Perceived Noise Level, in PNL dB, of each aircraft. Additionally, unlike $L_{Aeq,t}$ the NNI was not easily comparable with other national systems and was only valid for Heathrow for which it was formulated. Also it ignored all noise events that are just under 80 PNL dB, and it makes no allowance for the duration of individual noise events or for the degree to which the noise levels exceeds 80 PNL dB.

In order to address issues with the use of NNI the United Kingdom Aircraft Noise Index Study (ANIS)[5], undertaken in 1982, was commissioned by the Department of Transport. The study and its findings were published by the Directorate of Research of the Civil Aviation Authority in 1985 as DR8402 United Kingdom Aircraft Noise Index Study. Areas, each approximately 1km^2 were identified for surveying: 18 in the vicinity of Heathrow; 2 at Gatwick; and one each at Aberdeen, Luton and Manchester airports.

The survey used the Guttman Annoyance Scale (GAS) and found that $L_{Aeq,24h}$ had a slightly better correlation than NNI with perceived annoyance/disturbance averaged over the three summer months, mid-June to mid-September.

In 1986, the Department of Transport undertook a consultative exercise involving all interested parties such as: Local Authorities; airport operators; airline companies; Members of Parliament etc. Responses and comments appeared in the DORA Report 9023 *'The use of L_{eq} as an Aircraft Noise Index'* (1990)[6].

The UK ANIS report had previously established the relationship between NNI and $L_{Aeq,24h}$ to be:

- 35 NNI is equivalent to 57 dB $L_{Aeq,24h}$ (low levels of community annoyance)
- 45 NNI is equivalent to 63 dB $L_{Aeq,24h}$ (moderate levels of community annoyance)
- 55 NNI is equivalent to 69 dB $L_{Aeq,24h}$ (high levels of community annoyance)

Based on the findings of the UK ANIS and the DORA 9023 reports the above were proposed as impact assessment criteria. However, it was felt that $L_{Aeq,24h}$ would be too radical a change from the 12-hour basis of NNI and therefore the following indices were proposed as these periods aligned with those in PPG 24[7] – the then current Ministerial advice on Planning and noise:

[5] The ANIS report can be viewed at: http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=1441 (viewed at 7th May 2014)

[6] The DORA 9023 report can be viewed at http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=761 (viewed at 7th May 2014)

[7] PPG 24 (1994)

- $L_{Aeq,16h}$ for 07:00 to 23:00 (day)
- $L_{Aeq,8h}$ for 23:00 to 07:00 (night)

In order to correlate with the then current ministerial advice on planning and noise PPG24, it was then proposed that these criteria are referenced over the following time periods:

- 57 dB $L_{Aeq,16h}$ (low levels of community annoyance)
- 63 dB $L_{Aeq,16h}$ (moderate levels of community annoyance)
- 69 dB $L_{Aeq,16h}$ (high levels of community annoyance)

The above values are now incorporated in the current Aviation Policy Framework[8] as follows:

Para 3.17 - "*We will continue to treat the 57dB L_{Aeq} 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance. However, this does not mean that all people within this contour will experience significant adverse effects from aircraft noise. Nor does it mean that no-one outside of this contour will consider themselves annoyed by aircraft noise.* "

Para 3.36 – "*The Government continues to expect airport operators to offer households exposed to levels of noise of 69 dB L_{Aeq},16h or more, assistance with the costs of moving*. "

3.37 – "*The Government also expects airport operators to offer acoustic insulation to noise-sensitive buildings, such as schools and hospitals, exposed to levels of noise of 63 dB LAeq,16h or more. Where acoustic insulation cannot provide an appropriate or cost-effective solution, alternative mitigation measures should be offered."*

3.4 Airports Commission Information

The Airport Commission has released a summary and main report on their Appraisal Framework[9] for assessing the options from their interim report. The sections on noise and place of the main report are most relevant.

The shortlisted options from the interim report are as follows:

- Gatwick Airport:
  - Gatwick Airport Ltd's proposal for a new runway to the south of the existing runway
- Heathrow Airport (two options):
  - Heathrow Airport Ltd's proposal for one new 3,500m runway to the northwest of the existing runways
  - Heathrow Hub's proposal to extend the existing northern runway to at least 6,000m, enabling the extended runway to operate as 2 independent runways.

In regard to an option for a new airport in the Thames estuary the Airport Commission stated the following in their interim report:

"*The Commission has not shortlisted any of the Thames Estuary options because there are too many uncertainties and challenges surrounding them at this stage. It will undertake further study of*

[8] Aviation policy framework (2013)

[9] Airports commission appraisal framework

the Isle of Grain option in the first half of 2014 and will reach a view later next year on whether that option offers a credible proposal for consideration alongside the other short-listed options."

The Airport Commission appraisal framework sets out how the appraisal will be done and confirms the information that will be produced.

The system wide base case to be considered for the assessment would be in relation to a 'do-minimum' scenario which will capture the predicted future levels of airport traffic at different airports, and the areas of land and numbers of houses contained within stated noise levels without any of the short listed options in place. The do-minimum will also account for predicted fleet mix and technological improvements to the aircraft fleet. The appraisal will then develop future "do-something" scenarios for each of the short listed options which also account for predicted fleet mix and technological improvements to the aircraft fleet. The assessment of the impacts will then be based on comparison of the do-minimum and do-something scenarios and the overall modelling assessment will progress in the following stages:

- an assessment of aviation noise impacts associated with a scheme (including any other airport sites affected);
- for the local assessment, a high level consideration of changes to surface access noise, modelled where a 25% or greater change in traffic low is expected;
- the estimation of the propagation of emissions from all identified sources, including accounting for local meteorology, within pre-defined study areas;
- an exposure assessment to determine the population and amenities (comprising schools, hospitals, community centres and places of worship) exposed to changes (positive or negative) to the relevant base case;
- an estimate of how the spatial and temporal impacts of airport related ground noise will be minimised through reference to change in air traffic movements and runway location.

The implications of different applications of respite will be fully considered in relation to all of the above.

The information produced form the assessment will include the following noise contours:

- L_{Aeq} - The average summertime noise contours for day (54-72 dB $L_{Aeq,16hr}$) and night (48-72 dB $L_{Aeq,8hr}$),
- L_{DEN} – calculated based on the annual average 24 hour Leq with weightings for evening and night time periods)
- 'Number Above' frequency contours – the N70 and N60 (the number of aircraft in a defined period aircraft exceeding a peak L_{Amax} noise level of 70 dBA at a receptor during the day and 60 dBA at night).

In addition the Airport Commission will also include useful information on the assumptions underlying the noise data in their appraisals e.g. the number and type of aircraft and flight paths etc. that will be helpful in meeting the aims and objectives of this project.

3.5 Noise Affecting Heritage Assets – Physical Damage

If sound energy is assumed to be unlimited, in theory the noise from any source including aircraft could cause physical damage to the structure of a heritage asset provided it is high enough. However, as shown in the table below, the energy content of the loudest sounds likely to occur in

even the most extreme circumstances range from very small to small and are insufficient to directly affect the structure of even the most at risk structures.

Table 1: Description of the physical energy associated with specific sound levels from various sources

Situation and sound source	Sound level dB re 10^{-12} W	Sound Power Watts
Threshold of pain	140	100
Machine gun	130	10
Heavy thunder	120	1
Rock concert	110	0.1
Underground Train	100	.01
Large diesel vehicle	90	0.001
Alarm clock	80	0.0001
Noisy office	70	10^{-5}
Quiet office	50	10^{-7}
Quiet home	40	10^{-8}
Broadcast studio	30	10^{-9}
Whisper	20	10^{-10}
Human breath	10	10^{-11}
Threshold of hearing	0	10^{-12}

However, high sound levels in low frequency sound e.g. below 200 Hz, and especially below approximately 80 Hz, can induce perceptible vibration of lightweight building elements. These impacts of low frequency noise can be exacerbated by resonance effects inside a room. Resonances increase the sound level in parts of the room whilst decreasing it in others. For example, a room of dimensions 4m by 5m by 2.5m has low frequency resonances from 34 Hz

upwards[10]; therefore the fabric of the structure may be subject to increased noise levels at these frequencies and may exhibit vibration at high sound levels at the resonant frequencies for a particular structure.

Research[11] indicates that high intensity airborne low frequency aircraft noise can induce perceptible vibrations in light weight structures and components of structures e.g. window "rattle".

A study commissioned by FAA/NASA/Transport Canada[12] showed that windows "known to rattle" would almost always produce audible rattle with peak external aircraft noise levels of 97 dBC L_{max}. An earlier study[13] produced similar results with vibration becoming perceptible in lightweight buildings at peak external aircraft noise levels of 80 to 90 dB. This effect is likely to exacerbate the impact of the aircraft noise on persons inside the building, as it is a "parallel effect" i.e. a simultaneously occurring effect linked to the noise event, likely to draw more attention to the aircraft noise and increase disturbance.

Whilst airborne low frequency noise can induce perceptible vibrations in light weight structures and loose fitting components of structures, the induced levels are typically substantially below levels at which even minor cosmetic damage to buildings and structures may occur[14]. It is also worth considering that whilst high levels of low frequency noise may induce perceptible vibration and parallel effects in light weight structures; the resulting vibration levels are likely to be substantially below those caused by persons walking around the building, using stairs and opening and closing doors etc. However, aircraft noise levels capable of inducing perceptible vibration and parallel effects such as window rattle are only likely to occur at Heritage sites very close to an airport; and are therefore unlikely to change significantly due to the negligible to minor changes in flight paths this close to Heathrow or Gatwick for any of the options at these airports; except for elimination or substantial reduction of the issue if an estuary option goes forward.

It is therefore considered highly unlikely that airborne noise from aircraft will cause even cosmetic damage to heritage assets and as a result is scoped out of this study and will not be considered further.

3.6 Noise Affecting Heritage Assets – Human Response

The second effect of aviation noise considered in the study is disturbing persons using, living or working at the heritage asset. For example, causing speech interference, inducing annoyance and

[10] A Review of Published Research on Low Frequency Noise and its Effects - Report for Defra by Dr Geoff Leventhall Assisted by Dr Peter Pelmear and Dr Stephen Benton (2003) see http://www.defra.gov.uk/environment/noise/research/lowfrequency/pdf/lowfreqnoise.pdf

[11] Building damage due to aircraft noise induced vibration, N Broner, Internoise 1992, Tototonto Canade, Pgs 687-690.

[12] Low Frequency Noise Study prepared byKathleen K. Hodgdon, Anthony A. Atchley, Robert J. Bernhard, April 2007 REPORT N0. PARTNER-COE-2007-001.

[13] Harvey H. Hubbard, Noise Induced House Vibrations and Human Perception, Noise Control Engineering Journal, September-October 1982.

[14] BS 5228:2009 advises that the threshold of perception of vibration lies typically in the Peak Particle Velocity range of 0.14 mm·s−1 to 0.3 mm·s−1. Whereas BS 7386 advise vibration levels, below which damage is unlikely to occur in 95% of buildings. For cosmetic damage, the standard advises the level is 15 mm/s at 4 Hz, increasing to 20 mm/s at 15 Hz, increasing to 50 mm/s at 40 Hz and above. Minor structural damage is possible at vibration levels twice those given, major damage at four times the levels given.

disrupting rest and recreation. Also disrupting use of the asset e.g. teaching and educational uses, use of the asset for performance activities, and use of the asset as a place of worship etc.

The auditory effects of noise such as hearing loss from long term exposure to high levels of persistent noise e.g. noise in heavy industrial work places, or short term exposure to very high levels of impulsive noise e.g. shooting/explosions, has been recognised as a hazard to hearing for a long time. However, this is normally only a risk in occupational situations where long term exposure to high levels of noise may occur; as noise levels in the environment are rarely sufficient to pose a substantial risk of hearing damage. However, there are also non-auditory effects of noise including effects on cardiovascular function (ischemic heart disease and hypertension), and changes in breathing, annoyance, sleeping problems, disruption of communication and activity interference. This wide range of effects has led researchers to believe that noise has the ability to act as a generalised non-specific stressor leading to health effects.

More information on the impacts of aviation noise and its assessment is provided in Appendix 2 of this report

Annoyance due to aviation noise

Annoyance[15] due to aviation noise is commonly used as the overarching effect used to appraise all its impacts except sleep disturbance.

Extensive research into noise annoyance and disturbance over many decades has shown that although average long-term effects e.g. annoyance, can be determined by asking a representative sample of a population to rate their individual annoyance on a numerical or category scale such as 'not annoyed, 'a little annoyed', 'moderately annoyed or 'annoyed very much', these responses tend to be only weakly linked with the degree of sound exposure. This modest correlation reflects very large differences between individuals' reactions to the same noise (due to the modifying non-acoustic factors such as attitude to the noise maker, personality traits, perception of control over the noise and noise sensitivity etc.) rather than a failure of experimental design.

The **Figure 2** below shows an indicative chart of the 'percentage highly annoyed' of a sample of a population plotted against noise exposure level based on data from numerous social survey studies of aircraft noise carried out in different countries[16]. Each point in the diagram represents the response of a sample of respondents exposed to a particular level of noise. The curve is a 'best fit' to the scattered data points, and the general shape has been re-confirmed more recently[17] by further research which shows the similar scattering of data points.

[15] The WHO guidelines for Community Noise (2000) provide a definition of noise annoyance as "*a feeling of displeasure associated with any agent or condition, known or believed by an individual or group to adversely affect them" (Lindvall & Radford 1973; Koelega 1987)".*

[16] Schultz, T.J: Synthesis of Social Surveys on Noise Annoyance J. Acoust. Soc. America, 64, 377-405, 1978; Fidell, S., Barber, D.S., Schultz, T. J: Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. J. Acoust. Soc. America, 89, 221 - 233, 1991.

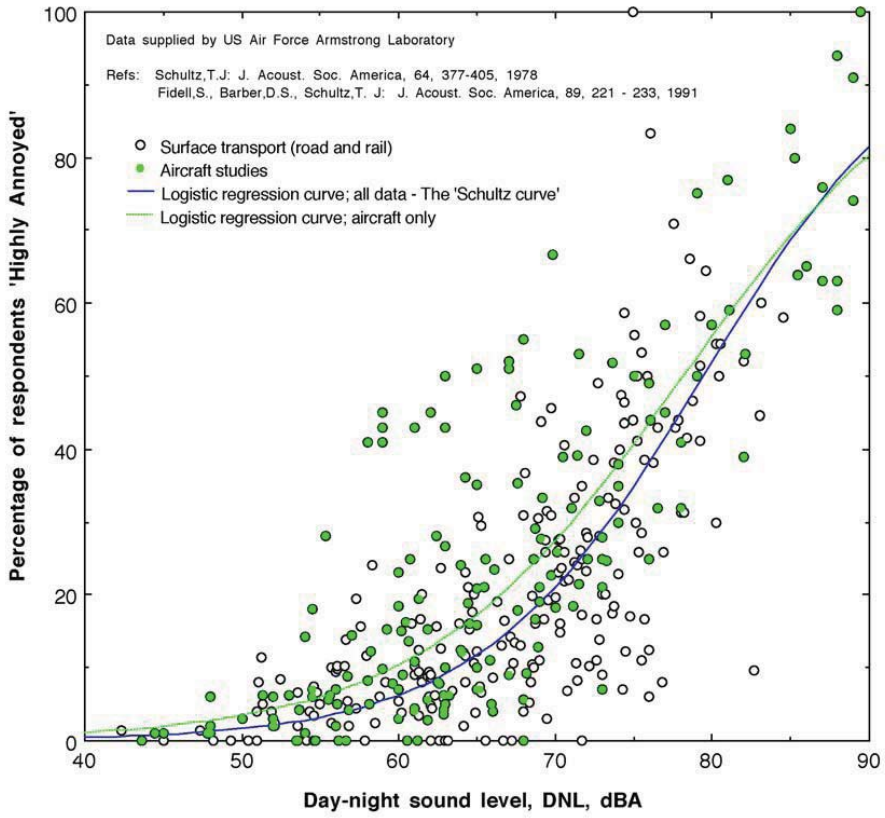
[17] Fidell, S. (2003). The Schultz curve 25 years later: A research perspective. J. Acoustical Society of America 114(6), 3007-3015; Fidell, S. & Silvati, L. (2004). Parsimonious alternative to regression analysis for characterizing prevalence rates of aircraft noise annoyance. Noise Control Engineering Journal, 5(2), March/April, 56-68; and, Miedema, H. M. E., Vos, H. (1998) Exposure response functions for transportation noise. Journal Acoustical Society of America 104, 3432-3445.

The purpose of reproducing this chart here is to illustrate how a statistical estimate of the underlying trend between annoyance and the noise index can be developed for a population as a whole, even though the scatter of data i.e. the variability of individual sensitivity is high; as shown by the deviation of individual points from the trend line.

Environmental noise assessment is not sufficiently precise, primarily due to the substantial variation in sensitivity to noise across a population, to enable the subjective reaction of individuals to be confidently predicted. Consequently, event noise levels and noise exposure contours only provide indications of the likely extent and severity of the general effects of aircraft noise on communities, but due to the significant variability and volatility of individual subjective response to noise, and the significant influence of non-acoustic factors on these traits, they cannot indicate accurately how particular individuals will react.

Despite these limitations, the curve in **Figure 2** illustrates the probable form of the relationship between noise exposure and community annoyance. It aggregates results from many surveys in different countries and may be considered typical, if not average. The main application of current aircraft noise assessment methodology is in comparing the effects of different noise exposures that might result from changes to an airport and its operations (or between different possible future scenarios). It is usual practice to compare, for the *current* and *future* situations, the numbers of people residing between noise exposure contours depicting low (e.g. < 57 dBA), moderate (e.g. >57<63 dBA) and high (e.g. >63 dBA) levels of exposure ($L_{eq,16\ hrs}$); and thus determine the corresponding changes in the extent of annoyance in the community. This, broadly, is the approach adopted in the Airport Commission's appraisal framework.

Figure 2:- Incidence of Community Annoyance due to Aircraft Noise from Social Survey Data



Note: Fig. 2 source – CAP 725 CAA Guidance on the Application of the Airspace Change Process Airspace Change Proposal - Environmental Requirements

Influence of non-acoustic factors

Many studies show that the issue of assessment of the impact of aviation noise is complicated by the influence of non-acoustic factors, some of which have concluded that:

- In regard to noise management at Heathrow airport: "*Non-acoustic factors in environmental noise can be broadly defined as all those factors other than noise level alone which contribute to noise annoyance and similar effects.*[18]
- In regard to changes in flight paths for the East Midlands Airport: "*Those of a higher socio-economic status and average income were shown to have a higher propensity to complain and a further disassociation between noise and complaints was seen in the capacity for media coverage to induce a higher rate of complaint. Finally, serial complainants exhibited very different complaint behaviour and influenced overall trends. Therefore, the evidence shows that many factors in addition to noise can impact the pattern of complaints.*" [19]
- In regard to a study involving Manchester, Lyon and Bucharest Airports: "*There is however a big difference in the tolerance or acceptance of the presence of an airport across the three study areas, and this is almost entirely due to the utility or disutility associated with the airport.*"[20]

The strong influence of non-acoustic factors on the subjective response to noise means that whilst some effects have been measured objectively and quantitatively and correlated well with noise exposure indicators e.g. speech disturbance and noise induced levels of hearing loss. There are some behavioural indicators, including annoyance, which can be quantified, but are strongly influenced by non-acoustic socio-psychological factors such as location, activity, state of well-being, familiarity with the noise, personality, environmental expectations, and attitudes to noise makers. The effects of such modifying factors can dramatically weaken correlations between noise and response indicators by masking or confounding their dependency on noise level. Such relationships are further obscured by variations in the actual noise exposure over time and space, because individuals tend to move around and engage in different activities; and the changes in socio-psychological factors which can be volatile.

The wide variability of individual responses to noise and the strong influence of non-acoustic factors leading to the absence of a clear threshold of acceptability applicable in all circumstances is common for most noise sources and most noise effects. This means that decisions in regard to noise "limits" and criteria are essentially a judgment of the balance between controlling the negative effects of the noise weighed against the positive social and economic benefits of the scheme giving rise to the noise.

[18] Flindell IH, Witter IJ. Non-acoustical factors in noise management at heathrow airport. Noise & Health 1999;1:27-44.

[19] *Pagliari, R. (supervisor); Ashman, Catherine An investigation into the influence of non-auditory factors on community response to aircraft noise* Sept 2007.

[20] Christine Heaver (Faber Maunsell Plc), Attitudes to Aircraft Annoyance Around Airports (5A) FOCUS GROUP REPORT EC/ENV/2002/009, Eurocontrol (2002).

3.7 Noise Affecting Heritage Assets – Heritage Setting

The glossary to the National Planning Policy Framework defines setting of a heritage asset as:

"*The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.*"

The same glossary also defines Significance (for heritage policy) as:

"*The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.*"

The English Heritage guidance document The Setting of Heritage Assets comments in several places that noise can be a factor influencing the setting of a heritage asset e.g. in the key principles whilst reinforcing that visual aspects are often important the document also states that "*the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration;".*

In developing a methodology to assess the effects of aviation noise on heritage assets the principles and conventions from Environmental Impact Assessment (EIA) are being used in this study as they provide an established and robust framework on which to base the project.

Somewhat confusingly, the term Environmental Impact Assessment suggests it means assessing impacts; but the EIA Directive and transposing UK legislation explicitly directs the practitioner to assess the "*significance of effects*". This leads to some practitioners using the terms "impact" and "effect" interchangeably. However, it is becoming common for practitioners to distinguish between impacts and effects, for example by correlating the sensitivity of the receptor with the potential impact, to help identify the environmental effect. The significance of any subsequent effect is then frequently determined by way of professional judgement and/or the use of matrices of quantitative and qualitative criteria. Therefore, despite the terms often being used interchangeably in many Environmental Statements, the definition and prediction of impacts and effects can be viewed as separate elements of the EIA process. The absence of a formal definition of what constitutes an impact or effect in either the EIA directive or the transposing legislation means that a definition of effects or impacts needs to be identified in an ES, for example as follows;

- Noise Impact: the noise level of the source under consideration, and/or any change in noise levels due to the scheme, and/or the relationship between the noise level of the source under consideration and a descriptor of the existing noise climate; at a receptor or group of receptors.

- Noise Effect: the consequence of the noise impact e.g. annoyance, sleep disturbance, speech interference, health consequences, fauna displacement, disruption of setting etc.

Consequently, this study uses the above definitions of "impact" and "effect".

Noise impact and noise effect have a clear relationship with each other; with the noise effect linked to the magnitude of the noise impact and the other factors that influence how the impact will affect the receptor e.g. sensitivity of the receptor etc. The magnitude of impact of aviation noise can be defined as the absolute aviation noise level i.e. how loud it is; and/or any change in aviation noise levels at a heritage asset or group of assets.

The absolute aviation noise level can be used where a heritage asset is currently unaffected by aviation noise; and the change in aviation noise level can be used where a heritage asset is currently affected by aviation noise but will be subject to lower or higher aviation noise levels as a consequence of the Airport Commission's final recommendations.

However, one complication in developing a methodology is that there is no attributable correlation between a heritage asset's sensitivity to noise and any of the following factors that may apply to the asset:

i. statutory protection;
ii. designated status i.e. grade; or ,
iii. perceived local value afforded to the asset.

For example a Grade I Listed building is not necessarily more noise sensitive than a Grade II Listed building. Any attempts to derive a relationship between these factors, without an explicit expression and understanding of what makes the heritage asset significant, is subject to substantial uncertainty and should be avoided.

The 'grading' of statutory protection is often used to determine the relative heritage significance of assets for examples see DMRB Vol. 11, part 2. Although simplistic and recognised as an industry standard, this ranking system, for the reasons defined above, cannot be applied to rank the noise sensitivity of heritage asset to noise i.e. an asset of schedulable quality is not of particular noise sensitivity due to its acknowledged significance / value.

However, if a proposed development (that results in increases in noise) is deemed to cause harm to a heritage asset, the scale of that harm and the relative significance of the heritage asset should influence the judgement of the 'planning balance' used in deciding if the benefits of the proposed scheme outweigh the harm it causes; where the more significant the asset, the greater the weight should be afforded to its conservation or protection.

The literature review carried out as part of this study has found that the Muir Woods National Monument study[21] identified that "*human-caused sounds*" (AKA anthropogenic noise) detracted from the visitor experience. If this evidence can be applied to the way in which we understand how heritage assets are experienced (and there is no reason why it shouldn't be) then all types and forms of heritage asset can potentially be affected.

A fundamental position that might have to be accepted primarily based on accumulated experience rather that the current limited research base, is that noise i.e. "unwanted sound", can affect people and this may undermine the way in which people experience cultural pursuits (the arts, the historic environment and nature). This is not necessarily linked to a specific type of pursuit (or attraction). Therefore, extrapolated from measured visitor data, it does not necessarily matter what type of

[21] Understanding and Managing Experiential Aspects of Soundscapes at Muir Woods National Monument: Ericka J. Pilcher, Peter Newman, Robert E. Manning; Environmental Management (2009) 43:425–435

heritage asset might be experienced, as based on this hypothesis some people will inevitably find that noise will spoil their experience and thus harm the significance of the asset.

3.8 Tranquillity and Soundscape

3.8.1 Soundscapes

Soundscapes can be defined as follows: "*the sound environment in context perceived by an individual, a group or a society*" [Kang, 2009[22]].

[Kang, 2010[23]] provides a summary of soundscape research and notes regarding the effect of soundscape on culture that "*soundscape is a significant factor in the 'sensing of places'*." The study notes that the introduction of more uniform sounds across different society's cities and landscapes leads to more similar sound environments whereas previously there may have been variation which would have helped distinguish and characterise places and show the diversity of cultures. Soundscape studies can help understanding how this aspect of culture may be changing and allow the conservation and restoration of the sound environment.

Five main issues are considered [Kang, 2010] within soundscape research:

- Understanding and exchanging: This encompasses defining what a soundscape is, evaluating it, describing it and potentially modelling it (in order to predict changes).
- Collecting and documenting: Surveys which can include 'soundwalks' where by someone walks through a soundscape and then after a period of time answers a series of questions.
- Harmonising and standardising: it will be important to standardise how soundscape definition, evaluation, surveys etc. are completed in order to promote more widespread use and understanding.
- Creating and designing: production of the tools and guidance on soundscapes.
- Outreaching: promoting the outputs and methods to policy makers and general public.

Key to soundscape research is understanding how the sound environment within its proper context affects its users. The interaction between acoustic and other physical environments is an essential consideration, and of various physical conditions the aural-visual interactions have been intensively studied. Although considerable work has been carried out in the evaluation of soundscapes, it is recognised that there is a need for further work; in particular there is quite a variation in how soundscapes are described and evaluated currently. A soundscape may be described in terms of 'designable' factors, these can essentially be broken down into four factor 'types' [Zhang and Kang, 2007[24]]:

- **Individual sound sources** (such as traffic, birdsong etc.) – these can each be described in terms of sound level, frequency spectrum (or tonality), temporal conditions (time of day, duration, impulsiveness), location and movement (i.e. is the source moving) and psychological / social characteristics (such as it's positive or negative meaning, natural or anthropogenic sound, relationship to activities etc.)

[22] Report on the COST Edinburgh workshop on Hot topics in Soundscapes. ISO?TC43/SC1/WG54 Meeting, Seoul, Korea; Kang J. and Management Committee.

[23] Soundscapes where are we?, Kang .J : Proc of Institute of Acoustics & Belgian Acoustical Society – Noise in the Built Environment, Ghent, 2010

[24] A systematic approach towards intentionally planning and designing soundscape in urban open public spaces. Kang. J. Proc of the international Congress on Noise Control Engineering, Istanbul, Turkey, 2007

- **Effect of the space** – the characteristics of the space (such as reverberation times an d acoustic reflection patterns) in which the soundscape is experienced can affect the perception of the sound sources.
- **Social aspect** – An individual 'user' of the soundscape can perceive it differently due to their social (cultural) or demographic characteristics or their typical acoustic conditions in everyday life (at home, at work) and other previous experience.
- **Other aspects** – this can include temperature, humidity, lighting, visual and landscape characteristics, for example.

Regarding the social aspect, it has been suggested [Bruce et al. 2009[25]] that soundscapes can lead to issues of distraction when it does not conform to a user's perceived sense of normality (expectations) or interferes with listening. Expectation is shown to be an important factor in the users rating (positive or negative) of a soundscape.

3.8.2 Tranquillity

Whilst there is no formal definition of tranquillity there are several in common use e.g. "*Tranquillity is the quality or state of being tranquil; meaning calmness, serenity and worry free*." [Wikipedia, 2014] and it "*is a highly valued yet seemingly elusive experience. It is stimulated by sight, sound and other senses either directly or as a trigger to memories*." [Jackson et al, 2007[26]]

Tranquillity research generally uses similar factors for description of the sound environment as soundscapes, as one aspect to help evaluate or describe the level of tranquillity at a location. Whilst it was mentioned above that it is important for soundscapes to consider non-acoustic aspects such as the landscape or visual aspects, it is particularly essential when describing how tranquil a location is.

Tranquillity Rating Prediction Tool

The University of Bradford (Watts et al[27].) have looked at developing a Tranquillity Rating Prediction Tool (TRAPT). The tranquillity rating is a score between 0 and 10 where 0 is '*not at all tranquil*' and 10 is '*most tranquil*'.

The TRAPT initially used a measure of the noise level ($L_{Aeq,T}$) and the percentage of natural features (excluding sky) within the scene (NF). An equation was derived through experiments surveying subject's subjective responses in controlled scenarios. It was found, however that there was not sufficient correlation between the predicted tranquillity score and the actual tranquillity score (from subjective experiment). The primary reason identified was that certain man-made cultural and contextual features can contribute to the perception of tranquillity. These features include heritage assets such as listed buildings, religious and historic buildings, landmarks,

[25] Expectation as a factor in the perception of soundscapes; Bruce, NS, Davies, WJ, and Adams, MD; Euronoise 2009, 26-28 October 2009, Edinburgh, U.K..

[26] Tranquillity Mapping: Developing a robust methodology for planning support; S Jackson, D Fuller, H Dunsford, R Mowbray; Northumberland University, Technical Report on Research in England, January 2008 (revised).

[27] Watts G R, Pheasant R J, Horoshenkov K V, 2010, "Validation of tranquillity rating method", Proceedings of the Institute of Acoustics and Belgium Acoustical Society: Noise in the Built Environment, Ghent, Belgium.

monuments, and man-made elements of the landscape that that are geographically and aesthetically in keeping with the surrounding environment.

The TRAPT was revised, therefore to use the percentage of NCF (natural and contextual features) in a scene rather than purely natural features. The tool was further revised as additional moderating factors (MF) are taken into account such as masking of anthropogenic noises e.g. from road traffic with natural sounds e.g. running water, which may increase the tranquillity, or the addition of litter to the scene; reducing the tranquillity. The TRAPT equation is given below.

Equation 1: $TR = 9.68 + 0.041\ NCF - 0.146\ L_{Aeq} + MF$

The equation shows that for fixed levels of natural and contextual features an increase in the noise level will lead to a decrease in the tranquillity rating. With higher noise levels, of approximately 65 dB $L_{Aeq,T}$ or higher, the tranquillity rating is around 4 or lower, so there is effectively a limit to how tranquil a scene may be when subjected to high noise levels, except with the addition of moderating factors.

CPRE Tranquillity Mapping

In 2006 CPRE commissioned a project to map tranquillity on a national scale. The maps were derived by giving a tranquillity score to each 500m by 500m grid square that the land was broken into. The tranquillity scores are derived from the individual relative tranquillity scores of 44 different factors which influence the overall tranquillity scoring (21 positive factors, 23 negative factors). The scores from each factor are weighted and added together for each square to give an overall relative tranquillity score for the grid square. The different factors are split into seeing and hearing, some positive and some negative. Positive factors include seeing lakes or trees in the landscape and hearing running water or no human sounds. Negative factors include seeing roads or wind turbines and hearing low flying aircraft or non-natural sounds. The weighting for each factor was derived through questionnaires whereby people would rate each factor as either positive or negative to the tranquillity at the location.

Interestingly, seeing villages and scattered houses is a negative attribute for the purposes of CPRE tranquillity mapping, however should they be in the right context; the above TRAPT study would treat them as positive to the tranquillity rating.

The research is useful as it highlights which factors are more important to others in maintaining a tranquil location. For example, '*seeing a natural landscape*' (positive) is weighted as 6.59% of the tranquillity score and '*Hearing, Constant noise from cars, lorries and/or motorbikes'* (negative) is 10.96% of the score, whilst '*Seeing, Villages and Scattered Houses*' is negative but only weighted 0.06% of the score.

As described above, the soundscape can be important to understanding the cultural characteristics of a place, and therefore can be important to understanding the significance heritage In heritage terms. Soundscape and tranquillity research provide a useful list of factors which help describe the sound environment and attempts to weight those factors to describe which are more important to people than others. The tranquillity research is also helpful as it illustrates that man-made features within a landscape, particularly heritage features, can add to the tranquillity rating of a location and that the introduction of certain types of noise can be detrimental to the positive soundscape required for tranquil conditions.

4.0 Aircraft Noise Impact Assessment using Tranquillity Maps

At first sight noise effects on heritage assets appear to be accounted for in the airports commission's appraisal framework's statement that it will review the effect of aviation on tranquillity using the CPRE's tranquillity maps as they *"also identify designated heritage assets located within tranquil areas, highlighting those that may be particularly susceptible to noise intrusion."* Also by the comment that the appraisal framework's "*methodology for assessing impacts on tranquillity from aircraft noise will involve overlaying maps showing flight paths below an altitude of 7,000 feet with the Campaign to Protect Rural England's (CPRE) national tranquillity maps, to illustrate areas where low-flying aircraft impact on landscapes and sites of tranquillity."*

The CPRE's tranquillity maps accounts for aviation noise as two negative attributes of the location assessed – *"Hearing, Low Flying Aircraft"* and *"Hearing, High Altitude aircraft"*

"Hearing, Low Flying Aircraft" is quantified by *"Modelling Noise – Time weighted"*. (PA weighting = 2.78%)

- Noise source level at distance from location (attenuated in 500m intervals)
- Source location is airport control zones (see figure 1) (and Military low flying areas) – relatively wide areas surrounding the airports.
- A time weighted coefficient is applied – this is an estimate of the amount of time an aircraft is audible at the location within a 12 hour period.

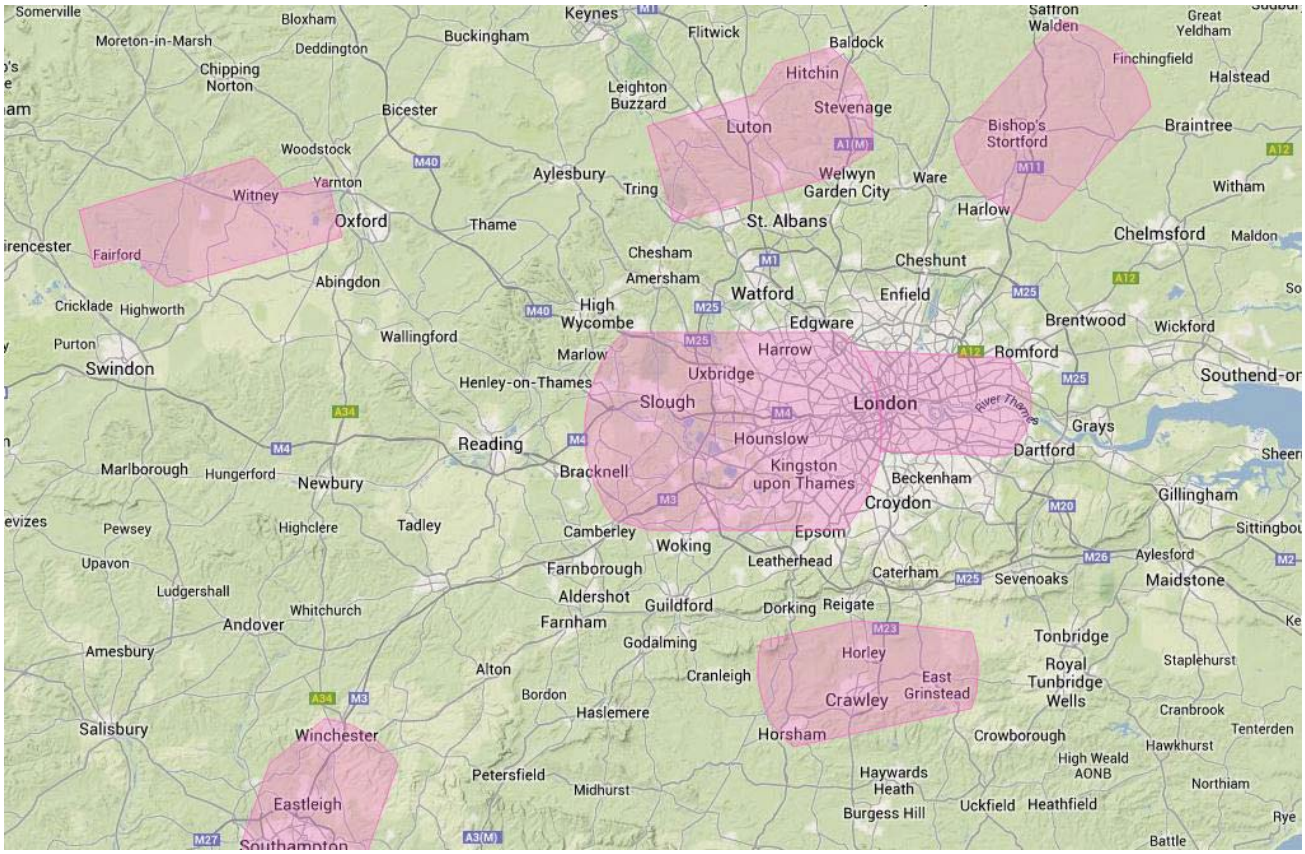
"Hearing, High Altitude Aircraft" is quantified by *"Modelling Noise - Context Specific Presence/absence"*. (PA weighting = 0.14%)

- Areas that lie underneath the main flight paths of England and that lie within each individual 500m x 500m grid cell are used as a proxy for noise for this option choice.

Overall, as described in the preceding section, the CPRE tranquillity score is made up of 44 different attributes (21 positive and 23 negative). The CPRE study found a range of absolute tranquillity scores in England from 148.51 (high) to -140.51 (low). This gives a range of 289. The maximum change at a location due to the presence of the maximum level of aircraft noise compared to no aircraft noise is a 'swing' of 29.2 or around 10% in the tranquillity score. In a scenario where the aircraft noise is increasing or decreasing by relatively small amounts then a 1 to 2% swing is more likely to be expected. Applying the CPRE method exactly, but with a 'new' airspace scenario may alter tranquillity scores, but it is unlikely to be by a significant amount, largely due to the 'coarseness' of the resolution of the mapping.

It is also worth noting that a location could have a relatively high score from the aircraft noise attribute but still lead to a relatively low tranquillity score compared with the surrounding area, particularly as aircraft flight paths may be directed over less populated areas. In this case the apparent change in tranquillity which may be assumed when overlaying aircraft flight paths on areas of relatively low tranquillity may be overstated.

Figure 3: - Illustrating Aircraft Control Zones (pink areas) in the South East of England. (Source: notaminfo.com)



In order to identify the heritage assets which may be exposed to a change in aircraft noise exposure, a scoping exercise should be undertaken. The airports commission have indicated that this would be achieved by overlaying updated flight track of noise information over up to date database information of all nationally designated historic places including:

- listed buildings;
- scheduled monuments;
- protected wreck sites;
- registered parks and gardens;
- registered battlefields;
- World Heritage Sites;
- applications for Certificates of Immunity; and
- current Building Preservation Notices

As indicated above, CPRE's tranquillity maps may be used to indicate heritage assets particularly susceptible to noise intrusion.

We have illustrated in a number of maps **(Figures 1 to 4 Appendix 4)** what the spatial scope might look like if this method is used:

1. Gatwick noise insulation boundary and heritage assets – this map indicates where noise insulation is currently offered due to noise from Gatwick. This is relevant as the heritage

buildings which are within this area have the potential for their building fabric (windows, roof) to be materially changed to protect noise levels inside.

2. CPRE tranquillity overlaid by heritage assets – this map indicates how the airports commission framework suggests highlighting heritage assets that may be particularly susceptible to noise intrusion.
3. CPRE tranquillity overlaid by heritage assets and Gatwick noise contours – this map indicates map 2 but overlaid by the aircraft noise contours from summer 2012.
4. CPRE tranquillity overlaid by heritage assets and Heathrow westerly departures – this map indicates the contents of map 2 but overlaid by an estimate of the footprint of westerly departures' radar track data below 4000ft.

5.0 Method to Assess Noise Impact on Heritage Assets

5.1 General Description of Methodology

The methodology developed to assess the impact of noise on heritage assets progresses using the following steps which are illustrated in the flow chart in **Figure 1**:

1. Scoping – the heritage assets with the potential for a noise impact are identified through a process of scoping using the National Heritage List and predicted noise change contours.
2. Sensitivity of Asset – the heritage assets which are identified in the scoping exercise are categorised according to how the sound environment contributes to the significance of the heritage asset. The assets which qualify within these categories could potentially be adversely effected (or benefit) from changes to the sound environment.
3. Detailed assessment – Heritage statements of significance, informed by an analysis of the existing sound environment would be assessed when an understanding of the nature of the noise change is known. .

The methodology is described in further detail below.

5.2 Scoping

The aim of the scoping exercise is to define which heritage assets are to be assessed and which of those are likely to experience a change in the ambient noise environment due to proposals from the Airports Commission on the future expansion of airport capacity in the South East of England.

The scoping exercise uses a geographical information systems (GIS) approach. Datasets identifying heritage assets including location information are obtained and mapped. A footprint (the noise change footprint) which covers all locations where there may be a change in aviation noise is derived from information provided by the Airports Commission appraisal. All designated heritage assets within the footprint are then identified as having the potential for a noise impact on their significance..

Designation data from The National Heritage List for England datasets and other readily available on-line data sets are to be used in the assessment. These will allow information to be captured on the following asset designations:

- Listed Buildings
- Scheduled Monuments
- Registered Park and Gardens
- Registered Battlefields
- World Heritage Sites
- Conservation Areas

Although it is acknowledged that airport noise can affect non-designated heritage assets, the large geographical scale of the study areas for this specific assessment (and thus potential quantity of heritage assets affected) necessitated a refinement in the scope to include only designated assets. However, if specific intelligence is available on non-designated heritage assets that warrant consideration they can be included within the scope of the assessment without the need to modify or amend the methodology in any way.

The noise change footprint is derived from the average summertime noise contours for daytime and the N60 contour (the number of flights where the maximum noise level exceeds 60 decibels at a particular location i.e. is likely to cause speech interference outdoors) for both the existing scenario and the future scenario.

The base case for this exercise will be informed by the base case put forward by the airports commission appraisal national assessment 'do minimum' scenario i.e.:

"The national (or 'system-wide') assessment will be measured in relation to the Commission's 'do-minimum' scenario which captures, as far as possible, the predicted future levels of airport traffic at different airports, and the areas of land and numbers of houses contained within stated noise levels. The do-minimum will also account for predicted fleet mix and technological improvements to the aircraft fleet."

The future scenario is the noise conditions due to aviation noise impacts associated with a scheme (including any other airport sites affected).

Firstly, the footprint indicating where changes in average summertime noise is derived. This involves overlaying the two scenarios contours in GIS to derive areas where there will be a 1 dB change in the average summertime noise level (positive or negative).

Secondly the footprint indicating where changes in number of significant over flights are likely will be derived. This will involve overlaying the N60 contours of both the scenarios in GIS to derive areas where there will be a 25% change in the number of flights exceeding the outdoor noise levels of 60dB L_{Amax} (positive or negative).

The two footprints showing locations of a potential positive change noise conditions will be combined to form the final 'positive change in aircraft noise conditions scoping footprint'.

The two footprints showing locations of a potential negative change noise conditions will be combined to form the final 'negative change in aircraft noise conditions scoping footprint'.

The two footprints will be overlaid in GIS over the identified heritage assets to give two lists of heritage assets which may have a positive or negative change in aircraft noise conditions. Each of the heritage assets in the lists will then be assessed as to whether the noise environment is important to the significance of the asset; this is described in the following section.

5.3 Potential Sensitivity of Heritage Assets

The assessment of sensitivity to noise is informed by a qualitative, thematic approach to understanding how the noise environment can specifically contribute to the experience of the heritage significance of the asset. A heritage asset which may be sensitive to the sound environment will qualify within one of the categories below; if they do not qualify, then the assets heritage significance is not deemed to be sensitive to changes in noise. Please note that the examples of heritage asset type are provided for illustrative purposes only, this is not a definitive list.

A. When solitude, embedded with quietness, is intrinsic to understanding the form, the function, the design intentions and the rationale for the siting of a heritage asset, e.g::

- Hermitages and retreats;
- Monastic sites e.g. those associated with Cistercian Order;

- Most places of worship;
- Components of designed landscapes; and
- Memorials and graveyards;

B. When a non-quiet and specific existing soundscape forms part of the functional understanding of the heritage asset, e.g:

- Working windmills (the grinding machinery and 'whoosh' of the sails / blades)
- Industrial sites e.g. working furnaces and workshops;
- Open air theatres;
- Specific areas within places of worship e.g. bell towers and chanting halls; and
- Cascades and fountains

C. When the abandonment of a heritage asset; a monument, building or landscape, in antiquity (or more recently), has created a perceived 'otherworldly romanticism' enabled by the absence of anthropogenic sounds (quietness) e.g:

- Battlefields; and
- Ruinous remains of former:
  - Estate houses;
  - Amphitheatres;
  - Factories and workshops;
  - Collieries and mining landscapes;
  - DMVs;

D. When the absence of 'foreign (modern) sounds' allow an asset to be experienced at 'a very specific point in time' that is intrinsic to understanding the heritage assets significance. This could be associated with e.g:

- The period of the monument or buildings construction;
- A key moment intrinsic to the heritage asset's 'story', i.e. its association with an important historic individual or event;
- An important phase of its redevelopment; and
- It's abandonment or destruction;

The provisional identification of an asset that could qualify within one of these categories will allow the assessment process to be taken forward in greater detail. It is envisaged that at this stage, the assessment will be derived from desk-based information. Therefore, it should be noted that the ease by which an asset can be classified within one of the categories, or the confidence that can be ascribed to the decision, could vary from asset to asset, due to the quality of the available information on the asset(s).

The approach advocated above does not allow for a heritage asset's sensitivity to noise to be 'ranked' or any relative scoring of sensitivity to be applied; this approach functions within the rationale that soundscape *either contributes to heritage significance or does not*. However, the different categories of asset do differ in their capacity to accept change i.e. in their tolerance to the introduction of noise or increased levels of noise. This tolerance can be determined following more detailed assessment of the heritage assets significance and the existing soundscape at each asset.

5.3.1

5.4 Detailed Assessment

Once a heritage asset has been identified as being sensitive to a change in environmental noise (in this case aviation noise), further assessment can be made. The assessment will be based on onsite observations, which will help inform what aspects of the noise environment are important to the setting of the heritage asset, and therefore what impact the change might have.

5.4.1 Aspects of Noise Environment Important to Setting

Before the site visit can be carried out initial identification of the aspects of the sound environment which are important to the significance of the heritage asset will need to be carried out to inform the noise survey.

The scope of the noise survey will be informed by:

- Locations at which setting may be experienced. These locations will inform the locations noise monitoring will be carried out. Whilst it may not always be possible to survey precisely at the sensitive location, alternative locations may be used to establish typical conditions.
- Time at which acoustic aspects of the setting may be important. This will inform the time of day or week when measurements are carried out. The noise survey, ideally, would take place during the sensitive times of day.
- Noise environment expectations. The expectation of the existing noise environment which lead to the assumption at this stage that the noise environment is important to the setting should be ascertained prior to the survey. This may include specific sounds which may be important for category B or D, for example.

5.4.2 Noise Survey

The noise survey will collect information on the following:

- Noise levels at sensitive locations derived above. The actual requirements of the noise survey may vary depending on the existing noise sources and the expectations of the noise environment. However L_{Aeq}, and L_{AMax} noise levels over the sensitive time period (e.g. day and night) and of specific aircraft fly overs (if currently present) may be measured to allow comparison to predictions of future air traffic noise changes. Should the site be in category B, for example, then additional measurements may be made of the specific noise important to the setting. Additional relevant factors should be recorded depending on the noise source, such as number and frequency of over flights for aircraft noise.
- Existing noise sources audible at the sensitive locations should be noted. The noise sources should be listed and information included on both their contribution to the setting of the heritage asset (e.g. positive/ negative/ neutral to the setting) and contribution to the measured ambient noise levels (e.g. dominant, significant, minor).
- The noise survey should be carried out at identified sensitive times of day or week. It is likely this would involve an attended survey at the most sensitive times, with additional unattended monitoring period to cover the typical 24 hour period during the weekdays and weekends if relevant.

- The noise survey would also confirm any existing contributions of ambient noise climate, or aspects of it, to the heritage setting, based upon the noise environment expectations.

5.4.3 Existing Noise and Future Aircraft Noise Impact on Setting

The assessment should progress by comparing the existing noise and assessing whether the introduced aircraft noise will change the impact (e.g. if the noise survey shows that road traffic noise already influences the setting of the heritage asset then the introduction of aircraft noise might not change the existing noise impact). Heritage assets fitting into categories A, B, C and D will respond differently to existing noise sources, and also to changes in the existing noise environment, as discussed above, the tolerance to noise changes will vary depending on the category.

The noise survey results, combined with any predicted changes likely to occur at the time of the 'do minimum scenario, should be used to inform the assessment of the existing setting of the heritage asset.

Future changes to the noise environment should be assessed using noise level predictions. The airports commission will provide $L_{Aeq,T}$ contours and N60 contours for each scenario.

Category A & C Assessment

It is important to assets falling into Category A and C to have relatively quiet sound environments. It is also important to note that how often any distractions occur within the setting. The impact on the setting of the heritage assets in Category A and C that may be caused by the noise can be described as follows:

- **Highly adverse impact** to the setting will result when noise is often highly disturbing during sensitive times.
- **No impact** to the setting will be caused when noise is either not noticeable, or just noticeable occasionally during sensitive times (i.e. there is respite from the just noticeable noise).
- **Adverse impacts** may be caused between these two categories depending on how disturbing the noise is (disturbing / highly disturbing) and how often this occurs.

Category B & D Assessment

It is important for the setting of assets falling into Category B and D to be able to hear specific sounds within the noise environment. It is therefore important how much the specific sound is interfered with by other sounds in the soundscape, from other sounds being just audible, to the specific sound that informs the setting being masked. It is also important to note that how often any interference occurs is important to the setting. The harm on the setting of the heritage assets in Category B and D that may be caused by the noise may be described as follows:

- **Highly adverse impact** to the setting will result when noise is often masking the specific sounds which are important to the setting during sensitive times.
- **No impact** to the setting will be caused when noise is either not audible, or just audible alongside the specific sounds, whilst not interfering with them occasionally during sensitive times (i.e. there is respite from the noise).
- **Adverse impacts** may be caused between these two categories depending on how much the noise interferes or masks the specific sounds and how often this occurs.

5.4.4 Quantitative Assessment

In the descriptions above there are a number of qualitative measures used to describe the impact of the environmental noise (such as when noise becomes 'disturbing'). These may be assessed quantitatively using thresholds (e.g. a threshold noise level when noise becomes disturbing); however the quantitative thresholds may vary depending on the specific asset, the existing noise environment, and the person experiencing the setting (given that the thresholds are likely to be subjective).

Below gives some guidance on how some of the qualitative measures given above might be quantified:

How disturbing the noise is: This may be described by an absolute noise level threshold informed by existing aircraft noise studies:

- Above 66 dB $L_{Aeq,T}$ (T is the sensitive time period identified) – aircraft noise is likely to be highly disturbing to most people.
- Below 54 dB $L_{Aeq,T}$) – aircraft noise is not likely to be disturbing to most people.
- Between the two extremes, noise may be disturbing to a greater or lesser proportion of the population depending on the noise level.

How much the noise is interfering with the specific noise: This may be described by a threshold change in noise level combined with a minimum noise levels, also informed by existing aircraft noise studies:

- Increase above 10 dB $L_{Aeq,T}$ with a minimum of 57 dB $L_{Aeq,T}$ – aircraft noise is likely to mask or interfere with the existing noise.
- Increase of less than or equal to 1 dB $L_{Aeq,T}$ with a minimum of 54 dB $L_{Aeq,T}$ – aircraft noise is not likely to interfere with existing noises in the noise environment.
- Between the two categories, noise may interfere with the specific noise sources in the setting, and may mask quieter specific noises during fly over.

How often the noise disturbance or interference occurs: This may be described by both how often the location may be overflown in any one mode of airport operation (e.g. number of flights per hour with westerly aircraft departures) and how often the airport might be overflown given the anticipated changes to modal operations throughout the year (e.g. only overflown on easterly departures and this accounts for 25% of the year).

- Modal operations leading to overflights for 75% of the year or more and number of flights over L_{Amax} of 60dB (N60) of greater than 100 a day could be described as 'often'.
- Modal operations leading to overflights for 25% of the year or less and/or number of flights over L_{Amax} of 60dB (N60)[28] of less than 20 a day could be described as 'occasional'.

5.4.5 Harm to Heritage Significance

The preceding sections have developed an understanding of the significance of a heritage asset's tolerance to change to its soundscape. The final consideration in the assessment process is

[28] Research has found that the maximum sound pressure level (L_{Amax}) and the percentage of natural features present at a location were key factors influencing perceptions of tranquillity - The acoustic and visual factors influencing the construction of tranquil space in urban and rural environments tranquil spaces-quiet places: R Pheasant, K Horoshenkov, G Watts and B Barrett; J. Acoust. Soc. Am. 123, 1446 (2008).

whether this change would constitute harm[29] to heritage significance and ultimately, an expression of the weight that this harm should be afforded in determining the sustainability of a proposed scheme.

The NPPF, paragraph 132, states that "*When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting*."

The same paragraph goes on to state that "*Substantial harm to or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional*."

Paragraph 134 states that "*Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal*…."

Therefore, although it is recognised that *substantial harm* is a key defining threshold to understanding the weight that should be attributed to determining the suitability of development proposals, it is also necessary to recognise that an impact of *less than substantial harm* can also influence the decision making process

Neither the NPPF nor PPG provide a definition of *substantial harm*, although several recent High Court and Planning Appeal decisions have sought to explore the concept. The consensus that is emerging from these decisions is that in the context of physical harm, *substantial harm* would apply in the case of demolition or destruction of a heritage asset, i.e. total loss. It would also apply to a case of serious damage to the structure of a monument, building or historic landscape. In the context of change within the setting of a heritage asset (such as aircraft noise) the test is effectively the same, i.e. where the change would have such a serious impact that the significance of the heritage asset was either vitiated altogether or very much reduced.

When the experience of a heritage asset is clearly affected, but not to the scale defined above, this would constitute less than *substantial harm*.

[29] Not all changes will necessitate harm; proposals can bring about changes to the soundscape that would enhance the heritage significance of assets i.e. reduction in noise levels or frequency of noise events

6.0 Case Studies

In order to illustrate the above methodology, a number of case studies have been prepared. An area in Windsor has been used. All heritage assets within this are have been ranked as described above. A map illustrating the area used is attached in figure 1.

An illustration of the list which would be produced in order to initially assess the potential sensitivity of the heritage assets is shown in the table below; a more complete list is included in Appendix 3.

Table 2: Example List of Heritage Assets and Methodology Grouping

Name	Grade	List Entry	Brief Description	Methodology Grouping
MAUSOLEUM OF THE DUCHESS OF KENT	I	1117780	Neo-classical mausoleum c.1850. Set within Frogmore Gardens.	A
THE ROYAL MAUSOLEUM	I	1117781	Romanesque mausoleum c.1862-71. Set within Frogmore Gardens. Burial place of Queen Victoria and Prince Albert.	A
FROGMORE HOUSE	I	1319304	The three-storey, stucco-faced central block (c.1680), flanked by early 19th century bow-fronted pavilions, with a Tuscan colonnade running along the ground floor of the central block overlooking the main lawn. Located in the north-east of Frogmore Gardens.	A
PRINCE ALBERTS DAIRY AND COTTAGE	II*	1272281	The Dairy Cottage dates back to circa 1830-40 but was refaced circa 1850-60 with the erection and decoration of dairy itself. Elaborately decorated in picturesque style. Within Frogmore Gardens.	N/A
ADELAIDE COTTAGE	II*	1319270	Formerly known as Adelaide Lodge. Incorporating part of John Nash's original Royal Lodge, built for the Prince Regent. Re-erected in this part of the Home Park, east of the Castle in 1831. On the edge of Home Park golf course and within Home Park RPG.	N/A
GOTHIC RUIN OF TEMPLE BY LAKE IN FROGMORE GARDENS	II*	1319305	c. 1793 by James Wyatt, as garden house with extensions in ruinous manner. Within Frogmore Gardens	A
1-3, TRINITY PLACE	II	1117678	Circa 1850 2 storey stock brick block of 3 houses. On minor road on the edge of Windsor centre. Residential area.	N/A

Further description is included below for selected assets to illustrate the decisions made above regarding the asset's sensitivity.

6.1 Duchess of Kent's Mausoleum, Frogmore Gardens, Windsor: Grade I Listed Building

The mausoleum is the burial place of Queen Victoria's mother, Victoria of Saxe-Coburg-Saalfeld, the Duchess of Kent, designed by the architect A J Humbert to a concept design by Prince Albert's favourite artist, Professor Ludwig Gruner. The mausoleum is located within an outcrop of land stretching into the serpentine Frogmore Lake in the centre of the designed landscape of Frogmore Gardens. Mature planting is located around the mausoleum, which can be access by a number of designed pathways through the gardens as well as via an ornamental bridge. The location of the asset provides an isolated, tranquil setting.

The primary element of the mausoleum is a galleried, ribbed copper domed rotunda surrounded by a pink granite colonnade with bronze iconic capitals in French Neo-Classical Design. The main approach to the rotunda, facing an ornamental bridge over a serpentine lake, comprises of a double flight of balustrade steps, which return to meet on a terrace in front of a rusticated opening at the base of the rotunda. Encased by the flight of steps is a heavily rusticated retaining wall with a central wall and bust. Within the mausoleum are heraldic paintings by Professor Gruner of Dresden, and a statue of the Duchess by William Theed the Younger.

The significance of the Duchess of Kent's Mausoleum is embodied within the surviving historic fabric and its architectural and historic interest reflected in the aesthetic value of the architectural design, and the associative value of its connection to notable members of the Royal Family, architects and artists. The associative value of the setting of the mausoleum within Frogmore Gardens (a former home of the Duchess) contributes to the significance of the asset, as does its tranquil setting and appreciation.

Based upon the above desk-based assessment it is considered that the existing soundscape has the potential to contribute to the significance of the Duchess of Kent's Mausoleum, and as such it qualifies as a Category A asset.

6.2 Prince Albert's Dairy and Cottage, Windsor: Grade II* Listed

Prince Albert's Dairy and Cottage is located to the north of the Prince Consort's Model Farm, a model farmstead commissioned by Prince Albert 1855 within Windsor Home Park.

The Dairy Cottage dates back to c. 1830-40, but was refaced circa 1850-60 with the erection and decoration of dairy itself. Italianate in its design, the structure has two storeys and is constructed of stock brick with ashlar dressings. The dairy is on north side of the two structures and features a four bay arcaded screen or veranda, with a stone balustrade to the exterior. Decorated entirely of Minton tiles and fayence, probably designed and partly executed by Prince Albert's sculptor John Thomas, the interior is the principal feature of the dairy. The supporting piers are elaborately decorated, and the ceiling compartmented to allow for ventilation, which alongside the double-walled construction served to keep the area cool at all times. Between the piers and along the walls on all sides are broad slabs of marble holding individual marble basins. A tiled frieze encompassing the main dairy room is embellished with portrait medallions of Queen Victoria, Prince Albert and the Royal children.

Although heavily ornate in its design, the dairy was functional in its use and formed part of the bustling domain of Home Farm.

The significance of Prince Albert's Dairy and Cottage is embodied within the surviving historic fabric and its architectural and historic interest. This is most accurately reflected in the aesthetic value of the interior design of the dairy, and the associative value by way of its connection to Prince Albert and the model farm of his design. The setting of the asset within Windsor Home Park and its historical and visual relationship with the other structures of the model farm contributes to the significance of the asset.

Based upon the above desk-based assessment it is not considered that the existing soundscape contributes to the significance of Prince Albert's Dairy and Cottage, and hence does not require specific consideration.

6.3 Frogmore Gardens, Windsor: Grade I Registered Park and Garden

Frogmore Gardens is a Picturesque landscape garden, laid out in the 1790s for Queen Charlotte on the site of an earlier 18th century formal garden, largely with advice from Major William Price, brother of Uvedale Price a pioneer of the Picturesque movement. Queen Victoria further developed the gardens in the 19th century.

The c.15ha grounds are laid out on largely level ground, with relief provided by various large, artificial mounds created and placed so that the whole area is not visible at once. The grounds are dominated by the serpentine Frogmore Lake, which enters as a small stream from the north-east, and broadens out to encircle an island lying c.150m west of the house, before continuing in sinuous form southwards, leaving the grounds 200m south-west of the house.

The setting is largely rural, with the Home Park surrounding the estate, the 19th century Prince Consort's Home Farm adjacent to the east, the vast Royal Gardens (walled kitchen gardens) to the south-east and further farm buildings to the south-west.

The principle building of the grounds is the Grade I Listed Frogmore House, located in the north-east of the grounds. The three-storey, stucco-faced central block (c.1680) is flanked by early 19th century bow-fronted pavilions, with a Tuscan colonnade running along the ground floor of the central block overlooking the main lawn. A number of Listed structures are incorporated into the design of the garden including an ornamental ruin (Gothic Ruin, James Wyatt c.1790), a marble Indian Kiosk (c.1850s) and Queen Victoria's Tea House (c.1869). At the south-eastern end of the garden are the Grade I Listed Duchess of Kent's Mausoleum and The Royal Mausoleum, situated on either side of the meandering serpentine lake with designed access via ornamental bridges. South of The Royal Mausoleum, in an area set back from the main garden complex, is the Royal Burial Ground. Since 1928, most members of the Royal Family, except for sovereigns and their consorts, have been interred here.

The significance of Frogmore Gardens is embodied within the surviving designed nature of the gardens and its aesthetic and historic interest reflected in the aesthetic value of its Picturesque design and the associative value of its connection to notable members of the Royal Family and designers associated with the Picturesque movement. The group value of the built assets within the gardens, and their relationship to its design, contribute to its setting and significance, as does its tranquil setting, particularly in the areas surrounding the lake, mausoleums and the Royal burial ground.

Based upon the above desk-based assessment it is considered that the existing soundscape has the potential to contribute to the significance and appreciation of Frogmore Gardens, and as such it qualifies as a Category A asset.

6.4 Adelaide Terrace, King's Road, Windsor: Grade II Listed

Adelaide Terrace is a symmetrical terrace of eight houses dated to 1831, set back slightly from a minor road on the fringes of the centre of Windsor. The houses are three storeys high, faced in Roman cement (rear elevations of stock brick) with a moulded cornice and blocking course. Numbers 64 and 66 form a central feature within the terrace, and project slightly from the flanking houses and feature an iron balcony at first floor level. The upper floors have flanking Ionic pilasters which divide the dwellings and support an entablature and pediment, with the name of the terrace and date of construction included within the tympanum.

The significance of Adelaide Terrace is embodied within the surviving historic fabric and its architectural and historic interest. This is most accurately reflected in the aesthetic value of the terrace as an example of Regency Neo-classical architectural design of early 19th century suburbia. The setting of the terrace facing onto The Long Walk and Windsor Home Park is considered to contribute to the significance of the asset. It is not considered that the existing soundscape contributes to the significance and appreciation of Adelaide Terrace as a heritage asset, with primary focused being upon its architectural interest and designed views.

Based upon the above desk-based assessment it is not considered that the existing soundscape contributes to the significance of Adelaide Terrace, and hence does not require specific consideration.

6.5 Moated site at Moat Park, New Windsor: Scheduled Monument

The monument comprises a small sub-rectangular moated site situated in a low- lying area at the northern end of Windsor Great Park, appearing on a Norden's map of 1607 as a moated lodge. The maximum external dimensions of the site are c.60m by 45m, with the 'island' surviving as a platform standing c.0.5m above the level of surrounding ground, c.50m by 35m in size. The 'island' is encircled by a dry moat surviving to a depth of up to 0.5m and a maximum width of 5m. The site is bisected by the Bourne Ditch, which is excluded from the scheduling.

Although a large number of moated sites are known in England, relatively few survive in Berkshire. This example is particularly important as it survives well as a small moated site and provides an interesting contrast to the larger and more complex moated sites which survive in the Great Park. The site also has a good level of historical documentation.

The significance of the moated site is principally derived from the historic illustrative value of the physical remains and the evidential value inherent in the potential for recovery of archaeological and historical evidence relating both to the monument and to the landscape in which it was constructed. The setting of the asset is not considered to be contemporary having experienced landscaping during the 19th century, however, the tranquil setting in which the ruinous state of the asset is now appreciated is considered to be contribute to its significance.

Based upon the above assessment it is considered that the existing soundscape has the potential to contribute to the significance of the Moated Site at Moat Park, and as such it qualifies as a Category C asset.

6.6 Church of Holy Trinity, Windsor: Grade II Listed

The Church of Holy Trinity is a uniform, buff brick church, constructed c.1842-44 to designs by Edward Blore. The Church is located on an 'island' site created as part of the mid-19th century suburban development in Windsor, and forms the closing vista to Trinity Place and Claremont Roads. In its present and designed state, the island within which the Church is located acts as a roundabout for the confluence of a number of busy, residential roads.

The significance of the Church of Holy Trinity is embodied within the surviving historic fabric and its architectural and historic interest. This is most accurately reflected in the associative and aesthetic value by way of its connection to Edward Blore, a 19th century British architecture who, among other sites, worked on Buckingham Palace and the restoration of the Salisbury Tower at Windsor Castle. The setting of the Church amongst 19th century designed suburbia, within which it forms the closing asset of a number of views and has 'group value', further contributes to the significance of the asset. The Church, although located on a designed 'island' does not sit within a grounds from which to experience it.

Based upon the above desk-based assessment it is not considered that the existing soundscape contributes to the significance of the Church of Holy Trinity, and hence does not require specific consideration.

6.7 Windsor Town Centre Conservation Area

Windsor Town Centre Conservation Area, amended to its current extent in 1991, is focused upon the historic core of the town and the built environment surrounding Windsor Castle, including: the High Street; Peascode Street; Windsor and Eton Central Station and Windsor Bridge. The built heritage and settlement planning of this section of the town is reflective of the key relationship between the development of the settlement and the dominance of Windsor Castle and the River Thames. Today this historic core remains the main focus of the experience of the settlement including a number of key 'gateways' such as the train station and Windsor Bridge; the main tourist attractions; busy shopping streets and; the main route between Windsor and Eton. The busy streets, both in terms of traffic and pedestrians, created a bustling setting.

Elements of the Conservation Area which contribute to its significance include the historic built fabric and the historic street planning; both of which demonstrate the historic development of the settlement and its relationship with both the Castle and the River Thames.

Based upon the above desk-based assessment it is not considered that the existing soundscape contributes to the significance of Winsor Town Conservation Area, and hence does not require specific consideration.

7.0 Assumptions, Limitations and Further Work

7.1 Assumptions and Limitations

The assumptions and limitations of this study include the following:

7.1.1 The Lack of Verified Research and Data on the Impact of Noise on the Setting of Heritage Assets

The study does not benefit from a pool of research providing verifiable data on the impact of noise on the setting of heritage assets. Ideally, in order to develop a wholly quantified method of assessing the impact of aviation noise on heritage assets the study would be able to draw on a range of cross-sectional research that provides information of how specific noise levels of various sources are linked to the setting of different types of heritage asset; and longitudinal studies that show how changes in noise levels influence the setting of different types of heritage asset.

However, in common with many areas of acoustics and the consideration of the effects of noise on humans, e.g. industrial noise; no such pool of research exists. Instead, the study takes a pragmatic approach that recognises that for certain categories of heritage asset noise can influence the setting and therefore the significance of the asset, and proposes a framework for assessing those impacts on a case by case basis using quantified noise data and a qualitative approach to assessing the impact.

7.1.2 Using Noise Contours to Define the Spatial Scope and Intensity of Potential Noise Impacts

The Airport Commission (AC) assessment framework uses “average mode” contours to assess the impact of noise from the airports. These contours are based on average daily aircraft movements over three months during the period June to September, during the 16 hours from 0700 to 2300 hours. Consequently, they take into account the variability of the operation of the airport over this period e.g. Heathrow and Gatwick broadly operate with take-offs to the west and landings from the east approximately 75% of the year and vice versa for the remaining approximately 25% as a reflection of the prevalent wind direction.

As an addendum to their approach the AC produced single mode noise contours in order to provide information in regard to the variability of airside noise propagation from the designated airports. The single mode contours generally show that the noise contours grow slightly further in the direction of take-off and shrink by marginally more in the direction from which aircraft are landing (because normally aircraft are noisier on take-off than landing). Use of single mode contours provides a worst case assessment. However, it has been argued that it would not reflect the reality of variable noise propagation from the airport simply to examine noise contours for a single mode or day, as community response to noise will reflect experience over longer time periods, including periods with varying mode, and could therefore include habituation to the noise. Community aviation noise exposure will change throughout the year as Air Traffic Movements at Heathrow and Gatwick airports fluctuate between easterly and westerly operations and; furthermore, as residents and workers near an airport are not static, but move around, they will experience further variability in aviation noise.

Consequently, in regard to the assessment of noise impacts on persons living and working at locations affected by aviation noise, it is therefore normally considered appropriate to use average

mode contours reflecting typical long term exposure, rather than those that only apply for shorter periods and cover only a single mode of airport operations, as these reflect the overall noise exposure of the surrounding community over time. The approach of using 'average mode' contours for assessing noise from airports has been current for many years. It is also the approach adopted throughout Europe by virtue of the EU Noise Mapping project; Directive 2002/49/EC. Additionally, the noise measurements used in the ANIS study, which directly informs UK aviation noise policy, were carried out over at least 22 days, a period which would have included a degree of variation of the modes of operation of each of the airports studied. Even though the study found the best correlation with subjective response was with the subject's previous seven days noise exposure, the study still established a reasonable degree of correlation between aviation noise and community response based on this variable exposure due to mixed modes rather than focussing on any single mode of use of the airports. However, most persons visiting a heritage asset do so for part or the whole of a day; although they may visit the asset repeatedly. Therefore for these "day visitors" any impact of aviation noise on the setting of the asset will be in the context of the effects on any particular day; which will be dependent on the mode of operation of the airport on that day; in which case the single mode contours should be used.

7.2 Further work

7.2.1 Research into the Impact of Noise on the Setting of Heritage Assets

As described above there is very little research into the effects of noise on the setting of heritage assets; although policy and expert opinion recognises that noise can affect the setting and therefore the significance of an asset. It would help further develop means of assessing the impact of noise on the setting of heritage assets if research was carried out to investigate what the effect on the setting of heritage assets might be of a range of different noise levels from a variety of specific noise sources and mixtures of various noise sources. It would be helpful if these studies could establish how different noise levels effect the setting of the same type of heritage assets (the steady state condition); and how change in noise levels effect the setting of particular heritage assets (the change condition). The studies should include extensive acoustic surveying of a wide range of noise metrics coupled with social surveys of the users and visitors to the assets so that the correlation between quantified acoustic measurement and perception of the effect on the setting and the expectation of users and visitors to the assets can be explored. The inclusion of soundscaping techniques in the studies would also help reduce some of the established shortcomings in the use of objective measurement of the physical characteristics of sound in the appraisal of the subjective impacts of noise.

7.2.2 Mitigation and Compensation

Where impacts of noise on the setting of heritage assets are identified, there may be a need to identify how those impacts can be mitigated; or compensated for where mitigation is impracticable. It would be helpful if further work were undertaken to review the range of established noise mitigation methods to assess their suitability for use in regard to heritage assets e.g. noise screening and potential visual impacts, and noise insulation and conflicts with listed building status; and to consider how more recent and emerging methods and technologies e.g. introducing positive soundscape sounds to mask or distract from negatively impacting noise, and using localised active noise control noise to eliminate or reduce the intruding noise, might be used to mitigate noise impacts on the setting of heritage assets. Where mitigation would be impracticable, only partially successfully or have secondary negative impacts, then compensation for the negative effects of noise on the setting of heritage assets might be appropriate. Decisions regarding the

value of compensation would be better informed if further work were carried out to value the noise impacts on the setting of heritage assets and on the significance of the heritage asset.

8.0 Conclusions

Intrusive noise i.e. unwanted sounds, including from aviation sources, has the potential to adversely affect the setting and therefore the significance of heritage assets. Conversely, the absence or restriction of noise and the presence of positive sounds can improve and enhance the setting and therefore the significance of heritage assets.

Heritage assets that are sensitive to noise can be classified into four categories that relate to how the noise environment contributes to the significance of the heritage asset. The assets which qualify within these four categories could potentially be adversely effected (or benefit) from changes to the noise environment in their setting.

Unfortunately, whilst there is a need for a consistent means of doing so; there are no established methods and metrics for assessing the impacts of noise on the setting of heritage assets. However, the principles of Environmental Impact Assessment (EIA) can be used to develop a method of assessing the impacts of aviation noise on heritage assets. Such a methodology can be summarised as follows:

- Use airport noise contours and noise information to identify the spatial scope of the study based on defined absolute noise levels or changes in noise levels.
- Use Geographic Information System (GIS) databases to locate heritage assets within the spatial scope of the study.
- Screen the identified heritage assets into a non-noise sensitive and four noise sensitive categories.
- Overlay the noise information on the GIS layer with the identified noise sensitive heritage assets.
- Screen out those heritage assets where a noise impact is unlikely due to the absolute noise levels or change in noise levels not being sufficient to have an adverse effect.
- Undertake a detailed site specific assessment of the noise impacts on the remaining noise sensitive heritage assets where the absolute noise levels or change in noise levels has been identified as being potentially sufficient to have an adverse or beneficial effect. This detailed appraisal will take into account factors including the following:

    a. The nature, character and level of existing ambient noise levels,

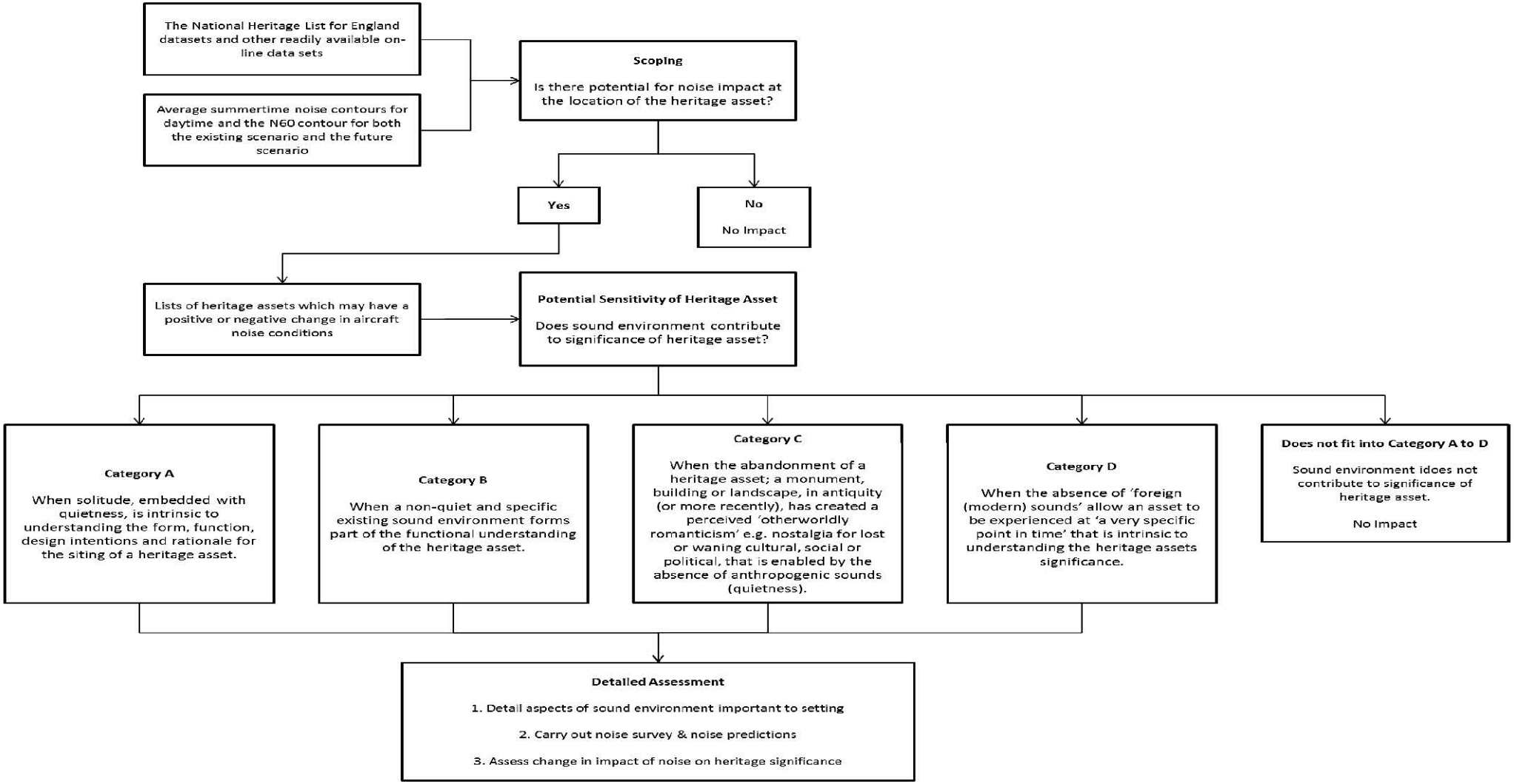
    b. The type of noise sensitive category the asset falls within,

    c. How frequently and for how long the aviation noise is likely to occur,

    d. How high is the absolute level of aviation noise or how big a change in aviation noise is expected.

The outcome of the method is an appraisal of whether the impacts of aviation noise or any change in aviation noise are likely to be beneficial, neutral, or cause harm to the significance of heritage assets.

Figure 1: Method Flow Chart



Appendix I Heritage Planning Policy Context

Legislative framework, national planning policy and relevant sector guidance

Advice and guidance to developers and decision-makers regarding the suitability of new development proposals and the potential affect (adverse or beneficial) on heritage assets is contained within a variety of legislative, planning policy and guidance documents. These documents are also supported by local planning policy, and some cases site specific policy and guidance, all designed to manage the historic environment.

No national planning policies or guidance documents deal in any meaningful detail with the potential harm that new noise, or appreciable increases in noise levels, can have on heritage assets. However, the following documents do include elements within their policies and guidance that allow 'heritage and noise impacts' to be contextualised within the decision-making process:

> ***Heritage asset:*** *A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage asset includes designated heritage assets and assets identified by the local planning authority (including local listing) (NPPF; DCLG, 2012).*

- Planning (Listed Buildings and Conservation Areas) Act (1990);
- Ancient Monuments and Archaeological Areas Act (1977);
- National Planning Policy Framework (2012);
- National Planning Policy Guidance (2014);
- English Heritage Conservation Principles: policies and guidance for the sustainable management of the historic environment (2008);
- English Heritage the setting of heritage assets: a guidance document (2011)

Planning (Listed Building and Conservation Area) Act

The Planning (Listed buildings and Conservation Areas) Act 1990 provides the statutory underpinning for the protection of built heritage in England. Under the act the Secretary of State (or persons on his/her behalf i.e. English Heritage) has a statutory duty to compile or approve a List of buildings of special architectural or historic interest. The act also considers the curtilage of the buildings, but does not refer to its setting, except in regard to the desirability of protecting the setting as a consideration in determining planning applications for Listed building consent.

Under the 1990 Act local authorities have a statutory duty to identify and designate 'areas of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance'. Section 72 of the Act requires that Local Planning Authorities pay special attention in the exercise of planning functions to the desirability of preserving or enhancing the character or appearance of a conservation area. They should take account of this in the adoption of planning and council policies, development control decisions, enforcement, controls relating to trees, advertisements, properties in need of maintenance and in exercising their highway powers.

Where new developments are proposed the Local Planning Authority must have special regard to the desirability of preserving or enhancing the conservation area, and those features which make it special.

National Planning Policy Framework (NPPF)

The National Planning Policy Framework sets out planning policies relating to 'conserving and enhancing the historic environment'. It defines the historic environment as 'all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.' It further classifies a 'heritage asset' as 'a building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest'.

Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing). Policies relate to both the treatment of the assets themselves and their settings, both of which are a material consideration in development management decision making.

The NPPF states that "The purpose of the planning system is to contribute to the achievement of sustainable development" and that there are "three dimensions to sustainable development: economic, social and environmental". The role the environment will play is described as "contributing to protecting and enhancing our natural, built and historic environment; and as part of this, helping to improve biodiversity, use of natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy".

Within the over-arching roles that the planning system will play, a set of 12 "core land-use planning principles" have been developed to underpin place-shaping and decision making. The 10th principle is:

- "conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations"

When determining planning applications local planning authorities should take account of:

- "the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- the desirability of new development making a positive contribution to local character and distinctiveness."

Further to this, local planning authorities can request that the applicant should describe "the significance of any heritage assets affected, including any contribution made by their setting". The level of detail required in the assessment should be "proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance". "Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation."

Local planning authorities should take this assessment into account when considering the impact of a proposed development, "to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal".

A key policy within the NPPF is that "when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be."

"Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification. Substantial harm to or loss of a Grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, Grade I and II* listed buildings, Grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional."

However, where a proposed development will lead to "less than substantial harm to the significance of a designated heritage asset", this harm should be weighed against the public benefits of the proposal.

With regard to non-designated heritage assets specific policy is provided in that a balanced judgement will be required having due regard to the scale of any harm or loss and the significance of the heritage asset affected.

National Planning Policy Guidance (NPPG)

The National Planning Policy Guidance provides supporting and expanded guidance relating to the NPPF, including more detailed definition of key terms and concepts. This includes further guidance on 'significance', why it is important in decision making, and more detail on using the concept of 'substantial harm' as a test.

There is only one explicit reference to noise or sound in the document, where the NPPG defines the setting of a heritage asset as including non-visual elements: "Although views of or from an asset will play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise…"

Conservation Principals

"Conservation Principles: Policies and Principles for the Sustainable Management of the Historic Environment" sets out a series of broad ideas designed to inform the management of the historic environment. Although there are no specific references to noise or sound within this document, there are more general concepts of 'place', of which sound forms a part.

Specifically, 'place' in this document is defined as any part of the historic environment with a perceptibly distinct identity. This idea of a distinct identity is key, particularly the crossover between the distinct identity of an aspect of the historic environment and the 'sense of place' unique to significant locations. A specific location or asset, for example, can form part of several overlapping 'places' defined by different characteristics.

This idea of 'place' goes beyond physical form, and one of these characteristics can certainly be considered to be noise or sound. For example, multiple heritage assets can be located within a country churchyard, a coherent landscape area at least partially defined by stillness and tranquillity.

Similarly, each place can have a setting, a combination of the surroundings in which it is experienced and its local context. This setting is defined by the extent to which change within it could affect the significance of the place. Although not directly referenced in the document, change

in noise levels or soundscape could clearly affect significance, and therefore must be considered to form part of the concept of 'setting'.

Conservation Principles also provides a framework for assessing why places or assets are valued. One of these values, *Aesthetic*, is derived from the ways in which people draw sensory and intellectual stimulation from a place. The soundscape certainly forms part of this sensory environment, and can contribute to the aesthetic value of a heritage asset.

A further point relevant to noise relates to the origin of this aesthetic value. Conservation Principles suggests that aesthetic value can be the result of conscious design, but also from a fortuitous, organic way in which a place has evolved over time. This includes the concept of the enhancement of a sense of place by the passage of time, known as the 'patina of age'. This patina of age can add to the range and depth of aesthetic value. This concept is particularly relevant to the noise/sound aspect of heritage assets, particularly with relation to the 'otherworldly romanticism' of certain assets, such as ruinous remains or prehistoric funerary monuments. The 'patina of age' is thrown into relief by the absence or recession of man-made sounds in these locations.

The setting of heritage assets: a guidance document

Setting is the surroundings in which a heritage asset is experienced. All heritage assets have a setting, irrespective of the form in which they survive and whether they are designated or not. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral.

> ***Setting is not a heritage asset**, nor a heritage designation. Its importance lies in what it contributes to the significance of the heritage asset. This depends on a wide range of physical elements within, as well as perceptual and associational attributes, pertaining to the heritage asset's surroundings. Each of these elements may make a positive or negative contribution to the significance of the asset, or be neutral. (SoHA; English Heritage, 2011).*

The extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset will play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration; by spatial associations; and by our understanding of the historic relationship between places. For example, buildings that are in proximity but not visible from each other may have a historic or aesthetic connection that amplifies the experience of the significance of each. They would be considered to be within one another's setting.

Setting will, therefore, generally be more extensive than curtilage, and its perceived extent may change as an asset and its surroundings evolve or as understanding of the asset improves.

The setting of a heritage asset can enhance its significance whether or not it was designed to do so. The formal parkland around a country house and the fortuitously developed multi-period townscape around a medieval church may both contribute to the significance.

The contribution that setting makes to the significance does not depend on there being public rights or an ability to access or experience that setting. This will vary over time and according to circumstance.

Appendix 2: Further information on Aircraft Noise Assessment

This Appendix provides a summary of how aircraft noise is currently assessed in the UK.

The assessment of the effects of aircraft noise has conventionally focussed on effects on humans. The auditory effects of noise such as hearing loss from long term exposure to high levels of persistent noise e.g. noise in heavy industrial work places, or short term exposure to very high levels of impulsive noise e.g. shooting/explosions, has been recognised as a hazard to hearing for a long time. However, auditory effects of aircraft noise are very rare beyond the perimeter of an airport as the levels are typically below recognised thresholds of harm. Nevertheless, there are also non-auditory effects of noise including effects on cardiovascular function (ischemic heart disease and hypertension), and changes in breathing, annoyance, sleeping problems, disruption of communication and activity interference. This wide range of effects has led researchers to believe that noise has the ability to act as a general, non-specific stressor. Unfortunately, many other environmental factors have similar effects making it often very difficult to pin point what the effects of noise are compared to the effects of a wide range of other general stressors.

Non-auditory effects can be divided into two categories - physiological effects and performance effects.

Physiological Effects

Examples of physiological effects are:

- the startle response to sudden loud noise, where muscles burst into activities, generally, with the intention to protect;
- the muscle tension response, where muscles tend to contract in the presence of loud noise;
- the respiratory reflexes, where the respiratory rhythm tends to change when noise is present;
- increases in stress hormones;
- increased blood pressure;
- ischaemic heart disease;
- changes in the heart beat pattern; and
- changes in the diameter of the blood vessels, particularly in the skin.

All these effects are similar to the response of the body to other stressors.

Performance Effects

Noise can interfere with verbal communications and can be distracting and annoying. Below are some examples of how these factors can affect work performance.

Speech Intelligibility

Speech intelligibility is the ability to understand spoken words. The presence of noise interferes with the understanding of what other people say. This includes face-to-face talks, telephone conversations, and speech over a public address system.

In order to be totally intelligible the sound level of speech must be greater than the background noise at the ear of the listener.

In social situations people often talk at distances of 2 to 4 metres. In such cases noise levels typically fall in the range 55 to 60 dB(A) for good intelligibility, when the background noise is not higher.

Table 3: Speech Communication Capability versus Level of Background Noise in dB(A)

Communication	Below 50 dB(A)	50-70 dB(A)	70-90 dB(A)	90-100 dB(A)	110-130 dB(A)
Face-to-face (unamplified speech)	Normal voice at distances up to 6 m	Raised voice level at distances up to 2 m	Very loud or shouted voice level at distances up to 50 cm	Maximum voice level at distances up to 25 cm	Very difficult to impossible, even at a distance of 1 cm
Telephone	Good	Satisfactory to slightly difficult	Difficult to unsatisfactory	Use press-to-talk switch and an acoustically treated booth	Use special equipment
Intercom system	Good	Satisfactory	Unsatisfactory using loudspeaker	Impossible using loudspeaker	Impossible using loudspeaker
Type of earphone to supplement loudspeaker	None	Any	Use any earphone	Use any in muff or helmet except bone conduction type	Use insert type or over-ear earphones in helmet or in muffs; good to 120 dB(A) on short-term basis
Public Address System	Good	Satisfactory	Satisfactory to difficult	Difficult	Very difficult
Type of microphone required	Any	Any	Any	Any noise-canceling microphone	Good noise-canceling microphone

Source: C.M. Harris. Handbook of Noise Control, 2nd Ed. New York: McGraw-Hill, 1979.

Children's cognitive development

The 2005 RANCH study in Britain, Holland and Spain published in The Lancet, found that young children living near airports lagged behind their classmates in reading by up to approximately two months for a five decibel increase in aviation noise in their surroundings. The study also associated aircraft noise with lowered reading comprehension, even after socio-economic differences were considered.

Annoyance

Noise is annoying. In noisy environments, people generally prefer to reduce the noise loudness, avoid it, or leave the noisy area if possible. However the study of noise annoyance is complicated by significant individual variability in annoyance response to the same level of the same sound, and to different noises i.e. the same noise could be annoying to some people but acceptable to others. There is no definite relationship between the degree of annoyance or unpleasantness of noise and the risk of adverse health effects. For example, loud music may be pleasant to one group of people and annoying to another group.

Besides loudness of sound, several other factors contribute to annoyance. The following table lists examples of such factors:

Table 4: Factors that affect annoyance due to noise

Factors that Affect Annoyance due to Noise	
Primary acoustic factors	Sound level Frequency Duration
Secondary acoustic factors	Spectral complexity Fluctuations in sound level Fluctuations in frequency Rise-time of the noise Localisation of noise source
Non-acoustic factors	Adaptation and past experience Fear Physiology How the listener's activity affects annoyance Predictability of when a noise will occur Is the noise necessary? Individual differences and personality traits Perception of need for or control over the noise Attitudes towards the noise maker

Activity interference

Depending on the type of activity, noise can affect efficiency of task performance. For example:

- Noise may distract a person and affect their concentration, hence reducing the ability to focus on a task or activity.
- A noisy environment could create an additional hazard, since audible alarms might not be heard.
- A noisy environment interferes with oral communication and thus, interferes with the activity.

Noise Perception and Indices

Between the quietest audible sound and the loudest tolerable sound, there is a million to one ratio in sound pressure (from 10-6 Pascals, Pa, to 1 Pa). Due to this very wide range of values, a noise level scale based on logarithms is used, called the decibel (dB) scale. Consequently, the typically audible scale of sound covers a relatively small decibel range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across all frequencies and as a result instrumentation used to measure noise can apply weighting networks that approximately represent the performance of the hearing system. The commonest used network is known as 'A weighting' and annotated as dB(A). The table below lists the sound pressure level in dB(A) for common situations.

Table 5: Indicative Noise Levels for Common Situations

Typical Range of Noise Levels, dB(A)	Example
0	Threshold of hearing
30-40	Rural area at night, still air
40-50	Public library, refrigerator humming at 2 m
50-60	Quiet office, no machinery, boiling kettle at 0.5 m
60-70	Normal conversation at 1 m
70-80	Telephone ringing at 2 m, Vacuum cleaner at 3 m
80-90	General factory noise level
90-100	HGV at pavement, powered lawnmower at operator's ear
100-110	Pneumatic drill
110-120	Rock Concert/Discotheque 1 m from speakers
140	Threshold of pain

The noise level at any specific point is rarely steady from one moment to the next, even in quiet situations, and varies over a range dependent upon local noise sources. For example, close to a busy motorway, the noise level may vary over a range of only 5 dB(A) as the near continual flow of traffic provides a persistent stream of overlapping noise events whose individual levels only vary over a narrow range; whereas in a suburban area this variability may increase to 20-30 dB(A) due to intermittent noise sources of varying level spread out over a wider area (cars, dogs, children playing etc.); in rural locations an even greater range of noise levels tends to occur e.g. up to 40 dBA, as noise sources tend to be more wide spread and less frequent in operation. Furthermore, in most locations the range of night-time noise levels will often be smaller and the levels significantly

reduced compared to daytime levels, as activity rates tend to be lower at night. When considering environmental noise, it is necessary to consider how to quantify the existing variable noise (the ambient noise) to account for these moment to moment, and longer term variations. Consequently, the science of acoustics has developed a range of different noise indices that produce more easily interpreted single figure values to describe rapidly changing and variable noise levels and how they relate to the subjective impact of noise.

The term ambient noise is often used to describe the overall noise conditions in a location and the A-weighted equivalent continuous sound pressure level index, LAeq, represents the total sound energy measured over that period. The LAeq is the A-weighted sound level of a notionally steady sound having the same energy as a fluctuating sound over a specific period. It is commonly used to express the energy level from individual sources that vary in level over their operational cycle. ISO 1996: 'Description, assessment and measurement of environmental noise' and BS 7445: 'Description and measurement of environmental noise. Guide to quantities and procedures', support the use of the LAeq to describe environmental noise; and this index, and variants, is the most commonly used for that purpose. Because the LAeq reflects the total noise energy in a defined time period and the decibel is logarithmic, then subtle changes in decibels can reflect large changes in noise energy i.e. a 3 dB change in noise level is equivalent to a doubling of noise energy, a 10 dB change is equivalent to a tenfold increase in noise energy, and a 20 dB change a 100 times increase in noise energy etc. As a result the LAeq will tend to be biased towards the highest noise levels that occur during a defined period.

A derivative of the LAeq is the sound exposure level (SEL), which, for example, for an aircraft event is defined as the sound level in A-weighted decibels of a one-second burst of steady sound which contains the same total A-weighted sound energy as the whole longer noise event i.e. it is the LAeq of the noise event over a period T seconds, normalised to a time period of only 1 second. For typical aircraft over flight most of the sound energy is concentrated in the time period during the middle part of the flyover when the instantaneous sound level is within 10 dB of LAmax, and the standard measurement procedures reflect this. For typical aircraft flyover events the SEL is often around 10 dB higher than the equivalent LAmax, reflecting a duration during the middle part of the flyover event of around 10 to 20 seconds. It is most commonly used to calculate longer term LAeqs and assess the potential for night-time sleep disturbance

The LAmax noise index is the maximum instantaneous sound pressure level attained during the measurement period. It is most commonly used to assess the potential for night-time sleep disturbance and speech interference.

An index that is widely used to describe the underlying noise in a location is the background noise level, LA90. This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a 1-hour period, the LA90 will be the noise level exceeded for 54 minutes.

An index that has been widely used in the UK to describe road traffic noise is the LA10 noise level. This is the noise level exceeded for 10% of the measurement period and generally reflects the higher noise levels as individual vehicles pass the microphone. Over a 1-hour period, the LA10 will be the noise level exceeded for 6 minutes.

The human ear can react very quickly to rapid changes in noise level, consequently noise measurement systems must consistently and quickly sample noise levels over a regular period in order to record meaningful data. Time weighting determines how quickly the sound level meter responds to changes in noise level. The 'fast' time weighting averages the measured level every eighth of a second, whereas the 'slow' weighting averages every 1 second. The 'fast' time

weighting most closely follows the response of the human ear to sound level changes and is most commonly specified for environmental noise measurement purposes (including the LA90 and LA10 statistical parameters). In the past the slow time weighting has been used to determine the peak LAmax noise events for aircraft movements (ATMs) but is used les commonly nowadays.

Measuring sound in decibels means that a 3 dB change is a doubling of the sound energy and a 10 dB change is a tenfold increase. Conventionally, for sounds which are very similar in all but magnitude, a change or difference of 1 dB is just perceptible under laboratory conditions, 3dB is perceptible under most normal conditions and a 10 dB increase appears to be twice as loud . These findings really only apply to changes in the same noise source, not changes due to introduction of a new noise into an existing soundscape, and do not necessarily apply to transient, non-steady or intermittent noise sources. It is important to recognise that these “rules” may not necessarily apply to changes in magnitude of the value of a noise index (which is the single figure representation of complex varying noise levels) as opposed to noise level. Additional factors that may influence the subjective impact of a change in magnitude of a noise index include the following :

- averaging time period;
- nature of the noise source (intermittency, variability of level etc);
- frequency of occurrence of the noise;
- spectral characteristics;
- absolute level; and,
- influence of the noise index used.

Aviation Noise

Noise disturbance around an airport is typically caused by noise from:

- aircraft in the air;
- reverse thrust used by aircraft to slow down after landing;
- aircraft on the ground, including taxiing, engine testing and running of on-board electrical generators;
- departing aircraft that stray from the Preferred Noise Routes (PNRs) ;
- road traffic to and from the airport; and,
- construction activity.

Regulation of Aircraft Noise

The control of aircraft noise reflects the international nature of the aviation industry and the wide range of ownership and operation of aircraft. The way in which aircraft are flown is not only determined by the pilot, who is completely responsible for the safety of the aircraft, but also by the safety rules set by the aircraft maker, the airlines, the Civil Aviation Authority and finally the airport. Often aircraft using an airport are required to stay on agreed Preferred Noise Routes (PNRs). These routes are designed to take aircraft away from built up areas where possible. Accurate ‘track keeping’ of where aircraft fly is also important as it assists planning authorities in identifying where sensitive developments such as housing should be built.

Agreements, laws, regulations and guidelines on the control of aircraft noise are laid down by a number of different organisations including:

- Department of Environment Food and Rural Affairs;
- Department of Transport;

- Civil Aviation Authority (CAA);
- National Air Traffic Services (NATS, part of the CAA);
- •Airports Council International;
- International Air Transport Association; and
- International Civil Aviation Organisation.

Noise Certification of New and Upgraded Aircraft

The noise certification requirements for aircraft are governed by International Treaty given in the Convention on International Civil Aviation (ICAO) Annex 16, which govern noise levels from individual aircraft. The UK discharges its responsibilities regarding ICAO requirements through the Aeroplane Noise Regulations 1999, the Aeroplane Noise (Amendment) Regulations 1999 and the Air Navigation (Environmental Standards) Order 2002.

The index used to assess aircraft noise in the ICAO certification scheme is the effective perceived noise level (EPNL) measured in EPN dB. This depends on factors including:

- The tonal content of the noise spectrum;
- The time during which the aircraft noise remains within 10 dB of the peak noise at the measurement position.

$$L_{EPN} = 10\lg\left(\frac{1}{10}\int_{t_1}^{t_2} 10^{\frac{PNL}{10}}\,dt\right)$$

Where:

PNL is the tone corrected perceived noise level of the over flight; and,

t1 and t2 are the times between which the PNL is within 10dB of the peak value.

The derivation of PNL is complex and uses the 1/3-octave frequency spectrum of the sound. It is very approximately equal to the dB(A) level + 13dB.

In the certification process the EPNL is measured at specified fixed positions beneath the approach and take off flight paths and on either side of the take - off flight path. This means the derived EPNL is a good descriptor of the relative noisiness of different aircraft; but has limited use in assessing the noise impacts of aircraft movements at any particular airport as the way in which planes fly in and out of the airport may not match the way they do in the standardised noise certification method.

Aircraft Noise Classification

Aircraft are classified according to the noise levels they produce by the International Civil Aviation Organisation (ICAO). Certification is based upon an international scale of ‘chapters’ (called Stages in North America). These include:

- Unclassified – the first generation of jet aircraft, which are now banned by international agreement (with rare exceptions), e.g. the Trident, Comet and Boeing 707;
- Chapter 2 – the older, noisier aircraft which have been phased out or upgraded by 2002. For example the BAC1-11, Boeing 727 and Boeing 737-200;
- Chapter 3 – the more modern, quieter aircraft. For example the Boeing 757, Boeing 767 and Boeing 737-300;

- Chapter 4 – in force for new aircraft designs from 2006 and 10 dB EPNL quieter than chapter 3. For example the Airbus 318, Boeing 737-600 and Bombardier CL-600-2B19;
- Chapter 5 –modern propeller aircraft including the BAE Advanced Turbo Prop and 'Shorts'.

Each ICAO Chapter covers a relatively wide range of noise levels, because the noise emission of an aircraft is dependent on weight, an aircraft can be certified at several noise levels and in more than one chapter depending on the certified loading of variants, and aircraft can be re-classified to a more stringent chapter by retro-fitting of "hush kits". In addition, noise for the same aircraft varies depending on altitude, loading, weather and how it is flown by the pilot. Over the past 30 years, improvements in aircraft technology have resulted in substantial reductions in the noise of individual aircraft and a significant minority of the current fleet already achieves a noise target better than the Chapter 3 standards. However, further improvements beyond the Chapter 4 standards (which, from 2006, required a 10 dB(A) reduction on Chapter 3 standards) will be increasingly difficult to achieve.

Some commentators have expressed concern about how the proposed 'Chapter 4' will effectively control future noise from aircraft. The 10 dB reduction represents the sum of the noise reduction at three measurement points and could be met by a combined margin including a reduction of only 2 dB at two of the three measurement points. It has been suggested that almost all aircraft currently in production can already meet the new standard and therefore the increase in stringency is not enough to promote technological advances. Furthermore, regardless of how quiet a new aeroplane may be, the existing noise may not be improved until the operations of the noisier aircraft are limited.

Aircraft noise arises from engines and from the movement of turbulent air over the physical structure (airframe) of an aircraft. To date, noise reduction has focused mainly on reducing engine noise. This is now sufficiently low that tackling noise from the airframe is becoming as important (although it may be more challenging to reduce) in terms of reducing the overall noise from aircraft. Technologies under development point to the perceived noise level from individual aircraft being halved, but translating laboratory-tested concepts into a fully functioning aircraft is difficult. In particular, the noise performance of new aircraft is difficult to characterise fully before they are built and flown.

More Recent Developments

More recently than the ANIS study described in section 2.3.7 above a report entitled Attitudes to Noise from Aviation Sources in England (ANASE) study has been published. The ANASE study can be viewed at:

http://www.dft.gov.uk/pgr/aviation/environmentalissues/Anase/

The purpose of the ANASE study was to produce an up-to-date analysis of the impacts of aircraft noise, building on previous research.

The ANASE study found that average annoyance was greater than in the previous ANIS survey. It then found that, using a new index in which a doubling of movements gave a 4.5 dB increase, as opposed to an equivalent 3 dB change for LAeq 16h, the regression lines for the ANIS and ANASE study converged. However, the correlation of this new number based index with annoyance was worse, at 0.665 compared with 0.739 for LAeq 16h. Based on the ANASE study two extreme hypotheses" can be inferred i.e. that:

(1) LAeq,t is the appropriate measure, and people really are more annoyed by a given sound level now than in the early 1980s;

and,

(2) LAeq,t is not the appropriate measure, and annoyance in both studies would correlate better with another measure of aircraft sound levels.

The Government had commissioned the study as it intended to review national policy in regard to noise from aircraft and wished to base any changes it might make on a sound and robust evidential basis. Consequently, the study incorporated a significant element of peer review, one purpose of which was to provide a means of assessing just how much weight could be given to the outcomes of the study. The peer review of the ANASE study can be viewed at:

http://www.dft.gov.uk/pgr/aviation/environmentalissues/Anase/nonsppeerreview.pdf

Unfortunately, the peer review of the ANASE included the statements that:

" 'the results of ANASE study are inconclusive and therefore should be treated with caution. Although the issue of the noise exposure characterisation of the [Common Noise Areas] could, in theory, be resolved by using the published values, the issues raised regarding the social survey cannot be addressed without repeating the survey using a modified approach that minimises the risk of bias.'

and

"…in the first version of this review it was stated that there were sufficient technical and methodological uncertainties still remaining with the study to mean that reliance on the detailed outcome of ANASE would be misplaced. In view of developments since the review of the July 2007 version of the ANASE main report, the reviewers are even more convinced that their concerns are fully justified…"

Other commentators have reviewed the ANASE study and strongly question its findings, e.g. Peter Brooker, "ANASE: Lessons from 'Unreliable Findings' - Proceedings of the Institute of Acoustics, Vol. 30. Pt.2. 2008. The Brooker paper and presentation slides can be viewed at:

https://dspace.lib.cranfield.ac.uk/handle/1826/2242

Since publication of the ANASE study and its peer review, the Government has decided that at this time there is insufficient evidence to warrant a change in policy on noise from aircraft, and the previous advice of the ANIS study remains current. Consequently, Government policy therefore remains that 57 dB LAeq (16 hour) marks the approximate onset of significant community annoyance from aircraft noise and that this should be used as the starting point for assessing trends in aircraft noise emissions and in forecasting impacts.

Other ways of describing aircraft noise

In 1994, Sydney Kingsford-Smith Airport opened its third runway. Following the opening, residents in areas predicted not to be affected during the planning stage, found themselves being disturbed by aircraft noise. Due to the great magnitude of publicity that surrounded the case a Senate Select Committee was formed to examine the issue of aircraft noise in Sydney. As a result of the Committee's findings, the Australian Department of Transport and Regional Services undertook an investigation of different methods of aircraft noise assessment. In March 2000, the Department published a discussion paper entitled "Expanding Ways to Describe and Assess Aircraft Noise".

The document was produced to "promote debate on the development and use of more transparent approaches to describing and assessing aircraft noise around Australian airports". The paper makes the suggestion that in order to allow aircraft noise to be better understood by the layperson, it should be described in terminology that relates to the most common questions asked by the layperson in connection with aircraft noise. It suggested that members of the public were often interested in answers to the following questions:

- "Where will the flight paths be?"
- "How many aircraft will use the flight paths?"
- "At what time will I get the noise – during the day, early morning, evenings or weekends?"
- "What will it be like on the 'bad' days?
- "Will I get more noise in the summer?"
- "Will the largest and noisiest aircraft fly over my area?"
- "Will I get take-offs or landings over my houses?"
- "When will I get a break from the noise?"

Whilst the questions may be simple, the conventional use of providing cumulative noise contours on their own does not give explicit answers to any of them. The paper was careful not to reject or dismiss the use of cumulative noise contours, but instead proposed that supplementing its use with other metrics should improve understanding of the impacts surrounding the introduction of or proposed changes to aircraft operations. Four main methods of presenting the level of aircraft noise are described.

These are as follows:

- Flight Paths and Movement Numbers
- Respite
- The N70
- The Person-Events Index and The Average Individual Exposure

Flight Paths and Movement Numbers

When looking at buying homes near airports people may examine flight path data in order to assist them with their task. It is assumed that if a property is under a flight path it will be noisy, and if not it will be quiet. Whilst this is an oversimplification of the situation the basic principle is correct. The level of air traffic utilising the different flight paths is also a major factor that will affect the level of noise received on the ground. To answer questions such as "where do the aircraft fly" and "how many overflights are there", the use of flight path movement charts has been developed.

Unlike traditional flight path plans which show individual thin lines for each path, those shown on the new charts get wider as they get further away from the airport. This displays the natural dispersion of aircraft in flight and dispelling the myth of aircraft flying along "railway tracks in the sky". In addition, the charts include:

- Data for each path on the average number of daily movements;
- The number of jet aircraft utilising the route as a percentage of the total number of jet aircraft movements;
- The daily range (i.e. min and max) of aircraft movements along the route; and,
- The percentage of days with no movements.

The discussion paper states that these types of charts have been used at Sydney Airport since 1998 and have been well received. However, limitations of this method have been identified. These include that there is no distinction between small and large aircraft (all are taken to be similar) and that the wider paths, showing more dispersion, are often wrongly interpreted as noisier in comparison with narrower paths where flights are concentrated over a smaller area.

Respite

A significant issue with the use of the LAeq index or similar systems is that they assume that annoyance levels will remain the same if the number of aircraft operations are doubled so long as the individual aircraft noise levels are reduced by 3 dB. Whilst a reduction of 3 dB for an individual aircraft event may only just be noticeable, a doubling of movements is likely to have a greater effect.

With this in mind, and as the number of aircraft movements increases, as they have in recent years and are predicted to in the future, the layperson is interested to know when they will have a break from the noise, hence the idea of specifying respite. In Australia, “extensive debate” took place over the most effective way to define respite. Examination was made of the threshold noise level and the time period over which no aircraft events occur. Due to difficulties with definitions and computation the use of a specific threshold noise level was not feasible. Instead, flight path usage was utilised for the purposes of respite description. This still left the issue of what time period should be used. The approach adopted by Sydney Kingsford-Smith Airport for their monthly monitoring report was to calculate the number of whole clock hours when no movements occurred on a given flight path. This figure is then presented as a percentage of the total number of clock hours in the period under examination. The example offered is that “if there were no movements on a particular flight path during 50 clock hours in a 100 hour clock period then it would be reported as ‘Respite Hours 50%’”. A clock hour is, for example, between 07:00 and 08:00 or 10:00 and 11:00, etc. The respite hours are calculated for the following four periods:

a) Morning Respite: 06:00-07:00 hrs (Weekdays)

b) Evening Respite: 20:00-23:00 hrs (Weekdays)

c) Weekend Respite: 06:00-23:00 hrs (Saturday or Sunday)

d) Daytime Respite: 07:00-20:00 hrs (Weekdays)

Periods a), b) and c) have been identified as sensitive times. The night-time period is not a prominent issue at Sydney Airport due to it’s strictly enforced curfew hence the lack of information relating to 23:00-06:00 hrs. Consideration has been given to producing a single figure for respite at a particular location by weighting and then combining the results for the various time periods. To date, this has been avoided since, it is felt, it would reduce the clarity of the information.

Respite charts have not been as well received as the flight path and movement charts described earlier. One criticism of the technique and its use in Sydney has been that certain areas may be close to more than one flight path. This would mean that whilst no aircraft might be operating on the nearest route to a particular location, it might still be affected by noise from activity on other routes. This problem is likely to be particularly prevalent at locations close to an airport. No obvious solution has been found for this problem though it is noted that “for most parts of Sydney the charts give a very good indication of the extent to which respite is being achieved”.

Another problem with the system in its current form is that the use of clock hours can lead to an underestimation of respite. The example given is that “if there were one movement at 12:05pm and

one movement at 1:55pm no respite would be recorded for that two hour period. This would be despite the fact that for virtually the whole of the period (110 minutes) there were no movements".

The N70

Due to some of the apparent shortcomings of the ANEF system, discussions took place in Sydney between the airport and the various local communities to find the best way to provide an easily comprehensible method to describe actual aircraft noise levels. After trialling the use of SEL footprints for individual aircraft it was found that to provide such information for all aircraft types, on all routes, and including information on the number of movements was unworkable. Instead, 'Number Above' contours were proposed. The N70 indicates the number of aircraft movements that exceed 70 dB(A) SEL at a given location. Locations with similar numbers of aircraft movements that exceed 70 dB(A) SEL, i.e. locations with similar N70 results, are joined together to provide the various N70 contours. The N70 is by no means a new concept but has been around for over 20 years and was examined in a study carried out by the National Acoustic Laboratory in Australia in 1982.

The Australian Standard AS202123 specifies the single event level of 60 dB(A) as "the indoor design sound level for normal domestic areas in dwellings" since this is the level at which "a noise event is likely to interfere with conversation or with listening to the radio or the television". Given that a house with partially open windows provides around 10 dB(A) attenuation of external noise sources leads us to the rationale behind the choice of 70 dB(A) SEL as the noise threshold, and hence the N70. The equivalent external value e.g. for outdoor amenity spaces, gardens, balconies etc. is 60 db i.e. N60.

The Person-Events Index and The Average Individual Exposure

A useful way to assess the impact of aircraft noise is to determine the number of people that will be affected by it. At many airports noise preferential routing is used to divert aircraft away from greatly populated areas. Whilst assessing the total number of people affected is important, decisions sometimes have to be made as to whether it is worse for a small number of people to be exposed to high noise levels or if it is worse for a large number of people to be exposed to lower noise levels. This question creates a problem for decision makers, many of whom will not be experts with regards to noise, since they may not understand the differences between the two scenarios sufficiently to make considered judgements. To assist non-experts with interpretation of this type of information, the Department of Transport and Regional Services in Australia has devised the Person-Events Index (PEI). The discussion paper states that "the index is not intended to replace existing noise indicators but to supplement them".

The PEI is calculated using the equation below:

$$PEI(x)\ P\ N\ N = \Sigma$$

Where:

x = The single event threshold noise level expressed in dB(A)

PN = The number on persons exposed to N events > x dB(A)

The PEI is summed over the range between Nmin (a defined cut-off level) and Nmax (the highest number of noise events louder than x dB(A) persons are exposed to during the period of interest)". An example given in the discussion paper is that if a single departure by one aircraft exposes 20,000 people to a single event level of 70 dB(A) or greater, the PEI (70) would be 20,000 for that

event. If an additional departure took place, similar to the first event, then the total PEI (70) for both events combined would be 40,000. A more detailed example of the use of PEI is presented in the discussion paper examining different operating scenarios at Sydney Airport. The information provided by the PEI is not comprehensive and requires further computation to make it so. It is very well knowing that the PEI(70) is, for example, 1,000,000, but this could mean that one person is exposed to a million events of 70 dB(A) or more, or it could mean that a million people are exposed to one event of 70 dB(A) or more, or any other situation between these two extremes. This requirement for further clarification has led to the creation of average individual exposure (AIE) which is calculated using the equation below:

Total Exposed Population

AIE = PEI

As with the PEI, the AIE is based on a defined minimum cut-off level of x number of events per day. Like the N70 described earlier, the PEI and AIE are both arithmetic and therefore show "differences between scenarios much more starkly than logarithmic indices which dampen any difference". The discussion paper notes that the PEI is useful "for computing partial noise loads" and can produce meaningful results even one or a small number of movements. It can also be used to compare results at different airports. It is advised that the AIE should not generally be used for this purpose but that it is useful "when comparing different operating scenarios at a particular airport".

Consequently this study proposes that the use of the LAeq,T noise index to assess the impacts of aviation noise on heritage assets should be supplemented by information regarding flight numbers and flight paths and the peak noise levels from aircraft over flight in terms of the N60 (for outdoors impacts) and N70 (for indoors impacts) indices.

Use of the LAmax Index to Assess Aviation Noise Impacts

Assessment of day time aircraft noise from airports conventionally uses contours presenting the LAeq (16 hrs) noise levels, these provide an estimate of the total noise from aircraft using the airport, as recommended by the UK government. This method takes into account the number of aircraft, how noisy each aircraft is and for how long the noise of each aircraft movement occurs.

However, the sole use of the LAeq (16 hrs) index for assessment of aviation noise has been criticised and use of supplementary indices has been discussed .

For example, the LAmax is a measure of the peak (or maximum) dB (A) value of the noise of a single aircraft passing by. On approaching an observer's position, aircraft noise increases to a maximum level, before fading gradually as the aircraft moves away from the observer's position to a point where it is no longer audible. Consequently, the LAmax can be used as part of the assessment of aviation noise impacts as it represents the highest levels of the aircraft noise experienced and, therefore arguably the worst case in terms of noise impact; and is a noise descriptor more easily understood by the non-acoustician than the energy average based LAeq (16 hrs).

Dis-advantages of using the LAmax noise index to asses aviation noise include that most of the total noise associated with an aircraft noise event will fall below the maximum level as it increases to its maximum level (as an aircraft approaches the listener) and declines (moves away from the listener); that the LAmax represents only the loudest single noise event during the assessment period and does not take account the number of aircraft noise events or the duration of each

aircraft noise event, and there is little research in to the correlation of LAmax with the subjective impact of aviation noise.

Normally airport LAmax noise contours show subtle changes in the peak aviation noise levels, with a slight reduction predicted in the LAmax values and areas covered for the future scenarios. At first sight this might appear counter intuitive as the future fleet mix at the airport may include larger aircraft than at present. Historically larger, heavier aircraft have tended to be the noisier than smaller, lighter types. However, these future larger aircraft will have to be in the quieter Chapter 4 category compared to the current majority of aircraft using the airport that fall in the noisier Chapter 3 category

Interestingly airport LAeq (16 hrs) noise contour maps can show the opposite trend, with the predicted future scenarios showing moderate growth in the areas covered, reflecting the ability of the LAeq (16 hrs) index to weight any future reduction in peak noise level from individual aircraft movements against any overall increased number of flights.

The LAmax contours on their own are of limited value as there are few established standards or guidance against which to weigh the data, except for night time sleep disturbance and speech interference in environments where good intelligibility is required.

As most Heritage assets are not normally visited during standard night time hours e.g. 0700 to 2300 hrs, the assessment of sleep disturbance is somewhat redundant; although consideration of speech interference is appropriate.

Many of the Heritage sites relevant to this study are currently affected by aircraft noise to a greater or lesser extent, and at a substantial minority the existing LAmax noise levels from aircraft movements are high enough to cause speech interference outdoors i.e. > 60-65 dBA; and will intrude to a varying degree inside buildings on these sites (depending on the sound insulation provided by the building envelope). Consequently, the impact of the expansion of airport capacity is likely to remain unchanged in terms of the magnitude of the airside LAmax noise levels (except for in the case of the Estuary proposal). Because even if the increased number of flights leads to modest decreases or increases in the LAmax of individual air movements, this will not result in any individual air movement causing less or more speech interference, as any reduction will not be to below the speech interference threshold and any increase will not lead to more speech interference as the threshold for this effect is already exceeded. As a result, the number of air movements becomes relevant, as increasing the frequency of occurrence of aircraft movements and the overall number and frequency of occurrence of potential speech interferences each day therefore increases the probability that such impacts are likely to occur. This also goes some way to explaining why existing residents affected by aviation noise at airports sometimes acknowledge that although individual aircraft have got quieter over time; they perceive that conditions have become noisier as the number of aircraft movements has increased over the same period i.e. the noise from individual aircraft has reduced, but still causes speech interference, and the number of occurrences of interference with speech has increased.

Use of the LAeq,t Index for Assessment of Aircraft Noise

The Aviation Policy Framework[30] , and other sources advise that aircraft noise is assessed in terms of LAeq, furthermore the LAeq forms the basis of methods of assessing noise recommended by the Government and the World Health Organisation (WHO) and the European Union (with

[30] Aviation Policy Framework – see https://www.gov.uk/government/publications/aviation-policy-framework

supplementary indices when deemed appropriate). Additionally there is a substantial body of international research which uses and corroborates the use of the Leq to assess aviation noise. Fields[31], in a study which examined more than 70 aircraft and railway noise surveys, found that although estimates of the impact of the number of events differ considerably, none is significantly greater than the impact implicit in the LAeq,t index. Miedema, Vos and de Jong[32] found that the trade-off between the levels of events assumed by a metric based on LAeq,t is approximately correct for the prediction of annoyance caused by aircraft noise in a large study conducted around Schiphol airport in Holland. Whilst Vogt[33] found that in a laboratory assessment the effect of number of events was less than for the LAeq index.

Notwithstanding the reservations in regard to other conclusions of the ANASE study it did conclude that "Overall, we consider that while LAeq continues to be a good proxy for measuring community annoyance….."

On the other hand, the sole reliance on LAeq,t to asses aviation noise has been criticised on the grounds that the time averaging element of the index disguises or underestimates the true impact of aircraft noise. For example, at the Public Inquiries relating to Heathrow T5, the increase in capacity at Stansted Airport, and proposed developments at several regional airports; typically it was pointed out that a significant increase in the number of Air Traffic Movements (ATMs) would have only a small effect on the value of the LAeq level, and it was suggested that the peak noise levels (Lmax) of individual events and the number of events also have a bearing on the perceived noise impact.

One of the arguments advanced by those sceptical of the use of the LAeq for aviation noise is that such noise is normally experienced as a series of discrete noise events with quiet periods between, rather than as part of a continuous but fluctuating noise, and so Lmax or SEL, and the number of aircraft movements are also significant parameters.

A particular point of contention in the use of the Leq,t to asses aviation noise, is its use for the assessment of the significance of the impact of changes in aviation noise where the time averaging period, t, is relatively long e.g. 16 hours. Conventionally, from various sources , the guidance on the significance of the impact of changes in a noise level can be summarised as:

- A change in noise level of 1 dB is only perceptible under controlled conditions, and;
- A change in noise level of 3 dB(A) is the minimum perceptible under normal conditions.

It has been pointed out that crucial to the interpretation of the above "rules" is an understanding of the differences between the terms noise level and noise index. If the moment to moment noise level of steady sound or the peak noise level of a specific noise event only changes by 3 dBA, then such a change is likely to be only just perceptible. Whereas, if the value of a noise index, which is a single figure means of representing a complex fluctuating pattern of noise over a defined time

[31] Fields, James M., The effect of numbers of noise events on people's reactions to noise: An analysis of existing survey data, J. Acoust. Soc. Am.75(2), February 1984

[32] Miedema, Henk, M.E., Vos, Henk, de Jong, Ronald G. Community reaction to aircraft noise: Time-of-day penalty and tradeoff between levels of overflights, J. Acoust. Soc. Am. 107(6), June 2000

[33] Vogt, Joachim, Kalveram, Karl Th., *Trading Level for Number of Aircraft Immissions: A full-factorial Laboratory Design*, University of Dortmund

period, changes by 3 dB or less, then these “rules” may not be applicable. For example, where the LAeq,t, changes by 3 dBA due to a doubling or halving of the number of noise events in the period t, then such a change in noise events is not likely to go un-noticed; although the significance of any noticeable change will be influenced by factors including the number of noise events to begin with and the noise level of each noise event.

As described above, in the UK before the change to use of the LAeq,t ,there was an index that treated the number of events in a way that increased its value by more than 3 dB per doubling e.g. the Noise and Number Index (NNI). This index used a 15 x Log N term which gave a 4.5 dB increase per doubling of noise events. However, the term in the NNI formula that accounted for noise level was insensitive to the duration of each noise event and noise events that were just under the cut-off limit, or the degree to which the peak noise level exceeded the cut-off limit. Whereas all these factors are included in the LAeq,t index.

At public inquiries for various airport developments the application of the “rules” described above to changes in noise indices such as the LAeq,t has been challenged, and evidence presented that the subjective response to changes in LAeq,t noise levels containing a series of discrete noise events with a large difference between the peak and minimum noise levels is more sensitive than suggested by the “rules”, particularly when the time averaging period is longer than the duration of each noise event. Typically, it has been argued that a supposedly barely perceptible 3 dB reduction in noise level of each individual aircraft would permit a doubling of the number of aircraft movements within the relevant time averaging period, and there would be no change in the overall LAeq,t, or noise impact. Many find this counter-intuitive as a doubling of aircraft movements would tend to be clearly noticeable in a wide range of circumstances. At the Heathrow Terminal 5 inquiry an expert witness for the DfT conceded that changes in LAeq,16 hr of less than 3 dBA could be significant. For example, if a less than 3 dB change in LAeq,16 hr was due to a large increase in aircraft movements during a much shorter and sensitive part of that longer period e.g. early in the morning or late evening, being averaged over the longer 16 hour period. In which case even though the apparent variation in the LAeq,16 hr could be less than 3 dB, the increased noise impact during the shorter sensitive period could be likely to be clearly noticed by some of the persons affected.

The T5 Inspector appeared to be concerned that LAeq, 16hr does not directly indicate the maximum noise of individual events so that it cannot indicate how many times conversation is interrupted in a particular location. This is largely true, but this is really a criticism of the presentation of the information using LAeq, 16hr, as these factors are incorporated into the index, rather than explicitly articulated by it.

Since levels of aircraft noise vary according to type, size, height and location of aircraft, the maximum noise levels at a particular location vary. As a result what matters is the extent to which people are annoyed or disturbed e.g. by interruptions to conversation, and to assess that it is necessary to balance the loudness of the event against the number of times the events of different loudness occur. Unfortunately, there is no established guidance against which to weigh these factors in isolation. Whereas these factors are fundamental components of the LAeq,t index which has been correlated with the subjective impact of aviation noise via extensive research. As a consequence in the UK, the LAeq,t index was adopted following the 1985 report of the United Kingdom Aircraft Noise Index Study (ANIS).

Except for SEL and LAmax for sleep disturbance, there is no current official UK guidance on how to use indices other than Leq,t to assess aviation noise (all though use of supplementary indices such as LAmax is allowed for in the EU directive and UK transposing legislation for strategic noise mapping). Whereas, as described above, the appropriateness of the use of the Leq,t index for

assessment of aviation noise has been tested and used extensively in the UK and around the world for several decades.

Conclusions

Aviation noise can cause significant disruption to many who live near to airports and under flight paths and can have health impacts, to say nothing of its effect on the value of land and property beneath.

The effects of noise can be difficult to separate from other environmental stressors and the individual sensitivity to aviation noise is highly variable and significantly influenced by non-acoustic factors, and is probably volatile over time.

Proposals for changes to airports, such as increasing the number of flights, have to include descriptions of how they will change noise exposure and impacts. In the UK this has conventionally been achieved by establishing noise contours around airports using an index called Leq,t i.e. the Equivalent Continuous Sound Level, which is essentially the total noise energy received on the ground averaged over time. It is measured in decibels, takes into account both the noise levels of aircraft, the duration of their noise and their number, and logarithmically averages the sound energy from all aircraft movements, based on average modes of use of the airport, in a certain area over a 16 hour period, between 0700 hrs and 2300 hrs each day, which covers the operations of the designated airports.

Whilst the LAeq,t has been reasonably well correlated to the subjective impact of aircraft noise in the UK and abroad, with its use for aviation noise being derived through extensive study of the disturbance ratings of people and communities exposed to aircraft noise. There remain criticisms of its sole use for the assessment of aviation noise; with strong cases being made for the use of the peak noise levels and the number of noise events as well, although there is no current UK guidance specifically on the noise implications of changes in numbers of air movements or the significance of peak aviation noise levels. However, this information appears to be useful in articulating potential noise impacts to those who are not familiar with the LAeq,t index.

Supplementary indicators, such as flight paths and numbers and N70 can assist in articulating the impact of aircraft noise; but are also subject to limitations and do not replace LAeq type indicators that remain the basis of aircraft noise impact assessment in the UK.

A recent re-examination of the impact of aviation noise in the UK and the introduction of the Aviation Policy Framework has not led to a change in the Government Policy of using LAeq, noise index to assess and manage aviation noise overall; although the use of supplementary indices is recognised in the APF.

Consequently, the this study recommends using the LAeq,16 hr and N60 indices to quantify and assess the impacts of aviation noise on the Heritage sites. This allows the assessment of the likely impacts on heritage sites against the current minimum statutory and established policy requirements and guidelines.

Appendix 3: Listed Buildings Within the Case Study Area

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
MAUSOLEUM OF THE DUCHESS OF KENT	I	1117780	Neo-classical mausoleum c.1850. Set within Frogmore Gardens.	A
THE ROYAL MAUSOLEUM	I	1117781	Romanesque mausoleum c.1862-71. Set within Frogmore Gardens. Burial place of Queen Victoria and Prince Albert.	A
FROGMORE HOUSE	I	1319304	The three-storey, stucco-faced central block (c.1680), flanked by early 19th century bow-fronted pavilions, with a Tuscan colonnade running along the ground floor of the central block overlooking the main lawn. Located in the north-east of Frogmore Gardens.	A
PRINCE ALBERTS DAIRY AND COTTAGE	II*	1272281	The Dairy Cottage dates back to circa 1830-40 but was refaced circa 1850-60 with the erection am decoration of dairy itself. Elaborately decorated in picturesque style. Within Frogmore Gardens.	N/A
ADELAIDE COTTAGE	II*	1319270	Formerly known as Adelaide Lodge. Incorporating part of John Nash's original Royal Lodge, built for the Prince Regent. Re-erected in this part of the Home Park, east of the Castle in 1831. On the edge of Home Park golf course and within Home Park RPG.	N/A
GOTHIC RUIN OF TEMPLE BY LAKE IN FROGMORE GARDENS	II*	1319305	c. 1793 by James Wyatt, as garden house with extensions in ruinous manner. Within Frogmore Gardens	A
1-3, TRINITY PLACE	II	1117678	Circa 1850 2 storey stock brick block of 3 houses. On minor road on the edge of Windsor centre. Residential area.	N/A
6-9, TRINITY PLACE	II	1117679	Circa 1850 2 storey stock brick block of 3 houses. On minor road on the edge of Windsor centre. Residential area.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
10 AND 11, TRINITY PLACE	II	1117680	Circa 1840-50 pair of 3 storeys red brick houses. On minor road on the edge of Windsor centre. Residential area.	N/A
14 AND 15, TRINITY PLACE	II	1117681	Circa 1840-50 double gabled pair of red brick houses. On minor road on the edge of Windsor centre. Residential area.	N/A
CHURCH OF HOLY TRINITY	II	1117682	1842-44 by Edward Blore. Located on an island site as designed, closing vista up Trinity Place. At junction of a number of minor roads on the edge of Windsor Centre.	N/A
18 AND 19, TRINITY PLACE	II	1117683	Circa 1840-50 pair of 3 storeys red brick houses. On minor road on the edge of Windsor centre. Residential area.	N/A
39-51, ST LEONARDS STREET	II	1117696	Circa 1890-1900, symmetrically designed row of 2 storey and attic red brick houses with original shop fronts. Located on a busy, minor road on the edge of Windsor centre.	N/A
85, ST LEONARD'S STREET	II	1117697	Built as projecting terminal house of otherwise much altered, c. 1830 terrace. Located on a busy, minor road on the edge of Windsor centre.	N/A
EDWARD VII STATUE IN HOSPITAL FORECOURT	II	1117698	1912 memorial statue with bronze figure of the King. Located in the centre of a car park to the front of the hospital.	N/A
THE STAG AND HOUNDS PUBLIC HOUSE AND ADJOINING COTTAGE	II	1117700	C17 timber building, considerably altered early C19th and C20th. Located on a major road on the edge of Windsor centre.	N/A
BRUNSWICK TERRACE	II	1117710	Nos 65 to 79 King's Road. Circa 1800, row of 2 storey (+ attic) brick terrace houses. Located on quiet minor road. Gardens to the rear back onto The Long Mile. Residential area.	N/A
BRUNSWICK TERRACE	II	1117711	Part of Brunswick Terrace. Located on quiet minor road. Garden to the rear backs onto The Long Mile. Residential area.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
81, KINGS ROAD	II	1117712	Nos 29 to 37 King's Road. Circa 1800, row of 2 storey (+ attic) brick terrace houses. Located on quiet minor road. Gardens to the rear back onto The Long Mile. Residential area.	N/A
QUEEN ANNE'S COTTAGE	II	1117713	Early C19 recasing/remodelling of late C17 or early C18 building. Located on major road (A322) to the south of the centre of Windsor. One the edge of Windsor Great Park	N/A
QUEEN ANNE'S GATE LODGE	II	1117714	c. 1830-36 lodge to Windsor Great Park. Located on major road (A322) to the south of the centre of Windsor. Within Windsor Great Park RPG.	N/A
PICKETS HOUSE	II	1117715	Early C19 2 storey stucco faced villa set back from road with flank on Grove Road. Located on minor road on the edge of centre of Windsor. Residential area.	N/A
THE ROYAL ADELAIDE HOTEL	II	1117716	c. 1830 late Regency classical style hotel, on the corner of two minor roads on the edge of the centre of Windsor. Residential area.	N/A
ADELAIDE TERRACE	II	1117717	Nos 58 to 72 (even) King's Road. Symmetrical terrace of 8 houses dated 1831 with central pediment. Located on minor road on the edge of centre of Windsor. Residential area. Has direct views across the The Long Mile.	N/A
GATEPIERS AND FORECOURT WALL OF QUEENS TERRACE	II	1117718	Tall brick gate piers and forecourt wall of Queen's Terrace. Located on minor road on the edge of centre of Windsor. Residential area.	N/A
CROWN COTTAGES	II	1117719	Nos 7 to 12 King's Road. Estate cottages. By Teulon probably and dated 1855. Set back slightly from major road (A322) to the south of the centre of Windsor. Within Windsor Great Park RPG.	N/A
76 AND 78, OSBORNE ROAD	II	1117724	c.1850 pair of three storeys, attic and basement, stock brick houses. Set back from major road. Residential	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
			area.	
84 AND 86, OSBORNE ROAD	II	1117725	c. 1850 similar detached villas of two storeys, stock brick with red brick quoins. Set back from major road. Residential area.	N/A
7 AND 8, CLAREMONT ROAD	II	1117731	Circa 1840-50 pair of similar 3 storey houses with basement. Slightly set back from road which forms part of the busy minor road around Trinity Church. Residential area.	N/A
9-14, GLOUCESTER PLACE	II	1117738	c. 1830 sequence of three pairs of cottage/villas. Set back from road which is a quiet minor road on the edge of the centre of Windsor. Residential area.	N/A
58 AND 60, GROVE ROAD	II	1117739	c. 1830-40 part of terrace but altered and stuccoed with large pilastered shop front of later C19 date. On quiet minor road on the edge of the centre of Windsor. Residential area.	N/A
SHAW FARMHOUSE	II	1117753	c. 1850 Italianate house. Not always a farmhouse? Set within Home Park set back from busy Albert Road to the south, however, screened by a large number of modern agricultural buildings.	N/A
1-29, ADELAIDE SQUARE	II	1117760	Nos 1 to 29. c. 1835-40, two storey London stock brick terrace, symmetrical design with 2nd houses from each end (Nos 3, 15 and 27) projecting and pediment. On minor road on the edge of the centre of Windsor. Residential area.	N/A
18 AND 20, ADELAIDE SQUARE	II	1117761	c.1835-40 pair of two storeys stock brick houses. Set back from road, which is a minor road on the edge of the centre of Windsor. Residential area.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
PRINCE CONSORT COTTAGES	II	1117762	Completed 1855. Architect Henry Roberts for the Royal Windsor Society in consultation with Prince Albert. Group of small simple gabled red brick cottages ranged around a green. Surrounded by residential dwellings and minor roads to the south of the centre of Windsor.	N/A
PRINCE CONSORT COTTAGES	II	1117763	Completed 1855. Architect Henry Roberts for the Royal Windsor Society in consultation with Prince Albert. Group of small simple gabled red brick cottages ranged around a green. Surrounded by residential dwellings and minor roads to the south of the centre of Windsor.	N/A
ROMAN CATHOLIC CHURCH OF ST EDWARD	II	1117764	c. 1867-8 ragstone rubble church by C A Buckler. Within a residential setting, surrounded by quiet and busy minor roads on the edge of the centre of Windsor.	N/A
1-6, CLAREMONT ROAD	II	1117775	Three pairs of circa 1840-50 houses. Slightly set back from road which forms part of the busy minor road around Trinity Church. Residential area.	N/A
FROGMORE HOUSE STABLES	II	1117777	c.1792 two storey stucco faced stables. Within Frogmore Gardens and associated with Frogmore House.	N/A
FROGMORE COTTAGE IN FROGMORE GROUNDS	II	1117778	Early C19 plain 2 storey house with parapet. Within Frogmore Gardens.	A
TEA HOUSE TO SOUTH OF FROGMORE HOUSE IN FROGMORE GROUNDS	II	1117779	c. 1860 tea house with Japanese and Tudor (!) design influences. Within Frogmore Gardens.	A
LODGE NORTH OF LYCH GATE FROM DRIVE TO THE ROYAL MAUSOLEUM IN FROGMORE GROUNDS	II	1117782	Italianate lych date c.1850-60. Within Frogmore Gardens. Associated with Royal Mausoleum.	N/A
THE HOME FARMHOUSE	II	1117783	Designed with the other farm buildings by S A Dean, c. 1850's for Prince Albert. Located within Home Park, and adjacent to Frogmore Gardens and Frogmore House.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
THE AVIARY	II	1117784	Late 1830's and 40's Gothic/Picturesque aviary. Located within Home Park, and adjacent to Frogmore Gardens and Frogmore House.	A
ADELAIDE LODGE	II	1117785	Formerly known as Adelaide Cottage , former service wing to Adelaide Cottage. On the edge of Home Park golf course and within Home Park RPG.	N/A
62-96, GROVE ROAD	II	1204438	c. 1830-40 main part of terrace of small 2 storey and basement houses. On quiet minor road on the edge of the centre of Windsor. Residential area.	N/A
26-34, KINGS ROAD	II	1205258	c. 1830-40, forms part of Brunswick Terrace. Set back slightly from a quiet minor road. Residential area.	N/A
48, KINGS ROAD	II	1205260	Corner site balancing Royal Adelaide Hotel and of the same date, c. 1830. On the corner of two minor roads on the edge of the centre of Windsor. Residential area.	N/A
ALBERT TERRACE	II	1205267	Nos 100 to 110 (even) King's Road. c. 1850-60 slightly Gothicised terrace 3 storeys and basements, red brick with some grey headers.	N/A
KING EDWARD VII MEMORIAL HOSPITAL (MAIN FRONT BLOCK)	II	1205473	c. 1909 by A W West, early C18 in style. Looks out onto a number of major roads to the south of the centre of Windsor. A number of modern buildings to the rear.	N/A
ELM PLACE	II	1205482	54 St Leonard's Road. c. 1760-80 2 storey stucco faced house, set back from street the right hand part of front partly obscured on ground floor by addition of projecting shop front. Located on a busy, minor road on the edge of Windsor centre.	N/A
YORK PLACE	II	1205507	Nos 51 to 71 (odd) Sheet Street. Early C19 buff brick terrace of 3 storey houses. Set back from busy major road to the south of the centre of	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
			Windsor.	
4 AND 5, TRINITY PLACE	II	1205837	c. 1840-50 pair of two storeys and basement stock brick houses. On minor road on the edge of Windsor centre. Residential area.	N/A
20 AND 21, TRINITY PLACE	II	1205959	c. 1840-50 pair of three storeys and basement stock brick houses with red brick dressings. On minor road on the edge of Windsor centre. Residential area.	N/A
GOLF COTTAGE	II	1244624	c. 1840 built as kennels, enlarged subsequently. Barge boarded Tudor style. Set alongside treelined Queen Elizabeth's Walk and other minor route ways within the parkland. Within Home Farm RPG. Close to golf course	N/A
LODGES EACH SIDE OF ALBERT ROAD SOUTH WEST OF SHAW FARM INCLUDING GATES	II	1272282	By Wyatville c. 1820-30. Stock brick with stone dressings. Located adjacent to Albert Road, a busy major road. Within Home Park RPG.	N/A
16 AND 17, TRINITY PLACE	II	1280441	c. 1840-50 pair of houses with three storeys and basement, stock brick above stucco ground floor. On minor road and busy roundabout close to Trinity Church, on the edge of Windsor centre. Residential area.	N/A
12 AND 13, TRINITY PLACE	II	1280478	c. 1840-50 pair of houses with three storeys and basement, red brick and stock brick. Slightly set back from road which forms part of the busy minor road around Trinity Church. Residential area.	N/A
THE MERRY WIVES OF WINDSOR	II	1280711	C17 timber framed building considerably altered. Ground floor built out with public house front c. 1900. Located on a busy, minor road on the edge of Windsor centre. Commercial area.	N/A
80 AND 82, OSBORNE ROAD	II	1280762	Circa 1850 pair of 2 storeys and attic, stock brick houses. Set back from	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
			major road. Residential area.	
HAMILTON LODGE	II	1280813	c. 1860-70 Gothic large red brick house with sandstone dressings. On corner of two semi-busy minor road (set back), with garden to the rear. Views towards The Long Mile.	N/A
3-8, GLOUCESTER PLACE	II	1281221	Three pairs of circa 1830-40 small cottage/villas. Set back from road on a quiet minor road. Residential area.	N/A
15-16, GLOUCESTER PLACE	II	1281224	c.1831-5 pair of Roman cement faced houses. Set back from road on a quiet minor road. Residential area.	N/A
BRIDGE FROM ISLAND LEADING TO DUCHESS OF KENT'S MAUSOLEUM	II	1319267	c.186l, designed in conjunction with terraced steps of mausoleum. Within Frogmore Gardens.	A
LYCH GATE FROM DRIVE TO ROYAL MAUSOLEUM IN FROGMORE GROUNDS	II	1319268	Humbert am Gruner c. 1862-71, ashlar Romanesque style lych gate. Within Frogmore Gardens.	A
RANGE OF COWSHEDS STABLING ETC TO WEST OF THE HOME FARMHOUSE	II	1319269	Principal north-south range with returns and inner wings ranging back to the farmhouse. c. 1850's for Prince Albert. Located within Home Park, and adjacent to Frogmore Gardens and Frogmore House.	N/A
THE CRISPIN PUBLIC HOUSE	II	1319287	No 56 Grove Road. circa 1830-40 terminal house of terrace. On quiet minor road on the edge of the centre of Windsor. Residential area.	N/A
CLOCK COTTAGE WITH WAGON SHED AT SHAW FARM	II	1319293	c.1850. Italianate style two storey stock brick cowshed with central belvedere tower porch. Set within Home Park set back from busy Albert Road to the south, however, screened by a large number of modern agricultural buildings.	N/A
4 AND 6, ADELAIDE SQUARE	II	1319298	c. 1835-40 pair of two storey stucco faced houses. On minor road on the edge of the centre of Windsor. Residential area.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
22-32, ADELAIDE SQUARE	II	1319299	c. 1835-40, two storey London stock brick terrace, symmetrical design with 2nd houses from each end projecting and pedimented. On minor road on the edge of the centre of Windsor. Residential area.	N/A
KIOSK TO SOUTH EAST OF COTTAGE IN FROGMORE GROUNDS	II	1319306	Indian Kiosk, all of marble. Taken from the Kaiserbajh at Lucknow and brought over in 1858 by Viceroy Earl Canning. Within Frogmore Gardens.	A
1, KINGS ROAD	II	1319312	c. 1800-20 narrow corner block. Set at junction of two roads, one of which is a busy, major road south of the centre of Windsor.	N/A
BRUNSWICK TERRACE	II	1319313	Nos 39 to 63 (odd) King's Road. A terrace of 13 houses c.1800. Located on quiet minor road. Garden to the rear backs onto The Long Mile. Residential area.	N/A
BRYN BRITH	II	1319314	c. 1830-40 2 storey buff brick house, mid C19 extension to garden front. et back slightly from major road (A322) to the south of the centre of Windsor. Within Windsor Great Park RPG.	N/A
CROWN COTTAGES	II	1319315	1 to 6 King's Road. Inter-linked L-plan group of estate cottages. By Teulon probably and dated 1855. Set back slightly from major road (A322) to the south of the centre of Windsor. Within Windsor Great Park RPG.	N/A
22, KINGS ROAD	II	1319316	c. 1830-50 3 storey stock brick house set at right angle to road. Located on quiet minor road. Residential area.	N/A
50 AND 52, KINGS ROAD	II	1319317	c. 1830-40 pair of three storey stucco faced houses. Set back from a quiet minor road. Residential area.	N/A
QUEENS TERRACE	II	1319318	Bold Jacobean design - terrace of three storey houses set back with forecourt. Teulon architect, exhibited at the Royal Academy 1849. Located on minor road on the edge of centre of Windsor. Residential area. Has direct views across the The Long Mile.	N/A

Listed Buildings Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
9 AND 10, CLAREMONT ROAD	II	1319322	c. 1840-50 pair of two storey brick houses. Slightly set back from road which forms part of the busy minor road around Trinity Church. Residential area.	N/A
CHURCH OF ALL SAINTS	II	1319326	c. 1862-4 by Sir Arthur Blomfield. Red brick with blue brick banding. Red, yellow and blue brick polychromy. Surrounded on two sides by, though slightly set back, from a busy road to the south of the centre of Windsor.	N/A
25, FRANCES ROAD	II	1392972	Detached house in a Domestic Revival style of 1888 by Thomas Edgington, architect, for himself. C20 alterations and additions. Facing onto a, though slightly set back, a busy road to the south of the centre of Windsor.	N/A

Scheduled Monuments Within Study Area			
Name	**List Entry**	**Brief Description**	**Methodology Grouping**
Moated site at Moat Park, New Windsor	1013358	The monument includes a small sub-rectangular moated site situated in a low- lying area at the northern end of Windsor Great Park and bisected from north- west to south-east by the Bourne Ditch (not included within the scheduling). The site appears on a map of 1607 as a moated lodge.	C

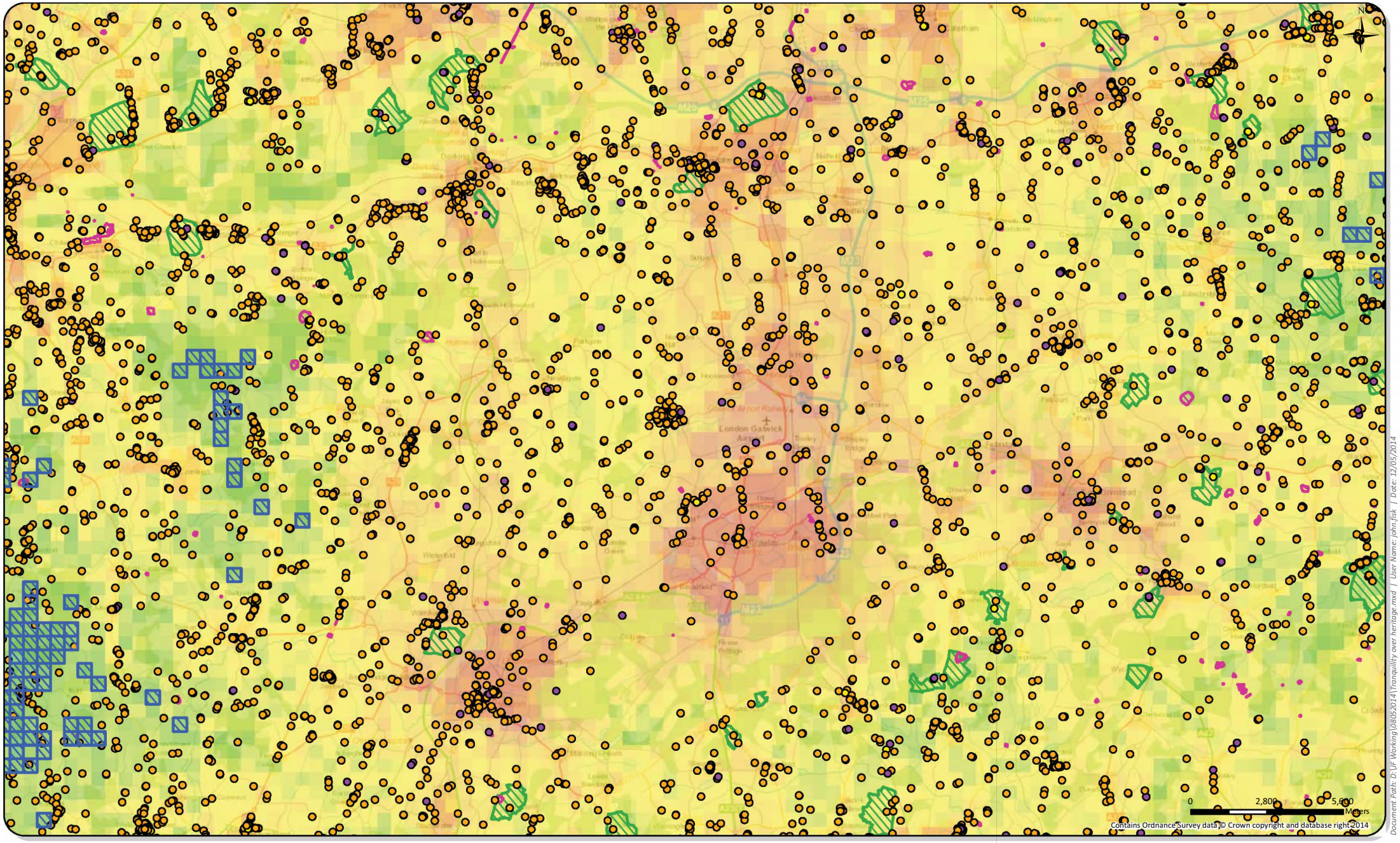
Registered Parks and Gardens Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**

Registered Parks and Gardens Within Study Area				
Name	**Grade**	**List Entry**	**Brief Description**	**Methodology Grouping**
FROGMORE GARDENS	I	1000587	Picturesque landscape garden, laid out in the 1790s for Queen Charlotte on the site of an earlier C18 formal garden, and further developed in the C19 by Queen Victoria. Also includes kitchen garden. Principal house is Frogmore House (GI). Set within Windsor Home Park and part of the Royal Estate, Windsor.	A
WINDSOR GREAT PARK	I	1000592	A royal park of medieval origin created out of Windsor Forest as a royal hunting park from the C11, and by c 1365 had evolved approximately to its present, late C20, size and shape. Containing many ancient trees. The park was later landscaped, and contains gardens attached to four principal residences within the park: Cumberland Lodge, Royal Lodge, Cranbourne Lodge and Forest Lodge. Lies immediately to the south and south-west of the town of Windsor and Windsor Home Park. Part of the Royal Estate, Windsor.	A
WINDSOR CASTLE & HOME PARK	I	1001434	England's premier castle with moat garden (used as a garden from the C15; remodelled late C19/early C20) and a terrace garden by Sir Jeffry Wyatville (mid 1820s) surrounded by pleasure grounds and a landscape park (in origin a medieval deer park), with intimate associations with the British Royal Family since the C11.Part of the Royal Estate, Windsor.	N/A

Conservation Areas Within Study Area		
Name	**Description**	**Methodology Grouping**

Conservation Areas Within Study Area		
Name	**Description**	**Methodology Grouping**
Windsor Town Centre	Windsor Town Centre Conservation Area, amended to its current extent in 1991, is focused upon the historic core of the town and the built environment surrounding Windsor Castle, including: the High Street; Peascode Street; Windsor and Eton Central Station and Windsor Bridge. Elements of the Conservation Area which contribute to its significance include the historic built fabric and the historic street planning; both of which demonstrate the historic development of the settlement and its relationship with both the Castle and the River Thames.	N/A

Appendix 4: Examples of the Spatial Scope of the Study Area



Project: **T2407 Heritage Assets Aviation Noise Metric**

Client: **English Heritage**

Title: **CPRE Tranquility Data overlyed by Heritage Assets**

Legend

CPRE Tranquility

Value

High : 148.699

Low : -140.517

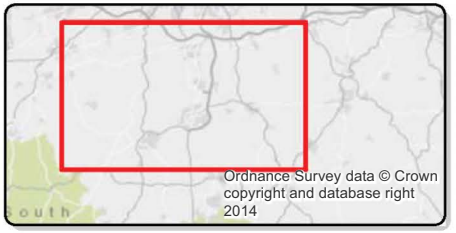
National top 20% most tranquil

20140502_ListedBuildingPoints

Grade

- I
- II
- II*

- 20140502_CertificateOfImmunityPoints
- 20140204_BuildingPreservationNoticePoints
- 20140204_WorldHeritageSite
- 20140417_ScheduledMonument
- 20140204_Battlefield
- 20140404_ProtectedWreck
- 20140417_ParkAndGarden



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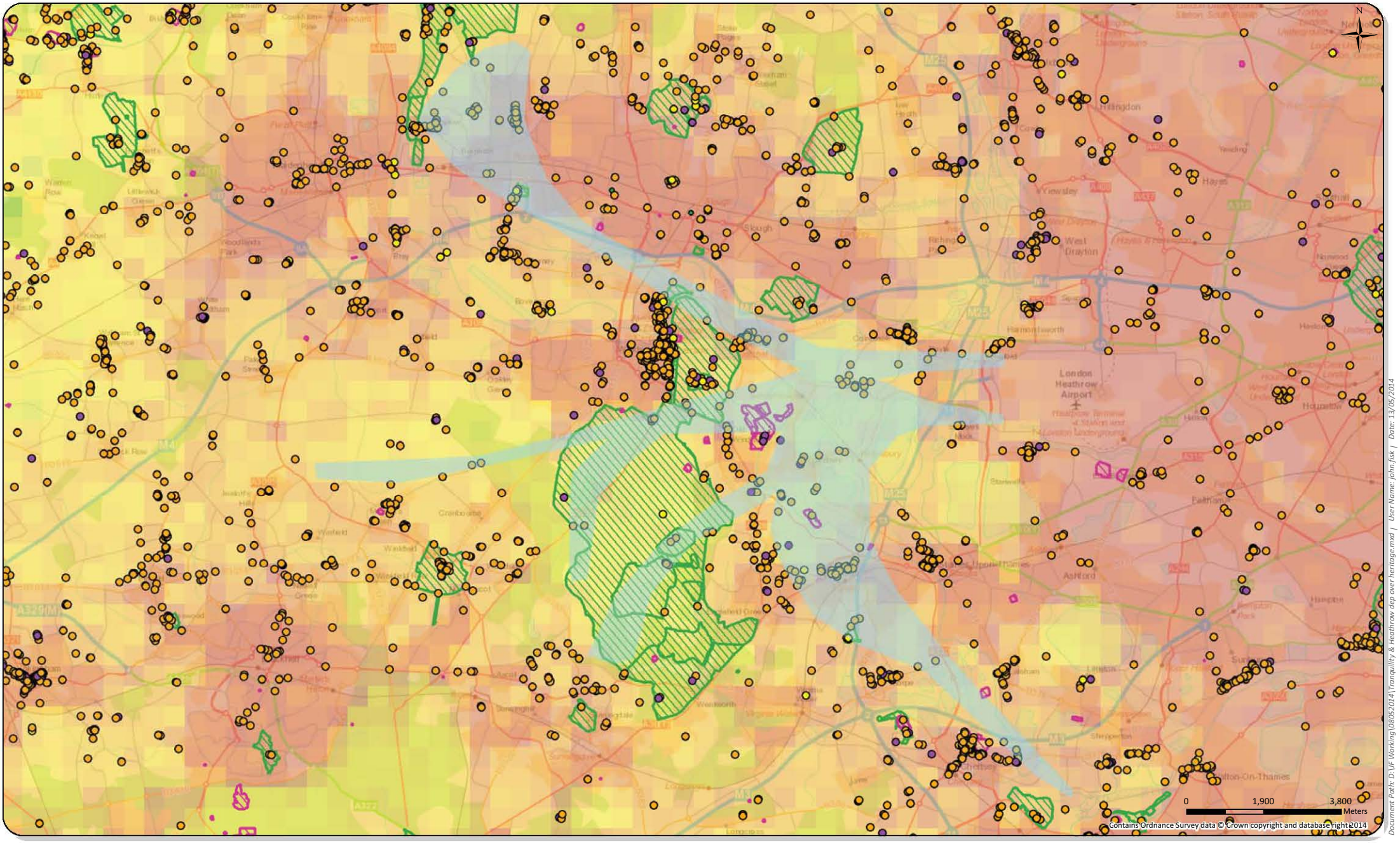


Project: **T2407 Heritage Assets Aviation Noise Metric**

Client: **English Heritage**

Title: **CPRE Tranquility Data and Heathrow Westerly Departures overlyed by Heritage Assets**

Legend

Heathrow westerly departures from 2013 map - Estiamte of Footprint of Radar track data below 4000ft

CPRE Tranquility

Value

High : 148.699

Low : -140.517

2014...

Grade

I

II

II*

20140502_CertificateOfImmunityPoints

20140204_BuildingPreservationNoticePoints

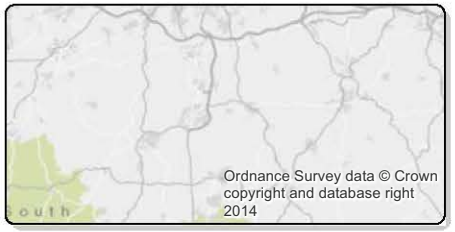
20140204_WorldHeritageSite

20140417_ScheduledMonument

20140204_Battlefield

20140404_ProtectedWreck

20140417_ParkAndGarden



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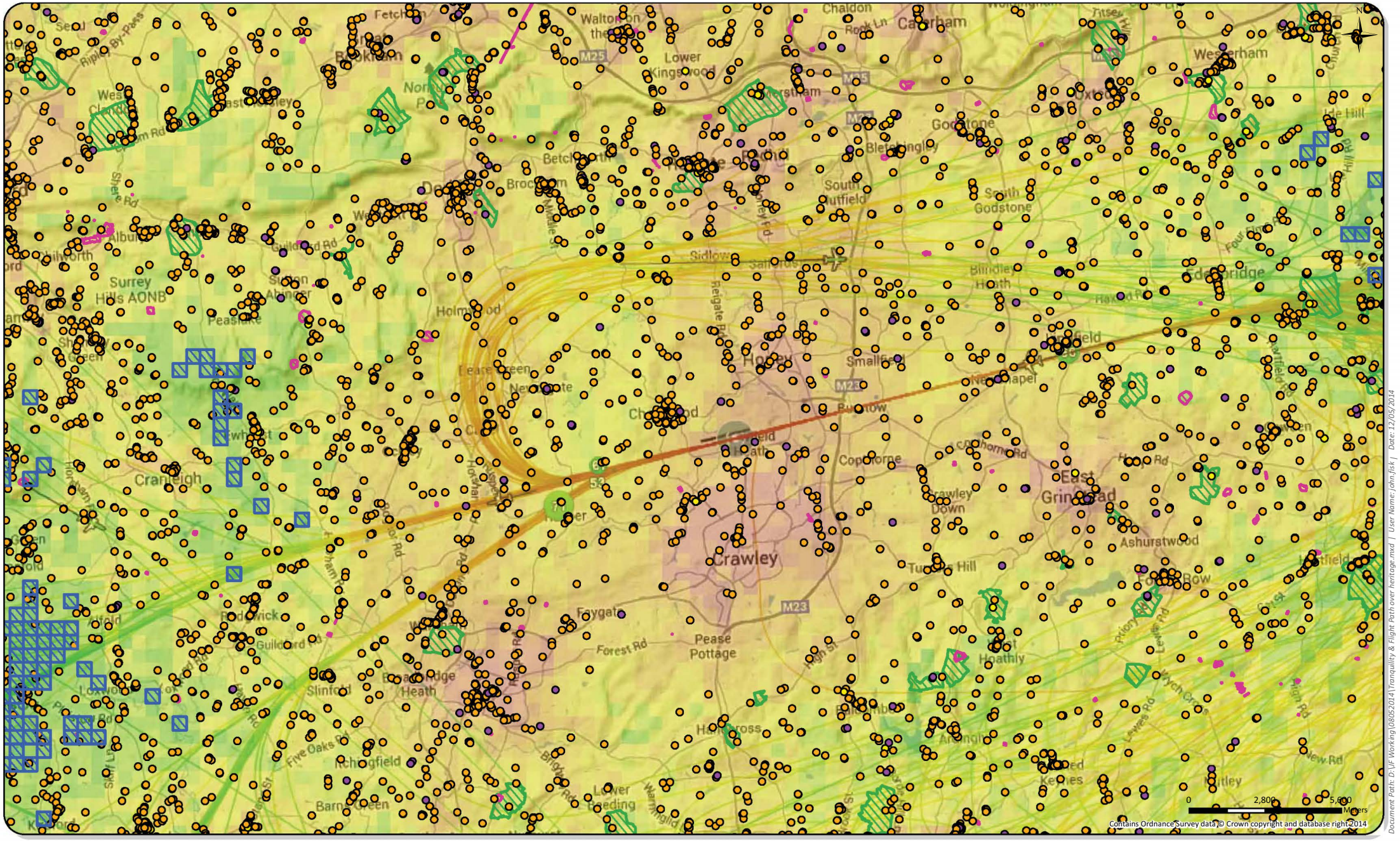


Project: **T2407 Heritage Assets Aviation Noise Metric**

Client: **English Heritage**

Title: **CPRE Tranquility Data overlyed by Heritage Assets and Gatwick westerly departure flight paths**

Legend

CPRE Tranquility Value

High : 148.699

Low : -140.517

National top 20% most tranquil

20140502_ListedBuildingPoints

Grade

- I
- II
- II*

20140502_CertificateOfImmunityPoints

20140204_BuildingPreservationNoticePoints

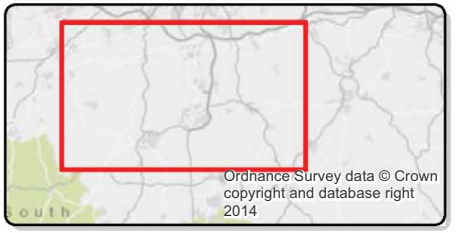
20140204_WorldHeritageSite

20140417_ScheduledMonument

20140204_Battlefield

20140404_ProtectedWreck

20140417_ParkAndGarden



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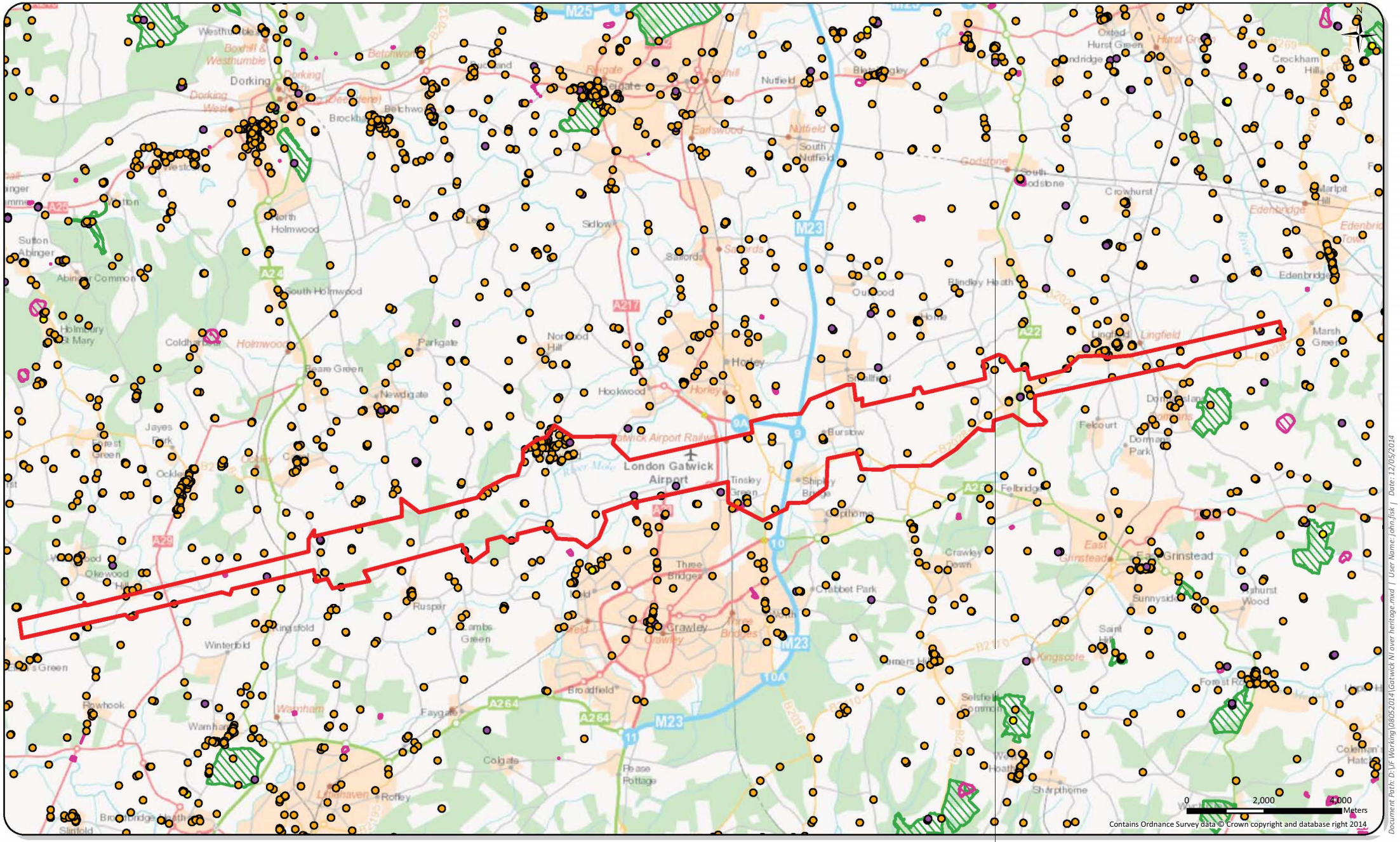

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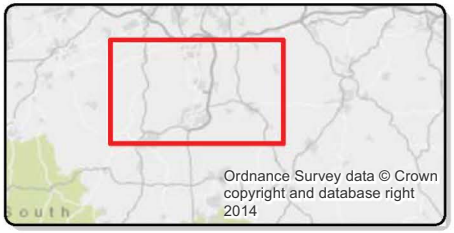
Project: **T2407 Heritage Assets Aviation Noise Metric**

Client: **English Heritage**

Title: **Gatwick Noise Insulation Boundary overlyed by Heritage Assets**

Legend

- Gatwick Noise Insulation boundary
- **20140502_ListedBuildingPoints**
  - **Grade**
    - I
    - II
    - II*
- 20140502_CertificateOfImmunityPoints
- 20140204_BuildingPreservationNoticePoints
- 20140204_WorldHeritageSite
- 20140417_ScheduledMonument
- 20140204_Battlefield
- 20140404_ProtectedWreck
- 20140417_ParkAndGarden



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LEADERS IN ENVIRONMENT, PLANNING & SUSTAINABILITY
Temple Group Ltd., Devon House, 58-60 St Katharine's Way, London E1W 1LB
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Temple Group Ltd
Devon House
58-60 St Katharine's Way
London E1W 1LB

Tel: +44 (0) 20 7394 3700
Fax: +44 (0) 20 7394 7871

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Appendix HE.2.3

Department for Transport

Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England

Presented to Parliament pursuant to Section 9(8) of the Planning Act 2008

Moving Britain Ahead

June 2018

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1. Introduction

Background

1.1 The UK aviation sector plays an important role in the modern economy, contributing around £20 billion per year[1] and directly supporting approximately 230,000 jobs.[2] The positive impacts of the aviation sector extend beyond its direct contribution to the economy by also enabling activity in other important sectors like business services, financial services, and the creative industries. The UK has the third largest aviation network in the world, and London's airports serve more routes than the airports of any other European city.

1.2 However, London and the South East are now facing longer term capacity problems. Heathrow Airport is operating at capacity today, Gatwick Airport is operating at capacity at peak times, and the whole London airports system is forecast to be full by the mid-2030s.[3] There is still spare capacity elsewhere in the South East for point to point and especially low cost flights. However, with very limited capability at London's major airports, London is beginning to find that new routes to important long haul destinations are being set up elsewhere in Europe. This is having an adverse impact on the UK economy, and affecting the country's global competitiveness.[4]

1.3 In September 2012, the Coalition Government established the independent Airports Commission to examine the scale and timing of any requirement for additional capacity to maintain the UK's position as Europe's most important aviation hub, and identify and evaluate how any need for additional capacity should be met in the short, medium and long term.[5]

1.4 In its Interim Report in December 2013, the independent Airports Commission concluded that there was a need for one additional runway to be in operation in the South East of England by 2030.[6] It also confirmed three shortlisted capacity schemes for further analysis: a Second Runway at Gatwick Airport (proposed by Gatwick Airport Ltd.), a Northwest Runway at Heathrow Airport (proposed by Heathrow Airport Ltd.), and an Extended Northern Runway at Heathrow Airport (proposed by Heathrow Hub Ltd.). The Airports Commission then consulted further on the three shortlisted schemes, plus proposals for a new airport in the inner Thames Estuary. In September 2014, the Airports Commission concluded not to consider further an inner Thames Estuary scheme.[7]

1.5 In its Final Report in July 2015, the Airports Commission unanimously concluded that the proposal for a Northwest Runway at Heathrow Airport, combined with a significant

[1] ONS, Input-Output Supply and Use tables, 2014
[2] ONS, Business Register and Employment Survey, 2014
[3] *https://www.gov.uk/government/publications/airport-expansion-updated-cost-and-benefits-appraisal Updated Appraisal Report,* p11
[4] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440316/airports-commission-final-report.pdf *Airports Commission: Final Report*, p3
[5] https://www.gov.uk/government/organisations/airports-commission
[6] https://www.gov.uk/government/publications/airports-commission-interim-report
[7] https://www.gov.uk/government/publications/inner-thames-estuary-airport-summary-and-decision

package of measures to address its environmental and community impacts, presented the strongest case and offered the greatest strategic and economic benefits.

1.6 The Airports Commission's remit also required it to look at how to make best use of existing airport infrastructure, before new capacity becomes operational.[8] The Commission noted in its final report that a new runway will not open for at least 10 years. It therefore considered it imperative that the UK continues to grow its domestic and international connectivity in this period, which it considered would require the more intensive use of existing airports other than Heathrow and Gatwick.[9]

1.7 On 14 December 2015, the Government accepted the Airports Commission's recommendation for increased capacity in the South East of England, and its shortlisted scheme options. The Government also confirmed that it would begin work on the building blocks of an Airports National Policy Statement ('Airports NPS'), and this is what happened.[10]

1.8 The Government believes that an NPS is the most appropriate method to put in place the planning framework for a new runway in the South East of England.[11] All three shortlisted airport schemes would have been classed as nationally significant infrastructure projects under the Planning Act 2008, and the Government's view is that an Airports NPS, and a development consent application made under the Planning Act 2008, is the most appropriate route to deliver the Government's preferred scheme.

1.9 In its announcement on 14 December 2015, the Government made clear that it would be important to undertake further work regarding the final location of the preferred scheme. This included additional work on air quality, noise, carbon, and mitigating impacts on affected local communities.

1.10 On 25 October 2016 the Government announced that a Northwest Runway at Heathrow Airport, combined with a significant package of supporting measures, was its preferred scheme to deliver additional airport capacity in the South East of England. It also confirmed that this would be included in a draft Airports NPS, to be the subject of consultation according to the procedures laid down in the Planning Act 2008.[12]

1.11 The draft Airports NPS and supporting Appraisal of Sustainability were published on 2 February 2017 and a 16 week public consultation was launched. On publishing the draft Airports NPS, the Government made a commitment to continue updating its evidence base on airport capacity, including revised passenger demand forecasts and the impact of the publication of the final Air Quality Plan (the UK plan for tackling roadside nitrogen dioxide concentrations). On 24 October 2017, the Government published and conducted an 8 week public consultation on a revised draft Airports NPS and other documents which were published alongside it. The revisions were made on the basis of changes to the evidence base and as a result of initial consideration of the responses to the February consultation and other broader government policy changes. Having considered the responses to both the February and October consultations, and the report published by the Transport Committee on 23 March 2018, the Government has made some further changes, principally to provide greater clarity and reflect updates to wider Government policies.

[8] *Airports Commission: Interim Report*, paragraph 5.2
[9] *Airports Commission: Final Report*, paragraph 16.40
[10] https://www.gov.uk/government/speeches/aviation-capacity
[11] Throughout this document, unless specified otherwise, the term "NPS" refers to the Airports NPS. Other NPSs, for example the National Networks NPS, are referred to in full as required
[12] https://www.gov.uk/government/speeches/airport-capacity

Purpose and scope of the Airports NPS

1.12 The Airports NPS provides the primary basis for decision making on development consent applications for a Northwest Runway at Heathrow Airport, and will be an important and relevant consideration in respect of applications for new runway capacity and other airport infrastructure in London and the South East of England. Other NPSs may also be relevant to decisions on airport capacity in this geographical area.

1.13 The Airports NPS sets out:

- The Government's policy on the need for new airport capacity in the South East of England;
- The Government's preferred location and scheme to deliver new capacity; and
- Particular considerations relevant to a development consent application to which the Airports NPS relates.

1.14 It sets out planning policy in relation to applications for any airport nationally significant infrastructure project in the South East of England, and its policies will be important and relevant for the examination by the Examining Authority, and decisions by the Secretary of State, in relation to such applications.

1.15 In particular, the Secretary of State will use the Airports NPS as the primary basis for making decisions on any development consent application for a new Northwest Runway at Heathrow Airport, which is the Government's preferred scheme. The policies in the Airports NPS will have effect in relation to the Government's preferred scheme, having a runway length of at least 3,500m and enabling at least 260,000 additional air transport movements per annum.[13] It will also have effect in relation to terminal infrastructure associated with the Heathrow Northwest Runway scheme and the reconfiguration of terminal facilities in the area between the two existing runways at Heathrow Airport. For the avoidance of doubt, the Airports NPS does not identify any statutory undertaker as the appropriate person or appropriate persons to carry out the preferred scheme.

1.16 It is possible that an applicant for development consent in respect of the preferred scheme will promote more than one application for development consent, dealing with different components individually. To the extent that this is the case, the Secretary of State will apply the Airports NPS to such applications to the extent that he or she determines to be appropriate in the circumstances.

1.17 For a scheme to be compliant with the Airports NPS, the Secretary of State would expect to see these elements comprised in its design, and their implementation and delivery secured, particularly with regard to runway length and increased capacity of air transport movements. Other NPSs may also be relevant to decisions on nationally significant infrastructure projects at airports but, if there is conflict between the Airports NPS and other NPSs, the conflict should be resolved in favour of the NPS that has been most recently designated.

1.18 Under section 104 of the Planning Act 2008, the Secretary of State must decide any application in accordance with any relevant NPS unless he or she is satisfied that to do so would:

[13] The Airports NPS stipulates the length of the new runway to ensure that the new infrastructure can accommodate the largest commercial aircraft, as they operate many of the long haul flights that support the UK's position as a major aviation hub

- Lead to the UK being in breach of its international obligations;
- Be unlawful;
- Lead to the Secretary of State being in breach of any duty imposed by or under any legislation;
- Result in adverse impacts of the development outweighing its benefits; or
- Be contrary to legislation about how the decisions are to be taken.[14]

1.19 The Airports NPS refers in some places to other relevant documents. These other documents may be replaced, updated or amended over the lifetime of the Airports NPS, and so successor documents should be referred to when this is the case.

1.20 Unlike the regime for the granting of planning permission under the Town and Country Planning Act 1990, there is no provision in the Planning Act 2008 for the making of an 'outline' application for development consent, followed by 'reserved matters' approval. This does not mean, however, that development cannot be phased, so that particular parts are brought forward at different times, or that the details of a proposal cannot be reserved for determination later. Guidance by the Ministry of Housing, Communities and Local Government recognises that development projects advanced through the development consent order process may be phased, but emphasises that every phase of the project contained in a development consent application must be considered in the application for the order and the order itself.[15]

Duration

1.21 The Airports NPS covers development that is anticipated to be required by 2030 as well as other development required to support it. It will remain in place until it is withdrawn, amended or replaced. It will be reviewed, in accordance with the Planning Act 2008, when the Secretary of State considers it appropriate to do so. When considering whether to review the Airports NPS, the Secretary of State will look at whether there has been a significant change in any circumstances on which the policy was based and whether such change was anticipated when the Airports NPS was designated.

Territorial extent

1.22 The Airports NPS covers England only. Some aspects of aviation noise policy are devolved but others are reserved.[16]

1.23 Aviation policy is largely a reserved matter, though planning policy is not. Specifically:

- The National Assembly for Wales has devolved powers relating to airports in terms of land use planning and surface access policy;
- The Scottish Parliament has competence for planning in Scotland, and some powers in relation to aerodromes are also devolved to the Scottish Parliament; and
- The Northern Ireland Executive and Assembly have devolved powers relating to airports in terms of regional land use planning, surface access policy and funding,

[14] Planning Act 2008, section 104 – decisions in cases where an NPS has effect
[15] https://www.gov.uk/government/publications/guidance-on-the-pre-application-process-for-major-infrastructure-projects
[16] For the avoidance of doubt, references to matters which are "reserved" in this section refer to those matters of legislative responsibility reserved to the Westminster Parliament under the UK's devolution arrangements

and environmental policy. The Northern Ireland Executive also has responsibility for airport economic regulation, has powers over land in relation to aviation safety, has the ability to grant aid for airports infrastructure, and may exercise certain controls relating to the management of airports.

European Union

1.24 On 29 March 2017 the Government formally notified the European Council of its intention to withdraw from the European Union, as provided for under Article 50 of the Treaty on European Union. Until the UK has left the EU, it remains a full Member of the European Union and all the rights and obligations of EU membership remain in force. Therefore, for the time being, European Union legislation applies to the development of this policy and to decision making in relation to the preferred scheme.

1.25 The UK and EU negotiating teams reached agreement in March 2018 on the terms of a transition or implementation period that will start on 30 March 2019, when the UK formally ceases to be a member of the EU, and last until 31 December 2020. The agreed text states that "Union law shall be applicable to and in the United Kingdom during the transition period". The limited exceptions to this are set out in the published text.

1.26 The Government has also introduced legislation to ensure that the UK exits the EU with maximum certainty and continuity. The EU Withdrawal Bill ends the supremacy of European Union (EU) law in UK law and converts EU law as it stands at the moment of exit into domestic law. The same rules and laws will apply on the day after exit as on the day before. It will then be for democratically elected representatives in the UK to decide on any changes to that law, after full scrutiny and proper debate.

Appraisal of Sustainability

1.27 An Appraisal of Sustainability is required by the Planning Act 2008 in relation to any NPS. An Appraisal of Sustainability, which describes the analysis of reasonable alternatives to the preferred scheme, has been carried out to inform the Airports NPS. The Appraisal of Sustainability informs the development of the Airports NPS by assessing the potential economic, social and environmental impacts of options to increase airport capacity.

1.28 The Appraisal of Sustainability also incorporates a strategic environmental assessment (pursuant to Directive 2001/42/EC as transposed by SI 2004/1633).[17] The Appraisal of Sustainability was published alongside the Airports NPS.

1.29 The overall conclusions of the Appraisal of Sustainability show that (provided any scheme remains within the parameters and boundaries in this policy), whilst there will be inevitable harm caused by a new Northwest Runway at Heathrow Airport in relation to some topics, the need for such a scheme, the obligation to mitigate such harm as far as possible, and the benefits that such a scheme will deliver, outweigh such harm. However, this is subject to the assessment of the effects of the preferred scheme, identification of suitable mitigation, and measures to secure and deliver the relevant mitigation.

[17] Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment

1.30 The preferred scheme has been subject to further refinement by Heathrow Airport since the conclusion of the work of the Airports Commission. These refinements were not captured within the Airports Commission's appraisals and are not expected to significantly alter the key appraisal findings. The Government expects any applicant to carry out a further and more detailed study, and to secure appropriate mitigation measures, ahead of seeking development consent.

Habitats Regulations Assessment

1.31 The Airports NPS has also been assessed under the Habitats and Wild Birds Directive and Regulations.[18] A Habitats Regulations Assessment has been undertaken at a strategic level, and was published alongside the Airports NPS.

1.32 The strategic level Habitats Regulations Assessment, conducted in accordance with the Conservation of Habitats and Species Regulations 2010,[19] concluded that the potential for the preferred scheme to have adverse effects on the integrity of European sites for the purposes of Article 6(3) of the Habitats Directive could not be ruled out. This is because more detailed project design information and detailed proposals for mitigation are not presently available and inherent uncertainties exist at this stage. The Airports NPS has thus been considered in accordance with Article 6(4) of the Habitats Directive. Consideration has been given to alternative solutions to the preferred scheme, and the conclusion has been reached that there are no alternatives that would deliver the objectives of the Airports NPS in relation to increasing airport capacity in the South East and maintaining the UK's hub status. In line with Article 6(4) of the Directive, the Government considers that meeting the overall needs case for increased capacity and maintaining the UK's hub status, as set out in chapter two, amount to imperative reasons of overriding public interest supporting its rationale for the designation of the Airports NPS. At detailed design stage, and in so far as it may be necessary, the matters set out in the Airports NPS will be relevant to determining whether there are alternative solutions and imperative reasons of overriding public interest, provided that the design remains consistent with the objectives of the Airports NPS.

1.33 Any development brought forward through an Airports NPS that was likely to have a significant effect on a European site, either alone or in combination with other plans or projects, would be subject to a project-level Habitats Regulations Assessment at the detailed design stage. If it could not be concluded that there would be no adverse effects on site integrity, the project would not receive development consent on this basis, unless (a) there were no alternative solutions, (b) there were imperative reasons of overriding public interest in support, and (c) the necessary compensatory measures to protect the site were secured.

Equality Assessment

1.34 The Airports NPS has been informed by an Equality Assessment, which was published alongside the Airports NPS.

1.35 Under the Equality Act 2010, public bodies have a statutory duty to ensure race, disability and equality are considered in the exercise of their functions. The Equality

[18] Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna; and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds

[19] http://www.legislation.gov.uk/uksi/2010/490/contents/made Since the revised draft Airports National Policy Statement was published, the Conservation of Habitats and Species Regulations 2017 have come into force

Assessment considered the potential equalities implications of airport expansion, including the effect on persons or groups of persons who share certain characteristics protected by the Equality Act 2010. The Equality Assessment concludes that all of the shortlisted schemes will have effects on these groups, but that such effects can be managed and can ultimately be within appropriate limits. The Airports NPS requires that final impacts on affected groups should be the subject of a detailed review, carefully designed through engagement with the local community, and approved by the Secretary of State. It should be possible to fully or partially mitigate negative equalities impacts through good design, operations and mitigation plans.

Health Impact Analysis

1.36 The Airports NPS has been subject to a Health Impact Analysis, which was published alongside the Airports NPS.

1.37 The Health Impact Analysis identified impacts which would affect the population's health, including noise, air quality and socio-economic impacts. In order to be compliant with the Airports NPS, a further project level Health Impact Assessment is required. The application should include and propose health mitigation, which seeks to maximise the health benefits of the scheme and mitigate any negative health impacts.

Relationship between the Airports NPS and the Aviation Policy Framework

1.38 The Airports NPS sets out Government policy on expanding airport capacity in the South East of England, in particular by developing a Northwest Runway at Heathrow Airport. Any application for a new Northwest Runway development at Heathrow will be considered under the Airports NPS. Other Government policy on airport capacity has been set out in the Aviation Policy Framework, published in 2013.[20] The Airports NPS does not affect Government policy on wider aviation issues, for which the 2013 Aviation Policy Framework and any subsequent policy statements still apply.[21]

1.39 On 21 July 2017, the Government issued a call for evidence on a new Aviation Strategy.[22] Having analysed the responses, the Government has confirmed that it is supportive of airports beyond Heathrow making best use of their existing runways. However, we recognise that the development of airports can have positive and negative impacts, including on noise levels. We consider that any proposals should be judged on their individual merits by the relevant planning authority, taking careful account of all relevant considerations, particularly economic and environmental impacts.

[20] https://www.gov.uk/government/publications/aviation-policy-framework
[21] This includes changes to the UK airspace policy published in the Government's response to the consultation, *UK Airspace policy: a framework for balanced decisions on the design and use of airspace*
[22] *Beyond the Horizon: The Future of Aviation*
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/636625/aviation-strategy-call-for-evidence.pdf - see paragraphs 7.19 to 7.21

Development covered by the Airports NPS

1.40 The Airports NPS has effect in relation to the delivery of additional airport capacity through the provision of a Northwest Runway at Heathrow Airport. It also applies to proposals for new terminal capacity located between the new Northwest Runway and the existing Northern Runway at Heathrow Airport, as well as the reconfiguration of terminal facilities in the area between the two existing runways at Heathrow Airport. Each of these elements is also capable of constituting a nationally significant infrastructure project.

1.41 The Airports NPS does not have effect in relation to an application for development consent for an airport development not comprised in an application relating to the Heathrow Northwest Runway, and proposals for new terminal capacity located between the Northwest Runway at Heathrow Airport and the existing Northern Runway and reconfiguration of terminal facilities between the two existing runways at Heathrow Airport. Nevertheless, the Secretary of State considers that the contents of the Airports NPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the South East of England. Among the considerations that will be important and relevant are the findings in the Airports NPS as to the need for new airport capacity and that the preferred scheme is the most appropriate means of meeting that need.

1.42 As indicated in paragraph 1.39 above, airports wishing to make more intensive use of existing runways will still need to submit an application for planning permission or development consent to the relevant authority, which should be judged on the application's individual merits. However, in light of the findings of the Airports Commission on the need for more intensive use of existing infrastructure as described at paragraph 1.6 above, the Government accepts that it may well be possible for existing airports to demonstrate sufficient need for their proposals, additional to (or different from) the need which is met by the provision of a Northwest Runway at Heathrow. As indicated in paragraph 1.39 above, the Government's policy on this issue will continue to be considered in the context of developing a new Aviation Strategy.

2. The need for additional airport capacity

The importance of aviation to the UK economy

2.1 International connectivity, underpinned by strong airports and airlines, is important to the success of the UK economy. It is essential to allow domestic and foreign companies to access existing and new markets, and to help deliver trade and investment, linking us to valuable international markets and ensuring that the UK is open for business. It facilitates trade in goods and services, enables the movement of workers and tourists, and drives business innovation and investment, being particularly important for many of the fastest growing sectors of the economy.

2.2 International connectivity attracts businesses to cluster round airports, and helps to improve the productivity of the wider UK economy. Large and small UK businesses rely on air travel, while our airports are the primary gateway for vital time-sensitive freight services. Air travel also allows us ever greater freedom to travel and visit family and friends across the globe, and brings millions of people to the UK to do business or enjoy the best the country has to offer.

2.3 The UK benefits from a strong and substantially privatised airport sector, with a regulatory system that supports growth while ensuring the interests of passengers are at its heart. The Government believes that this is the right approach for the airport sector, but that Government has an important role to play in strategic decisions like planning future airport capacity.

2.4 The UK has the third largest aviation network in the world after the USA and China,[23] and London's airports serve more routes than any other European city.[24] The UK's airports handled over 268 million passengers in 2016, a 6.7% increase from the previous year.[25] The sector benefits the UK economy through its direct contribution to GDP and employment, and by facilitating trade and investment, manufacturing supply chains, skills development, and tourism.

2.5 In 2014 the UK aviation sector generated around £20 billion[26] of economic output, and directly employed around 230,000 workers,[27] supporting many more jobs indirectly. The UK has the second largest aircraft manufacturing industry in the world after the USA, and will benefit economically from growth in employment and exports from future aviation growth.[28] Air Passenger Duty remains an important contributor to Government revenue, raising over £3 billion in2015/16.[29] Heathrow Airport directly supports around 75,000 jobs on site.[30]

[23] *The Global Competitiveness Report 2014-2015*, World Economic Forum, 2015, based on available airline seat kilometres
[24] *Airports Commission: Final Report*, p55
[25] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-Airport-data/Airport-data-2016/
[26] ONS, Input-Output Supply and Use tables, 2014
[27] ONS, Business Register and Employment Survey, 2014
[28] UK Aerospace Industry Survey, Aerospace, Defence, Security Trade Association, 2010
[29] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/691309/Feb18_Receipts_NS_Bulletin_Final.pdf
[30] https://www.heathrowexpansion.com/local-community/local-benefits/

2.6 Businesses from across the UK utilise our aviation network to access markets worldwide. The UK's strong services sector, which provides significant export earnings for the country, is particularly reliant on aviation. The sector includes, among others, financial services, insurance, creative industries, education, and health – all of which rely on face-to-face engagement with customers for success.

2.7 Air freight is also important to the UK economy. Although only a small proportion of UK trade by weight is carried by air, it is particularly important for supporting export-led growth in sectors where goods are of high value or time critical. Heathrow Airport is the UK's biggest freight port by value.[31] Over £178 billion of air freight was sent between UK and non-European Union countries in 2016, representing over 45% of the UK's extra-European Union trade by value.[32] This is especially important in the advanced manufacturing sector, where air freight is a key element of the time-critical supply chain. By 2030, advanced manufacturing industries such as pharmaceuticals or chemicals, whose components and products are predominantly moved by air, are expected to be among the top five UK export markets by their share of value.[33] In the future, UK manufacturing competitiveness and a successful and diverse UK economy will drive the need for quicker air freight.

2.8 Aviation also brings many wider benefits to society and individuals, including travel for leisure and visiting family and friends. This drives further economic activity. In 2013, for example, the direct gross value added of the tourism sector, one of the important beneficiaries of a strong UK aviation sector, was £59 billion.[34] Likewise, 2015 saw the value of inbound tourism rise to over £22 billion,[35] with the wider UK tourism industry forecast to grow significantly over the coming decades.

2.9 The importance of aviation to the UK economy, and in particular the UK's hub status, has only increased following the country's decision to leave the European Union. As the UK develops its new trading relationships with the rest of the world, it will be essential that increased airport capacity is delivered, in particular to support development of long haul routes to and from the UK, especially to emerging and developing economies.

The need for new airport capacity

2.10 However, challenges exist in the UK's aviation sector, stemming in particular from capacity constraints. These constraints are affecting our ability to travel conveniently and to a broader range of destinations than in the past. They create negative impacts on the UK through increased risk of flight delays and unreliability, restricted scope for competition and lower fares, declining domestic connectivity, erosion of the UK's hub status[36] relative to foreign competitors, and constraining the scope of the aviation sector to deliver wider economic benefits.

2.11 The UK now faces a significant capacity challenge. Heathrow Airport is currently the busiest two-runway airport in the world, while Gatwick Airport is the busiest single runway airport in the world. London's airports are filling up fast, and will all be full by the mid-2030s if we do not take action now.[37]

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[31] https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Home.aspx
[32] https://www.uktradeinfo.com/Statistics/Pages/Statistics.aspx
[33] HSBC Trade Forecast Tool, Accessed 2015
[34] Estimates of the Economic Importance of Tourism 2008-2013, Office for National Statistics, December 2014
[35] https://www.visitbritain.org/2015-snapshot. This figure represents tourism by all modes of transport. The equivalent figure for inbound tourists by air is £19 billion in 2015
[36] Defined as the frequency of flights and the density of a route network
[37] *Updated Appraisal Report*, p11

2.12 Aviation demand is likely to increase significantly between now and 2050.[38] All major airports in the South East of England[39] are expected to be full by the mid-2030s, with four out of five full by the mid-2020s. By 2050 demand at these airports is expected to outstrip capacity by at least 34%, even on the department's low demand forecast.[40] There is relatively little scope to redistribute demand away from the region to less heavily utilised capacity elsewhere in the country.[41]

2.13 The UK's hub status, stemming from the convenience and variety of its direct connections across the world, is already being challenged by restricted connectivity.[42] Hub airports at Paris, Frankfurt and Amsterdam have spare capacity and are able to attract new flights to growth markets in China and South America.[43] These competitors have benefited from the capacity constraints at Heathrow Airport, and have seen faster growth over the past few years. The UK's airports also face growing competition from hubs in the Middle East like Dubai, Abu Dhabi, Doha and Istanbul. Heathrow Airport was overtaken by Dubai in 2015 as the world's busiest international passenger airport.[44]

2.14 The consequences of not increasing airport capacity in the South East of England – the 'do nothing' or 'do minimum scenarios' – are detrimental to the UK economy and the UK's hub status. International connectivity will be restricted as capacity restrictions mean airlines prioritise their routes, seeking to maximise their profits. Capacity constraints therefore lead to trade-offs in destinations, and while there is scope to respond to changing demand patterns, this necessarily comes at the expense of other connections. Domestic connectivity into the largest London airports will also decline as competition for slots encourages airlines to prioritise more profitable routes.

2.15 Operating existing capacity at its limits means there will be little resilience to unforeseen disruptions, leading to delays. Fares are likely to rise as demand outstrips supply, and the lack of available slots makes it more difficult for new competitors to enter the market.

2.16 The Government believes that not increasing capacity will impose costs on passengers and on the wider economy. The Airports Commission estimated that direct negative impacts to passengers, such as fare increases and delays, would range from £21 billion to £23 billion over 60 years.[45] Without expansion, capacity constraints would impose increasing costs on the rest of the economy over time, lowering economic output by making aviation more expensive and less convenient to use, with knock-on effects in lost trade, tourism and foreign direct investment.

2.17 It is very challenging to put a precise figure on these impacts, but using alternative approaches the Airports Commission estimated these costs to be between £30 billion and £45 billion over 60 years.[46] The Airports Commission urged caution interpreting these figures, which overlap with the direct passenger costs reported above and so are not wholly additional. But they do illustrate that not increasing airport capacity carries real economic costs to the whole economy beyond aviation passengers. Having reviewed this further, the Government accepts this analysis and considers that

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[38] *Updated Appraisal Report*, p8
[39] Defined as Gatwick, Heathrow, London City, Luton and Stansted
[40] *Updated Appraisal Report*, p11
[41] *Airports Commission: Interim Report*, pp117-126
[42] For more analysis on the UK's hub status, see *Airports Commission: Interim Report*, pp90-92
[43] *Airports Commission: Final Report*, p249
[44] http://www.aci.aero/News/Releases/Most-Recent/2016/09/09/Airports-Council-International-releases-2015-World-Airport-Traffic-Report-The-busiest-become-busier-the-year-of-the-international-hub-airport
[45] *Airports Commission: Final Report*, p81; present value over 60 years
[46] *Airports Commission: Final Report*, p81

recent demand growth in the South East suggests an even greater possible cost if expansion is not undertaken.[47]

2.18 The Government also acknowledges the local and national environmental impacts of airports and aviation, for example noise and emissions, and believes that capacity expansion should take place in a way that satisfactorily mitigates these impacts wherever possible. Expansion must be deliverable within national targets on greenhouse gas emissions and in accordance with legal obligations on air quality.

The Airports Commission

2.19 To address these issues, in September 2012, the Coalition Government established the independent Airports Commission, led by Sir Howard Davies. The Airports Commission had two objectives:

- To produce an Interim Report, setting out the nature, scale and timing of steps needed to maintain the UK's global hub status alongside recommendations for making better use of the UK's existing runway capacity over the next five years; and
- To produce a Final Report, setting out recommendations on how to meet any need for additional airport capacity in the longer term.[48]

2.20 The Airports Commission was asked to take appropriate account of the national, regional and local implications of any expansion. As well as seven discussion papers and an appraisal framework, the Airports Commission delivered its recommendations to Government in its Interim Report in December 2013 and its Final Report in July 2015. It also published a summary and decision paper in September 2014 on whether to add an inner Thames Estuary airport proposal to a shortlist for further appraisal.[49]

Alternatives to additional runway capacity

2.21 The Airports Commission explored potential alternatives to additional runway capacity, which included:

- Doing nothing;
- A 'do minimum' set of alternatives with very limited provision for additional capacity;
- Redistribution methods, for example changing the rate of Air Passenger Duty, changing slot allocation regimes, traffic distribution rules, and prohibiting certain types of flights;
- Investment in high speed rail and improved surface access options; and
- New technologies.[50]

2.22 The Airports Commission found that none of these options delivered a sufficient increase in capacity, and that many required investment far in excess of the cost of runway expansion. However, the Airports Commission did note that the need to make best use of existing infrastructure would remain.[51]

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[47] *Updated Appraisal Report*, p11
[48] https://www.gov.uk/government/organisations/airports-commission/about/terms-of-reference
[49] https://www.gov.uk/government/publications/inner-thames-estuary-airport-summary-and-decision
[50] *Airports Commission: Final Report*, p84
[51] *Airports Commission: Final Report*, paragraph 16.1 and 16.40

The Airports Commission's shortlisting process

2.23 The Airports Commission consulted widely on its appraisal framework, which contained its criteria for sifting proposed schemes,[52] and the Government is satisfied that the appraisal framework was appropriate. The Airports Commission received 52 proposals, with three options developed by the Airports Commission itself. The Airports Commission took advice from a number of relevant stakeholders, including NATS Holdings, the Civil Aviation Authority, Network Rail, and the Highways Agency (as it then was). The Government believes that the Airports Commission has analysed all the options put forward to the appropriate degree of detail, and discounted non-shortlisted schemes fairly and objectively according to the sift criteria. The Government does not consider that any of the non-shortlisted schemes represents a reasonable alternative to its preferred scheme.

2.24 The three shortlisted schemes were:

- Gatwick Second Runway scheme;
- Heathrow Northwest Runway scheme (which the Airports Commission recommended and is the Government's preferred scheme); and
- Heathrow Extended Northern Runway scheme.

2.25 The Government has made clear in its announcement of 14 December 2015 that it agrees with the Airports Commission's three shortlisted schemes for expansion, and has taken forward its further work on this basis. As set out at paragraph 1.40 of this document, the Airports NPS will only have effect in relation to a scheme located at Heathrow Airport for the provision of a Northwest Runway, and not the other shortlisted schemes.

The Airports Commission's conclusions

2.26 In its Interim Report in December 2013,[53] the Airports Commission concluded that there was a need for one additional runway to be in operation in the South East of England by 2030. It also set in train a period of further consultation on three shortlisted schemes (Gatwick Second Runway scheme, Heathrow Northwest Runway scheme, and Heathrow Extended Northern Runway scheme), as well as the option of a new airport in the inner Thames Estuary. In September 2014, the Airports Commission concluded that a new airport in the inner Thames Estuary did not perform sufficiently well to warrant consideration alongside the three schemes that it decided to shortlist.

2.27 In its Final Report in July 2015, the Airports Commission concluded that the proposed Northwest Runway at Heathrow Airport presented the strongest case for expansion and would offer the greatest strategic and economic benefits to the UK. A copy of the illustrative Heathrow Northwest Runway scheme masterplan is included at Annex B. The Airports Commission also made clear that expansion would have to involve a significant package of supporting measures to address the environmental and community impacts of the new runway.

2.28 The Commission's remit also required it to look at how to make best use of existing airport infrastructure, before new capacity becomes operational.[54] The Commission noted in its final report that a new runway will not open for at least 10 years. It

[52] https://www.gov.uk/government/publications/sift-criteria-for-long-term-capacity-options-at-uk-airports
[53] *Airports Commission: Interim Report*, p11
[54] *Airports Commission: Interim Report*, paragraph 5.2

therefore considered it imperative that the UK continues to grow its domestic and international connectivity in this period, which it considered would require more intensive use of existing airports other than Heathrow and Gatwick.[55]

The Government's work

2.29 The Government has reviewed the Airports Commission's work and the representations Government has received on the issue of airport capacity, and is confident that the Airports Commission's arguments and reasoning are clear and thorough.

2.30 The Airports Commission undertook an extensive appraisal over two and a half years, consulting widely and analysing all the evidence before making its final recommendations. Since then, the Government has reviewed the Airports Commission's work and concluded that its evidence base on the case for expansion and its use of this evidence are both sound.[56] This has given the Government the assurance required to use the evidence to inform its further work, which is set out in more detail later. The Government has therefore considered the Airports Commission data in great depth and also carried out its own further work, all of which informs the Airports NPS.

2.31 In coming to these decisions, the Government has fully considered the Airports Commission's Interim and Final Reports, as well as the inner Thames Estuary summary and decision paper. The Government also received a range of information from a variety of stakeholders in response to those reports, which was taken into account by the Government in reaching its preference.

2.32 Having reviewed the work of the Airports Commission and considered the evidence put forward on the issue of airport capacity, the Government believes that there is clear and strong evidence that there is a need to increase capacity in the South East of England by 2030 by constructing one new runway. The Government also agrees with the Airports Commission that this can be delivered within the UK's obligations under the Climate Change Act 2008.[57] The Government considers that following the country's decision to leave the European Union the country will increasingly look beyond Europe to the rest of the world, and so the importance of maintaining the UK's hub status, and in that context long haul connectivity in particular, has only increased.

2.33 The next chapter of the Airports NPS sets out how the Government has identified the most effective and appropriate way to address the overall need for increased airport capacity, and maintain the UK's hub status, while meeting air quality and carbon obligations and identifies that the Northwest Runway at Heathrow is the Government's preferred scheme.

[55] *Airports Commission: Final Report*, paragraph 16.40
[56] https://www.gov.uk/government/publications/airport-expansion-further-review-and-sensitivities-report
[57] https://www.gov.uk/government/publications/airport-expansion-dft-review-of-the-airports-commissions-final-report *Review of the Airports Commission Final Report*, p19

3. The Government's preferred scheme: Heathrow Northwest Runway

Overview

3.1 While the previous chapter of the Airports NPS sets out the Government's underlying policy and evidence on the need to expand airport capacity in the South East of England, this chapter sets out why the Government has stated its preference for the Heathrow Northwest Runway scheme.

3.2 As set out in the previous chapter, the Airports Commission undertook a detailed shortlisting process, which resulted in three shortlisted schemes being considered by the Government for additional airport capacity:

- Gatwick Second Runway scheme;
- Heathrow Northwest Runway scheme (which the Airports Commission recommended and is the Government's preferred scheme);
- Heathrow Extended Northern Runway scheme.

3.3 The Government accepted the Airports Commission's three shortlisted schemes on 14 December 2015, agreeing with the Airports Commission's conclusion that one new runway in the South East of England by 2030 would be required to meet the need for additional capacity.

3.4 Following the publication of the Airports Commission's Final Report, the Government undertook further work on:

- Air quality;
- Noise;
- Carbon emissions; and
- Impacts on local communities.

3.5 The Government has carried out additional sensitivities, which show the worst case scenarios on noise, carbon and the economy, within the Appraisal of Sustainability.

3.6 The work on air quality, which demonstrated that expansion (with mitigation) is capable of taking place within legal limits, is outlined in the Government's air quality re-analysis[58] and the Appraisal of Sustainability. Both documents contain a worst case scenario.

3.7 The Government agrees with the Airports Commission's assessment that a new runway is deliverable within the UK's climate change obligations.[59]

[58] https://www.gov.uk/government/publications/airport-expansion-further-updated-air-quality-re-analysis

[59] https://www.gov.uk/government/publications/airport-expansion-dft-review-of-the-airports-commissions-final-report *Review of the Airports Commission Final Report*, p19

3.8 Following engagement with all three shortlisted scheme promoters, the Government has recommended a package of community supporting measures.

3.9 The Government also carried out additional work in relation to surface access, and further economic analysis. This work has allowed the Government to consider carefully the effectiveness of each of the three schemes to meet the need for additional capacity.

3.10 The detailed results of this work can be found in a number of reports published by the Government on 25 October 2016:

- A formal review by the Department for Transport of the Airports Commission's Final Report;[60]
- An air quality re-analysis to test the Airports Commission's work against the Government's air quality plan;[61]
- A further review of the Airports Commission's analytical approach, providing greater assurance in those areas where needed;[62]
- A comparison of the originally shortlisted schemes' compensation packages against other expansion projects around the world;[63]
- An assurance report by Highways England on the schemes' road surface access proposals;[64] and
- A non-binding statement of principles between Heathrow Airport and the Secretary of State for Transport on the Heathrow Northwest Runway scheme.[65]

3.11 On 25 October 2016, the Government announced that its preferred scheme to meet the need for new airport capacity in the South East of England was a Northwest Runway at Heathrow Airport.[66] It also confirmed that this would be included in a draft Airports NPS, which would be subject to consultation in accordance with the procedures laid down in the Planning Act 2008.

3.12 The draft Airports NPS and supporting Appraisal of Sustainability were published on 2 February 2017 and a 16 week public consultation was launched. On publishing the draft Airports NPS, the Government made a commitment to continue updating its evidence base on airport capacity, including revised passenger demand forecasts and the impact of the publication of the final Air Quality Plan (the UK plan for tackling roadside nitrogen dioxide concentrations). On 24 October 2017, the Government published and conducted an 8 week public consultation on a revised draft Airports NPS and other documents which were published alongside it. The revisions were made on the basis of changes to the evidence base and as a result of initial consideration of the responses to the February consultation and other broader government policy changes. Having considered the responses to both the February and October consultations, and the report published by the Transport Committee on 23 March 2018, the Government has made some further changes, principally to provide greater clarity and reflect updates to wider Government policies. The Government believes that the Heathrow Northwest Runway scheme, of all the three shortlisted schemes, is the most effective and most appropriate way of meeting the

[60] https://www.gov.uk/government/publications/airport-expansion-dft-review-of-the-airports-commissions-final-report
[61] https://www.gov.uk/government/publications/airport-expansion-further-analysis-of-air-quality-data
[62] https://www.gov.uk/government/publications/airport-expansion-further-review-and-sensitivities-report
[63] https://www.gov.uk/government/publications/airport-expansion-global-comparison-of-airport-mitigation-measures
[64] https://www.gov.uk/government/publications/airport-expansion-highways-england-assurance-report
[65] https://www.gov.uk/government/publications/heathrow-airport-limited-statement-of-principles
[66] https://www.gov.uk/government/speeches/airport-capacity

needs case set out in chapter 2. As such, the Government has also concluded that the other shortlisted schemes do not represent true alternatives to the preferred scheme.

3.13 The remainder of this chapter is broken down into two distinct sections. The first section focuses on why the Government prefers the Heathrow Northwest Runway Scheme to the Gatwick Second Runway scheme in terms of delivering additional airport capacity by 2030. The second section focuses on why the Government prefers the Heathrow Northwest Runway scheme to the Heathrow Extended Northern Runway scheme.

3.14 Increasing airport capacity in the South East of England and maintaining the UK's hub status can be expected to result in both positive and negative impacts, as would be the case for any major infrastructure project. Important positive impacts are expected to include better international connectivity and providing benefits to passengers and the UK economy as a whole (for example for the freight industry). The negative impacts are expected to include environmental impacts, for example on air quality and affected local communities.

3.15 In its considerations on a preferred scheme, the Government has fully taken into account the work of the Airports Commission, information provided by a variety of stakeholders, and the results of the Government's further work outlined in paragraphs 3.4-3.10 above. As set out below, the Government has considered the positive and negative effects from each of the three shortlisted schemes, and reached its conclusion by weighing these expected effects, along with considering how positive effects can be enhanced and negative effects mitigated.

Heathrow Northwest Runway and Gatwick Second Runway

3.16 In identifying the preferred scheme, a wide range of factors has been taken into account, including:

- International connectivity and strategic benefits;
- Passenger and wider economic benefits;
- Domestic connectivity and regional impacts;
- Surface access links;
- Views of airlines, regional airports and the business community;
- Financeability;
- Deliverability; and
- Local environmental impacts.

3.17 While the Government acknowledges the differences between the three shortlisted schemes, carbon impacts (unlike the factors above) have not been considered as a differentiating factor between schemes due to the Airports Commission's overarching assessment that all three are deliverable within the UK's climate change obligations.

International connectivity and strategic benefits, including freight

3.18 Heathrow Airport is best placed to address this need by providing the biggest boost to the UK's international connectivity. Heathrow Airport is one of the world's major hub airports, serving around 180 destinations worldwide with at least a weekly service,

including a diverse network of onward flights across the UK and Europe.[67] Building on this base, expansion at Heathrow Airport will mean it will continue to attract a growing number of transfer passengers, providing the added demand to make more routes viable. In particular, this is expected to lead to more long haul flights and connections to fast-growing economies, helping to secure the UK's status as a global aviation hub, and enabling it to play a crucial role in the global economy.

3.19 By contrast, expansion at Gatwick Airport would not enhance, and would consequently threaten, the UK's global aviation hub status. Gatwick Airport would largely remain a point to point airport, attracting very few transfer passengers. Heathrow Airport would continue to be constrained, outcompeted by competitor hubs which lure away transfer passengers, further weakening the range and frequency of viable routes. At the UK level, there would be significantly fewer long haul flights in comparison to the preferred scheme, with long haul destinations served less frequently. Expansion at Heathrow Airport is the better option to ensure the number of services on existing routes increases and allows airlines to offer more frequent new routes to vital emerging markets.

3.20 This was demonstrated by the forecasts produced by the Airports Commission, and continues to be found in the department's 2017 forecasts.[68] Compared to no expansion, the Government estimate that a Northwest Runway at Heathrow Airport by 2040 would result in 113,000 additional flights a year across the UK as a whole (including 43,000 long haul), and 28 million additional passengers a year. By way of comparison, the Heathrow Extended Northern Runway would add 85,000 more flights and 22 million additional passengers.[69] [70]

3.21 Compared to no expansion, the Second Runway scheme at Gatwick would add 15,000 flights and 10 million passengers by 2040, across the UK as a whole, increasing to 77,000 and 23 million respectively in 2050. The Government project that 8,000 of these additional flights would be long haul in 2040, rising to 17,000 in 2050.[71] Gatwick Airport has recently been successful in securing a number of long haul routes to the USA and Canada from low cost carriers, a new market segment.

3.22 As set out above, the ease with which businesses can move staff around the globe is an important facilitator of trade and for businesses locating and remaining in the UK. The broader range and greater frequency of long haul flights at Heathrow Airport best meets this need. It would deliver benefits for UK passengers (both business and leisure) by allowing them to travel to more destinations flexibly. These benefits include the additional frequency of flights, for example connecting the UK to long haul destinations daily instead of weekly, or several times a day instead of daily. Businesses from across the UK currently take advantage of Heathrow Airport's international connections, and will continue to benefit from these following expansion. In particular, the additional capacity delivered at Heathrow Airport will support growth

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[67] CAA, 2016

[68] An important uncertainty to the central estimates concerns the forecasts of future aviation demand and allocation across UK airports. The Airports Commission reflected this uncertainty using five demand scenarios, as well as two carbon policy regimes. The Department for Transport has further considered uncertainty through the use of low, central and high demand scenarios. Further uncertainty arises from the choice of individual modelling assumptions. More information on the Airports Commission's scenarios and sensitivity analysis, can be found in the *Further Review and Sensitivities Report*. More information on the department's 2017 scenarios and sensitivity analysis can be found in the Updated Appraisal Report

[69] *Updated Appraisal Report,* p14 and 17.This number includes all point to point and transfer passengers at UK airports, and refers to terminal passengers who are counted each time they land or take off at a UK airport. Further disaggregation is provided in the Updated Appraisal Report

[70] Due to the expected use of larger planes with higher load factors, the department's 2017 forecasts find smaller increases in ATMs are needed to deliver similar increases in passenger numbers. This is particularly evident for Gatwick, where load factors have increased notably over the past few years. Further information is provided in the Updated Appraisal Report

[71] *Updated Appraisal Report,* p 14 and 17

in important sectors of the UK economy, including tourism, financial services, and the creative industries.

3.23 The aviation sector can also boost the wider economy by providing more opportunities for trade through air freight. The time-sensitive air freight industry, and those industries that use air freight, benefit from greater quantity and frequency of services, especially long haul. By providing more space for cargo, lowering costs, and by the greater frequency of services, this should in turn provide a boost to trade and GDP benefits.[72]

3.24 As set out above, expansion at Heathrow Airport delivers the biggest boost in long haul flights, and the greatest benefit therefore to air freight. This is further facilitated by the existing and proposed airport development of freight facilities as part of the Northwest Runway scheme. Heathrow Airport currently has a substantial freight handling operation, around 20 times larger by tonnage[73] than that at Gatwick Airport, and accounting for 34% of the UK's non-European Union trade by value – around 170 times more than Gatwick Airport.[74] Expansion at Heathrow Airport will further strengthen the connections of firms from across the UK to international markets.

Passenger and wider economic benefits

3.25 Without expansion, passengers and other users of airports are likely to suffer from higher fares and more delays. High demand for air travel at airports with limited or no scope for increased capacity could weaken competition, allowing airlines to charge higher fares. As airports fill up and operate at full capacity, there is little resilience to deal with any disruption, leading to delays.

3.26 Expansion via the Heathrow Northwest Runway scheme is best placed to address this need. Heathrow Airport is currently the busiest two runway airport in the world, already operating at full capacity, with substantial pent up demand from passengers and airlines. Expansion at Heathrow Airport would increase the availability of services, and increase competition between airlines. This would lower fares that passengers can expect to face relative to no expansion, leading to significant benefits to business and leisure passengers and the wider economy. Crucially, the extent of the pent up demand at Heathrow Airport means that these benefits will be experienced more rapidly once the new capacity is operational, with both Heathrow schemes providing more passenger benefits by 2050 than the Gatwick Second Runway scheme, and with total benefits (not including wider trade benefits) of up to £74 billion over 60 years for the Northwest Runway scheme.[75] [76] These benefits are expected to be realised by passengers across the UK as they make use of the additional services provided by the expanded airport. Cumulative benefits delivered by a Northwest Runway scheme remain highest throughout most of the appraisal period, until the mid-2070s, although total benefits are slightly lower than would be delivered by Gatwick expansion over the full 60 year assessment.[77]

3.27 The Government also recognises the role airports can play in supporting wider economic growth in the local community. Expansion at Heathrow Airport is expected to result in larger benefits to the wider economy than expansion at Gatwick Airport. These additional benefits come from workers moving to more productive jobs around the expanded airport as well as the productivity benefits from firms who will enjoy lower aviation transport costs. Heathrow Airport already has a more developed cluster

[72] *Updated Appraisal Report*, p16
[73] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-airport-data/Airport-data-2016/
[74] HMRC, 2016, https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Home.aspx
[75] For clarity of presentation, only the central demand scenario estimate is presented here. This value is the same for the department's carbon-traded and carbon-capped scenarios – see the Updated Appraisal Report for further details
[76] This includes passenger benefits to UK residents, non-UK residents and international-to-international interliners
[77] *Updated Appraisal Report*, p45

of businesses in its surrounding area, which should enable an even larger economic boost from expansion in the local economy.[78]

3.28 Expansion via the Heathrow Northwest Runway scheme should deliver additional jobs at the airport, through its supply chain and in the local community. The Heathrow Northwest Runway scheme is expected to generate up to 114,000 additional jobs in the local area by 2030,[79] with Heathrow Airport also pledging to provide 5,000 additional apprenticeships by this time. The number of local jobs created at an expanded Heathrow Airport is predicted to be much greater than at Gatwick Airport (up to 21,000 by 2030 and 60,000 by 2050),[80] and the jobs would also be created more quickly. The numbers are higher at Heathrow Airport because the additional capacity is forecast to be used more quickly following expansion and, importantly, because the types of services offered at an expanded Heathrow Airport are likely to be more complex, particularly with the greater number of full service airlines operating there.

3.29 Expansion brings a wide set of non-monetised benefits such as local job creation, trade, and freight benefits, which indicate a stronger case for a Heathrow scheme than for the Gatwick Second Runway scheme.[81]

Domestic connectivity

3.30 The Government recognises the importance that the nations and regions of the UK attach to domestic connectivity, particularly connections into Heathrow Airport. Airports across the UK provide a vital contribution to the economic wellbeing of the whole of the UK. Without expansion, there is a risk that, as airlines react to limited capacity, they could prioritise routes away from domestic connections. The Government therefore sees expansion at Heathrow Airport as an opportunity to not only protect and strengthen the frequency of existing domestic routes, but to secure new domestic routes to the benefit of passengers and businesses across the UK.

3.31 Passengers from across the UK are likely to benefit from the improved international connectivity provided by expansion. In 2040, 5.9 million additional passengers from outside of London and the South East are forecast to make one way international journeys[82] from Heathrow Airport. Under a Gatwick Second Runway scheme, 3.8 million additional passengers from outside London and the South East would be forecast to make one way international journeys from Gatwick Airport in 2040. By way of comparison, under a Heathrow Extended Northern Runway scheme, 4.6 million additional passengers from outside London and the South East would be forecast to make one way international journeys from Heathrow Airport in 2040. While expansion will also see some displacement of passengers from regional airports to the London system, overall regional airports are expected to continue displaying strong growth in passenger numbers by 2050.[83]

3.32 An expanded Heathrow Airport should therefore mean that more passengers from across the UK are likely to benefit from lower fares and access to important international markets from the airport.

3.33 The Government expects to see expansion at Heathrow Airport driving an increase in the number of UK airports with connections specifically into the airport. Heathrow

[78] *Updated Appraisal Report*, p27
[79] *Updated Appraisal Report*, p29
[80] *Ibid.*
[81] *Updated Appraisal Report*, p42
[82] Defined as any passenger who travels to (or from) an international destination from a region outside of London and the South East, and uses the expanded airport as part of this journey. A one-way journey is counted as either an outbound or an inbound journey. Return passengers are therefore counted twice.
[83] *Updated Appraisal Report*, p20

Airport and Gatwick Airport set out plans on domestic connectivity which they say they could deliver by 2030:

- at least 14 domestic routes for Heathrow Airport, compared to the eight routes currently in operation; and
- at least 12 domestic routes for Gatwick Airport, compared to the six currently offered.[84]

The following table provides examples of potential domestic routes:[85]

Heathrow Airport under expansion in 2030[86]	Gatwick Airport under expansion in 2030
8 domestic routes operating today (Aberdeen, Belfast City, Edinburgh, Glasgow, Inverness, Leeds Bradford, Manchester, Newcastle) **plus** Belfast International, Durham Tees Valley, Humberside, Liverpool, Newquay, Prestwick **Total: 14**	**6 domestic routes operating today** (Aberdeen, Belfast International, Edinburgh, Glasgow, Inverness, Newquay) **plus** Belfast City, Derry-Londonderry, Dundee, Leeds Bradford, Manchester, Newcastle **Total: 12**

Government expectation on domestic connectivity

3.34 The Government recognises that air routes are in the first instance a commercial decision for airlines and are not in the gift of an airport operator. But the Government is determined that new routes will be secured, and will hold Heathrow Airport to account on this. The Government requires Heathrow Airport to demonstrate it has worked constructively with its airline customers to protect and strengthen existing domestic routes, and to develop new domestic connections, including to regions currently unserved.

Surface access links

3.35 To realise the benefits of expansion, passengers and users must have good access to the airport. On this basis Heathrow Airport has the advantage, because of its more accessible location and more varied surface access links.

3.36 Heathrow Airport already has good surface transport links to the rest of the UK. It enjoys road links via the M25, M4, M40 and M3, and rail links via the London Underground Piccadilly Line, Heathrow Connect, and Heathrow Express. In the future, it will connect to Crossrail, and link to HS2 at Old Oak Common. Plans are being developed for improved rail access: the proposed Western Rail Access could link the airport to the Great Western Main Line, and Southern Rail Access could join routes to the South Western Railway network and London Waterloo Station. This varied choice of road and rail connections makes Heathrow Airport accessible to both passengers

[84] The DfT 2017 aviation forecasts do not take account of the ability of airport levers to strengthen specific routes. Domestic routes proposed by promoters are therefore not included in the updated forecasts

[85] Table excludes UK Crown Dependencies

[86] Taken from promoter plans for domestic connections at Heathrow Airport and Gatwick Airport, compared to existing domestic connections at both airports. The Government would expect Heathrow Airport's plan to be broadly equivalent for the Extended Northern Runway proposal if it was taken forward

and freight operators in much of the UK, and provides significant resilience to any disruption.

3.37 Access to Gatwick relies on the M23 and the Brighton Main Line, which means it serves London well but makes it less convenient for onward travel to the rest of the UK. It is also less resilient than Heathrow Airport. Heathrow Airport has advantages over Gatwick Airport with its greater integration into the national transport network, benefitting both passengers and freight operators. It also currently has significantly larger freight operations than Gatwick Airport, around 20 times larger in terms of total tonnage[87] and around 170 times larger in terms of value.[88]

3.38 The airport scheme promoters have pledged to meet the cost of surface access schemes required to enable a runway to open. For Gatwick Airport, this covers the full cost of the works (including the M23 and A23) needed to support expansion. The two Heathrow schemes would pay for the full cost of M25, A4 and A3044 works, as well as other local road works. They would make a contribution towards the cost of the proposed Western Rail Access and Southern Rail Access schemes. Improvements which are already underway, such as Thameslink and Crossrail, will be completed, and the Government has not assumed any change to these schemes' existing funding.

3.39 The majority of the surface access costs where a split of beneficiaries is expected (for example, where multiple businesses and the public at large benefit from a new road junction or rail scheme) are likely to be borne by Government, where the schemes provide greater benefits for non-airport users. The airport contribution would be subject to a negotiation, and review by regulators.

3.40 Because of the early stages of development, there is some variability of surface access costs, which are subject to more detailed development and, for example, choices over precise routes. The additional public expenditure effects of the options would likely be as follows:

- For both Heathrow proposals, there is no Government road spend directly linked to expansion; the promoter would pay for changes to the M25, A4 and A3044 and any local roads. The Western and Southern Rail schemes are at different levels of development and the cost estimates will change as these schemes are developed. The Government would expect the costs of the schemes to be partly offset by airport contributions, which would be negotiated when the schemes reach an appropriate level of development.
- For the Gatwick proposal, there would be no additional public expenditure solely because of expansion, as all road enhancement costs for airport expansion would be met by the scheme promoter. The Government has assumed that any improvements to the Brighton Main Line that may be required would take place regardless of expansion and would be publicly funded.

Views and support of airlines, regional airports and the business community

3.41 The benefits of expansion will be delivered only if airlines and the industry choose to use the new capacity, and pay for it via airport charges. There is much greater airline support for expansion via the Heathrow Northwest Runway scheme than the other two schemes, subject to various concerns being met, for example on costs.

3.42 The majority of regional airports who have stated a public preference support expanding Heathrow Airport, on the basis of its current status as the UK's hub (though

[87] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-airport-data/Airport-data-2016/
[88] https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Home.aspx

Birmingham Airport has supported expansion at Gatwick Airport). This support is driven by airports' considerations on connectivity and other commercial issues.

3.43 Expansion is critical for business confidence in the UK. The Heathrow Northwest Runway scheme has strong support from the wider business community across the whole of the UK, including from the Confederation of British Industry,[89] the British Chambers of Commerce,[90] the Federation of Small Businesses,[91] the manufacturers' organisation EEF,[92] and regional business groups across the UK. 61% of the directors asked by the Institute of Directors stated that their preference was for expansion at Heathrow Airport, compared to 39% who favoured expansion at Gatwick Airport.[93]

Financeability

3.44 While the Gatwick Second Runway scheme would be significantly cheaper than the two schemes at Heathrow, with the Heathrow Northwest Runway the most expensive of the three shortlisted schemes, all three are private sector schemes which the Government believes could be financeable without Government support.[94]

3.45 The level of debt and equity required for the Gatwick Second Runway scheme would be significantly lower than for the Heathrow schemes, but the Airports Commission noted that the Gatwick Second Runway scheme would have comparatively higher demand risk, which is harder for Government to mitigate compared to the Heathrow schemes.[95] Both Heathrow schemes build on a strong track record of proven demand that has proven resistant to economic downturns. Independent financial advisers have undertaken further work for the Government, and agree that all three schemes are financeable without Government support.

Deliverability and safety

3.46 The three shortlisted schemes involve different levels of delivery risk. Gatwick Airport said its Second Runway scheme is capable of being delivered by 2025, while Heathrow Airport said its Northwest Runway scheme is capable of being delivered by 2026. The Gatwick Second Runway scheme would be much simpler to build. The process for delivering powers for the Heathrow schemes will be more complex because the schemes themselves are more complex. The delivery dates for both Heathrow schemes are therefore likely to be more risky than that for the scheme at Gatwick.

3.47 The Airports Commission worked with the Civil Aviation Authority and NATS Holdings to review the operational and airspace implications of all three shortlisted schemes, including conducting fast-time simulation modelling of the proposed airspace routes. This work concluded that, while safely managing the expected increase in air traffic for any scheme will be challenging, it should nevertheless be achievable given modernisation of airspace in the South East of England and taking advantage of new technologies – changes which will be necessary with or without expansion.

3.48 The Airports Commission also asked the Health and Safety Laboratory (HSL) to review the scale of increase in crash risk associated with each of the schemes. This review considered two risks: the background risk, which accounts for aircraft cruising in UK airspace, and an airfield crash rate, relating to aircraft taking off and landing at a

[89] http://mediacentre.heathrow.com/pressrelease/details/81/Expansion-News-23/4789
[90] http://www.britishchambers.org.uk/press-office/press-releases/bcc-while-britain-dithers-on-aviation,-others-do.html
[91] https://www.fsb.org.uk/media-centre/press-releases/heathrow-s-third-runway-sends-clear-signal-britain-is-open-for-business
[92] https://www.eef.org.uk/about-eef/media-news-and-insights/media-releases/2016/oct/eef-comment-on-heathrow-expansion
[93] https://www.iod.com/news-campaigns/news/articles/Business-leaders-welcome-Airports-Commission-recommendations
[94] The Airports Commission estimated capital costs at £9 billion for the Gatwick Second Runway scheme, £14.4 billion for the Heathrow Extended Northern Runway Scheme, and £17.6 billion for the Heathrow Northwest Runway scheme, not including surface access costs
[95] *Airports Commission: Final Report*, p270

specific airfield.[96] This review concluded that "the changes to the background crash risk are minimal regardless of whether or not expansion takes place at the airports."[97] In addition the increase in airfield crash risks for both airports was proportionate to the additional number of flights anticipated, meaning that the "scenario for Heathrow with the highest crash rates represents an increase of 60% in the crash rate compared to 2013. At Gatwick Airport, the crash rate is more than doubled in the scenario with the highest rates."[98] As noted by HSL, "there is a high level of uncertainty in the calculated crash rates" due to the limited number of previous incidents to assess. Of the over 36 million aircraft movements examined by HSL that are of relevance to either Heathrow or Gatwick's airfield crash risk, only three resulted in accidents.[99] The Civil Aviation Authority conducted a preliminary safety assessment of the schemes and concluded that the schemes were feasible in principle from a safety perspective.[100]

Local environmental, health and community impacts

3.49 Decisions on airport capacity must rightly balance local, environmental and social considerations against the national and local benefits stemming from expansion. As set out above, in terms of economic and strategic benefits, expansion via the Heathrow Northwest Runway scheme best meets the need for additional capacity in the South East of England. However, set against these positive impacts, airport expansion can also have negative impacts. For example, all three schemes will have significant impacts on the environment and local communities.

3.50 The Appraisal of Sustainability presents an assessment of the likely environmental, social and economic impacts of all three schemes. The Health Impact Analysis also presents an assessment of the health impacts. The following discussion of assessments of the three schemes considers the impacts of expansion without the benefits of the mitigation package put forward by scheme promoters or required by the Government under this NPS. The *Updated Appraisal Report* monetises, where possible, the air quality, noise and carbon impacts affecting people from each of the three schemes. These monetised values are small relative to the size of the monetised economic benefits of each scheme over the 60-year appraisal period. The Appraisal of Sustainability shows that, while all three schemes are expected to lead to a reduction in air quality and increased noise (without consideration of potential mitigations of the three schemes), the Gatwick Second Runway scheme would have a lower level of adverse effects relating to noise and air quality than either scheme at Heathrow. All three schemes will have an impact on the natural environment, including biodiversity, water and landscape. Negative effects upon quality of life, health and amenity were assessed, when unmitigated, to be of a greater magnitude for the two Heathrow expansion schemes and of a lower magnitude for the Gatwick Second Runway scheme. This is primarily because Gatwick Airport is in a more rural location, with fewer people impacted by the airport. The Appraisal of Sustainability also outlines measures to mitigate these local impacts to ensure that legal obligations will be met.

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[96] *Operational Efficiency: Ground Risk Analysis*, Health and Safety Laboratory, p3 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/437269/operational-efficiency-ground-risk-analysis.pdf

[97] *Operational Efficiency: Ground Risk Analysis*, Health and Safety Laboratory, pvi https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/437269/operational-efficiency-ground-risk-analysis.pdf

[98] *Operational Efficiency: Ground Risk Analysis*, Health and Safety Laboratory, p15 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/437269/operational-efficiency-ground-risk-analysis.pdf

[99] *Operational Efficiency: Ground Risk Analysis,* Health and Safety Laboratory, p9 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/437269/operational-efficiency-ground-risk-analysis.pdf

[100] *Airports Commission: Final report*, p243

As set out below, the Government believes this demonstrates how the commitment to ensure that local impacts of expansion will be mitigated satisfactorily can be met.

3.51 Heathrow Airport has committed to ensuring its landside airport-related traffic is no greater than today. The airport will be expected to achieve a public transport mode share of at least 50% by 2030, and at least 55% by 2040, for passengers.

3.52 The Government agrees with the evidence set out by the Airports Commission that expansion at Heathrow Airport is consistent with the UK's climate change obligations.[101]

3.53 The Appraisal of Sustainability identifies that, in addition to changes due to local noise and air quality impacts, communities may be affected by airport expansion through loss of, and/or additional demand for housing, community facilities or services, including recreational facilities. In addition, there will be effects on parks, open spaces and the historic environment, which will affect the quality of life of local communities which benefit from access to these facilities and features. These effects will be of a higher magnitude for the two Heathrow expansion schemes and a lower magnitude for Gatwick Second Runway. Overall, each of the three schemes is expected to have negative impacts on local communities, with more severe impacts expected from the Heathrow schemes. Impacts of all three schemes will not be felt equally across social groups. Equality impacts are set out in chapter four.

3.54 The Heathrow Northwest Runway scheme will be accompanied by a package of measures to mitigate the impact of airport expansion on the environment and affected communities.[102] The Government agrees with the Airports Commission's conclusion that "to make expansion possible…a comprehensive package of accompanying measures [should be recommended to] make the airport's expansion more acceptable to its local community, and to Londoners generally".[103] This is expected to include a highly valued scheduled night flight ban of six and a half hours between 11pm and 7am (with the exact start and finish times to be determined following consultation), and the offer of a predictable, though reduced, period of respite for local communities.

3.55 To mitigate environmental and social impacts, Heathrow Airport and Gatwick Airport both announced compensation packages (covering residential property acquisition, noise insulation, and other community measures like funding for schools), of more than £1 billion at Heathrow Airport and more than £200 million at Gatwick Airport (over 15-20 years from 2020). Heathrow Airport's package reflects the much greater number of people affected in the local area.

Heathrow Northwest Runway and Heathrow Extended Northern Runway

3.56 The Heathrow Extended Northern runway scheme has two advantages over the Heathrow Northwest Runway scheme: lower capital costs (£14.4 billion for the Extended Northern Runway scheme compared to £17.6 billion for the Northwest Runway scheme), and significantly fewer houses being demolished (242 rather than 783), as well as avoiding impacts on a number of commercial properties.

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[101] https://www.gov.uk/government/publications/airport-expansion-dft-review-of-the-airports-commissions-final-report *Review of the Airports Commission Final Report*, p19

[102] By way of comparison, the Government engaged Ernst & Young to prepare a report on the approaches taken by other international airports in addressing the local impacts of the airport - https://www.gov.uk/government/publications/airport-expansion-global-comparison-of-airport-mitigation-measures

[103] *Airports Commission: Final Report*, p4

3.57 However, the Government made a preference for the Heathrow Northwest Runway based on a number of factors:

- Resilience;
- Respite from noise for local communities; and
- Deliverability.

3.58 The Heathrow Northwest Runway scheme would provide respite by altering the pattern of arrivals and departures across the runways over the course of the day to give communities breaks from noise. However, respite would decrease from one half to one third of the day. The Heathrow Extended Northern Runway scheme has much less potential for respite. It would use both runways for arrivals and departures for most of the day, although it may be able to 'switch off' one runway for a short time during non-peak periods with a corresponding reduction in capacity.[104]

3.59 The Heathrow Northwest Runway scheme should provide greater resilience than the Heathrow Extended Northern Runway scheme because of the way the three separate runways could operate more flexibly when needed to reduce delays, and the less congested airfield. It delivers greater capacity (estimated on a like for like basis by the Airports Commission at 740,000 flights departing and arriving per annum compared to the Extended Northern Runway scheme at 700,000),[105] accordingly higher economic benefits, and a broader route network. It also provides greater space for commercial development, which could be used to enhance onsite freight capacity.

3.60 The Airports Commission assessed the Heathrow Extended Northern Runway scheme to be deliverable.[106] However, the Extended Northern Runway scheme has no direct global precedent. As such, there is greater uncertainty as to what measures may be required to ensure that the airport can operate safely, and what the impact of those measures may be, including the restriction on runway capacity.

Carbon emissions

3.61 Although not a differentiating factor between the three shortlisted schemes, the Government has considered the issue of carbon emissions, given the Government's commitment to tackle climate change, and its legal obligations under the Climate Change Act 2008.

3.62 The Airports Commission identified carbon impacts from expansion in four areas: a net increase in air travel; airside ground movements and airport operations; changes in travel patterns as a result of the scheme's surface access arrangements; and construction of new infrastructure. Emissions from air travel, specifically international flights, are by far the largest of these impacts.[107]

3.63 To address uncertainties over the future policy treatment of international aviation emissions,[108] the Airports Commission used two carbon policy scenarios in its analysis.

3.64 The first was a 'carbon capped' scenario, in which emissions from the UK aviation sector are limited to the Committee on Climate Change's planning assumption for the

[104] *Airports Commission: Final Report*, pp180-184
[105] *Airports Commission: Final Report*, p29
[106] *Airports Commission: Final Report*, p236
[107] Intra-UK flights account for approximately 6% of the total emissions from all flights departing UK airports. These emissions are included in the UK's carbon budgets
[108] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/186683/aviation-and-climate-change-paper.pdf *Airports Commission: discussion paper 03: aviation and climate change*, pp12-16

sector of 37.5 million tonnes of carbon dioxide in 2050. The second was a 'carbon traded' scenario, in which emissions are traded as part of a global carbon market, allowing reductions to be made where they are most efficient across the global economy.

3.65 The Airports Commission then assessed whether the needs case could be met under each of these scenarios, that is whether expansion would still deliver the necessary improvements and provide benefits to passengers and the wider economy. The Government has updated this analysis to take account of the latest passenger demand forecasts.

3.66 This further analysis reinforces the conclusion that any one of the three shortlisted schemes could be delivered within the UK's climate change obligations, as well as showing that a mix of policy measures and technologies could be employed to meet the Committee of Climate Change's planning assumption.[109]

3.67 Of the three shortlisted schemes, the Heathrow Northwest Runway scheme produces the highest carbon emissions in absolute terms. However, this is in part due to the greater additional connectivity provided by the scheme, and, in relation to the increase in emissions caused by expansion under any of the schemes, the differences between the schemes are small. Both of the carbon policy scenarios incorporated measures to ensure that the increased emissions from any of the shortlisted schemes were not additional overall either at the global level (in the carbon traded case) or at the UK level (in the carbon capped case).

3.68 The further analysis also shows that, in both carbon policy scenarios, the Heathrow Northwest Runway scheme would deliver significant benefits to passengers and the wider economy (such as lower fares, improved frequency and higher productivity), and would do so more quickly than the Gatwick Second Runway scheme. Both Heathrow schemes provide more passenger benefits by 2050 than the Gatwick Second Runway scheme.

3.69 The Government has considered this further analysis, and concludes both that expansion via a Northwest Runway at Heathrow Airport (as its preferred scheme) can be delivered within the UK's carbon obligations, and that the scheme is the right choice on economic and strategic grounds regardless of the future regime to deal with emissions from international aviation.[110]

Strategic environmental assessment

3.70 Strategic environmental assessments are required by the law. A strategic environmental assessment is set out in full in the Appraisal of Sustainability.[111] It demonstrates that airport expansion will attract additional air traffic, which impacts upon quality of life and wellbeing, in particular through noise, air quality, housing, community facilities, and access to nature and cultural heritage. Negative impacts upon quality of life were of a greater scale within the two Heathrow schemes and of lower magnitude for the Gatwick Second Runway scheme. However, when assessing against the objective of maximising economic benefits and improving competitiveness and employment, the Heathrow Northwest Runway scheme generates the most benefits, as well as producing the highest direct benefits to passengers.

[109] *Updated Appraisal Report*, p36
[110] *Updated Appraisal Report*, p35 and p42
[111] https://www.gov.uk/government/publications/appraisal-of-sustainability-for-the-revised-draft-airports-national-policy-statement

Conclusion

3.71 This section summarises the factors the Government considered when evaluating each of the three schemes shortlisted by the Airports Commission against the needs case presented in chapter 2. As part of this, the Government identified where schemes could have negative impacts, for example on the local environment. It considered the predicted beneficial effects of the three schemes, particularly in relation to the needs case and economic considerations. It also assessed how the schemes could conform to wider Government strategic objectives and meet legal obligations, for example on air quality. Bringing these considerations together, the Government's decision on a preferred scheme balances this range of factors, enabling it to determine which scheme, overall, is the most effective and appropriate means of meeting the needs case and maintaining the UK's hub status in particular.

3.72 The Appraisal of Sustainability provides an assessment of the schemes against a number of the factors considered in this chapter. It concludes that the Heathrow Northwest Runway scheme is best placed to maximise the monetised economic benefits that the provision of additional airport capacity could deliver in the short term, although this scheme is likely to do so with the greatest negative impact on local communities. However, the Appraisal of Sustainability also identifies measures which can help to mitigate these impacts, for example by reducing noise, ensuring that the development is in accordance with legal obligations on air quality, showing how future carbon targets could be met, and assessing future demand scenarios.

3.73 Building on this assessment, the Government has identified a number of attributes in the manner of strategic effects, which it believes only the preferred scheme is likely to deliver to meet the overall needs case for increased capacity in the South East of England and to maintain the UK's hub status. The Government has afforded particular weight to these:

- Expansion via the Heathrow Northwest Runway scheme would provide the biggest boost to connectivity, particularly in terms of long haul flights. This is important to a range of high value sectors across the economy in the UK which depend on air travel, as well as for air freight. It will enable more passengers to fly where they need to, when they need to.
- Expansion via the Heathrow Northwest Runway scheme would provide benefits to passengers and to the wider economy sooner than the other schemes. This is regardless of the technical challenges to its delivery. It would also provide the greatest boost to local jobs.
- Heathrow Airport is better connected to the rest of the UK by road and rail. Heathrow Airport already has good road links via the M25, M4, M40 and M3, and rail links via the London Underground Piccadilly Line, Heathrow Connect and Heathrow Express. In the future, it will be connected to Crossrail, and linked to HS2 at Old Oak Common. The number of such links provides resilience.
- The Heathrow Northwest Runway scheme delivers the greatest support for freight. The plans for the scheme include a doubling of freight capacity at the airport. Heathrow Airport already handles more freight by value than all other UK airports combined, and twice as much as the UK's two largest container ports.

3.74 The needs case has shown the importance of developing more capacity more quickly, and in a form which passengers and businesses want to use. The Heathrow Northwest Runway scheme is best placed to deliver this capacity, delivering the greatest benefits soonest as well as providing the biggest boost to the UK's international connectivity,

doing so in the 2020s at a point when without the scheme 4 out of 5 London airports would be full, with all the problems to passengers this could entail. Taken together, benefits to passengers and the wider economy are substantial, even having regard to the proportionally greater environmental disbenefits estimated for the Heathrow Northwest Runway. Even though the preferred scheme's environmental disbenefits are larger than those of the Gatwick Second Runway scheme, when all benefits and disbenefits are considered together,[112] overall the Heathrow Northwest Runway scheme is considered to deliver the greatest net benefits to the UK.

3.75 A number of mitigation measures will need to be applied to reduce the impacts of the Heathrow Northwest Runway scheme felt by the local community and the environment. Airport expansion is also expected to be accompanied by an extensive and appropriate compensation package for affected parties. With these safeguards in place, the Government considers that the Heathrow Northwest Runway scheme delivers the greatest strategic and economic benefits, and is therefore the most effective and appropriate way of meeting the needs case.

[112] *Updated Appraisal Report*, p44

4. Assessment principles

General principles of assessment

4.1 The statutory framework for deciding applications for development consent is contained in the Planning Act 2008. This chapter of the Airports NPS sets out general policies in accordance with which applications relating to a Northwest Runway at Heathrow Airport are to be decided. This chapter is specific to assessments necessary for the Heathrow Northwest Runway scheme, but is not exhaustive as to the assessments that may be applicable to that scheme.

4.2 The Airports NPS covering the Heathrow Northwest Runway scheme establishes the needs case for that proposed development, provided it adheres to the detailed policies and protections set out in the Airports NPS, and the legal constraints contained within the Planning Act 2008. The statutory framework for deciding nationally significant infrastructure project applications where there is a relevant designated NPS is set out in section 104 of the Planning Act 2008.[113]

4.3 The Airports NPS applies to schemes at Heathrow Airport (in the area shown, for this purpose, illustratively, within the scheme boundary map at Annex A) that include a runway of at least 3,500m in length and that are capable of delivering additional capacity of at least 260,000 air transport movements per annum, and associated infrastructure and surface access facilities. In particular, it also applies to the reconfiguration of and provision of new terminal capacity to be located between the two existing runways at Heathrow Airport. The Secretary of State's policy in relation to other airport infrastructure in the South East of England is set out at paragraph 1.41 above.

4.4 In considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State will take into account:

- Its potential benefits, including the facilitation of economic development (including job creation) and environmental improvement, and any long term or wider benefits; and
- Its potential adverse impacts (including any longer term and cumulative adverse impacts) as well as any measures to avoid, reduce or compensate for any adverse impacts.

4.5 In this context, environmental, safety, social and economic benefits and adverse impacts should be considered at national, regional and local levels. These may be identified in the Airports NPS, or elsewhere. The Secretary of State will also have regard to the manner in which such benefits are secured, and the level of confidence in their delivery.

[113] Planning Act 2008, section 104 – decisions in cases where an NPS has effect

4.6 The National Networks NPS sets out the Government's policies to deliver development of nationally significant infrastructure projects on the national road and rail networks and strategic rail freight interchanges. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.

4.7 Where the applicant's proposals in relation to surface access meet the thresholds to qualify as nationally significant infrastructure projects under the Planning Act 2008, or is associated development under section 115 of the Planning Act 2008, the Secretary of State will consider those aspects by reference to both the National Networks NPS and the Airports NPS, as appropriate. To the extent that discrete aspects of the surface access proposals do not qualify as nationally significant and cannot be included in a development consent application as associated development (for example), the applicant will be expected to pursue or secure necessary consent(s) through the most appropriate alternative consenting regime. This might include, for example, the Town and Country Planning Act 1990, the Highways Act 1980, or the Transport and Works Act 1992, promoted by a third party if need be.

4.8 The Secretary of State will consider any relevant nationally significant road and rail elements of the applicant's proposals in accordance with the National Networks NPS and with the Airports NPS. If there is conflict between the Airports NPS and other NPSs, the conflict should be resolved in favour of the NPS that has been most recently designated. The Airports NPS and the National Networks NPS may also be a material consideration in decision making on applications for road and rail schemes associated with or related to the preferred scheme that fall under the Town and Country Planning Act 1990, the Transport and Works Act 1992, or other legislation relating to planning. Whether, and to what extent, the Airports NPS and the National Networks NPS are a material consideration will be judged on a case by case basis by the relevant decision makers.

4.9 The Examining Authority should only recommend, and the Secretary of State will only impose, requirements in relation to a development consent, that are necessary, relevant to planning, relevant to the development to be consented, enforceable, precise, and reasonable in all other respects.[114] The need for requirements in respect of the phasing of the scheme is likely to be an important consideration, so that effects of construction and operational phases are properly mitigated, as well as any changes in the operations of the airport that may occur in line with the phasing of physical works and commencement of operations. Guidance on the use of planning conditions or any successor to it should be taken into account where requirements are proposed.

4.10 Obligations under section 106 of the Town and Country Planning Act 1990 should only be sought where they are necessary to make the development acceptable in planning terms, (including where necessary to ensure compliance with the Airports NPS), directly related to the proposed development, and fairly and reasonably related in scale and kind to the development.[115]

Scheme variation

4.11 While the Government has decided that a Northwest Runway at Heathrow Airport is its preferred scheme to deliver additional airport capacity (an illustrative masterplan is at

[114] National Planning Policy Framework, March 2012, paragraph 206, or any successor document
[115] Town and Country Planning Act 1990, section 106; Regulation 122(2) Community Infrastructure Levy Regulations 2010; National Planning Policy Framework, March 2012, paragraph 204

Annex B of the Airports NPS), this does not limit variations resulting in the final scheme for which development consent is sought. To benefit from the full support of policy within the Airports NPS, any application(s) will have to fall within the boundaries and parameters set out in the Airports NPS. However, the form of a development for which an application is made is a matter for the applicant. The Airports NPS does not prejudice the viability or merits of any particular application, detailed scheme or applicant. It governs the location, limits and nature of such schemes. It will be for an Examining Authority, and ultimately the Secretary of State, to determine whether any future application is compliant with the Airports NPS, meets the need for additional capacity, and is of benefit to the UK, whilst minimising any harm caused.

Environmental Impact Assessment

4.12 All proposals for projects that are subject to the European Union's Environmental Impact Assessment Directive,[116] and are likely to have significant effects on the environment, must be accompanied by an environmental statement, describing the aspects of the environment likely to be significantly affected by the project.[117] The Directive specifically requires an Environmental Impact Assessment to identify, describe and assess effects on human beings, fauna and flora, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them. Schedule 4 to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017[118] sets out the information that should be included in the environmental statement. This includes a description of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, positive and negative effects of the project, and also the measures envisaged for avoiding or mitigating significant adverse effects.

4.13 When examining a proposal to which the Airports NPS applies, the Examining Authority should ensure that likely significant effects at all stages of the project have been adequately assessed. The effects of any changes in operations, including the number of air traffic movements, during the construction and operational phases must be properly assessed and appropriate mitigation secured for any significant effects. Any requests for environmental information not included in the original environmental statement should be proportionate and focus only on likely significant effects. In the Airports NPS, the terms 'effects', 'impacts' or 'benefits' should accordingly be understood to mean likely significant effects, impacts or benefits.

4.14 When considering significant cumulative effects, any environmental statement should provide information on how the effects of an applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence if they are not part of the baseline).[119]

4.15 The Examining Authority should consider how significant cumulative effects, and the interrelationship between effects, might as a whole affect the environment, even

[116] Directive 2014/52/EU of the European Parliament and of the Council amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. The amendments to Directive 2011/92/EU made by Directive 2014/52/EU have been transposed into domestic legislation. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 have, subject to transitional arrangements, with amendments, consolidated the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 and various amending regulations

[117] http://www.legislation.gov.uk/uksi/2017/572/contents/made

[118] Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (S.I. 2017/572)

[119] The applicant should refer to the Planning Inspectorate's advice on assessing cumulative effects https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf

though they may be acceptable when considered on an individual basis or with mitigation measures in place.

4.16 In some instances it may not be possible at the time of the application for development consent for all aspects of the proposal to have been settled in precise detail. Where this is the case, the applicant should explain in its application which elements of the proposal have yet to be finalised, and the reasons why this is the case.

4.17 Effort should be made to refine the detail of the proposed development. However, where details are still to be finalised, such as in respect of the phasing of the development and operational changes at the airport, the applicant is advised to set out in the environmental statement the relevant design parameters used for the assessment. The environmental statement should explain, with reference to the parameters, what the maximum extent of the proposed development may be (for example in terms of site area) or the extent of change in respect of operational impacts, and assess the potential adverse effects which the project could have, to ensure that the impacts of the project as it may be constructed have been properly assessed.

4.18 Should the Secretary of State decide to grant development consent for an application where details are still to be finalised, this will need to be reflected in appropriate development consent requirements in the development consent order. It may be the case that development consent is granted for a proposal and, at a later stage, the applicant wishes (for technical or commercial reasons) to construct it in such a way that it is outside the terms of what has been consented, for example because its extent will be greater than has been provided for in terms of the consent. In this situation, it will be necessary for the applicant to apply for a change to be made to the development consent provided under the Planning Act 2008.

Habitats Regulations Assessment

4.19 Prior to granting development consent, the Secretary of State as competent authority must comply with the duties under the Conservation of Habitats and Species Regulations 2017. Under these regulations, if the competent authority considers that the proposed development is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and is not connected with or necessary to the management of that site, it must make an Appropriate Assessment of the implications for the site in view of the site's conservation objectives.[120] [121] The applicant should also refer to the Airports NPS sections on biodiversity, land use, and air quality. The competent authority must consult Natural England to ensure that impacts on European sites are adequately considered.

4.20 The applicant is required to provide sufficient information with their applications for development consent to enable the Secretary of State to carry out an Appropriate Assessment if required. This information should include details of any measures that are proposed to minimise or avoid any likely significant effects on a European site. The information provided may also assist the Secretary of State in concluding that an Appropriate Assessment is not required because significant effects on European sites

[120] This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in Regulation 8 of the Conservation of Habitats and Species Regulations 2017

[121] Directive 2011/92/EU was amended in 2014 by Directive 2014/52/EU. As amended, Article 2(3) of the Directive provides that, where an obligation to assess environmental effects arises simultaneously from the EIA Directive and the Habitats Directive (Directive 92/43/EU) and/or the Wild Birds Directive (Directive 2009/147/EC), Member States "shall, where appropriate, ensure that coordinated and/or joint procedures" are provided for

are sufficiently unlikely that they can be excluded. If it is concluded there is likely to be a significant effect, or such effects cannot be ruled out (alone or in combination), an Appropriate Assessment is required.

4.21 If an Appropriate Assessment for a proposed airport development concludes that it is not possible to rule out an adverse effect on the integrity of a European site, the Habitats Directive permits a derogation, subject to the proposal meeting three tests. These tests are (a) that there are no less damaging alternative solutions, (b) that there are imperative reasons of overriding public interest for the proposal going ahead, and (c) that adequate and timely compensation measures will be put in place to ensure the overall coherence of the network of protected sites is maintained. At detailed design stage, and in so far as it may be necessary, the matters set out in the Airports NPS will be relevant to determining whether there are alternative solutions and imperative reasons of overriding public interest, provided that the design remains consistent with the objectives of the Airports NPS.

4.22 Where a development may negatively affect any priority natural habitat type or priority species,[122] any imperative reasons of overriding public interest case would need to be established solely on one or more of the grounds relating to human health, public safety or beneficial consequences of primary importance to the environment. The competent authority may only rely on other (i.e. social or economic) imperative reasons of overriding public interest if it has first obtained an opinion from the European Commission.

Equalities

4.23 The Airports Commission's stated objective on equalities was "to reduce or avoid disproportionate impacts on any social group".[123] At consultation stage, the Airports Commission carried out a high level Equality Impact Assessment.

4.24 The Appraisal of Sustainability to the Airports NPS sets out an assessment of equalities impacts, informed by the work of the Airports Commission. The Airports Commission was clear that its assessment was based upon current scheme design, and that a more detailed Equality Impact Assessment would likely be necessary as design, supporting measures and operational plans were developed.

4.25 The Airports Commission's assessment identified different types of equalities impacts for each of its shortlisted schemes, but no substantial difference in the overall extent of equalities impacts. The Airports Commission's assessment, and the assessment carried out for the Appraisal of Sustainability that informs the Airports NPS, both concluded that negative equalities impacts could be well mitigated through good design and operation, and supporting measures and plans.

4.26 The Department for Transport has reviewed the Airports Commission's work, informed by the Equality Assessment carried out as part of the Appraisal of Sustainability. The Government is satisfied that the scope of the Airports Commission's work was appropriate at this stage of scheme development, that the Airports Commission's approach was consistent with the Equality Act 2010, and that its conclusion is consistent with the evidence produced.

4.27 For any application to be considered compliant with the Airports NPS, it must be accompanied by a project level Equality Impact Assessment examining the potential impact of that project on groups of people with protected characteristics. In order to

[122] As listed in Annex I and II of the Habitats Directive
[123] *Airports Commission: Appraisal Framework*, p98

benefit from the support of the Airports NPS, the results of that project level Equality Impact Assessment must be within the legal limits and parameters of acceptability outlined in the Appraisal of Sustainability that informs the Airports NPS.

Assessing alternatives

4.28 The applicant should comply with all legal obligations and policy set out in the Airports NPS on the assessment of alternatives. In particular:

- The Environmental Impact Assessment Directive requires projects with significant environmental effects to include a description of the reasonable alternatives studied by the applicant which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the project on the environmental effects;
- There may also be other specific legal obligations requiring the consideration of alternatives, for example, under the Habitats and Water Framework Directives; and
- There may be policies in the Airports NPS requiring consideration of alternatives, for example the flood risk sequential test.

Criteria for 'good design' for airports infrastructure

4.29 The applicant should include design as an integral consideration from the outset of a proposal.

4.30 Visual appearance should be an important factor in considering the scheme design, as well as functionality, fitness for purpose, sustainability and cost. Applying 'good design' to airports projects should therefore produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction, and matched by an appearance that demonstrates good aesthetics as far as possible.

4.31 A good design should meet the principal objectives of the scheme by eliminating or substantially mitigating the adverse impacts of the development, for example by improving operational conditions. It should also mitigate any existing adverse impacts wherever possible, for example in relation to safety or the environment. A good design will also be one that sustains the improvements to operational efficiency for as many years as is practicable, taking into account capital cost, economics and environmental impacts.

4.32 Scheme design will be an important and relevant consideration in decision making. The Secretary of State will need to be satisfied that projects are sustainable and as aesthetically sensitive, durable, adaptable and resilient as they can reasonably be, having regard to regulatory and other constraints and including accounting for natural hazards such as flooding. The Secretary of State will also need to be satisfied that extant security, customs and immigration measures are maintained or reprovided.

4.33 The scheme should take into account, as far as possible, both functionality, including fitness for purpose and sustainability, and aesthetics, including the scheme's contribution to the quality of the area in which it would be located. The applicant will want to consider the role of technology in delivering new airports projects. Professional, independent advice on the design aspects of a proposal should be undertaken to ensure good design principles are embedded into infrastructure proposals.

4.34 There may be opportunities for the applicant to demonstrate good design in terms of siting and design measures relative to existing landscape and historical character and function, landscape permeability, landform, and vegetation.

4.35 The applicant should be able to demonstrate in its application how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, the applicant should set out the reasons why the favoured choice has been selected. The Examining Authority and Secretary of State will take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security standards which the design has to satisfy.

Costs

4.36 The relationship between cost and affordability for a scheme is governed by the regulated funding of the airport and funding from other sources, and the need to comply with the Government's guidance on compulsory acquisition of land under the Planning Act 2008.[124] This guidance is relevant to any scheme that will require the compulsory acquisition of land, which is expected in relation to any scheme to which this NPS applies which would include any application for development consent for a Northwest Runway at Heathrow Airport. That guidance sets out what a promoter must demonstrate if it is to be granted powers of compulsory acquisition - including in relation to impediments to a scheme and financial resources.

4.37 Heathrow Airport is subject to economic regulation by the Civil Aviation Authority (CAA) under the Civil Aviation Act 2012. As part of the CAA's discharge of its duty under the Civil Aviation Act 2012 to further the interests of users of air transport services (passengers and cargo owners), the CAA has granted an economic licence to the operator of Heathrow Airport to levy airport charges. This licence sets a maximum yield per passenger that can be recovered by the operator of Heathrow Airport through airport charges (the "maximum yield"). This maximum yield is set by the CAA having conducted a process that scrutinises, among other things, the business plan submitted by the licence holder and developed through constructive engagement with the airlines, as well as other submissions from airlines and stakeholders. This process of scrutiny of costs will include benchmarking exercises from industry professionals and assessments by an Independent Fund Surveyor as well as by the CAA. Expansion will also be subject to specific gateway reviews by airlines and stakeholders. The final business plan will include details of the future capital expenditure that the licensee proposes to incur.

4.38 For the development of new capacity at Heathrow, the CAA will set the maximum yield having regard to the matters required by the Civil Aviation Act 2012. The CAA will consider, among other things:

- the need to secure that the licence holder is able to finance its provision of airport operation services; and
- the economy and efficiency of the proposals set out in any business plan (including such capital expenditure proposals as are contained in it),

as part of its process of setting the maximum yield per passenger in the period covered by the price control.

[124] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/236454/Planning_Act_2008_-_Guidance_related_to_procedures_for_the_compulsory_acquisition_of_land.pdf

4.39 The applicant should demonstrate in its application for development consent that its scheme is cost-efficient and sustainable, and seeks to minimise costs to airlines, passengers and freight owners over its lifetime.

4.40 Detailed scrutiny of any business plan put forward by the licence holder will fall under the CAA's regulatory process under the Civil Aviation Act 2012, and the detailed matters considered under that process are not expected to be scrutinised in the same way during the examination and determination of an application for development consent. The CAA is a statutory consultee for all proposed applications relating to airports or which are likely to affect an airport or its current or future operation. The applicant is expected to provide the CAA with the information it needs to enable it to assist the Examining Authority in considering whether any impediments to the applicant's development proposals, insofar as they relate to the CAA's economic regulatory and other functions, are capable of being properly managed.

Climate change adaptation

4.41 The Planning Act 2008 requires the Secretary of State to have regard to the desirability of mitigating, and adapting to, climate change in designating an NPS.[125]

4.42 This section sets out how the Airports NPS puts Government policy on climate change adaptation into practice, and in particular how the applicant and the Secretary of State will take into account the effects of climate change when developing and considering airports infrastructure applications. Climate change mitigation is essential to minimise the most dangerous impacts of climate change, as previous global greenhouse gas emissions will already mean some degree of continued climate change for at least the next 30 years. Climate change is likely to mean that the UK will experience on average hotter, drier summers and warmer, wetter winters. There is potentially an increased risk of flooding, drought, heatwaves, intense rainfall events and other extreme events such as storms and wildfires, as well as rising sea levels.

4.43 Adaptation is therefore necessary to deal with the potential impacts of these changes that are already happening. New development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the provision of green infrastructure.

4.44 The Government has published a set of UK Climate Projections, and every five years prepares a statutory UK Climate Change Risk Assessment and National Adaptation Programme.[126] In addition, the Climate Change Act 2008 adaptation reporting power has been used by Government to invite reporting authorities (a defined list of public bodies and statutory undertakers, including airports) to consider the impact on them of current and predicted climate change, and to report on progress implementing adaptation actions.[127] Successive strategies for adaptation reporting will be laid alongside five yearly updates to the National Adaptation Programme.

4.45 New airports infrastructure will typically be a long-term investment which will need to remain operational over many decades, in the face of a changing climate. Consequently, the applicant must consider the impacts of climate change when planning design, build and operation. Any accompanying environmental statement

[125] Planning Act 2008, section 10(3)(a)
[126] Climate Change Act 2008, section 58
[127] Climate Change Act 2008, section 62

should set out how the proposal will take account of the projected impacts of climate change.

4.46 Detailed consideration must be given to the range of potential impacts of climate change using the latest UK Climate Projections available at the time, and to ensuring any environmental statement that is prepared identifies appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure. Should a new set of UK Climate Projections become available after the preparation of any environmental statement, the Examining Authority should consider whether it needs to request additional information from the applicant.

4.47 Where transport infrastructure has safety-critical elements, and the design life of the asset is 60 years or greater, the applicant should apply the latest available UK Climate Projections, considering at least a scenario that reflects a high level of greenhouse gas emissions at the 10%, 50% and 90% probability levels, to assess the impacts of climate change over the lifetime of the development.

4.48 The applicant should demonstrate that there are no critical features of infrastructure design which may be seriously affected by more radical changes to the climate beyond those projected in the latest set of UK Climate Projections. Any potential critical features should be assessed, taking account of the latest credible scientific evidence on, for example, sea level rise, and on the basis that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime through potential further mitigation or adaptation.

4.49 Any adaptation measures should be based on the latest set of UK Climate Projections,[128] the most recent UK Climate Change Risk Assessment,[129] consultation with statutory consultation bodies, and any other appropriate climate projection data. Any adaptation measures must themselves also be assessed as part of any Environmental Impact Assessment and included in the environmental statement, which should set out how and where such measures are proposed to be secured.

4.50 If any proposed adaptation measures themselves give rise to consequential impacts, the Secretary of State will consider the impact in relation to the application as a whole and the assessment principles set out in the Airports NPS.

4.51 Adaptation measures can be required to be implemented at the time of construction where necessary and appropriate to do so.

4.52 Where adaptation measures are necessary to deal with the impact of climate change, and that measure would have an adverse effect on other aspects of the project or the surrounding environment, the Secretary of State may consider requiring the applicant to ensure that the adaptation measure could be implemented should the need arise, rather than at the outset of the development.

Pollution control and other environmental protection regimes

4.53 Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality or the marine environment, or which include noise, may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. Relevant permissions will need to be obtained for any activities within the development that are regulated under those regimes before the activities can be operated.

[128] http://ukclimateprojections.metoffice.gov.uk/
[129] https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report

4.54 In deciding an application, the Secretary of State should focus on whether the development is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The Secretary of State should assess the potential impacts of processes, emissions or discharges to inform decision making, but should work on the assumption that, in terms of the control and enforcement, the relevant pollution control regime will be properly applied and enforced. Decisions under the Planning Act 2008 should complement but not duplicate those taken under the relevant pollution control regime.

4.55 These considerations apply in an analogous way to other environmental regulatory regimes, including those on land drainage, flood defence, and biodiversity.

4.56 When an applicant applies for an environmental permit, the relevant regulator (in this case the Environment Agency) requires that processes are in place that are sufficient for the grant of the permit and to ensure compliance with conditions attached to any permit. In examining the impacts of the project, the Examining Authority may wish to seek the views of the regulator on the scope of the permit or consent and any management plans (such as any produced for noise) that would be included in an environmental permit application.

4.57 The applicant should begin pre-application discussions with the Environment Agency as early as possible. It is expected, however, that an applicant will have first considered what the Environment Agency is likely to require as a starting point for discussion. Some consents require a significant amount of preparation: as an example, the Environment Agency strongly recommends the applicant should start work towards submitting the permit application at least six months prior to the submission of a development consent order application, where it wishes to parallel track the applications. This will help ensure that applications take account of all relevant environmental considerations and that the relevant regulators are able to provide timely advice and assurance to the Examining Authority and the Secretary of State.

4.58 The Secretary of State will be satisfied that development consent can be granted taking full account of environmental impacts. This will require close cooperation with the Environment Agency, the local planning authority and pollution control authority, and other relevant bodies, such as Natural England, Drainage Boards, and water and sewerage undertakers, to ensure that, in the case of potentially polluting developments:

- The relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework; and
- The effects of existing sources of pollution in and around the project are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits.

4.59 The Secretary of State should not refuse consent on the basis of regulated impacts unless there is good reason to believe that any relevant necessary operational pollution control permits or licences or other consents will not subsequently be granted.

Common law nuisance and statutory nuisance

4.60 Section 158 of the Planning Act 2008 provides a defence of statutory authority in civil or criminal proceedings for nuisance. Such a defence is also available in respect of anything else authorised by an order granting development consent. The defence does not extinguish the local authority's duties under Part III of the Environmental Protection Act 1990 to inspect its area and take reasonable steps to investigate complaints of statutory nuisance and to serve an abatement notice where satisfied of its existence, likely occurrence or recurrence.

4.61 During the examination of an application for development consent for infrastructure covered under the Airports NPS, possible sources of nuisance under section 79(1) of the Environmental Protection Act 1990 and under sections 76 and 77 of the Civil Aviation Act 1982 should be considered by the Examining Authority. The Examining Authority should also consider how those sources of nuisance might be mitigated or limited so they can recommend appropriate requirements that the Secretary of State might include in any subsequent order granting development consent.

4.62 The defence of statutory authority is subject to any contrary provision made by the Secretary of State in any particular case by an order granting development consent.[130]

Security and safety considerations

4.63 National security considerations apply across all national infrastructure sectors. The Department for Transport acts as the sector sponsor department for the aviation sector, and in this capacity has lead responsibility for security matters and for directing the security approach to be taken, working with the Civil Aviation Authority. The Department for Transport works closely with Government agencies, including the Centre for the Protection of National Infrastructure, to reduce the vulnerability of the aviation sector to terrorism and other national security threats.

4.64 Government policy is to ensure that, where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the project development. The nature of the aviation sector as a target for terrorism means that security considerations will likely apply in the case of the infrastructure project for which development consent may be sought under the Airports NPS.

4.65 Where national security implications have been identified, the applicant should consult with relevant security experts from the Centre for the Protection of National Infrastructure and the Department for Transport to ensure that physical, procedural and personnel security measures have been adequately considered in the design process, and that adequate consideration has been given to the management of security risks. If the Department for Transport, taking advice from the Civil Aviation Authority, Centre for the Protection of National Infrastructure and others it considers appropriate, forms the opinion that it is satisfied that current and potential future security needs are adequately addressed in the project and that relevant guidance on these matters has been appropriately taken into account in the application, it will provide confirmation of this to the Secretary of State, and the Examining Authority should not need to give any further consideration to the details of the security measures during the examination.

[130] Planning Act 2008, section 158(3)

4.66 The applicant should only include such security-related information in the application as is necessary to enable the Examining Authority to examine the development consent issues and make a properly informed recommendation on the application.

4.67 In exceptional cases where examination of an application would involve public disclosure of information about defence or national security which would not be in the national interest, the Secretary of State can intervene and may appoint an examiner to consider evidence in closed session.

4.68 Air transport is one of the safest forms of travel, and the UK is a world leader in aviation safety. Maintaining and improving that record, while ensuring that regulation is proportionate and cost-effective, remains of primary importance to the UK. Since 2003, rules and standards for aviation safety in Europe have increasingly been set by the European Aviation Safety Agency. The UK will continue to work closely with the European Aviation Safety Agency to ensure that a high and uniform level of civil aviation safety is maintained across Europe. The preferred scheme at Heathrow must comply with the UK's civil aviation safety regime, regulated by the Civil Aviation Authority.

4.69 There remains a considerable threat to aviation security from terrorism. The UK meets this threat with a multi-layered aviation security regime built on intelligence, effective risk management and robust, proportionate measures, brought together under the National Aviation Security Programme. The regulations governing aviation security in the UK have their basis in UK and European law, and are enforced by the Civil Aviation Authority on behalf of the Secretary of State. The design and operation of the Heathrow Northwest Runway scheme, to which the Airports NPS relates, must comply with aviation security regulations and guidance in the same way as existing airports. There may also be other security considerations linked to any application for development consent under the Airports NPS.

Health

4.70 The construction and use of airports infrastructure has the potential to affect people's health, wellbeing and quality of life. Infrastructure can have direct impacts on health because of traffic, noise, vibration, air quality and emissions, light pollution, community severance, dust, odour, polluting water, hazardous waste and pests.

4.71 New or enhanced airports infrastructure may also have indirect health impacts, for example if they affect access to key public services, local transport, opportunities for cycling and walking, or the use of open space for recreation and physical activity. It should also be noted, however, that the increased employment stemming from airport expansion may have indirect positive health impacts.

4.72 As described elsewhere in the Airports NPS, where the proposed project has likely significant environmental impacts that would have an effect on human beings, any environmental statement should identify and set out the assessment of any likely significant health impacts.

4.73 The applicant should identify measures to avoid, reduce or compensate for adverse health impacts as appropriate. These impacts may affect people simultaneously, so the applicant, the Examining Authority and the Secretary of State (in determining an application for development consent) should consider the cumulative impact on health.

Accessibility

4.74 The Government is committed to creating a more accessible and inclusive transport network that provides a range of opportunities and choices for all people to connect with jobs, services and leisure opportunities. This commitment extends to all the users of new airports infrastructure, and to the associated surface access facilities.

4.75 In 2008, the Department for Transport published *Access to Air Travel for Disabled Persons and Persons with Reduced Mobility – Code of Practice*,[131] which sets out the legal framework and gives advice and information. Since then, the Equality Act 2010 has updated and extended the legal framework for accessibility.[132]

4.76 In accordance with legal and best practice in relation to accessibility:

- The Government requires the applicant to include clear details of how plans will improve access on and around the airport by designing and delivering schemes (both new construction and upgrade or refurbishment) that address the accessibility needs of all those who use, or are affected by, surface access infrastructure, including those with physical and/or mental impairments as well as older users. Every opportunity to deliver improvements in accessibility on and to the existing national road network should also be taken;
- The Government will continue to work to ensure that all bus and train fleets comply with legal access standards by 2020, and to improve rail station access for those with impairments in accordance with legislation and best practice; and
- The car will continue to play an important role, providing disabled people with independence where other forms of transport are not accessible or available. Easy access and car parking provision at the airports is essential to this goal and must meet standards set down in guidance (such as the Department for Transport's *Inclusive Mobility*).[133]

[131] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/transportforyou/access/aviationshipping/accesstoairtravelfordisabled.pdf
[132] http://www.legislation.gov.uk/ukpga/2010/15/contents
[133] https://www.gov.uk/government/publications/inclusive-mobility

5. Assessment of impacts

Introduction

5.1 This chapter focuses on the potential impacts of the Heathrow Northwest Runway scheme, the assessments that any applicant will need to carry out, and the specific planning requirements that they will need to meet, in order to gain development consent.

5.2 In its Final Report, the Airports Commission recommended that "to make expansion possible…a comprehensive package of accompanying measures [should be recommended to] make the airport's expansion more acceptable to its local community, and to Londoners generally".[134]

5.3 When the Government stated in December 2015 that it agreed with the Airports Commission that one additional runway was required in the South East of England by 2030, it also emphasised the importance of securing the best possible deal for communities affected by the preferred scheme to increase airport capacity. The Government undertook further work, including through engagement with all three shortlisted scheme promoters, during 2016 to develop a package of location-specific measures to mitigate the impacts of increased capacity, and to enhance beneficial effects.

5.4 The Government announced on 25 October 2016 that its preferred scheme to deliver additional airport capacity in the South East of England was a Northwest Runway at Heathrow Airport. Alongside this, it set out a number of supporting measures that any application for development consent will be required to demonstrate and secure in order to mitigate the impacts of expansion on the environment and affected communities.

Surface access

Introduction

5.5 The Government's objective for surface access is to ensure that access to the airport by road, rail and public transport is high quality, efficient and reliable for passengers, freight operators and airport workers who use transport on a daily basis. The Government also wishes to see the number of journeys made to airports by sustainable modes of transport maximised as much as possible. This should be delivered in a way that minimises congestion and environmental impacts, for example on air quality.

5.6 A Northwest Runway at Heathrow Airport will have a range of impacts on local and national transport networks serving the airport, during both the construction and operational phases. Passengers, freight operators and airport workers share the

[134] *Airports Commission: Final Report*, p4

routes to and from the airport with other road and rail users, including commuters, leisure travellers and business users. Without effective mitigation, expansion is likely to increase congestion on existing routes and have environmental impacts such as increased noise and emissions.

5.7 The Airports Commission identified three major rail improvements which would support a new Northwest Runway at Heathrow Airport. These were Crossrail, a Western Rail Link to Heathrow and Southern Rail Access to the airport. Notwithstanding the requirements for the applicant's assessment set out below, Government has supported, or is supporting, all three of these schemes subject to a satisfactory business case and the agreement of acceptable terms with the Heathrow aviation industry. Crossrail is in construction and full services are anticipated to commence in 2019. The Western Rail Link to Heathrow was one of the schemes named as being in the 'develop' phase in the Rail Network Enhancements Pipeline, published in March 2018 and, subject to obtaining planning consent, it is expected to commence operations before 2030. Any Southern Rail Access to Heathrow is at an earlier stage of development and, subject to an acceptable business case and obtaining planning consent, should commence operations as soon as reasonably practicable after a new runway has opened.

5.8 It is important that improvements are made to Heathrow Airport's transport links to be able to support the increased numbers of people and freight traffic which will need to access the expanded airport, should development consent be granted.

Applicant's assessment

5.9 The applicant must prepare an airport surface access strategy in conjunction with its Airport Transport Forum, in accordance with the guidance contained in the Aviation Policy Framework.[135] The airport surface access strategy must reflect the needs of the scheme contained in the application for development consent, including any phasing over its development, implementation and operational stages, reflecting the changing number of passengers, freight operators and airport workers attributable to the number of air traffic movements. The strategy should reference the role of surface transport in relation to air quality and carbon. The airport surface access strategy must contain specific targets for maximising the proportion of journeys made to the airport by public transport, cycling or walking. The strategy should also contain actions, policies and defined performance indicators for delivering against targets, and should include a mechanism whereby the Airport Transport Forum can oversee implementation of the strategy and monitor progress against targets alongside the implementation and operation of the preferred scheme.

5.10 The applicant should assess the implications of airport expansion on surface access network capacity using the WebTAG methodology stipulated in the Department for Transport guidance,[136] or any successor to such methodology. The applicant should consult Highways England, Network Rail and highway and transport authorities, as appropriate, on the assessment and proposed mitigation measures. The assessment should distinguish between the construction and operational project stages for the development comprised in the application.

5.11 The applicant should also consult with Highways England, Network Rail and relevant highway and transport authorities, and transport operators, to understand the target completion dates of any third party or external schemes included in existing rail, road or other transport investment plans. It will need to assess the effects of the preferred

[135] https://www.gov.uk/government/publications/aviation-policy-framework, paragraphs 4.20-4.21
[136] https://www.gov.uk/guidance/transport-analysis-guidance-webtag

scheme as influenced by such schemes and plans. Such consultation and assessment, both of third party schemes on which the preferred scheme depends, and others which interact with it, all of which may be subject to their own planning, funding and approval processes, must be understood in terms of implications of the timings for the applicant's own surface access proposals.

5.12 The applicant will need to demonstrate that Highways England, Network Rail and any relevant highway and transport authorities and transport providers have been consulted, and are content with the deliverability of any new transport schemes or other changes required to existing links to allow expansion within the timescales required for the preferred scheme as a whole, the requirements of the Airports NPS and other statutory requirements. This includes changes to the M25 to allow a new runway to cross the motorway, local road changes, and improvements including the diversion of the A4 and A3044, changes to the Colnbrook Freight branch railway and on-airport station works and safeguarding. On the strategic road network, it will be important to ensure that any changes to the M25 which the applicant proposes will be implemented consistently with the Secretary of State's statutory directions and guidance set out in Highways England's licence. This includes ensuring that sufficient provision is made to accommodate flexibility and future-proofing in planning the long-term development, improvement and operation of Highways England's network.

5.13 For schemes and related surface access proposals or other works impacting on the strategic road network, the applicant should have regard to DfT Circular 02/2013, *The Strategic Road Network and the delivery of sustainable development*[137] (or prevailing policy), and the National Networks NPS. This sets out the way in which the highway authority for the strategic road network will engage with communities and the development industry to deliver sustainable development and economic growth, whilst safeguarding the primary function and purpose of the network.

5.14 The surface access systems and proposed airport infrastructure may have the potential to result in severance in some locations. Where appropriate, the applicant should seek to deliver improvements or mitigation measures that reduce community severance and improve accessibility.

Mitigation

5.15 In its application, the applicant should set out the mitigation measures that it considers are required to minimise and mitigate the effect of expansion on existing surface access arrangements.

5.16 The applicant should demonstrate in its assessment that the proposed surface access strategy will support the additional transport demands generated by airport expansion. This should be appropriately secured.

5.17 Any application for development consent and accompanying airport surface access strategy must include details of how the applicant will increase the proportion of journeys made to the airport by public transport, cycling and walking to achieve a public transport mode share of at least 50% by 2030, and at least 55% by 2040 for passengers. The applicant should also include details of how, from a 2013 baseline level, it will achieve a 25% reduction of all staff car trips by 2030, and a reduction of 50% by 2040.[138]

5.18 The applicant should commit to annual public reporting on performance against these specific targets. The airport surface access strategy should consider measures and

[137] https://www.gov.uk/government/publications/strategic-road-network-and-the-delivery-of-sustainable-development
[138] These mode share targets are derived from *Heathrow Airport Ltd. Statement of Principles*, part 5, paragraph 1.6 https://www.gov.uk/government/publications/heathrow-airport-limited-statement-of-principles

incentives which could help to manage demand by car users travelling to and from the airport, as well as physical infrastructure interventions, having at all times due regard to the effect of its strategy on the surrounding area and transport networks. The strategy should also include an assessment of the feasibility of the measures proposed as well as the benefits and disbenefits related to those measures, including any implications for Highways England, Network Rail and affected relevant highway authorities and transport providers. These measures could be used to help achieve mode share targets and should be considered in conjunction with measures to mitigate air quality impacts as described in the Airports NPS.

5.19 The Government expects the applicant to secure the upgrading or enhancing of road, rail or other transport networks or services which are physically needed to be completed to enable the Northwest Runway to operate. This includes works to the M25, local road changes and improvements including the diversion of the A4 and A3044, and on-airport station works and safeguarding, as set out in more detail in paragraph 5.12.

5.20 Where a surface transport scheme is not solely required to deliver airport capacity and has a wider range of beneficiaries, the Government, along with relevant stakeholders, will consider the need for a public funding contribution alongside an appropriate contribution from the airport on a case by case basis. The Government recognises that there may be some works which may not be required at the time the additional runway opens, but will be needed as the additional capacity becomes fully utilised. The same principle applies that, where a transport scheme is not solely required to deliver airport capacity, the Government, along with relevant stakeholders, will consider the need for a public funding contribution alongside an appropriate contribution from the airport on a case by case basis.

Decision making

5.21 The applicant's proposals will give rise to impacts on the existing and surrounding transport infrastructure. The Secretary of State will consider whether the applicant has taken all reasonable steps to mitigate these impacts during both the development and construction phase and the operational phase. Where the proposed mitigation measures are insufficient to effectively offset or reduce the impact on the transport network, arising from expansion, of additional passengers, freight operators and airport workers, the Secretary of State will impose requirements on the applicant to accept requirements and / or obligations to fund infrastructure or implement other measures to mitigate the adverse impacts, including air quality.

5.22 Provided the applicant is willing to commit to transport planning obligations to satisfactorily mitigate transport impacts identified in the transport assessment (including environment and social impacts), with costs being considered in accordance with the Department for Transport's policy on the funding of surface access schemes, development consent should not be withheld on surface access grounds.

Air quality

Introduction

5.23 Increases in emissions of pollutants during the construction or operational phases of the scheme could result in the worsening of local air quality. Increased emissions can contribute to adverse impacts on human health and on the natural environment.

5.24 The European Union has established common, health-based and ecosystem based ambient concentration limit values for the main pollutants in the Ambient Air Quality Directive (2008/50/EC) ('the Air Quality Directive'),[139] which member states are required to meet by specified dates.

5.25 Where compliance by those dates has not been achieved, the member state is required to put in place an action plan showing how the period of exceedance in each non-compliant area will be kept as short as possible. In December 2015, the UK submitted its national air quality plan for nitrogen dioxide, including a zonal plan for Greater London and the South East, for the approval of the European Commission.

5.26 In November 2016 the High Court ordered the Government to produce a modified air quality plan that delivers compliance in the shortest possible time. The Government published a final, modified air quality plan on 26 July 2017. The European Commission were notified of this plan on 31 July 2017.[140]

5.27 Other relevant legislation includes the fourth daughter Air Quality Directive (2004/107/EC), which sets targets for levels in outdoor air of certain toxic heavy metals and polycyclic aromatic hydrocarbons, and the National Emission Ceilings Directive (2016/2284/EU),[141] which sets national emission limits for a range of atmospheric pollutants.

5.28 Air quality impacts are generated by all types of infrastructure development to varying degrees, and the geographical extent and distribution can cover a large area. At Heathrow Airport in 2015, aircraft movements were modelled to have contributed 17% on average to local NOx concentrations at nearby roadside locations. Road transport, by comparison, accounted for 64% of NOx concentrations in the same areas. Off-road transport and mobile machinery (a category which would include airside vehicles) contributed 5%[142].

5.29 The Airports Commission identified (and in some cases quantified the impact of) a number of measures that would help mitigate any negative impacts on air quality.[143] In addition, for the Heathrow Northwest Runway scheme, the Airports Commission recommended the following supporting measures:

- That Heathrow Airport should be held to performance targets to increase the percentage of employees and passengers accessing the airport by public transport; and
- That the introduction of a congestion or access charge for road vehicles should be considered.

5.30 The Airports Commission undertook extensive analysis on air quality and concluded that expansion could take place within legal obligations (including in a high demand growth scenario). The Department for Transport conducted a study of the implications of the Government's 2015 national air quality plan on the conclusions of the Airports Commission's air quality assessment.[144]

5.31 Since this work was completed in June 2016, updated international evidence on vehicle emission forecasts was published at the end of September 2016. The Department for Transport has conducted further analysis to assess the impact that this updated evidence base would have on estimated compliance with EU limit values of

[139] The Ambient Air Quality Directive (2008/50/EC) was brought into law in England through the Air Quality Standards Regulations 2010
[140] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf
[141] This Directive succeeds an earlier National Emissions Ceilings Directive (2001/81/EC) and contains transitional provisions
[142] Based on 2015 data from the Pollution Climate Mapping Model for roads affected by Heathrow emissions
[143] https://www.gov.uk/government/consultations/airports-commission-air-quality-assessment
[144] https://www.gov.uk/government/publications/airport-expansion-further-analysis-of-air-quality-data

expansion options at Heathrow Airport and Gatwick Airport. This analysis has been updated to take account of the revised aviation demand forecasts and the Government's final air quality plan. The result of this analysis helped inform the Government's view that, with a suitable package of policy and mitigation measures, including the Government's modified air quality plan, the Heathrow Northwest Runway scheme would be capable of being delivered without impacting the UK's compliance with air quality limit values.

Applicant's assessment

5.32 The applicant should undertake an assessment of the project, to be included as part of the environmental statement, demonstrating to the Secretary of State that the construction and operation of the Northwest Runway will not affect the UK's ability to comply with legal obligations. Failure to demonstrate this will result in refusal of development consent.

5.33 The environmental statement should assess:

- Existing air quality levels for all relevant pollutants referred to in the Air Quality Standards Regulations 2010 and the National Emission Ceilings Regulations 2002 (as amended) or referred to in any successor regulations;
- Forecasts of levels for all relevant air quality pollutants at the time of opening, (a) assuming that the scheme is not built (the 'future baseline'), and (b) taking account of the impact of the scheme, including when at full capacity; and
- Any likely significant air quality effects of the scheme, their mitigation and any residual likely significant effects, distinguishing between those applicable to the construction and operation of the scheme including any interaction between construction and operational changes and taking account of the impact that the scheme is likely to cause on air quality arising from road and other surface access traffic.

5.34 Defra publishes future national projections of air quality based on evidence of future emissions. Projections may be updated as the evidence base changes. The applicant's assessment should, in so far as practicable, be based on the latest available projections.

Mitigation

5.35 The Secretary of State will need to be satisfied that the mitigation measures put forward by the applicant are acceptable, including at the construction stage. A management / project plan may help record and secure mitigation measures.

5.36 Mitigation measures may affect the project design, layout, construction and operation, and / or may comprise measures to improve air quality in pollution hotspots beyond the immediate locality of the scheme.

5.37 While the precise package of mitigations should be subject to consultation with local communities and relevant stakeholders to ensure the most effective measures are taken forward, an extensive range of mitigation measures is likely to be required.

5.38 In addition, Heathrow Airport should continue to strive to meet its public pledge to have landside airport-related traffic no greater than today. To achieve this, it should set out and regularly review its plans to meet the mode share targets set at paragraph 5.17 above. Heathrow Airport should also develop and keep under review plans to improve the impact of road freight serving the airport.

5.39 Other mitigation measures which may be put forward by the applicant could include, but are not limited to:

- Landing charges structured to reward airlines for operating cleaner flights (for example NOx emissions charging);
- Zero- or low-emission hybrid or electric vehicle use (ultra-low emission vehicles), charging and fuel facilities;
- Reduced or single engine taxiing (improved taxiing efficiency);
- Reducing emissions from aircraft at the gate (for example installation of fixed electrical ground power and preconditioned air to aircraft stands to reduce the use of auxiliary power unit);
- Modernised heating supplies in airport buildings;
- Changes to the layout of surface access arrangements;
- Traffic restrictions and / or traffic relocation around sensitive areas;
- An emissions-based access charge; and
- Physical means, including barriers to trap or better disperse emissions and speed control on roads.

5.40 Mitigation measures at the construction stage should also be provided and draw on best practice from other major construction schemes, including during the procurement of contractors. Specific measures could include but are not limited to:

- Development of a construction traffic management plan (which may include the possible use of rail and consolidation sites or waterways);
- The use of low emission construction plant / fleet, fitting of diesel particulate filters, and use of cleaner engines;
- The use of freight consolidation sites;
- Active workforce management / a worker transport scheme;
- Construction site connection to grid electricity to avoid use of mobile generation; and
- Selection of construction material to minimise distance of transport and increase recycling percentages of the material where appropriate.

5.41 The implementation of mitigation measures may require working with partners to support their delivery.

Decision making

5.42 The Secretary of State will consider air quality impacts over the wider area likely to be affected, as well as in the vicinity of the scheme. In order to grant development consent, the Secretary of State will need to be satisfied that, with mitigation, the scheme would be compliant with legal obligations that provide for the protection of human health and the environment.

5.43 Air quality considerations are likely to be particularly relevant where the proposed scheme:

- is within or adjacent to Air Quality Management Areas,[145] roads identified as being above limit values, or nature conservation sites (including Natura 2000 sites and Sites of Special Scientific Interest);
- would have effects sufficient to bring about the need for new Air Quality Management Areas or change the size of an existing Air Quality Management Area, or bring about changes to exceedances of the limit values, or have the potential to have an impact on nature conservation sites; and
- after taking into account mitigation, would lead to a significant air quality impact in relation to Environmental Impact Assessment and / or to a deterioration in air quality in a zone or agglomeration.

Noise

Introduction

5.44 The impact of noise from airport expansion is a key concern for communities affected, and the Government takes this issue very seriously. High exposure to noise is an annoyance, can disturb sleep, and can also affect people's health. Aircraft operations are by far the largest source of noise emissions from an airport, although noise will also be generated from ground operations and surface transport, and during the construction phase of a scheme.

5.45 Aircraft noise is not only determined by the number of aircraft overhead, but also by engine technologies and airframe design, the paths the aircraft take when approaching and departing from the airport, and the way in which the aircraft are flown.

5.46 Over recent decades, there have been reductions in aviation noise due to technological and operational improvements, and this trend is expected to continue.[146] New technology is already making aircraft quieter. Newer generation aircraft coming into service have a noise footprint typically 50% smaller on departure than the ones they are replacing, and at least 30% smaller on arrival. In addition, further opportunities for noise reductions are expected in the next decade as part of the UK airspace modernisation programme. One of the key benefits of this programme is expected to be "reduced noise from aircraft overflying communities, with less 'holding' at lower altitudes".[147] However, evidence has shown that people's sensitivity to noise has increased in recent years, and there has been growing evidence that exposure to high levels of aircraft noise can adversely affect people's health.[148] Expansion will lead to a rise in the number of flights in the local area compared to a no expansion scenario.

5.47 The Government wants to strike a fair balance between the negative impacts of noise (on health, amenity, quality of life and productivity) and the positive impacts of flights. There is no European or national legislation which sets legally binding limits on aviation noise emissions. Major airports are, however, under a legal obligation[149] to

[145] https://uk-air.defra.gov.uk/aqma/
[146] *The Sustainable Aviation Noise Roadmap, A Blueprint for Managing Noise from Aviation Sources to 2050*: http://www.sustainableaviation.co.uk/road-maps/
[147] UK Airspace Policy: A framework for balanced decisions on the design and use of airspace, p21, para 3.9, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/588186/uk-airspace-policy-a-framework-for-balanced-decisions-on-the-design-and-use-of-airspace-web-version.pdf
[148] *CAP 1164, Aircraft noise, sleep disturbance and health effects 2014*: http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=6275
CAP 1506, Survey of noise attitudes 2014: Aircraft http://www.gov.uk/government/publications/survey-of-attitudes-to-aviation-noise
[149] The EU Environmental Noise Directive 2002/49 which is implemented in England by the Environmental Noise (England) Regulations 2006 (S.I. 2006/2238 as amended)

develop strategic noise maps and produce Noise Action Plans based on those maps, on a five yearly basis. They are also required to review and, if necessary, revise action plans when a major development occurs affecting the existing noise situation. In addition, the Government already expects the noise-designated airports (Heathrow, Gatwick and Stansted) to produce noise exposure maps on an annual basis.

5.48 The International Civil Aviation Organisation introduced the concept of a 'Balanced Approach' to noise management (resolution A33/7). This is given legal effect in the UK through EU Regulation 598/2014.[150]

5.49 The Airports Commission undertook a thorough assessment of the noise impacts of the proposed development. The Airports Commission used a "noise scorecard" to assess the noise impacts of the scheme in 2030, 2040 and 2050.[151] The noise scorecard included both conventional metrics, which assess noise levels over a period of time (daytime, night time and 24-hour), and more innovative metrics that assess the number of times a location is overflown by aircraft whose noise impacts exceed a specified level.

5.50 The Airports Commission's assessment was based on 'indicative' flight path designs, which the Government considers to be a reasonable approach at this stage in the process. Precise flight path designs can only be defined at a later stage after detailed airspace design work has taken place. This work will need to consider the various options available to ensure a safe and efficient airspace which also mitigates the level of noise disturbance. Once the design work has been completed, the airspace proposal will be subject to extensive consultation as part of the separate airspace decision making process established by the Civil Aviation Authority.

5.51 The Airports Commission concluded that "expansion at Heathrow must be taken forward with a firm guarantee that the airport and its airlines will be held to the very highest standards of noise performance". In addition, the Airports Commission stated that "the airport should not be allowed to expand without appropriate conditions being put in place in respect of its noise impacts".[152]

Applicant's assessment

5.52 Pursuant to the terms of the Environmental Impact Assessment Regulations,[153] the applicant should undertake a noise assessment for any period of change in air traffic movements prior to opening, for the time of opening, and at the time the airport is forecast to reach full capacity, and (if applicable, being different to either of the other assessment periods) at a point when the airport's noise impact is forecast to be highest. This should form part of the environmental statement. The noise assessment should include the following:

- A description of the noise sources;
- An assessment of the likely significant effect of predicted changes in the noise environment on any noise sensitive premises (including schools and hospitals) and noise sensitive areas (including National Parks and Areas of Outstanding Natural Beauty);
- The characteristics of the existing noise environment, including noise from aircraft, using noise exposure maps, and from surface transport and ground operations

[150] Regulation (EU) No 598/2014 of the European Parliament and of the Council on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC
[151] *Airports Commission: Final Report*, p170-171
[152] *Airports Commission: Final Report*, p276
[153] Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (S.I. 2017/572)

associated with the project, the latter during both the construction and operational phases of the project;

- A prediction on how the noise environment will change with the proposed project; and
- Measures to be employed in mitigating the effects of noise.

These should take into account construction and operational noise (including from surface access arrangements) and aircraft noise. The applicant's assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design. This may involve the use of appropriate design parameters and scenarios based on indicative flightpaths.

5.53 Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. For the prediction, assessment and management of construction noise, reference should be made to any British Standards and other guidance which give examples of mitigation strategies. In assessing the likely significant impacts of aircraft noise, the applicant should have regard to the noise assessment principles, including noise metrics, set out in the national policy on airspace.

Mitigation

5.54 Noise management at airports where a noise problem has been identified is subject to the concept of a 'Balanced Approach', referred to above. EU Regulation 598/2014, which adopts the Balanced Approach,[154] also lays down a procedure for the adoption of noise-related operating restrictions, in particular a requirement for prior consultation.

5.55 The Government recognises that aircraft noise is a significant concern to communities affected and that, as a result of additional runway capacity, noise- related action will need to be taken. Such action should strike a fair balance between the negative impacts of noise and positive impacts of flights.

5.56 The Government also recognises that predictable periods of relief from aircraft noise (known as respite) are important for communities affected, and that noise at night is widely regarded as the least acceptable aspect of aviation noise for those communities, with the costs on communities of aircraft noise during the night (particularly the health costs associated with sleep disturbance) being higher.

5.57 While the package and detail of noise mitigation measures should be subject to consultation with local communities and other stakeholders to ensure the most appropriate and effective measures are taken forward, in the context of Government policy on sustainable development, the Government expects the applicant to make particular efforts to avoid significant adverse noise impacts and mitigate other adverse noise impacts as a result of the Northwest Runway scheme and Heathrow Airport as a whole.

5.58 The Secretary of State will consider whether the mitigation measures put forward by the applicant following consultation are acceptable. The noise mitigation measures should ensure the impact of aircraft noise is limited and, where possible, reduced compared to the 2013 baseline assessed by the Airports Commission.[155]

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[154] For the purposes of EU Regulation 598/2014, an airport means an airport which has more than 50,000 civil aircraft movements per calendar year (a movement being a take-off or landing), on the basis of the average number of movements in the last three calendar years before the noise assessment

[155] With reference to the 2013 baseline for the 54 decibel LAeq, 16h noise contour assessed by the Airports Commission. LAeq,16h indicates the annual average noise levels for the 16-hour period between 0700 – 2300

5.59 The applicant should specifically seek to deliver the mitigation measures set out in paragraphs 5.60-5.62 below.

5.60 The applicant should put forward plans for a noise envelope. Such an envelope should be tailored to local priorities and include clear noise performance targets. As such, the design of the envelope should be defined in consultation with local communities and relevant stakeholders, and take account of any independent guidance such as from the Independent Commission on Civil Aviation Noise. The benefits of future technological improvements should be shared between the applicant and its local communities, hence helping to achieve a balance between growth and noise reduction. Suitable review periods should be set in consultation with the parties mentioned above to ensure the noise envelope's framework remains relevant.

5.61 The applicant should put forward plans for a runway alternation scheme that provides communities affected with predictable periods of respite (though the Government acknowledges that the duration of periods of respite that currently apply will be reduced). Predictability should be afforded to the extent that this is within the airport operator's control.[156] The details of any such scheme, including timings, duration and scheduling, should be defined in consultation with local communities and relevant stakeholders, and take account of any independent guidance such as from the Independent Commission on Civil Aviation Noise.

5.62 The Government also expects a ban on scheduled night flights for a period of six and a half hours, between the hours of 11pm and 7am, to be implemented.[157] The rules around its operation, including the exact timings of such a ban, should be defined in consultation with local communities and relevant stakeholders, in line with EU Regulation 598/2014. In addition, outside the hours of a ban, the Government expects the applicant to make particular efforts to incentivise the use of the quietest aircraft at night.

5.63 It is recognised that Heathrow Airport already supports a number of initiatives to mitigate aircraft noise, such as developing quieter operating procedures (like steeper descent approaches) and keeping landing gear up as long as possible. The applicant is expected to continue to do so, and to explore all opportunities to mitigate operational noise in line with best practice. The implementation of such measures may require working with partners to support their delivery.

5.64 Noise mitigation measures at the construction stage should also be provided. These should draw on best practice from other major construction schemes, with due regard given to any relevant British Standards and other guidance, and should be taken into account during the procurement of contractors.

5.65 Other measures to mitigate noise during the construction and operation of the development may include one or more of the following:

- Reducing noise at point of generation and containment of noise generated;
- Where possible, optimising the distance between source and noise-sensitive receptors, and incorporating good design to minimise noise transmission through screening by natural barriers or other buildings; and
- Restricting activities allowed on the site.

5.66 The Secretary of State will expect the applicant to put forward proposals as to how these measures may be secured and enforced, including the bodies who may enforce

[156] Examples of circumstances outside of an airport operator's control might be severe weather disruption and similar events
[157] 11pm to 7am is the standard night period used in noise measurement, and is used in World Health Organisation guidelines and the Environmental Noise Directive

the measures. These bodies might include the Secretary of State, local authorities (including those over a wider area), and / or the Civil Aviation Authority.

Decision making

5.67 The proposed development must be undertaken in accordance with statutory obligations for noise.[158] Due regard must have been given to national policy on aviation noise, and the relevant sections of the Noise Policy Statement for England,[159] the National Planning Policy Framework,[160] and the Government's associated planning guidance on noise.[161] However, the Airports NPS must be used as the primary policy on noise when considering the Heathrow Northwest Runway scheme, and has primacy over other wider noise policy sources.

5.68 Development consent should not be granted unless the Secretary of State is satisfied that the proposals will meet the following aims for the effective management and control of noise, within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life from noise;
- Mitigate and minimise adverse impacts on health and quality of life from noise; and
- Where possible, contribute to improvements to health and quality of life.

Carbon emissions

Introduction

5.69 The Planning Act 2008 requires that a national policy statement must give reasons for the policy set out in the statement and an explanation of how the policy set out in the statement takes account of Government policy relating to the mitigation of, and adaptation to, climate change.[162] The Government has a number of international and domestic obligations to limit carbon emissions. Emissions from both the construction and operational phases of the project will be relevant to meeting these obligations.

5.70 The Government's key objective on aviation emissions, as outlined in the Aviation Policy Framework, is to ensure that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions.[163] This must be achieved while minimising the risk of putting UK businesses at a competitive international disadvantage. The development of the Heathrow Northwest Runway scheme being considered under the Airports NPS does not override this objective.

5.71 The UK's obligations on greenhouse gas emissions are set under the 2008 Climate Change Act. Under this framework, the UK has a 2050 target to reduce its greenhouse gas emissions by at least 80% on 1990 levels, and has a series of five year carbon budgets on the way to 2050.

Coverage of aviation emissions under the UK's Climate Change Act

5.72 Whilst UK domestic aviation emissions are included in the 2050 target, international aviation emissions are not currently formally included within the UK's 'net carbon account' for greenhouse gas emissions and are therefore not included in the 2050 target as defined by the Climate Change Act, nor within the first five carbon budgets. The Climate Change Act says that the Government must "take into account" the

[158] EU Regulation 598/2014; The Environmental Noise (England) Regulations 2006
[159] Noise policy statement for England, March 2010, https://www.gov.uk/government/publications/noise-policy-statement-for-england
[160] National Planning Policy Framework, March 2012, paragraph 123, or any successor document
[161] https://www.gov.uk/guidance/noise--2
[162] Planning Act 2008, section 5(8)
[163] *Aviation Policy Framework*, paragraph 12

"estimated amount of reportable emissions from international aviation for the budgetary period or periods in question" when setting carbon budgets. The Committee on Climate Change has interpreted the requirement to take these emissions into account as requiring the UK to aim to meet a 2050 target which includes these emissions, and has made its recommendations for the levels of the existing carbon budgets on this basis.

5.73 The Government has accepted the Committee on Climate Change's recommendations on the first five carbon budgets. The fifth carbon budget, for the period 2028-2032, was set in July 2016 in line with the Committee on Climate Change's advice. In effect, this means that carbon budgets for other sectors of the UK economy have been set at a level which the Committee on Climate Change considers is consistent with meeting the overall 2050 target when international aviation emissions are included.

Impacts

5.74 The carbon impact of the proposed development falls into four areas: increased emissions from air transport movements (both international and domestic) as a result of increased demand, emissions from airport buildings and ground operations, emissions from surface transport accessing the expanded airport, and emissions caused by construction. The first is by far the largest of these impacts.

5.75 The Airports Commission used two sets of carbon scenarios: one in which a cap is imposed on UK aviation emissions in line with the Committee on Climate Change's planning assumption of 37.5 million tonnes of CO_2 in 2050; and another in which an international trading mechanism allows carbon emissions from aviation to be offset by paying for emissions reductions in other sectors of the global economy. The analysis also assumed certain carbon-limiting developments largely outside the applicant's control. These include growth in numbers of more fuel-efficient aircraft, increasing use of biofuels, and other airline operational measures.

Applicant's assessment

5.76 Pursuant to the terms of the Environmental Impact Assessment Regulations,[164] the applicant should undertake an assessment of the project as part of the environmental statement, to include an assessment of any likely significant climate factors. The applicant should provide evidence of the carbon impact of the project (including embodied carbon), both from construction and operation, such that it can be assessed against the Government's carbon obligations, including but not limited to carbon budgets. The applicant should quantify the greenhouse gas impacts before and after mitigation to show the impacts of the proposed mitigation. This will require emissions to be split into traded sector and non-traded sector emissions, and for a distinction to be made between international and domestic aviation emissions.

5.77 As far as possible, the applicant's assessment should also seek to quantify impacts including:

- Emissions from surface access due to airport and construction staff;
- Emissions from surface access due to freight and retail operations and construction site traffic.
- Emissions from surface access due to airport passengers / visitors; and
- Emissions from airport operations including energy and fuel use.

[164] Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (S.I. 2017/572). Regulation 5(2)(c) refers to the significant effects of the proposed development on, among other factors, climate.

This should be undertaken in both a 'do minimum' and also in the 'do something' scenario for the opening, peak operation, and worst case scenarios.

Mitigation

5.78 The Secretary of State will need to be satisfied that the mitigation measures put forward by the applicant are acceptable, including at the construction stage. A management / project plan may help clarify and secure mitigation at this stage. The applicant is expected to take measures to limit the carbon impact of the project, which may include, but are not limited to:

- Zero or low-emission hybrid or electric vehicle use (ultra-low emission vehicles), charging and fuel facilities;
- Reduced engine taxiing (improved taxiing efficiency);
- Reducing emissions from aircraft at the gate;
- Reduced emissions from airport buildings (for example from lower carbon heating);
- Changes to the layout of surface access arrangements; and
- Encouraging increased use of public transport by staff and passengers.

5.79 Aircraft are expected to become cleaner as technology and standards improve and fleets evolve. It is recognised that the applicant already supports a number of initiatives to reduce the carbon emissions from flights, such as reduced-engine taxiing and ground-towing, and airspace and navigational reform.

5.80 Mitigation measures at the construction stage should also be provided and draw on best practice from other major construction schemes, including during the procurement of contractors. Specific measures could include but are not limited to:

- Development of a construction traffic management plan (which may include the possible use of rail and consolidation sites);
- Transport of materials to site by alternative modes to road (for example by rail or water);
- Increased efficiency in use of construction plant;
- Use of energy efficient site accommodation;
- Reduction of waste, and the transport of waste;
- Construction site connection to grid electricity to avoid use of mobile generation;
- Selection of construction material to utilise low carbon options; and
- Selection of construction material to minimise distance of transport.

5.81 The implementation of mitigation measures may require working with partners to support their delivery.

Decision making

5.82 Any increase in carbon emissions alone is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the project is so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets.

5.83 Evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) in both design and construction should be presented as part of any application for development consent. The Secretary of

State will consider the effectiveness of such mitigation measures in order to ensure that, in relation to design and construction, the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures relating to design, construction and operational phases will be a material factor in the decision making process.

Biodiversity and ecological conservation

Introduction

5.84 Biodiversity is the variety of plant and animal life in the world or in a particular habitat, and encompasses all species of plants and animals and the complex ecosystems of which they are a part. Government policy for the natural environment, including on biodiversity, is set out in the *Natural Environment White Paper*.[165] The biodiversity section in the *Natural Environment White Paper* sets out a vision of moving progressively from new biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and establishing more coherent ecological networks that are more resilient to current and future pressures. It is also a requirement of the Water Framework Directive to protect and enhance biodiversity associated with the water environment. Geological conservation relates to the sites that are designated for their geology and / or geomorphological importance.[166]

5.85 The Government's biodiversity strategy is set out in *Biodiversity 2020: A Strategy for England's wildlife and ecosystem services*.[167] Its aim is to halt overall biodiversity loss, support healthy, well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people. The contribution that the planning system should make to enhancing the local and natural environment, including establishing coherent ecological networks, is set out in the National Planning Policy Framework, to which the applicant should also refer.[168]

5.86 The National Planning Policy Framework states that pursuing sustainable development involves seeking positive improvements in the quality of the built, natural and historic environment, as well as in people's quality of life. This includes moving from a net loss of biodiversity to achieving net gains for nature.[169]

5.87 The wide range of legislative provisions at the international and national level that can impact on planning decisions affecting biodiversity and ecological conservation is set out in the Planning Practice Guidance on biodiversity and ecosystems.[170] This includes a description of the potential impacts on internationally, nationally and locally protected sites which may arise through development, and should therefore be considered through further assessment.

5.88 Airport development may require the netting of open watercourses to manage the risk of bird strike, which may have a detrimental impact on water environment and biodiversity.

Applicant's assessment

5.89 The applicant should ensure that the environmental statement submitted with its application for development consent clearly sets out any likely significant effects on

[165] https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature
[166] A list of designated sites is included in the Geological Conservation Review held by the Joint Nature Conservation Committee
[167] https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services
[168] National Planning Policy Framework, March 2012, paragraph 109, or any successor document
[169] National Planning Policy Framework, March 2012, paragraph 9, or any successor document
[170] http://planningguidance.communities.gov.uk/blog/guidance/natural-environment/biodiversity-ecosystems-and-green-infrastructure/

internationally, nationally and locally designated sites of ecological or geological importance, protected species, and habitats and other species identified as being of principal importance for the conservation of biodiversity.

5.90 The Environmental Impact Assessment should reflect the principles of *Biodiversity 2020* and identify how the effects on the natural environment will be influenced by climate change, and how ecological networks and their physical and biological process will be maintained.

5.91 The applicant should show how the project has taken advantage of and maximised opportunities to conserve biodiversity and geological conservation interests.

Mitigation

5.92 The Secretary of State will consider what requirements should be attached to any consent and / or in any planning obligations entered into in order to ensure that mitigation measures are delivered and monitored for their effectiveness.

5.93 The Secretary of State will take account of any mitigation measures agreed between the applicant and Natural England, and whether Natural England has granted or refused, or intends to grant or refuse, any relevant licences, including protected species mitigation licences.

5.94 The applicant's proposal should address the mitigation hierarchy (which supports efforts to conserve and enhance biodiversity), which is set out in the National Planning Policy Framework.[171]

5.95 Compensation ratios relating to the effects of the preferred scheme should be considered in more detail during the design. The application of 2:1 compensation ratio is considered to represent the minimum requirement. However, there are other mechanisms for establishing compensation ratios, such as Defra's biodiversity offsetting metric. Equally, it is important to note that habitat ratios form only one part of potential compensation which should be considered, and the location and quality of any compensation land is of key importance. In this regard, habitat creation, where required, should be focused on areas where the most ecological and ecosystems services benefits can be realised.

Decision making

5.96 As a general principle, and subject to the specific policies set out below and the Infrastructure Planning (Decisions) Regulations 2010,[172] development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated.[173] Where significant harm cannot be avoided or mitigated, as a last resort appropriate compensation measures should be sought. The development consent order, or any associated planning obligations, will need to make provision for the long term management of such measures.

5.97 In taking decisions, the Secretary of State will ensure that appropriate weight is attached to designated sites of international, national and local importance, protected

[171] National Planning Policy Framework, March 2012, paragraph 118, or any successor document
[172] http://www.legislation.gov.uk/uksi/2010/305/regulation/7/made
[173] https://www.gov.uk/government/collections/biodiversity-offsetting Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for residual adverse biodiversity impacts arising from a development after mitigating measures have been taken. The goal of biodiversity offsets is to achieve no net loss and, preferably, a net gain of biodiversity

species, habitats and other species of principal importance for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment.

International sites

5.98 The most important sites for biodiversity are those identified through international conventions and European Directives. The Habitats Regulations provide statutory protection for European sites and require an assessment of impacts upon such sites.[174] The Government considers that the following wildlife sites should have the same protection as European sites:

- Potential Special Protection Areas and possible Special Areas of Conservation;
- Listed or proposed Ramsar sites;[175] and
- Sites identified or required as compensatory measures for adverse effects on European sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites.

5.99 At this stage, it is not possible to rule out adverse effects of the Heathrow Northwest Runway scheme, given that more detailed project design information, and detailed proposals for mitigation, are not presently available. However, the applicant will need to demonstrate that Article 6(3) or 6(4) of the Habitats Directive are complied with in order to satisfy the competent authority that development consent can be granted on that basis.

Sites of Special Scientific Interest

5.100 Many Sites of Special Scientific Interest are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of Sites of Special Scientific Interest that are not covered by an international designation, will be given a high degree of protection. All National Nature Reserves are notified as Sites of Special Scientific Interest.

5.101 Where a proposed development on land within or outside a Site of Special Scientific Interest is likely to have an adverse effect on the site (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest. The Secretary of State will ensure that the applicant's proposals to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest, are acceptable. Where necessary, requirements and / or planning obligations should be used to ensure these proposals are delivered.

Regional and local sites

5.102 Sites of regional and local biodiversity interest (which include Local Nature Reserves, Local Wildlife Sites and Nature Improvement Areas) have a fundamental role to play in meeting overall national biodiversity targets, contributing to the quality of life and the wellbeing of the community, and supporting research and education. The Secretary of State will give due consideration to such regional or local designations. However,

[174] This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in Regulation 8 of the Conservation of Habitats and Species Regulations 2010

[175] Potential Special Protection Areas, possible Special Areas of Conservation and proposed Ramsar sites are sites on which Government has initiated public consultation on the scientific case for designation as a Special Protection Area, candidate Special Area of Conservation or Ramsar site

given the need for new infrastructure, these designations should not be used in themselves to refuse development consent, although adequate compensation should always be considered, and ecological corridors and their physical processes should be maintained as a priority to mitigate widespread impacts.

Irreplaceable habitats including ancient woodland and veteran trees

5.103 Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost, it cannot be recreated. The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided.[176] Where such trees would be affected by development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons for this.

Biodiversity within and around developments

5.104 The proposed development comprised in the preferred scheme should provide many opportunities for building in beneficial biodiversity as part of good design. When considering proposals, the Secretary of State will consider whether the applicant has maximised such opportunities in and around developments, and particularly to establishing and enhancing green infrastructure. The Secretary of State may use requirements or planning obligations where appropriate in order to ensure that such beneficial features are delivered.

Protection of other habitats and species

5.105 In addition to the habitats and species that are subject to statutory protection or international, regional or local designation, other habitats and species have been identified as being of principal importance for the conservation of biodiversity in England and Wales and therefore requiring conservation action. The Secretary of State will ensure that the applicant has taken measures to ensure that these other habitats and species are protected from the adverse effects of development. Where appropriate, requirements or planning obligations may be used in order to deliver this protection. The Secretary of State will refuse consent where harm to these other habitats, or species and their habitats, would result, unless the benefits of the development (including need) clearly outweigh that harm. In such cases, compensation will generally be expected to be included in the design proposals.

Land use including open space, green infrastructure and Green Belt

Introduction

5.106 Access to high quality open spaces and the countryside[177] and opportunities for sport and recreation can be a means of providing necessary mitigation and / or compensation requirements. Green infrastructure can enable developments to provide positive environmental and economic benefits.

[176] This does not prevent the loss of such trees where the decision maker is satisfied that their loss is unavoidable

[177] All open space of public value, including not just land but also areas of water (such as rivers, canals, lakes and reservoirs) which offer important opportunities for sport and recreation and can act as a visual amenity

5.107 Green Belts, defined in a development plan,[178] are situated around certain cities and built up areas, including London. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open. The essential characteristics of Green Belts are their openness and their permanence. Further information on the purposes and protection of Green Belt is set out in the National Planning Policy Framework.[179]

5.108 Best and most versatile agricultural land is land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals. The National Planning Policy Framework sets out how local planning authorities should take into account the economic and other benefits of best and most versatile agricultural land.[180] Planning practice guidance for the natural environment provides additional guidance on best and most versatile agricultural land and soil issues.

5.109 Development of land will affect soil resources, including physical loss of and damage to soil resources, through land contamination and structural damage. Indirect impacts may also arise from changes in the local water regime, organic matter content, soil biodiversity and soil process.

5.110 Construction and operation of airport facilities is a potential source of contaminative substances (for example, through de-icing or leaks and spills of fuel). Where pre-existing land contamination is being considered through development, the objective is to ensure that the site is suitable for its intended use. Risks would require consideration in accordance with the contaminated land statutory guidance as a minimum.[181]

Applicant's assessment

5.111 The applicant should identify existing and proposed land uses[182] near the project, including any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing. The applicant should also assess any effects of precluding a new development or use proposed in the development plan. The assessment should be proportionate to the scale of the preferred scheme and its likely impacts on such receptors.

5.112 Existing open space, sports and recreational buildings and land should not be developed unless the land is no longer needed or the loss would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location. If the applicant is considering proposals which would involve developing such land, it should have regard to any local authority's assessment of need for such types of land and buildings.

5.113 During any pre-application discussions with the applicant, the local planning authority should identify any concerns it has about the impacts of the application on land use, having regard to the development plan and relevant applications and including, where relevant, whether it agrees with any independent assessment that the land is no longer needed. These are also matters that local authorities may wish to include in their Local Impact Report which can be submitted after an application for development consent has been accepted.

[178] Or else so designated under the Green Belt (London and Home Counties) Act 1938
[179] National Planning Policy Framework, March 2012, paragraphs 79-92, or any successor document
[180] National Planning Policy Framework, March 2012, paragraph 112, or any successor document
[181] https://www.gov.uk/government/publications/contaminated-land-statutory-guidance
[182] For example, where a planning application has been submitted

5.114 The general policies controlling development in the countryside apply with equal force in Green Belts but there is, in addition, a general presumption against inappropriate development within them. Such development should not be approved except in very special circumstances which are already the subject of Government guidance.[183] The applicant should therefore determine whether the proposal, or any part of it, is within an established Green Belt and, if so, whether its proposal may be considered inappropriate development within the meaning of Green Belt policy. Metropolitan Open Land and land designated a Local Green Space in a local or neighbourhood plan are subject to the same policies of protection as Green Belt, and inappropriate development should not be approved except in very special circumstances.

5.115 The applicant should take into account the economic and other benefits of best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, the applicant should seek to use areas of poorer quality land in preference to that of a higher quality. The applicant should also identify any effects, and seek to minimise impacts, on soil quality, taking into account any mitigation measures proposed.

5.116 For developments where land may be affected by contamination, or existing mitigation is in place in respect of historic contamination, the applicant should have regard to the statutory regime contained in Part IIA of the Environmental Protection Act 1990 and relevant Government guidance relating to or dealing with contaminated land.[184]

5.117 The applicant should safeguard any mineral resources on the proposed site for the preferred scheme as far as possible.

Mitigation

5.118 The applicant can minimise the direct effects of a project on the existing use of the proposed site, or proposed uses near the site, by the application of good design principles, including the layout of the project and the protection of soils during construction.[185]

5.119 Where green infrastructure is affected, the applicant should aim to ensure the functionality and connectivity of the green infrastructure network is maintained and any necessary works are undertaken, where possible, to mitigate any adverse impact and, where appropriate, to improve that network and other areas of open space, including appropriate access to National Trails and other public rights of way.

5.120 The Secretary of State must also consider whether mitigation of any adverse effects on green infrastructure or open space is adequately provided for by means of requirements, planning obligations, or any other means, for example to provide exchange land and provide for appropriate management and maintenance agreements. Any exchange land should be at least as good in terms of size, usefulness, attractiveness, quality and accessibility. Alternatively, where sections 131 and 132 of the Planning Act 2008 apply,[186] any replacement land provided under those sections will need to conform to the requirements of those sections.

5.121 Where the preferred scheme has an impact on a mineral safeguarding area, the Secretary of State must ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources.

[183] https://www.gov.uk/guidance/housing-and-economic-land-availability-assessment#paragraph_044
[184] https://www.gov.uk/government/collections/land-contamination-technical-guidance
[185] https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites
[186] http://www.legislation.gov.uk/ukpga/2008/29/section/131 and http://www.legislation.gov.uk/ukpga/2008/29/section/132

5.122 Where a project has a sterilising effect on land use, there may be scope for this to be mitigated through, for example, using the land for nature conservation or wildlife corridors.

5.123 Public rights of way, National Trails and other rights of access to land are important recreational facilities for walkers, cyclists and equestrians. The applicant is expected to take appropriate mitigation measures to address adverse effects on National Trails, other public rights of way and open access land and, where appropriate, to consider what opportunities there may be to improve access. In considering revisions to an existing right of way, consideration needs to be given to the use, character, attractiveness and convenience of the right of way. The Secretary of State should consider whether the mitigation measures put forward by an applicant are acceptable and whether requirements or other provisions in respect of these measures might be attached to any grant of development consent.

Decision making

5.124 The Secretary of State should not grant consent for development on existing open space, sports and recreational buildings and land, including playing fields, unless an assessment has been undertaken either by the local authority or independently, which has shown the open space or the buildings and land to be no longer needed, or the Secretary of State determines that the benefits of the project (including need) outweigh the potential loss of such facilities, taking into account any positive proposals made by the applicant to provide new, improved or compensatory land or facilities.

5.125 Where networks of green infrastructure have been identified in development plans, they should normally be protected from development and, where, possible, strengthened by or integrated within it. The Secretary of State will also have regard to the effect of the development upon and resulting from existing land contamination, as well as the mitigation proposed.

5.126 The Secretary of State will take into account the economic and other benefits of the best and most versatile agricultural land, and ensure the applicant has put forward appropriate mitigation measures to minimise impacts on soils or soil resources.

5.127 When located in the Green Belt, projects may comprise inappropriate development. Inappropriate development is by definition harmful to the Green Belt and there is a presumption against it except in very special circumstances. The Secretary of State will need to assess whether there are very special circumstances to justify inappropriate development. Very special circumstances will not exist unless the potential harm to the Green Belt by reason of inappropriateness, and any other harm, is clearly outweighed by other considerations. In view of the presumption against inappropriate development, the Secretary of State will attach substantial weight to the harm to the Green Belt, when considering any application for such development. In exchange for, or so as to ensure the reprovision of, lost Green Belt land,[187] the Secretary of State may require the provision of other land by the applicant, to be declared as Green Belt under the Green Belt (London and the Home Counties) Act 1938. The provision of such land should be in accordance with the National Planning Policy Framework or any successor document, and take into account relevant development plan policies.

[187] The term "Green Belt land" refers to land designated as Green Belt land under a local development plan and/or land declared as Green Belt under the 1938 Act.

Home Office assets

Introduction

5.128 There are two Immigration Removal Centres (IRCs) to the north-west of Heathrow Airport, run as one facility, within the land shown inside the red line on the scheme boundary map (at Annex A). Detention at immigration removal centres plays a vital role as part of the infrastructure which allows the Government to maintain effective immigration control and secure the UK's borders. The IRCs are Harmondsworth IRC and the Colnbrook IRC.

5.129 Continuous service provision of the IRCs at Heathrow is necessary. This consideration extends to the need to provide appropriate road access to the IRCs.

Assessment

5.130 The applicant should show how it has considered the impacts of the project upon the existing IRCs. This should include the process in identifying alternative means of addressing the impact of the project on the IRCs, including the means by which they will be reprovided.

5.131 The applicant should discuss the provision to be made in substitution for the existing IRCs with the Home Office and any local authority whose area is likely to be affected by a replacement facility.

5.132 The applicant's assessment should also set out how a replacement IRC would function in relation to neighbouring land uses, as well as how it can best be accommodated without adversely affecting such uses. These are also matters which local authorities may wish to address in their local impact report, which can be submitted after an application for development consent has been submitted.

Decision making

5.133 The Secretary of State considers that replacement facilities in substitution for the affected IRCs should be provided prior to any works which may significantly interfere with the service and facilities provided by the existing IRCs. The Secretary of State will consider whether the applicant has taken all reasonable steps to mitigate impacts of the project on the existing IRCs. Where necessary, the Secretary of State will impose requirements or obligations upon the applicant to deliver suitable replacement facilities.

5.134 Provided that the applicant is willing to commit to appropriate provision of such facilities on a continuous service basis and with constant road access, and to mitigate the effect of the project on the existing and replacement IRCs, development consent should not be withheld on the grounds of its effects on the existing IRCs.

Resource and waste management

Introduction

5.135 Government policy on hazardous and non-hazardous waste is intended to protect human health and the environment by producing less waste and by using it as a resource wherever possible. Where this is not possible, waste management regulation ensures that waste is disposed of in a way that is least damaging to the environment and to human health.

5.136 Sustainable waste management is implemented through the waste hierarchy:

- Waste prevention;
- Preparing for reuse;
- Recycling;
- Other recovery, including energy recovery; and
- Disposal.

5.137 The targets for preparation for re-use and recycling of municipal waste (50%), and for construction and demolition waste (70%) set out by the Waste Framework Directive (2008/98/EC)[188] should be considered 'minimum acceptable practice' for the construction and operation of any new airport infrastructure. Exceeding these targets if possible by aiming for exemplar performance in resource efficiency and waste management is recommended, to align with the principles of the EU Action Plan for the Circular Economy.[189]

5.138 Large airport infrastructure projects may generate hazardous and non-hazardous waste during construction and operation. The Environment Agency's environmental permitting regime incorporates operational waste management controls for certain activities. When the applicant applies to the Environment Agency for an environmental permit, the Environment Agency will require the application to demonstrate that processes are in place to meet all relevant conditions.

5.139 In addition, the Heathrow Northwest Runway scheme would involve the removal of the Lakeside energy from waste plant.

5.140 Waste generated and sent to landfill during construction and operation will be an ongoing management issue, and will continue to have adverse effects on the environment into and beyond the operational phase. The principal adverse effects of sending waste to landfill include:

- Permanent loss of materials from potential use higher up the waste management hierarchy;
- Reduction of local and regional landfill capacity;
- Visual, noise, health and other nuisance impacts on local communities;
- Environmental degradation and pollution;
- Greenhouse gas emissions; and
- Environmental implications of transporting waste to landfill sites.

Applicant's assessment

5.141 The applicant should set out the arrangements that are proposed for managing any waste produced in the application for development consent. The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to minimise the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental, social and economic outcome when considered over the whole lifetime of the project.

5.142 The effects of removing the Lakeside energy from waste plant upon capacity for treatment of waste will require assessment.

[188] http://ec.europa.eu/environment/waste/framework/
[189] http://ec.europa.eu/environment/circular-economy/index_en.htm

Mitigation

5.143 The applicant should set out a comprehensive suite of mitigations to eliminate or significantly reduce the risk of adverse impacts associated with resource and waste management.

5.144 The Government recognises the role of the Lakeside Energy from Waste plant in local waste management plans. The applicant should make reasonable endeavours to ensure that sufficient provision is made to address the reduction in waste treatment capacity caused by the loss of the Lakeside Energy from Waste plant.

Decision making

5.145 The Secretary of State will consider the extent to which the applicant has proposed an effective process that will be followed to ensure effective management of hazardous and non-hazardous waste arising from all stages of the lifetime of the development. The Secretary of State should be satisfied that the process set out provides assurance that:

- Waste produced will be properly managed, both onsite and offsite;
- The waste from the proposed development can be dealt with appropriately by the waste infrastructure which is, or is likely to be, available. Such waste arising should not have an adverse effect on the capacity of existing waste management facilities to deal with other waste arising in the area; and
- Adequate steps have been taken to ensure that all waste arising from the site is subject to the principles of the waste hierarchy[190] and are dealt with at the highest possible level within the hierarchy.

5.146 Where necessary, the Secretary of State will require the applicant to develop a resource management plan to ensure that appropriate measures for sustainable resource and waste management are secured.

Flood risk

Introduction

5.147 Climate change over future decades is likely to result in milder, wetter winters and hotter, drier summers in the UK, while sea levels will continue to rise. Within the lifetime of the proposed development, these factors will lead to increased flood risk in areas susceptible to flooding, and to an increased risk of flooding in some areas not currently thought of as being at risk. In addition to increasing flood risk, longer term climate change will result in changes to weather-related disruption, most often caused by wind, rain, snow and ice. The applicant, the Examining Authority and the Secretary of State in taking decisions should take account of the policy on climate change adaptation as set out in the National Planning Policy Framework[191] and other supporting guidance.[192]

5.148 The National Planning Policy Framework sets out that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk.[193] But where development is necessary, it should be made safe without

[190] Article 4 of the revised EU Waste Framework Directive (Directive 2008/98/EC) sets out the 'waste hierarchy' with five steps for dealing with waste, ranked according to environmental impact
[191] National Planning Policy Framework, March 2012, paragraph 99, or any successor document
[192] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances and https://www.gov.uk/government/publications/adapting-to-climate-change-for-risk-management-authorities
[193] National Planning Policy Framework, March 2012, paragraphs 100-104, or any successor document

increasing flood risk elsewhere. Supporting guidance[194] explains that essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk is permissible in areas of high flood risk, subject to the Exception Test. In addition, as set out in the National Planning Policy Framework, new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change.[195]

5.149 Loss of flood plain storage may increase the overall flood risk for the catchment. The extent of any impact will depend on the ability of the development to manage storage of water on or off-site.

5.150 There is the potential for airport expansion to result in increased risk from climate change effects, particularly to increased surface water runoff rate and pressure on potable water supply. There may also be effects on groundwater.

5.151 Where the Airports NPS mentions the UK Climate Change Risk Assessment, the reader should refer to the most recent version of the document.

Applicant's assessment

5.152 Applications for projects in the following locations should be accompanied by a flood risk assessment:

- Flood Zones 2 and 3 (medium and high probability of river and sea flooding);
- Flood Zone 1 (low probability of river and sea flooding) for projects of 1 hectare or greater, or projects which may be subject to other sources of flooding (local watercourses, surface water, groundwater or reservoirs), or where the Environment Agency has notified the local planning authority that there are critical drainage problems.

5.153 The applicant should identify and assess the risks of all forms of flooding to and from the preferred scheme, and demonstrate how these flood risks will be managed, taking climate change into account.[196]

5.154 In preparing a flood risk assessment the applicant should:

- Consider the risk of all forms of flooding arising from the development comprised in the preferred scheme, in addition to the risk of flooding to the project, and demonstrate how these risks will be managed and, where relevant, mitigated, so that the development remains safe throughout its lifetime;[197]
- Take into account the impacts of climate change, clearly stating the development lifetime over which the assessment has been made;
- Consider the need for safe access and exit arrangements;
- Include the assessment of residual risk after risk reduction measures have been taken into account, and demonstrate that this is acceptable for the development;
- Consider if there is a need to remain operational during a worst case flood event over the preferred scheme's lifetime; and
- Provide evidence for the Secretary of State to apply the Sequential Test and Exception Test,[198] as appropriate.

[194] http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/
[195] National Planning Policy Framework, March 2012, paragraph 99, or any successor document
[196] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications
[197] Updated flood maps are available on the Environment Agency's website
[198] National Planning Policy Framework, March 2012, paragraphs 100-104, or any successor document

5.155 Where the preferred scheme may be affected by, or may add to, flood risk, the applicant is advised to seek early pre-application discussions with the Environment Agency, and, where relevant, other flood risk management bodies such as lead local flood authorities, Internal Drainage Boards, sewerage undertakers, highways authorities and reservoir owners and operators. These discussions can be used to identify the likelihood and possible extent and nature of the flood risk, help scope the flood risk assessment, and identify the information that may be required by the Secretary of State to reach a decision on the application. If the Environment Agency has concerns about proposals on flood risk grounds, the applicant is encouraged to discuss these concerns at a sufficiently early stage with the Environment Agency and explore ways in which the proposal might be amended, or additional information provided, which would satisfy the Environment Agency's concerns, before the application for development consent is submitted.

5.156 For local flood risk (surface water, groundwater and ordinary watercourse flooding), local flood risk management strategies and surface water management plans provide useful sources of information for consideration in a flood risk assessment. Surface water flood issues need to be understood to allow them to be taken into account, for example by clearly identifying and managing flow routes.

5.157 When assessing the potential impacts of climate change on airports which can be wider than flooding impacts, such as implications from heat and water availability and the potential adaptation strategies for them, the applicant should take into account the latest UK Climate Change Risk Assessment, the latest set of UK Climate Projections, and other relevant sources of climate change evidence.

Mitigation

5.158 The applicant should ensure that the preferred scheme design takes into account flood risk, and should put forward measures to mitigate the impact of flooding.

5.159 Mitigation measures will need to be developed as part of the applicant's application for development consent to ensure that it is safe from flooding, and will not increase flood risk elsewhere for the proposed development's lifetime, taking into account climate change.

5.160 To satisfactorily manage flood risk and the impact of the natural water cycle on people, property and ecosystems, good design and infrastructure may need to be secured using requirements or planning obligations. This may include the use of sustainable drainage systems but could also include vegetation to help to slow runoff, hold back peak flows, and make landscapes more able to absorb the impact of severe weather events.

5.161 In the Airports NPS, the term sustainable drainage systems is used and taken to cover the whole range of sustainable approaches to surface water drainage management including:

- Source control measures including rainwater recycling and drainage;
- Infiltration devices to allow water to soak into the ground, that can include individual soakaways and communal facilities;
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;
- Filter drains and porous pavements to allow rainwater and runoff to infiltrate into permeable material below ground and provide storage if needed;

- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding; and
- Flood routes to carry and direct excess water through developments to minimise the impact of severe rainfall flooding.

5.162 Site layout and surface water drainage systems should be able to cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts.

5.163 The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, taking into account climate change, unless specific off-site arrangements are made and result in the same net effect.

5.164 It may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the main application site. There may be circumstances where it is appropriate for infiltration attenuation storage to be provided outside the project site, if necessary through the use of a planning obligation or a development consent order requirement.

5.165 The sequential approach should be applied to the layout and design of the project. Vulnerable uses should be located on parts of the site at lower probability and residual risk of flooding. The applicant should seek opportunities where appropriate to use open space for multiple purposes such as amenity, wildlife habitat, and flood storage uses. Opportunities can be taken to lower flood risk by improving flow routes, flood storage capacity and using sustainable drainage systems.

Decision making

5.166 Where flood risk is a factor in determining an application for development consent, the Secretary of State will need to be satisfied that, where relevant:

- The application is supported by an appropriate flood risk assessment; and
- The Sequential Test[199] has been applied as part of site selection and, if required, the Exception Test.[200]

5.167 When determining an application, the Secretary of State will need to be satisfied that flood risk will not be increased elsewhere, and will only consider development appropriate in areas at risk of flooding where, informed by a flood risk assessment, following the Sequential Test and, if required, the Exception Test, it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- Over its lifetime, development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning, and that priority is given to the use of sustainable drainage systems.

5.168 The applicant should take into account the potential impacts of climate change using the latest UK Climate Change Risk Assessment, the latest set of UK Climate Projections, and other relevant sources of climate change evidence. The applicant should also ensure any environment statement that is prepared identifies appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new

[199] National Planning Policy Framework, March 2012, paragraph 101, or any successor document
[200] National Planning Policy Framework, March 2012, paragraph 102, or any successor document

infrastructure. Should a new set of UK Climate Projections become available after the preparation of an environmental statement, the Examining Authority or the Secretary of State will consider whether they need to request additional information from the applicant as part of the development consent application.

5.169 When determining an application, the Secretary of State will need to be satisfied that the potential effects of climate change on the development have been considered as part of the design.

5.170 For construction work which has drainage implications, approval for the preferred scheme's overall approach to drainage systems will form part of any development consent issued by the Secretary of State.[201] The Secretary of State will therefore need to be satisfied that the proposed drainage system complies with any technical standards issued by the Government[202] or to any National Standards[203] issued under Schedule 3 to the Flood and Water Management Act 2010.[204] In addition, the development consent order, or any associated planning obligations, will need to make provision for the adoption and maintenance of any sustainable drainage systems, including any necessary access rights to property. The Secretary of State will need to be satisfied that the most appropriate body would be given the responsibility for maintaining any sustainable drainage systems, taking into account the nature and security of the infrastructure on the proposed site. The responsible body could include, for example, the applicant, the landowner, the relevant local authority, or another body such as the Internal Drainage Board.

5.171 If the Environment Agency continues to have concerns, and therefore objects to the grant of development consent on the grounds of flood risk, the Secretary of State can grant consent, but would need to be satisfied that all reasonable steps have been taken by the applicant and the Environment Agency to attempt to resolve the concerns. Similarly, if the lead local flood authority objects to the development consent on the grounds of surface or other local sources of flooding, the Secretary of State can grant consent, but would need to be satisfied that all reasonable steps have been taken by the applicant and the lead local flood authority to attempt to resolve the concerns.

Water quality and resources

Introduction

5.172 Airport infrastructure projects can have adverse effects on the water environment, including groundwater, inland surface water and transitional waters.[205] During construction and operation, it can lead to increased demand for water, involve discharges to water, and cause adverse ecological effects resulting from physical modifications to the water environment. There may also be an increased risk of spills and leaks of pollutants to the water environment. These effects could lead to adverse impacts on health or on protected and other species and habitats, and could, in

[201] Drainage implications as defined in Paragraph 7(2) of Schedule 3 to the Flood and Water Management Act 2010 http://www.legislation.gov.uk/ukpga/2010/29/schedule/3/crossheading/requirement-for-approval

[202] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

[203] The National Standards set out requirements for the design, construction, operation and maintenance of sustainable drainage systems, and may include guidance to which the Secretary of State will have regard

[204] http://www.legislation.gov.uk/ukpga/2010/29/contents

[205] As defined in the Water Framework Directive (2000/60/EC), transitional waters are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters by which are substantially influenced by freshwater flows

particular, result in surface waters, groundwaters or protected areas[206] failing to meet environmental objectives established under the Water Framework Directive.[207]

5.173 The Government's planning policies make clear that the planning system should contribute to and enhance the natural and local environment by, among other things, preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, water pollution. The Government has issued guidance on water supply, wastewater and water quality considerations in the planning system.[208] Where applicable, an application for development consent has to contain a plan with accompanying information identifying water bodies in a river basin management plan.[209]

5.174 Development may result in an increased potential for impacts on the water environment, especially the quality of the surface and groundwater through the discharge of waters contaminated with de-icer along with hydrocarbons and other pollutants.

Applicant's assessment

5.175 The applicant should make sufficiently early contact with the relevant regulators, including the Environment Agency, for abstraction licensing and environmental permitting, and with the water supply company likely to supply the water. Where the proposed development is subject to an Environmental Impact Assessment and the development is likely to have significant adverse effects on the water environment, the applicant should ascertain the existing status of, and carry out an assessment of, the impacts of the proposed project on water quality, water resources and physical characteristics as part of the environmental statement.

5.176 Any environmental statement should describe:

- The existing quality of water affected by the proposed project;
- Existing water resources affected by the proposed project and the impacts of the proposed project on water resources;
- Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project, and any impact of physical modifications to these characteristics;
- Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones around potable groundwater abstractions; and
- Any cumulative effects.

5.177 The applicant should assess the effects on the surrounding water and wastewater treatment network in cooperation with the relevant water and sewerage undertaker(s). It should also address any future water infrastructure needed for the preferred scheme, including for supplies and sewerage treatment, and the effects on the surrounding water and wastewater treatment network. This assessment would be based on the additional wastewater flows which would need to be treated at sewage treatment works and should be developed through liaison with the relevant water and sewerage undertaker(s).

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[206] Protected areas are areas which have been designated as requiring special protection under specific community legislation for the protection of their surface water and groundwater or for the conservation of habitats and species directly depending on water

[207] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy

[208] http://planningguidance.communities.gov.uk/blog/guidance/water-supply-wastewater-and-water-quality/

[209] http://www.legislation.gov.uk/uksi/2009/2264/made

Mitigation

5.178 The impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling.

5.179 The Secretary of State will need to consider whether the mitigation measures put forward by the applicant which are needed for operation and construction (and which may be over and above any which may form part of the development consent application) are acceptable.

5.180 The project should adhere to any national standards for sustainable drainage systems, which introduce a hierarchical approach to drainage design that promotes the most sustainable approach but recognises the feasibility and use of conventional drainage systems as part of a sustainable solution for any given site given its constraints.

5.181 The risk of impacts on the water environment can be reduced through careful design to adhere to good pollution practice.

Decision making

5.182 Activities that discharge to the water environment are subject to pollution control, and the considerations set out at paragraphs 4.53-4.59 above covering the interface between planning and environmental permitting therefore apply. These considerations will also apply in an analogous way to the abstraction licensing regime regulating activities that take water from the environment, and to the control regimes relating to works to, and structures in, on, or under, a controlled water.

5.183 The Secretary of State will generally need to give more weight to impacts on the water environment where a project would have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive.

5.184 The Secretary of State will need to be satisfied that a proposal has had regard to the Thames river basin management plan and the Water Framework Directive and its daughter Directives on priority substances and groundwater. In terms of Water Framework Directive compliance, the overall aim of development should be to prevent deterioration in status of water bodies, to support the achievement of the objectives in the Thames river basin management plan and not to jeopardise the future achievement of good status for any affected water bodies. If the development is considered likely to cause deterioration of water body status or to prevent the achievement of good groundwater status or of good ecological status or potential, compliance with Article 4.7 of the Water Framework Directive must be demonstrated. Any use of Article 4.7 must be reported in the Thames river basin management plan.

5.185 The Secretary of State will need to consider the interactions of the preferred scheme with other plans, such as statutory water resources management plans.

5.186 The Secretary of State will need to consider proposals put forward by the applicant to mitigate adverse effects on the water environment, taking into account the likely impact of climate change on water availability, and whether appropriate requirements should be attached to any development consent and / or planning obligations. If the Environment Agency continues to have concerns, and objects to the grant of development consent on the grounds of impacts on water quality / resources, the Secretary of State can grant consent, but will need to be satisfied that all reasonable steps have been taken by the applicant and the Environment Agency to try to resolve the concerns.

Historic environment

Introduction

5.187 The construction and operation of airports and associated infrastructure has the potential to result in adverse impacts on the historic environment above and below ground. This could be as a result of the scale, form and function of the development, and the wider impacts it can create in terms of associated infrastructure to connect the airport to existing transport networks, changes in aircraft movement on the ground and in the surrounding airspace, additional noise and light levels, and the need for security and space to ensure the airport's operation.

5.188 The historic environment includes all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.

5.189 Those elements of the historic environment that hold value to this and future generations because of their historic, archaeological, architectural or artistic interest are called 'heritage assets'. Heritage assets may be buildings, monuments, sites, places, areas or landscapes, or any combination of these. The sum of the heritage interests that a heritage asset holds is referred to as its significance. Significance derives not only from a heritage asset's physical presence, but also from its setting.[210]

5.190 Some heritage assets have a level of significance that justifies official designation. Categories of designated heritage assets are:

- World Heritage Sites;
- Scheduled Monuments;
- Listed Buildings;
- Protected Wreck Sites;
- Protected Military Remains;
- Registered Parks and Gardens;
- Registered Battlefields; and
- Conservation Areas.[211]

5.191 Non-designated heritage assets of archaeological interest that are demonstrably equivalent to Scheduled Monuments should be considered subject to the policies for designated heritage assets.[212] The absence of designation for such heritage assets does not indicate lower significance.

5.192 The Secretary of State will also consider the impacts on other non-designated heritage assets on the basis of clear evidence that the assets have a significance that merits consideration in that decision, even though those assets are of lesser value than designated heritage assets. The non-designated heritage assets would be identified

[210] Setting of a heritage asset is the surroundings in which it is experienced. Its extent is not fixed, and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral

[211] The issuing of licences to undertake works on protected wreck sites in English waters is the responsibility of the Secretary of State for Culture, Media and Sport and does not form part of development consent orders. The issuing of licences for protected military remains is the responsibility of the Secretary of State for Defence

[212] There will be archaeological interest in a heritage asset if it holds, or may potentially hold, evidence of past human activity worthy of expert investigation at some point. Heritage assets with archaeological interest are the primary source of evidence about the substance and evolution of places, and the people and cultures that made them

either through the development plan process by local authorities, including through 'local listing', or through the nationally significant infrastructure project examination and decision making process.

Applicant's assessment

5.193 As part of the environmental statement, the applicant should provide a description of the significance of the heritage assets affected by the proposed development, and the contribution of their setting to that significance. The level of detail should be proportionate to the asset's importance, and no more than is sufficient to understand the potential impact of the proposal on the significance of the asset. Consideration will also need to be given to the possible impacts, including cumulative, on the wider historic environment. At a minimum, the relevant Historic Environment Record[213] should be consulted and the heritage assets assessed using appropriate expertise. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, the applicant should include an appropriate desk-based assessment and, where necessary, a field evaluation. The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage asset affected can be adequately understood from the application and supporting documents.

5.194 Detailed studies will be required on those heritage assets affected by noise, light and indirect impacts based on the guidance provided in *The Setting of Heritage Assets*[214] and the *Aviation Noise Metric*.[215] Where proposed development will affect the setting of a heritage asset, accurate representative visualisations may be necessary to assess the impact.

5.195 The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where possible:

- Enhancing, through a range of measures such as sensitive design, the significance of heritage assets or setting affected;
- Considering measures that address those heritage assets that are at risk, or which may become at risk, as a result of the scheme; and
- Considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to or interpretation, understanding and appreciation of the heritage assets affected by the scheme.

Careful consideration in preparing the scheme will be required on whether the impacts on the historic environment will be direct or indirect, temporary or permanent.

Decision making

5.196 In determining applications, the Secretary of State will seek to identify and assess the particular significance of any heritage asset that may be affected by the proposed development (including by development affecting the setting of a heritage asset), taking account of the available evidence and any necessary expertise from:

[213] Historic Environment Records are information services maintained and updated by (or on behalf of) local authorities and National Park Authorities with a view to providing access to comprehensive and dynamic resources relating to the historic environment of an area for public benefit and use. Details of Historic Environment Records in England are available from the Heritage Gateway website. Historic England should also be consulted where relevant

[214] https://www.historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/

[215] https://www.historicengland.org.uk/images-books/publications/aviation-noise-metric/

- Relevant information provided with the application and, where applicable, relevant information submitted during examination of the application;
- Any designation records included on the National Heritage List for England;
- Historic landscape character records;
- The relevant Historic Environment Record(s) and similar sources of information;
- Representations made by interested parties during the examination; and
- Expert advice, where appropriate and when the need to understand the significance of the heritage asset demands it.

5.197 The Secretary of State must also comply with the regime relating to Listed Buildings, Conservation Areas and Scheduled Monuments set out in The Infrastructure Planning (Decisions) Regulations 2010.[216]

5.198 In considering the impact of a proposed development on any heritage assets, the Secretary of State will take into account the particular nature of the significance of the heritage asset and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between their conservation and any aspect of the proposal.

5.199 The Secretary of State will take into account: the desirability of sustaining and, where appropriate, enhancing the significance of heritage assets; the contribution of their settings; and the positive contribution their conservation can make to supporting sustainable communities – including to their quality of life, their economic vitality, and to the public's enjoyment of these assets. The Secretary of State will also take into account the desirability of new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include scale, height, massing, alignment, materials, use and landscaping (for example screen planting).

5.200 When considering the impact of a proposed development on the significance of a designated heritage asset, the Secretary of State will give great weight to the asset's conservation. The more important the asset, the greater the weight should be. The Secretary of State will take into account the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation, the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality, and the desirability of new development making a positive contribution to local character and distinctiveness.

5.201 Once lost, heritage assets cannot be replaced, and their loss has a cultural, environmental, economic and social impact. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. Given that heritage assets are irreplaceable, any harm or loss should require clear and convincing justification.

5.202 Substantial harm to or loss of a Grade II Listed Building or a Grade II Registered Park or Garden should be exceptional. Substantial harm to or loss of designated sites of the highest significance, including World Heritage Sites, Scheduled Monuments, Grade I and II* Listed Buildings, Protected Wreck Sites, Registered Battlefields, and Grade I and II* Registered Parks and Gardens should be wholly exceptional.

5.203 Any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of development, recognising that the greater the

[216] http://www.legislation.gov.uk/uksi/2010/305/regulation/3/made

harm to the significance of the heritage asset, the greater the justification that will be needed for any loss.

5.204 Where the proposed development will lead to substantial harm to or the total loss of significance of a designated heritage asset, the Secretary of State will refuse consent unless it can be demonstrated that the substantial harm or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm, or alternatively that all of the following apply:

- The nature of the heritage asset prevents all reasonable uses of the site;
- No viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation;
- Conservation by grant funding or some form of charitable or public ownership is demonstrably not possible; and
- The harm or loss is outweighed by the benefit of bringing the site back into use.

5.205 Where the proposed development will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal, including securing its optimum viable use.

5.206 Not all elements of a World Heritage Site or conservation area will necessarily contribute to its significance. The Secretary of State will treat the loss of a building (or other element) that makes a positive contribution to the significance of a World Heritage Site or conservation area's significance either as substantial harm or less than substantial harm, as appropriate, taking into account the relative significance of the elements affected and their contribution to the significance of the World Heritage Site or conservation area as a whole.

5.207 Where the loss of significance of any heritage asset is justified on the merits of the new development, the Secretary of State will consider imposing a requirement on the consent, or require the applicant to enter into an obligation, that will prevent the loss occurring until it is reasonably certain that the relevant part of the development is to proceed.

5.208 The applicant should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance and better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to or better reveal the significance of the asset should be treated favourably.[217]

Recording

5.209 A documentary record of our past is not as valuable as retaining the heritage asset, and therefore the ability to record evidence of the asset should not be a factor in deciding whether consent should be given.

5.210 Where the loss of the whole or part of a heritage asset's significance is justified, the Secretary of State will require the applicant to record and advance understanding of the significance of the heritage asset before it is lost (wholly or in part). The extent of the requirement should be proportionate to the nature and level of the asset's significance. The applicant should be required to publish this evidence and to deposit copies of the reports with the relevant Historic Environmental Record. They should

[217] Further good practice advice on decision making in the historic environment can be found at: https://www.historicengland.org.uk/images-books/publications/gpa2-managing-significance-in-decision-taking/

also be required to deposit the archive generated in a local museum or other public repository willing to receive it.

5.211 Where appropriate, the Secretary of State will impose requirements to the development consent order to ensure that the work is undertaken in a timely manner, in accordance with a written scheme of investigation that complies with the policy in the Airports NPS and has been agreed in writing with the relevant local authority, and that the completion of the exercise is properly secured.

5.212 Where there is a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, the Secretary of State will consider requirements to ensure appropriate procedures are in place for the identification and treatment of such assets discovered during construction.

Landscape and visual impacts

Introduction

5.213 For airport development, landscape and visual effects also include tranquillity effects, which would affect people's enjoyment of the natural environment and recreational facilities. In this context, references to landscape should be taken as covering local landscape, waterscape and townscape character and quality, where appropriate.

Applicant's assessment

5.214 Where the development is subject to an Environmental Impact Assessment, the applicant should undertake an assessment of any likely significant landscape and visual impacts and describe them in the environmental statement. The landscape and visual assessment should reference any landscape character assessment and associated studies as a means of assessing landscape impacts relevant to the preferred scheme. In addition, the applicant's assessment should take account of any relevant policies based on these assessments in local development documents.

5.215 The applicant's assessment should include any significant effects during construction of the preferred scheme and / or the significant effects of the completed development and its operation on landscape components and landscape character, including historic characterisation. This should include assessment of any landscape and visual impacts as a result of the development, for example surface access proposals or aviation activity.

5.216 The assessment should include the visibility and conspicuousness of the preferred scheme during construction and the presence and operation of the preferred scheme and potential impacts on views and visual amenity. This should include any noise and light pollution effects, including on local amenity, tranquillity and nature conservation.

Mitigation

5.217 Adverse landscape and visual effects may be minimised through appropriate design (including choice of materials), and landscaping schemes. Materials and designs for the Heathrow Northwest Runway scheme should be given careful consideration.

Decision making

Landscape impact

5.218 Landscape effects depend on the nature of the existing landscape likely to be changed and nature of the effect likely to occur. Both these factors need to be considered in judging the impact of the preferred scheme on the landscape. The preferred scheme

needs to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints, the development should aim to avoid or minimise harm to the landscape, providing reasonable mitigation where possible and appropriate.

Development proposed within nationally designated areas

5.219 Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions.

5.220 The Secretary of State should refuse development consent in these areas except in exceptional circumstances and where it can be demonstrated that it is in the public interest. Consideration of such applications should include an assessment of:

- The need for the development, including in terms of any national considerations, and the impact of consenting, or not consenting it, upon the local economy;
- The cost of, and scope for, developing elsewhere, outside the designated area, or meeting the need for it in some other way; and
- Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated.

5.221 Where consent is given in these areas, the Secretary of State should be satisfied that the applicant has ensured that the preferred scheme will be carried out to high environmental standards and, where possible, includes measures to enhance other aspects of the environment. Where necessary, the Secretary of State should consider the imposition of appropriate requirements to ensure these standards are delivered.

Developments outside nationally designated areas which might affect them

5.222 The duty to have regard to the purposes of nationally designated areas also applies when considering applications for projects outside the boundaries of these areas which may have impacts within them. The development should aim to avoid compromising the purposes of designation, and such projects should be designed sensitively given the various siting, operational, and other relevant constraints.

Developments in other areas

5.223 Outside nationally designated areas, there are local landscapes and townscapes that are highly valued locally and may be protected by local designation. Where a local development document in England has policies based on landscape character assessment, these should be given particular consideration. However, local landscape designations should not be used in themselves as reasons to refuse consent, as this may unduly restrict acceptable development.

5.224 In taking decisions, the Secretary of State will consider whether the preferred scheme has been designed carefully, taking account of environmental effects on the landscape and siting, operational and other relevant constraints, to avoid adverse effects on landscape or to minimise harm to the landscape, including by reasonable mitigation.

Visual impact

5.225 The Secretary of State will judge whether the visual effects on sensitive receptors, such as local residents, and other receptors, such as visitors to the local area, outweigh the benefits of the development.

Land instability

Introduction

5.226 The effects of land instability may result in landslides, subsidence or ground heave. Failing to deal with this issue could cause harm to human health, local property and associated infrastructure, and the wider environment. They occur in different circumstances for different reasons and vary in their predictability and in their effect on development.

Applicant's assessment

5.227 Where necessary, land stability should be considered in respect of new development, as set out in the National Planning Policy Framework and supporting planning guidance.[218] Specifically, proposals should be appropriate for the location, including preventing unacceptable risks from land instability. If land stability could be an issue, the applicant should seek appropriate technical and environmental expert advice to assess the likely consequences of proposed developments on sites where subsidence, landslides and ground compression is known or suspected. Applicants should liaise with the Coal Authority if necessary.

5.228 A preliminary assessment of ground instability should be carried out at the earliest possible stage before a detailed application for development consent is prepared. The applicant should ensure that any necessary investigations are undertaken to confirm that their sites are and will remain stable, or can be made so as part of the development. The site needs to be assessed in the context of surrounding areas where subsidence, landslides and land compression could threaten the development during its anticipated life or damage neighbouring land or property. This could be in the form of a land stability or slope stability risk assessment report.

Mitigation

5.229 The applicant has a range of mechanisms available to mitigate and minimise risks of land instability. These include:

- Establishing the principle and layout of new development, for example avoiding mine entries and other hazards;
- Ensuring proper design of structures to cope with any movement expected and other hazards such as mine and / or ground gases; or
- Requiring ground improvement techniques, usually involving the removal of poor material and its replacement with suitable inert and stable material. For development on land previously affected by mining activity, this may mean prior extraction of any remaining mineral resource.

Dust, odour, artificial light, smoke and steam

5.230 The construction and operation of airports infrastructure has the potential to create a range of emissions such as dust, odour, artificial light, smoke and steam. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990.[219] These may also be covered by pollution control or other environmental consenting regimes.

[218] https://www.gov.uk/guidance/land-stability
[219] http://www.legislation.gov.uk/ukpga/1990/43/part/III

5.231 Because of the potential effects of these emissions and in view of the availability of the defence of statutory authority against nuisance claims described previously, it is important that the potential for these impacts is considered by the applicant in its application, by the Examining Authority in examining applications, and by the Secretary of State in taking decisions on development consent.

5.232 For nationally significant infrastructure projects of the type covered by the Airports NPS, some impact on amenity for local communities is likely to be unavoidable. Impacts should be kept to a minimum and should be at a level that is acceptable.

Applicant's assessment

5.233 Where the development is subject to an Environmental Impact Assessment, the applicant should assess any likely significant effects on amenity from emissions of dust, odour, artificial light, smoke and steam, and describe these in the environmental statement.

5.234 In particular, the assessment provided by the applicant should describe:

- The type and quantity of emissions;
- Aspects of the development which may give rise to emissions during construction, operation and decommissioning;
- Premises or locations that may be affected by the emissions;
- Effects of the emission on identified premises or locations; and
- Measures to be employed in preventing or mitigating the emissions.

5.235 The applicant is advised to consult the relevant local planning authority and, where appropriate, the Environment Agency, about the scope and methodology of the assessment.

Mitigation

5.236 The Secretary of State should ensure the applicant has provided sufficient information to show that any necessary mitigation will be put into place. In particular, the Secretary of State should consider whether to require the applicant to abide by a scheme of management and mitigation concerning emissions of dust, odour, artificial light, smoke and steam from the development to reduce any loss to amenity which might arise during the construction and operation of the development. A construction management plan may help clarify and secure mitigation.

Decision making

5.237 The Secretary of State should be satisfied that all reasonable steps have been taken, and will be taken, to minimise any detrimental impact on amenity from emissions of dust, odour, artificial light, smoke and steam. This includes the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

5.238 If development consent is granted for a project, the Secretary of State should consider whether there is a justification for all of the authorised project (including any associated development) being covered by a defence of statutory authority against nuisance claims. If the Secretary of State cannot conclude that this is justified, then the defence should be disapplied, in whole or in part, through a provision in the development consent order.

Community compensation

Introduction

5.239 The Secretary of State recognises that, in addition to providing economic growth and employment opportunities, airport expansion will also have negative impacts upon local communities. This will include impacts through land take requiring the compulsory acquisition of houses that fall within the new boundary of the airport, exposure to air quality impacts, and aircraft noise, that is both an annoyance and can have an adverse impact on health and cognitive development.

5.240 The Secretary of State expects the applicant to provide an appropriate community compensation package, relevant to planning. This will include financial compensation to residents who will see their homes compulsorily acquired, as well as ongoing financial compensation to the local community. In addition to controlling and reducing aircraft noise impacts, the applicant will be required to commit appropriate resources to mitigate the impacts of aircraft through noise insulation programmes for both private homes and public buildings such as schools.

5.241 A number of statutory protections are provided in these areas, and the applicant must fulfil its statutory duties in a timely and efficient manner.

5.242 Under planning law, residential and agricultural owners in the area within the red line on the map shown in Annex A will be able to make a claim for statutory blight upon the designation of the Airports NPS.

5.243 In addition, compensation can be sought in respect of loss of value of a property arising from the development during construction (under the Compulsory Purchase Act 1965)[220] and for loss of value arising from the operation of an expanded airport (under Part 1 of the Land Compensation Act 1973)[221] after one year of operation.

5.244 People are entitled to know what steps will be taken to help protect them against aircraft noise and, where appropriate, to help them to move house.

5.245 In addition to statutory requirements, Heathrow Airport has publicly committed to a community compensation package comprising a number of more generous offers:

- To pay 125% of market value, plus taxes and reasonable moving costs, for all owner occupied homes within the compulsory acquisition zone;[222]
- To pay 125% of market value, plus taxes and reasonable moving costs, for all owner occupied homes within an additional voluntary purchase / acquisition zone incorporating the area known as the Heathrow Villages;[223]
- Following a third party assessment, to provide full acoustic insulation for residential property within the full single mode easterly and westerly 60dB LAeq (16hr)[224] noise contour of an expanded airport;
- Following a third party assessment, to provide a contribution of up to £3,000 for acoustic insulation for residential properties within the full single mode easterly and

[220] http://www.legislation.gov.uk/ukpga/1965/56/contents
[221] http://www.legislation.gov.uk/ukpga/1973/26/contents
[222] http://your.heathrow.com/newpropertycompensation/
[223] http://your.heathrow.com/newpropertycompensation/
[224] Leq is the measure used to describe the average sound level experienced over a period of time (usually sixteen hours for day and eight hours for night) resulting in a single decibel value. Leq is expressed as LAeq when it refers to the A-weighted scale

westerly 57dB LAeq (16hr) or the full 55dB Lden[225] noise contours of an expanded airport, whichever is the bigger; and

- To deliver a programme of noise insulation and ventilation for schools and community buildings within the 60dB LAeq (16hr) contour.[226]

5.246 In addition to the statutory requirements and the public commitments made by Heathrow Airport, the Government also supports the Airports Commission's recommendation for an additional component of ongoing community compensation proportionate to environmental impacts.

5.247 The Airports Commission suggested this should take the form of a national noise levy paid for by passengers. The Government does not consider a national levy appropriate, but supports the development of a community compensation fund at an expanded Heathrow Airport. The Government expects that the size of the community compensation fund will be proportionate to the environmental harm caused by expansion of the airport. The Government notes that, in its consideration of a noise levy, the Airports Commission considered that a sum of £50 million per annum could be an appropriate amount at an expanded Heathrow Airport, and that, over a 15 year period, a community compensation fund could therefore distribute £750 million to local communities.

5.248 Expansion at Heathrow Airport is likely to increase the amount of locally collected business rates in the area. The Government will consider how authorities can benefit from this through a business rate retention scheme and the opportunities for authorities to work together to share the benefits. Heathrow Airport is currently the highest single site business rates payer in the UK.[227]

Applicant's assessment

5.249 The Government expects to see arrangements being made for the community compensation schemes which Heathrow Airport has publicly stated would be provided, and for a community compensation fund.

5.250 The applicant should seek to minimise impacts on local people, to consult on the details of its works, and to put them in place quickly. The Government also looks to the applicant to consult on the detail of a community compensation fund.

Decision making

5.251 The Secretary of State will consider whether and to what extent the applicant has sought to minimise impacts on local people, has consulted on the details of its works, and has put mitigations in place, at least to the level committed to in Heathrow Airport's public commitments. This includes whether the applicant has set out appropriate eligibility criteria, how delivery will be ensured, and whether the applicant has made reasonable efforts to put the works in place quickly.

5.252 The Secretary of State will also consider whether the applicant has consulted on the details of a community compensation fund, including source of revenue, size and duration of fund, eligibility, and how delivery will be ensured.

5.253 The Secretary of State will expect the applicant to demonstrate how these provisions are secured, and how they will be operated. The applicant will also need to show how these measures will be administered to ensure that they are relevant to planning when in operation. The mechanisms for enforcing these provisions should also be

[225] Lden is the 24 hour LAeq calculated for an annual period, but with a five decibel weighting for evening and a ten decibel weighting for night to reflect people's greater sensitivity to noise within these periods
[226] http://your.heathrow.com/newpropertycompensation/
[227] http://www.cvsuk.com/news-resources/news/draft-list-release

demonstrated, along with the appropriateness of any identified enforcing body, which may include the Secretary of State.

Community engagement

Introduction

5.254 The Government recognises that the planning, construction, and subsequent operation of a Northwest Runway will bring both significant impacts and opportunities to communities living around Heathrow Airport. Communities will wish to participate fully in the development and delivery of expansion, and the Government expects them to be able to do so.

5.255 There will be many opportunities for communities to engage as expansion is taken forward. The Government is required to consult on and publicise the Airports NPS, and the applicant is subject to pre-application consultation duties. Additional consultations on issues such as airspace change, overseen by the Civil Aviation Authority, will take place outside of the planning process. Ongoing engagement will also be required as the applicant takes forward its compensation package.

5.256 The Government wishes to maximise local stakeholder engagement with the expansion process, and it wishes to encourage any applicant and local stakeholders to strengthen the way in which the airport and local stakeholders work together to make engagement effective. Local stakeholders, including those representing communities around Heathrow Airport, have the experience and expertise to identify solutions tailored to their specific circumstances. A number of engagement forums already exist at Heathrow Airport. These have developed over time in response to emerging needs and are consistent with the Government's view that, in principle, it encourages collaborative local solutions.

5.257 A community engagement board will be developed at Heathrow Airport to help to ensure that local communities are able to contribute effectively to the delivery of expansion, including to consultations and evidence gathering during the planning process.

Applicant's assessment

5.258 The applicant must engage constructively with the community engagement board throughout the planning process, with its membership (including an independent chair), and with any programme(s) of work the community engagement board agrees to take forward.

Decision making

5.259 The Secretary of State will consider whether the applicant has engaged constructively with this community engagement board throughout the planning process.

Skills

Introduction

5.260 The Government is committed to helping people into jobs and improving the skills of the UK workforce, with a target of three million new apprenticeships being created in the current Parliament.[228] Continuing to create jobs and new training opportunities will

[228] https://www.gov.uk/government/news/government-kick-starts-plans-to-reach-3-million-apprenticeships

help to consolidate the national economic recovery, put the UK on the path to full employment and raise the nation's productivity. Apprenticeships have an essential role to play within this work, helping individuals to develop key skills which will benefit both them and employers.

5.261 To help deliver the Government's wider skills agenda, the Department for Transport published *Transport Skills Strategy: building sustainable skills* in January 2016, setting out its skills strategy for transport, including aviation, and an additional 30,000 apprenticeships by 2020 across the road and rail sectors.[229] The Strategic Transport Apprenticeship Taskforce has been created to deliver this work.[230]

5.262 The Government notes that Heathrow Airport already makes a significant contribution to local employment and already has a number of skills and employment initiatives designed to support the business needs of the airport. The Heathrow Academy, established in 2004, supports recruitment and retention of local residents across the retail, construction, aviation and logistics sectors, and includes apprenticeships as a part of the package.[231]

5.263 The Government notes that, with expansion, Heathrow Airport has publicly committed to ensuring 10,000 apprenticeships before 2030, thereby doubling the number currently available at the airport and in its supply chain and airport-related businesses.[232]

5.264 The Heathrow Northwest Runway scheme represents an opportunity to grow the number of jobs and apprenticeships supported by the applicant and its supply chain and airport-related businesses, particularly in neighbouring communities.

Applicant's assessment

5.265 Heathrow Airport should put in place arrangements for the delivery of the 5,000 new apprenticeships which it has publicly stated would be created. Heathrow Airport should set out the timetable for delivering the apprenticeships, provide information on the areas and skills to be covered by these apprenticeships, the breakdown between opportunities to be created within the core airport and those being offered by companies within its supply chain and other airport-related businesses, and the qualification level and standards which they will need to achieve. Heathrow Airport should also set out how it will publicly report progress against the target.

5.266 The Government expects the applicant to maximise the employment and skills opportunities for local residents, including apprenticeships.

5.267 Heathrow Airport will also need to show how these measures will be administered to ensure that they are relevant to planning when in operation. The mechanisms for enforcing these provisions should also be demonstrated, along with the appropriateness of any identified enforcing body, which may include the Secretary of State.

Decision making

5.268 The Secretary of State will consider whether Heathrow Airport has set out a credible plan to implement its commitment to deliver a total of 10,000 apprenticeships at an expanded airport.

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[229] https://www.gov.uk/government/publications/transport-infrastructure-skills-strategy-building-sustainable-skills
[230] https://www.gov.uk/government/news/strategic-transport-apprenticeship-taskforce-to-boost-apprenticeships
[231] http://www.heathrow.com/company/heathrow-jobs/heathrow-academy
[232] https://www.heathrowexpansion.com/uk-growth-opportunities/job-opportunities/

5.269 The Secretary of State will consider how these provisions are secured, and how they will be operated.

Ruling out a fourth runway

Introduction

5.270 As part of its work, the Airports Commission considered the possibility that, in addition to the increased capacity provided by a Northwest Runway at Heathrow Airport, the airport might wish in the future to develop a fourth runway. The Airports Commission found no sound case for such a development.

5.271 First, the Airports Commission concluded that the airspace around the airport would be increasingly difficult to manage if a fourth runway was built. It noted that the airport could safely support 800,000 air transport movements per year at a four runway site, only 60,000 more than under the (three runway) Heathrow Northwest Runway scheme, but that the airspace impacts would lead to reduced numbers of air transport movements at the other airports in the London area.

5.272 Second, the Airports Commission concluded that it would be increasingly challenging to physically accommodate a fourth runway at the Heathrow Airport site. Taken together, these conclusions mean that building a fourth runway at Heathrow Airport would result in significant costs while providing less overall additional benefit.

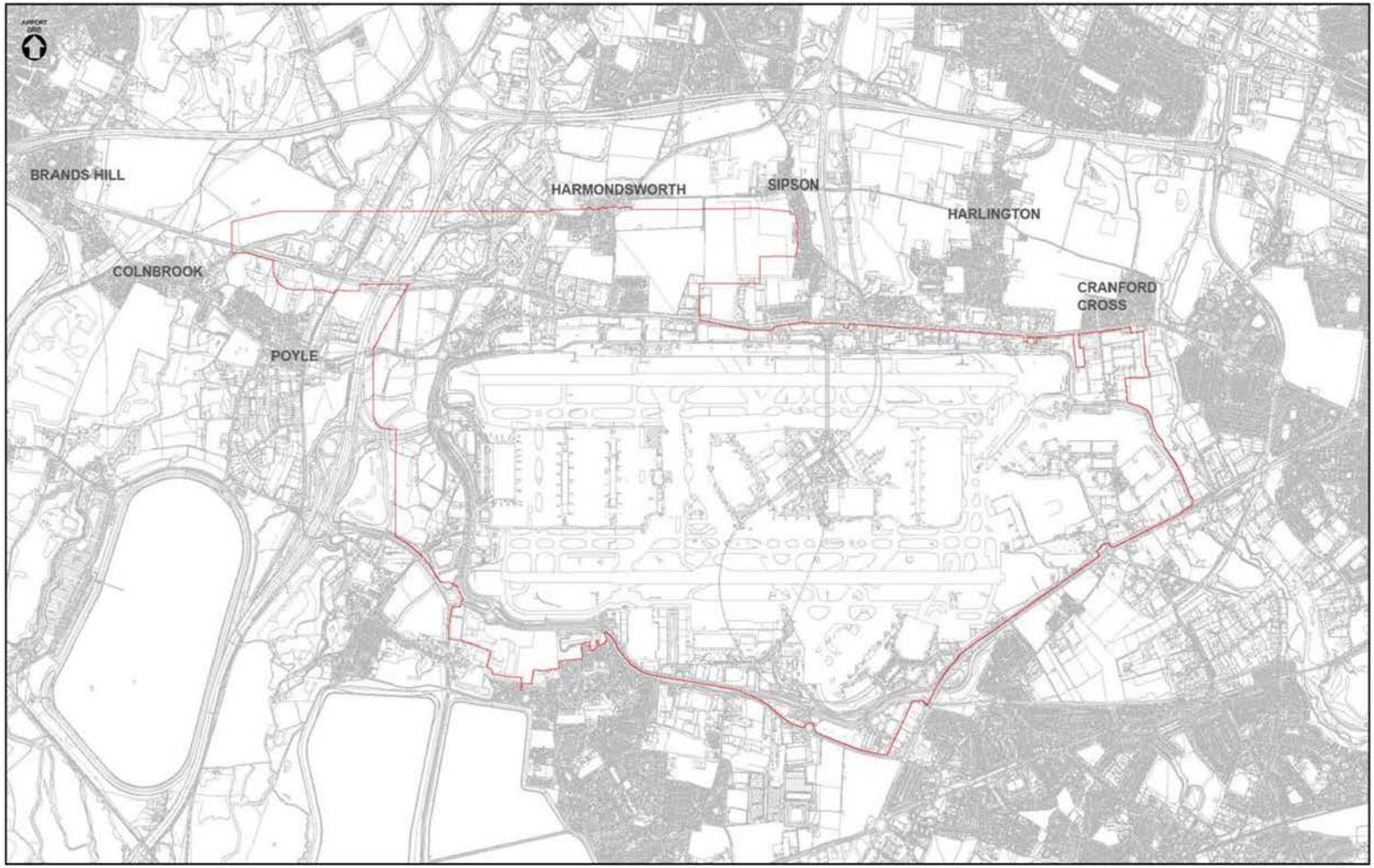
5.273 Finally, the Airports Commission noted that there would be no guarantee that the potential demand for a further runway would be backed by a strong economic or environmental case. Any project to deliver a fourth runway at Heathrow Airport would be costly and extremely difficult to deliver given all of these considerations.

5.274 The Airports Commission also noted the importance of a clear signal from Government on limiting expansion to reassure local communities that Heathrow Airport will not expand any further.

Decision making

5.275 The Government agrees with the Airports Commission's recommendation and the analysis that underpins it, and therefore does not see a need for a fourth runway at Heathrow Airport. An application in the vicinity of Heathrow Airport for a fourth runway would not be supported in policy terms, and should be seen as being in conflict with the Airports NPS.

Annex A: Heathrow Northwest Runway scheme boundary map



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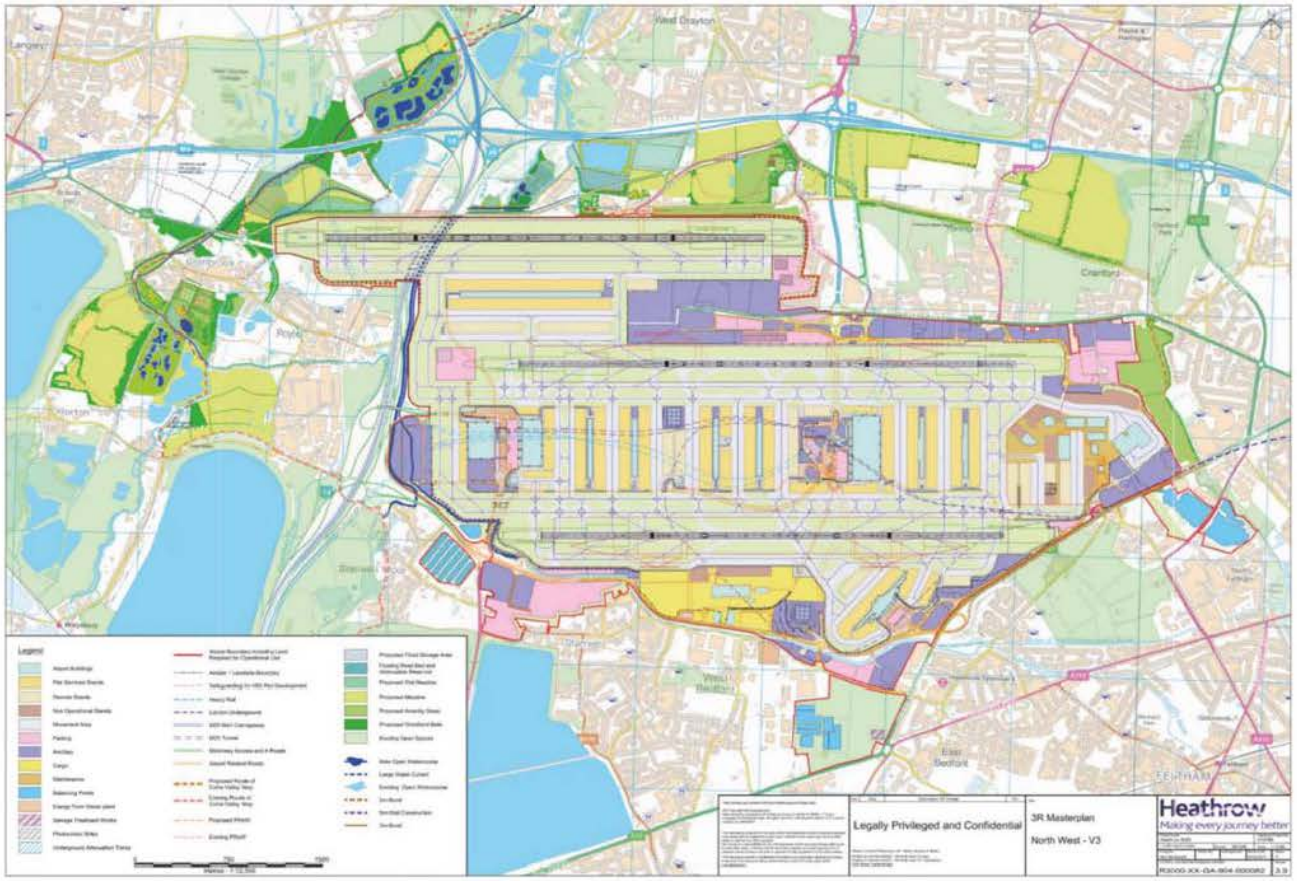
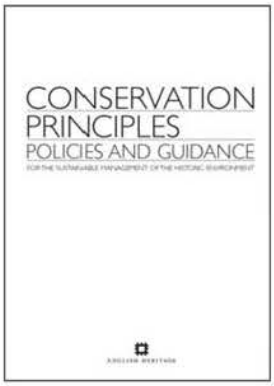
Annex B: Illustrative Heathrow Northwest Runway scheme masterplan



NB: This map is for illustrative purposes and is a masterplan of the Heathrow Northwest Runway scheme as submitted by Heathrow Airport to the Airports Commission. It should not be considered as a detailed site plan; the full detail and design of the scheme will be considered as part of Heathrow Airport's development consent application.

Historic England

Conservation Principles, Policies and Guidance



On 1st April 2015 the Historic Buildings and Monuments Commission for England changed its common name from English Heritage to Historic England. We are now re-branding all our documents.

Although this document refers to English Heritage, it is still the Commission's current advice and guidance and will in due course be re-branded as Historic England.

Please see our website for up to date contact information, and further advice.

We welcome feedback to help improve this document, which will be periodically revised. Please email comments to guidance@HistoricEngland.org.uk

We are the government's expert advisory service for England's historic environment. We give constructive advice to local authorities, owners and the public. We champion historic places helping people to understand, value and care for them, now and for the future.

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CONSERVATION PRINCIPLES

POLICIES AND GUIDANCE

FOR THE SUSTAINABLE MANAGEMENT OF THE HISTORIC ENVIRONMENT

ENGLISH HERITAGE

FOREWORD

The sustainable management of the historic environment depends on sound principles, clear policies and guidance based on those principles, and the quality of decisions that stem from their consistent application. We need a clear, over-arching philosophical framework of what conservation means at the beginning of the 21st century; and to distil current good practice in casework, given the impending reform of legislation and the need for more integrated practice.

These *Principles, Policies and Guidance* for the sustainable management of the historic environment have been developed through extensive debate and consultation, both within English Heritage and with colleagues in the historic environment sector and beyond. Our main purpose in producing the *Principles, Policies and Guidance* is to strengthen the credibility and consistency of decisions taken and advice given by English Heritage staff, improving our accountability by setting out the framework within which we will make judgements on casework. Our success will also be measured by the extent to which this document is taken up more widely in the sector.

Over time, and in conjunction with legislative reform and improving capacity in the sector, we hope that the document will help to create a progressive framework for managing change in the historic environment that is clear in purpose and sustainable in its application – constructive conservation.

Lord Bruce-Lockhart

Chairman
English Heritage
April 2008

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OVERVIEW

Using this document

1 English Heritage sets out in this document a logical approach to making decisions and offering guidance about all aspects of England's historic environment. This will help us to ensure consistency in carrying out our role as the Government's statutory advisor on the historic environment.

2 As the **Introduction** (pages 13-16) explains, we have avoided using the terminology of current heritage designations. Instead, we have adopted the term 'place' for any part of the historic environment that can be perceived as having a distinct identity.

3 The **Conservation Principles** (pages 19-24) provide a comprehensive framework for the sustainable management of the historic environment, under six headlines:

Principle 1: The historic environment is a shared resource
Principle 2: Everyone should be able to participate in sustaining the historic environment
Principle 3: Understanding the significance of places is vital
Principle 4: Significant places should be managed to sustain their values
Principle 5: Decisions about change must be reasonable, transparent and consistent
Principle 6: Documenting and learning from decisions is essential

4 We define *conservation* (under Principle 4.2) as the process of managing change to a significant place in its setting in ways that will best sustain its heritage values, while recognising opportunities to reveal or reinforce those values for present and future generations.

5 **Understanding the values** (pages 27-32) describes a range of *heritage values*, arranged in four groups, which may be attached to places. These are:

- Evidential value: the potential of a place to yield evidence about past human activity.
- Historical value: the ways in which past people, events and aspects of life can be connected through a place to the present – it tends to be illustrative or associative.
- Aesthetic value: the ways in which people draw sensory and intellectual stimulation from a place.
- Communal value: the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

6 **Assessing heritage significance** (pages 35-40) sets out a process for *assessing the heritage significance* of a place:
- Understand the fabric and evolution of the place
- Identify who values the place, and why they do so
- Relate identified heritage values to the fabric of the place
- Consider the relative importance of those identified values
- Consider the contribution of associated objects and collections
- Consider the contribution made by setting and context
- Compare the place with other places sharing similar values
- Articulate the significance of the place.

7 **Managing change to significant places** (pages 43-48) explains how to apply the *Principles* in **making decisions** about change to significant places by:
- Establishing whether there is sufficient information to understand the impacts of potential change
- Considering the effects on authenticity and integrity
- Taking account of sustainability
- Considering the potential reversibility of changes
- Comparing options and making the decision
- Applying mitigation
- Monitoring and evaluating outcomes.

8 **English Heritage Conservation Policies and Guidance** (pages 51-63), a series of *Policies* specific to some common kinds of action, followed by associated *Guidance* on their interpretation. While some of these policies have a close relationship to particular principles, it is important that they are interpreted in the context of the *Principles* as a whole. These policies, which English Heritage will follow, are that:

9 The conservation of significant places is founded on **appropriate routine management and maintenance**.

10 **Periodic renewal** of elements of a significant place, intended or inherent in the design, is normally desirable unless any harm caused to heritage values would not be recovered over time.

11 **Repair** necessary to sustain the heritage values of a significant place is normally desirable if:

a. there is sufficient information comprehensively to understand the impact of the proposals on the significance of the place; and
b. the long term consequences of the proposals can, from experience, be demonstrated to be benign, or the proposals are designed not to prejudice alternative solutions in the future; and
c. the proposals are designed to avoid or minimise harm, if actions necessary to sustain particular heritage values tend to conflict.

12 Intervention in significant places primarily to increase knowledge of the past involving material loss of evidential values, should normally be acceptable if:

a. preservation *in situ* is not reasonably practicable; or
b. it is demonstrated that the potential increase in knowledge
   - cannot be achieved using non-destructive techniques; and
   - is unlikely to be achieved at another place whose destruction is inevitable; and
   - is predicted decisively to outweigh the loss of the primary resource.

This policy most commonly applies to research excavation.

13 Restoration to a significant place should normally be acceptable if:

a. the heritage values of the elements that would be restored decisively outweigh the values of those that would be lost;
b. the work proposed is justified by compelling evidence of the evolution of the place, and is executed in accordance with that evidence;
c. the form in which the place currently exists is not the result of an historically-significant event;
d. the work proposed respects previous forms of the place;
e. the maintenance implications of the proposed restoration are considered to be sustainable;

14 New work or alteration to a significant place should normally be acceptable if:

a. there is sufficient information comprehensively to understand the impacts of the proposal on the significance of the place;
b. the proposal would not materially harm the values of the place, which, where appropriate, would be reinforced or further revealed;
c. the proposals aspire to a quality of design and execution which may be valued now and in the future;
d. the long-term consequences of the proposals can, from experience, be demonstrated to be benign, or the proposals are designed not to prejudice alternative solutions in the future.

15 Changes which would **harm the heritage values of a significant place** should be unacceptable unless:

a. the changes are demonstrably necessary either to make the place sustainable, or to meet an overriding public policy objective or need;
b. there is no reasonably practicable alternative means of doing so without harm;
c. that harm has been reduced to the minimum consistent with achieving the objective;
d. it has been demonstrated that the predicted public benefit decisively outweighs the harm to the values of the place, considering:
   - its comparative significance,
   - the impact on that significance, and
   - the benefits to the place itself and/or the wider community or society as a whole.

16 **Enabling development** to secure the future of a significant place should be unacceptable unless:

a. it will not materially harm the heritage values of the place or its setting
b. it avoids detrimental fragmentation of management of the place;
c. it will secure the long term future of the place and, where applicable, its continued use for a sympathetic purpose;
d. it is necessary to resolve problems arising from the inherent needs of the place, rather than the circumstances of the present owner, or the purchase price paid;
e. sufficient subsidy is not available from any other source;
f. it is demonstrated that the amount of enabling development is the minimum necessary to secure the future of the place, and that its form minimises harm to other public interests;
g. the public benefit of securing the future of the heritage asset through such enabling development decisively outweighs the disbenefits of breaching other public policies.

17 We conclude with a general statement about **Applying the *Principles*** (page 67), acknowledging that the cultural and natural heritage values of significant places, including those reflected in landscape designations, should be managed in parallel, fostering close working relationships between cultural and natural heritage interests. Finally, we provide a set of key **Definitions** (pages 71-72).

INTRODUCTION

Aims

18 The historic environment is central to England's cultural heritage and sense of identity, and hence a resource that should be sustained for the benefit of present and future generations. English Heritage's aim in this document is to set out a logical approach to making decisions and offering guidance about all aspects of the historic environment, and for reconciling its protection with the economic and social needs and aspirations of the people who live in it.

19 The *Conservation Principles, Policies and Guidance* are primarily intended to help us to ensure consistency of approach in carrying out our role as the Government's statutory advisor on the historic environment in England. Specifically, they make a contribution to addressing the challenges of modernising heritage protection by proposing an integrated approach to making decisions, based on a common process. The *Principles* look forward to the consolidated framework of heritage protection proposed in the White Paper *Heritage Protection for the 21st Century* (March 2007), but their application is not dependent upon it.

20 The *Principles* will inform English Heritage's approach to the management of the historic environment as a whole, including the community engagement, learning and access issues addressed under Principle 2. The *Policies and Guidance* will specifically guide our staff in applying the *Principles* to English Heritage's role in the development process, and in managing the historic sites in our care. We hope, of course, that, like all our guidance, the *Principles* will also be read and used by local authorities, property owners, developers, and their advisers. In due course, the *Principles, Policies and Guidance* will be supported by further, more detailed guidance about particular types of proposal or place, and current English Heritage guidance will make specific reference to them as it is updated.

Terms and concepts

21 The practice of recognising, formally protecting and conserving particular aspects of the historic environment has developed along parallel paths, trodden by different professional disciplines. The lack of a common, 'high level' terminology has been a barrier to articulating common principles, and using them to develop a more integrated approach. We have therefore deliberately avoided the specialised terminology of current law and public policy relating to heritage designations, such as 'listed building' and 'scheduled monument'. We use the word 'place' as a proxy for any part of the historic environment, including under the ground or sea, that people (not least practitioners) perceive as having a distinct identity, although recognising that there is no ideal term to cover everything from a shipwreck to a landscape.

22 The term 'place' goes beyond physical form, to involve all the characteristics that can contribute to a 'sense of place'. It embraces the idea that places, of any size from a bollard to a building, an historic area, a town, or a region, need to be understood and managed at different levels for different purposes; and that a particular geographical location can form part of several overlapping 'places' defined by different characteristics. Similarly, we have stretched the concept of 'fabric', commonly used to describe the material from which a building is constructed, to include all the material substance of places, including geology, archaeological deposits, structures and buildings, and the flora growing in and upon them. 'Designation' embraces any formal recognition of heritage value, including registration, listing, scheduling and inscription.

23 Our approach anticipates the proposed consolidation of national cultural heritage protection and, more importantly, avoids the suggestion that the *Principles* are concerned only with places that meet the particular thresholds of significance necessary for formal international, national or local designation. Beyond heritage designations, in the wider framework of environmental management and spatial planning, an understanding of the heritage values a place may have for its owners, the local community and wider communities of interest should be seen as the basis for making sound decisions about its future.

24 Sustainable management of a place begins with understanding and defining how, why, and to what extent it has cultural and natural heritage values: in sum, its significance. Communicating that significance to everyone concerned with a place, particularly those whose actions may affect it, is then essential if all are to act in awareness of its heritage values. Only through understanding the significance of a place is it possible to assess how the qualities that people value are vulnerable to harm or loss. That understanding should then provide the basis for developing and implementing management strategies (including maintenance, cyclical renewal and repair) that will best sustain the heritage values of the place in its setting. Every conservation decision should be based on an understanding of its likely impact on the significance of the fabric and other aspects of the place concerned.

25 Our definition of conservation includes the objective of sustaining heritage values. In managing significant places, 'to preserve', even accepting its established legal definition of 'to do no harm', is only one aspect of what is needed to sustain heritage values. The concept of conservation area designation, with its requirement 'to preserve or enhance', also recognises the potential for beneficial change to significant places, to reveal and reinforce value. 'To sustain' embraces both preservation and enhancement to the extent that the values of a place allow. Considered change offers the potential to enhance and add value to places, as well as generating the need to protect their established heritage values. It is the means by which each generation aspires to enrich the historic environment.

Relationship to other policy documents

26 Planning Policy Statement 1 *Delivering Sustainable Development* (2005) includes the explicit objective of 'protecting and enhancing the natural and historic environment'.[1] In these *Principles, Policies and Guidance*, we provide detailed guidance on sustaining the historic environment within the framework of established government policy. In particular, the document distils from Planning Policy Guidance note (PPG) 15 *Planning and the Historic Environment* (1994) and PPG16 *Archaeology and Planning* (1990) those general principles which are applicable to the historic environment as a whole. It also provides a structure within which other current English Heritage policy and guidance should be applied. The *Policies and Guidance* will be updated to refer to and reflect new heritage legislation and government policy as they emerge, and in the light of experience in use.

27 At the international level,[2] the *Principles* reflect many of the presumptions of the *World Heritage Convention*, with its call to give all natural and cultural heritage a function in the life of communities. The *Principles* are consistent with the *Granada Convention* on the protection of the architectural heritage, and the *Valletta Convention* on the protection of the archaeological heritage, both ratified by the United Kingdom. The *European Landscape Convention*, also ratified by the United Kingdom, has been influential, not least for its definition of a landscape as 'an area, as perceived by people…', and its references to the need to consider sustaining cultural values in managing all landscapes, as well as the importance of public engagement in that process.

[1] See paragraphs 5, 17-18

[2] *Convention concerning the Protection of the World Cultural and Natural Heritage* (UNESCO, 1972)
Convention for the Protection of the Architectural Heritage of Europe (Granada: Council of Europe, 1985, ETS 121)
European convention on the Protection of the Archaeological Heritage (Valletta: Council of Europe, 1992, ETS 143)
European Landscape Convention (Florence: Council of Europe, 2000, ETS 176)

Correlation with current and proposed legislation

28 The White Paper *Heritage Protection for the 21st Century* (March 2007) proposed a single national *Register of historic buildings and sites of special architectural, historic or archaeological interest*, which will include all those places currently on the statutory list of buildings of special architectural or historic interest and the schedule of monuments, the non-statutory registers of historic parks and gardens and of battlefields, and World Heritage Sites (although the latter are designated internationally). 'Historic asset' is the proposed shorthand for registered places, although marine 'historic assets' will remain outside this system. Conservation areas will continue to be designated at local level, alongside non-statutory local designations, and much of the archaeological resource will continue to be managed by policy, rather than designation.

29 In the proposed new national system of cultural heritage protection, 'reasons for designation' will set out why each 'historic asset' is above the threshold for designation for its 'architectural, historic or archaeological interest'. Grounds for designation will necessarily be confined to specific values under these headings, directly related to published selection criteria. The statutory basis of designation will, however, be sufficiently broad to embrace the range of values which the *Principles* identify as desirable to take into account in the management of significant places.

Equalities impact assessment
Public bodies are legally required to ensure that their plans, policies and activities do not unfairly discriminate against a group protected by equalities legislation. It is the responsibility of those public bodies for whom we provide advice to ensure that that they have conducted any relevant Equalities Impact Assessment that may be required when implementing the advice of English Heritage.

CONSERVATION PRINCIPLES

1 The historic environment is a shared resource

1.1 Our environment contains a unique and dynamic record of human activity. It has been shaped by people responding to the surroundings they inherit, and embodies the aspirations, skills and investment of successive generations.

1.2 People value this historic environment as part of their cultural and natural heritage. It reflects the knowledge, beliefs and traditions of diverse communities. It gives distinctiveness, meaning and quality to the places in which we live, providing a sense of continuity and a source of identity. It is a social and economic asset and a resource for learning and enjoyment.

1.3 Each generation should therefore shape and sustain the historic environment in ways that allow people to use, enjoy and benefit from it, without compromising the ability of future generations to do the same.

1.4 Heritage values represent a public interest in places, regardless of ownership. The use of law, public policy and public investment is justified to protect that public interest.

1.5 Advice and assistance should be available from public sources to help owners sustain the heritage in their stewardship.

2 Everyone should be able to participate in sustaining the historic environment

2.1 Everyone should have the opportunity to contribute his or her knowledge of the value of places, and to participate in decisions about their future, by means that are accessible, inclusive and informed.

2.2 Learning is central to sustaining the historic environment. It raises people's awareness and understanding of their heritage, including the varied ways in which its values are perceived by different generations and communities. It encourages informed and active participation in caring for the historic environment.

2.3 Experts should use their knowledge and skills to encourage and enable others to learn about, value and care for the historic environment. They play a crucial role in discerning, communicating and sustaining the established values of places, and in helping people to refine and articulate the values they attach to places.

2.4 It is essential to develop, maintain and pass on the specialist knowledge and skills necessary to sustain the historic environment.

3 Understanding the significance of places is vital

3.1 Any fixed part of the historic environment with a distinctive identity perceived by people can be considered a place.

3.2 The significance of a place embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it. These values tend to grow in strength and complexity over time, as understanding deepens and people's perceptions of a place evolve.

3.3 In order to identify the significance of a place, it is necessary first to understand its fabric, and how and why it has changed over time; and then to consider:

- who values the place, and why they do so
- how those values relate to its fabric
- their relative importance
- whether associated objects contribute to them
- the contribution made by the setting and context of the place
- how the place compares with others sharing similar values.

3.4 Understanding and articulating the values and significance of a place is necessary to inform decisions about its future. The degree of significance determines what, if any, protection, including statutory designation, is appropriate under law and policy.

4 Significant places should be managed to sustain their values

4.1 Change in the historic environment is inevitable, caused by natural processes, the wear and tear of use, and people's responses to social, economic and technological change.

4.2 Conservation is the process of managing change to a significant place in its setting in ways that will best sustain its heritage values, while recognising opportunities to reveal or reinforce those values for present and future generations.

4.3 Conservation is achieved by all concerned with a significant place sharing an understanding of its significance, and using that understanding to:

- judge how its heritage values are vulnerable to change
- take the actions and impose the constraints necessary to sustain, reveal and reinforce those values
- mediate between conservation options, if action to sustain one heritage value could conflict with action to sustain another
- ensure that the place retains its authenticity – those attributes and elements which most truthfully reflect and embody the heritage values attached to it.

4.4 Action taken to counter harmful effects of natural change, or to minimise the risk of disaster, should be timely, proportionate to the severity and likelihood of identified consequences, and sustainable.

4.5 Intervention may be justified if it increases understanding of the past, reveals or reinforces particular heritage values of a place, or is necessary to sustain those values for present and future generations, so long as any resulting harm is decisively outweighed by the benefits.

4.6 New work should aspire to a quality of design and execution which may be valued both now and in the future. This neither implies nor precludes working in traditional or new ways, but should respect the significance of a place in its setting.

5 Decisions about change must be reasonable, transparent and consistent

5.1 Decisions about change in the historic environment demand the application of expertise, experience and judgement, in a consistent, transparent process guided by public policy.

5.2 The range and depth of understanding, assessment and public engagement should be sufficient to inform and justify the decision to be made, but efficient in the use of resources. Proportionality should govern the exercise of statutory controls.

5.3 Potential conflict between sustaining heritage values of a place and other important public interests should be minimised by seeking the least harmful means of accommodating those interests.

5.4 If conflict cannot be avoided, the weight given to heritage values in making the decision should be proportionate to the significance of the place and the impact of the proposed change on that significance.

6 Documenting and learning from decisions is essential

6.1 Accessible records of the justification for decisions and the actions that follow them are crucial to maintaining a cumulative account of what has happened to a significant place, and understanding how and why its significance may have been altered.

6.2 Managers of significant places should monitor and regularly evaluate the effects of change and responses to it, and use the results to inform future decisions. Public bodies similarly should monitor and respond to the effects on the historic environment of their policies and programmes.

6.3 If all or part of a significant place will be lost, whether as a result of decision or inevitable natural process, its potential to yield information about the past should be realised. This requires investigation and analysis, followed by archiving and dissemination of the results, all at a level that reflects its significance.

6.4 Where such loss is the direct result of human intervention, the costs of this work should be borne by those who benefit from the change, or whose role it is to initiate such change in the public interest.

UNDERSTANDING HERITAGE VALUES

Preamble

30 People may value a place for many reasons beyond utility or personal association: for its distinctive architecture or landscape, the story it can tell about its past, its connection with notable people or events, its landform, flora and fauna, because they find it beautiful or inspiring, or for its role as a focus of a community. These are examples of cultural and natural heritage values in the historic environment that people want to enjoy and sustain for the benefit of present and future generations, at every level from the 'familiar and cherished local scene'[3] to the nationally or internationally significant place.

31 Many heritage values are recognised by the statutory designation and regulation of significant places, where a particular value, such as 'architectural or historic interest' or 'scientific interest', is judged to be 'special', that is above a defined threshold of importance. Designation necessarily requires the assessment of the importance of specific heritage values of a place; but decisions about its day-to-day management should take account of *all* the values that contribute to its significance. Moreover, the significance of a place should influence decisions about its future, whether or not it is has statutory designation.

32 Although most places of heritage value are used, or are capable of being used, for some practical purpose, the relationship between their utility and their heritage values can range from mutual support (in the normal situation of use justifying appropriate maintenance) to conflict. Places with heritage values can generate wider social and economic ('instrumental') benefits, for example as a learning or recreational resource, or as a generator of tourism or inward economic investment, although their potential to do so is affected by external factors, such as ease of access. Utility and market values, and instrumental benefits, are different from heritage values in nature and effect.

33 This section is intended to prompt comprehensive thought about the range of inter-related heritage values that may be attached to a place. The high level values range from evidential, which is dependent on the inherited fabric of the place, through historical and aesthetic, to communal values which derive from people's identification with the place.

34 Some values can be appreciated simply as a spontaneous, although culturally influenced, response; but people's experience of all heritage values tends to be enhanced by specific knowledge about the place.

[3] PPG 15, *Planning and the historic environment* (1994), para 1.1.

Evidential value

35 Evidential value derives from the potential of a place to yield evidence about past human activity.

36 Physical remains of past human activity are the primary source of evidence about the substance and evolution of places, and of the people and cultures that made them. These remains are part of a record of the past that begins with traces of early humans and continues to be created and destroyed. Their evidential value is proportionate to their potential to contribute to people's understanding of the past.

37 In the absence of written records, the material record, particularly archaeological deposits, provides the only source of evidence about the distant past. Age is therefore a strong indicator of relative evidential value, but is not paramount, since the material record is the primary source of evidence about poorly-documented aspects of any period. Geology, landforms, species and habitats similarly have value as sources of information about the evolution of the planet and life upon it.

38 Evidential value derives from the physical remains or genetic lines that have been inherited from the past. The ability to understand and interpret the evidence tends to be diminished in proportion to the extent of its removal or replacement.

Historical value

39 Historical value derives from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be *illustrative* or *associative*.

40 The idea of *illustrating* aspects of history or prehistory – the perception of a place as a link between past and present people – is different from purely evidential value. Illustration depends on visibility in a way that evidential value (for example, of buried remains) does not. Places with illustrative value will normally also have evidential value, but it may be of a different order of importance. An historic building that is one of many similar examples may provide little unique evidence about the past, although each illustrates the intentions of its creators equally well. However, their distribution, like that of planned landscapes, may be of considerable evidential value, as well as demonstrating, for instance, the distinctiveness of regions and aspects of their social organisation.

41 Illustrative value has the power to aid interpretation of the past through making connections with, and providing insights into, past communities and their activities through shared experience of a place. The illustrative value of places tends to be greater if they incorporate the first, or only surviving, example of an innovation of consequence, whether related to design, technology or social organisation. The concept is similarly applicable to the natural heritage values of a place, for example geological strata visible in an exposure, the survival of veteran trees, or the observable interdependence of species in a particular habitat. Illustrative value is often described in relation to the subject illustrated, for example, a structural system or a machine might be said to have 'technological value'.

42 *Association* with a notable family, person, event, or movement gives historical value a particular resonance. Being at the place where something momentous happened can increase and intensify understanding through linking historical accounts of events with the place where they happened – provided, of course, that the place still retains some semblance of its appearance at the time. The way in which an individual built or furnished their house, or made a garden, often provides insight into their personality, or demonstrates their political or cultural affiliations. It can suggest aspects of their character and motivation that extend, or even contradict, what they or others wrote, or are recorded as having said, at the time, and so also provide evidential value.

43 Many buildings and landscapes are associated with the development of other aspects of cultural heritage, such as literature, art, music or film. Recognition of such associative values tends in turn to inform people's responses to these places. Associative value also attaches to places closely connected with the work of people who have made important discoveries or advances in thought about the natural world.

44 The historical value of places depends upon both sound identification and direct experience of fabric or landscape that has survived from the past, but is not as easily diminished by change or partial replacement as evidential value. The authenticity of a place indeed often lies in visible evidence of change as a result of people responding to changing circumstances. Historical values are harmed only to the extent that adaptation has obliterated or concealed them, although completeness does tend to strengthen illustrative value.

45 The use and appropriate management of a place for its original purpose, for example as a place of recreation or worship, or, like a watermill, as a machine, illustrates the relationship between design and function, and so may make a major contribution to its historical values. If so, cessation of that activity will diminish those values and, in the case of some specialised landscapes and buildings, may essentially destroy them. Conversely, abandonment, as of, for example, a medieval village site, may illustrate important historical events.[4]

Aesthetic value

46 Aesthetic value derives from the ways in which people draw sensory and intellectual stimulation from a place.

47 Aesthetic values can be the result of the conscious *design* of a place, including artistic endeavour. Equally, they can be the seemingly *fortuitous* outcome of the way in which a place has evolved and been used over time. Many places combine these two aspects – for example, where the qualities of an already attractive landscape have been reinforced by artifice – while others may inspire awe or fear. Aesthetic values tend to be specific to a time and cultural context, but appreciation of them is not culturally exclusive.

48 *Design value* relates primarily to the aesthetic qualities generated by the conscious design of a building, structure or landscape as a whole. It embraces composition (form, proportions, massing, silhouette, views and vistas, circulation) and usually materials or planting, decoration or detailing, and craftsmanship. It may extend to an intellectual programme governing the design (for example, a building as an expression of the Holy Trinity), and the choice or influence of sources from which it was derived. It may be attributed to a known patron, architect, designer, gardener or craftsman (and so have associational value), or be a mature product of a vernacular tradition of building or land management. Strong indicators of importance are quality of design and execution, and innovation, particularly if influential.

49 Sustaining design value tends to depend on appropriate stewardship to maintain the integrity of a designed concept, be it landscape, architecture, or structure.

50 It can be useful to draw a distinction between design created through detailed instructions (such as architectural drawings) and the direct creation of a work of art by a designer who is also in significant part the craftsman. The value of the artwork is proportionate to the extent that it remains the actual product of the artist's hand. While the difference between design and 'artistic' value can be clear-cut, for example statues on pedestals (artistic value) in a formal garden (design value), it is often far less so, as with repetitive ornament on a medieval building.

[4] For guidance on the restoration on ruins see para 133, on alterations to sustain use, para 154.

51 Some aesthetic values are not substantially the product of formal design, but develop more or less *fortuitously* over time, as the result of a succession of responses within a particular cultural framework. They include, for example, the seemingly organic form of an urban or rural landscape; the relationship of vernacular buildings and structures and their materials to their setting; or a harmonious, expressive or dramatic quality in the juxtaposition of vernacular or industrial buildings and spaces. Design in accordance with Picturesque theory is best considered a design value.

52 Aesthetic value resulting from the action of nature on human works, particularly the enhancement of the appearance of a place by the passage of time ('the patina of age'), may overlie the values of a conscious design. It may simply add to the range and depth of values, the significance, of the whole; but on occasion may be in conflict with some of them, for example, when physical damage is caused by vegetation charmingly rooting in masonry.

53 While aesthetic values may be related to the age of a place, they may also (apart from artistic value) be amenable to restoration and enhancement. This reality is reflected both in the definition of conservation areas (areas whose 'character or appearance it is desirable to preserve or enhance') and in current practice in the conservation of historic landscapes.

Communal value

54 Communal value derives from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values, but tend to have additional and specific aspects.

55 *Commemorative* and *symbolic* values reflect the meanings of a place for those who draw part of their identity from it, or have emotional links to it. The most obvious examples are war and other memorials raised by community effort, which consciously evoke past lives and events, but some buildings and places, such as the Palace of Westminster, can symbolise wider values. Such values tend to change over time, and are not always affirmative. Some places may be important for reminding us of uncomfortable events, attitudes or periods in England's history. They are important aspects of collective memory and identity, places of remembrance whose meanings should not be forgotten. In some cases, that meaning can only be understood through information and interpretation, whereas, in others, the character of the place itself tells most of the story.

56 *Social value* is associated with places that people perceive as a source of identity, distinctiveness, social interaction and coherence. Some may be comparatively modest, acquiring communal significance through the passage of time as a result of a collective memory of stories linked to them. They tend to gain value through the resonance of past events in the present, providing reference points for a community's identity or sense of itself. They may have fulfilled a community function that has generated a deeper attachment, or shaped some aspect of community behaviour or attitudes. Social value can also be expressed on a large scale, with great time-depth, through regional and national identity.

57 The social values of places are not always clearly recognised by those who share them, and may only be articulated when the future of a place is threatened. They may relate to an activity that is associated with the place, rather than with its physical fabric. The social value of a place may indeed have no direct relationship to any formal historical or aesthetic values that may have been ascribed to it.

58 Compared with other heritage values, social values tend to be less dependent on the survival of historic fabric. They may survive the replacement of the original physical structure, so long as its key social and cultural characteristics are maintained; and can be the popular driving force for the re-creation of lost (and often deliberately destroyed or desecrated) places with high symbolic value, although this is rare in England.

59 Spiritual value attached to places can emanate from the beliefs and teachings of an organised religion, or reflect past or present-day perceptions of the spirit of place. It includes the sense of inspiration and wonder that can arise from personal contact with places long revered, or newly revealed.

60 Spiritual value is often associated with places sanctified by longstanding veneration or worship, or wild places with few obvious signs of modern life. Their value is generally dependent on the perceived survival of the historic fabric or character of the place, and can be extremely sensitive to modest changes to that character, particularly to the activities that happen there.

ASSESSING HERITAGE SIGNIFICANCE

Preamble

61 Understanding a place and assessing its significance demands the application of a systematic and consistent process, which is appropriate and proportionate in scope and depth to the decision to be made, or the purpose of the assessment. This section sets out such a process, which can be applied not only to places already acknowledged as significant, but also to those where the potential for change generates the need for assessment. Not all stages will be applicable to all places.

Understand the fabric and evolution of the place

62 To identify the cultural and natural heritage values of a place, its history, fabric and character must first be understood. This should include its origins, how and why it has changed over time (and will continue to change if undisturbed), the form and condition of its constituent elements and materials, the technology of its construction, any habitats it provides, and comparison with similar places. Its history of ownership may be relevant, not only to its heritage values, but also to its current state.

63 The study of material remains alone will rarely provide sufficient understanding of a place. The information gained will need to be set in the context of knowledge of the social and cultural circumstances that produced the place. Documentation underpinning any existing statutory designations is also important. Historical and archaeological archives always help with understanding how and why the place has changed over time, as may personal recollections, which can be fundamental to identifying some historical and communal values. Published research frameworks may highlight particular aspects of evidential value or potential, but absence of evidence is not evidence of absence, especially of concealed or buried remains.

64 Historic Environment Records play a vital role in developing a comprehensive and dynamic information resource, both for understanding particular places and as a wider research tool. Key elements of documentation generated through understanding places, and making changes to significant places, should be copied to Historic Environment Records, as well as remaining accessible to everyone directly concerned with the place.

65 Extensive mapping, description, understanding and assessment – 'characterisation' – can facilitate rapid analysis of large areas, both urban and rural. Its aim is to help people recognise how the past has shaped the present landscape, by identifying the distinctive historic elements of an area, and explaining past contexts of particular places within it.[5]

Identify who values the place, and why they do so

66 To provide a sound basis for management, the people and communities who are likely to attach heritage values to a place should be identified, and the range of those values understood and articulated, not just those that may be a focus of contention. This involves engaging with owners, communities and specialists with a sufficient range of knowledge of the place, subject to the need for proportionality.

67 Different people and communities may attach different weight to the same heritage values of a place at the same time. Experience shows that judgements about heritage values, especially those relating to the recent past, tend to grow in strength and complexity over time, as people's perceptions of a place evolve. It is therefore necessary to consider whether a place might be so valued in the future that it should be protected now.

68 Understanding the history of a place does not necessarily make it significant; but the process of investigation often generates and helps to define perceptions of heritage value. This may happen through physical or documentary discoveries, or dialogue; but equally may be prompted by the articulation of links between the qualities of a particular place and the evolution of the culture that produced it, or the events that happened there.

[5] See *Boundless Horizons: Historic Landscape Characterisation* and *Using Historic Landscape Characterisation* (English Heritage, 2004) and at a more detailed level, *Guidance on conservation area appraisals* (English Heritage, 2006).

Relate identified heritage values to the fabric of the place

69 An assessment of significance will normally need to identify how particular parts of a place and different periods in its evolution contribute to, or detract from, each identified strand of cultural and natural heritage value. This is current practice in statutory designation, in relation to those particular values that are the basis of selection. The most useful categories for differentiating between the components of a place ('what') are temporal ('when', often linked to 'by whom') and spatial ('where', 'which part', often linked to 'why'). Understanding a place should produce a chronological sequence of varying precision, allowing its surviving elements to be ascribed to 'phases' in its evolution. Some phases are likely to be of greater significance than others, while some values, such as historical or communal, will apply to the place as a whole. For example:

'The evidential value and potential of Smith's Hall lies primarily in the timber-framed elements of the medieval hall house and 16th century cross-wing, and to a moderate extent in the 18th century alterations and partial casing. The latter is, however, of high architectural value, marred by superficial 19th century accretions, but complemented by a study extension of c1970 by A Architect. The contemporary garden is an outstanding design, integrating framework, sculpture and planting. The building well illustrates a regionally typical pattern of development from a medieval core, and its historical value is enhanced by its association with the writer A Wordsmith who commissioned the study and garden. Since his death Smith's Hall has developed as a creative writing centre and the focus of an annual literary festival'.[6]

70 In other cases, differentiation will be spatial, for example:

'The street block of the factory was designed by A N Other to demonstrate the architectural potential of the company's terracotta; it is a bold and well-proportioned design which was followed by others in the district. Its architectural value is reinforced by the technological [*ie illustrative historical*] value of the fireproof construction of the floors using hollow pots. The rear block, although it followed soon afterwards, is by contrast architecturally entirely typical of its date and place. While of lesser architectural value, it and the other buildings on the site, each of which fulfilled a specific role in the manufacturing process, are collectively of high evidential and historical value.'

71 In many cases, differentiation will be a combination of the spatial and the temporal. It will normally best be illustrated by maps or plans showing the age and relative significance of the components or character areas of a place. Where the assessment is prompted by potential change, it is important that elements that would be directly affected are addressed at an appropriate level of detail, but always in relation to the place as a whole.

[6] As a result of which it may also acquire social value over time.

Consider the relative importance of those identified values

72 It is normally desirable to sustain all the identified heritage values of a place, both cultural and natural; but on occasion, what is necessary to sustain some values will conflict with what is necessary to sustain others (paragraphs 91-92). If so, understanding the relative contribution of each identified heritage value to the overall value of the place – its significance – will be essential to objective decision-making. A balanced view is best arrived at through enabling all interested parties to appreciate their differing perspectives and priorities.

73 As the 'Smith's Hall' example above demonstrates, some elements of a place may actually mar or conceal its significance. Identifying these is current good practice in statutory designation, both national and local, the latter through conservation area character appraisals. Eliminating or mitigating negative characteristics may help to reveal or reinforce heritage values of a place and thus its significance.

Consider the contribution of associated objects and collections

74 Historically-associated objects can make a major contribution to the significance of a place, and association with the place can add heritage value to those objects. The range includes, but is not limited to, artefacts recovered through archaeological fieldwork, artworks and furnishings, collections, tools and machinery, and related archives, both historical and archaeological. The value of the whole is usually more than the sum of the parts, so that permanent separation devalues both place and objects. The contribution of such objects and archives, including evolving collections, should be articulated, even if they are currently held elsewhere, and regardless of whether their contribution falls within the scope of statutory protection.

75 Where places have been created around accumulated collections (for example, museums or libraries), the interior of a room or part of a garden has been designed as an entity (including a specific collection of furniture or sculpture, as well as fixed elements), or where an industrial building was designed around or to accommodate particular machinery, the relationship between the objects or elements and the place is fundamental to the significance of the place.

Consider the contribution made by setting and context

76 'Setting' is an established concept that relates to the surroundings in which a place is experienced, its local context, embracing present and past relationships to the adjacent landscape. Definition of the setting of a significant place will normally be guided by the extent to which material change within it could affect (enhance or diminish) the place's significance.

77 'Context' embraces any relationship between a place and other places. It can be, for example, cultural, intellectual, spatial or functional, so any one place can have a multi-layered context. The range of contextual relationships of a place will normally emerge from an understanding of its origins and evolution. Understanding context is particularly relevant to assessing whether a place has greater value for being part of a larger entity, or sharing characteristics with other places.

Compare the place with other places sharing similar values

78 Understanding the importance of a place by comparing it with other places that demonstrate similar values normally involves considering:

- how strongly are the identified heritage values demonstrated or represented by the place, compared with those other places?
- how do its values relate to statutory designation criteria, and any existing statutory designations of the place?

79 Designation at an international, national or local level is an indicator of the importance of particular value(s) of a place; but the absence of statutory designation does not necessarily imply lack of significance. Detailed research and analysis may reveal new evidence about any place, and designation criteria are reviewed from time to time. The heritage values of a place established through detailed study should therefore normally be compared with current selection criteria for designation or the application of protective policies.

80 Value-based judgements about elements of the historic environment have implications both for places and for everyone with an interest in them. Such judgements provide the basis for decisions about whether, or to what extent, a place should be conserved, rather than remade or replaced. Designation forms the basis of the statutory system of heritage protection. It may have important financial and other consequences for owners, while the refusal to designate may mean the loss of a place to which some people attached considerable significance. Consistency of judgement is therefore crucial to the public acceptability and fairness of the process. Detailed criteria for statutory designation, periodically updated,[7] and a methodical articulation of how a particular place does or does not meet such criteria, make a major contribution to achieving that consistency.

81 The fact that a place does not meet current criteria for formal designation does not negate the values it may have to particular communities. Such values should be taken into account in making decisions about its future through the spatial planning system,[8] or incentive schemes like Environmental Stewardship.

Articulate the significance of the place

82 A 'statement of significance' of a place should be a summary of the cultural and natural heritage values currently attached to it and how they inter-relate, which distils the particular character of the place. It should explain the relative importance of the heritage values of the place (where appropriate, by reference to criteria for statutory designation), how they relate to its physical fabric, the extent of any uncertainty about its values (particularly in relation to potential for hidden or buried elements), and identify any tensions between potentially conflicting values. So far as possible, it should be agreed by all who have an interest in the place. The result should guide all decisions about material change to a significant place.

83 Assessments in support of a decision that a place passes the threshold for statutory designation for a particular value normally stand the test of time. However, the values of a place tend to extend beyond those which justify designation, and to grow in strength and complexity as time passes (Principle 3.3). A statement of significance is an informed and inclusive judgement made on a particular set of data, applying prevailing perceptions of value, primarily to inform the management of a significant place. The statement will therefore need review in the light of new information, and periodically to reflect evolving perceptions of value (Principle 3.4).

[7] Communities and Local Government Circular 01/2007, *Revision to principles of selection for listing buildings* complemented by detailed *Selection Guides* for particular building types produced by English Heritage, are a major step towards achieving this objective for listed buildings.

[8] In line with the *European Landscape Convention,* Articles 5, 6.

MANAGING CHANGE TO SIGNIFICANT PLACES

Preamble

84 Conservation involves people managing change to a significant place in its setting, in ways that sustain, reveal or reinforce its cultural and natural heritage values (Principle 4.2). Conservation is not limited to physical intervention, for it includes such activities as the interpretation and sustainable use of places. It may simply involve maintaining the *status quo*, intervening only as necessary to counter the effects of growth and decay, but equally may be achieved through major interventions; it can be active as well as reactive. Change to a significant place is inevitable, if only as a result of the passage of time, but can be neutral or beneficial in its effect on heritage values. It is only harmful if (and to the extent that) significance is eroded.

85 The public interest in significant places is recognised through specific legislative and policy constraints on their owners, but there are few fiscal concessions to encourage conservation, and direct financial assistance is very limited. It is the potential of significant places to be used and enjoyed that generates value in the market or to a community, and so tends to motivate and enable their owners to exercise positive, informed stewardship. Very few significant places can be maintained at either public or private expense unless they are capable of some beneficial use; nor would it be desirable, even if it were practical, for most places that people value to become solely memorials of the past.

86 Keeping a significant place in use is likely to require continual adaptation and change; but, provided such interventions respect the values of the place, they will tend to benefit public (heritage) as well as private interests in it. Many places now valued as part of the historic environment exist because of past patronage and private investment, and the work of successive generations often contributes to their significance. Owners and managers of significant places should not be discouraged from adding further layers of potential future interest and value, provided that recognised heritage values are not eroded or compromised in the process.

87 The shared public and private interest in sustaining significant places in use demands mutual co-operation and respect between owners or managers and regulators. The best use for a significant place – its 'optimum viable use'[9] – is one that is both capable of sustaining the place and avoids or minimises harm to its values in its setting. It is not necessarily the most profitable use if that would entail greater harm than other viable uses.

[9] PPG 15, paragraph 3.9, in the context of listed buildings, but the principle is applicable to most significant places.

88 Decisions about change to significant places may be influenced by a range of interests. They may involve balancing the heritage value(s) of what exists now against the predicted benefits and disbenefits of the proposed intervention; that is to say, the public interest in the historic environment (which, if statutorily protected, is subject to a policy presumption in favour of preservation), with other, usually inter-related, public and private interests. There is rarely a single right answer, so adequate information and adopting a consistent, rigorous process are crucial to reaching publicly-justifiable decisions.

Establish whether there is sufficient information

89 Understanding the impacts or consequences of proposed change should go beyond implications that are immediately apparent; for example, how much physical intervention would really be required to implement a proposal or a change of use? Specific investigation is often required, not only of ongoing processes of growth, change and decay, and other factors which may make the significance of the place vulnerable to harm or loss, but also of technical information about all the implications of a potential change, and often of the methods by which it would be achieved.

90 Having understood the scope of continuing or proposed change, sufficient information about the values of the elements of the place that would be affected is essential. The general process of assessing values and significance is addressed above (paragraphs 61-65). But detailed, targeted investigation and evaluation may be required, particularly of habitats, and of potential buried archaeological deposits or concealed structure, in order adequately to establish the contribution they make to the significance of the place. If required as part of a statutory process, such research must, however, be directly and proportionately related to the nature of proposal and its potential effects.

Consider the effects on authenticity and integrity

91 Evidential value, historical values and some aesthetic values, especially artistic ones, are dependent upon a place retaining (to varying degrees) the actual fabric that has been handed down from the past; but authenticity lies in whatever most truthfully reflects and embodies the values attached to the place (Principle 4.3). It can therefore relate to, for example, design or function, as well as fabric. Design values, particularly those associated with landscapes or buildings, may be harmed by losses resulting from disaster or physical decay, or through ill-considered alteration or accretion. Design value may be recoverable through repair or restoration, but perhaps at the expense of some evidential value. Keeping a large machine, like a water mill or boat lift, in use, may require replacement and modification of structural or moving parts which could be retained if it ceased to operate, producing a tension between authenticity of fabric and function.

92 The decision as to which value should prevail if all cannot be fully sustained always requires a comprehensive understanding of the range and relative importance of the heritage values involved (guided by the assessment of significance: paragraphs 82-83), and what is necessary (and possible) to sustain each of them. Retaining the authenticity of a place is not always achieved by retaining as much of the existing fabric as is technically possible.

93 A desire to retain authenticity tends to suggest that any deliberate change to a significant place should be distinguishable, that is, its extent should be discernible through inspection. The degree of distinction that is appropriate must take account of the aesthetic values of the place. In repair and restoration, a subtle difference between new and existing, comparable to that often adopted in the presentation of damaged paintings, is more likely to retain the coherence of the whole than jarring contrast.

94 Integrity (literally, 'wholeness, honesty') can apply, for example, to a structural system, a design concept, the way materials or plants are used, the character of a place, artistic creation, or functionality. Decisions about recovering any aspect of integrity that has been compromised must, like authenticity, depend upon a comprehensive understanding of the values of the place, particularly the values of what might be lost in the process.

95 Every place is unique in its combination of heritage values, so, while it is technically possible to relocate some structures, their significance tends to be diminished by separation from their historic location. There are exceptions, for example public sculpture not significantly associated with its current site, or moving a structure back from an eroding cliff edge, thus recovering its intended relationship with the landform. Relocated structures may also acquire new values in a new location.

Take account of sustainability

96 Significant places should be used and managed in ways that will, wherever possible, ensure that their significance can be appreciated by generations to come, an established aspect of stewardship. Sustaining the value of the historic environment as a whole depends also on creating in the present the heritage of the future, through changes that enhance and enrich the values of places. Both objectives involve the difficult task of anticipating the heritage values of future generations, as well as understanding those of our own.

97 Sustaining heritage values is likely to contribute to environmental sustainability, not least because much of the historic environment was designed for a comparatively low-energy economy. Many historic settlements and neighbourhoods, tending towards high density and mixed use, provide a model of sustainable development. Traditional landscape management patterns have been sustained over centuries. Many traditional buildings and building materials are durable, and perform well in terms of the energy needed to make and use them. Their removal and replacement would require a major reinvestment of energy and resources.

98 The re-use of sound materials derived from the place being repaired or altered is traditional practice and contributes to the sustainable use of energy and material resources. Mixing old and new materials in exposed situations, however, may be inadvisable. Maintaining demand for new traditional and local materials will also stimulate their continued or renewed production, and help to ensure a sustainable supply and the craft skills to utilise it.

99 The re-use of sound traditional materials recovered from alteration and demolition elsewhere can also contribute to sustainability, provided they are not derived from degrading other significant places primarily because of the value of their materials.

Consider the potential reversibility of changes

100 In reality, our ability to judge the long-term impact of changes on the significance of a place is limited. Interventions may not perform as expected. As perceptions of significance evolve, future generations may not consider their effect on heritage values positive. It is therefore desirable that changes, for example those to improve energy efficiency in historic buildings, are capable of being reversed, in order not unduly to prejudice options for the future.

101 However, places should not be rendered incapable of a sustainable use simply because of a reluctance to make modest, but irreversible, changes. It is also unreasonable to take the idea of reversibility to the point that intervention in significant places diminishes their aesthetic values by appearing contrived, awkward or ugly, in order to ensure that it can be undone. Unless of very short duration, crude and intrusive changes are certainly not justifiable simply because they are theoretically temporary or reversible, for they risk becoming permanent.

Compare options and make the decision

102 Ideally, proposed changes will cause no harm to any of the values of the place, and the right decision will be obvious. In practice, however, there tend to be options for achieving the objective of proposed change, each of which will have different impacts on values. The predicted long-term or permanent consequences of proposals (in terms of degree, and whether positive, negative or neutral) on each of the identified heritage values of a place, and thus on the significance of the whole, should provide the reasoned basis for a decision, where necessary taking other interests into account.

103 Where there are options for the conservation management of change, or reconciling conservation and other interests, 'heritage impact assessment' can be used to compare the predicted effects of alternative courses of action (including taking no action) on the values of a place, in order to identify the optimum solution. The approach can be refined by weighting different values to reflect their relative importance for the place and its significance. Heritage impact assessment can be particularly useful if applied at the conceptual stage of a proposal, and refined at each successive step towards making a decision.

Apply mitigation

104 If some negative impact or loss of fabric is unavoidable, mitigation should be considered to minimise harm. This will normally include making records and archiving parts of significant elements, including archaeological deposits, that will be removed or altered prior to and during the work, in accordance with Principles 6.3 and 6.4. A high quality of design of proposed interventions is not mitigation; it is essential in any significant place (Principle 4.6), regardless of any unavoidable harm. Mitigation should not be confused with compensation – non-essential benefits to other aspects of the place, or to other heritage interests.

Monitor and evaluate outcomes

105 Monitoring implementation helps to ensure that outcomes reflect expectations. If, despite prior investigation, the unexpected is revealed during implementation, proposals should, so far as is reasonably possible, be amended to minimise harm.

106 The management of significant places should include regular monitoring and evaluation of the effects of change, in accordance with Principles 6.1 and 6.2. This provides the basis for action to address ongoing change (including action by authorities to mitigate the effects of deliberate neglect). Outcomes of decisions can be compared with expectations, often revealing unanticipated consequences, and informing future policy and decisions.

107 Conservation management plans, regularly reviewed, can provide a sound framework for the management of significant places, particularly those in responsible long-term ownership.

ENGLISH HERITAGE CONSERVATION POLICIES AND GUIDANCE

Preamble

108 This section summarises the policies that will guide English Heritage in offering advice or making decisions about particular types of change affecting significant places. More than one type of change may of course be included in any particular proposal. English Heritage is primarily concerned with the effect of proposals on the heritage values of places, and its policies are framed accordingly.

109 While some of the policies have a close relationship to particular principles (for example 'New work and alteration' to Principle 4.6), it is important that all the policies are interpreted in the framework of the *Principles* as a whole.

110 Tension between conservation and other public policies usually arises from a perceived need to harm the heritage values of a place in order to achieve another important public policy objective, or to sustain the place itself (paragraph 150). The converse is 'enabling development' contrary to public policy, which is proposed in order to sustain a significant place (paragraph 158). In both cases, it is important to keep a sense of proportion, and not automatically to assume that cultural or natural heritage values must prevail over all other public interests. Such tensions are usually best reconciled by integrating conservation with the other public interests through dialogue, based on mutual understanding and respect.

Routine management and maintenance

111 **The conservation of significant places is founded on appropriate routine management and maintenance.**

112 The values of landscapes and buildings tend to be quickly obscured or lost if long-standing management and maintenance regimes are discontinued. Such regimes are often closely linked to historic design, function and stewardship, and dependent on traditional processes and materials. Since most habitats in England are the result of long-established land management practices, sustaining their ecosystems can depend upon continuing those practices. Reinstating a lapsed regime can help to recover both cultural and natural heritage values.

113 Regular monitoring should inform continual improvement of planned maintenance and identify the need for periodic repair or renewal at an early stage. If a permanent solution to identified problems is not immediately possible, temporary works should be undertaken to prevent the problems from escalating. Temporary solutions should be effective, timely and reversible.

Periodic renewal

114 **Periodic renewal of elements of a significant place, intended or inherent in the design, is normally desirable unless any harm caused to heritage values would not be recovered over time.**

115 Periodic renewal, such as re-covering roofs, differs from maintenance in that it occurs on a longer cycle, is usually more drastic in nature and often has a greater visual impact. It involves the temporary loss of certain heritage values, such as the aesthetic value of the patina of age on an old roof covering, or the value of a dying tree as a habitat for invertebrates; but these values are likely to return within the next cycle, provided the replacement is physically and visually compatible (normally 'like for like', to the extent that this is sustainable). By contrast, the consequence of not undertaking periodic renewal is normally more extensive loss of both fabric and heritage values.

116 The justification required for periodic renewal will normally be that the fabric concerned is becoming incapable of fulfilling its intended functions through more limited intervention; and additionally, in the case of landscapes, that succession planting cannot achieve the objective in a less drastic way. Harm to values that will normally be recovered during the next cycle can, in most cases, be discounted, but potential permanent harm cannot be ignored in making the decision.

Repair

117 **Repair necessary to sustain the heritage values of a significant place is normally desirable if:**

a. **there is sufficient information comprehensively to understand the impacts of the proposals on the significance of the place; and**
b. **the long term consequences of the proposals can, from experience, be demonstrated to be benign, or the proposals are designed not to prejudice alternative solutions in the future; and**
c. **the proposals are designed to avoid or minimise harm, if actions necessary to sustain particular heritage values tend to conflict.**

118 It is important to look beyond the immediate need for action, to understand the reasons for the need for repair and plan for the long-term consequences of inevitable change and decay. While sufficient work should be undertaken to achieve a lasting repair, the extent of the repair should normally be limited to what is reasonably necessary to make failing elements sound and capable of continuing to fulfil their intended functions.

119 The use of materials or techniques with a lifespan that is predictable from past performance, and which are close matches for those being repaired or replaced, tends to carry a low risk of future harm or premature failure. By contrast, the longer term effects of using materials or techniques that are innovative and relatively untested are much less certain. Not all historic building materials or techniques were durable – iron cramps in masonry, or un-galvanised steel windows, for example, are both subject to corrosion. Some structural failures are the inevitable, if slowly developing, consequences of the original method of construction. Once failure occurs, stabilising the structure depends on addressing the underlying causes of the problem, not perpetuating inherent faults.

120 The use of original materials and techniques for repair can sometimes destroy more of the original fabric, and any decoration it carries, than the introduction of reinforcing or superficially protective modern materials. These may offer the optimum conservation solution if they allow more significant original fabric to be retained. In historic landscapes, planting may need to utilise alternative species, to resist disease or the effects of climate change. Before making decisions, it is essential to understand all the heritage values of the elements concerned, and to consider the longer term, as well as the immediate, conservation objectives.

121 Sometimes, the action necessary to sustain or reinforce one heritage value can be incompatible with the actions necessary to sustain others. Understanding the range, inter-relationships and relative importance of the heritage values associated with a place should establish priorities for reconciling or balancing such tensions. While every reasonable effort should be made to avoid or minimise potential conflict, contrived solutions requiring intensive maintenance are likely to be difficult to sustain.

Intervention to increase knowledge of the past

122 **Intervention in significant places primarily to increase knowledge of the past, involving material loss of evidential values, should normally be acceptable if:**

a. preservation *in situ* is not reasonably practicable; or

b. it is demonstrated that the potential increase in knowledge

- **cannot be achieved using non-destructive techniques; and**
- **is unlikely to be achieved at another place whose destruction is inevitable; and**
- **is predicted decisively to outweigh the loss of the primary resource.**

If acceptable, an intervention demands:

c. a skilled team, with the resources to implement a project design based on explicit research objectives;

d. funded arrangements for the subsequent conservation and public deposit of the site archive, and for appropriate analysis and dissemination of the results within a set timetable;

e. a strategy to ensure that other elements and values of the place are not prejudiced by the work, whether at the time or subsequently, including conservation of any elements left exposed.

123 The historic environment provides a unique record of past human activity, but differs from written archives in that 'reading' some parts of it can only be achieved through the destruction of the primary record. This policy applies particularly to the excavation of buried archaeological deposits, but can be relevant to the physical investigation of structures. It concerns intervention that goes beyond the evaluation and targeted investigation that may be necessary to inform and justify conservation management decisions.

124 The continuing development of investigative techniques suggests that, in future, it will be possible to extract more data from excavation and intervention than is currently possible, just as now it is usual to extract much more information than was possible a few decades ago. This demands a cautious approach to the use of a finite resource, and seeking to avoid loss of integrity, but it cannot reasonably exclude all research at a significant place. It must be recognised that much of the evidential value of the primary archive – the place itself – lies in its potential to increase knowledge of the past, to help protect the place and other similar places by a better understanding of their significance, to stimulate research, to encourage the further development of techniques to extract data, and to train successive generations of archaeologists.

125 Intervention must be justified primarily by considering the potential gain in knowledge in relation to the impact on the archaeological resource, and specifically on the place or type of site in question. Established, relevant research framework priorities should be taken into account. Intervention should always be the minimum necessary to achieve the research objectives, fully utilising the potential of non-destructive techniques; but also extensive enough to ensure that the full research potential of what is necessarily to be destroyed in the process can be realised.

Restoration

126 **Restoration to a significant place should normally be acceptable if:**

a. the heritage values of the elements that would be restored decisively outweigh the values of those that would be lost;
b. the work proposed is justified by compelling evidence of the evolution of the place, and is executed in accordance with that evidence;
c. the form in which the place currently exists is not the result of an historically-significant event;
d. the work proposed respects previous forms of the place;
e. the maintenance implications of the proposed restoration are considered to be sustainable.

127 Restoration is intervention made with the deliberate intention of revealing or recovering a known element of heritage value that has been eroded, obscured or previously removed, rather than simply maintaining the *status quo*. It may also achieve other conservation benefits, for example restoring a roof on a roofless building may make it both physically and economically sustainable in the long term. Restoration of some elements of a place may be a desirable precursor to the introduction of new work (paragraph 138), which will necessarily take over where the evidence for restoration ends.

128 The concept of authenticity (paragraph 91) demands that proposals for restoration always require particularly careful justification. Reinstating damaged elements of work directly created by the hand of an artist normally runs counter to the idea of authenticity and integrity. However, the reinstatement of damaged architectural or landscape features in accordance with an historic design evidenced by the fabric of a place may not do so, if the design itself was the artistic creation, intended to be constructed by others, and the necessary materials and skills are available.

129 Mitigation through recording (paragraph 104) is particularly important in restoration work. The results should be integrated with and used to update the initial analysis of the evidence for restoration (which will often be expanded and modified in detail during the early stages of work), and the result deposited in the appropriate Historic Environment Record.

'The heritage values of the elements that would be restored decisively outweigh the values of those that would be lost.'

130 Any restoration inevitably removes or obscures part of the record of past change to a significant place, and so reduces its evidential value, as well as potentially affecting its historical and aesthetic values. Restoration may, however, bring gains by revealing other heritage values, such as the integrity and quality of an earlier and more important phase in the evolution of a place, which makes a particular contribution to its significance. Careful assessment of the values of the elements affected is essential. Where the significance of a place is the result of centuries of change, restoration to some earlier stage in its evolution is most unlikely to meet this criterion.

'The nature of the work proposed is justified by compelling evidence of the evolution of the place, and is executed in accordance with that evidence'.

131 Evidence of the evolution of the place, and particularly of the phase to which restoration is proposed, should be drawn from all available sources – from study of the fabric of the place itself (the primary record of its evolution), any documentation of the original design and construction process, and subsequent archival sources, including records of previous interventions. The results of this research and the reasoned conclusions drawn from it should be clearly set out.

132 Speculative or generalised re-creation should not be presented as an authentic part of a place: the criteria for new work should apply to its design. But judgement is needed in determining the level of information specific to the place required to justify restoration. For example, reinstatement of an historic garden requires compelling evidence of its planned layout and hard materials, usually based upon or verified by archaeological investigation, and the structure of its planting; but it would be neither essential nor possible to replicate the precise location of every plant once within the garden.

'The form in which the place currently exists is not the result of an historically-significant event'.

133 If a building or structure was ruined or its character fundamentally changed as a consequence of an important historical event, its subsequent state will contribute to its significance: castles slighted in the Civil War, or monastic houses unroofed at the Dissolution, provide examples. In the wake of such episodes, some places were ruined, some cleared away completely, and others repaired and adapted for new purposes. Attempts to restore those exceptional places that have survived as ruins would deny their strong visual and emotional evidence of important historic events. Ruins – real or contrived – can also play a major role in designed landscapes, define the character of places, or be celebrated in art. Even so, their restoration or adaptive re-use may be justified if the alternative is loss.

134 The response to dramatic contemporary events which may ultimately come to be seen as historically significant – to memorialise, rebuild or redevelop – tends to be driven by public debate. If the place involved was not previously considered significant, such debate may be regarded solely as part of the event. Physical sustainability and changing values will, however, tend to influence the medium- to long-term future of memorialised ruins of comparatively modern buildings, or the scars of conflict.

135 By contrast, neglect and decay, abandonment, including the removal of roofs, crude adaptation for transient uses, accidental fires and similar circumstances are not normally historically-significant events, and subsequent restoration of the damaged parts of the place, even after a long interval, will not fail this test. Retaining gutted shells as monuments is not likely, in most cases, to be an effective means of conserving surviving fabric, especially internal fabric never intended to withstand weathering; nor is this approach likely to be economically sustainable. In such cases, it is appropriate to restore to the extent that the evidence allows, and thereafter to apply the policy for new work (paragraph 138).

'The work proposed respects previous forms of the place'

136 The more radical the restoration, the more likely it is to introduce an element of incongruity. The reversal of relatively minor but harmful changes, to restore a place to a form in which it recently existed as a complete entity, is unlikely to contradict this criterion. By contrast, the restoration of isolated parts of a place to an earlier form, except as legible elements of an otherwise new design, would produce an apparently historic entity that had never previously existed, which would lack integrity.

'The maintenance implications of the proposed restoration are considered to be sustainable'

137 It is essential to consider the long term implications of a proposed restoration for viability and sustainability. If, for instance, a place or part of it was modified primarily in order to reduce maintenance costs, restoration without considering the increased resources needed for maintenance is likely to be counter-productive. The reinstatement of elaborate parterres in historic gardens is an obvious example, but others can have more serious consequences. For example, reversing a 'crown flat' – a flat roof inserted between ridges to eliminate a valley gutter in an historic roof – will lead to rapid decay if the restored valley gutter is not readily accessible and adequately maintained.

New work and alteration

138 **New work or alteration to a significant place should normally be acceptable if:**

a. **there is sufficient information comprehensively to understand the impacts of the proposal on the significance of the place;**
b. **the proposal would not materially harm the values of the place, which, where appropriate, would be reinforced or further revealed;**
c. **the proposals aspire to a quality of design and execution which may be valued now and in the future;**
d. **the long-term consequences of the proposals can, from experience, be demonstrated to be benign, or the proposals are designed not to prejudice alternative solutions in the future.**

139 The recognition of the public interest in heritage values is not in conflict with innovation, which can help to create the heritage of the future. Innovation is essential to sustaining cultural values in the historic environment for present and future generations, but should not be achieved at the expense of places of established value.

'The proposal would not materially harm the values of the place, which, where appropriate, would be reinforced or further revealed'

140 The greater the range and strength of heritage values attached to a place, the less opportunity there may be for change, but few places are so sensitive that they, or their settings, present no opportunities for change. Places whose significance stems essentially from the coherent expression of their particular cultural heritage values can be harmed by interventions of a radically different nature.

141 Quality of design, materials, detailing and execution is obviously essential in places of established value. Conversely, places of lesser significance offer the greatest opportunity for the creation of the heritage values of tomorrow, because they have the greatest need of quality in what is added to them. Their potential will only be achieved if all new work aspires to the quality routinely expected in more sensitive places.

'The proposals aspire to a quality of design and execution which may be valued now and in the future'

142 The need for quality in new work applies at every level, from small interventions in an historic room, to major new buildings or developments. Small changes need as much consideration as large ones, for cumulatively their effect can be comparable.

143 There are no simple rules for achieving quality of design in new work, although a clear and coherent relationship of all the parts to the whole, as well as to the setting into which the new work is introduced, is essential. This neither implies nor precludes working in traditional or new ways, but will normally involve respecting the values established through an assessment of the significance of the place.

144 Quality is enduring, even though taste and fashion may change. The eye appreciates the aesthetic qualities of a place such as its scale, composition, silhouette, and proportions, and tells us whether the intervention fits comfortably in its context. Achieving quality always depends on the skill of the designer. The choice of appropriate materials, and the craftsmanship applied to their use, is particularly crucial to both durability and to maintaining the specific character of places.

'The long-term consequences of the proposals can, from experience, be demonstrated to be benign, or the proposals are designed not to prejudice alternative solutions in the future'

145 New work frequently involves some intervention in the existing fabric of a place, which can be necessary to keep it in or bring it back into use. A 'presumption in favour of preservation' (doing no harm), even preservation of evidential value, does not equate to a presumption against any intervention into, or removal of, existing fabric; but such interventions require justification in terms of impacts on heritage values.

146 There are limits, however, beyond which loss of inherited fabric compromises the authenticity and integrity of a place. At the extreme, a proposal to retain no more than the façade of an historic building attached to a modern structure must be considered in the light of an assessment of the existing values of the building, both as a whole and in its elements. The relationship between the façade and the existing and proposed structures behind will be crucial to the decision, but retaining the façade alone will not normally be acceptable.

147 Changes designed to lessen the risk or consequences of disaster to a significant place require a balance to be struck between the possibility of major harm to heritage values without them, and the certainty of the lesser, but often material, harm caused by the works themselves. The need for physical precautions should be considered as part of disaster response and recovery planning for the place as a whole, based on risk assessment and management requirements, and any statutory duties. All options should be evaluated, including improved management as an alternative to, or in conjunction with, lower levels of physical intervention.

148 As with repair, the use in interventions of materials and techniques proven by experience to be compatible with existing fabric, including recycled material from an appropriate source (paragraphs 98-99), tends to bring a low risk of failure. Work which touches existing fabric lightly, or stands apart from it, brings progressively greater opportunity for innovation. Energy efficiency (in production as well as use), sustainable sourcing of materials, and environmental good practice should guide all new work, but not to the extent of causing harm to the heritage values of the place.

Integrating conservation with other public interests

149 **Changes which would harm the heritage values of a significant place should be unacceptable unless:**

a. **the changes are demonstrably necessary either to make the place sustainable, or to meet an overriding public policy objective or need;**
b. **there is no reasonably practicable alternative means of doing so without harm;**
c. **that harm has been reduced to the minimum consistent with achieving the objective;**
d. **it has been demonstrated that the predicted public benefit decisively outweighs the harm to the values of the place, considering**
   - **its comparative significance,**
   - **the impact on that significance, and**
   - **the benefits to the place itself and/or the wider community or society as a whole.**

150 The integration of heritage and other environmental interests with economic and social objectives at every level of strategic planning – national, regional, local – helps to minimise conflict. A willingness to consider and compare the impacts on the significance of a place of a range of options to achieve the public objective concerned is essential, as is selecting an option that either eliminates, or (as far as is possible) mitigates harm. This will often involve those representing heritage interests in employing the skills necessary critically to appraise the case and options for development, as well as its promoters employing the skills needed to evaluate heritage implications. The heritage case should be put fully and robustly.

'Comparative significance'

151 The greater the significance of a place to society, the greater the weight that should be attached to sustaining its heritage values. This concept of 'proportionality' (Principle 5.4) relies on judgement rather than formulae, but is fundamental to equitable reconciliation of the public interest in heritage with other public and private interests.

152 Since statutory designation, at local as well as national level, is a clear indicator of the significance of a place, the fact of designation can itself play a vital role in guiding options for strategic change. The absence of designation, however, does not necessarily mean that a place is of low significance (paragraphs 79, 81). The weight to be attached to heritage values relative to other public interests should not be considered until those heritage values have been properly evaluated, assessed against current criteria and, if they meet them, safeguarded by designation.

'Impact on significance'

153 The assessment of the degree of harm to the significance of a place should consider the place as a whole and in its parts, its setting, and the likely consequences of doing nothing. In the case of a derelict historic building, for example, should a viable, but modestly damaging, proposal be refused in the hope that a better or less damaging scheme will come forward before the place reaches the point of no return? In such circumstances, the known or predicted rate of deterioration is a crucial factor, and hope must be founded on rational analysis. The potential availability of subsidy as an alternative to harmful change, or to limit its impact, should be considered. The fact that a place is neglected should not, of itself, be grounds for agreeing a scheme that would otherwise be unacceptable.

'Benefits to the place'

154 Quite minor changes, for example to meet the duties to make 'reasonable adjustments' under the Disability Discrimination Act 1995, or accommodate changing liturgy in a church, may keep a place fit for use. This in turn can make a place sustainable by maintaining its market value, or allowing its continued use by a community. Any changes that would cause harm to the heritage values of the place should obviously be limited to what is necessary to sustain it in use, and their impacts mitigated so far as possible. However, a high quality of design of proposed interventions is not mitigation, but essential in any significant place (Principle 4.6), and offers of compensation should not make harmful proposals more acceptable (paragraph 104).

'Benefits to the wider community or society as a whole'

155 These assessments are broader and more complex than those concerned only with the gains and losses for the heritage values of a place. The underlying considerations should always be proportionality and reasonableness: whether, in relation to the place or society, the predicted benefits of change outweigh the residual, unavoidable harm that would be done to the significance of the place. The balance lies between retaining significance – the sum of the heritage values ascribed at the point of change to something which, if lost, cannot be replaced – and the predicted, and potentially short-term, benefits of development. The benefits, including those of strategies to mitigate and adapt to climate change, need to be subject to scrutiny in proportion to their impact on heritage values.

156 Reconciling conservation and other public objectives can be most difficult when the heritage values of a significant place, often an archaeological site or an historic building, must be compared with the potential of a replacement to enhance the place because of its allegedly greater cultural value. Subjective claims about the architectural merits of replacements cannot justify the demolition of statutorily-protected buildings.[10] There are less clear-cut situations, however, in which it is proposed to replace a building or develop a place of modest, but positive, heritage value with one that is claimed to be of much greater architectural quality, or where such a proposal would affect the setting of a significant place. Its supporters claim net enhancement, while its opponents claim absolute harm to the heritage values of the place. Each is making a value-based judgement, but choosing to attach different weights to particular values. If such positions are maintained, the choice is ultimately a political one, or for decision at public inquiry.

Enabling development

157 **Enabling development that would secure the future of a significant place, but contravene other planning policy objectives, should be unacceptable unless:**

a. it will not materially harm the heritage values of the place or its setting
b. it avoids detrimental fragmentation of management of the place;
c. it will secure the long term future of the place and, where applicable, its continued use for a sympathetic purpose;
d. it is necessary to resolve problems arising from the inherent needs of the place, rather than the circumstances of the present owner, or the purchase price paid;
e. sufficient subsidy is not available from any other source;
f. it is demonstrated that the amount of enabling development is the minimum necessary to secure the future of the place, and that its form minimises harm to other public interests;
g. the public benefit of securing the future of the significant place through such enabling development decisively outweighs the disbenefits of breaching other public policies.

158 Enabling development is development that would deliver substantial benefit to a place, but which would be contrary to other objectives of national, regional or local planning policy. It is an established planning principle that such development may be appropriate if the public benefit of rescuing, enhancing, or even endowing a significant place decisively outweighs the harm to other material interests. Enabling development must always be in proportion to the public benefit it offers.

[10] This is currently stated as government policy in PPG 15, *Planning and the historic environment* (1994) at paragraph 3.19 (iii).

159 If it is decided that a scheme of enabling development meets all the criteria set out above, planning permission should be granted only if:

a. the impact of the development is precisely defined at the outset, normally through the granting of full, rather than outline, planning permission;
b. the achievement of the heritage objective is securely and enforceably linked to the enabling development, bearing in mind the guidance in ODPM Circular 05/05, *Planning obligations*;
c. the place concerned is repaired to an agreed standard, or the funds to do so made available, as early as possible in the course of the enabling development, ideally at the outset and certainly before completion or occupation; and
d. the planning authority closely monitors implementation, if necessary acting promptly to ensure that obligations are fulfilled.

CONCLUSION

Applying the *Principles*

160 These *Conservation Principles, Policies and Guidance* build on earlier statements and experience, to formalise an approach which takes account of a wide range of heritage values. They are intended to help everyone involved to take account of the diverse ways in which people value the historic environment as part of their cultural and natural heritage. They acknowledge that the cultural and natural heritage values of places, including those reflected in landscape designations, should be managed in parallel, fostering close working relationships between cultural and natural heritage interests.

161 Balanced and justifiable decisions about change in the historic environment depend upon understanding who values a place and why they do so, leading to a clear statement of its significance and, with it, the ability to understand the impact of the proposed change on that significance.

162 Every reasonable effort should be made to eliminate or minimise adverse impacts on significant places. Ultimately, however, it may be necessary to balance the public benefit of the proposed change against the harm to the place. If so, the weight given to heritage values should be proportionate to the significance of the place and the impact of the change upon it.

163 The historic environment is constantly changing, but each significant part of it represents a finite resource. If it is not sustained, not only are its heritage values eroded or lost, but so is its potential to give distinctiveness, meaning and quality to the places in which people live, and provide people with a sense of continuity and a source of identity. The historic environment is a social and economic asset and a cultural resource for learning and enjoyment.

164 Although developed primarily to guide the activities of English Heritage staff, we therefore commend these *Principles, Policies and Guidance* for adoption and application by all involved with the historic environment and in making decisions about its future.

DEFINITIONS

This section includes words used in a specific or technical sense. The *Oxford English Dictionary* definition otherwise applies.

Alteration
Work intended to change the function or appearance of a place

Authenticity
Those characteristics that most truthfully reflect and embody the cultural heritage values of a place[11]

Conservation
The process of managing change to a significant place in its setting in ways that will best sustain its heritage values, while recognising opportunities to reveal or reinforce those values for present and future generations

Conservation area
'An area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance', designated under what is now s69 of the Planning (Listed Buildings and Conservation Areas) Act 1990

Context
Any relationship between a place and other places, relevant to the values of that place

Designation
The recognition of particular heritage value(s) of a significant place by giving it formal status under law or policy intended to sustain those values

Fabric
The material substance of which places are formed, including geology, archaeological deposits, structures and buildings, and flora

Harm
Change for the worse, here primarily referring to the effect of inappropriate interventions on the heritage values of a place

Heritage
All inherited resources which people value for reasons beyond mere utility

Heritage, cultural
Inherited assets which people identify and value as a reflection and expression of their evolving knowledge, beliefs and traditions, and of their understanding of the beliefs and traditions of others

Heritage, natural
Inherited habitats, species, ecosystems, geology and landforms, including those in and under water, to which people attach value

Historic environment
All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible or buried, and deliberately planted or managed flora

Historic Environment Record
A public, map-based data set, primarily intended to inform the management of the historic environment

Integrity
Wholeness, honesty

Intervention
Any action which has a physical effect on the fabric of a place

Maintenance
Routine work regularly necessary to keep the fabric of a place in good order

Material
Relevant to and having a substantial effect on, demanding consideration

Natural change
Change which takes place in the historic environment without human intervention, which may require specific management responses (particularly maintenance or periodic renewal) in order to sustain the significance of a place

[11] This definition is based on *The Nara Document on Authenticity* (ICOMOS 1994)

Object
Anything not (now) fixed to or incorporated within the structure of a place, but historically associated with it

Place
Any part of the historic environment, of any scale, that has a distinctive identity perceived by people

Preserve
To keep safe from harm[12]

Proportionality
The quality of being appropriately related to something else in size, degree, or other measurable characteristics

Public
Of, concerning, done, acting, etc. for people as a whole

Renewal
Comprehensive dismantling and replacement of an element of a place, in the case of structures normally reincorporating sound units

Repair
Work beyond the scope of maintenance, to remedy defects caused by decay, damage or use, including minor adaptation to achieve a sustainable outcome, but not involving restoration or alteration

Restoration
To return a place to a known earlier state, on the basis of compelling evidence, without conjecture

Reversible
Capable of being reversed so that the previous state is restored

Transparent
Open to public scrutiny

Setting
The surroundings in which a place is experienced, its local context, embracing present and past relationships to the adjacent landscape

Significance [of a place]
The sum of the cultural and natural heritage values of a place, often set out in a statement of significance

Significant place
A place which has heritage value(s)

Sustain
Maintain, nurture and affirm validity

Sustainable
Capable of meeting present needs without compromising ability to meet future needs

Value
An aspect of worth or importance, here attached by people to qualities of places

Value, aesthetic
Value deriving from the ways in which people draw sensory and intellectual stimulation from a place

Value, communal
Value deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory

Value, evidential
Value deriving from the potential of a place to yield evidence about past human activity

Value, historical
Value deriving from the ways in which past people, events and aspects of life can be connected through a place to the present

Value-based judgement
An assessment that reflects the values of the person or group making the assessment

[12] The legal interpretation established in South Lakeland DC v Secretary of State for the Environment and Rowbotham [1991] 2 L.P.R. 97

Text prepared for English Heritage by Paul Drury and Anna McPherson
of The Paul Drury Partnership.

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Historic England

CONSERVATION PRINCIPLES

FOR THE SUSTAINABLE MANAGEMENT OF THE HISTORIC ENVIRONMENT

Consultation Draft
10th November 2017

DRAFT

If you would like to comment on this consultation document please visit our website at:
https://historicengland.org.uk/about/what-we-do/consultations/guidance-open-for-consultation/

You will be able to respond until 2nd February 2018

Historic England

CONSERVATION PRINCIPLES

FOR THE SUSTAINABLE MANAGEMENT OF THE HISTORIC ENVIRONMENT

Introduction

1: Historic England's Conservation Principles

2: Understanding Significance

3: Applying the Conservation Principles

INTRODUCTION

1. Research consistently shows that there is overwhelming support for heritage in England. So many people care passionately about their heritage; they want to protect it, but nothing stands still forever. Our understanding changes, the way we protect the historic environment evolves, and new uses for buildings and other spaces emerge. Helping manage that change and continuing to develop our understanding of our heritage are key objectives for Historic England.

2. Historic England will use these Conservation Principles to guide its advice and decisions affecting the conservation of England's heritage. It does not directly address intangible heritage. They will help ensure that Historic England approaches the management of the historic environment in a transparent, logical and consistent manner. Historic England also encourages local authorities, property owners, developers and their advisers to refer to these Principles when considering how to approach a particular proposal or situation that may impact on the historic environment, whether in relation to designated or non-designated heritage assets.

3. The Principles are consistent with:

   - the relevant legislation including the Acts relating to both planning and designation.
   - the objectives and policies for the historic environment stated in the Government's National Planning Policy Framework (NPPF), Planning Practice Guidance and the DCMS Principles of Selection.
   - the approach to heritage conservation required of the UK as a signatory to the Council of Europe's 'Granada' Convention (The Convention for the Protection of the Architectural Heritage of Europe), 'Valetta' Convention (The European Convention on the Protection of the Archaeological Heritage), the 'Florence' Convention (The European Landscape Convention), and the 1972 UNESCO World Heritage Convention.
   - British Standard 7913 (2013) Guide to the Conservation of Historic Buildings.

4. In 2008 the Conservation Principles published by English Heritage (which this document updates and revises) described significance in terms of four values: evidential value, historical value, aesthetic value and communal value. In describing significance, this document is more closely aligned with the terms used in the NPPF (which are also used in designation and planning legislation): archaeological, architectural, artistic and historic interest. This is in the interests of consistency, and to support the use of the Conservation Principles in more technical decision-making. It does not preclude or ignore other ways in which Historic England might describe something as significant, and the values referred to above remain part of the palette of terms which may be used to articulate significance. The interests and values referred to above cover the same ground, and provide a framework that can help us describe what we value about our historic environment.

5. All heritage assets have a degree of significance but this is on a spectrum. Those that meet certain thresholds, defined in legislation, are formally protected in the public interest through designation, but these principles are relevant to all assets whether designated or not. These principles apply to all activities affecting the historic environment, including researching and identifying what makes them heritage assets, formal designation processes and managing change to them both through formal systems of control as well as everyday building and site management. These activities – which are core to Historic England's purpose – are addressed in turn in Chapter 3.

Key Definitions

6. The following definitions are used in this document (drawn from the NPPF):

- **Historic Environment:** All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.
- **Heritage asset:** A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage asset includes designated heritage assets and assets identified by the local planning authority (including local listing).
- **Conservation:** The process of maintaining and managing change to a heritage asset in a way that sustains and, where appropriate, enhances its significance.
- **Significance:** The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

CHAPTER 1: HISTORIC ENGLAND'S CONSERVATION PRINCIPLES

Principle 1: **The historic environment is of value to us all**

7. England's historic environment holds a unique and irreplaceable record of past human activity which forms a crucial part of our wider cultural heritage. It reflects the knowledge, beliefs and traditions of diverse communities over time. It gives distinctiveness, meaning and quality to the places in which we live. It is a social, economic and environmental asset, providing a sense of continuity, a draw for overseas visitors and a source of identity, learning and enjoyment.

8. Owners play a central role in conserving heritage assets. However, the competition for land on our small island is such that the long-term public value of heritage assets to this and future generations (including social, economic and environmental benefits) cannot be easily reconciled by market economics with the commercial value of land for development. As such, ensuring that heritage assets are appropriately and sustainably managed has long been a matter of public interest.

9. Each generation should aim to shape and sustain heritage assets in ways that allow people to use, enjoy and benefit from them, without compromising the ability of future generations to do the same. The use of law, public policy and public investment is justified in support of this objective because the market alone cannot achieve this balance of private and public interest.

Principle 2: **Everyone should be able to participate in sustaining the historic environment**

10. Everyone should have the opportunity to contribute their knowledge of the value of places to assessments of significance and to decisions regarding change. Wider engagement ensures that the full range of perspectives on what makes a place special are understood, as far as practical, and that these views are given consideration in decisions.

11. Experts play a crucial role in discerning, communicating and sustaining the established heritage interest of places, and in helping people to refine and articulate the values they attach to places. However expert a specialist may be about a particular piece of heritage, alternative perspectives are valuable as decision-makers and experts may not be aware of the complete range of views held by people who care about the place.

12. It is essential to develop, maintain and pass on the specialist knowledge and skills necessary to sustain the historic environment and help people articulate and share what they value about particular places.

Principle 3: **Understanding the significance of heritage assets is the starting point for effective conservation**

13. Understanding and articulating what is significant about a heritage asset is necessary to inform decisions about its future. Good-quality information about an asset will help ensure a decision is well-informed and robust. The degree and nature of the significance determines what level and type of protection, including national or local designation, may be appropriate under law and policy and informs wider future management decisions.

14. Any building, monument, site, place, area or landscape has the potential to be a heritage asset. The significance of a heritage asset embraces all the diverse cultural heritage values or interests that people associate with it. As sites and society change over time, these values or interests will evolve. Many heritage assets are already on the National Heritage List for England, which includes the most important buildings and sites in the country. Historic Environment Records, held at a local level, identify millions of additional sites of interest.

15. In order to identify the full significance of a heritage asset, so far as that is possible at a point in time, it is necessary first to understand its physical fabric, its links with its surroundings (including other heritage assets), together with how and why these have changed over time, and then to consider:

    - who values the heritage asset, and why they do so;
    - how their valuation of it relates to its physical form, fabric and associations;
    - whether associated objects and historical records contribute to its interest;
    - the relative weighting of the heritage asset's interests (some parts may be more important than others); and
    - the relative weighting of the heritage asset's interests with those of other heritage assets, sharing similar interests (some sites or buildings will be more important than others).

Principle 4: **Heritage assets should be managed to sustain their heritage values**

16. Change in the historic environment is inevitable. It may be caused by natural processes, the wear and tear of use, or how we all respond to social, economic and technological change and changing values. Successful conservation is about

managing change to a heritage asset and its setting in ways that will best sustain the asset's significance, while taking opportunities to better reveal or enhance that significance for present and future generations.

17. Conservation is best achieved when those involved share a common appreciation of an asset's significance, and use that understanding to:

- identify how its significance is vulnerable to change;
- take the actions and accept the constraints necessary to sustain, reveal or enhance significance;
- Take a balanced view where conflict between conservation needs of different aspects of significance requires may require some loss of an asset's significance to secure its sustainable conservation; and
- minimise loss of its authenticity as a source for future generations by doing invasive work only when any resulting harm to significance is demonstrably outweighed by the heritage benefits of that work.

Principle 5: **Decisions about change need to be reasonable, transparent and consistent**

18. Decisions about change in the historic environment demand the application of expertise, experience and judgement, in a consistent and transparent process which is as accessible as possible. They need to take account of views of those who have an interest in the assets affected and/or the changes being proposed.

19. The range and depth of understanding, assessment and public engagement should be sufficient to inform and justify the decision to be made, but efficient and proportionate in the use of resources. Where heritage assets have been designated in the public interest, and made subject to additional controls, proportionality should govern the exercise of those controls.

20. Potential conflict between sustaining heritage significance and delivering other important public benefits should be avoided or minimised by looking at other ways of delivering those benefits. If conflict cannot be avoided, the weight given to heritage interests in making the decision should be proportionate to the significance of the heritage asset and the impact of the proposed change on that significance.

Principle 6: **Documenting and learning from decisions is essential to inform future management**

21. Records of the justification for conservation decisions (including assessments of significance and of the impact of proposals upon that significance), and the actions

that follow them, are crucial to maintain a cumulative account of what has happened to a heritage asset and understand how and why its significance may have been altered. These records should be as physically accessible, and intelligible to non-expert audiences as possible.

22. Managers of heritage assets and responsible public bodies should monitor and regularly evaluate the effects of change resulting from decisions and policies and use the results to inform future decisions and policies.

23. If all or part of a heritage asset will be lost, whether as a result of a decision or an inevitable natural process, its potential to yield information and further our understanding of the past should be realised. This requires investigation, recording and analysis, followed by archiving and dissemination of the results, all in proportion to the asset's significance. The results of investigation and the advancement in understanding of the asset's significance should be made publicly available through relevant archives or records in a reasonable time period to help inform future change affecting similar assets. An asset's form prior to an episode of change should also be captured by proportionate record-making. In many cases this will be through photography. If the recording is necessitated by proposed development, the developer should bear the cost of the exercise.

CHAPTER 2: UNDERSTANDING SIGNIFICANCE

24. We value our nation's heritage for many reasons: distinctive design, inspiring landscapes, the story an asset can tell about our past, its connection with notable people or events, evidence of past society we can or might yet glean, or the role it has played and continues to play as the symbol of a community. We all want to enjoy and sustain that significance for the benefit of present and future generations and to achieve this, there needs to be a reasonable level of understanding of what should be protected.

25. Heritage assets can generate wider social and economic ('instrumental') benefits, for example as a learning or recreational resource, or because they lead to tourism or make a place attractive for investment; they add to the quality of our lives. These benefits are different from heritage interest in nature and effect.

26. The term 'significance' is used in conservation to mean the heritage value of an asset due to its heritage interest – in simple terms, it is the sum total of why a place matters from a heritage point of view. According to this definition, significance is encompassed by four headings: archaeological interest, architectural interest, artistic interest and historic interest. A heritage asset's significance may be expressed under more than one heading and sometimes under all four.

27. Decisions in research, designation, planning and conservation management are informed by the consideration of these different interests, which are explored in more detail below. Assessment for listing (or designation) sites of particular importance is carried out by Historic England on behalf of the Department for Digital, Culture, Media and Sport (DCMS) and uses the criteria set out in DCMS Principles of Selection to establish the special interest necessary for the physical fabric to receive statutory protection. These encompass the interests expressed below but for listing it is often helpful to refer to the Selection Guides (see also para 54 below).

Historic Interest

28. This is sometimes called historical value. A heritage asset is most commonly valued for its historic interest – because of the way in which it can illustrate the story of past events, people and aspects of life (illustrative value, or interest). When these stories become enmeshed with the identity of a community, in addition to the asset's historic interest it can be said to hold communal value.

29. Some assets illustrate aspects of the past better than others. This aspect of an asset's historic interest tends to be at its greatest if it incorporates the first, only, or

best surviving example of an innovation of consequence, whether related to design, artistry, technology or social organisation.

30. Original fabric is often valuable, particularly where it is associated with an individual or event, and an asset's integrity (completeness) may heighten the ability to illustrate the way past lives were led. 'Time capsules' that vividly capture a particular period or life are very valuable (although in practice buildings or sites that have genuinely not been altered, even on a like-for-like basis, are extremely rare). Sometimes it is the story of change from one fashion or style to another that the asset illustrates and which provides the interest. An asset's ability to illustrate can usually sustain faithful replacement of features, for example the replanting of an avenue of trees, or the careful adaptation of features so that they continue to support the historical narrative. However, the same adaptation may jeopardise the asset's archaeological interest (see below) so prioritisation between interests may sometimes be necessary.

31. The use of a heritage asset for its original purpose, for example as a place of recreation, worship, or manufacture, illustrates the relationship between design and function, and so may make a major contribution to its historic interest. If so, cessation of that activity will normally diminish that interest. Occasionally abandonment, for example as of a medieval village site or an abbey, may itself illustrate important historical events.

32. In addition to its illustrative value, a heritage asset may also be of historic interest because of the meaning of the place for those who draw part of their identity from it or have emotional links to it. The most obvious examples are war and other memorials raised by community effort, which bind certain modern communities with past lives, sacrifices and events of importance to them. They are important aspects of collective memory and identity; places of remembrance whose meanings should not be forgotten. In some cases, that meaning can only be understood through information and interpretation (including designation where appropriate), whereas, in others, the character of the place itself tells most of the story.

33. This communal value can be distinguished from simple usefulness by the essential connection with the history of the asset. Sports venues may be valued for the sense of continuity created by generations of supporters. A faith group identifies with a place of worship because of the tradition of worship there. A publicly-accessible historic landscape, may for some possess only utility value but others may search out such places and feel that the heritage dimension brings a deeper meaning and enjoyment.

34. Historic interest also embodies associative value. Association with a notable person, event, or movement gives an asset a particular resonance and this may be equally as important as its illustrative value. Being at the place where something momentous happened can increase and intensify understanding through linking historical accounts of events with the place where they happened, as can surviving

insights into how past lives were led – provided that the place still retains some semblance of its appearance at the time.

35. Not all associations are positive or straightforward: some heritage is disputed, problematic, or contested. There is no single historical narrative, and all of England's heritage has been and will be understood and valued differently at different times by different people. Public understanding of more challenging heritage is usually harmed by the removal of historic fabric, and reinterpretation at or near the object or site in question can make clear that contemporary values differ from those presented by the asset. Tangible heritage plays a vital role in helping us understand the past, and retaining as much of this primary evidence as possible is critical in our ability to properly understand its realities. In assessing significance, a number of complex and sometimes competing considerations will need to be weighed, and the Conservation Principles in Chapter 1 (above) provide a means of approaching those deliberations.

36. Many heritage assets are associated with the development of other aspects of our culture, such as literature, science, art, music or drama. An asset that is principally valued for its architectural or artistic interest (see below) may also be illustrative of the work of an important architect, engineer or artist and so may hold a degree of historic interest too. For assets that may be of a standard meriting designation, the Principles of Selection and Historic England Selection Guides provide detailed advice.

37. The more social dimensions of communal value tend to be less dependent on the survival of historic fabric. They may relate to an activity that is associated with the place, rather than with its physical fabric, and may survive the replacement of the original physical structure, so long as its key social and cultural characteristics are maintained. Statutory recognition of heritage assets (designation) needs to meet defined standards (para 27). Social value can be the popular driving force for the re-creation of lost (and often deliberately destroyed or desecrated) places with high symbolic value, although this is rare in England.

Archaeological Interest

38. This is sometimes called evidential or research value. There will be archaeological interest in a heritage asset if it holds, or potentially may hold, evidence of past human activity that could be revealed through investigation at some point. Archaeological interest in this context includes above-ground structures as well as earthworks and buried or submerged remains more commonly associated with the study of archaeology. Heritage assets with archaeological interest may be the only source of evidence for human activities in the distant past. Equally, they may contain evidence that complements or contradicts the evidence of written records or verbal accounts in more recent times.

39. Heritage assets will vary in how much they can contribute to our understanding of our history and in the vulnerability of the potential for new knowledge. Any activity that impairs the prospects of a future archaeological investigation harms the research value of a heritage asset. This can mean that some assets, or parts of them, are very sensitive to change. Expert advice will often be needed to identify those sensitivities and to assess how they can be worked around or how harm may be minimised.

40. Potential for research may exist in buildings and landscapes (whether designed or not), as well as buried archaeological sites. Previous decorative schemes within buildings may be concealed by later wallpaper, for example, whilst analysis of the pollen preserved in ponds or canal features may reveal a record of species planted in a historic garden. The quality of the anticipated evidence may be diminished not only by removal of fabric or deposits, but also by, for example, geochemical or hydrological changes – resulting in dewatering of waterlogged deposits.

41. If an asset has archaeological potential, carefully targeted research to understand that potential can help inform subsequent decisions about managing change to that asset. Non-intrusive investigation is preferable to intrusive work, with the latter only normally being justified where the public benefits, which include the enhanced understanding delivered, clearly outweigh the damage caused.

Architectural and Artistic Interest

42. Architectural and artistic interests derive from a contemporary appreciation of the asset's aesthetics. Architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is derived from the use of human imagination and skill to convey meaning through all forms of creative expression. This might include the use, representation or influence of historic places or buildings in artworks (contributing to their significance through their association with art), as well as the meaning, skill and emotional impact of works of art within our environment that are either part of heritage assets or assets in their own right. There is often an overlap between architectural and artistic interest. However, when making decisions about conservation it can be useful to draw a distinction between design created through detailed instructions (such as architectural drawings) and the direct creation of a work of art by a designer who is also in significant part the craftsman (such as a sculptor).

43. The sensory and intellectual stimulation we derive from a heritage asset dictates its aesthetic value, which can be the result of conscious design, including artistic endeavour or technical innovation, or the seemingly fortuitous outcome of the way in which a place has evolved and been used over time. Many places combine these two aspects – for example, where the qualities of an already attractive landscape

have been reinforced by human embellishment – while others may have inspired awe or fear (such as ‘sublime’ landscapes of the Lake District).

44. The design of an asset imparts aesthetic qualities through its composition, decoration or detailing, and craftsmanship. As a result, the materials or planting used, and the form, proportions, massing silhouette, views and vistas and circulation created can all affect how the architectural interest is experienced and valued. Equally, points of access, corridors and pathways, the arrangement of spaces and plan form, sources of heat, light and power may all contribute to the architectural interest.

45. Architectural interest may extend to an intellectual idea governing the design (for example, a building’s form that expresses the Holy Trinity), and the choice or influence of sources from which it was derived. It may be attributed to a known patron, architect, designer, landscape gardener or craftsman, or be a mature product of a vernacular tradition of building or land management and so has historic interest as well. In each case the design of the building or structure as it survives has value for illustrating the ideas and influences of people in the past and forms a tangible connection with them.

46. Architectural interest can extend beyond factors directly in the control of the architect. For example, the seemingly organic form of an urban or rural landscape; the relationship of vernacular buildings and structures and their materials to their use and setting; or a harmonious, expressive or dramatic quality in the juxtaposition of vernacular or industrial buildings and spaces.

47. The architectural or artistic merit of buildings or sites displaying technological innovation or virtuosity may not be immediately obvious to the non-expert observer but its aesthetic interest derives from its design and such attributes are grouped under this heading.

48. The action of nature on human works, particularly the often-perceived enhancement of the appearance of a heritage asset by the passage of time (‘the patina of age’), may overlie the conscious design and influence how we feel and respond to an asset. It may simply add to the range and depth of our valuing, and thus the significance of the asset; or on occasion it may be in conflict possibly representing a threat to that asset and its significance, for example, when physical damage is caused by vegetation charmingly rooting in masonry.

49. Sustaining architectural interest tends to depend on appropriate stewardship to maintain the integrity of a designed concept, be it landscape, architecture, or structure. While aesthetic values may be related to the age of a place, they may also be amenable to restoration and enhancement. Artistic interest, however, is more reliant on the integrity of work which remains the actual product of the artist’s hand, and is more vulnerable to over-restoration: a minimum of intervention will more often be preferable. The aesthetic and design values of the artwork will be proportionate to the extent that it remains.

CHAPTER 3: APPLYING THE PRINCIPLES

50. The Conservation Principles will inform a wide range of decisions in the management of the historic environment. This chapter sets the context for decision-making in research and designation, before focusing in particular on decisions about managing change.

Research and making information accessible

51. Since understanding is the starting point for effective conservation (see above – Principle 3), research plays a vital part in informing a range of decisions that relate to the sustainable management of the historic environment. Most designation activity will incorporate some research, which has the potential to reveal new evidence about an asset. Research is often required to inform decisions about the management of change (particularly in relation to significance - see para 65). Research may also be carried out to advance our understanding and enjoyment of the historic environment without an immediate driver of designation or informing an immediate proposal for change.

52. Historic Environment Records play a vital role in developing a comprehensive and dynamic digital information resource, both for understanding particular places and as a wider research tool; other repositories of digital information, such as OASIS (the Online Access to the Index of Archaeological investigationS) and Historic England's 'Pastscape', also have an important part to play. Physical source materials, for instance in county record offices, libraries, museums and collections, are fundamentally important resources for researchers. Key elements of documentation generated through understanding and making changes to an asset, should be copied to the relevant local Historic Environment Record, as well as remaining accessible to everyone directly concerned with the asset (see above – Principle 6).

Designation

53. Listing (or 'designation') of specific parts of our environment helps us appreciate and protect those areas by recognising that they have special significance (Principle 3). Almost everywhere is valued by someone; designation helps us identify our more important heritage assets, but it does not follow that something that is not designated has no significance.

54. Where the significance of a heritage asset is judged to be 'special' or 'nationally important' – that is above a defined threshold – it may be designated via one of the statutory or national regimes. For example, historic, architectural and group value

criteria are used to determine if a building passes the threshold to be put on the National Heritage List for England as a listed building, and thus be recognised to be of ‘special interest’ by the Secretary of State for Culture Media and Sport; the threshold for battlefields and parks and gardens to be put on the register is special historic interest.

55. Historic England aims to guide decisions about the day-to-day management of an asset that take account of all the interests that contribute to its significance, and not just those which reach the threshold for formal designation’.

56. Heritage designations can also be made at a local level. Conservation Areas are designated for special architectural and historic interest. Most are designated by the Council as the Local Planning Authority, governed by legislation and informed by detailed advice produced by Historic England.

57. Local lists established by local planning authorities play an essential role in building and reinforcing a sense of local character and distinctiveness in the historic environment. Local lists can be used to identify heritage assets that are locally significant to support the development of local planning policy.

58. There are other designations that are not heritage-specific but can be used to protect heritage assets. These include Local Green Spaces, Assets of Community Value, Tree Preservation Orders, playing fields, ancient woodland, Green Belt, World Heritage Sites, National Parks and Areas of Outstanding Natural Beauty.

Managing change in the planning system

59. Conservation is about managing change to a heritage asset and its setting in ways that will best sustain its significance (Principle 4), while taking opportunities to better reveal or enhance that significance for present and future generations. This largely takes place within the planning system, for example, Listed Building Consent, Listed Building Heritage Partnership Agreements and Listed Building Consent Orders (see Enterprise and Regulatory Reform Act 2013). Conservation objectives are also met in areas where activity does not need any formal consent in relation to heritage such as most recommendations in Management Plans.

60. Making decisions about change to a heritage asset is a key part of conservation, but also critical to the long-term outcome is the maintenance regime and, where the asset is capable of active use, finding uses that are sympathetic to its significance and supportive of its maintenance.

61. This section covers the full range of changes that an owner may wish to carry out: from minor repair or land management, through works requiring formal permission of some kind and including complete removal of the asset.

62. Conservation may simply involve trying to maintain the status quo, intervening only as necessary to counter the effects of vegetation growth and physical decay,

including by the action of the sea, or it may require positive action and more major change. As well as being potentially harmful, change can be neutral or beneficial in its effect on heritage assets; it is only harmful if (and to the extent that) the asset's significance is reduced.

63. If changes to an asset respect its significance, then in most cases they are likely to serve both the public interest of its conservation and the private interests of those who use it. Many places now valued as part of the historic environment exist because of past patronage and investment, and the work of successive generations often contributes to their significance. Owners and managers of heritage assets ought not to be discouraged from adding further layers that are judged to be of a quality that could add future interest, provided that the current significance is not materially reduced in the process.

64. Decisions about change to heritage assets may be influenced by a range of factors. They may involve balancing existing heritage interests against the predicted benefits and disbenefits of the proposed intervention. The public benefit from heritage conservation needs to be reconciled with other, usually inter-related, impacts in economic, social and environmental terms. There is rarely a single right answer, so adequate information and adopting a rigorous process is crucial to reaching transparent, publicly-justifiable decisions.

65. Where change to a heritage asset is being proposed, it is important to identify in sufficient detail the significance of the asset (in accordance with the steps outlined in paragraph 14, above), and what impact the change will have on it. Factors to consider in assessing the impact of change include:

- the relative contribution to significance of the elements affected (where appropriate, by reference to criteria for national or local designation), including the contribution of its setting;
- how the proposed change would affect these elements;
- the extent of any uncertainty about its interests (particularly in relation to potential for hidden or buried elements); and
- any tensions between potentially conflicting interests, if possible agreed by all who have an interest in the asset.

66. Judgements that a heritage asset passes the threshold for designation are necessarily cautious and normally stand the test of time. We can reasonably expect that a designated heritage asset will be of importance to society for generations to come. However, the significance of a heritage asset tends to extend beyond that which justifies designation, and to vary over time. A good assessment of significance will be an informed and inclusive judgement made on a particular body of information, applying prevailing perceptions of what we value about the asset (its heritage interest) primarily to inform the management of a heritage asset at the time

the decision is to be made. Any such assessment will therefore need periodic review in the light of new information and evolving perceptions.

67. Ideally, proposed changes will cause no harm to the significance of the heritage asset and the right decision will be obvious. In practice, however, there tend to be options for achieving the objective of proposed change, each of which will have different impacts. The options (including taking no action) can usefully be assessed in terms of their impacts on significance. In other words, the decision will be informed by the predicted long-term or permanent consequences of proposals, in terms of degree and whether their impact is positive, negative or neutral on each of the identified heritage interests (noting that the cumulative impact of a number of broadly neutral changes may be negative).

68. The approach can be refined by weighting different heritage interests to reflect their relative importance for the place and its significance. The assessment can be particularly useful if applied at the conceptual stage of a proposal, and refined at each successive step towards making a decision until the optimum solution is attained, minimising harm while still achieving the desired purpose.

69. Even the optimum solution may cause harm to the significance of a heritage asset. The best use for a significant place – its 'optimum viable use' – is one that is both capable of sustaining the place and avoids or minimises harm to its significance. It is not necessarily the most profitable use if that would entail greater harm than other viable uses. When considering the loss of the public benefits provided by a heritage asset it is important to consider that these would normally be expected to be long-lived, delivered to this and future generations, where other public benefits, though valuable, may not be able to claim these lasting characteristics.

70. Consistent and transparent decisions help to maintain confidence in the system that has been put in place to strive for sustainable development. Working through the steps described here (and in paragraph 14) – and, where the decision is taken within the planning system, complying with relevant legislation, policy and guidance – will deliver both reasonable decision-making and consistency in approach, although every case must be considered on its own merits so that similar-looking cases may still result in different decisions (Principle 5).

71. Proper record-keeping allows periodic reviews of the effect of decisions and consequent learning. Sometimes the records of previous repairs have revealed the cause of deterioration today, or have shown which repair methods have worked well. Periodic reviews of the effect of decisions over time or across a class of heritage asset will provide evidence for sound policy-making and can lead to better decisions (Principle 6).

GLOSSARY

Alteration	Work resulting in a change to the function or appearance of a place
Archaeological Interest	There will be archaeological interest in a heritage asset if it holds, or potentially may hold, evidence of past human activity worthy of expert investigation at some point. Heritage assets with archaeological interest are the primary source of evidence about the substance and evolution of places, and of the people and cultures that made them (NPPF)
Architectural Interest	The properties of a place resulting from and revealing the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types
Artistic Interest	The influence of human imagination and skill to convey meaning through all forms of creative expression on the physical properties of a place and its setting or on their associations and appreciation. Artistic interest may relate to the influence of a place on art as well as the use of skill and design embodied in its fabric
Authenticity	Those characteristics that most truthfully reflect and embody the cultural heritage values of a place (This definition is based on The Nara Document on Authenticity (ICOMOS 1994))
Conservation	The process of maintaining and managing change to a heritage asset in a way that sustains and, where appropriate, enhances its significance (NPPF)
Conservation Area	‘An area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance’, designated under what is now s69 of the Planning (Listed Buildings and Conservation Areas) Act 1990
Context	Any relationship between a place and other places, relevant to the values of that place
Designation	The recognition of particular heritage value(s) of a significant place by giving it formal status under law or policy intended to sustain those values
Designated Heritage Asset	A World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation (NPPF)

Fabric	The material substance of which places are formed, including geology, archaeological deposits, structures and buildings, construction materials, decorative details and finishes and planted or managed flora
Harm	Change for the worse, here primarily referring to the effect of inappropriate interventions on the heritage interest of a place that reduces their values to society
Heritage	All inherited resources which people value for reasons beyond mere utility
Heritage, Cultural	Inherited assets which people identify and value as a reflection and expression of their evolving knowledge, beliefs and traditions, and of their understanding of the beliefs and traditions of others
Heritage, Natural	Inherited habitats, species, ecosystems, geology and landforms, including those in and under water, to which people attach value
Heritage Asset	A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions because of its heritage interest. Heritage asset includes designated heritage assets and assets identified by the local planning authority (including local listing) (NPPF)
Historic Environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible or buried, and deliberately planted or managed flora (NPPF)
Historic Environment Record	Information services that seek to provide access to comprehensive and dynamic resources relating to the historic environment of a defined geographic area for public benefit and use (NPPF)
Historic Interest	The connections between a place and past lives and events
Instrumental Benefits	The ways in which places are able to deliver beneficial contributions to public life – the significance of a heritage asset should provide means to deliver benefits beyond its physical utility, sometimes referred to as their non-use values
Integrity	A measure of the wholeness and intactness of a heritage asset and the survival and condition of those elements that

	contribute to their significance
Intervention	Any action which has a physical effect on the fabric or appreciation of a place
Maintenance	Routine work regularly necessary to keep the fabric of a place in good order
Material (Consideration)	Relevant to and having a substantial effect on, demanding consideration, e.g. “the effect of a proposal on the significance of a heritage asset is a material consideration in planning decisions”
Natural Change	Change which takes place in the historic environment without human intervention, which may require specific management responses (particularly maintenance or periodic renewal) in order to sustain the significance of a place
Object	Anything not (now) fixed to or incorporated within the structure of a place, but historically associated with it
Place	Any part of the historic environment, of any scale, that has a distinctive identity perceived by people
Preserve	To keep safe from harm (The legal interpretation established in South Lakeland DC v Secretary of State for the Environment and Rowbotham [1991] 2 L.P.R. 97)
Proportionality	The quality of being appropriately related to something else in size, degree, or other measurable characteristics
Public	Of, concerning, done, acting, etc. for people as a whole
Renewal	Comprehensive dismantling and replacement of an element of a place, in the case of structures normally reincorporating sound units
Repair	Work beyond the scope of maintenance, to remedy defects caused by decay, damage or use, including minor adaptation to achieve a sustainable outcome, but not involving restoration or alteration
Restoration	To return a place to a known earlier state, on the basis of compelling evidence, without conjecture
Reversible	Capable of being reversed so that the previous state is restored
Setting of a heritage asset	The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or

	may be neutral (NPPF)
Significance [of a place/heritage asset]	The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting (NPPF)
Significant Place	A place which has heritage significance
Sustain	Maintain, nurture and affirm validity
Sustainable	Capable of meeting present needs without compromising ability to meet future needs
Value	An aspect of worth or importance, here attached by people to qualities of places
Value, Aesthetic	Value deriving from the ways in which people draw sensory and intellectual stimulation from a place
Value, Communal	Value deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory
Value, Evidential	Value deriving from the potential of a place to yield evidence about past human activity
Value, Historical	Value deriving from the ways in which past people, events and aspects of life can be connected through a place to the present
Value-based Judgement	An assessment that reflects the values of the person or group making the assessment

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Historic England

Managing Significance in Decision-Taking in the Historic Environment

Historic Environment Good Practice Advice in Planning: 2

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Historic Houses Association

Historic Towns Forum

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It is one of three related Good Practice Advice (GPA) Notes, along with GPA1 *The Historic Environment in Local Plans* and GPA3 *The Setting of Heritage Assets*.

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Introduction

1 The purpose of this Historic England Good Practice Advice note is to provide information to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy in the National Planning Policy Framework (NPPF) and the related guidance given in the Planning Practice Guidance (PPG). These include; assessing the significance of heritage assets, using appropriate expertise, historic environment records, recording and furthering understanding, neglect and unauthorised works, marketing and design and distinctiveness.

2 This good practice advice acknowledges the primacy of relevant legislation and the NPPF and PPG, and is intended to support the implementation of national policy. It does not however constitute a statement of Government policy, nor does it seek to prescribe a single methodology or particular data sources. In order to gain a full understanding of the relevant issues, this document should be read in conjunction with the relevant legislation, national planning policy and guidance (the NPPF and PPG), as well as Good Practice Advice Note 1 (*The Historic Environment in Local Plans*) and Good Practice Advice Note 3 (*The Setting of Heritage Assets*) and other Historic England Advice Notes. Alternative approaches may be equally acceptable, provided they are demonstrably compliant with legislation, national policies and objectives.

3 The advice in this document, in accordance with the NPPF, emphasises that the information required in support of applications for planning permission and listed building consent should be no more than is necessary to reach an informed decision, and that activities to conserve or investigate the asset needs to be proportionate to the significance of the heritage assets affected and the impact on that significance.

General advice on decision-taking

4 Development proposals that affect the historic environment are much more likely to gain the necessary permissions and create successful places if they are designed with the knowledge and understanding of the significance of the heritage assets they may affect. The first step for all applicants is to understand the significance of any affected heritage asset and, if relevant, the contribution of its setting to its significance. The significance of a heritage asset is the sum of its archaeological, architectural, historic, and artistic interest. A variety of terms are used in designation criteria (for example, outstanding universal value for World Heritage Sites, national importance for scheduled monuments and special interest for listed buildings and conservation areas), but all of these refer to a heritage asset's significance.

5 Heritage assets include designated heritage assets and non-designated assets identified by the local planning authority as having a significance justifying consideration in a planning decision (NPPF glossary, page 52). The National Heritage List for England is the official database of all nationally designated heritage assets – see www.HistoricEngland.org.uk/listing/the-list. Non-designated heritage assets include those that have been identified in a Historic Environment Record, in a local plan, through local listing or during the process of considering the application. Archaeological potential should not be overlooked simply because it is not readily apparent.

6 Both the NPPF (paragraph 188) and the PPG (section ID20) highlight early engagement and pre-application discussion. Where the proposal is likely to affect the significance of heritage assets, applicants are encouraged to consider that significance at an early stage and to take their own expert advice, and then to engage in pre-application discussion with the local planning authority and their heritage advisers to ensure that any issues can be identified and appropriately addressed. As part of this process, these discussions and subsequent applications usually benefit from a structured approach to the

assembly and analysis of relevant information. The stages below indicate the order in which this process can be approached – it is good practice to check individual stages of this list but they may not be appropriate in all cases and the level of detail applied should be proportionate:

> For example, where significance and/or impact are relatively low, as will be the case in many applications, only a few paragraphs of information might be needed, but if significance and impact are high then much more information may be necessary.

- Understand the significance of the affected assets
- Understand the impact of the proposal on that significance
- Avoid, minimise and mitigate impact in a way that meets the objectives of the NPPF
- Look for opportunities to better reveal or enhance significance
- Justify any harmful impacts in terms of the sustainable development objective of conserving significance and the need for change
- Offset negative impacts on aspects of significance by enhancing others through recording, disseminating and archiving archaeological and historical interest of the important elements of the heritage assets affected

The assessment of significance as part of the application process

7 Heritage assets may be affected by direct physical change or by change in their setting. Being able to properly assess the nature, extent and importance of the significance of a heritage asset and the contribution of its setting early in the process is very important to an applicant in order to conceive of and design a successful development and to the local planning authority in order to make decisions in line with legal requirements and the objectives of the development plan and the policy requirements of the NPPF.

8 Understanding the **nature of the significance** is important to understanding the need for and best means of conservation. For example, a modern building of high architectural interest will have quite different sensitivities from an archaeological site where the interest arises from the possibility of gaining new understanding of the past.

9 Understanding the **extent of that significance** is also important because this can, among other things, lead to a better understanding of how adaptable the asset may be and therefore improve viability and the prospects for long term conservation.

10 Understanding the **level of significance** is important as it provides the essential guide to how the policies should be applied. This is intrinsic to decision-taking where there is unavoidable conflict with other planning objectives.

11 To accord with the NPPF, an applicant will need to undertake an assessment of significance to inform the application process to an extent necessary to understand the potential impact (positive or negative) of the proposal and to a level of thoroughness proportionate to the relative importance of the asset whose fabric or setting is affected.

12 Although there are many sources of information and methods for assessing significance and impact upon it, the most common steps an applicant might take are as follows. The first three steps are almost always necessary:

12.1 Examine the asset and its setting (see GPA 3).

12.2 Check:

a the Local Development Plan, evidence base and policies

b main local, county and national records including the relevant Historic Environment Record (see paragraph 21),

c statutory (these can be accessed via the National Heritage List for England) and local lists

d the Heritage Gateway

e the Historic England Archive, and

f other relevant sources of information that would provide an understanding of the history of the place and the value the asset holds for society, for example historic maps, conservation area appraisals, townscapes studies or the urban archaeology database

12.3 Consider whether the nature of the significance of the affected assets requires an expert assessment to gain the necessary level of understanding; where there is archaeological interest (including buildings, areas and wreck sites), consider whether it requires a desk-based assessment to understand the significance. It is good practice to use professionally accredited experts and to comply with relevant standards and guidance. To find a list of expert groups, see paragraph 19.

A **desk-based assessment** will determine, as far as is reasonably possible from existing records, the nature, extent and significance of the historic environment within a specified area, and the impact of the proposed development on the significance of the historic environment, or will identify the need for further evaluation to do so. See the relevant **standards and guidance** provided by the Chartered Institute for Archaeologists (CIfA).

CIfA Standard and Guidance: Historic Environment Desk Based Assessment 2014

12.4 In order to ensure that the scope of the assessment or evaluation meets the requirements of the local planning authority (LPA) and avoids the risk of damage to heritage assets, it is good practice to discuss the scope of the work with the LPA in advance and to agree a written scheme of investigation (WSI), if necessary, before commencement, thus precluding abortive work.

12.5 Carry out additional investigations if initial research has established an archaeological, architectural, artistic, and/or historic interest but where the extent, nature or importance needs to be established more clearly before decisions can be made about change to the site. This may include documentary research.

For example, see *Understanding Place: An Introduction*, *Understanding Place: Historic Area Assessments in a Planning and Development Context*, *Understanding Place: Historic Area Assessment* – Principles and Practice (all 2010: English Heritage).

12.6 Where an archaeological desk-based assessment is insufficient to assess the archaeological interest of a heritage asset fully, consider whether an on-site field evaluation would provide the necessary information.

An **archaeological field evaluation** will determine, as far as is reasonably possible, the nature of the archaeological resource within a specified area using appropriate methods and practises, including: geophysical survey, physical appraisal of visible structures and/or trial trenching for buried remains.

CIfA Standard and Guidance: Evaluation.

See also *Mineral Extraction and Archaeology: A Practice Guide*, English Heritage on behalf of the Minerals Historic Environment Forum, 2008.

12.7 Consider, in the case of buildings, whether physical intervention such as the selected removal of non-historic plaster, may be helpful to reveal important details hidden behind later additions and alterations bearing in mind that such investigations should be proportionate to the significance. Most evaluation of significance in buildings is likely to be based on a mixture of documentary research and non-intrusive examination of fabric but where the significance lies below-ground or more deeply concealed in a building's fabric, a greater level of intrusive investigation may be required.

For further information on the investigation of historic buildings, see *Understanding Historic Buildings: A Guide to Good Recording Practice* (2006), *Understanding Historic Buildings: Policy and Guidance for Local Planning Authorities* (2008 - both English Heritage) and CIfA Standard and Guidance: *Archaeological Investigation and Recording of Standing Buildings or Structures*.

12.8 Establish whether any investigative work may itself require listed building consent, scheduled monument consent or other permissions.

Conservation Principles and assessment

13 The reason why society places a value on heritage assets beyond their mere utility has been explored at a more philosophical level by English Heritage in *Conservation Principles* (2008). *Conservation Principles* identifies four types of heritage value that an asset may hold: aesthetic, communal, historic and evidential value. This is simply another way of analysing its significance. Heritage values can help in deciding the most efficient and effective way of managing the heritage asset so as to sustain its overall value to society.

14 Assessment of significance, on a UK wide basis, is also covered in Part 4 of British Standard 7913:2013 *Guide to the Conservation of Historic Buildings*.

Curtilage structures

15 Some buildings and structures are deemed designated as listed buildings by being fixed to the principal building or by being ancillary within its curtilage and pre-dating 1 July 1948. Whether alteration, extension or demolition of such buildings amounts to harm or substantial harm to the designated heritage asset (ie the listed building together with its curtilage and attached buildings) needs careful consideration. Some curtilage structures are of high significance, which should be taken fully into account in decisions, but some are of little or none. Thus, like other forms of heritage asset, curtilage structures should be considered in proportion to their significance. Listed buildings designated very recently (after 25 June 2013) are likely to define curtilage definitively; where this is (or is not) the case will be noted in the list description.

Archaeological and historic interest

16 Archaeological interest, as defined in the NPPF, differs from historic interest because it is the prospects for a future expert archaeological investigation to reveal more about our past that need protecting. Caring for an asset that has a well-understood historic interest, but no substantial archaeological interest, will be relatively straightforward as our existing knowledge of the asset will guide how it can be managed in order to sustain its significance. However, if for example there is good reason to suspect that a bare field which has never been investigated contains important remains, or that an apparently ordinary building contains a hidden medieval timber-frame, the task of managing it would be different.

Historic interest is an interest in what is already known about past lives and events that may be illustrated by or associated with the asset.

17 Where a heritage asset is thought to have archaeological interest, the potential knowledge which may be unlocked by investigation may occasionally be harmed by even minor disturbance, thus damaging the significance of the asset. This can make some assets, or parts of them, very sensitive to change. Expert advice will be needed to identify these sensitivities and assess whether and how they can be worked around (see paragraphs 20 - 23), however, a proportionate approach should be maintained. It has been estimated that disturbance would have an adverse impact in less than 3% of all planning applications currently (Information from forthcoming ALGAO casework survey (to be published summer 2015).

The archaeological interest of an asset can remain even after apparently thorough investigation. As techniques and the understanding of our past improve, a previously investigated asset may be revisited to see what further can be learned.

Using appropriate expertise

18 Expert advice on where the significance lies and its sensitivity to change can unlock viable uses for the asset and secure its long-term future. It can also be very valuable in minimising and mitigating impact, therefore avoiding conflicts between the owner's reasonable aspirations for the site and its conservation, particularly if it is sought early. Where the proposal is likely to affect the significance of heritage assets, early engagement with appropriate expert advice and the relevant local authority heritage advisers will be helpful both in developing an understanding of significance and in identifying the level of information needed to support the application and can be helpful throughout the process. National amenity societies and local groups, such as civic and historical societies, museums and local records/archives can also be particularly valuable sources of advice and information. Where a heritage asset may have a cultural or faith interest to a particular community, it is important to consult them as their views and information may add to the understanding of the asset's significance.

19 There are several established registers that can be used to identify appropriately qualified specialists or organisations, depending on the nature of the project. Though not exhaustive, the alphabetical list below may be helpful:

Architects Accredited in Building Conservation Ltd operates a register of specialist architectural heritage expertise.

The **Chartered Institute for Archaeologists (CIfA)** has a register of accredited organisations for historic environment practice. CIfA requires its members to meet defined levels of competence. www.archaeologists.net/ro

The **Institution of Civil Engineers and the Institution of Structural Engineers** operate a joint register of engineers (Conservation Accreditation Register for Engineers - CARE) who have demonstrated to their peers that they meet a required standard in conservation.

The **Institute for Conservation (ICON)** operates a register of accredited conservator-restorers.

The **Institute of Historic Building Conservation (IHBC)** has a register of accredited organisations for historic environment practice. The IHBC requires its members to meet defined levels of competency. www.ihbc.org.uk/hespr/

The **Royal Institute of British Architects** also operates a register of architects accredited in building conservation, for works on listed buildings, scheduled monuments and pre-1900 buildings.

The **Royal Institution of Chartered Surveyors** maintains a register of accredited building conservation surveyors.

20 Some projects may need more than one type of specialist and, indeed, others, for instance planners and architectural historians.

Finding appropriate information: Historic Environment Records (HERs)

21 To ensure sustainable development, local planning authorities need to have access to HERs that are publicly-accessible and dynamic sources of information about the local historic environment, its archaeological remains, architecture and town- and landscape of all periods. They need to provide an up-to-date catalogue of heritage assets and interventions within a defined geographical area. They will assist in informing good planning decisions by providing information about the historic environment, complementary to that provided by museums, archives and libraries, to communities, owners and developers. As an information service managed by dedicated specialist staff, they consist of databases, indexes and reference collections linked to a Geographical Information System (GIS) and thus provide core information for plan-making, designation and development management decisions in the planning system as set out in the NPPF, as well as decisions relating to environmental stewardship schemes (details can be found at: www.heritagegateway.org.uk/Gateway/CHR).

22 An effective HER is likely to contain information on the following:

22.1 Designated heritage assets.

22.2 Locally designated heritage assets.

22.3 Heritage assets with archaeological interest that are neither nationally nor locally designated (including assets that are known to have been demolished or destroyed or known only from antiquarian sources, assets which do not meet the criteria for national or local designation, and those which have yet to be formally assessed as such).

22.4 Other heritage assets with historic, architectural and artistic interest that are of local significance (including undesignated historic buildings, parks and gardens and historic places commemorating events and people).

22.5 Findspots.

22.6 Archaeological objects and their findspots under the Portable Antiquities Scheme.

22.7 Investigations of the archaeological, architectural, historic or artistic interest of a place or landscape, including desk-based assessments, field evaluations, excavation reports, archaeological watching briefs, environmental assessments, conservation management plans and assessments, reports on significance from Design and Access Statements, record reports on buildings, conference notes and proceedings, etc.

22.8 Historic area assessments and characterisation studies, urban archaeological databases, conservation area appraisals and management plans.

22.9 Output from the National Mapping Programme (NMP).

22.10 Scientific data relevant to the understanding of heritage assets such as borehole logs, absolute dating and palaeoenvironmental data.

22.11 Documentation, such as Listed Building Heritage Partnership Agreements, Local Listed Building Consent Orders and (National) Listed Building Consent Orders, which derive from changes to the Planning (Listed Building and Conservation Areas) Act 1990 under the Enterprise and Regulatory Reform Act 2013.

23 HERs will usually be defined by the administrative boundaries (whether terrestrial, inter-tidal or marine) of the local authority(-ies) that an HER covers. To ensure useful coverage in all types of planning casework, HERs are encouraged to consult user groups regularly and take account of their information requirements in sourcing material.

24 Information generated in putting together the local plan, during the process of applying for consent and in the discharging of conditions placed on consents will often provide new evidence of the state and significance of the historic environment. It can be invaluable in plan-making and decision-making in the future and is of significant public benefit in furthering the understanding of our surroundings and our past. This information should be made publicly accessible, usually through the Historic Environment Record.

Assessing the proposals

25 In deciding applications for planning permission and listed building consent, local planning authorities will need to assess the particular significance of the heritage asset(s) which may be affected by the proposal and the impact of the proposal on that significance reflecting the approach as described in paragraphs 3-5 above. In most cases, to assess significance LPAs will need to take expert advice, whether in-house, from shared services or from consultants. It is good practice to use professionally accredited experts and to comply with relevant standards and guidance (For example, the CIfA Standard and Guidance: *Archaeological Advice*). To find a list of expert groups, see paragraph 19.

26 Successful sustainable development achieves economic, social and environmental gains jointly and simultaneously through planning decisions (NPPF, Paragraph 8). If there is any apparent conflict between the proposed development and the conservation of a heritage asset then the decision-maker might need to consider whether alternative means of delivering the development benefits could achieve a more sustainable result, before proceeding to weigh benefits against any harm. For example, raft foundations can span archaeological deposits, so minimising both the physical impact and the costs associated with excavation.

27 Substantial harm is a high test which may not arise in many cases. In those cases where harm or loss is considered likely to be substantial (NPPF, Paragraph 132 & PPG 01-7), then the LPA will need to consider the relevant NPPF tests. Further detail on the tests on levels of harm can be found at paragraphs 133-135 and 139 of the NPPF. Further guidance on heritage conservation as a public benefit in itself, optimum viable use, levels of harm and mitigating harm are given in the PPG section ID 18a, paragraphs 15 to 20.

Cumulative impact

28 The cumulative impact of incremental small-scale changes may have as great an effect on the significance of a heritage asset as a larger scale change. Where the significance of a heritage asset has been compromised in the past by unsympathetic development to the asset itself or its setting, consideration still needs to be given to whether additional change will further detract from, or can enhance, the significance of the asset in order to accord with NPPF policies. Negative change could include severing the last link to part of the history of an asset or between the asset and its original setting. Conversely, positive change could include the restoration of a building's plan form or an original designed landscape.

Listed building consent regime

29 Change to heritage assets is inevitable but it is only harmful when significance is damaged. The nature and importance of the significance that is affected will dictate the proportionate response to assessing that change, its justification, mitigation and any recording which may be needed if it is to go ahead. In the case of listed buildings, the need for owners to receive listed building consent in advance of works which affect special interest is a simple mechanism but it is not always clear which kinds of works would require consent. In certain circumstances there are alternative means of granting listed building consent under the Enterprise & Regulatory Reform Act 2013.

Further advice is given in Historic England Advice Note *Making Changes to Heritage Assets* (forthcoming).

For the Enterprise and Regulatory Reform Act 2013 see: www.legislation.gov.uk/ukpga/2013/24/contents/enacted

Decision-taking for assets with archaeological interest

30 Many heritage assets have a significance that is a combination of historic, architectural, artistic and archaeological interest. However, some will currently hold only an archaeological interest, in that nothing substantial may be known about the site and yet there is a credible expectation that investigation may yield something of strong enough interest to justify some level of protection.

31 For sites with archaeological interest, whether designated or not, the benefits of conserving them are a material consideration when considering planning applications for development.

Recording and furthering understanding

32 If a decision in principle is made to allow a proposal that would cause the loss of an asset (either wholly or in part), developers are required to record and advance our understanding of the significance of the asset or the relevant part in a manner proportionate to its importance and the potential impact (NPPF, Paragraph 141). Nevertheless, records cannot deliver the sensory experience and understanding of context provided by the original heritage asset, so the ability to investigate and record a heritage asset is not a factor in deciding whether consent for its destruction should be given.

33 Developers are more likely to achieve the NPPF objective if the recording is undertaken by a professionally accredited organisation or individual with appropriate expertise and that it complies with professional standards and guidance and takes account of relevant research frameworks.

Accredited members:
The CIfA maintains a Register of accredited organisations and holds a directory of members:
www.archaeologists.net/ro

Guidance:
CIfA Standard and Guidance: *Evaluation; Watching Briefs*; *Archaeological Excavation* and *Archaeological Investigation and Recording of Standing Buildings or Structures*.

Mineral Extraction and Archaeology: A Practice Guide, English Heritage on behalf of the Minerals Historic Environment Forum, 2008.

Understanding Historic Buildings: a guide to good recording practice. English Heritage 2006.

Understanding Historic Buildings: Policy and Guidance for Local Planning Authorities English Heritage 2008.

Local authority archaeological advisers may have additional, locally specific guidance.

Research Frameworks:
See: www.HistoricEngland.org.uk/research/support-and-collaboration/research-resources/research-frameworks/

Written Schemes of Investigation (WSI)

34 In those cases where development will lead to loss of a substantive part of the significance of a heritage asset, the steps to be taken by the developer to achieve the NPPF requirements are best controlled through a WSI, although given the number of planning applications likely to have an adverse impact such an investigation may not be required in many cases. A WSI is usually commissioned by the applicant and approved by the LPA. The planning authority will need to satisfy itself that any WSI is set out to a level of detail proportionate to the asset's likely significance and in accordance with appropriate standards and is flexible enough to be able to take account of reasonable and unavoidable changes or unexpected discoveries. WSIs are used to set out proposals for assessment and evaluation, as well as post-permission investigation and recording.

35 The LPA (and their heritage advisers) can advise as to what the WSI should cover; additional guidance is also available, for example through CIfA standards and guidance. Schemes normally include:

- Background information and context relating to existing understanding and the purpose of the investigation
- Proposals for the site investigation, including statements on research objectives, methodology and community engagements
- Proposals for the assessment, analysis, publication, dissemination, archiving and curation of the results of the investigation. Assessment and analysis may need to be a two stage process with detailed proposals for investigation and analysis being agreed following completion of the assessment stage

- Operational matters including timetable, resourcing, expertise of those undertaking the work, compliance with professional standards and legislative or regulatory requirements

Archaeological conditions and obligations for WSIs

36 A requirement to record the significance of a heritage asset with archaeological interest that will be harmed may be made enforceable through conditions, a planning obligation or a combination of the two (see Paragraphs 203-206 of the NPPF). The use of conditions or obligations can be applied where the legal and policy tests in the NPPF have been met, and it has been established that sustainable development can only be achieved through harm to a heritage asset. An approach for using conditions to identify and secure the appropriate level of work is set out below. Depending on the nature of the proposals and the heritage assets affected, the timing of submission of details relating to works (ie in this case the WSI), their approval and implementation may need to be tied to the phases of development or occupation. Information requirements should also be tailored to the development.

37 The following is suggested as an example condition which can be helpful to identify and to secure the appropriate level of work that is necessary before commencement of the development, and also what may be required after commencement and in some cases after the development has been completed. The staged approach to discharge can therefore help to avoid problems for developers with the delay of fully discharging pre-commencement conditions such as where lengthy programmes of archaeological work are secured by a single clause pre-commencement condition. Care will be needed to ensure the conditions are enforceable and otherwise comply with the NPPF. A planning obligation may be needed in certain circumstances:

- No demolition/development shall take place/commence until a written scheme of investigation (WSI) has been [submitted to and] approved by the local planning authority in writing. For land that is included within the WSI, no demolition/development shall take place other than in accordance with the agreed WSI, which shall include the statement of significance and research objectives, **and**

  - The programme and methodology of site investigation and recording and the nomination of a competent person(s) or organisation to undertake the agreed works

  - The programme for post-investigation assessment and subsequent analysis, publication & dissemination and deposition of resulting material. This part of the condition shall not be discharged until these elements have been fulfilled in accordance with the programme set out in the WSI

Reporting, publication and archiving

38 Where the local planning authority has indicated that a report detailing the findings of the investigation shall be published, it is helpful to consider the following points:

- The best means of publication to reach target audiences, dependent upon the nature of the findings

- For important sites, the publication of detailed findings to an appropriate and proportionate level through books, archaeological, architectural or historical journals or via the internet

- The general structure, length and format of the report including summaries

39 Local planning authorities are advised to ensure that the compilation, deposition and appropriate conservation of the material, digital and documentary archive in a museum, or other publicly accessible repository willing and capable of preserving it, forms an integral part of any recording project. Securing the archive of an investigation according to the terms of deposition or guidelines issued by the receiving body will facilitate future research. Proposals for these stages of work will have been included in the WSI but may need to be updated following completion of the on-site investigation.

40 The CIfA publishes standards and guidance for the creation, compilation, transfer and deposition of archaeological archives (CIfA Standard and Guidance: *Archives*), while advice is also available from the Museums Association and individual museums and archives. Deposition of copies of reports and site summaries with the HER is vital in providing an evidence base that can be called on by applicants for future development and by planners when drawing up plans and making decisions, as well as being important to local communities. Advice on the content of site summaries may be available from the HER.

Human remains

41 There are important, additional legal requirements that apply where development or on-site evaluation may affect human remains and it is advisable to follow established professional guidelines. Further guidance on compliance with burials legislation is available from the Ministry of Justice and Historic England.

Mineral extraction

42 Archaeological interest is often of particular importance in proposals for minerals extraction. The Minerals and Historic Environment Forum has published *Mineral Extraction and Archaeology: a Practice Guide* (2008) to provide guidance on minerals planning and archaeology. This is currently being updated given the subsequent publication of the NPPF.

Public engagement

43 Where appropriate, local planning authorities and the developer are advised to consider the benefits of making the investigative works open to and interpreted for the public and to include that as part of the WSI. The results can contribute to a deeper sense of place, ownership and community identity. Promoting understanding will increase active protection for the historic environment. Opportunities for public engagement, proportionate to the significance of the investigation, could, for example, include enabling participation in investigation, providing viewing platforms and interpretation panels, jointly designed open days in partnership with the local community, public talks and online forums as well as coverage in local media. Once analysed, the results and the knowledge gained may be communicated, in addition to formal publication and deposition of the archive, through displays, exhibitions and popular publications and might inform site design and public art.

Unexpected discoveries during work

44 Where a new heritage asset is discovered or an existing known asset proves to be more significant than foreseen at the time of application, the local planning authority is advised to work with the developer to seek a proportionate solution that protects the significance of the new discovery, so far as is practical, within the existing scheme. Developers are advised to incorporate the potential for unexpected discoveries into their risk-management strategies.

Scheduled monument consent

45 Guidance on scheduling and scheduled monument consent is published by DCMS. Scheduled monument consent is a separate approval process from the planning system.

Neglect

45 While most disrepair is not deliberate neglect, and while LPAs need to be wary of delaying sympathetic proposals which would give the heritage asset a future, where an owner appears to have permitted a heritage asset to deteriorate deliberately in the hope of making consent or permission easier to gain, the local planning authority will need to disregard the deteriorated state of the asset. In all other cases the condition of the property and its impact on viability can be a material consideration.

46 Working with the owner is the route to solving heritage at risk issues and informal approaches to the owner are the normal starting point. LPAs may need to consider exercising their repair and compulsory purchase powers to remedy neglect, deliberate or otherwise (NPPF, Paragraphs 126 and 207). The potential to exercise these powers as an alternative means of conserving a heritage asset could be a material consideration in determining applications (see: *Stopping the Rot: A Guide to Enforcement Action to Save Historic Buildings*).

Unauthorised works, enforcement notices and prosecution

47 The objective of conserving heritage assets for generations to come will not be met if there is no deterrent to those contemplating not applying for a consent and no remedy applied when consents are not sought when they should have been. Wrongdoing should obviously not be rewarded and those who obey the law should not be disadvantaged. Local planning authorities may, where it is expedient and in the public interest, consider the following steps, as appropriate: to remind people of the need for consents; to investigate and prosecute breaches of the law; and, to remedy the effects of any wrongdoing using their enforcement powers. The strategy for enforcement in the historic environment would form part of the 'local enforcement plan' (NPPF, Paragraph 207).

48 Carrying out works that affect the special interest of a listed building and the demolition of a building in a conservation area without consent are both criminal offences. Expert heritage advice should be sought if there is any doubt as to whether consent should be obtained and, if in doubt owners are encouraged to talk to their LPA before works are undertaken. Although scheduled monument consent is a separate regime, unauthorised works are a criminal offence under the Ancient Monuments and Archaeological Areas Act 1979.

Marketing to demonstrate redundancy

49 Excepting those which, by their nature, have limited or no economic end use, total loss or substantial harm to a designated heritage asset may be justified where certain conditions apply (NPPF, Paragraph 133). Marketing is required to demonstrate redundancy as expert evidence of possible purchasers and their intended uses for the site can never be conclusive and the seriousness of the proposed harm justifies the time taken in the marketing exercise (See section 4.7 of *Enabling Development and the Conservation of Significant Places* – English Heritage, 2008).

50 No-one is obliged to sell their property. The aim of a marketing exercise is to reach all potential buyers who may be willing to find a use for the site that still provides for its conservation to some degree. If such a genuine purchaser comes forward who would be willing to maintain the asset, there is no obligation to sell to them, of course, but redundancy will not have been demonstrated. To ensure that those marketing efforts have been genuine and given the best chance of succeeding, local planning authorities may consider the following aspects of the campaign in order to judge its merits:

a **The timing of the marketing.** Paragraph 133 of the NPPF requires that there is clear evidence that no viable use can be found in the 'medium term'. Under poor market conditions the applicant may wish to consider whether 'mothballing' the asset might be appropriate until conditions have improved to the point when a negative response can be reasonably ascribed to a genuine lack of interest in the asset itself rather than to general market conditions.

b **The period and means of marketing.** These will be set to give the best chance of reaching all categories of potential purchaser.

c **The asking price.** A price that does not fairly reflect the market value of the heritage asset will deter enquiries.

d **Condition of the site and deliberate neglect.** To test the market adequately the price would need to reflect the cost of any works needed to repair the asset. Deterioration from deliberate neglect of the asset in the hope of obtaining consent should be ignored. This means that if the cost of making good the deterioration from deliberate neglect is greater than any value the site may have had without the neglect, the applicant is unlikely to be able to demonstrate that the asset would have been unviable in the assumed condition that the policy requires.

e **The extent of the land included and nature of the interest being marketed.** The land being offered needs to be sufficient to provide necessary infrastructure; if a lease rather than freehold is offered and it is too short or has otherwise onerous terms genuine interest may be deterred.

Public or charitable interest and support for assets under threat

51 Where there are no expressions of interest in the general market for maintaining the asset, reasonable endeavours will need to be made to see if there is a public or charitable organisation willing to take on the asset and to find grant-funding that may pay for its continued conservation. This might include approaching the local authority, Historic England, the Heritage Lottery Fund, the Architectural Heritage Fund (who maintain a list of possible alternative sources of funding), charitable foundations, national and local amenity societies and preservation trusts.

Opportunities to enhance assets, their settings and local distinctiveness

52 Sustainable development can involve seeking positive improvements in the quality of the historic environment. There will not always be opportunities to enhance the significance or improve a heritage asset but the larger the asset the more likely there will be. Most conservation areas, for example, will have sites within them that could add to the character and value of the area through development, while listed buildings may often have extensions or other alterations that have a negative impact on the significance. Similarly, the setting of all heritage assets will frequently have elements that detract from the significance of the asset or hamper its appreciation.

Design and local distinctiveness

53 Both the NPPF (section 7) and PPG (section ID26) contain detail on why good design is important and how it can be achieved. In terms of the historic environment, some or all of the following factors may influence what will make the scale, height, massing, alignment, materials and proposed use of new development successful in its context:

- The history of the place
- The relationship of the proposal to its specific site
- The significance of nearby assets and the contribution of their setting, recognising that this is a dynamic concept
- The general character and distinctiveness of the area in its widest sense, including the general character of local buildings, spaces, public realm and the landscape, the grain of the surroundings, which includes, for example the street pattern and plot size
- The size and density of the proposal related to that of the existing and neighbouring uses
- Landmarks and other built or landscape features which are key to a sense of place
- The diversity or uniformity in style, construction, materials, colour, detailing, decoration and period of existing buildings and spaces
- The topography
- Views into, through and from the site and its surroundings
- Landscape design
- The current and historic uses in the area and the urban grain
- The quality of the materials

Contact Historic England

East Midlands
2nd Floor, Windsor House
Cliftonville
Northampton NN1 5BE
Tel: 01604 735400
Email: eastmidlands@HistoricEngland.org.uk

East of England
Brooklands
24 Brooklands Avenue
Cambridge CB2 2BU
Tel: 01223 582700
Email: eastofengland@HistoricEngland.org.uk

Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth PO4 9LD
Tel: 023 9285 6704
Email: fort.cumberland@HistoricEngland.org.uk

London
1 Waterhouse Square
138-142 Holborn
London EC1N 2ST
Tel: 020 7973 3000
Email: london@HistoricEngland.org.uk

North East
Bessie Surtees House
41–44 Sandhill
Newcastle Upon Tyne
NE1 3JF
Tel: 0191 269 1200
Email: northeast@HistoricEngland.org.uk

North West
Suites 3.3 and 3.4
Canada House
3 Chepstow Street
Manchester M1 5FW
Tel: 0161 242 1400
Email: northwest@HistoricEngland.org.uk

South East
Eastgate Court
195-205 High Street
Guildford GU1 3EH
Tel: 01483 252000
Email: southeast@HistoricEngland.org.uk

South West
29 Queen Square
Bristol BS1 4ND
Tel: 0117 975 0700
Email: southwest@HistoricEngland.org.uk

Swindon
The Engine House
Fire Fly Avenue
Swindon SN2 2EH
Tel: 01793 414700
Email: swindon@HistoricEngland.org.uk

West Midlands
The Axis
10 Holliday Street
Birmingham B1 1TG
Tel: 0121 625 6820
Email: westmidlands@HistoricEngland.org.uk

Yorkshire
37 Tanner Row
York YO1 6WP
Tel: 01904 601901
Email: yorkshire@HistoricEngland.org.uk

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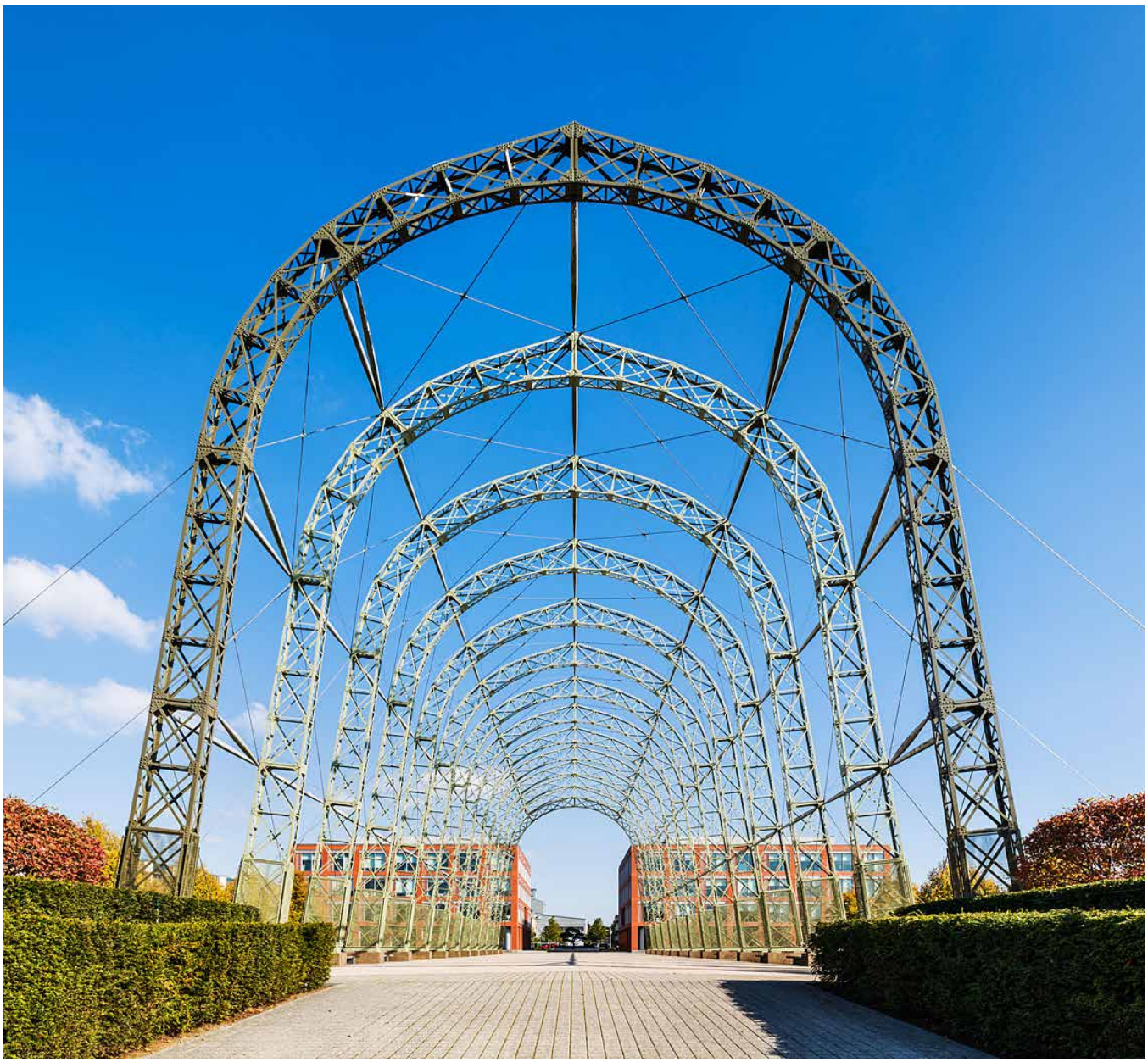
Appendix HE.2.5

Historic England

Historic Military Aviation Sites

Conservation Guidance



Summary

This guidance is intended to promote the appreciation of historic military airfields and their associated buildings, so that their significance is properly recognised and conserved through appropriate management. It explains how the operational needs and development potential of these sites can be reconciled with the recognition of their special historic, architectural or archaeological significance. It is also intended to assist with the preparation of guidelines, agreements and plans for individual sites.

The guidance is aimed at anyone that has a role in deciding how these sites are used and managed, including owners, their professional advisers, local planning authorities and the relevant statutory agencies. It applies to active military establishments as well as those that have been sold by the Ministry of Defence (MOD) and adapted for other uses.

This guidance note has been prepared by Billy Reading, Will Holborow, Jeremy Lake, Veronica Fiorato, Wayne Cocroft and Alisa Moss.

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Front cover: Farnborough airship hangar
Portable airship shelter at Farnborough (Hampshire), originally constructed in 1912 and moved to its present position in 2004.

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Introduction

Military aviation sites have left a unique imprint on the English landscape and, along with other military sites, serve as a reminder of the global conflicts and fast-changing technology of the 20th century. Their historical, cultural and environmental significance needs to be understood and protected through careful management. Of the hundreds of military aviation sites that were in use in the period up to 1945, comparatively few survive in a recognisable form. Most have either been swept away and returned to agriculture, or heavily adapted for alternative civilian uses. However, some of the permanent RAF stations have survived relatively unaltered. This guidance highlights 28 'key' sites which represent the best preserved airfield landscapes and the most historically significant groups of original buildings in England (see Appendix). Some are now designated as conservation areas. Many individual buildings and structures, both on these key sites and elsewhere, are now protected as listed buildings or scheduled monuments.

This guidance note demonstrates how the character of historic military aviation sites can be maintained and enhanced, whilst allowing for the changes necessary to ensure that they have a sustainable future. Finding the right balance between change and preservation requires a partnership approach between the owners, their professional advisers, local planning authorities and the various statutory agencies concerned, including Historic England. Any decisions about the development of military aviation sites should be based on a proper understanding of their special archaeological, architectural or historical significance. With reasonable flexibility and imagination, historic airfield buildings can be adapted to new uses without loss of significance. On sites where coherent groups of historic buildings survive – including the 'key' sites listed in the Appendix – it is desirable to maintain the scale and density of the original development and the visual connections between the original buildings. A sensitive approach to the design of

Runway at former RAF Coltishall (Norfolk), prior to closure as a fighter station in 2006.

First World War buildings at Stow Maries (Essex) prior to their repair in 2010.

any new buildings or extensions and a consistent policy towards minor alterations, maintenance and landscaping can all help to maintain the restrained and co-ordinated character of these sites.

Background

Research by English Heritage (now Historic England) on military airfields, beginning in the late 1990s, provided a coherent national overview of the most significant military aviation sites. This work led to the first edition of this guidance note, published in 2003. This edition updates the original guidance to include new information about designation and changes in national planning policy.

Scope of the guidance

This guidance relates to military aviation sites in England that were constructed during the period from just before the First World War up to the end of the Second World War in 1945. It also refers to later development on these sites up to the end of the Cold War in 1989. It applies to the whole landscape of military aviation sites: domestic and technical sites, married quarters, the airfields themselves, archaeological and landscape features, and individual buildings and structures.

Value of military aviation sites

Military aviation sites have left their mark on the English landscape and remind us of the global conflicts and fast-changing technologies developed during the 20th century. They are typically extensive and highly complex sites. While some remain in military use, the majority have returned to civilian ownership, and are used for commercial, agricultural, light industrial or residential uses, of value both to local communities and to the economy as a whole. Other uses include markets, warehousing, vehicle storage and green infrastructure – including solar and wind farms – and civil aviation.

Public interest is reflected in growing visitor numbers to museums and sites connected with military aviation, the promotion of airfield trails by local authorities and the numerous specialist publications and societies devoted to military history. There are around 80 local military aviation museums across the UK, the majority run by volunteers as trusts. Other redundant airfields have been integrated into areas of public amenity and wildlife habitats, as at Hornchurch in Essex and Greenham Common in Berkshire. Thus, military airfields are of cultural value, as well as having social and economic significance. The importance of individual sites varies, from those of international significance – such as Duxford – to those where only fragmentary remains survive, contributing to local character and a sense of place in the modern landscape.

Second World War RAF station at Westcott (Buckinghamshire), now used as a solar farm.

Vulnerability

Aviation sites are particularly vulnerable to change and demolition. Most airfield buildings and structures were built along strictly functional lines, without an eye to architectural expression or long-term durability. Therefore, the great majority of the airfield buildings and structures that were in place in 1945 have already been either altered or demolished. The significance of surviving airfield sites – and their original buildings and landscape character – may be threatened by:

- demolition in order to make way for new development (for example, airfields that are deemed to be 'brownfield' sites are under particular pressure)
- new development which is harmful to the setting of heritage assets
- disrepair of vacant buildings and the related risks of vandalism and theft
- inappropriate alterations and poorly executed repairs
- the subdivision of site ownership, which can result in changes to the original layout and character of a site
- the removal of airfield buildings and hard surfaces for the commercial reclamation of hardcore material, usually before the site's return to agriculture

1 Historic Character

1.1 Layout of Royal Air Force stations

Military aerodromes or air stations fall into various categories according to their function. Those built during the First World War included Home Defence Stations, Airship Stations and Seaplane Stations. During the inter-war period other types of station were built, including Bomber Command Stations, Fighter Command Stations, Coastal Command Stations, Flying Training Schools and Aircraft Storage Units. Military airfields demanded the integration of a wide range of requirements, from maintaining and servicing aircraft to housing communities of aircrew, technicians, administrators and their families. Airfield sites are organised into the separate functional areas of flying field, domestic areas and technical sites, and include many different building types such as control towers, hangars, technical and training buildings, barracks, officers' messes and other domestic buildings. Hundreds of different designs are represented within these groups, reflecting development over time and changing functions. *British Military Airfield Architecture* (Francis, 1996) provides a detailed description of many of the various standardised building types designed by the Air Ministry's Directorate of Works and Buildings. In the inter-war period the layout of RAF stations increasingly conformed to the requirements that fabric must be dispersed against attack from the air. During the Second World War, provision for close defence was often added in the form of pillboxes and battle headquarters.

Hullavington (Wiltshire) is an exemplary model of the improved architectural quality of 1930s RAF airfields; most is protected as a conservation area.

1.2 Flying fields and hangars

Until the adoption of perimeter dispersal from the late 1930s all the aircraft of an operational airfield – typically an omni-directional flying field of 1,000 yards diameter – would be accommodated in its hangars. Military planners responded to aircraft development through the planning and development of hangar buildings. Wooden construction had been used for many hangars before 1919. Subsequently, hangars were mostly metal-framed with the exception of parabolic concrete and steel hangars used on the aircraft storage units constructed from 1936. The now-familiar airfield landscape of runway, perimeter dispersals and flight control was only beginning to gain acceptance within the Air Ministry in the late 1930s, when increasing attention was being given in airfield planning to their ability to disperse and shelter aircraft from attack, ensure serviceable landing and take-off areas, and control movement. Early airfields (such as Duxford) incorporated an orthogonal arrangement of buildings, but in the 1930s this evolved into a fan arrangement for the hangars, as protection against multiple losses from a single stick of bombs.

1.3 Airfield defences and air raid shelters

Airfield defences were constructed in three main phases. The first phase was part of the huge programme of airfield building during the 1930s. At this stage defences were designed to provide protection from air attacks (including poison gas); dispersed layouts, air-raid shelters, protected buildings and anti-aircraft guns were the principal measures used. The second phase followed the realisation in the spring of 1940 that airfields would be targets in an invasion. This phase is represented by the construction of airfield defences, including pillboxes and battle headquarters buildings, from which defence of the airfield would have been co-ordinated.

Air-raid shelters dating from the inter-war period were built in basements of the major domestic buildings. Second World War air-raid shelters survive in great numbers, either as earth-covered shelters or free-standing structures. For much of the Cold War fixed airfield defences were far less evident. From the late 1950s remote Bloodhound missile sites protected the key nuclear deterrent bases. Later, the NATO hardening programme of the 1970s and 1980s offered nuclear, chemical and biological protection to essential airfield structures. In response to the threat of attack from terrorists and Soviet special forces more emphasis was also placed on ground defences. These included the addition of barbed-wire entanglements and prefabricated pillboxes. Mobile Rapier anti-aircraft missile deployments have left few traces. In the event of nuclear attack existing buildings were also identified as possible personnel shelters.

1.4 Technical and domestic buildings

There is a broad distinction to be drawn between the prefabricated structures of both world wars, whose survival is highly fragmentary, and the permanent structures of the inter-war period. From 1923, when the first phase of inter-war expansion commenced, air bases were built in permanent materials (mostly brick and concrete with slate, tile or concrete roofs) and planned on dispersed principles. The improved design of post-1933 buildings was a product of the government's request – spurred by popular fears over rearmament and the impact of air bases in the environment – for the RAF to liaise with the Royal Fine Art Commission over the matter of station design. A clear distinction was drawn between neo-Georgian styles chosen for domestic buildings and more modern styles for technical buildings. The gas decontamination centres and protected operations blocks that appeared on RAF bases from 1937, along with the flat roofs widely introduced for technical and domestic buildings in the same period, were designed to counter the effects of incendiary bombs and bomb fragmentation.

2 Historical Development

2.1 1909-14

The headquarters building and balloon store of the Royal Engineers' Air Battalion, built after April 1911, has survived at Farnborough. Remarkably, hangars have survived from the pre-1912 flying schools at Larkhill on the edge of Salisbury Plain (army) and Eastchurch in Kent (navy) and extensive ranges of buildings dated 1913-14 on newly established Royal Flying Corps (RFC) sites at Upavon and Netheravon, also around Salisbury Plain, and Montrose in Scotland. These survivals are of exceptional rarity and of international importance in the context of the development of military aviation.

2.2 1914-18

This period saw the completion of coastal stations (for both balloons and aircraft) for the navy and Home Defence Stations for the RFC, the latter integrated by the end of the war into a complex infrastructure linked to searchlight and anti-aircraft gun provision. Reserve Squadrons, from 1917 designated as Training Squadrons, trained pilots destined for the Western Front: the opening of Training Depot Stations from 1917 became the greatest airfield construction programme of the period. The RFC and Royal Naval Air Service were amalgamated to form the Royal Air Force (RAF) on the 1st of April 1918.

Officers' accommodation at RAF Netheravon (Wiltshire) dating from 1913-14. Restored in 2013.

The majority of buildings erected in the period 1914-18 – of temporary materials expected to last for the duration of the conflict only – were either cleared after 1919 (271 out of 301 sites that existed in November 1918) or have since decayed. Attention is consequently drawn to complete aircraft hangars and especially the principal hangar groups, of which six (Calshot, Duxford, Henlow, Hooton Park, Lee-on-Solent and Old Sarum) survive in England, and one (Leuchars) in Scotland. These exemplify their aviation use more clearly through their plan and form than isolated survivals of domestic or technical buildings. The best survival of the latter is at Stow Maries in Essex. Only one site, Old Sarum, has retained its suite of hangar and technical buildings fronting onto an airfield relatively unaffected by later developments. Cardington in Bedfordshire retains the only in situ and ex situ survivals of entire airship sheds from this period and East Fortune in Fife retains the best surviving group of technical buildings associated with a balloon station.

2.3 1919-23

When the RAF was formed as the world's first independent air force in April 1918, and during the period of retrenchment which lasted from the Armistice until the early 1920s, its founding father and first Chief of the Air Staff, General Sir Hugh Trenchard, concentrated on developing its strategic role as an offensive bomber force. His primary considerations were in laying the foundations for a technology-based service, through the training of officers at Cranwell and technicians at Halton. Delays in the construction of permanent buildings at Cranwell until the early 1930s have meant that only the Groves and Henderson Barracks at Halton relate to this relatively dormant period of development.

2.4 1923-40

More than 100 stations were built in permanent fabric between 1923 and 1940, dividing into two main periods of construction. Between 1923 and 1926, Trenchard's expansion of the air force was centred upon the building of offensive bomber bases in East Anglia and Oxfordshire, behind an 'aircraft fighting zone' some 15 miles deep and extending round London from Duxford in Cambridgeshire to Salisbury Plain. The second major phase of expansion and rearmament took place between 1934 and 1940, and commenced after Hitler's rise to power and the collapse of the Geneva disarmament talks in 1933. Bases constructed in this period were markedly improved in their overall design and architectural quality (see Section 1.4), resulting from discussions with the Royal Fine Art Commission and political sensitivities over the landscape impact of the construction programme. Development was concentrated on the establishment of training and maintenance bases behind an eastern front line facing Germany.

The airfields of this inter-war period, which comprised the bulk of those retained as the core bases of the RAF and United States Air Force (USAF) after 1945, have survived in the best condition. The completeness or otherwise of inter-war bases – and the extent to which they have retained their architectural detail, external fitments and inter-relationship as part of planned groups – is closely linked to the nature and intensity of post-war use. Upper Heyford, for example, which was the test bed for the planning of Trenchard's Home Defence Scheme stations, was greatly extended and adapted as a key USAF site in the Cold War period. Less intensive military use of Bicester - another of Trenchard's Oxfordshire bomber bases – has ensured its survival as the most complete group representative of developments on bomber airfields for the period up to 1939. Hullavington in Wiltshire, faced in Cotswold stone in response to representations by the Council for the Preservation of Rural England (now known as Campaign to Protect Rural England, CPRE), is in every respect the key station representative

of the improved architectural quality of post-1934 expansion. Kemble (on the Wiltshire/Gloucestershire border) has the greatest range of advanced hangar types on any of the 24 aircraft storage units built between 1936 and 1941.

2.5 1940-45

The last of the stations planned in the inter-war period were not completed until 1941, although this period saw the country's total of 150 expanded to 740. The majority of the inter-war-period airfields were built with grass landing surfaces, but the increased weight of the new aircraft being introduced during the Second World War meant that concrete runways and hardstandings were laid during the conflict. Examples include Kenley, the most complete example of one of the fighter airfields around London, and Scampton in Lincolnshire, which achieved worldwide fame on account of its association with 617 Squadron and the Dambusters raid in May 1943.

Throughout the Second World War, new airfields were built with concrete runways and perimeters and sited amongst clutches of domestic and technical sites dispersed in the surrounding countryside and constructed from materials which were intended only to last for the duration of the conflict. Most of these were built for Bomber Command and the United States Army Air Force (USAAF). The location of these airfields reflected key strategic considerations. For example, they were sited in south-west England to protect shipping lanes, in eastern England in support of the Strategic Bomber Offensive, and in southern England in support of the Allied invasion of north-west Europe.

Temporary airfields of the Second World War

In contrast to the permanent structures and tightly defined sites characteristic of the inter-war period, the temporary structures of the stations built during the Second World War were spread across many square miles. Most were abandoned after the conflict and re-used for a variety of purposes. However, the US Navy site at Dunkeswell in Devon (see Appendix) survives as a remarkably complete example. Other fighter airfield landscapes with their fighter pens and defences have survived at Culmhead in Somerset, Croughton in Northamptonshire and Predannack in Cornwall. Elsewhere, the process of post-war clearance, including for hardcore in road building, has swept away the great majority of temporary airfield landscapes. Runways and perimeter tracks have only been retained and adapted in a minority of cases, for example in the case of the race circuit at Castle Coombe in Wiltshire and for poultry and turkey sheds in East Anglia. A recent survey (Francis, Flagg and Crisp 2016) has found that fewer than 20 of these landscapes survive in a legible state with their runways and perimeter tracks.

2.6 Post-1945 developments

After 1945, the wartime airfields that were retained and developed to meet new roles during the Cold War underwent radical rebuilding. With the introduction of jet aircraft, and increasingly heavy bombers, the wartime trend of replacing grass flying fields with concrete runways and hardstandings continued. By the 1950s the distinctive type of post-war airfield had evolved. This consisted of a long central runway, often with quick reaction platforms at either end and flanked by parallel taxiways connected to aircraft servicing platforms and dispersal hardstandings of various designs.

Most of these airfields were able to make use of pre-existing domestic and technical areas, although new structures were added where these areas were inadequate. The introduction of increasingly complex aircraft and weapons systems demanded new infrastructure, including avionics buildings, nuclear weapon stores, and facilities to maintain and store guided weapons. The USAF was a major presence in England during this era and many distinctive structures are associated with its airfields. Hardened structures – used to protect aircraft and the essential facilities on an airfield against Warsaw Pact attack – were a feature of the key military airfields from the mid-1970s.

Since the Second World War, air power has increasingly been used to transport troops and materials to overseas deployments and for close support on the battlefield. To accommodate these new roles existing airfields were adapted. At Brize Norton, Oxfordshire, a hangar was specially constructed to house large transport aircraft and at Lyneham, Wiltshire, a terminal building analogous to civilian examples was added to process troops before and after flights. Rotary wing technology underwent rapid progress, and helicopters have been developed to fulfil many functions including transport, rescue and low-level attack. They too were stationed on existing airfields and, thanks to their relatively small size, few adaptations to the existing fabric were necessary. At other places helicopter landing pads are often distinguished by a large letter 'H' painted onto concrete surfaces.

Layout of hangars, hardstandings and technical buildings at RAF Lyneham (Wiltshire) post-1945.

3 Research, Evaluation and Recording

3.1 Airfield studies and statements of significance

Any decisions about the management of individual historic aviation sites and structures should be based on a proper understanding of their special archaeological, architectural or historic significance.

An analysis of a site's significance should begin with the collation of available information. Sources of relevant information include:

- statutory list descriptions and scheduling documentation
- thematic survey reports prepared by English Heritage/Historic England
- conservation area designation statements and local list descriptions
- airfield studies and reports
- published works (see References)
- the Defence of Britain Project database: the project was completed in March 2002 and the records are held by the Historic England Archive, while the database can be searched online through the Archaeological Data Service
- Historic Environment Records (HERs), which can be accessed via the Heritage Gateway
- aerial photographs and site records in the Historic England Archives
- Airfield Research Group (ARG) Forum, formerly the Airfield Information Exchange

The National Archives, Imperial War Museums, Fleet Air Arm Museum at Yeovilton, and the RAF Museum at Hendon hold many primary documents relating to aviation sites, ranging from Building Committee minutes to plans, drawings and photographs. Contact details for these organisations are provided in Section 10.

A conservation plan can be a useful tool for explaining the significance of heritage assets and how that significance will be sustained. An example is the conservation plan for RAF Upper Heyford (September 2005).

3.2 Archaeological remains

It is most important to establish at an early stage whether below-ground archaeological remains exist on aviation sites, particularly where development is proposed. Archaeology exists under some airfields from earlier periods (for example Iron Age settlements at RAF Boscombe Down, or Roman sites and Saxon cemeteries at RAF Lakenheath). Archaeological remains are also likely to survive from the recent military occupation of the site (for example in the form of weapon pits and slit trenches, buried dumps containing redundant materiel, and even discarded ordnance). A guidance note on military aircraft crash sites is available from Historic England.

3.3 Local and communal values

Military aviation sites can be valued by local communities for a variety of reasons. They will have communal value through the personal links that may have developed between military sites and local communities. There are often strong associations with particular squadrons and with the individual service personnel of various nationalities who served in Britain during the Second World War. These associations are often commemorated by memorials, including war memorials which record the names of those who either lost their lives or served in the armed forces during wartime.

Many airfields that are no longer in military use are of value to local communities for leisure uses such as flying and weekend markets. The ecological significance of airfields (for example as semi-improved grassland) should not be overlooked. Parts of some airfields, usually on the periphery, lie within Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) or Special Areas of Conservation (SACs). Management of these areas is subject to consultation with Natural England.

3.4 Recording

Standard guidance on building recording is available from Historic England; the level of recording will be determined by the impact of the work and the significance of a structure.

Recording may be undertaken for a variety of reasons. Where flying is about to cease, photographic characterisation is particularly effective in portraying the activities and use of space on a base. An example of this is the report on RAF Coltishall in Norfolk undertaken by English Heritage (Cocroft and Cole 2007).

v

Kings Cliffe memorial stands on an abandoned Second World War airfield in Northamptonshire.

4 Statutory Protection

4.1 Assessment of sites in England

A programme of research in the late 1990s, initiated by English Heritage, established a comprehensive understanding and assessment of 20th-century military sites across the country. Key principles were initially set out in Monuments of War (English Heritage 1998). The programme produced:

- a thematic survey of airfield buildings up to 1945 and identification of key airfield sites (Survey of Military Aviation Sites and Structures: Summary Report, Lake 2003).
- A shortlist of the best surviving airfield defences and a study of control towers.
- A survey of Cold War sites (Cold War Monuments: An Assessment by the Monuments Protection Programme, Cocroft 2001).

1950s 'Gaydon' hangar built at RAF Wittering (Cambridgeshire) to accommodate Valiant bombers. It was listed in 2011.

4.2 International context

Work has been undertaken in other countries to identify the most important military aviation sites and structures for protection. Knowledge of this international context has contributed to our understanding of the significance of what remains in the United Kingdom. For example, the hangars at Leuchars in Scotland and the group of sites developed around the army training areas at Salisbury Plain (Larkhill, Upavon and Netheravon) represent a uniquely complete grouping dating from before the First World War.

4.3 Listing and scheduling

The vast majority of nationally significant airfield structures will be most appropriately protected through listing (under Section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990). To be listed, buildings must be of special architectural or historic interest, and the majority of designations are concentrated at those key sites listed in the Appendix. Historic England has published a guide to the selection of military sites and structures for listing which further explains the criteria for this. All national designations are entered on the National Heritage List for England, which is available online.

More detailed advice about listed building consent can be found on the Historic England website.

Less commonly, airfield heritage assets may be protected through scheduling (under Section 1 of the Ancient Monuments and Archaeological Areas Act 1979) because of their national importance. Examples of scheduled airfield structures include bomb stores at Bicester, fighter pens at Kenley, and the Cold War hardened aircraft shelters at Upper Heyford. A guide setting out the criteria for scheduling military sites is available on the Historic England website.

Scheduled monument consent is required for almost any works which affect a scheduled monument. More detailed advice about the need for consent and the application process can be found on the Historic England website.

4.4 Local listing

Airfield buildings, structures or airfield landscapes which do not meet the criteria for statutory designation may nonetheless be of considerable local significance and may merit inclusion on a local list. A good practice guide for local listing is available to help local authorities and their community groups set up or improve their local list.

4.5 Conservation areas

Another mechanism by which the significance of an airfield can be highlighted, as a historic landscape, is through conservation area status. An assessment of the character and significance of an area is necessary to justify the designation and to provide the basis of its future management. An example is the appraisal for the RAF Hornchurch Conservation Area. Guidance about conservation areas is available on the Historic England website.

Trees in conservation areas benefit from additional protection. Anyone proposing to carry out works to a tree should notify the local planning authority in writing. They may not go ahead until the work has been granted consent, or six weeks have expired. If a tree is protected by a Tree Preservation Order, consent must always be obtained before works commence.

The following airfields have been designated as conservation areas:

Site	Local Authority	Year of designation
Bicester	Cherwell District Council	2002
Biggin Hill	London Borough of Bromley	1993
Coltishall	Broadland District Council / North Norfolk District Council	2008
Daedalus	Gosport Borough Council	1999
Duxford	South Cambridgeshire District Council	2007
Hornchurch	London Borough of Havering	1989
Hullavington	North Wiltshire District Council	1992
Kenley	Tandridge District Council & London Borough of Croydon	2005 and 2006
Old Sarum	Salisbury District Council	2001
Stow Maries	Maldon District Council	2008
Upper Heyford	Cherwell District Council	2006
Yatesbury	North Wiltshire District Council	1998

5 Managing Change

5.1 General character

The ‘campus’ character of many airfield sites derives from the open layout of the buildings, the consistent use of materials and the generous provision of trees and grassed areas. Many sites, especially those planned after 1936, were built on the principle of dispersal in order to minimise exposure to concentrated bombing. On sites where coherent groups of historic buildings survive, it is desirable to maintain the scale and density of the original development and the visual connections between the original buildings. Such cohesiveness may warrant designation of a conservation area by the local planning authority (see Section 4.5).

With care, most airfield buildings are capable of being adapted to new purposes without harm to their essential character. Many airfield buildings have already undergone some change of use, for example airmen’s barracks converted to residential use and offices and aircraft hangars converted to industrial use, archive storage or agricultural storage.

Former airfield powerhouse at Bicester (Oxfordshire), conserved and now used as a vintage car show room.

5.2 Development on historic aviation sites

The National Planning Policy Framework (NPPF 2012) requires the local planning authority to have a robust evidence base to support their plan-making process. Where this involves allocating a former airfield for development in their Local Plan, the local planning authority will need to have a clear understanding of its significance as a whole together with the significance of individual buildings or structures within it. An example is the planning brief for RAF Bicester, published by Cherwell District Council in 2009. This comprised informal development principles and conservation management guidelines for a surplus MOD site. The NPPF stresses the importance of conserving heritage assets in a manner appropriate to their significance. Any application should describe the significance of any heritage asset affected by proposed works, including any contribution made by their setting.

5.3 Development on former runways and flying fields

The continuation of flying activity on historic airfields will generally contribute to their character – by demonstrating their original use – and can help to maintain original buildings (particularly hangars) in appropriate use. Where the future of flying is in doubt, local authorities will need to weigh these advantages with other planning and technical considerations (for example, the impact of flying on local amenity).

If flying is discontinued, the layout of any new development on the former airfield should respect the setting of any listed buildings or scheduled monuments and the special architectural or historic interest of any conservation area. A Good Practice Advice note on the setting of heritage assets is available. It may be possible to incorporate features such as runways, perimeter tracks and defensive structures into new development proposals. In cases where preservation of standing structures can be shown to be unsustainable, it may be appropriate to maintain their footprint as a 'ghost' in any new layout. This applies particularly to temporary, prefabricated or ancillary structures.

Many airfields are in open countryside or on green belt land, or are located alongside such areas. In these cases any development potential may be limited by planning policies designed to protect the wider landscape. There is relevant advice in NPPF Section 9, 'Protecting Green Belt land.'

5.4 Extensions

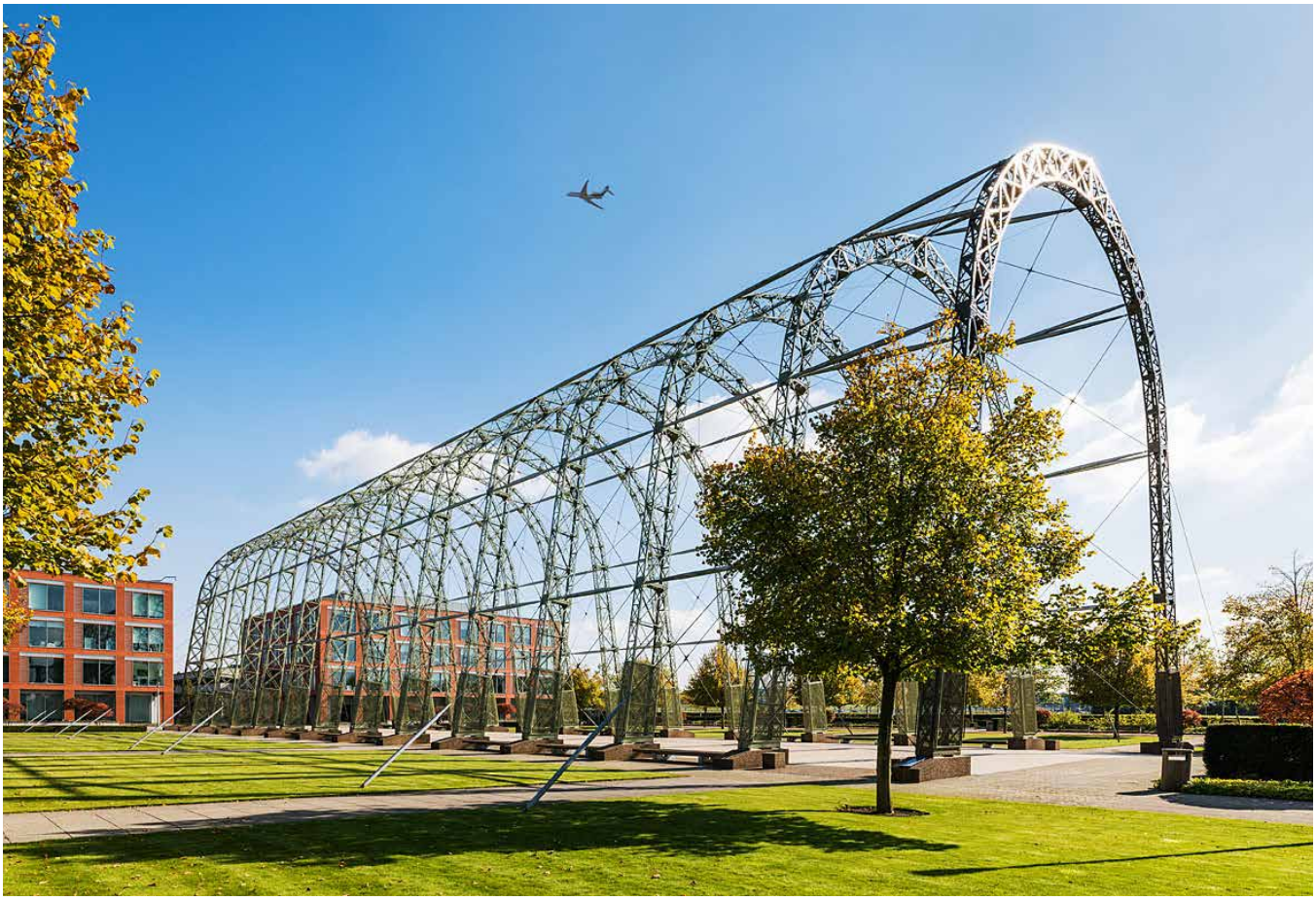
The scope for extending historic airfield buildings will depend on a number of factors, including the degree of formality in the original architecture and site planning. Where sites were designed or laid out according to a strictly applied symmetry or formal arrangement, care will need to be taken to sustain and enhance this when considering extensions or alterations.

Most aviation buildings are characterised by simplicity in detailing and consistency in the use of materials. It is therefore appropriate that the design of any new extensions should respect the prevailing character.

5.5 Conservation management

The key to successful conservation management lies in establishing a good relationship between the various parties involved, including the owner and the local planning authority, and in discussing proposals for development at an early stage. On large sites it may be useful to hold regular liaison meetings at which future work programmes are discussed. Management guidelines can set out an agreed approach to re-use, development, alterations and repairs.

Structures on airfields often pose a risk to health and safety because they have become structurally unsound, or because they may contain hazardous materials such as asbestos or explosive ordnance. It is important that structural engineers and those responsible for



Portable airship shelter at Farnborough (Hampshire), originally constructed in 1912 and moved to its present position in 2004.

clearing ordnance and other hazardous materials are made aware of any historic significance attached to the areas concerned. Abandoned or unattended buildings and structures on airfields can be dangerous. Safety measures (for example to restrict access) need to be designed carefully to avoid irreversible damage and to minimise their impact. Where assets are listed or scheduled, early consultation with the statutory authorities is essential to establish whether proposed safety measures need consent and to agree an appropriate solution.

Rather than demolishing a dangerous structure it may be possible to make it safe by temporary support or by preventing unauthorised access. Where partial demolition is unavoidable, it may be necessary to agree a method of working that will minimise the risk of damage.

Under the Enterprise and Regulatory Reform Act of 2013, it is possible for the owner of a listed building and the local planning authority to enter into a Listed Building Heritage Partnership Agreement. This allows the local planning authority to grant listed building consent for specified works of alteration or extension (but not demolition) of those listed buildings covered by the Agreement. The first example to be concluded, in 2014, is for the Stow Maries First World War aerodrome in Essex.

6 Alterations and Repairs

This section is concerned principally with works to listed buildings but may also be applicable to other heritage assets built for military aviation purposes. The advice of the local planning authority should be sought regarding the need for Listed Building Consent for any works referred to below.

6.1 Hangar structures

Most historic airfields retain one or more hangar structures built for the maintenance or storage of aircraft. The need to provide large, unobstructed covered spaces has given rise to specialised long-span structures that are technically distinct from other aviation buildings. Although built to standardised designs, they range in durability from lightweight demountable structures of timber and canvas to hardened aircraft shelters built in reinforced concrete. In most cases hangar designs were purely utilitarian, using materials that have a limited life – such as corrugated metal or asbestos sheeting. In some cases, however, higher-quality materials such as brick or stone were employed for aesthetic reasons. The essential characteristics of historic hangars, such as their overall form, structure and cladding, should be maintained as far as possible. Any decisions relating to alterations and repairs are likely to require the advice of a structural engineer. On MOD sites, technical advice may be sought from the Defence Infrastructure Organisation. Information on the different types of hangar can be found in *British Military Airfield Architecture* (Francis, 1996).

6.2 Roofs and roof coverings

The roof form and construction is often the defining characteristic of airfield structures and the original roof form – whether pitched, flat, curved or 'saw-toothed' – should be retained. Flat roofs are characteristic of certain periods, particularly of 1930s' modernist architecture, and their replacement with pitched roofs is generally to be avoided. Original features such as lantern lights and rooflights are often a distinctive feature of roofs and should normally be retained.

The original roofing materials – such as tile or natural Welsh slate – should be retained and repaired. Where it is not practical to replace like-for-like, every effort should be made to match the original appearance. For example, where original asbestos-cement slates need to be replaced, it may be necessary to specify a replacement slate of another material but of matching size, thickness and colour.

Earth-covered roofs (for example, on hangars) should not be stripped of their earth covering unless there are compelling reasons to do so. The exposure of waterproof membranes such as asphalt will tend to hasten their decay as well as changing the original appearance of the building.

Earth roof covering, Bicester (Oxfordshire).

6.3 Brickwork and pointing

Many 20th-century brick structures were built using a cement-gauged mortar mix. Where repairs are required, any replacement bricks should be carefully matched to the original colour and size, and laid to match the original bond. Any original features within the brickwork – such as vents made from sawn tile – should be retained. Repointing should be executed to match the appearance of the original work and be restricted to those areas where the existing pointing is substantially decayed.

The temporary structures built during the Second World War are often found to be decaying due to the use of incompatible materials – for example highly porous under-fired bricks laid in hard cement mortar. In such cases, a balance needs to be struck between maintaining the authenticity of the structure, both in terms of its appearance and materials, and ensuring a durable repair that helps to maintain the asset in a sustainable condition. This will usually mean repointing in a weak cement mix or possibly using lime mortar to minimise future harm to the bricks. For more detailed advice, see *Practical Building Conservation: Mortar, Renders and Plasters* (Ashgate 2011).

6.4 Concrete

Concrete is used in many different situations on airfield buildings and structures – such as flat roofs, floor slabs, structural members, staircases, retaining walls – and on some sites concrete is the dominant external facing material. Many airfield defences such as pillboxes were built with concrete of varying quality.

Some concrete structures were built in mass concrete; others, more commonly, were reinforced with steel bars. These may have corroded where the concrete cover is failing or gives insufficient depth of cover to the steel. This corrosion can cause the concrete cover to delaminate. The majority of repairs will involve the removal of damaged concrete in order to expose the reinforcement so that it may be completely de-rusted by chemical or mechanical means, followed by anti-corrosion treatment. The concrete can then be reinstated back to the ‘cleaned’ steel.

It is usually possible to repair damaged concrete to maximise retention of original material. However, where extreme degradation of concrete elements has taken place, it may be necessary to dismantle and rebuild. New reinforcement should be given adequate cover.

Work to reinforced concrete will normally require the advice of a structural engineer.

For more detailed advice on the conservation of concrete, see *Practical Building Conservation: Concrete* (Ashgate 2013).

6.5 Camouflage

It is important to retain any surviving evidence of camouflage techniques applied during the Second World War. The replacement of bricks or mortar within affected areas of masonry will require careful colour matching. However, replacement bricks should be colour matched to the original brick colour and not to the camouflage colour. The subsequent treatment of bricks to tone their colour to match the effect of weathered camouflage paint can be achieved with a thin wash of natural hydraulic lime paint or other lime-based washes. It is best to assess trial panels over a few months, as the eventual colour will depend on the properties of the brick.

Most of the hardened airfield structures built during the 1970s and 1980s were treated with a chemical colouring, 'Novolant', to produce a dull rusty brown finish. This is in line with NATO policy to dull down the appearance of its bases from the air to make them less vulnerable to attack by manned aircraft.

6.6 External painting

A consistent use of paint colour for external joinery and metalwork can greatly contribute to the disciplined character appropriate to a military site. Paint research using archival sources and an analysis of paint samples can provide a basis for choosing an appropriate colour scheme. External brick surfaces, some of which may retain traces of original camouflage colours, should not be painted.

At RAF Bicester a paint scheme has been adopted which is based on an unpublished report (*Report Following an Investigation of the Paint Colours on the External Joinery and Metalwork* prepared for English Heritage by Patrick Baty of Papers and Paints, March 2000).

6.7 Doors and windows

Original doors and windows should be retained and conserved in a manner consistent with their significance. They should be repaired and maintained by an experienced joiner. If the originals are beyond repair, they should be replaced to match the existing design and materials. Their replacement with modern substitutes made of aluminium, stained hardwood or PVCu will almost always be damaging to the character of the building.

It may be necessary to improve the energy efficiency of external doors and windows. Guidance on the application of Part L of the building regulations to historic buildings is available from Historic England.

6.8 External rainwater goods

Original details such as cast iron rainwater gutters and downpipes should usually be retained or, where necessary, replaced to match the original in appearance, profile and material. The use of alternative materials such as PVCu should be avoided. However, it is essential that the water-disposal arrangements perform effectively, to ensure the preservation of the building. It is important to check that gutters and downpipes can cope with the predicted volume of water run-off from the roof, and that they are capable of easy inspection and maintenance. Further advice on this topic is included in *Practical Building Conservation: Building Environment* (English Heritage 2014).

6.9 External services

All external service fittings – such as vent terminals, conduits, air-conditioning plant, aerials and bin stores – should be carefully considered. Consultation will be necessary to ensure that they are suitably designed and located, and to establish whether consent is required.

Watch tower at Thorpe Abbots (Norfolk) following restoration in which the original windows were refurbished and the glass house rebuilt.

6.10 Internal layouts and partitions

The majority of airfield buildings have functional interiors which can sustain some degree of change without damage to their architectural or historic significance. It is recognised that these interiors will need to be adapted from time to time in response to new or changed uses (for example by subdivision of original spaces). However, the demolition of structural elements such as solid partition walls or staircases should be avoided, unless it is essential to allow the ongoing use of the building. Great care should be taken where the internal layouts are particularly well preserved, or where the interiors retain a strong decorative character (for example in officers' messes) or provide evidence of a significant function (for example, operations rooms).

Some buildings may retain underground air-raid refuges that may also be subject to listed building controls, even if not included in the list description.

6.11 Internal finishes and fittings

Care should be taken to retain any original plasterwork, joinery, tiling and decorative features such as skirtings, architraves, picture rails, dados, doors and fireplaces. Evidence of previous uses or occupation – for example signage, fittings, murals and graffiti – should be retained where possible and recorded where appropriate.

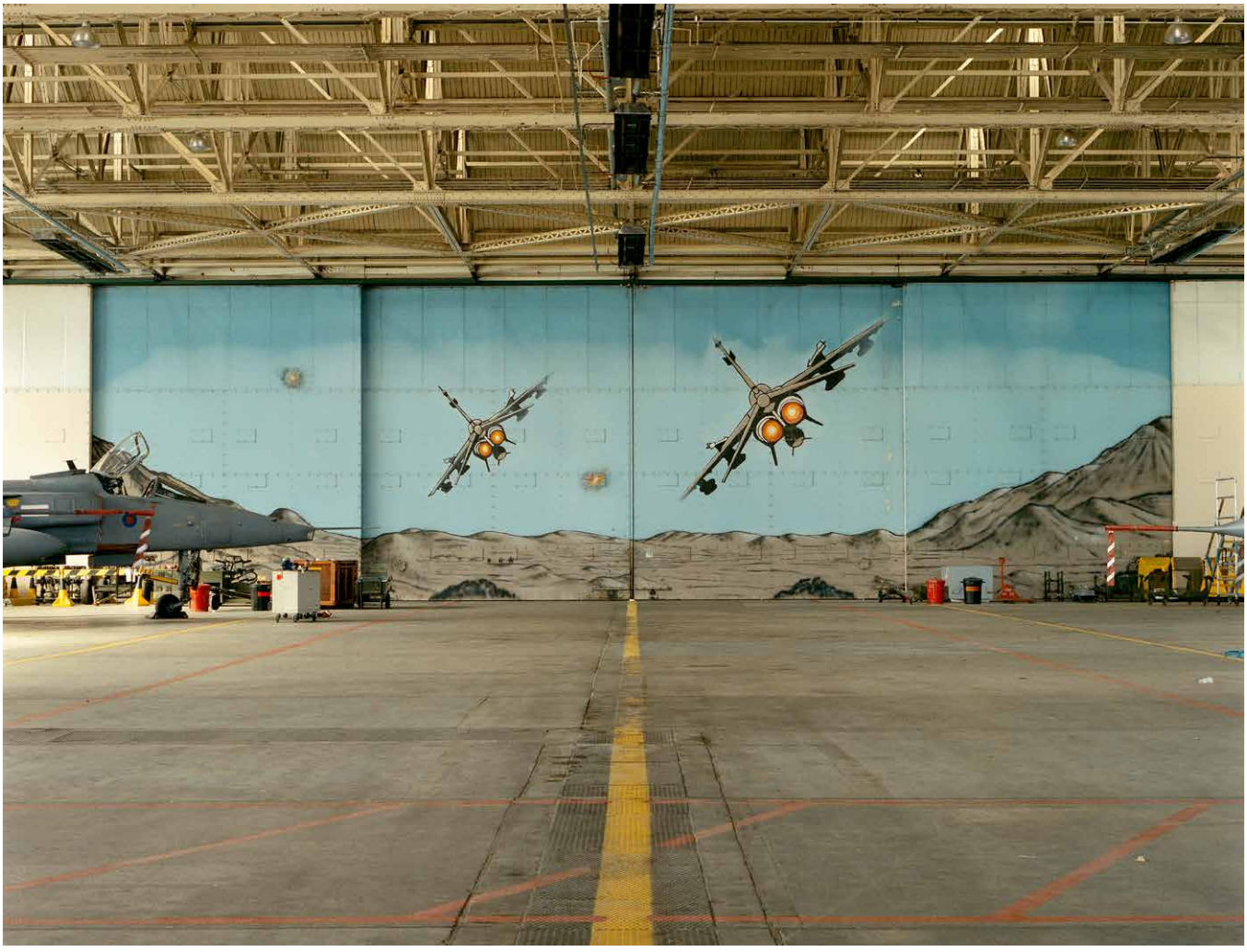
6.12 Wall Art

Wall art may be broadly categorised as images varying from casual doodles to elaborate murals that may occupy whole walls. They form an important and often personal link to the heritage of the units and personnel who have served on an airfield. Ideally, wall art should be cared for in its original position. More information is available in Historic England's guidance on military war art; see also *War Art, Murals and Graffiti: Military Life, Power and Subversion* (Cocroft et al 2006).

6.13 Internal services

In some instances original services installations that form an intrinsic part of the building's original function are of interest (for example the extraction plant in decontamination centres).

Internal works to install central heating, air conditioning, plumbing, sanitary installations, security systems, fire detection and so on should be carefully planned so that their impact is minimised, especially where they relate to notable interiors. Such works will require consent if the local authority considers that they affect the significance of the listed building.



Murals in the hangar at the former RAF Coltishall (Norfolk).

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8 Glossary

Airmen's institute A building housing recreational facilities for airmen and corporals, and operated by the Navy, Army and Air Force Institutes (NAAFI).

Air Ministry Founded in 1918. The Air Ministry's responsibilities included the selection and purchase of airfields; its Directorate of Works and Buildings took charge of the design and building of fabric. The Air Ministry became part of the unified MoD in 1964.

ASU Aircraft storage unit.

Avionics building A building used for the inspection and maintenance of complex electronic flight control equipment.

Barracks A building or group of buildings accommodating service personnel in dormitory rooms with additional rooms for corporals.

Bloodhound A surface-to-air missile system deployed by the RAF during the Cold War.

Bomber Command One of four specialised commands of the RAF formed in 1936.

Control tower A building from which all movements on and above an airfield are controlled. On RAF stations, this building type was referred to as the watch office.

Dispersal The scattered deployment of aircraft on hardstandings – or dispersal platforms – around the perimeter of an airfield to reduce their vulnerability to aerial attack.

Dispersed layout The scattered layout of buildings that was intended to minimise their vulnerability to concentrated bombing.

Domestic site Site for the accommodation of personnel including barracks and messes.

Expansion period A period of rapid expansion of the RAF during the inter-war period. This expansion took place in two stages: the first from 1923–6 and the second from 1934–40.

Fighter Command One of four specialised commands of the RAF formed in 1936.

Fighter pen Hardstanding for fighter aircraft with a protective traverse.

Hangar Structure to house or service aircraft.

Hardened structure Structures, including aircraft shelters, constructed from reinforced concrete and designed to withstand a pre-emptive attack. Characteristic of NATO bases of the 1970s and 1980s.

Hardstanding A generic term describing any open area of concrete or tarmacadam on which an aircraft or other vehicle might be parked.

NATO North Atlantic Treaty Organisation. Founded in 1949.

Officers' mess Building for purposes of officers' dining and recreation, typically with a 'club' atmosphere. Often contains accommodation for officers and servants.

Operations room/block Room or building from which the deployment of forces over a wide area is monitored and controlled.

Pillbox Typically a circular or hexagonal concrete structure built for close defence.

RAF Royal Air Force. Formed in 1918 through the union of the Royal Flying Corps (RFC) and Royal Naval Air Service (RNAS).

Squadron A unit of a definite number of aeroplanes with its officers and men.

Technical site Area of an airfield where the functions of maintenance and engineering are accommodated.

Thor IRBM Intermediate-range ballistic missile deployed between 1959 and 1964.

Traverse An earthen bank forming a protective barrier.

USAAF United States Army Air Force.

USAF United States Air Force. Founded September 1947.

Weapon pit Position cut into the earth for protection of artillery piece, mortar or machine gun.

Wing A unit formed from a number of squadrons.

9 Appendix

‘Key’ sites in England

The following list summarises the pre-1945 military aviation sites in England that retain the best-preserved airfield landscapes and/or most historically significant groups of original buildings. Almost all of these sites started out as RAF stations and many of them are still in military use. Some of them are also designated conservation areas (see Section 4.5).

Bicester, Oxfordshire

Bicester was built as a bomber station from 1924. It retains – better than any other aviation site in Britain – the layout and built fabric relating both to the first expansion period of the RAF and subsequent developments up to 1940. The grass flying field survives with its 1939 boundaries largely intact. It is surrounded by a group of bomb stores built in 1938-9 and airfield defences built in the early stages of the Second World War.

Biggin Hill, Greater London

Biggin Hill, Britain’s most celebrated fighter station, retains a particularly fine officers’ mess of 1934 and a good group of technical and domestic buildings (mostly 1930-4). The latter include the best-preserved group of married quarters buildings – dating from the 1920s – associated with a nationally important site. The flying field, with later runways, retains defence posts and fighter pens from 1939. The Memorial Chapel dates from 1951.

Calshot, Hampshire

Calshot Activity Centre on the Solent makes full use of its unique surviving group of seaplane hangars. These were sited next to one of Henry VIII’s coastal forts, which were built in the 1530s in order to help defend shipping in this strategically crucial area. It retains the best-preserved group of early seaplane hangars in Europe, ranging from a small timber hangar built early in 1914 for housing Sopwith Bat Boats to the immense steel-framed hangar, now in use as a sports centre and velodrome, which housed the Felixstowe flying boats used on anti-submarine patrols.

Catterick, North Yorkshire

Originating as a Home Defence Station in 1914, Catterick is the best-preserved fighter station in the north of England. It retains a group of First World War hangars (later reclad) and buildings dating from the expansion periods of the 1920s and 1930s. Fighter pens and defences were added around the airfield at the beginning of the Second World War.

Coltishall, Norfolk

Construction of RAF Coltishall began in February 1939. It was originally planned as a bomber station, but in May 1940 the still unfinished station was handed over to Fighter Command, and it played a distinguished role in the Battle of Britain. Since this date it has been associated with air defence and fighter aircraft and as such has probably been the most active RAF airfield in East Anglia. In the early 1950s it was adapted to accept jet fighter interceptors. In the 1990s it was closely associated with the Jaguar force’s operations in the 1991 Gulf War and the conflict in the former Yugoslavia. The airfield exemplifies the geometric layout and open character of the 1930s’ expansion period and how these were adapted to meet new post-war requirements.

Cranwell, Lincolnshire

The development of the Cadet College at Cranwell, begun in 1929, was a cornerstone of Britain's independent air force. College Hall (1929-33) and its formal setting make up the most architecturally impressive set-piece designed for the RAF. Although best known for the Cadet College, Cranwell has in addition a long aviation history dating back to 1918.

Debden, Essex

Opened as a fighter station in 1937, Debden retains much of its 1930s' character. It is also noted for the largely intact preservation of its flying field and defensive perimeter. Its historical importance resides chiefly in its role as one of the important 11 Group sector stations during the Battle of Britain.

Dunkeswell, Devon

The airfield, begun by the contractor George Wimpey in 1941, was occupied by US Air Force and Navy Liberator bombers whose task was to patrol the sea areas traversed by U-boats en route between their bases in France and their hunting sites in the North Atlantic. The bulk of the airfield site, with its runways, perimeter track and hardstandings, has survived as a very rare example of a substantially complete Second World War airfield site. The historical and landscape importance of this site has underpinned recommendations to protect key fabric, notably the operations block – a complete hangar with its associated hutting and the control tower group.

Duxford, Cambridgeshire

This famous fighter station is known for its Battle of Britain associations and later used as a USAAF fighter station. Much of the First World War technical site survives, including three paired hangars. The domestic site was built in the 1930s. The architecture, which is representative of both expansion periods, is remarkably well preserved and the airfield is largely intact.

Farnborough, Hampshire

Farnborough is one of the key sites in Europe relating to the development of aviation technology and aeronautical research. Originating as the base for the Royal Engineers' School of Ballooning in 1906, the site was occupied by the Royal Engineers' Air Battalion from 1911, and later by the Royal Aircraft Establishment. It closed as a military research establishment in 1999. Although much altered, the site retains a small number of historically significant buildings, including two Grade I-listed wind tunnels of 1934-5 and 1939-42.

Halton, Buckinghamshire

Halton was established as the centre for technical training for the Royal Flying Corps in 1917. After the First World War the site was developed to house the Aircraft Apprentice Scheme. The domestic site retains an extensive and well-preserved group of buildings from the 1920s and 1930s including the Groves and Henderson Barracks.

Henlow, Bedfordshire

The five general service sheds at Henlow comprise the most complete ensemble of hangar buildings on any British site for the period up to 1923. The domestic site retains an extensive group of married quarters, built in the Garden City tradition, and barracks and office buildings that date to 1933-5. These display a unique architectural treatment for a military air base.

Hullavington, Wiltshire

Hullavington opened in 1937 as a flying training station. It embodies, to a unique degree, the improved architectural quality associated with the post-1934 expansion of the RAF. Most of the original buildings have survived and form a particularly coherent and well-ordered ensemble. The flying field remains, with groups of hangars along its boundaries.

Kemble, Gloucestershire/Wiltshire

Kemble is the most strongly representative – by virtue of its range of hangar types – of 24 aircraft storage unit (ASU) sites planned and built by the Air Ministry between 1936 and 1940. The hangars are dispersed in pairs around the airfield and include the most advanced Air Ministry hangar types of parabolic form and concrete construction.

Kenley, Greater London/Surrey

Kenley, one of the key fighter stations, is famous for its associations with the Battle of Britain. Although most of the original buildings have gone, the officers' mess and airmen's institute survive. The airfield, which was completed at the beginning of the Second World War, is uniquely well preserved and retains runways, fighter pens and perimeter tracks, as well as elements of its defences.

Lee-on-Solent, Hampshire

Lee-on-Solent – the best-preserved seaplane base in Britain – has three seaplane sheds of 1918 grouped around the original slipway. A major rebuilding took place after 1931, including the addition of a particularly fine officers' mess of 1934. HMS Daedalus later occupied this site.

Manby, Lincolnshire

Manby was built as an armament training school from 1936-8. After Hullavington, it is the most complete and architecturally unified station of the post-1934 expansion period in Britain. Both the technical and domestic buildings show a meticulous attention to layout and detail. The airfield is now in agricultural use.

Netheravon, Wiltshire

Begun in 1912, Netheravon is the most complete of the sites that date to the crucial formative phase in the development of military aviation in Europe, which occurred prior to the First World War. The domestic site retains a remarkably well-preserved group of single-storey barracks and mess buildings dating from 1913-14. The grass airfield remains intact.

Northolt, Greater London

Northolt was one of the 11 Group fighter stations that played a significant operational role in the Battle of Britain. Although parts of the site have been subject to post-war redevelopment, a number of the original buildings of the 1920s and 1930s survive. Among these are the officers' mess, four barracks blocks, two hangars and the operations room. A fine memorial commemorates the contribution of Polish airmen to the Allied war effort during the Second World War.

North Luffenham, Rutland

Opened in 1940, North Luffenham is representative of contemporary bomber bases. It retains two J-type hangars as well as a coherent group of contemporary technical and domestic buildings. The runways, perimeter tracks and dispersal platforms were added in 1944 and form one of the most complete airfield landscapes of that period. The site was adapted in the Cold War period as a Thor IRBM (intermediate-range ballistic missile) site and a Bloodhound missile tactical control centre was also added.

North Weald, Essex

North Weald is a fighter sector station with Battle of Britain associations. After Kenley and Debden, it retains the best-preserved of the airfield landscapes put in place by Fighter Command at the beginning of the Second World War.

Old Sarum, Wiltshire

Old Sarum is one of the best-preserved flying fields of the First World War period. It is bounded by one of the most complete suites of technical and hangar buildings of the period.

Scampton, Lincolnshire

Opened in 1936 as a bomber station, Scampton's association with 617 Squadron and the Dambuster raids make it Bomber Command's most famous base of the Second World War. It also played an important role in the Strategic Bomber Offensive and the daylight raids in support of the Allied offensive in Europe. Scampton retains its layout and flying landscapes, complete with its full complement of hangars (including 617's offices). After the war, the airfield was further remodelled for V-bombers, the nuclear-armed deterrent force of the early Cold War period.

Stow Maries, Essex

Aircraft flew in the defence of London against Zeppelins and, after June 1917, Gotha bombers, from the Home Defence station at Stow Maries in Essex. The flying field, together with 24 workshop and barracks buildings, has survived. It is the largest known surviving group of Royal Flying Corps buildings on a First World War aerodrome which, being abandoned in 1918, was not adapted for further military use later in its history.

Upavon, Wiltshire

Founded in 1912 as the Royal Flying Corps's Central Flying School, Upavon is one of three sites around the Army training ground on Salisbury Plain that date from the crucial formative phase in the development of military aviation in Europe prior to the First World War. Several buildings of the 1913-14 period survive, including a guardroom, officers' cottages, airmen's barracks and institute, and the finest RFC officers' mess.

Upper Heyford, Oxfordshire

RAF Upper Heyford opened in 1916 and from that date was mainly concerned with aircrew training. Many buildings from the inter-war period survive. From the early 1950s it was occupied by the USAF and modified to accept long-range bombers. In the late 1970s it was substantially remodelled with the addition of hardened aircraft shelters and other protected structures. It is one of the best examples of a late Cold War airfield.

West Malling, Kent

A barracks square, officers' mess with its associated garages and control tower survive at West Malling, one of the RAF's key front-line fighter stations. After the Second World War it became the main rehabilitation centre for POWs returning from Germany to Britain.

West Raynham, Norfolk

This site, which was opened in April 1939 as a bomber station, has retained fabric in a remarkable state of preservation thanks to its 'mothballing' after closure. These include domestic and technical buildings with flat concrete roofs offering protection against bomb blast and incendiary bombs. The runways were extended during the Second World War and the airfield was further modified as part of West Raynham's establishment as a premier fighter base at the start of the Cold War. Construction work on a Bloodhound missile site on the south side of the base, near a well-preserved set of Second World War bomb dumps, commenced in 1964.

10 Where to Get Advice

The first point of contact for any planning or listing enquiry regarding a historic military aviation site should be the local planning authority or Historic England office. For more specialist enquiries, particularly those concerning historical information, please see the next page for details of other organisations.

Historic England

East Midlands
2nd Floor, Windsor House
Cliftonville
Northampton NN1 5BE
Tel: 01604 735460
Email: eastmidlands@HistoricEngland.org.uk

East of England
Brooklands
24 Brooklands Avenue
Cambridge CB2 8BU
Tel: 01223 582749
Email: eastofengland@HistoricEngland.org.uk

London
1 Waterhouse Square
138-142 Holborn
London EC1N 2ST
Tel: 020 7973 3700
Email: london@HistoricEngland.org.uk

North East
Bessie Surtees House
41-44 Sandhill
Newcastle Upon Tyne
NE1 3JF
Tel: 0191 269 1255
Email: northeast@HistoricEngland.org.uk

North West
3rd Floor, Canada House
3 Chepstow Street
Manchester M1 5FW
Tel: 0161 242 1416
Email: northwest@HistoricEngland.org.uk

South East
Eastgate Court
195-205 High Street
Guildford GU1 3EH
Tel: 01483 252020
Email: southeast@HistoricEngland.org.uk

South West
29 Queen Square
Bristol BS1 4ND
Tel: 0117 975 1308
Email: southwest@HistoricEngland.org.uk

Swindon
The Engine House
Fire Fly Avenue
Swindon SN2 2EH
Tel: 01793 445050
Email: swindon@HistoricEngland.org.uk

West Midlands
The Axis
10 Holliday Street
Birmingham B1 1TG
Tel: 0121 625 6870
Email: westmidlands@HistoricEngland.org.uk

Yorkshire
37 Tanner Row
York YO1 6WP
Tel: 01904 601948
Email: yorkshire@HistoricEngland.org.uk

Government Historic Estates Unit
gheu@HistoricEngland.org.uk
http://www.historicengland.org.uk/services-skills/our-planning-services/advice-for-government-historic-estates/

Historic England Archives
Tel: 01793 414600
archive@HistoricEngland.org.uk
http://archive.historicengland.org.uk/

Other organisations and contacts

Air Historical Branch (RAF) and Publications Clearance Branch (Air)
Tel: 020 8833 8175
ahb.raf@btconnect.com
http://www.raf.mod.uk/ahb/

Airfield Research Group Forum (previously Airfield Information Exchange (AiX)
https://www.airfieldresearchgroup.org.uk/forum

The American Air Museum in Britain
http://www.americanairmuseum.com

Defence of Britain Project
http://archaeologydataservice.ac.uk/archives/view/dob/

Imperial War Museums
http://www.iwm.org.uk/

The National Archives
Tel: 020 8876 3444
http://www.nationalarchives.gov.uk/

Natural England
Tel: 0300 060 3900
enquiries@naturalengland.org.uk
https://www.gov.uk/government/organisations/natural-england

Royal Air Force Museum
Tel: 020 8205 2266
http://www.rafmuseum.org.uk

Royal Navy Fleet Air Arm Yeovilton
Tel: 01935 840565
http://www.fleetairarm.com

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Historic England

Military Structures

Listing Selection Guides

Summary

Historic England's twenty listing selection guides help to define which historic buildings are likely to meet the relevant tests for national designation and be included on the National Heritage List for England. Listing has been in place since 1947 and operates under the Planning (Listed Buildings and Conservation Areas) Act 1990. If a building is felt to meet the necessary standards, it is added to the List. This decision is taken by the Government's Department for Digital, Culture, Media and Sport (DCMS). These selection guides were originally produced by English Heritage in 2011: slightly revised versions are now being published by its successor body, Historic England.

The DCMS' *Principles of Selection for Listing Buildings* set out the over-arching criteria of special architectural or historic interest required for listing and the guides provide more detail of relevant considerations for determining such interest for particular building types. See https://www.gov.uk/government/publications/principles-of-selection-for-listing-buildings.

Each guide falls into two halves. The first defines the types of structures included in it, before going on to give a brisk overview of their characteristics and how these developed through time, with notice of the main architects and representative examples of buildings. The second half of the guide sets out the particular tests in terms of its architectural or historic interest a building has to meet if it is to be listed. A select bibliography gives suggestions for further reading.

This guide outlines our approaches to listing England's military buildings and structures, some of the most eloquent witnesses to the impact of world events on our national story. Military sites are both offensive and defensive: they include fortifications designed to withstand assaults, and bases from which operations could be launched. To these the twentieth century added buildings designed to protect civilians from various forms of air-attack. Some structures are unique; other types, particularly in the twentieth century, were constructed using standard designs, methods of construction and materials. Here, especially, the most careful designation assessment is called for.

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HistoricEngland.org.uk/listing/selection-criteria/

Front cover
Dragon's Teeth erected as an anti-invasion defence on the Isle of Grain (Kent) in 1940. Listed Grade II in 2009.

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Introduction

Britain's military buildings and structures are eloquent witnesses to the impact of world events on our national story. The range is vast, from Hadrian's Wall to Cold War bunkers. Military sites are both offensive and defensive: they include fortifications designed to withstand assaults, and bases from which operations could be launched. To these the twentieth century added buildings designed to protect civilians from various forms of air-attack. Taken overall, the range of military buildings is extremely wide. Some structures are unique; other types, particularly in the twentieth century, were constructed using standard designs, methods of construction and materials (although these do not always survive in large numbers). Specialist knowledge will often be required to assess the relative significance of a site for designation.

Broadly speaking, military buildings can be divided into the operational and the ancillary (commonly known in the military as 'the teeth and the tail'): buildings for fighting, and buildings for living and working. Very few barracks or other 'tail' buildings survive from before 1800, but thereafter numbers increase and become predominant over the next two hundred years. This selection guide provides a brisk survey of the range and chronology of military buildings, and sets out the salient principles of selection. The subject is an intricate and complex one: more detailed guidance will often exist on specific topics, and all structures will have to be judged on their individual merits. This survey is biased towards more recent military structures, large numbers of which are considered for designation each year. It is these more recent sites that provide the greatest challenges for assessment.

The emphasis in this document is on buildings and structures that are assessed for listing. It is vital to remember that other designation responses are sometimes appropriate too. Scheduling, the designation of archaeological monuments, has been applied to defensive structures for over a century, and a number of twentieth-century sites have been protected in this way (Fig 1). Some military sites, usually spatially extensive, have been designated by local authorities as conservation areas, and this is the most satisfactory way of acknowledging an area of special interest, rather than just the key individual buildings within it. In the text which follows designations are noted only selectively, as especially on larger sites there will be several, possibly under different regimes and at different grades. All are recorded on the National Heritage List for England.

Figure 1
RAF Neatishead, Norfolk. A Type 84 radar, the last large Cold War air defence radar surviving in England. A Scheduled Monument.

As noted, the category of military buildings is a particularly broad one, and overlaps are inevitable with others. Naval buildings are deliberately excluded from this section: they are covered in the Maritime and Naval Buildings selection guide. Military hospitals are touched upon in the Health and Welfare Buildings selection guide. There is also cross-over with places of military production in the Industrial Buildings selection guide, and with communications centres in the Infrastructure: Utilities and Communications selection guide. War memorials and other monuments are considered under Commemorative Structures.

1 Historical Summary

The development of military architecture is intricate and impressively well documented. For works of synthesis, Saunders (1989) and Osborne (2004) are recommended. What follows is a very cursory overview of the field by date categories. Because of the complexity of the subject, the vast range of structures surviving, and the particular sensitivities attached to them, especially locally, fuller consideration is given at the end about twentieth-century military buildings.

1.1 Military buildings up to 1700

Defence was the rationale behind many of our finest archaeological sites, both pre-Roman (such as Iron Age hillforts) and Roman: whatever its intended function, Hadrian's Wall remains one of the great linear defence structures in the world. Early structures have usually only survived where of massive construction, and in the past they have invariably been scheduled. Town defences and coastal fortifications (memorably combined at Berwick-upon-Tweed, in Northumberland) have enjoyed similar protection, but some shorter stretches of wall (as in Bath, in Somerset) have been listed instead.

Early artillery fortifications and coastal defences date from the fourteenth to the early sixteenth century. They range from castles and town walls with gun ports to purpose built stone towers such as that at Dartmouth (Devon; Fig 2), and later with ditch defences and outworks. From the sixteenth century (and specifically in the period

Figure 2
Dartmouth Castle, Devon, guarded one of the most important harbours in the south-west. It was periodically updated, and in 1481 this gun tower was added – at the time, one of the most important fortifications in England. By 1492 sixteen guns here guarded the mouth of the River Dart: four large 'murderers', and sixteen smaller 'serpentynes'. A Scheduled Monument and Grade I listed building.

1539-43) a national defence policy emerged under Henry VIII, intended to deny the enemy a harbour or anchorage from which to base an invasion. Individual forts protected harbour entrances, with effective artillery range governing the location of supporting blockhouses. The major castles were self-contained, self-defensible, and carefully sited. Numerous examples survive along the east and south coasts, at Hurst and Calshot castles in the Solent (Hampshire), for example (and see Fig 3). The reign of Henry VIII was a period of transition, and during the final years of his life, one of dramatic and rapid development. The great defence programme of 1539-43 marks a high point of the progression from the mural tower to the round tower, from simple gun-tower to concentric fort. Within two or three years, however, there was a move from the round to the square, rectangular or polygonal, with the bastioned systems derived from Renaissance Italy visible for example at Yarmouth and Carisbrooke castles (both Isle of Wight) and Pendennis (Cornwall).

The Civil War saw further developments in the seventeenth century with siegeworks and earthwork fortifications predominant, while Charles II's reign saw massive expansion of permanent fortification, partly due to naval and mercantile rivalry with the Dutch. Most visible and impressive survivals today are the fortifications protecting the Royal Dockyards of Portsmouth and Plymouth, Thames and Medway based on the design principles of Sir Bernard de Gomme, with regular bastions, demi-bastions, ravelins and ditches. As well as the dockyard defences, de Gomme spent much of his time designing and building defences for the towns themselves. Tilbury Fort (Essex) is an outstanding example of this category of defence.

Political unease at the concept of a standing army discouraged the construction of any permanent military building, bar fortifications. Permanent quarters for troops were exceedingly rare. Military and naval hospitals at Chelsea and Greenwich are the most grandiose military structures in this category of the later period (more information can be found in the Health and Welfare Buildings selection guide).

Figure 3
Pendennis Castle, Cornwall. Pendennis and St Mawes castles were built between 1539 and 1545 to guard Falmouth Haven as Henry VIII fortified England's coast against the threat from newly-allied France and Spain. Both were low, squat, artillery platforms, with basic accommodation within for the gun captain and his gunners. The castle was periodically modified over the next century, and withstood a five-month siege in 1646. Listed Grade I.

Previously, most military buildings and structures from this period have been scheduled. Extent of survival, early date, rarity, and their potential for yielding further information, are key determinants. Where buildings continue to be in use, listing may be more appropriate, with scheduling – with the differing management regime it confers – directed to important earthwork remains and buried deposits. Each case will need assessing on its own merits.

1.2 Military buildings 1700-1856

This period saw the rise of empire and the considerable expansion of Britain's armed forces, up to the close of the Crimean War. Naval dockyards generally eclipsed in scale Army sites throughout the period, but structures set in expansive new grounds such as the Royal Arsenal, Woolwich (1717 on) and the Royal Artillery Barracks, Woolwich (1775-1802; both in the Royal

Figure 4
A Martello Tower built between 1808 and 1812 during the Napoleonic Wars at Bawdsey, Suffolk. These formed a series of interdependent gun-towers, intended to delay and harass an invading force. Listed Grade II.

Borough of Greenwich) show the arrival of a permanent military architecture on an impressive scale. The Board of Ordnance, the Government department responsible for the equipment and accommodation of the Army, oversaw a steadily growing programme of works. Permanent barracks continued to be rare and confined to forts but with the outbreak of the protracted Revolutionary and Napoleonic Wars (1793-1815) came a major increase in military building, funded (for the first time) by direct taxation. This included fortifications, such as the chain of Martello Towers along the south and east coasts (Fig 4), which together with detached redoubts (Maker Heights, Cornwall) exemplify the move away from bastioned defences) to infantry and cavalry barracks (Christchurch, Exeter, Weymouth), gunpowder magazines (Purfleet, Essex, and Marchwood, Hampshire) and defended inland depots (Weedon Bec, Northamptonshire).

Listing is increasingly applied to structures from this period, and there will be a presumption in favour of designating all buildings that survive in anything like their original form. Architectural interest is often present alongside functional and technological interest in structures of this period. Some sites, like forts with systems of earthwork outworks, may be given appropriate protection via complementary listing and scheduling, as discussed above.

1.3 Military buildings 1856-1914

This period saw the creation of much of the modern built infrastructure of the Army, and saw the first developments of military flight. It also witnessed the strengthening of coastal defences and the creation of the most powerful complex of permanent fortifications ever seen, prompted by rivalry with France during the 1850s and the

Figure 5
The Keep, Imphal Barracks, York. Built 1877-80 by the War Department. The Keep was a secure armoury, stores, guard house and lock up, and the characteristic building of the Localisation depots. These were part of the Cardwell reforms, which redistributed barracks around the country to encourage local connections, and assist recruitment. This is one of only ten remaining examples of this important symbolic structure. Listed Grade II.

arrival of the steam-powered iron-clad warship, armed with increasingly powerful ordnance. This led to a major expansion of the defence system, especially around the naval bases of Chatham, Portsmouth, Sheerness and Devonport. Rifled and later breech-loading guns had an impact on the design of fortifications, as did more powerful types of gunpowder and new explosives such as cordite. With the new explosives came a requirement for enhanced storage facilities. By the early 1900s, forts were typically low in profile, with concrete gun emplacements, and with barracks and other support functions housed at a safe distance away rather than being integrated into the overall design.

The move to permanent depots for regiments led to the construction of barracks across Britain, as well as the construction of permanent training depots and teaching institutions. Britain's imperial commitments grew continuously, necessitating the creation of a home establishment capable of replenishing forces in the field with trained and rested replacements. The Cardwell reforms of the 1870s ushered in a new epoch of planning for military needs (Fig 5).

On a local level, the volunteer movement of the 1850s onwards led to the appearance in towns of a new building type, the drill hall. These were first built for various Rifle Volunteers Corps, established from 1859-60 onwards to defend Britain against the perceived threat of invasion from France. As well as providing military training, rifle-shooting, fencing and other organised sports, the Volunteers provided a strong social network and lent their members great social caché (partly owing to their military titles and impressive uniforms). Early examples include the drill halls for the Artists' Rifles (1889) and the Bloomsbury Rifles (1882) in Chenies Street (London Borough of Camden; listed Grade II), and many others

survive in towns throughout the country (the Northampton drill hall of 1859 is a classic instance of the baronial brick armoury, that at Bury, Lancashire, listed Grade II, a gaunter ensemble in local stone). Drill halls for the professional forces followed slightly later. The 'drill shed' at Shoebury, Essex (1859-60; listed Grade II) is exceptionally early. Like Shoebury's, most later drill halls are important components in extensive barracks complexes. They share a simple external panache, often of red brick with terracotta details and lettering on the principal elevation, and are occasionally treated in a castellated Gothic or proudly Baroque idiom. The need for large unencumbered internal spaces, as with riding schools, stimulated the early use of steel roofs and experiments with laminated timber trusses (in the nineteenth century) and lamella trusses (in the 1930s), a German system of latticed steel or more usually timber roofing.

More selection is required for buildings from the 1850-1914 period on account of their greater survival. Many fortifications were overhauled during this period, with artillery housing undergoing extensive reconfiguration to accommodate rifled and quick-firing ordnance. Such changes added another chapter to the evolution of Britain's defences, and are regarded as significant interventions, deserving of inclusion in designations where they survive well as examples of rapidly changing technologies. Some barracks were designed with attention to architectural effect, such as the Peninsula Barracks of about 1900 at Winchester (Hampshire), and the naval barracks at Plymouth and Devonport (Devon) and Chatham (Kent), while the majority followed type-designs produced by the War Office. Architectural quality, planning interest, degree of alteration and group value with other related structures will be key considerations here. Specialist buildings, such as military medical quarters, unusual training facilities, and novel forms of structures (such as the naval gun-training platform, shaped like a boat, at Mount Wise in Plymouth), may also deserve designation because of their national rarity.

1.4 Military buildings 1914-1945

The broad developments of this short but intense period, which saw two world wars as well as other conflicts, can be summarised under three main headings. Firstly, the rise of air power and the creation of a huge infrastructure associated with it. Secondly, the move away from monumentalised permanent quarters and permanent fortification towards temporary accommodation and more specialist technical premises, many of standardised forms. Thirdly, the arrival of the home front, and the greatly increased threat posed to civilians as a result of aerial bombing.

The twentieth century was the age of flight, and military aviation was of critical importance in its development. The British Army was using balloons from 1890, while airships were under development from around 1911. The first flight by a British Army aeroplane took place in 1908 when Col S F Cody flew at Farnborough (Hampshire). In 1910 a permanent flying school and factory was opened at Larkhill, on Salisbury Plain (Wiltshire); an expanded Central Flying School was opened at nearby Upavon (Wiltshire) shortly after. Separate naval and army services formed before the First World War (the Royal Flying Corps and the Royal Naval Air Service) merged to form the Royal Air Force (RAF) in 1918. As military aviation developed, so too did the need for new building types, like wide-span hangers with Belfast truss roofs.

Military architecture acquired much of its monumental character in the inter-war period, especially after 1934 as the RAF was placed in the front line of deterrent power. The RAF College at Cranwell, Lincolnshire (1929-33, by J G West of the Office of Works), was an old-fashioned homage to Sir Christopher Wren, while the RAF training base at Hullavington (Wiltshire) was carefully designed and built in local materials in order not to disrupt the landscape setting. Hullavington, where several buildings are listed at Grade II, forms perhaps the most outstanding example, as a whole, of the way in which the planners of new air powers had to take account of political and public concerns over rearmament

Figure 6
Former RAF Coltishall, Norfolk, late 1930s neo-Georgian style officers' mess. A good example of the type, although not currently listed.

and the impact of these huge sites on the environment. Some building types, like officers' housing, barracks and officers' messes, were executed in a pleasing neo-Georgian style (Fig 6), while other technical buildings were executed in a Moderne style. The officers' mess at RAF Biggin Hill (London Borough of Bromley; listed Grade II), for example, is a good example of neo-Georgian architecture and shows the lengths the youngest branch of the armed forces went to in creating premises that provided a sense of tradition and helped to attract new recruits. Contemporary army buildings, especially officers' messes, were also executed in neo-Georgian, neo-Baroque and Moderne styles, while permanent barracks and ancillary buildings were more utilitarian. In the lead up to the outbreak of war in 1939 temporary wooden Militia camps were built and thin-skinned brick building became the norm on temporary wartime airfields. Army and air force camps of this date exhibit carefully designed plans with distinct functional zones. Many also exhibit a campus-like quality with wide tree-lined roads. In some instances this character may be conserved through conservation area status.

1.5 Operational structures

Aviation sites

Perhaps the largest category of modern military buildings in England is aviation sites. Powered flight has had a profound influence on the human experience of the twentieth century, and on the landscape. Military airfields are typically large and complex sites that were built in great numbers. From modest beginnings in 1909 at the flying field at Larkhill (Wiltshire), already used for observation balloons, an independent Royal Flying Corps was founded in 1912. About 250 flying stations or aerodromes existed in the summer of 1918, a number that had increased to 740 during the Second World War. Their former ubiquity should not be taken for granted, however, as many sites continue to be cleared and adapted for new uses. Many aerodromes which were subject to rebuilding in the inter-war period were front-line operational places, playing a role for example in the Battle of Britain and the Strategic Bomber Offensive, which adds to their significance in terms of the richness and poignancy of historical association.

Figure 7
The watch office (or control tower, as they are more generally known) at RAF Elvington, Yorkshire. Built in 1942, this is one of a very small number of Second World War control towers to survive in this degree of preservation. As well as its architectural interest, this structure has historic and other resonances as Halifax bombers took off from here to take part in the Battle of the Ruhr in early 1943, while in the summer of 1944 the Free French flew from Elvington to support the invasion of Europe. Listed Grade II.

Types of aerodrome varied considerably, from operational stations to training bases; from bomber aerodromes to home defence or fighter use. Layouts and categories of buildings varied accordingly, and specialist interpretation is often needed to understand the component structures. Airfields were increasingly given concrete runways for all-weather flying: the scale of the wartime construction enterprise in this area was vast. The component elements range from architecturally polite messes, station HQs and guard houses, to more functional technical blocks, hangars and control towers (Fig 7). Almost all were built to standard Air Ministry designs, repeated – with variations – across the country.

Aerodromes of 1939-45 and before have received considerable study, and thematic listing has identified the outstanding survivals of permanent airfields (temporary examples lay outside the study, but still deserve consideration where structures survive). While all aerodrome sites have strong local resonance, national designation will only be appropriate for a selection of sites, given the huge numbers involved and the degree of standardisation of structure. The thematic survey focused on the identification of those key sites which best reflect the development of military aviation from 1910 to 1945, and those which are most strongly representative of functionally distinct airfield types: at these selected sites, designations are numerous and statutory protection is of a high order. The relationship of built fabric to the flying field, its character and development, has also been fundamental to the selection process.

Outside these key sites, it is only groups (of buildings, fighter pens and defences) and individual examples of strong intrinsic or associational importance, particularly those with key historical episodes of the Second World War, which have been recommended for protection (Fig 8). Selection principles will include rarity;

Figure 8
Hanger 1, RAF Scampton, Lincolnshire. Scampton's four Type C hangers, designed to house heavy bombers, typify the Air Ministry's careful preparations in the run-up to the Second World War. In spring 1943 617 Squadron, based in Hanger 2, took off from here on the Dambusters' Raid, while later in the war U-boat pens and rocket sites were attacked from here. All four hangers are listed Grade II.

technical or structural interest; group value with related structures; and operational importance (such as direct involvement in an important campaign such as the Battle of Britain or the Battle of the Atlantic). Judgment will be required to assess such candidates for designation. Certain non-adaptable structures, such as blast pens, have historically been designated by scheduling, as have certain defence structures (like the Pickett Hamilton fort) and bomb stores. More recently consideration has been given to listing such structures (including Pickett Hamiltons, at Grade II, as at RAF Worthy Down Hampshire) because of the greater flexibility this offers in terms of maintenance and protection. The totality of an aerodrome cannot be captured through statutory designation alone, and other approaches such as conservation area protection – as at Old Sarum (Wiltshire), the best-preserved flying field of the First World War, and Upper Heyford (Oxfordshire), a key Cold War base – have been shown to be appropriate.

Army buildings

Those of this period range from permanent barracks and officers' messes, to temporary – even tented – structures. Vast amounts of short-life hutted accommodation was erected, particularly in the Second World War, most of which no longer survives but which can be identified through documentation and archaeology. Permanent structures will need to be judged against criteria such as architectural interest, associations with significant military events, and rarity. More impermanent structures will often have undergone alteration over time, and assessment will have to take this into account. As with airfield structures, the designation of individual structures will be sparing, and normally limited to examples of strong intrinsic or associational importance, particularly those with key historical episodes. Army camps have often continued in use, with early examples of prefabricated hutting being repeatedly modernised and upgraded to suit modern needs. Many army camps

however were transient – often tented – affairs, built in preparation for D-Day embarkation for example and only surviving today in buried or earthwork form. Certain training sites, such as the First World War practice trench complexes on Cannock Chase (Staffordshire), a camp and practice range on Sutton Common (West Midlands) and practice trenches at Otterburn (North Yorkshire) have even been scheduled as archaeological monuments. Ancillary structures can be of special interest if they are an integral part of outstanding groups or if they have direct historical associations with specific events, well-known individuals or of broader developments and aspects of the war. Military efficiency and morale is heavily dependent upon logistical support, and the United States Army postal sorting office at Sutton Coldfield, West Midlands (listed Grade II), directly illustrates the volume of personal communication between families and servicemen in the European theatre.

Prisoner of war camps,

These were mostly of Second World War date, and either made use of existing buildings, or were purpose-built, using standard types of hutting but arranged in a distinctive plan form, designed for the control and easy administration of prisoners. Some of these remain standing, but far more now exist as sites: a study undertaken for English Heritage has shown that their overall footprint and impact on the landscape is more readily discernible than might at first be thought. Designation of buildings is exceptional. The camp at Harperley (Co Durham; Fig 9) has been scheduled in its entirety, whereas several huts at Lippitts Hill (Essex) have been listed. In both cases, the interest of individual buildings and of the group as a whole was enhanced by the survival of murals and other artefacts and works of art.

Military sites do not have to be in the front line to be of the foremost significance. Signals Intelligence (SIGINT) and Communications, for example, play an ever-growing part in modern defence and security. The development of radio communication led to new signals complexes and networks. Radar is discussed below. Bletchley Park, in Buckinghamshire, was the

Figure 9
Harperley, County Durham, A Second World War Prisoner of War camp built by Italian PoWs late in 1942, and later occupied by German PoWs engaged in agricultural work until 1947. A Scheduled Monument.

wartime location of the Government Code and Cypher School, and became a renowned centre for decryption and the early development of computing machines: these included the world's first stored programme computer, the Colossus, built here in 1944. Its seemingly unremarkable huts and wartime buildings exemplify the site's development from a cryptography school to a global information hub, receiving and processing information for dispatch to strategic commands and units in the field (Figs 10-11). It witnessed extraordinary events which influenced the course of the war, and many of the structures there are listed accordingly. Other sites are representative of the broadcasting of Black Propaganda – misinformation and the like – to occupied Europe, and some structures associated with this activity have been listed including a radio communications building at King's Standing, Maresfield, East Sussex (listed Grade II), and the Political Warfare Executive Studio at Potsgrove, Bedfordshire (listed Grade II).

Figure 10 (top)
Hut 1, Bletchley Park, Buckinghamshire. The Government Code and Cypher School was established at Bletchley Park in 1939, and soon became the focal point of inter-service intelligence activities, especially Enigma-encrypted messages. Hut 1, perhaps at first a radio transmission station, was among the first group of huts erected in mid-late 1939, and was extended in 1942. Listed Grade II.

Figure 11 (bottom)
D Block, Bletchley Park, Buckinghamshire. As the Government Code and Cypher School intelligence centre at Bletchley Park expanded in 1942-3, several new office blocks were rapidly constructed. D Block has 13 office spurs off a central spine; at the war's end 700 people worked in the building on the vital work of breaking, deciphering and analysing German Enigma coded traffic. Listed Grade II.

1.6 The Home Front: Military structures

Twentieth-century defensive structures survive in very considerable numbers, especially from the Second World War. All bear witness to the greatest conflict of world history, but claims to special interest vary widely. Discretion is thus required when assessing them for designation: designs were often standardised; construction was often rushed, and materials were often not intended to be durable. Our understanding has advanced considerably in recent years.

Early warning systems

Developed from the First World War. Early sites were based on acoustic detection and the rare surviving complexes of sound mirrors along the south and east coasts at Denge, East Sussex, and Fulwell, Sunderland, are designated. Radio Direction Finding (later known as Radar) developed in the 1930s from experiments conducted at Orford Ness and at Bawdsey Manor, Suffolk. Radar transmitter masts, in lines of four, 350 ft high, carried aerials which sent out electronically generated signals: wooden towers brought signals to the receiver blocks. The original 20 Chain Home stations stretched from the Orkneys to the Isle of Wight, and were considerably augmented, most notably by separate systems that had developed to detect aircraft at high and low levels (the Chain Home High and Chain Home Low systems) during the war. While various sites have retained elements of the ground structures such as the transmitter or receiver building, buried reserves (an anti-attack mechanism: each station had underground mini-receiver and transmitter sites so that if bombed, as many were, they could still operate), accommodation buildings and perimeter defences, surviving examples of the iconic masts are very rare (Fig 12): a Grade II listed example remains at Stenigot, (Lincolnshire). Surviving ancillary structures may warrant consideration where they survive well and advance appreciation and understanding of the radar complex. Royal Observer Corps posts provided another layer of defence, passing visual observations up to the RAF chain of command; here degree of survival will be a crucial consideration in assessment. Many ROC posts took advantage of existing buildings, and where there has been designation it has generally been listing.

Figure 12
Swingate, Dover, Kent, a Second World War Chain Home radar station. Today only two self-supporting towers (not listed) remain standing, one original and one an early 1950s replacement.

Anti-aircraft batteries

Once very numerous, particularly in the south-east. Survivals in good condition are rare, especially for the First World Wa; an example at Lodge Hill, Kent, is a Scheduled Monument. Some Heavy Anti-Aircraft sites (for instance, Slade's Green, London Borough of Bexley; listed Grade II) have been designated where plan, fabric and the functioning of the battery remains evident. Many associated searchlight sites survive as earthwork or cropmark remains, while numerous concrete barrage-balloon tethering points are also extant. Light Anti-Aircraft sites rarely survive on account of their mobility and impermanence, so where they do survive well they may be strong candidates for designation. The most unusual anti-aircraft structures of all were the Maunsell Forts of the Thames estuary and North Sea: massive oil rig-like platforms moored far out to sea. As offshore structures they

are not eligible for listing, and their unsuitability for monumentalisation due to the hostile environment in which they stand renders them unsuitable for scheduling: a state of affairs that belies their interest.

Bombing decoys

Intricate systems of deception, laid out away from urban areas to draw enemy raiders away from their intended targets. Dummy systems of lighting, and street grids, simulating cities under aerial assault, were laid out on less vulnerable sites. No fewer than 800 sites were constructed: of these, 300 or so attracted bombs – a testament to their effectiveness. Because of their impermanence, survival levels are often low; control houses, for orchestrating the effects, are the most likely to remain. Some of these sites, which can be most clearly appreciated from the air, may deserve designation as archaeological landscapes and some have thus been scheduled; an example is the concrete ponds on the Humber foreshore which from 1941 acted as decoys for Hull docks.

Pillboxes

Strong-points, generally of reinforced concrete, placed at strategic locations, such as at river crossings, or along coastal and inland anti-invasion 'stop lines' which were intended to slow down the progress of an attacking force. Some were designed for machine guns; others, more

Figures 13 (top) and 14 (bottom)
Top: A Type 25 pillbox and anti-tank defences at Kimmeridge, Dorset. These form part of a Scheduled Monument.

Bottom: A Type 22 pill box at Dovedale, Derbyshire, on the Western Command Defensive Line No. 5. Unlisted, but certainly of local interest.

Figure 15
Anti-tank pimples, Isle of Grain, Kent. This 570-metre long line of anti-tank obstacles, principally of a type known colloquially as dragon's teeth, was erected about 1940 along a beach that was potentially a landing place for German forces. Increasingly listing is being used as an appropriate way of designating military structures of the Second World War and Cold War. Listed Grade II.

unusually, housed artillery. A number of pillboxes were constructed along the coast during the First World War, but these are rare in comparison to the thousands built in the early stages of the Second: 28,000 are thought to have been erected, and a recent survey calculated that some 6,500 survive. They frequently formed parts of defence lines, which were belts of defensive structures intended to delay the invader. Claims to special interest will include rarity of type; group relationship with other defence structures (including tank traps and road blocks); survival; and their built form (Figs 13-15). Group value with other historic items (from hillforts to bridges) may be relevant too: that at Bodiam Castle, East Sussex, creates an instructive contrast with its grander medieval neighbour. Others, as at Dover Castle, can be cut into earlier fortifications. Some pillboxes were disguised as civilian buildings: where this camouflage survives the case for designation is much stronger. Given the very considerable numbers of items that survive, considerable discretion should be used in their selection, particular attention being justified for those which directly illustrate their intended function as part of a key defensive line or nodal point. Where fittings like wooden shutters survive, or the pillbox has internal signage, or painted aids to aircraft recognition, or wall art, the case for designation will be strengthened.

Operation Overlord (D-Day)

The preparations for the Allied invasion of France in 1944, Operation Overlord, led to the construction of many buildings and sites. These include pumping stations for the Pipe Line Under the Ocean – PLUTO – as encountered at Shanklin, Isle of Wight; embarkation slipways, at Torbay, Devon; and mooring posts or 'Dolphins' and the construction sites for floating harbours, at Lepe, Hampshire. Where these structures merit designation they are now likely to be listed rather than scheduled. Far more sites associated with

Figure 16
St John's School, Redhill, Surrey, murals on the wall of the school's air raid shelter depicting scenes and characters from British history. Not currently listed.

the renowned event, such as tented camps, have left no visible traces.

1.7 The Home Front: Civilian structures

Air raid shelters

Proven First World War air raid shelters are sufficiently rare to warrant serious consideration for listing. Much greater discretion is required over Second World War examples which in general are fairly common. From the later 1930s all new factories were obliged to provide purpose-built shelters, so their survival is not unusual. Determinant factors will include rarity of type; relationship to other listed buildings; and significance for overall understanding of the development of the category. Painted signs will not generally be enough to warrant designation, although shelters with surviving benches, other fittings and signage will warrant serious consideration. The more common domestic Anderson Shelter was provided to millions of urban and suburban homes during the Second World War. While many survive today as garden sheds, the great majority of these are ruinous and no longer retain original details of their construction, or have been moved. Even so, few ordinary domestic shelters are likely to be listed; exceptional degree of survival will be key.

Air Raid Precaution (ARP) centres

These were built to co-ordinate local government responses to air raids and contained control centres, air filtration plants and other features: sometimes located within municipal buildings, these can be of particular interest when survival is good, and warrant serious consideration for designation. Subsidiary ARP Posts, and even in some cases mortuaries, were also built; their local context, as well as condition, will be considerations – one ARP Post alongside Dover Priory railway station is listed (Grade II) largely as a tangible reminder of the heavy assault Dover's civilian population suffered from the air and from cross-Channel shelling.

Similar considerations apply to other civilian structures, which exceptionally may have the special interest necessary for listing. A firewatcher's post, and the late pre-war factory it stands on top of at Park Works, Borough Road, Kingston upon Thames, were listed at Grade II in 2015.

Evacuation camps

Opened from 1939 onwards, both to remove vulnerable town children from bombing and to create outdoor rural complexes for their better development. Certain key structures, such as the main hall at Sayers Croft (Surrey; listed Grade II), may warrant designation in their own right, but generally the best designation for such complexes will be as conservation areas.

Bomb damage

Numerous towns and cities still bear the marks of the impact of bombing. Ruined churches have long been listed for their memorial value as much as for their intrinsic historical importance, most famously at Coventry Cathedral: other

Figure 17
The shrapnel-damaged former Labour Exchange, Milk Street, Bath. Bath suffered terribly in air raids during the spring of 1942 in the so-called Baedeker reprisal raids which targeted strategically relatively unimportant but picturesque English cities. Over 400 people were killed, and thousands of buildings destroyed or badly damaged. It is principally because it serves as a vivid reminder of the raids that this building is designated. Listed Grade II.

examples are to be seen in Canterbury, Dover, Portsmouth, Southampton, Exeter, Plymouth, Bristol, Hull, York and, of course, the City of London. Other listed buildings may well retain the scars from bomb damage as part of their special interest, such as the Victoria and Albert Museum, London. Exceptionally, some buildings have been designated solely because of their war-damaged appearance (as in Milk Street, Bath; listed Grade II, Fig 17). Bomb sites were once all too common; 60 years on and more, this is no longer the case. Designation will only be warranted after careful consideration of the case. Factors such as the visible evidence elsewhere of bombing (such as wholesale rebuilding or gaps in the urban fabric), and the intrinsic appearance of the ruin and any strong commemorative associations will need to be weighed up.

Sites of commemoration

These range from war memorials, to markers of particular events, to plaques recalling civilian losses; a noticeable trend in the later twentieth century was the erection of roadside memorials on the site of wartime aerodromes (especially those of the USAAF) to commemorate the wartime activities which took place, and to remember those who served. The separate selection guide on Commemorative Structures sets out our approaches in more detail for funerary and memorial structures. A wide range of objects has been permanently installed in this way, from defused floating mines now installed as Shipwrecked Mariners' Society collecting boxes, to aircraft – generally now replaced with replicas – placed outside aerodromes as gate guardians. Listing will be warranted for memorials of aesthetic quality; recent ones are generally unlikely to warrant this.

Figure 18
Royal Observer Group Headquarters, Howe Hill, Acomb, York. Part of a national network of monitoring posts set up after 1956 to monitor nuclear explosions and fallout, this was one of only 12 'protected' Group HQs added in the early 1960s. Sixty men and women would have served within in time of war. This was designated as a Scheduled Monument; today listing, with its greater flexibility, would be the more likely approach.

1.8 Post 1945: The Cold War and beyond

Throughout the Cold War the threat of mutually-assured nuclear destruction overshadowed spheres of national life – political, economic, scientific and cultural. Some sites were purpose-built, but it was more common to adapt existing defence sites, from naval dockyards to barracks, munitions factories to airfields. But there was also a significant amount of new building. Cold War (and now post-Cold War) architecture is distinguished by its severely functional appearance, largely constructed from concrete, steel and earth. Centralised planning and the deployment of standardised and increasingly sophisticated weapons systems resulted in numerous near-identical sites and structural types across the country, representing both the country's continuing role as a global superpower and a significant investment in science and technology. Other buildings have strikingly innovative form, such as the massive Rotor (radar) bunkers and War Rooms of the 1950s, the Regional Seats of Government (some of which absorbed earlier War Rooms) of the early 1960s, and the US Air Force Avionics Building at Alconbury of about 1989 (listed Grade II*). Ancillary structures and specialised building types attest to the technological innovation of the time. These include military research establishments including the Atomic Weapons Research Establishment

sites at Foulness (Essex) and Fort Halstead (Kent), Naval research establishments in Dorset and rocket testing sites such as at RAF Spadeadam in Cumbria. The deployment of tested systems necessitated the storage of nuclear warheads at such sites as RAF Barham (Suffolk), one of the two bomb store sites which housed the first British nuclear bomb, Blue Danube. Guided surface to air missile systems to defend the country against nuclear attack, notably the Bloodhound Mark I and II, created distinctive military landscapes.

Airfields

These formed a significant part of the military estate during the Cold War, and beyond. For much of the 1950s and 60s, for example, Britain's airborne nuclear deterrent was carried by the so-called V-force (Victor, Valiant and Vulcan aircraft) for which ten main airfields were provided in the east of England. This made use of pre-war buildings for the most part, although the airfields themselves were provided with extended runways and hard-standings. On fighter stations concrete blast walls were added, and later Hardened Aircraft Shelters for protection and servicing of the aircraft themselves. Related to these airfields were the bomb stores and Thor intermediate-range ballistic missiles, with their distinctive triple emplacements, for which some distinctive buildings survive although many were quickly and cheaply erected.

Also from the 1950s some airfields were used by the United States Air Force Strategic Air Command (SAC). SAC airfields saw a considerable amount of new building, much of it distinctively American in style and execution, and some to NATO design. This ushers in a new development in English military architecture: the presence of permanent installations by an allied, yet foreign, power. Airfields were typically hardened in the 1970s and 1980s, including the construction of Hardened Aircraft Shelters dispersed at sites like Alconbury (Cambridgeshire) and Upper Heyford (Oxfordshire), while two sites – Greenham Common (Berkshire) and Molesworth

Figure 19
Former Squadron HQ building, Upper Heyford, Oxfordshire. In 1970 this airfield became home to a Wing of USAF F111s, low level nuclear-armed aircraft. Later in the 1970s 56 concrete aircraft shelters and other hardened structures, designed to withstand conventional, chemical and biological attack, were built. Among other designations a Squadron Headquarters (Building 234) is listed at Grade II.

Figure 20
Former satellite airfield at Montford Bridge, Shropshire. Designation of Second World War military buildings is necessarily highly selective. But all have a place in the nation's story, and often retain great local interest. Here pilots were trained 1942-5 on Spitfires and Mustang III fighters. The remaining buildings, on farmland, are unlisted but their role is remembered by local villagers, and by those who served there.

(Cambridgeshire) were adapted to accommodate ground-launched cruise missiles. This phase of activity can be most clearly seen at the (now scheduled) cruise missile shelters at Greenham Common. This, the final phase of the Cold War, produced very distinctive military landscapes which will be seen as encapsulating approaches to the defence of the realm, just as Expansion Period aerodromes of the 1930s embody the pre-war period.

Radar

The development of radar continued through the Cold War and beyond. Perhaps best known is the modernisation programme initiated in the late 1940s, seeking to re-establish an effective air defence radar network (known as Rotor). Not only was this the most ambitious military engineering project of the 1950s, but also required the co-ordination of a massive manufacturing effort to produce the radar sets, consoles and plant. The largest structures built were the 29 underground operations blocks. A fully computerised air defence scheme known as Linesman was developed in the 1960s, and a more integrated and flexible system (United Kingdom Air Defence Ground Environment or UKADGE) in the 1970s. The radar station at RAF Neatishead, Norfolk, has a number of designated structures that reflect the evolution of Cold War radar systems. Early warning during the Cold War era is also evident in the Ballistic missile early warning system (or BMEWS), developed in the United States in the 1950s and introduced in Britain in the early 1960s.

Cold War sites represent challenges for designation. Some buildings were short-lived; others were designed with very specific functions in mind, and may be challenges for re-use. Other categories were built to standard designs, and may survive on various sites (such as Royal Observer Corps posts). Some buildings will still be in operational use. For many, this represented a fearsome epoch in modern history. However, recent research by Historic England has set out the context in which the buildings and structures were created, and with the passing of time, the historical significance of this period of armed peace becomes ever clearer. Careful assessment has produced recommendations for designation which can inform future decisions. Rarity, group value, military and technological significance, and architectural or structural interest, will be the principal considerations in most cases. Wall art, representing the buildings' former use, or the reaction of servicemen to the spaces in which they worked, may also be a factor in determining significance. Military sites where survival levels are high, as at RAF Upper Heyford, for instance (where a number of structures are designated), are likely to warrant particularly close attention.

Many Cold War structures are as significant for the technological innovations they housed as for their new functional architecture. Where front-line technical equipment (as opposed to plant and services) survives, as in the Operations Room at RAF Neatishead (listed Grade II*), this will generally add to the structure's interest. Other considerations however include the centrality of buildings to British and/or NATO defence policy and their representation of distinct phases of the Cold War.

2 Specific Considerations

2.1 Historical association

Military sites are often evocative witnesses to past conflicts. While all military structures will be of some historic interest, the degrees of historical association will inevitably vary. Government policy is clear that candidates for designation ought to be well preserved in a form which directly illustrates and confirms their historical associations, if they are to be designated on historical grounds. Particularly close links with noted military actions may sometimes be significant.

2.2 Listing and scheduling

More than in any other area, military remains have been the subject of complementary approaches to designation. Historically, listing has been applied to buildings in use: scheduling to those monuments where re-use is inappropriate, or in ruinous condition. In practice, there are listed inert buildings in ruinous condition, and scheduled monuments in use. The most appropriate designation regime will be applied to all candidates, and in some cases a review of the existing designation may be warranted.

2.3 Local and national significance

Some categories of military structures, particularly from the twentieth century, are legion; others are rare despite large numbers having been built. Like war memorials, all have an emotive power which connects communities with world events of the greatest magnitude. Local significance should not be under-estimated. conservation area designation has been and will be appropriate for some ensembles, such as aerodromes (RAF Kenley, London Borough of Croydon, and Surrey, is an example), and most military structures can be recorded on Historic Environment Records and accommodated within the planning process. Nevertheless, some structures, following the criteria here articulated, will have an undeniable claim to listing or scheduling because of their manifest special interest.

2.4 Period

The period of construction may add to a military subject's claims for special interest. For example, if they are definitive examples of the construction employed in a particular phase in our defence policy and contribute to our understanding of this period, their date adds significance. Similarly, if they evidence technological developments that distinguish a particular period, this can enrich the case.

2.5 Rarity

Being a rare survival of its type will strengthen the case for special interest. In some cases, for example with experimental sites, many buildings are by definition rare or unique. Where this is the case, structures with rarity and uniqueness may warrant designation if they survive relatively intact and represent developments of national significance. But it is a paradox that for a period so recent, some categories of building from the

Second World War, and even from the Cold War era – albeit in some cases once quite common – are now extremely rare. It is not the case simply that old sites are rare survivals, and modern sites more common.

2.6 Selectivity

Government policy is clear that in cases of mass-produced or frequently encountered structures, a selection of the best and most representative examples is the approach to follow.

2.7 Site significance and group value

Military structures often do not stand alone: they form parts of ensembles, such as fortification lines, camps, barracks or aerodromes. The claim to designation can often be greatly strengthened by group value factors, when survival of complementary structures creates a legible ensemble, in which the functioning of various parts is strongly sensed and where the military experience is readily captured. With aerodromes the approach has been to concentrate designations at exemplary sites, which survive well. Such an approach may also be relevant to army camps, prisoner of war camps, barracks, research and development sites, industrial complexes and defence areas where pillboxes and associated works form a coherent group. Conservation area designation (as discussed above under aviation sites) is sometimes warranted too, and will often be the best way of registering area significance.

2.8 Survival

The case for listing will always be stronger where the structural integrity of a building remains, with evidence of internal configuration and occasionally plant and fittings, or where it retains its contemporary setting, character and relationship to other buildings, sites and monuments. Wall art – whether sanctioned or unofficial – and graffiti are not rare in wartime buildings, but can add to their interest. Good examples, and ones with a particular historical resonance, will enhance the case for designation.

2.9 Sustainability

Many modern defensive structures were erected quickly in response to immediate needs. They were never intended to be permanent, which creates challenges in terms of their endurance as monuments. For good examples of short-life structures, such as huts, the best approach may be to encourage their removal to museum sites where they can receive appropriate care. The survival of footings and plan-form, and of service roads and overall plan, can aid the legibility and coherence where such structures survive as parts of larger sites, such as prisoner of war camps.

2.10 Extent of listing

Amendment to the Planning (Listed Buildings and Conservation Areas) Act 1990 provides two potential ways to be more precise about what is listed.

The empowerments, found in section 1 (5A) (a) and (b) of the 1990 Act, allow the List entry to say definitively whether attached or curtilage structures are protected; and/or to exclude from the listing specified objects fixed to the building, features or parts of the structure. These changes do not apply retrospectively, but New listings and substantial amendments from 2013 will provide this clarification when appropriate.

Clarification on the extent of listing for older lists may be obtained through the Local Planning Authority or through the Historic England's Enhanced Advisory Service, see www.HistoricEngland.org.uk/EAS.

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4 Where to Get Advice

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YO1 6WP
Tel: 01904 601948
Fax: 01904 601999

South Region
4th Floor
Cannon Bridge House
25 Dowgate Hill
London
EC4R 2YA
Tel: 020 7973 3700
Fax: 020 7973 3001

East Region
Brooklands
24 Brooklands Avenue
Cambridge
CB2 8BU
Tel: 01223 582749
Fax: 01223 582701

West Region
29 Queen Square
Bristol
BS1 4ND
Tel: 0117 975 1308
Fax: 0117 975 0701

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Appendix LV.2.10

EIA Quality Mark Article

Predicting the growth of tree and hedge planting when determining the effectiveness of mitigation

Landscape mitigation for schemes in the UK is often provided in the form of native hedge and tree planting. It is usual practice to predict the effect of such mitigation after set periods, such as 5 and 15 years after planting. To do this, forecasting is required of the likely extent of growth, and particularly height, for these periods. This is particularly important if preparing photomontages to show the effectiveness of the mitigation over time.

The Guide for Landscape and Visual Impact Version 3 (paragraph 4.42) states "*Assumptions about plant growth or other changes over time should be realistic and not over optimistic. The design concept for the mitigation has to have a good chance of being achieved in practice to be taken seriously by the competent authority*." There are many variables active in achieving this, and this article explores the issues that must be considered.

Predicting plant growth and height over time

The growth of native trees and shrubs is influenced by many factors, such as soil type, climate, species, seasonal weather, maintenance and management. Much can be learnt from examining the conditions on a site. For example is the soil a lowland arable rich loam or a poor thin stony soil? Growth can be impeded if planting is to be on soils that have been compacted by construction activities – is amelioration possible? Is the site cold and exposed, or sheltered? Is the vegetation shaped by the wind? Are the leaves scorched by salt spray?

A good indication of likely annual growth at a site can be gained by examining the growth patterns of existing nearby vegetation. Annual extension growth is not difficult to measure on young trees or hedges in autumn when the fresh green or light brown shoots are easily distinguished from the older weathered bark of the previous season.

Certain species, such as willows, poplars and alders have a '*sustained* 'growth pattern and can grow continuously throughout the growing season, extending up to 200 cm if conditions are favourable. Other species, such as oak and conifers, have growth patterns which are '*preformed'* from bud development that has taken place in the previous year. They tend to put on a 20 – 60 cm growth surge in spring and then slow down.

Whilst it may be tempting to plant faster growing sustained growth species for quick effect, it is often preferable to plant species typical of the location or which support ecological objectives. While planting a solid line of willow or poplar will rarely be appropriate, temporary use of fast growing 'nurse species' (to be removed later) to provide shelter for slower species could be considered. Preformed growth species are usually longer lived and stronger than sustained growth species.

Extension growth also varies depending upon the maturity of the plant. Newly planted trees can require 2 -5 years to overcome the shock of being transplanted. Once established, however, they can go through a phase of maximum extension growth before slowing towards maturity. Browsing by deer, drought and disease can further limit growth. Good management is important. Grass growing around the base of new planting can restrict growth to a significant degree and, if plants are planted densely and not thinned, competition will reduce growth.

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To establish a good thick twiggy hedge it will be necessary to clip it annually and therefore increase height slowly. Since hedges often only need to be 2-3 m high (above head height) to provide effective mitigation, this is not necessarily problematic. Such a hedge can be achieved in 4 years in the right conditions, but 5-7 years is probably a good estimate.

Is there a rule of thumb with so many variables?

Newly planted stock is unlikely to have any significant screening effect in Year 1 since it is typically planted as 60-80 cm high transplants. It can be useful to include some feathered trees and standards 2-3 m in height for a more instant effect. Stakes and shelters could be considered to have a negative visual effect.

Given that most UK mitigation planting will be of mixed natives in largely unexposed conditions, an average annual growth of 30 cm/year in the first 5 years can normally be assumed. Once established, growth rate will increase and circa 50 cm/year for the next 10 years can be anticipated. If planted as transplants, this gives a height of 2-2.5 m in the first year and 7-7.5 m after 15 years. For more exposed locations it is recommended that annual growth is calculated by taking clues from the existing trees and hedges in the locality.

Author: Chris McDermott, Principal Landscape Architect (The Landmark Practice)

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Appendix LV.2.11

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Technical note:

SWQ LV.2.11- Analysis and Methodology used to arrive at the conclusion that overflying aircraft will not be significant in LVIA terms

In SWQ LV.2.11 the Examining Authority highlighted that the response to LV.1.20 [REP3-195] states that "*The intermittent and transient nature of the presence of overflying aircraft would not equate to visual changes that are of a long duration and so are not considered to be significant.*" In response to the above referenced question, this technical note provides clarity on the analysis and methodology employed to arrive at a non-significance conclusion.

Introduction

The analysis that the intermittent and transient presence of overflying aircraft would not equate to significant visual changes is based upon review of the overarching methodological approach contained in the *'Guidelines for Landscape and Visual Impact Assessment'* Third Edition (hereafter referred to as 'GLVIA3'). Particular reference is made to Section 6, which sets out issues that might be included in the description and comparison of visual effects (Section 6.27) and in assessing the magnitude of visual effects (Sections 6.38 – 6.41).

These considerations have been applied to the predicted aircraft movement scenarios for the Proposed Development during its operation i.e. two to three overflying aircraft per hour from 07.00 – 23.00 at Year 10, rising to four to five overflying aircraft per hour at Year 20. The analysis has also utilised the information on the flight paths of aircraft, shown in **Figure 12.4** and **Figure 12.6** in the Environmental Statement (ES) [APP-042].

Issues included in the description and comparison of visual effects

The issues set out in Section 6.27 in GLVIA3 are summarised below and a brief analysis is provided regarding how the proposed aircraft movement levels relate to each issue:

1. *The nature of the view of the development i.e. the aircraft taking off and landing at Manston Airport, and whether the views available will be full, partial or only a glimpse.*

Reference to the baseline description, viewpoints and visual assessments in the ES [APP-034, APP-041] alongside information on proposed aircraft movements and flight paths shows that only a small proportion of visual receptors will have full views of aircraft movements.

These visual receptors are likely to be located close to more distant viewpoints sited in relatively open locations, for example viewpoints 17 and 22, where relatively uninterrupted views of eastern and western approaches and departures will be possible. The majority of visual receptors experience baseline visual conditions in which screening from built development and vegetation cover will only result in partial or glimpsed views of aircraft movement. Views of the aircraft movements at low elevations, i.e. close to the Proposed Development, will be most likely to be screened in this manner.

2. *The proportion of particular features that would be visible.*

When visible, aircraft will generally constitute small scale elements in the views available, with the possible exception of any visual receptors located close to or under the flight paths to the immediate west and east of the Proposed Development's runways.

3. *The distance of the viewpoint from the development and whether the viewer would focus on the development I.e. the aircraft movements, due to scale and proximity or whether the development would be a small, minor element in a panoramic view.*

Reference to the 24 annotated baseline viewpoint photographs [APP-041], together with experience of undertaking visual assessments at other operational airports shows that individual aircraft movements are small, minor elements other than for visual receptors sited close to or directly under the flight path in the immediate vicinity of the ends of the runway(s). This analysis is reinforced at greater separation distances from the flight paths when there is no discernible sound to draw the attention of a visual receptor to the approach or departure of an aircraft.

4. *Whether the view is stationary or transient.*

With regard to the visual aspect of aircraft movement, the key consideration is not whether the visual receptor itself is stationary or transient (most will be stationary) but that the visual change, (i.e. the approaching or departing aircraft) is transient. Even under the worst-case visibility scenario, in terms of the longevity of the view availability of the moving aircraft, i.e. open, long distance viewpoints to the north and south of the Proposed Development, an approaching or departing aircraft will only be visible for a few minutes in total and for the majority of that time will form only a very small feature in a distant view.

5. *The nature of the changes that may include:*

- *Changes in the existing skyline profile* – this is not applicable for aircraft movements;
- *Creation of a new visual focus in the view* – it is acknowledged that the aircrafts' movement against a clear sky backdrop will have the potential to '*draw*' visual receptors' attention (when open views are available in the requisite direction). However, the scale of the aircraft in the context of all except the closest views and the transient nature of the aircrafts' presence will not result in a new visual focus being created;
- *Introduction of new man-made objects* – whilst aircraft are new man-made objects the comment to the previous bullet point is applicable.
- *Changes in visual simplicity or complexity* – there will be a slight temporary increase in the visual complexity in some visual receptors' views; and
- *Alteration of visual scale and degree of visual enclosure* – no change is expected.

Issues included in assessing the magnitude of visual effects

The considerations that impact upon the magnitude of the visual effects, as set out in Sections 6.38-6.41 of GLVIA3, are considered for the expected aircraft movements.

1. *Size or scale - the scale of change in the view and changes to its composition.*

The proposed aircraft movements will not result in a change of scale in visual receptors' views with the possible short-lived exception of the small proportion of visual receptors sited under the approach and departure routes in the immediate vicinity of the runway(s). No features will be lost in any views and any changes to a view's composition will be temporary with only a small to minute proportion of any view temporarily 'occupied by the new development' i.e. the approaching or departing aircraft.

2. *Size or scale - the degree of contrast or integration of any new features or changes.*

The degree of contrast will be variable and is dependent upon a range of factors. Nevertheless, pertinent considerations include the transient nature of any contrasts; the small-scale nature of the aircraft in the overwhelming majority of available views; and the historic precedent of the long operational period of Kent International Airport .

3. *Size or scale - the nature of the view in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpsed*.

Year 20, with a four to five aircraft movements per hour, is the worst-case scenario in terms of aircraft movements. Even then the presence of aircraft approaching and departing will amount to a short period of time during which views of aircraft movement may be experienced. These movements will only be visible to a limited number of visual receptors in the landscape and visual assessment (LVIA) study area. Where such views will be available, analysis of the baseline information concludes that most visual receptors will experience partial or glimpsed views of the aircraft movements, e.g. most of the residential visual receptors residing in villages or the coastal towns of Ramsgate, Broadstairs and Margate.

4. *Geographical extent - the angle of view in relation to the main activity of the visual receptor and the distance from the proposed development.*

Beneath or close to the flight paths, as shown in ES **Figures 2.14** and **12.6** [APP-042], the angle of view will generally be overhead (90º), which is not a natural angle of view, especially for residential visual receptors where people will potentially experience the view from within in their properties. Views are more likely when a lower angle of view is more readily or naturally available. These views will be more widely available to receptors at middle- or long-distance locations. The outcome of this geographical distribution will be that the aircraft will be small components when views are available and that views in the required direction(s) are more likely to contain built development and/or adequate vegetation cover that provides partial screening.

5. *Geographical extent – the extent of the area over which changes would be visible.*

Different aircraft types will have different angles of approach and departure, however, it is reasonable to assume that, in theory, all aircraft will be visible across the LVIA study area. However, as the above analysis and observation at other operational airports has demonstrated, the combination of factors listed will combine to substantially reduce the true availability of transient views to visual receptors. This will be particularly applicable to residential visual receptors, vehicular visual receptors and recreational visual receptors in areas with tall vegetation, or in built up areas where upward and/or views to the horizon are entirely or partly screened.

6. *Duration and reversibility of visual effects.*

When the Proposed Development becomes fully operational, with a maximum of four to five aircraft movements per hour, such movements will only potentially facilitate views of aircraft movements across a small period of daylight hours. This duration will be further reduced when weather conditions result in the presence of low cloud or reduced visibility due to precipitation or haze. All visual effects arising from aircraft movement will be reversible.

Summary

In summary, analysis of the operational phase of the Proposed Development, utilising the methodological approach advocated in GLVIA3, demonstrates the validity of the conclusion that was stated in the response to LV.1.20 [REP3-195]. A review and commentary upon the factors that visual assessment should consider in identifying possible visual effects and the resultant magnitudes of change that will be experienced by visual receptors has been undertaken, drawing upon the baseline information and assessment provided in the ES

[APP-034, APP-041]. This review demonstrates that the intermittent and transient views of aircraft movement will not result in significant visual effects for visual receptors.

[redacted]

[redacted]

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Nick Hilton

Kate Ward

SEAFISH

SEAFOOD INDUSTRY **FACTSHEET**

FEBRUARY 2018

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Note: GB is data for England, Scotland and Wales only. Some of the data is only available on either a GB or UK level.

1. Seafood Industry Overview

In the latest 12 months* over the last year 97% of households in GB bought seafood, with their total purchases estimated to be worth around £6.61bn which is 4.7% more than the previous year.

*Nielsen HomeScan year ending 7 Oct'17, and NPD Crest data year ending Jun'17.

UK Sea Fish Processing Sector

- In 2016 the UK sea fish processing industry provided around 13,554 full-time jobs across 307 units. The industry is consolidating with the number of sites reducing and average employment per site increasing over the last five years.
- Humberside and the Grampian region of Scotland dominate the sea fish processing industry in terms of full-time equivalent employment (over 60% of total industry employment in 2016 located within these regions).
- In 2014 the industry had an estimated turnover of over £3 billion of which £184 million was operating profit.
- In 2014 the industry contributed over £550 million in Gross Value Added to the UK economy.

Source: 2016 UK Seafood Processing Industry Report (Seafish)

UK Seafood Industry

- In 2016, there were 6,378 registered fishing vessels, a reduction of 7% since 2006. Of these vessels 1,754 are classified as inactive and 1,703 are classified as 'low activity', referring to vessels with average landings of less than £10,000 per year.
- Excluding inactive vessels, the fleet in 2016 comprised 3,394 vessels under 10m in length and 1,230 over 10m.
- There were an estimated 11,757 fishermen in the UK in 2016, down 9% since 2006 and 350 lower than in 2015. Of these, 5,306 were based in England, 753 in Wales, 4,823 in Scotland and 875 in Northern Ireland. Part-time fishermen accounted for 19 percent of the total compared with 20% a decade ago.

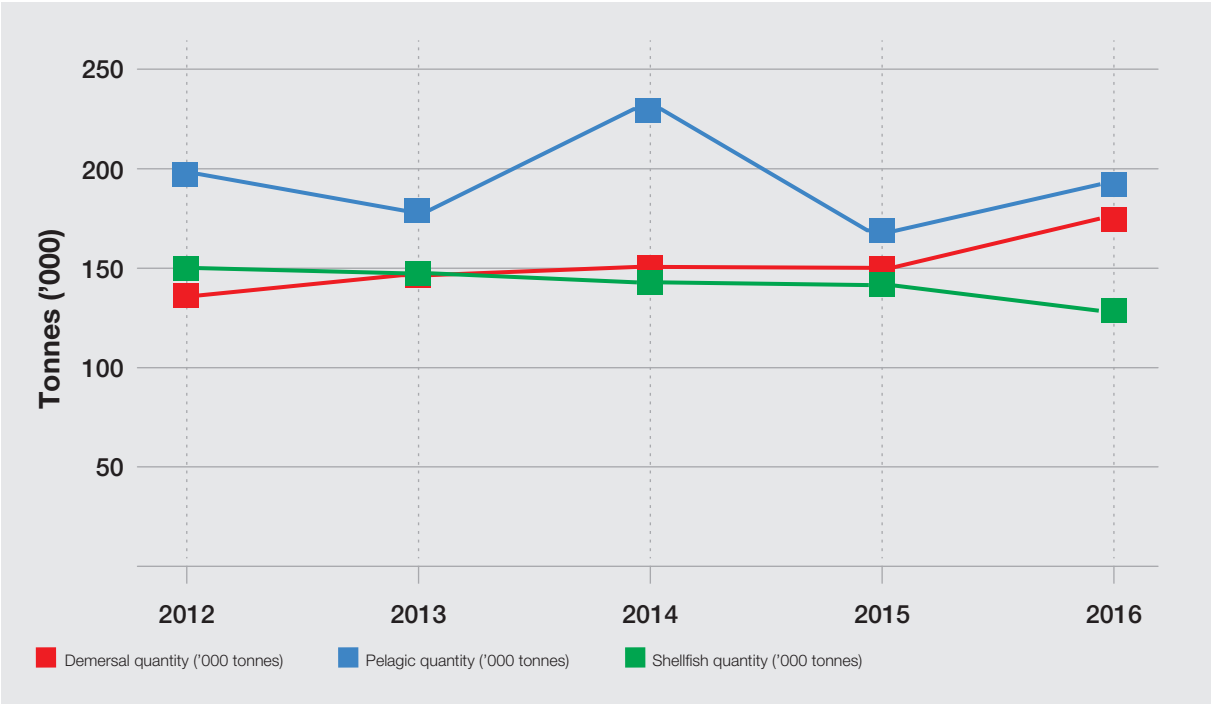
Source: UK Sea Fisheries Annual Statistics Report 2016 (MMO)

4. UK Landings

- In 2016, UK vessels landed 701,000 tonnes of seafood into the UK and abroad with a value of £936 million. Compared with 2015, this represents a 1% decrease in quantity but a 21% increase in value and was mainly driven by large increases in market prices for key pelagic and shellfish species.
- In 2016, the average value of shellfish landed by UK vessels into the UK was around £2,200 per tonne (live weight) compared with £1,900 per tonne in 2015. For demersal species, the average price increased from £1,800 per tonne in 2015 to £1,900 per tonne in 2016. Pelagic prices rose from an average of £500 per tonne to £700 per tonne.
- 64% of fish caught by the UK fleet was landed in the UK. Landings in the UK made up 74% of fishing income for UK vessels. The UK fleet accounted for 89% of all fish landed into the UK.
- By quantity landed, pelagic species accounted for around 53% of all landings by UK vessels in 2015, with demersal fish and shellfish making up around 26% and 22% respectively. The quantity of pelagic and demersal fish landed decreased by 7% and 5% respectively between 2015 and 2016. Shellfish landings were largely static in 2015 and 2016.
- By value, demersal fish and shellfish each accounted for 36% of total landings with pelagic fish at 28%.

Source: UK Sea Fisheries Annual Statistics Report 2015 (MMO)

UK landings by UK and foreign vessels 2010 - 2016



Source: Fisheries Administrations in the UK

Landings into the UK by UK vessels: 2012 to 2016 (a)

	Quantity ('000 tonnes)					Value (£ million)				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Bass	0.8	0.8	1.0	0.7	0.5	5.7	5.7	7.4[R]	5.4	4.9
Brill	0.4	0.3	0.3	0.4	0.4	2.0	1.9	1.8[R]	1.9	2.3
Cod	14.4	13.5	14.7	16.7	21.7	26.9	26.7	29.3[R]	31.9	39.9
Dogfish	0.8	0.8	0.8	1.8	1.9	0.2	0.2	0.2[R]	0.5	0.5
Gurnard	2.0	2.0	1.4	1.9	1.9	1.5	1.3	0.9	1.1	1.2
Haddock	34.4	39.2	37.2	33.5	33.9	36.2	44.1	51.7[R]	45.6[R]	45.0
Hake	12.0	11.0	15.6	15.9	19.9	26.1	27.2	37.4	38.4	47.6
Halibut	0.1	0.1	..	0.1	0.1	0.7	0.5	0.4	0.4	0.9
Lemon sole	2.8	2.8	2.7	2.1	2.2	7.5	8.3	8.6[R]	8.2	9.0
Ling	5.1	5.3	6.1	5.8	7.0	7.4	7.2	7.6[R]	7.7	10.3
Megrim	4.0	4.6	3.7	3.5	3.7	10.0	10.0	9.4[R]	8.7[R]	10.2
Monks or anglers	12.2	12.0	12.7	15.8	18.7	38.3	34.8	35.1[R]	38.8	52.9
Plaice	4.2	4.9	4.3	4.4	5.2	4.6	4.8	4.1[R]	4.5	5.9
Pollack (lythe)	1.8	1.6	2.0	1.7	2.0	4.0	3.5	3.6[R]	3.2	4.5
Saithe	16.4	19.7	17.5	18.8	17.4	17.3	17.1	17.0	17.0	18.8
Sand eels	..	..	..	..	..	..	..	..	..	..
Skates and rays	3.8	3.5	3.1	3.2	3.1	5.0	4.4	3.5	4.0	4.1
Sole	2.7	2.6	2.6	2.1	2.1	22.8	18.1	16.5[R]	15.7	18.6
Turbot	0.6	0.5	0.6	0.6	0.6	4.5	4.3	4.6[R]	4.7	5.3
Whiting	11.0	12.4	11.7	11.3	11.0	11.1	11.7	12.3[R]	11.6	11.4
Witch	1.0	0.9	0.8	0.7	0.9	1.2	0.9	0.8	0.8	1.1
Other demersal (b)	9.7	10.9	11.8	9.0	10.1	14.3	16.1	17.5	13.9	18.2
TOTAL DEMERSAL	140.2	149.5[R]	150.7	150.1[R]	164.4	247.4	248.8	269.8[R]	264.1[R]	312.4
Blue whiting	24.5	9.4	9.7	12.1	11.9	7.5	2.1	1.3	2.0	2.4
Herring	63.1	46.0	48.8	42.0	47.9	33.2	16.9	13.5	14.6	29.5
Horse mackerel	9.6	2.9	3.7	3.2	1.7	3.4	1.1	1.6	1.5	0.8
Mackerel	89.2	99.6	155.6	103.9	114.5	80.6	89.4	125.7	66.5	97.5
Sardines	4.3	3.7	3.4	4.2	8.0	1.1	1.0	0.8	1.6	2.6
Other pelagic	8.8	5.2	5.7	3.8	6.1	2.9	1.1	2.1	0.8	1.6
TOTAL PELAGIC	199.5	166.7	226.9	169.3	190.0	128.7	111.6	145.1	86.9	134.3
Cockles	2.2	10.1	10.2	11.2	5.0	1.5	5.3	7.9	5.7	3.5
Crabs	29.9	29.3	32.8	29.4[R]	32.5	39.1	39.1	44.8[R]	39.8[R]	47.6
Cuttlefish	5.4	3.7	3.1	6.2	5.2	10.9	6.6	6.5	10.9	14.4
Lobsters	3.1	3.0	3.4	3.1	3.3	31.0	29.9	33.5	32.2[R]	39.5
Mussels	0.7	0.5	0.2	1.0	1.6	0.4	0.2	0.1	0.8	0.2
Nephrops	33.0	28.5	30.5	25.9	30.9	111.3	86.3	98.8	82.3[R]	100.8
Scallops	54.3	49.4	39.7	41.5[R]	39.4	68.4	63.7	60.3[R]	65.7[R]	76.0
Shrimps and prawns	1.0	0.9	0.6	0.3	0.8	2.4	2.4	1.4	0.8	3.0
Squid	1.9	1.9	2.9	1.9	2.0	6.7	7.3	9.3	6.6	8.3
Whelks	16.5	20.1	19.8	20.9	22.7	11.2	13.8	16.2[R]	18.6	22.9
Other shellfish	2.4	1.9	1.1	1.3	1.2	5.9	5.4	3.7	4.0	4.7
TOTAL SHELLFISH	150.3	149.2	144.3	142.6[R]	144.6	288.7	259.9	282.4[R]	267.3[R]	321.0
TOTAL ALL SPECIES	490.1	465.4	521.8	462.0[R]	499.0	664.9[R]	620.3	697.3[R]	618.3[R]	767.7

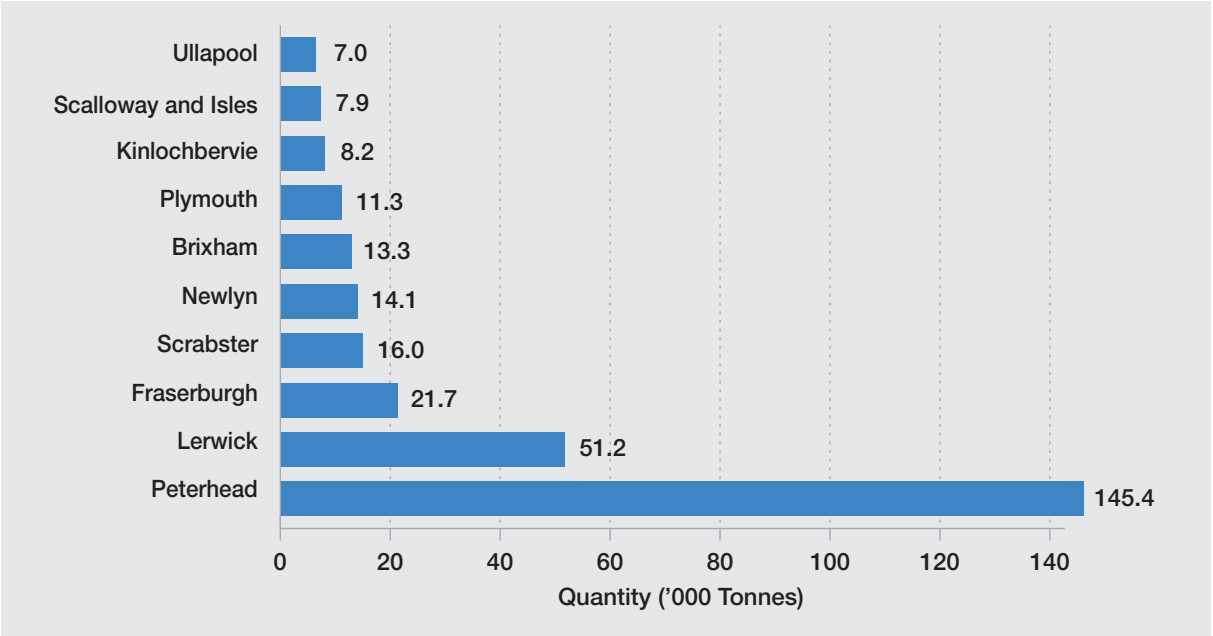
Source: Fisheries Administrations in the UK (a) Landings data include transhipments and Islands figures. (b) Includes fish roes and livers.

.. means 'negligible' (less than half the last digit shown).

[R] means 'revision'.

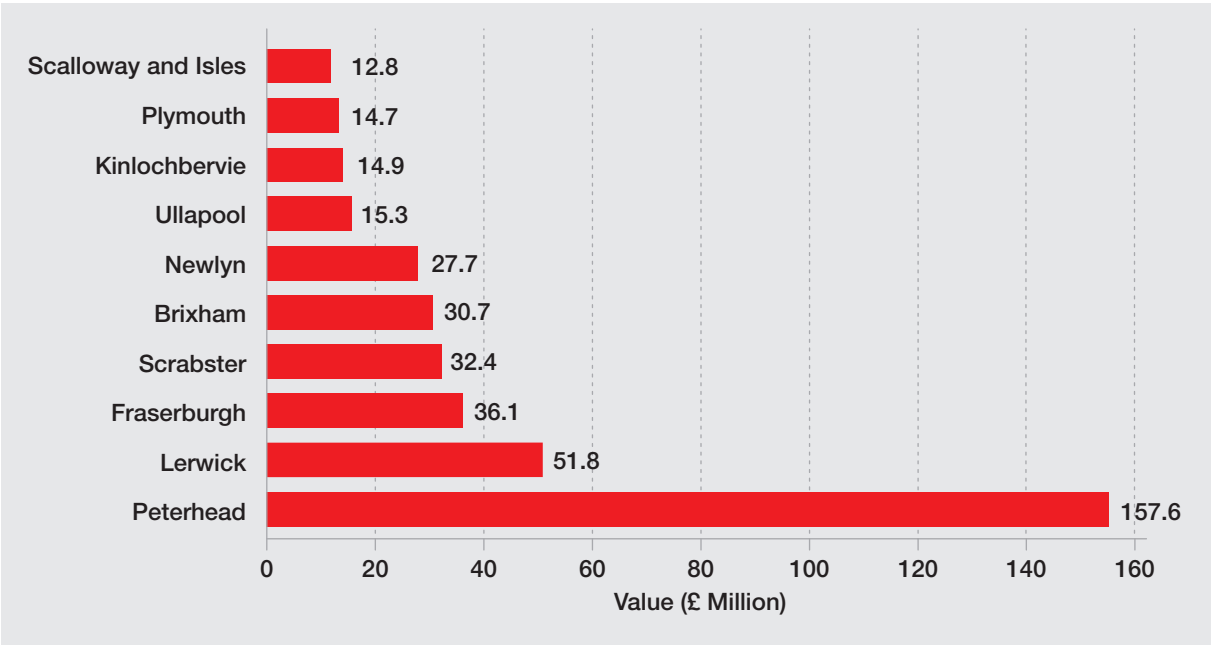
5. UK Ports

Top 10 UK ports – landings by UK vessels: 2016 By volume



Source: MMO: UK Sea Fisheries Statistics 2016 - Landings

Top 10 UK ports – landings by UK vessels: 2016 By value



Source: MMO: UK Sea Fisheries Statistics 2016 - Landings

6. UK Seafood Imports

- According to the 2016 annual data*, seafood imports from abroad and landings by foreign vessels, account for approximately 68% of the value and 53% of the total volume within the UK seafood value chain.
- Over the year ending August 2017, the volume of seafood imported into the UK fell 1.8% to just under 700,800 tonnes, whilst the average price per kg increased 14.9% to £4.58. This increased the value of seafood imports 12.8% to over £3.21bn.
- Several species have experienced growth in both import volumes and values: warm-water shrimps and prawns, prepared and preserved shrimps and prawns, crabs, cold-water shrimps and prawns, coley and monkfish.
- The following species have seen inflation driven import value growth, as the import volume declined: salmon, cod, tuna, haddock, pollack, mackerel and plaice.
- The only species to experience a decline in both import value and volume are: lobster, scallops, herring and nephrops.
- These shifts in species are reflected in the performance of the countries who import to the UK. The value and volume of seafood imported from the following countries increased: China, Denmark, Sweden, Vietnam, India, Netherlands, Poland, Spain, Russia and Ecuador.
- The following countries imported less volume but for a higher value: Faroe Islands, Germany, Norway, Ghana and Bangladesh.
- However, seafood imports from the following countries decreased by value and volume: Iceland, Canada, U.S.A., Thailand and France.

* Source: HMRC via BTS Dec'16, MMO UK Sea Fisheries Statistics 2016, Cefas data for 2015. Source: HMRC via British Trade Statistics YE August 2017

Top import species ranked by value 2016 - 2017

Species	Imports YE August 2016			Imports YE August 2017			% Change 2017 v 2016		
	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value	Volume	Ave £ per Kg
Salmon	£471,539	90,029	£5.24	£570,784	85,546	£6.67	21.0%	-5.0%	27.4%
Cod	£469,947	118,797	£3.96	£506,413	114,588	£4.42	7.8%	-3.5%	11.7%
Tuna	£349,240	118,271	£2.95	£416,478	114,627	£3.63	19.3%	-3.1%	23.0%
WW shrimps & prawns	£285,396	37,876	£7.53	£356,914	42,124	£8.47	25.1%	11.2%	12.4%
P&P Shrimps & prawns	£297,812	38,818	£7.67	£323,052	39,048	£8.27	8.5%	0.6%	7.8%
Haddock	£118,406	46,417	£2.55	£120,523	44,238	£2.72	1.8%	-4.7%	6.8%
Pollack	£65,440	32,551	£2.01	£70,130	32,027	£2.19	7.2%	-1.6%	8.9%
Mackerel	£40,060	20,678	£1.94	£45,117	17,819	£2.53	12.6%	-13.8%	30.7%
Lobster	£37,769	2,971	£12.71	£34,062	2,329	£14.63	-9.8%	-21.6%	15.0%
Scallops	£46,815	4,378	£10.69	£22,923	1,511	£15.17	-51.0%	-65.5%	41.9%
Crabs	£17,905	2,314	£7.74	£20,662	2,830	£7.30	15.4%	22.3%	-5.7%
CW shrimps & prawns	£14,886	2,060	£7.23	£17,459	2,160	£8.08	17.3%	4.9%	11.8%
Herring	£15,234	10,119	£1.51	£13,907	7,394	£1.88	-8.7%	-26.9%	24.9%
Plaice	£12,729	4,515	£2.82	£13,715	4,361	£3.14	7.7%	-3.4%	11.6%
Nephrops	£10,264	3,038	£3.38	£9,782	2,601	£3.76	-4.7%	-14.4%	11.3%
Coley	£7,533	2,391	£3.15	£8,150	2,848	£2.86	8.2%	19.1%	-9.2%
Monkfish	£5,598	1,625	£3.44	£5,911	1,759	£3.36	5.6%	8.2%	-2.5%
All others	£580,435	177,049	£3.28	£654,354	182,954	£3.58	12.7%	3.3%	9.1%
Total	£2,847,009	713,895	£3.99	£3,210,336	700,764	£4.58	12.8%	-1.8%	14.9%

Key: YE - Year Ending, CW - Cold Water, WW - Warm Water, P&P - Prepared and Preserved

Source: HMRC via British Trade Statistics YE August 2017

Top 20 import countries ranked by value 2016 - 2017

Country	Imports YE August 2016			Imports YE August 2017			% Change 2017 v 2016		
	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value	Volume	Ave £ per Kg
Iceland	£285,857	63,117	£4.53	£269,227	55,564	£4.85	-5.8%	-12.0%	7.0%
Faroe Islands	£203,666	43,009	£4.74	£233,407	40,244	£5.80	14.6%	-6.4%	22.5%
China	£185,464	63,796	£2.91	£212,686	66,213	£3.21	14.7%	3.8%	10.5%
Germany	£194,836	53,623	£3.63	£208,961	52,142	£4.01	7.2%	-2.8%	10.3%
Denmark	£149,807	39,757	£3.77	£195,434	41,353	£4.73	30.5%	4.0%	25.4%
Sweden	£129,884	31,515	£4.12	£178,521	32,026	£5.57	37.4%	1.6%	35.3%
Vietnam	£136,516	29,974	£4.55	£177,309	31,929	£5.55	29.9%	6.5%	21.9%
India	£93,647	17,070	£5.49	£130,140	19,775	£6.58	39.0%	15.8%	20.0%
Netherlands	£109,254	25,646	£4.26	£120,288	27,359	£4.40	10.1%	6.7%	3.2%
Canada	£114,483	14,554	£7.87	£112,799	13,985	£8.07	-1.5%	-3.9%	2.5%
Norway	£93,559	34,436	£2.72	£98,363	30,358	£3.24	5.1%	-11.8%	19.3%
U.S.A.	£91,510	21,557	£4.25	£89,131	18,304	£4.87	-2.6%	-15.1%	14.7%
Poland	£66,757	16,844	£3.96	£85,018	19,259	£4.41	27.4%	14.3%	11.4%
Thailand	£87,179	21,238	£4.10	£84,306	15,448	£5.46	-3.3%	-27.3%	32.9%
Spain	£61,984	14,172	£4.37	£81,989	16,943	£4.84	32.3%	19.6%	10.6%
Ghana	£59,069	21,348	£2.77	£74,190	21,290	£3.48	25.6%	-0.3%	25.9%
France	£78,195	12,770	£6.12	£71,074	10,291	£6.91	-9.1%	-19.4%	12.8%
Bangladesh	£69,268	7,366	£9.40	£70,142	6,998	£10.02	1.3%	-5.0%	6.6%
Russia	£50,140	15,342	£3.27	£62,900	15,979	£3.94	25.4%	4.2%	20.4%
Ecuador	£37,039	11,856	£3.12	£59,924	14,995	£4.00	61.8%	26.5%	27.9%
Top 20 total	£2,298,114	558,990	£4.11	£2,615,809	550,455	£4.75	13.8%	-1.5%	15.6%
Top 20 share of total imports	80.7%	78.3%		81.5%	78.6%				

Key: YE - Year Ending

Source: HMRC via British Trade Statistics YE August 2017

UK Seafood Exports

- Over the year ending August 2017, export volumes fell 2.1% to just under 446,500 tonnes, whilst the value increased 26.5% to £1.89bn, as the average price per kg increased 29.2% to £4.23. These exports include a large proportion of the UK's domestic catch, as it earns a higher price in foreign markets.
- Several species have experienced growth in both export volumes and values: salmon, nephrops, warm-water shrimps and prawns, monkfish, cold-water shrimps and prawns, haddock and plaice.
- The following species have seen inflation driven export value growth, as the export volume declined: mackerel, crabs, cod, lobster, prepared and preserved shrimps and prawns, coley and pollack.
- The only species to experience a decline in export value and volume are: scallops, herring and tuna.
- The top four export markets by value, remain the same as in 2016: France, U.S.A., Spain and the Irish Republic.
- The value and volume of seafood exported to the following countries increased: France, U.S.A., Spain, China, South Korea, Belgium, Taiwan, Canada, Portugal and Romania.
- The UK exported less volume but for a higher value to the following countries: Irish Republic, Italy, Netherlands, Germany, Poland, Vietnam, Hong Kong and United Arab Emirates.
- Seafood exports to the following countries decreased by both value and volume: Denmark and Nigeria.

Source: HMRC via British Trade Statistics YE August 2017

Top export species ranked by value 2016 - 2017

Species	Exports YE August 2016			Exports YE August 2017			% Change 2017 v 2016		
	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value	Volume	Ave £ per Kg
Salmon	£543,651	115,993	£4.69	£759,507	122,433	£6.20	39.7%	5.6%	32.4%
Nephrops	£105,566	13,487	£7.83	£119,116	13,673	£8.71	12.8%	1.4%	11.3%
Scallops	£123,507	13,364	£9.24	£110,623	9,283	£11.92	-10.4%	-30.5%	28.9%
Mackerel	£79,522	90,284	£0.88	£91,675	80,940	£1.13	15.3%	-10.3%	28.6%
Crabs	£55,839	16,031	£3.48	£67,958	15,403	£4.41	21.7%	-3.9%	26.7%
WW shrimps & prawns	£49,415	7,444	£6.64	£65,570	8,345	£7.86	32.7%	12.1%	18.4%
Cod	£56,818	17,615	£3.23	£60,057	16,080	£3.73	5.7%	-8.7%	15.8%
Lobster	£41,391	3,543	£11.68	£46,331	3,295	£14.06	11.9%	-7.0%	20.4%
Herring	£36,729	58,079	£0.63	£36,385	40,692	£0.89	-0.9%	-29.9%	41.4%
Monkfish	£22,414	4,177	£5.37	£31,488	5,201	£6.05	40.5%	24.5%	12.8%
P&P shrimps & prawns	£20,258	3,705	£5.47	£22,321	3,485	£6.40	10.2%	-5.9%	17.1%
Tuna	£22,490	6,145	£3.66	£19,974	4,707	£4.24	-11.2%	-23.4%	16.0%
CW shrimps & prawns	£8,399	1,085	£7.74	£14,960	1,880	£7.96	78.1%	73.3%	2.8%
Coley	£11,791	5,332	£2.21	£13,489	5,233	£2.58	14.4%	-1.9%	16.6%
Pollack	£6,204	2,102	£2.95	£6,576	2,083	£3.16	6.0%	-0.9%	7.0%
Haddock	£2,869	950	£3.02	£3,951	1,369	£2.89	37.7%	44.2%	-4.5%
Plaice	£1,127	796	£1.42	£2,262	1,348	£1.68	100.6%	69.3%	18.5%
All others	£306,786	95,950	£3.20	£418,065	111,008	£3.77	36.3%	15.7%	17.8%
Total	£1,494,778	456,082	£3.28	£1,890,308	446,458	£4.23	26.5%	-2.1%	29.2%

Key: :YE – Year Ending, CW - Cold Water, WW - Warm Water, P&P - Prepared and Preserved

Source: HMRC via British Trade Statistics YE Aug 2017

Top 20 export countries ranked by value 2016 - 2017

Country	Exports YE August 2016			Exports YE August 2017			% Change 2017 v 2016		
	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value (£000's)	Volume (tonnes)	Ave £ per Kg	Value	Volume	Ave £ per Kg
France	£410,183	88,065	£4.66	£517,099	90,733	£5.70	26.1%	3.0%	22.4%
U.S.A.	£190,130	32,732	£5.81	£267,587	37,391	£7.16	40.7%	14.2%	23.2%
Spain	£151,122	33,815	£4.47	£192,392	41,199	£4.67	27.3%	21.8%	4.5%
Irish Republic	£138,538	40,869	£3.39	£152,533	30,438	£5.01	10.1%	-25.5%	47.8%
China	£79,895	19,161	£4.17	£120,157	21,329	£5.63	50.4%	11.3%	35.1%
Italy	£103,545	18,557	£5.58	£118,150	17,743	£6.66	14.1%	-4.4%	19.3%
Netherlands	£68,014	70,526	£0.96	£82,188	65,772	£1.25	20.8%	-6.7%	29.6%
Germany	£60,134	20,401	£2.95	£72,141	19,213	£3.75	20.0%	-5.8%	27.4%
South Korea	£27,681	3,748	£7.39	£39,075	5,006	£7.81	41.2%	33.6%	5.7%
Belgium	£23,269	4,294	£5.42	£31,742	4,912	£6.46	36.4%	14.4%	19.3%
Denmark	£30,999	18,523	£1.67	£29,996	9,711	£3.09	-3.2%	-47.6%	84.6%
Poland	£23,786	14,560	£1.63	£28,421	11,996	£2.37	19.5%	-17.6%	45.0%
Vietnam	£18,193	10,505	£1.73	£24,765	8,059	£3.07	36.1%	-23.3%	77.4%
Taiwan	£8,044	2,224	£3.62	£18,621	3,224	£5.78	131.5%	45.0%	59.7%
Canada	£7,346	1,629	£4.51	£17,054	3,002	£5.68	132.1%	84.3%	26.0%
Hong Kong	£12,346	1,763	£7.00	£13,124	1,729	£7.59	6.3%	-1.9%	8.4%
Nigeria	£19,108	22,098	£0.86	£11,890	9,592	£1.24	-37.8%	-56.6%	43.4%
Portugal	£9,243	3,783	£2.44	£11,573	4,278	£2.71	25.2%	13.1%	10.7%
United Arab Emirates	£10,022	1,303	£7.69	£11,352	1,210	£9.38	13.3%	-7.1%	22.0%
Romania	£8,247	10,092	£0.82	£11,100	11,590	£0.96	34.6%	14.8%	17.2%
Top 20 total	£1,399,843	418,646	£3.34	£1,770,960	398,127	£4.45	26.5%	-4.9%	33.0%
Top 20 share of total exports	93.6%	91.8%		93.7%	89.2%				

Key: YE - Year Ending

Source: HMRC via British Trade Statistics August 2017

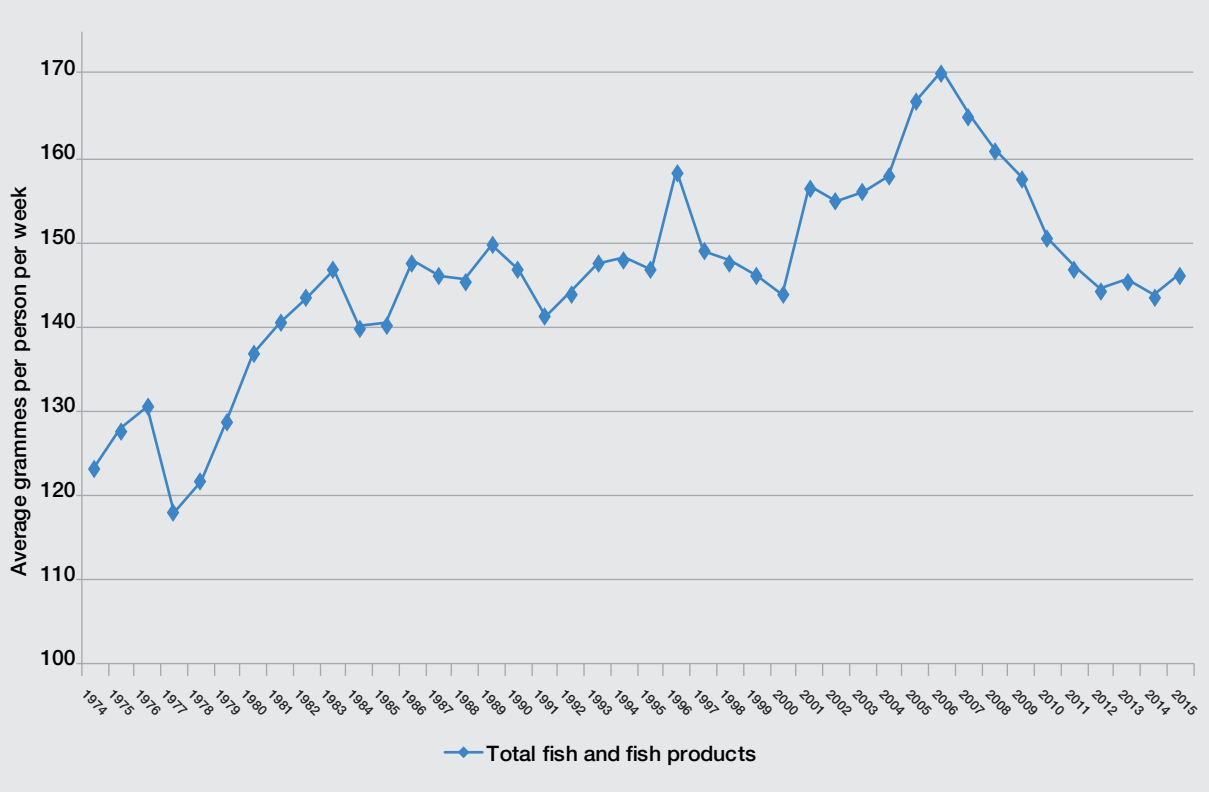
8. Consumers and Consumption

- 72% of UK adults do not know that it is recommended that they eat two portions of fish a week, one of which should be oily[1].
- Almost a third (32%) of UK adults who eat one or less portions of fish a week claim that it is the cost of fish that prevents them from eating more fish[1].
- Of those UK adults who eat at least one portion of fish a week, 43% are doing so as they "try and have a balanced diet" and 35% do so because of the "general health benefits of eating fish" [1].
- Amongst UK adults who eat fish, 47% claim to regularly (at least once a month) eat cod, 39% regularly eat salmon, 37% tuna, 26% haddock and 23% prawns[1].
- Almost a quarter (24%) of UK adults spontaneously (i.e. without prompting) know that omega-3 is one of the health benefits of eating fish. 15% say that it is good for you because it is low in fat and 15% mention fish oils / oils or essential oils. 13% say it is a good source of protein and 11% describe fish as brain food[1].
- When prompted, 50% of UK adults see fish as having healthy heart benefits. 49% say that fish contributes to healthy skin, hair and nails and 48% that it helps contribute to the maintenance of normal brain function. 28% associate fish with maintaining healthy blood pressure and 23% that it helps maintain healthy vision[1].
- When told of the multitude of health benefits of fish, 66% of UK adults agree that they are encouraged to eat more fish than they already do and 78% agree that they feel encouraged to specifically eat two portions of fish a week. This demonstrates that once people are made aware of the many health benefits of eating fish they are encouraged to up their intake[1].
- According to the latest annual retail and foodservice data, over 467,000 tonnes of seafood was purchased by GB consumers, which was 0.4% less than the previous year. Retail sales account for 69% of this volume with over 321,000 tonnes, however this volume fell 2.4% when compared to last year. The number of seafood servings purchased in commercial foodservice increased 4.1% to just over 1bn, and based on an average serving size of 140g, is estimated to account for 146,000 tonnes, 31% of the overall seafood volume purchased by GB consumers[2].
- In 2015, each person in the UK ate an estimated 161g of seafood per week. This amounted to an average of 1.15 portions per person per week (based on a 140g portion size)[3].

Source:
[1] YouGov 2 a Week study December 2016
[2] Nielsen ScanTrack WE 07.10.17, NPD Crest YE June 17
[3] Defra Family Food 2015

Trends in UK household purchases of fish for in-home consumption

Data from 1974 - 2015



Source: DEFRA family food 2015

9. GB Commercial Foodservice Sector

- To year end June 2017, consumers spent £54.4bn on eating out of home, an increase of 2.8% on the previous year. The industry has remained buoyant with a 0.7% increase in visits, a 1.1% increase in the number of servings, and a 2.1% increase in the average diner spend driven by rising prices.

- In the last year all channels except workplace/college/university canteens reported higher sales value. The quick service restaurant channel drove the majority of the sector's growth and out-performed the total market by offering consumers affordable meals out of home. Visits to all channels also increased except to travel & leisure and workplace/college/university outlets.

- Overall Seafood servings and incidence grew this year making it the fourth fastest growing protein in terms of servings and incidence. Consumers spent approximately £3.4bn on eating seafood out of home, an increase of 6.1% on the previous year. Seafood servings increased 4.1% this year, driven by positive performance in all channels, except travel & leisure which saw an 8.3% decline in their seafood servings.

- From June '16 to June'17 the commercial foodservice market has seen a mixed performance across the different species and product formats. Fried fish still dominate, however servings fell 0.9% driven by servings of other fried fish and crab / fish cakes, as servings of fried cod, haddock and fish fingers increased. Overall non-fried fish servings increased 1.1%, thanks to cod, trout and tuna. Shellfish servings also increased 1.4%, driven by mussels, prawns and scampi. Both fish burger and shellfish sandwich servings declined, 13.1% and 3.2% respectively, however servings of fish sandwiches increased 16.5%.

Source: NPD Crest 52 week ending June'17

UK Fish and Chip Sector

- There are approximately 10,500 takeaway fish and chip shops in the UK, collectively serving around 103 million servings of fish and chips as a meal, each year.
- It is estimated that in the region of 80,000 people are employed in the takeaway fish and chip shop sector.
- The most popular species of fish consumed via the fish and chip shop sector are cod and haddock, followed by a range of other species such as plaice, hake, coley, whiting, and lemon sole. Many species of shellfish are also increasingly available via fish and chip shops – principally breaded or battered scampi but also species such as scallops and prawns. Haddock is the usual fish of choice in Scotland, Yorkshire, other parts of northern England and many parts of the Midlands – while cod is the usual fish of choice in most other parts of the UK. Plaice is regularly enjoyed by an older demographic of consumer.
- Most (approximately 95%) of the cod sold by UK fish and chip shops is caught in the Arctic waters of the Barents Sea and Iceland. In England, most of the haddock eaten comes from the Barents Sea and Iceland – both of these being supplied in FAS (frozen at sea) fillet format. In Scotland, haddock is much more likely to come from the North Sea via landings into the port of Peterhead.
- The largest ever portion of fish and chips weighed 47.75 kg and was served by Fish and Chips@London Road, Enfield, Middlesex, London on 30 July 2012.
- Popular accompaniments to fish and chip meals include mushy peas, salt and vinegar, tomato ketchup, curry sauce and pickled onions.
- It is estimated that 80% of the UK population visit fish and chip shops at least once a year, while 22% of people visit a fish and chip shop every week. Friday is still the busiest day of the week for most fish and chip shops.
- 56% of UK consumers buy fish and chips from a takeaway outlet to eat in the home as a family meal.
- Fish and chips is one of the least adulterated prepared foods that we can eat; wild caught fish, freshly harvested potatoes, some flour for batter and an oil or fat for the cooking medium.
- A serving of fish and chips provides a third of the recommended daily allowance of vitamins for a man and nearly half for a woman. A portion of fish and chips provides the body with carbohydrate, vitamins B6 and B12, vitamin C, iron, calcium, phosphorous, as well as the trace elements iodine, fluorine, zinc and some important dietary fibre.

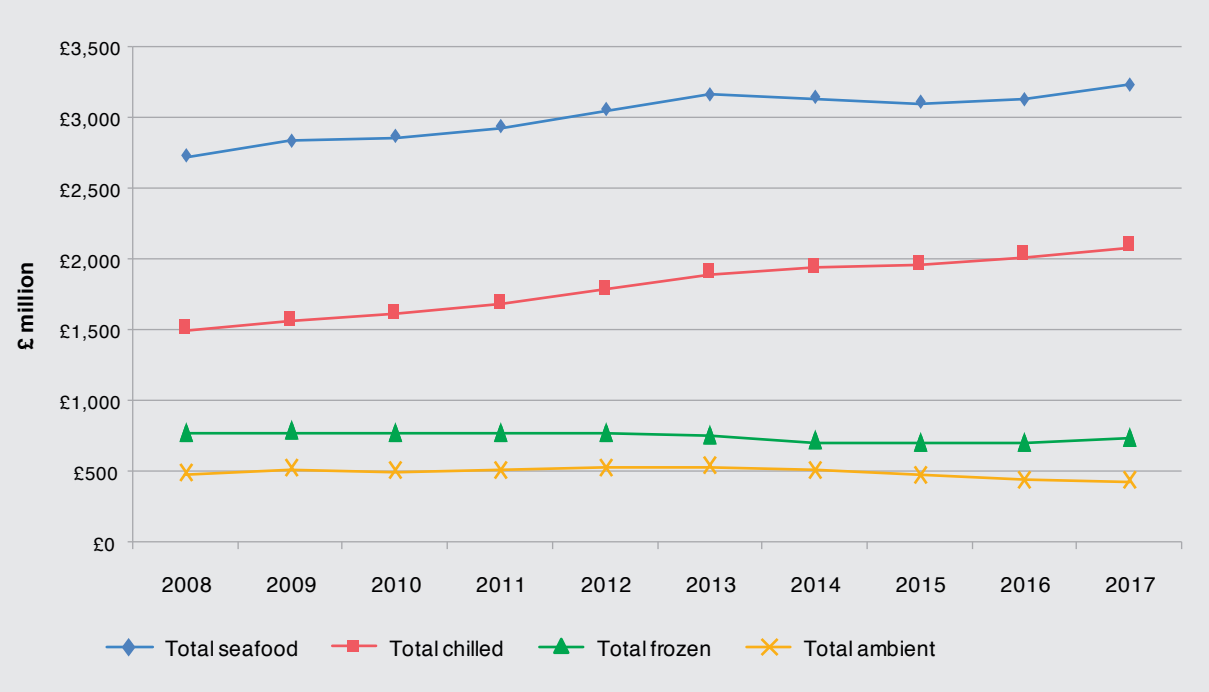
Source: Seafish

11. GB Retail Sector

- In the year ending 7 October 2017, we bought over 321,000 tonnes of seafood for £3.22bn from the major multiple supermarkets in GB.
- When compared to the previous year, overall volume declined 2.4% which equates to more than 7,800 tonnes. However, continued price inflation has increased the average price per kg 5.7% to £10.03, resulting in 3.2%, almost £100m value growth.
- With over £2bn of sales, the chilled sector dominates the category. However volume sales declined 1% to just over 151,700 tonnes, whilst the sales value increased 3.8%, as the average price per kg paid for chilled fish increased 4.8%.
- Only the frozen sector is reporting growth of both sales value and volume. Value sales increased 4.4% to just over £700m and volume increased 0.4% to over 105,300 tonnes. The disparity in growth rates is a result of the average price per kg paid increasing 4.1% to £6.83.
- The ambient sector (shelf stable tins, jars, pouches) is also reporting an 8.9% increase in the average price paid per kg which is now £6.62, however the sector remains in overall decline. Sales value fell 1.4% to just over £420m and volume sales are 9.4% lower than the previous year at just over 64,100 tonnes.
- The 35 top species by sales value remain the same as last year with salmon, cod, tuna, warm-water prawns, haddock and cold-water prawns maintaining their top six rankings. In fact the only species which have changed their ranks are: mackerel +1, pollock -1, basa +1, scampi -1, sea bream +1, scallops -1, squid (calamari) +1, anchovy +1, lobster -2, pilchards +1, cockles +1, shrimps +2, crayfish -3 and monkfish -1.
- By overall volume, the two largest product segments within retail are natural (seafood with no additional ingredients) and prepared (seafood prepared by any other means not specified by the other segments). Combined these account for just below 55% of all sales, however they are experiencing a decline along with sauce and breaded segments. The segments that are reporting an increase in sales volume are meals, fingers, batter, cakes, sushi and dusted.

Source: Nielsen ScanTrack YE 07.10.17

GB seafood retail sales value by sector 2008 - 2017



Source: AC Nielsen ScanTrack 22.01.11, 07.12.13, 05.11.16, 07.10.17

Top 35 species by value and volume

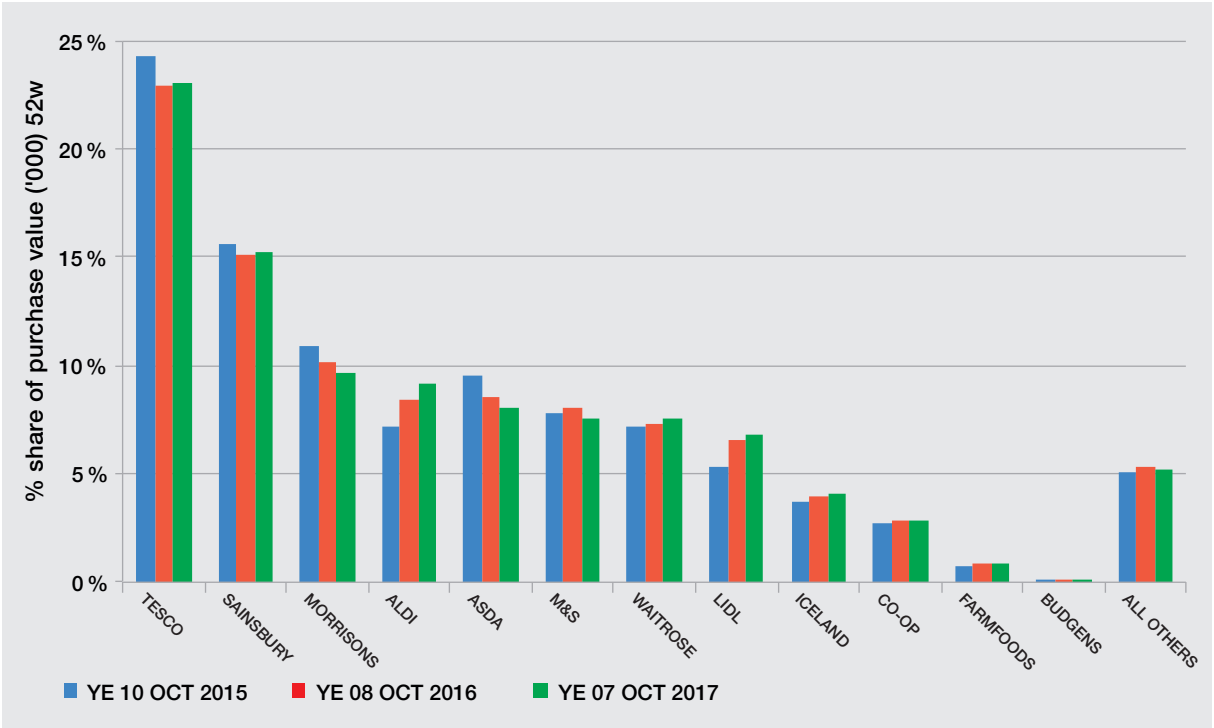
		Value Sales ('000)			Volume Sales ('000 kg)			% Change 2017 v 2016	
	Rank	YE 10.10.15	YE 08.10.16	YE 07.10.17	YE 10.10.15	YE 08.10.16	YE 07.10.17	Value	Volume
Total seafood		£3,093,367	£3,121,247	£3,221,144	328,673	328,968	321,141	3.2	-2.4
Salmon	1	£866,768	£870,350	£901,843	55,555	58,088	52,847	3.6	-9.0
Cod	2	£358,527	£379,200	£399,022	44,504	47,103	48,591	5.2	3.2
Tuna	3	£334,736	£314,852	£319,188	54,615	53,153	48,462	1.4	-8.8
Warm-water prawns	4	£231,119	£257,500	£269,568	15,138	17,612	18,728	4.7	6.3
Haddock	5	£185,309	£195,266	£205,618	18,188	19,422	20,223	5.3	4.1
Cold-water Prawns	6	£179,650	£179,427	£173,553	15,157	14,080	13,277	-3.3	-5.7
Mixed seafood	7	£132,848	£142,716	£159,162	15,596	16,461	17,738	11.5	7.8
Mackerel	8	£111,613	£104,424	£105,423	15,113	14,164	13,865	1.0	-2.1
Pollock	9	£132,020	£105,533	£105,136	28,903	24,188	24,081	-0.4	-0.4
Other	10	£98,702	£90,869	£89,199	17,850	15,559	14,257	-1.8	-8.4
Sea bass	11	£45,782	£53,311	£58,005	3,069	3,364	3,529	8.8	4.9
Basa	12	£39,091	£44,566	£49,228	5,084	5,787	5,994	10.5	3.6
Scampi	13	£43,987	£46,622	£46,935	4,209	4,356	4,209	0.7	-3.4
Trout	14	£34,451	£34,040	£35,230	3,092	2,965	2,821	3.5	-4.9
Sardines	15	£29,318	£28,723	£29,122	5,641	5,572	5,392	1.4	-3.2
Plaice	16	£27,748	£28,395	£28,079	2,780	2,871	2,920	-1.1	1.7
Crab	17	£26,401	£28,109	£27,728	1,444	1,550	1,431	-1.4	-7.7
Sole	18	£27,757	£27,700	£27,445	2,235	2,223	2,100	-0.9	-5.5
Crabstick	19	£24,091	£22,359	£25,284	4,892	4,808	5,317	13.1	10.6
Mussels	20	£21,146	£20,884	£22,511	3,388	3,368	3,593	7.8	6.7
Sea bream	21	£13,229	£16,014	£16,700	918	1,067	1,096	4.3	2.7
Scallops	22	£19,096	£17,434	£16,357	884	798	755	-6.2	-5.4
Kipper	23	£15,248	£14,353	£13,729	2,010	1,885	1,676	-4.3	-11.1
Squid (calamari)	24	£10,737	£11,118	£11,996	769	787	756	7.9	-4.0
Anchovy	25	£10,624	£10,398	£10,678	615	635	638	2.7	0.5
Lobster	26	£8,430	£11,628	£9,960	320	449	372	-14.3	-17.2
Herring	27	£8,558	£8,554	£8,609	1,297	1,324	1,265	0.6	-4.4
Hake	28	£7,127	£7,309	£7,856	687	639	624	7.5	-2.3
Pilchards	29	£6,782	£6,115	£5,890	2,172	1,983	1,941	-3.7	-2.1
Cockles	30	£6,275	£5,421	£5,551	580	538	506	2.4	-5.9
Shrimps	31	£3,986	£4,025	£4,587	101	115	170	14.0	48.7
Crayfish	32	£5,156	£6,203	£4,446	215	258	173	-28.3	-32.9
Monkfish	33	£4,814	£4,719	£4,124	115	108	85	-12.6	-21.0
Swordfish	34	£2,676	£2,864	£2,730	118	107	91	-4.7	-15.3
Skate/ray	35	£2,248	£2,393	£2,355	78	85	79	-1.6	-7.0

Key: YE - Week Ending

Source AC Nielsen ScanTrack YE 07.10.17

Share of trade value between major GB retailers – total seafood

Total seafood – 52 week - share of trade by value



Source: Nielsen HomeScan YE 07.10.17

SEAFISH

Supporting a profitable, sustainable and socially responsible future for the seafood industry.

18 Logie Mill, Logie Green Road, Edinburgh EH7 4HS
Origin Way, Europarc, Grimsby DN37 9T

t: +44 (0)131 558 3331
t: +44 (0)1472 252 300

e: seafish@seafish.co.uk
w: www.seafish.org

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House of Commons

Environment, Food and Rural Affairs Committee

Brexit: Trade in Food

Third Report of Session 2017–19

HC 348

House of Commons

Environment, Food and Rural Affairs Committee

Brexit: Trade in Food

Third Report of Session 2017–19

Report, together with formal minutes relating to the report

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The Environment, Food and Rural Affairs Committee

The Environment, Food and Rural Affairs Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Department of Environment, Food and Rural Affairs and associated public bodies.

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Committee staff

The current staff of the Committee are Eliot Barrass (Clerk), Sian Woodward (Clerk), Daniel Schlappa (Second Clerk), Anwen Rees (Committee Specialist), James Hockaday (Senior Committee Assistant), and Ian Blair and Annabel Russell (Committee Assistants).

Contacts

All correspondence should be addressed to the Clerk of the Environment, Food and Rural Affairs Committee, House of Commons, London SW1A 0AA. The telephone number for general enquiries is 020 7219 7341; the Committee's email address is efracom@parliament.uk.

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Summary

The UK's food and farming industry generates over £110 billion a year and employs one in eight people in the UK. Trade is vital to the industry. The EU is the UK's single largest trading partner in agri-food products, accounting for 60% of exports and 70% of imports.

Brexit will inevitably introduce friction to trading routes. Our Report focused on the impact to different agri-food sectors of the UK having to trade under World Trade Organisation (WTO) rules, in the event that the UK and EU fail to reach a trade agreement.

In withdrawing from the EU, the UK will withdraw from the Common Agricultural Policy (CAP). We intend to look at the Government's proposals to replace CAP later in this Session.

The Committee's key recommendations and conclusions are:

- The EU is the UK's most significant trading partner. Although the Government's intention is to agree a comprehensive free trade agreement and customs agreement with the EU, there is no guarantee that this will occur. In the event that the UK leaves the EU without a free trade agreement, UK-EU trade will proceed under World Trade Organisation (WTO) rules. Reverting to WTO tariffs will have a significant impact upon agriculture as tariffs are higher for agricultural products than for other goods and services.
- We recommend that Defra publishes a sector-by-sector analysis of the impact of Brexit before the publication of the Agriculture Bill.
- The agricultural industry needs clarity as to the Government's long-term vision and future support. We call for the publication of the Agriculture Bill as soon as possible.
- The Government needs to support British farming and agriculture in preparing for business post-Brexit. Defra should consider providing a fund to support our food producing industry to adapt effectively to the challenge ahead.
- The Government should consider what support can be offered to sectors where imports into the UK and exports out of the UK are roughly equal, such as the dairy industry, that can make us more self-sufficient. This would offer these sectors an opportunity to become more productive. It would give people the confidence to invest, keep food prices down and keep farmers in business.
- When establishing its own tariffs at the WTO, the Government must give careful consideration to the impact on the UK's agricultural industry. High tariffs on imports would raise the cost for consumers while removing tariffs could lower the cost for consumers but have a devastating effect on the long-term future of the UK's agricultural industry. Such a move could put many UK farmers out of business, which would be detrimental to the rural economy, and render the UK dependent on imported food.

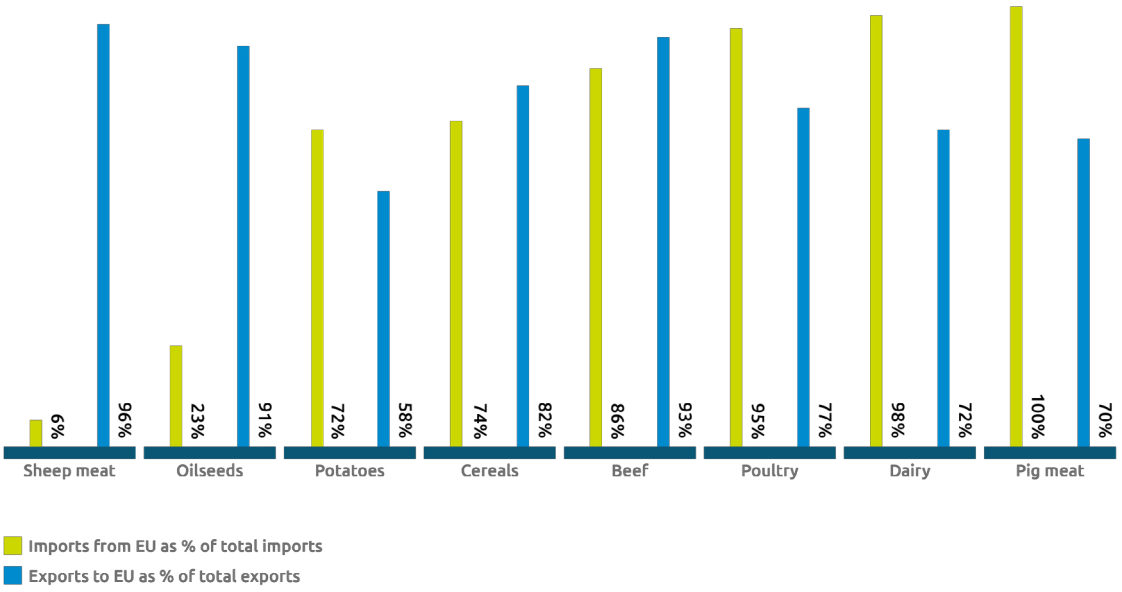
- The Government has offered no clarity to the agricultural industry on its post-Brexit policy. The Government must offer this clarity and stability so that the industry has the confidence to invest and take advantage of the opportunities offered to the sector post-Brexit. We would like to see the Government offer policies that would stimulate home grown food production.
- The UK has an international reputation for high animal welfare, environmental and food standards. These must not be sacrificed on the altar of cheap imports. Doing so could undermine the premium British brand and might affect our ability to negotiate trade deals with other countries. We will hold the Secretary of State to his assurances that there will be no compromise on animal welfare, environmental and food standards.
- The Government must make it clear to industry how it intends to deal with potential regulatory divergence with the EU, and the mechanisms it will put in place to track divergence in the future.
- The Government must ensure that protected geographical indicators are retained in a similar form after the UK leaves the EU.
- It is imperative that the Government invest in IT systems to support a more efficient export certification process in order to minimise delays to trade.
- Non-British EU veterinary surgeons are critical to the UK veterinary workforce. The Government must set out how it intends to ensure working rights for non-British EU vets currently working in the UK and to support the veterinary workforce going forward to ensure that it can meet the needs of the UK's food industry in the future.
- Delays at border inspection posts lead to increased costs, and are a threat to perishable goods. It is imperative that the Government sets out how it intends to ensure that the right IT systems and infrastructure are in place for the import and export of agricultural produce so that businesses can continue to trade smoothly with Europe, including the Republic of Ireland, and the rest of the world.
- The Government must start developing relationships at a high political level with potential trading partners in order to ensure that agreements are signed to the benefit of the UK. The Government must also investigate how it can utilise the expertise within the House of Lords and House of Commons in building relationships and representing the UK overseas.
- While we recognise the huge benefit that trade agreements could bring, these must not at the detriment of the UK's reputation for high animal welfare, environmental and food standards. The UK Government must not allow imports that that have not been produced to the UK's high standards.
- We recommend that the Government improve country of origin labelling following the UK's departure from the EU. We also recommend that the Government introduce mandatory method of production labelling.

1 Introduction

1. The UK's food and farming industry generates over £110 billion a year and employs one in eight people in the UK.[1] Trade is vital to the industry. The EU is the UK's single largest trading partner in agri-food products, accounting for 60% of exports and 70% of imports.

2. The graph below shows the significance of the EU's market to UK agriculture. It sets out the imports and exports of eight key agricultural commodities to and from the EU as a percentage of the total import and export of these goods.[2]

Graph 1: UK agricultural trade with the EU



Source: Comtrade

3. Brexit will fundamentally change our relationship with the EU. Currently the UK benefits from tariff-free trade within the EU, and the UK and other EU members levy common tariffs on products imported into the EU from other countries.

4. The Prime Minister, the Rt Hon Theresa May MP, stated that after the UK leaves the EU, it will cease to be a full member of either the Single Market or the Customs Union. In her speech on 17 January 2017, setting out the Government's negotiating objectives for exiting the EU, the Prime Minister announced her intention to "pursue a bold and ambitious Free Trade Agreement with the European Union … [to] allow for the freest possible trade in goods and services between Britain and the EU's member states".[3]

5. While we acknowledge the Government's aims, we recognise that the timetable for withdrawal negotiations is tight, and concluding a free trade agreement (FTA) in the time available may be extremely ambitious. If an FTA is not reached, World Trade Organisation (WTO) rules would automatically apply to any trade between the UK and the EU.

1 Department for Environment, Food and Rural Affairs (BRT0042)
2 Brexit: implications for agriculture & trade, Agriculture and Horticulture Development Board
3 The government's negotiating objectives for exiting the EU: PM speech, 17 January 2017

6. We launched our inquiry on 20 October 2017. Our inquiry considered the impact of trading under WTO rules and the opportunities and challenges that different agricultural sectors could face.

7. In withdrawing from the EU, the UK will withdraw from the Common Agricultural Policy (CAP). We intend to look at the Government's proposals to replace CAP later in this Session.

8. We took oral evidence from representatives from some of the main agri-food industries, such as sheep, beef, poultry, pork, horticulture, cereals, and the dairy industry. We also took evidence from consumer organisations, academics, Tim Martin (Founder and Chairman, JD Wetherspoon), and the Department for Environment, Food and Rural Affairs. We are grateful to those who provided oral and written evidence.

2 Tariff Barriers

Tariff Barriers

9. Tariffs (or customs duties) are a state levy imposed on goods crossing from one customs territory to another. Tariffs can be imposed on exports and imports. Tariffs are the most visible barriers to trade.

10. There are no tariffs on products traded between the EU Member States, and its Common Customs Tariff applies to all goods imported from third countries (with some exceptions e.g. Tariff-Rate Quotas).

11. As soon as the UK leaves the EU Customs Union, both UK exports to the EU, and EU exports to the UK, will be potentially subject to tariff barriers. In the absence of a free trade agreement with the EU or customs union arrangement, the UK and EU will trade under the default framework governed by the World Trade Organisation (WTO).

Most Favoured Nation Principle

12. The WTO's 164 country members must observe the "most favoured nation" (MFN) principle: this "non-discrimination principle" means the same tariffs must be applied to all countries. Lower-than-MFN tariffs may only be applied where a free trade agreement (FTA) or customs union (CU) agreement has been concluded with one or more trading partners, or when preferential treatment is given to developing countries.[4]

13. In this Chapter we examine the impact that tariffs could potentially have on different agri-food sectors.

Tariffs on UK-EU exports under WTO rules

14. Individual tariffs vary between different sectors and products. For non-agricultural goods, the average tariffs are relatively small. However, tariffs on agricultural goods are typically much higher, with the intention of protecting domestic markets.

15. The average EU tariff on dairy products is over 30%, while tariffs could be as high as 87% for frozen beef. Some other examples include a tariff of 46% for cheese or 21% for tomatoes. Some individual products have tariffs over 100%.[5]

16. Witnesses told us that tariff-free access to the EU was "crucial".[6] Tariffs would have a detrimental impact on those agricultural sectors that were dependent on EU exports for their profitability.

17. We heard particular concerns about the impact of tariffs on the sheep sector. The EU is very important for UK sheep meat exports, with more than 95% of its export volume destined for the EU. The Welsh lamb market is very dependent on the EU market, with 92% of exports (by value) and 85% (by volume) destined for the EU.[7]

4 World Trade Organisation website
5 WTO World Tariff Profiles 2016
6 National Farmers Union (BRT0030)
7 Hybu Cig Cymru (BRT0034)

18. Sheep exports, with a tariff of at least 50%, would become uncompetitive on the EU market.[8] The Agriculture and Horticulture Development Board (AHDB) told us that this would have a "devastating" effect on the sector.[9] The Andersons Centre estimated that in Northern Ireland alone, exports to the EU would drop by about 90%.[10] It would have serious consequences in Wales, where sheep farming was such a vital part of the Welsh economy, with producer prices estimated to decrease by 30%.[11]

19. The EU market is also important to the beef market, with more than 90% of UK beef exports shipped to other EU countries in 2015/16.[12]

20. In addition to their raw value, exports are important in the meat sector in helping to secure value for the whole carcass, finding markets for parts of the animal that are less favourable in the domestic market. In the UK, consumers prefer to eat chicken breast, lamb legs, mince, beef steaks, pork chops. There is little or no domestic market for dark chicken meat, chicken necks, chicken feet, sow meat and pigs trotters, for example.[13] Exporting these allow producers to maximise their return.

21. The EU is also a key market for an "export-focused and orientated" dairy market.[14] Currently, 15% of current output in the sector is exported, with 85% to 90% going to mainland Europe.[15] In Northern Ireland, the situation is exacerbated by the fact that, unlike other regions of the UK, it exports between 70%–85% of its milk product, mostly as milk powders, and does not have a reliance on the liquid milk market.

22. AHDB noted that the introduction of tariffs would prevent most imports of dairy products into the EU.[16] Dairy UK stated:

> If you take cheese as an example, WTO tariffs on dairy will do what they are designed to do: they will stop trade. The WTO tariff on cheese is of the order of 40% to 50% depending on the cheese variety. We do not make 50% margins in this sector, so the ability to absorb is minimal, if not non-existent.[17]

23. In the cereals sector, wheat and barley exports would be most affected. Approximately 80% of exports go to EU markets.[18] AHDB told us that cereals would find it difficult to compete in the EU market with other third country wheat producers, such as Russia, Ukraine, the US or South America: "They not only have been exporting effectively for a very long time, but they do it in volumes we cannot imagine".[19]

24. An exception to the general concern was fruit and vegetables. Exports are minimal, with most trade focused on the domestic market.[20]

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8 Agriculture and Horticulture Development Board (BRT0029)
9 Q98
10 Q89
11 Hybu Cig Cymru (BRT0034)
12 Agriculture and Horticulture Development Board (BRT0029)
13 International Meat Trade Association (BRT0002)
14 Q283
15 Q280
16 Agriculture and Horticulture Development Board (BRT0029)
17 Q296
18 Q205
19 Q210
20 Agriculture and Horticulture Development Board (BRT0029)

25. George Eustice MP, Minister of State for Agriculture, Fisheries and Food, Defra, recognised that the lamb industry and cereals industry would be affected by tariffs on exports.[21]

26. During our evidence session with Rt. Hon. Michael Gove MP, Secretary of State, and the Minister of State for Agriculture, Fisheries and Food, we were surprised to hear that Defra had not completed work on sector by sector analysis.[22] More surprising was the admission that this work may not be completed before the publication of the Agriculture Bill. Although DexEU had produced Brexit impact assessments and made them available for Members to view, we were not impressed with the depth of analysis in the documents.

27. **The EU is the UK's most significant trading partner. Although the Government's intention is to agree a comprehensive free trade agreement and customs agreement with the EU, there is no guarantee that this will occur. In the event that the UK leaves the EU without a free trade agreement, UK-EU trade will proceed under World Trade Organisation (WTO) rules. Reverting to WTO tariffs will have a significant impact upon agriculture as tariffs are higher for agricultural products than for other goods and services.**

28. **We note that the sheep, dairy and cereals sectors, those particularly dependent on the export market, will be most affected.**

29. **While we recognise and welcome work that has been done by organisations such as AHDB in providing detailed sectoral analysis on the impact of tariffs on the UK's agricultural sectors, it is imperative that Defra undertakes similar work as a matter of urgency to evaluate the impact of any deal that the Government might be negotiating.**

30. ***We recommend that Defra publishes a sector-by-sector analysis of the impact of Brexit before the publication of the Agriculture Bill.***

UK Tariffs on Imports under WTO rules

31. If no trade deal with the EU is struck, any food or agricultural product that we need to import from the EU will be subject to UK tariffs. Under WTO rules, the UK will not be able to set tariffs that discriminate between trading partners, except as part of a free trade agreement or to give developing countries special access to its markets.

32. The Government has said that it wishes to replicate as far as possible the EU's existing set of tariffs, at least in the short term.

33. Looking ahead, a decision would then need to be taken over whether to maintain the current high level of tariffs or to lower them. The UK would need to set out its own schedule of tariffs and TRQs at the WTO. The two main scenarios discussed by the agri-food sector focus on:

- Fortress UK, applying WTO tariffs on imports

  versus

- Trade liberalisation with low/no tariffs on imports.

21 Q530
22 Q543

34. In this section, we look at possible outcomes of both scenarios.

Fortress UK, applying WTO tariffs on imports

Increased prices for consumers

35. Some witnesses told us that applying tariffs on imports would lead to increased costs for importers, leading to higher costs for consumers.[23] Which? stated that there was the potential for "stark price rises".[24] The British Retail Consortium told us that, having applied the current WTO tariffs to four typical products in supermarkets, they were able to show that consumer beef and cheese prices could increase by up to 30%, tomatoes by up to 18% and broccoli by up to 10%.[25]

36. In contrast, Tim Martin, Founder and Chairman of Wetherspoon, has said that no-deal Brexit fears are "overblown".[26] He told the Committee that he disagreed that no-deal would result in higher food and drink prices. He estimated that it would actually reduce the price of a Wetherspoon meal by 3.5p, and reduce the cost of a pint by 0.5p: "We simply looked at all our supplies, found out the tariffs that apply on food that comes from outside of the EU, and then averaged it across all food, including from the UK, etc.".[27]

37. George Eustice MP told us that the impact on retail prices would be quite modest, with retail prices rising by 4.3%.[28]

Opportunities for UK businesses

38. 30% of the food consumed in the UK is imported from the EU.[29] Some witnesses told us that high tariffs on imports offered an opportunity for import substitution. Price rises on imported products could give an opportunity to British products, making them more attractive to domestic consumers with the potential to displace imports.[30] This was particularly significant for certain sectors with high levels of imports.

39. AHDB identified dairy as the sector with the most scope to displace imports. Currently the UK produces approximately 14.5 billion litres of milk per annum, depending on weather conditions and milk prices. For the UK to become self-sufficient, it would need to produce another 3.3 billion litres of milk, which was an extra 20%.[31] The UK also currently imports two-thirds of its cheese from the EU.

40. The pig sector was also identified as one with potential to grow, with the UK only 56% self-sufficient in pig meat.[32] However, imports would still be required to meet UK consumers demand for certain type of meat. Tulip Ltd told us:

23 Hybu Cig Cymru (BRT0034)
24 Which? (BRT0071)
25 British Retail Consortium (BRT0061)
26 No deal Brexit fears overblown, says JD Wetherspoon boss, The Guardian, 8 November 2017
27 Q399
28 Q530
29 Q393
30 Agriculture and Horticulture Development Board (BRT0029)
31 Q300
32 Q336

> We require a funny pig in the UK … we want it with lots of legs and lots of loins, but not so much shoulder and belly, so we have a rather interesting scenario where we are exporting shoulders and fifth quarter, but we are massively importing loins and legs from Europe.[33]

41. The horticultural sector was very positive about the opportunities around import substitution. The UK berry industry was approximately 90% self-sufficient from May to October and year-round opportunities could be provided by using technology, such as LEDs and glass houses. It could provide £350 million of sales extra.[34] The sector was also importing approximately £350 million a year of hardy nursery stock, and domestic production could be increased with minimal output.[35]

42. Witnesses agreed that it was unrealistic to think that import displacement would totally remove the need for exports. It was not possible to grow all products that consumers demanded in the UK: "We cannot grow bananas or citrus, and those are the key products that we import in high volumes. There is a lot we can do to improve, but we need to have a realistic perspective on the situation".[36]

43. Witnesses agreed that opportunities to increase domestic agri-food sectors would be affected by a decline in attracting overseas labour to the UK. We examined the issue of labour shortages earlier in the Session in our Seventh Report of Session 2016–2017, in Feeding the nation: labour constraints.[37] We will return to this issue later in this Session, and therefore do not intend to comment further in this Report.

44. Ladies in Beef told us that there was an increased appetite for British products amongst domestic consumers.[38] However, witnesses agreed that import substitution would take time and were concerned that their industry would not be able to adapt to the new requirement post-Brexit—as they were unknown at this stage of the Brexit negotiations. For example, increasing the amount of beef took two years "from conception to killing".[39] Cargill Meats Europe spoke of similar timescales in the poultry sector, and highlighted that getting planning permission to up-scale premises could often take up to three years.[40] Ladies in Beef noted that this was a long time to "have your cash and risk tied up".[41]

45. We also heard concerns that businesses were afraid to invest without stability and clear direction from the Government: "The willingness is there. The environment needs to be there. You need capital to invest … We need stability in the market to access the capital to do that. We need to be assured that what we are competing with is of a similar standard, so we are not suddenly hit by price falls".[42]

46. The National Farmers' Union (NFU) Dairy Board noted the support that US farmers had received from the US Department of Agriculture's insurance scheme, in order to

33 Q330
34 Q144
35 Q146
36 Q189
37 Environment, Food and Rural Affairs, Seventh Report of Session 2016—2017, Feeding the nation: labour constraints HC 1009
38 Q32
39 Q29
40 Q347
41 Q29
42 Q111

help them manage the impact of price volatility on their businesses: "In the first year, the uptake was quite substantial. … As the market has gone the right way, fewer and fewer farmers have bought into it".[43]

47. ***The agricultural industry needs clarity as to the Government's long-term vision and future support. We call for the publication of the Agriculture Bill as soon as possible.***

48. ***The Government needs to support British farming and agriculture in preparing for business post-Brexit. Defra should consider providing a fund to support our food producing industry to adapt effectively to the challenge ahead.***

49. ***The Government should consider what support can be offered to sectors where imports into the UK and exports out of the UK are roughly equal, such as the dairy industry, that can make us more self-sufficient. This would offer these sectors an opportunity to become more productive. It would give people the confidence to invest, keep food prices down and keep farmers in business.***

Trade liberalisation

Cheap imports

50. The UK Government could decide to remove all tariffs on imports into the UK. This would lower the cost of imported goods, leading to reduced prices for UK consumers. Removing tariffs on imports does not guarantee any reciprocal arrangement for our exported goods.

51. Witnesses expressed concern that the removal of tariffs would result in the UK market being flooded with imports produced to different and by inference, lower welfare, environmental and health standards. Which? told us that, although prices were important, they should not be delivered at the sake of undermining standards: "Food safety is absolutely critical … If we compromise on standards, it will have an effect on consumers but also on the wider economy".[44]

52. Witnesses highlighted products produced with different methods of farming across the globe that included, higher level of pesticides use, genetically modified organisms (GMOs), growth hormones, animal cloning and cultured meat.[45] Two high profile examples are hormone-treated beef and chlorinated chicken. We return to the issue of standards later in this Report when discussing free trade agreements.

53. We also heard concerns about lower farm animal welfare standards in overseas countries, including the EU.[46] Although the UK upheld high animal welfare and environmental standards, it was pointed out that they came at a cost to UK producers.[47] Dairy UK told us that it was important that UK farmers competed with imports on an even playing-field, with equivalence on animal welfare, quality standards and health

43 Q309
44 Q392
45 Dr Ludivine Petetin (BRT0056)
46 Compassion in World Farming (BRT0003)
47 Q78

standards: "That is a key concept that needs to be borne in mind as we go forward … We compete on a global stage, but we want to compete on an equal footing, so the concept of equivalence is key as far as we are concerned".[48]

54. We heard that if UK farmers had to compete with such imports, welfare and environmental standards could fall. Dr Petetin, from the School of Law and Politics at Cardiff University, warned of a potential "race to the bottom".[49] The National Beef Association agreed there was a risk, but told us that this was a situation no farmer wanted.[50]

55. Many British brands are seen as premium products domestically and across the world, and are in high demand. Any lowering of standards would affect consumer confidence about the farming industry and the product amongst domestic consumers. Hybu Cig Cymru (Meat Promotion Wales) (HCC) told us that being perceived as a country that had lowered animal welfare and environmental standards would make it difficult to maintain trade and establish new markets.[51]

56. There seemed to be some confusion over whether imports could be restricted on the basis of animal welfare. WTO rules impose limits on the extent to which countries can restrict imports on the basis of welfare concerns. However, Compassion in World Farming were of the opinion that recent developments in WTO case law indicated a shift towards such restrictions.[52]

57. The Secretary of State told us that there would be no compromise on animal welfare and environmental standards.[53]

Continued viability of UK businesses

58. High tariffs on agricultural goods have offered a degree of protection from non-EU countries. Witnesses expressed concern that a liberalisation of tariffs could cause "irreversible damage" to the agricultural sector in the UK, affecting the viability of many British farms.[54] Scenario forecasting by AHDB show that cereals, upland beef and sheep producers would be most impacted by decreases to farm business income.[55]

59. HCC projected that producer prices in the beef and sheep sectors could decrease by 45% and 29%, respectively, compared with reductions of 12%, 9% and 10% in producer prices for the pig, poultry and dairy sectors respectively.[56] The National Beef Association reported: "If you want to close down the beef sector, including processing, et cetera, you allow as much cheap beef in as possible".[57]

48 Q322
49 Dr Ludivine Petetin (BRT0056)
50 Q104
51 Hybu Cig Cymru (BRT0034)
52 In *EC-Seal Products*, the WTO Appellate Body ruled that in the EU (and therefore in the UK) animal welfare is a concern that comes within the field of public morals. WTO dispute panels and the Appellate Body have stated on several occasions that WTO member countries have the right to determine the level of protection that they consider appropriate to achieve a given policy aim for example as regards public health, conservation, prevention of deceptive practices or public morals.
53 Q564
54 NFU Scotland (BRT0035)
55 Brexit Scenarios: an impact assessment, Agriculture and Horticulture Development Board, October 2017
56 Hybu Cig Cymru (BRT0034)
57 Q104

60. The dairy industry would also be affected, with domestic products such as butter and cheese under increased competition from global exporters.[58]

61. The Secretary of State told us that, in the event of no free trade agreement with the EU, he would argue for WTO tariffs to remain.[59] He recognised that the removal of tariffs, while leading to reduced food prices, would "put considerable strain on farmers".[60]

62. **When establishing its own tariffs at the WTO, the Government must give careful consideration to the impact on the UK's agricultural industry. High tariffs on imports would raise the cost for consumers while removing tariffs could lower the cost for consumers but have a devastating effect on the long-term future of the UK's agricultural industry. Such a move could put many UK farmers out of business, which would be detrimental to the rural economy, and render the UK dependent on imported food.**

63. **The Government has offered no clarity to the agricultural industry on its post-Brexit policy. The Government must offer this clarity and stability so that the industry has the confidence to invest and take advantage of the opportunities offered to the industry post-Brexit. We would like to see the Government offer policies that would stimulate home grown food production.**

64. **The UK has an international reputation for high animal welfare, environmental and food standards. These must not be sacrificed on the altar of cheap imports. Doing so could undermine the premium British brand and might affect our ability to negotiate trade deals with other countries. We will hold the Secretary of State to his assurances that there will be no compromise on animal welfare, environmental and food standards.**

Tariff Rate Quotas

65. Tariff Rate Quotas (TRQs) have been set for some products to allow some countries preferential access into the EU Single Market for these products. The UK does not currently have its own national tariffs. They are set for all member states by the EU.

66. WTO members may establish autonomous TRQs at any time. As part of establishing UK-specific WTO schedules, it will be necessary to decide how the EU28's WTO TRQs will be apportioned between the UK and the EU27. There are currently 128 TRQs on agri-food imports covering approximately 6% of EU agri-food imports by value.

67. The UK and EU have brokered a preliminary agreement on dividing current EU28 WTO Tariff Rate Quotas. The proposed deal does not expand overall quotas, instead it divides up current quotas according to where the goods have historically been consumed amongst the EU28.

58 NFU Scotland (BRT0035)
59 Q559
60 Q530

68. The idea of dividing up current TRQs was rejected in a public letter signed by major agricultural exporters including the US, Argentina, Brazil and New Zealand.[61] Commentators have suggested that they fear the chosen methodology would lead to loss of access for their agricultural exporters to both the EU and UK markets.[62]

69. The British Retail Consortium stated that they wanted to maintain the same tariff rate quotas. They expressed concern about any delay to agreements as their members needed to agree contracts for 2019 onwards. NFU Scotland told us that any change to the current agreement had the potential to drive down prices and undermine domestic production standards in the UK.

70. George Eustice MP told us that countries such as Thailand and New Zealand had an interest in continuing the current quotas, as the lion's share of their quotas came to the UK.

71. ***Post-Brexit, the UK will be responsible for setting its own Tariff Rate Quotas. This should be carefully considered as it will have an impact on England, Scotland, Wales and Northern Ireland. We call on the Government to announce these quotas as soon as possible, so that the UK agricultural industry can have trading certainty for 2019 and onwards.***

61 Letter to the Permanent Representative of the European Union and the Permanent Representative of the United Kingdom, 26 September 2017

62 Dividing EU-UK farm trade quotas: no friends, just interests, Global Counsel, 6 October 2017

3 Non-Tariff Barriers

72. A non-tariff barrier is any measure, other than a customs tariff, that acts as a barrier to international trade. The UN Conference on Trade and Development classifies 16 types of non-tariff barriers.[63] Examples include sanitary and phytosanitary measures, labelling requirements, pre-shipment inspection and formalities, subsidies and rules of origin as well as protected product descriptions known as Geographical Indicators (GIs).

73. Witnesses expressed concern that, following Brexit, non-trade barriers could pose significant obstacles to trade in goods. In this Chapter, we focus on two major non-trade barriers: regulations and standards; and customs checks.

Regulations and standards

74. The regulatory environment can be an important factor in trade as it can be an impediment to trade. Membership of the Single Market removes many regulatory barriers to trade, through harmonisation of standards[64] and mutual recognition of standards,[65] which are underpinned by supranational institutions.[66]

75. Immediately after leaving the EU, the UK will be fully aligned with EU rules. It will then be for Parliament to decide whether to keep current regulations or to change them. But even if the UK has (as it intends to through the EU (Withdrawal) Bill) transferred EU laws into UK law, that will not in itself prevent new regulatory barriers. As the Institute for Government stated in a recent report, "There is a difference between having the same rules and having those rules legally recognised as being the same as the EU's".[67]

76. Witnesses told us that they wanted to see limited regulatory divergence so that no non-tariff barriers were introduced. The Andersons Centre said: "If you keep the standards aligned and harmonised, you make the challenges a lot more attainable in terms of managing the changeover into the post-Brexit world".[68]

77. British Summer Fruits put it in starker terms: "There is a risk that, if you diverge from the EU standards, the export opportunities that exist will disappear".[69]

78. Witnesses highlighted the increased costs to businesses that regulatory divergence would cause. As Sustain noted, "Generally, when standards start to diverge then costs start to accrue in tracking the difference between the products. What kind of paperwork will have to be provided? What kind of proof of certification or standard-setting will there have to be, and also what kind of inspection regimes, particularly at borders?"[70]

63 International Classification of Non-Tariff Measures, United Nations Conference on Trade and Development, 2012
64 In some areas the EU replaces national legislation with harmonised rules. These are common standards which exist in areas such as technical regulations, and food safety and animal health.
65 Where rules are not harmonised, the Single Market guarantees that products and services can be sold irrespective of their differences through mutual recognition of member state regulations.
66 The rules of the Single Market are underpinned by institutions to ensure they are enforced.
67 Trade after Brexit: Options for the UK's relationship with the EU, Institute for Government, 18 December 2017
68 Q137
69 Q167
70 Q441

79. We also heard concerns that regulatory divergence from the EU could have a negative impact on seeking FTAs with non-EU countries post-Brexit. AHDB told us:

> We are already experiencing questions from third-country markets about how the UK, post Brexit, proposed to maintain the current EU standards, which were the standards that were agreed with these importing countries that we have historic agreements with.[71]

80. Some witnesses told us that Brexit was an opportunity to seek some degree of change in regulations to better target them to the United Kingdom. But they recognised that any change in regulations would be constrained by the need for some sort of continued alignment in order to facilitate trade with the EU.[72] Some examples included: "streamlining and rationalising" the pig sector;[73] and introducing a more open, more risk-based approach to certain niche sectors in plant health regulation.[74]

81. We heard that Brexit would be an opportunity to re-develop regulation around animal disease and animal welfare policy. The National Pig Association spoke of the current threat to the pig sector from African swine fever, and the danger it posed to our export market if it reached the UK. It continued:

> There is definitely an opportunity to rationalise our policy on imports in particular, and to look at a more country-by-country profile in Europe as to where risks are generated. At the moment, it is a common trade area and products can move very freely. We can look at that and rationalise it. Being an island nation, … we at least have the ability to look at it again and decide how we can implement a policy that keeps disease out properly.[75]

82. The RSPCA told us that there was also an opportunity to go further than current EU legislation to improve farm animal welfare standards, for example, for the UK to develop animal specific legislation in sectors such as ducks, dairy and beef cattle standards.[76]

83. Some witnesses, on the other hand, cautioned that raising standards could undermine UK farmers' competitiveness. The British Retail Consortium told that there was a need to "be careful about raising regulations to a certain point simply for the sake of it, but you may not always be able to pass the value of that on to consumers. The last thing we want to do is look at a higher tier of regulation that is not valuable to the consumer".[77]

84. Food and Drink Federation (FDF) Scotland spoke of the need to ensure that the EU recognised UK regulations in any post-Brexit scenario: "The whole point of Brexit is to make sure that we can make our own rules in the UK, but without mutual recognition of those standards between the UK and EU there is an enormous amount of additional work that businesses will have to do, in particular to export into the EU".[78]

71 Q126
72 Q167
73 Q381
74 Qq144,167
75 Q372
76 RSPCA (BRT0025)
77 Q505
78 Q469

85. **Leaving the Single Market could lead to regulatory divergence. It is not yet clear if the Government intends to maximise UK sovereignty, at the cost of less access, or whether it intends to achieve maximum access, but with the loss of opportunity to create bespoke regulations for the UK's benefit.**

86. ***The Government must make it clear to industry how it intends to deal with potential regulatory divergence with the EU, and the mechanisms it will put in place to track divergence in the future.***

Geographical indicators

87. A geographical indicator (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. The United Kingdom has a total of 65 products with protected status. Examples in the UK include cornish clotted cream, stilton cheese, welsh lamb, and scotch beef. Witnesses mentioned geographical indicators (GIs) as a priority for a trade agreement with the EU.

88. HCC told us that GIs added value to products such as Welsh Lamb and Welsh Beef: "In some established EU markets there is high consumer recognition of this designation, but more generally in the global food industry, it is recognised as a mark of quality".[79] Ladies in Beef told us that more could be done in promoting geographical indicators. She noted that the Protected Geographical Indicators of West County Beef and Lamb had been "hard won" and that it had huge potential, but there needed to be an increased marketing budget behind it.[80]

89. HCC told us that the loss of PGI status might require a fundamental re-branding exercise for Welsh lamb and Welsh beef, which could entail "very substantial costs".[81]

90. The EU scheme for GIs allows for international registration, for example Colombian Coffee. However, HCC told us that legislation giving mutual equivalent protection for European food names had to be incorporated into the third country's law.

91. **Geographical indicators enable UK businesses to add value to their product and to assert provenance and quality. *The Government must ensure that protected geographical indicators are retained in a similar form after the UK leaves the EU.***

Customs Checks

92. UK membership of the EU Customs Union means that there are no customs duties inside the union and there is no need for UK traders to prove the origin of their goods at internal borders. Trade in food products of animal origin for human consumption between Members States takes place without certification or controls at borders between the different Member states. There are no charges or any specific hygiene inspections on these consignments.[82]

93. During the inquiry, we took evidence on the impact that the UK trading as a "third country" would have. Our witnesses told us that Brexit presented challenges to maintaining

79 Hybu Cig Cymru (BRT0034)
80 Q61
81 Hybu Cig Cymru (BRT0034)
82 Mr Neil Brooks (BRT0005)

the current flow of trade. As a "third country" the UK will be subject to strict customs checks and controls at the first point of entry into the territory of the EU, to ensure that products are of a satisfactory standard.

94. For example, exporters of products of animal origin will need to go through the following steps:

(1) register with the EU as a third country company that is authorised to export animal products to the EU;

(2) apply for relevant import licences along with documentary proof of the product's country of origin:

(3) apply and pay for veterinary certificates to show that the product meets EU public health standards;

(4) notify the relevant EU Border Inspection Post (BIP) in advance of the arrival of the goods;

(5) arrive at the first point of entry into the EU only at an approved EU Border Inspection Post;

(6) submit the goods for veterinary inspection before the consignment is permitted to freely move on to its destination within the EU.[83]

95. During the inquiry we looked at two impacts of trading outside a customs agreement: an increase in cross border administration paperwork; and border inspection post capacity.

Increased Cross Border Administration Paperwork

96. Witnesses told us that new checks on rules of origin[84] and new declarations would be a significant barrier to the smooth flow of goods between the UK and EU. Rules of origin would apply to the UK both were it to agree a FTA with the EU, and also if it were to trade under WTO rules.

97. Rules of origin are an "incredible complex subject", and many UK small and medium-sized businesses will not have had experience of dealing with them.[85] The British Meat Processors Association noted the negative affect it would have on supply chains, particularly on the pork sector: "The real complications come when you bring something into a country, make it in another product and then export it. Then you have to start deciding what percentage of that product has come from one particular country. It is a pretty complicated area".[86]

98. If the UK is treated as a third country post-Brexit, exports or imports of animals or animal products to and from the EU must be accompanied by a health certificate, signed by a veterinary surgeon. The British Veterinary Association estimated that post-Brexit the volume of products requiring veterinary certifications could increase by 325%.[87]

83 Mr Neil Brooks (BRT0005)
84 Rules of origin are used to determine where a product and its components were produced, thereby ensuring that the correct customs is levied.
85 Q61
86 Q61
87 British Veterinary Association (BRT0027)

99. The current system for veterinary certificates is a paper-based system. AHDB told us there was a need to transition towards an electronic health certificate type arrangement. The NFU agreed that the Government needed to invest in IT systems to improve traceability that enabled data to be shared along the supply chain and to ensure that export health certificates were in place.[88]

100. There are currently 1,063 Official Veterinarians authorised by the Government's Animal and Plant Health Agency (APHA) to certify food products for export to third countries. The British Veterinary Association told us that this would have to be significantly increased.[89] The Royal College of Veterinary Surgeons highlighted the UK's reliance on non-British vets. The Food Standards Agency estimated that 95% of veterinary surgeons working in the meat hygiene sector graduated overseas.[90] They stated that any threat to the inflow of EU vets would be a threat to the UK's ability to trade animal products internationally.[91]

101. Witnesses told us that it was important for the UK to retain veterinary equivalence once it left the EU in order to maintain access to third markets. The NFU cited the example of South Africa (the UK's biggest export market for poultry), where the EU has a veterinary agreement with South Africa, which grants EU Member States, including the UK, veterinary equivalence.[92]

102. **Export certification demands are likely to increase dramatically. We recommend that the Government set out how it intends to increase resources to ensure that trade is not affected by delays in the process.** ***It is imperative that the Government invest in IT systems to support a more efficient export certification process in order to minimise delays to trade.***

103. ***Non-British EU veterinary surgeons are critical to the UK veterinary workforce. The Government must set out how it intends to ensure working rights for non-British EU vets currently working in the UK and to support the veterinary workforce going forward to ensure that it can meet the needs of the UK's food industry in the future.***

Border Inspection Post capacity

104. Any consignment of animals or animal products from third countries to the EU, may only enter the EU at a designated border inspection post (BIP). All such consignments of imported animal food products are subject to a documentary, identity and possibly physical examination at the first point of entry into the EU, and all consignments must pay a hygiene inspection charge depending upon the type and amount of the commodity being examined. These charges are harmonised, laid down in EU legislation and quite independent of any customs dues payable.[93]

105. On the northern coast of the EU nearest to Britain there are only a limited number of approved EU border inspection posts. Mr Neil Brooks, former Principal Veterinary

88 National Farmers' Union (BRT0030)
89 British Veterinary Association (BRT0027)
90 Written evidence received from the Food Standards Agency as part of our Feeding the nation: labour constraints inquiry, Session 2016-17, (LSH0010)
91 Royal College of Veterinary Surgeons (BRT0054)
92 National Farmers' Union (BRT0030)
93 Mr Neil Brooks (BRT0005)

Administrator at the European Commission, told us that this would limit the ports through which UK exporters of products of animal origin may initially send or route their consignments of these products.[94] Calais and Boulogne are not currently listed as border inspection posts; while the only listed BIP in the Republic of Ireland is Dublin. There are no control points at the land border between the Republic of Ireland and Northern Ireland.

106. Witnesses expressed concern that additional checks at the border would lead to delays and affect the flow of trade. FDF Scotland described the physical delays that additional customs checks would cause:

> [They] require[…] a lorry to stop. It requires someone to look in the lorry, it requires the paperwork to be checked. It requires the lorry to go back in line and it requires it to go on to the train or on to the boat, or across the border between Ireland and Northern Ireland. All that is something that is currently in play with countries outside the European Union when it comes in. All of that can be a delay.[95]

107. Current border inspection posts are not capable of dealing with additional checks required from imports and exports to and from the EU. The primary freight port between Europe and the UK is the Port of Dover. On an average day, almost 16,000 trucks pass through the Port of Dover.[96] This capacity was achieved through dismantling all checks at both Dover and Calais.

108. At ferry terminals, disembarkation is free flow unless a vehicle is pulled aside, and vehicles travel through the ports incredibly quickly, with very limited human intervention.[97] There is no parking space for disembarking from the ships and there are no services in the terminal for any truck that does have to stop. The ferry terminal has a just-in-time logistics model which is dependent on goods arriving punctually and predictably. The British Meat Processors Association expressed concern that Dover and Holyhead would be unable to cope with the likely amount of border clearances involved unless suitable arrangements were put in place.[98]

109. The RSPCA expressed concern that, on leaving the EU customs union, the UK would no longer have access to TRACES (Trade Control and Expert System). This is a web-based veterinarian certification tool used by the European Union for controlling the import and export of live animals and animal products within and without its borders. It facilitates the exchange of information between all trading parties and control authorities, speeds up the administrative procedures when trading in plants and animals and can even aid as an enforcement tool. The RSPCA told us that continued access to the system needed to be a "fundamental goal".[99]

94 Mr Neil Brooks (BRT0005)
95 Q464
96 Catastrophe looms at ports after Brexit, shipping industry warns, The Guardian, 12 April 2017
97 Q126
98 British Meat Processors Association (BRT0007)
99 RSPCA (BRT0025)

Northern Ireland

110. There are specific issues relating to trade between Northern Ireland and the Republic of Ireland due to the complexity of the land border. Trade between the two countries is interlinked.

111. The trade in live cattle and sheep, and beef and lamb across the Northern Ireland/Republic of Ireland border takes place on a daily basis, with approximately 390,000 live lambs crossing the border annually.[100] The Livestock and Meat Commission for Northern Ireland told us that the Northern Ireland sheep industry was particularly exposed to the effects of more complicated border arrangements, with approximately 45% of all lambs born in Northern Ireland exported to the Republic of Ireland each year. In 2016, the value of this live trade was approximately £31.5 million.[101]

112. The dairy industries in Northern Ireland and the Republic of Ireland act as one through the supply chain, and dairy products cross the border several times between the farm gate and the consumer. Republic of Ireland dairy co-operatives own approximately 60% of the processing capacity in Northern Ireland. Exports to the Republic of Ireland were approximately 15% of total sales of the Northern Ireland dairy industry in 2015.[102]

113. Witnesses told us that it was essential that two-way access between Northern Ireland and the Republic of Ireland remained "without tariffs and free from burdensome non-tariff administrative measures".[103] Dairy UK said that a hard border would be the least desirable option for the dairy industry.[104]

114. On Friday 8 December 2017, a Joint Statement from the negotiators of the European Union and the United Kingdom Government on Phase 1 included commitments on the approach to be taken to avoid a "hard border" between the Republic of Ireland and Northern Ireland. This entails a commitment, if agreed solutions with the EU are not found to achieve this, to maintaining a "full alignment" with the rules of the Internal Market and the Customs Union in respect of "North-South cooperation, the all island economy and the protection of the 1998 [Belfast] agreement". The document also commits to ensuring there are no new regulatory barriers between Northern Ireland and the rest of the United Kingdom.[105]

115. The Secretary of State told us that the Government was aiming to secure a trade deal overall that would work in the "interests" of the Republic and the UK. He continued that "full alignment […] means that we seek to achieve the same goals, but we reserve the right to achieve them through different means".[106]

116. **Any change in our trade arrangements has implications for the smooth movement of goods between the EU and the UK, and could lead to serious disruption to supply chains. A future bespoke agreement must address the costs and delays associated with customs and border controls.**

100 Q115
101 The Livestock and Meat Commission for Northern Ireland (BRT0013)
102 Dairy UK (BRT0059)
103 Dairy UK (BRT0059)
104 Dairy UK (BRT0059)
105 The Government's negotiating objectives for exiting the EU, 17 January 2017
106 Q575

117. ***Delays at border inspection posts lead to increased costs, and are a threat to perishable goods. It is imperative that the Government sets out how it intends to ensure that the right IT systems and infrastructure are in place for the import and export of agricultural produce so that businesses can continue to trade smoothly with Europe, including the Republic of Ireland, and the rest of the world.***

4 Trade Agreements with Non-EU countries

New Market opportunities

118. EU members have a common trade policy and are represented by the EU in all international trade negotiations. Post Brexit, the UK would be free to seek its own trade deals with the rest of the world.

119. 10% of UK trade currently comes through bilateral agreements that the EU has with third countries. The British Retail Consortium told us that the UK needed to prioritise agreements with those countries, such as South Korea, South Africa, Peru, Chile and Iceland.[107]

120. Witnesses agreed that opportunities for growth areas were outside Europe, in countries such as China, India and the United States. However, the National Sheep Association expressed concern at the length of time it could take to agrees such deals, with some taking 8 to 10 years.[108] In addition, the UK would be competing with others for these export markets. For example, the US was a threat to increasing the poultry market for dark meat, as it had a large established export market in this product.[109]

121. In countries such as China, where status was important, we heard that relationship building at a high level was extremely important in order to achieve trade agreements. While organisations such as AHDB were invaluable in terms of international marketing, sectoral organisations told us that Government to Government relationships were key.[110] The National Sheep Association criticised the current level of engagement: "Where we have fallen down is at a governmental and ambassadorial level, in terms of relationship building at the highest possible level".[111]

122. Witnesses expressed concern that not enough resources were being put into marketing the UK abroad. The National Pig Association said there was a need to better finance and equip "UK plc" to promote exports abroad:

> When you look at our competitors outside the European Union—the United States is a good example—the amount of resource they put in to promoting their export agendas, particularly in south-east Asia, is huge. It is seismic in comparison to anything that we do. If we really want those economies, not just in south-east Asia but around the world, to seriously think that the UK is looking to export quality products that have full traceability … we have to look at properly resourcing UK plc exports so that we are taken seriously as a serious exporting nation.[112]

In agreeing with that, Tulip Ltd. told us "Denmark is a major exporter of pig meat and has 20 people sitting in China. In the UK pig sector, we have one person in China".[113]

107 Q471
108 Q90
109 Q367
110 Q214
111 Q92
112 Q343
113 Q343

123. We have already examined the risk of food produced to lower animal welfare and environmental standards entering the UK when operating under WTO terms (see para 51). Witnesses also expressed concern that welfare standards would be sacrificed in order to achieve free trade agreements. This was felt to be particularly relevant in discussions with the USA, where there has been a lot of media focus on chlorinated chicken and hormone-treated beef.

124. Compassion in World Farming told us that it was "vital" that any new trade agreement included a clause requiring imports to meet UK animal welfare and environmental standards.[114]

125. In an earlier appearance before the Committee, the Secretary of State went on record saying *yes* to the question as to whether a trade deal could be thwarted on standards issues.[115] During this inquiry, he told us that the Government would be assertive in defence of its own interests. He agreed that high welfare standards were not only important to consumers but also to the UK's international reputation.[116]

126. It was recognised that new market opportunities would not replace EU trade, particularly as it was a natural trade partner.[117]

127. **On leaving the EU, if there is no customs union, the UK will be able to pursue free trade agreements with non-EU countries. It is essential that the Government identify those countries where resources should be targeted.** ***The Government must start developing relationships at a high political level with potential trading partners in order to ensure that agreements are signed to the benefit of the UK. The Government must also investigate how it can utilise the expertise within the House of Lords and House of Commons in building relationships and representing the UK overseas.***

128. ***While we recognise the huge benefit that trade agreements could bring, these must not at the detriment of the UK's reputation for high animal welfare, environmental and food standards. The UK Government must not allow imports that that have not been produced to the UK's high standards.***

Country of Origin labelling

129. Witnesses told us that leaving the EU would allow the Government to frame its own food labelling legislation. Improved legislation would allow consumers to distinguish between food produced domestically and to high welfare standards, and imports where standards were not as high.

130. Currently, EU regulations on country of origin labelling of meat allow for meat products to be labelled with the country where the last significant change in production took place—and not necessarily where the animal had spent its entire life. If the UK continued with current practice, the Royal Institute of International Affairs noted that this could lead to a situation where, were chlorine-washed US chicken used as an ingredient in a UK-made chicken pie, it would not require labelling.[118]

114 Compassion in World Farming (BRT0003)
115 The work of Defra, Oral Transcript, Environment, Food and Rural Affairs Committee, Session 2017-2019 HC 321
116 Q565
117 Hybu Cig Cymru (BRT0034)
118 The Royal Institute of International Affairs (BRT0058)

131. Sustain also spoke of the need to introduce mandatory method of production labelling.[119] At present, meat and milk do not have to be labelled to identify how they were produced. We heard that mandatory egg labelling had seen free-range sales increase dramatically, and that this should be replicated into other areas.[120]

132. George Eustice MP told us the UK had always supported more mandatory country of origin labelling, and that the EU has resisted clearer labelling on processed food such as bacon, sausages and cheese. He recognised that this was an area that the UK could introduce nationally post-Brexit.[121]

133. **It is essential that consumers be fully informed about the food that they are consuming. Current food labelling under EU regulations is not sufficient**. ***We recommend that the Government improve country of origin labelling following the UK's departure from the EU. We also recommend that the Government introduce mandatory method of production labelling.***

119 Sustain (BRT0039)
120 RSPCA (BRT0025)
121 Q649

5 Conclusion

134. For over 40 years, the UK has shared a strong trading relationship with the EU. Brexit will inevitably introduce friction to trading routes.

135. During trade negotiations, it is vital that the impacts of tariffs on the agricultural industry are fully understood and taken account of. The Government must ensure that the interests of the industry are not pushed aside for the benefit of other higher-profile industries, such as financial services. Different scenarios will affect agri-food sectors differently.

136. Non-tariff barriers are also a huge concern to the agricultural industry. These will add additional paperwork and checks to trade, with the potential to cause an additional expense and delays to businesses. The Government must be prepared for a situation where we trade under WTO rules, and start preparing accordingly.

137. There are opportunities for different sectors to improve their domestic markets. However, this will not happen overnight. The Government must look at ways to support the agricultural industry during this transition.

138. As the Government looks beyond the EU for new free trade agreements, it must not sacrifice our reputation for animal welfare and environmental standards. Cheap imports into the UK could have a huge impact on how the British brand is viewed overseas and affect our long term prospects.

Conclusions and recommendations

Tariffs on UK-EU exports under WTO rules

1. The EU is the UK's most significant trading partner. Although the Government's intention is to agree a comprehensive free trade agreement and customs agreement with the EU, there is no guarantee that this will occur. In the event that the UK leaves the EU without a free trade agreement, UK-EU trade will proceed under World Trade Organisation (WTO) rules. Reverting to WTO tariffs will have a significant impact upon agriculture as tariffs are higher for agricultural products than for other goods and services. (Paragraph 27)

2. We note that the sheep, dairy and cereals sectors, those particularly dependent on the export market, will be most affected. (Paragraph 28)

3. While we recognise and welcome work that has been done by organisations such as AHDB in providing detailed sectoral analysis on the impact of tariffs on the UK's agricultural sectors, it is imperative that Defra undertakes similar work as a matter of urgency to evaluate the impact of any deal that the Government might be negotiating. (Paragraph 29)

4. *We recommend that Defra publishes a sector-by-sector analysis of the impact of Brexit before the publication of the Agriculture Bill.* (Paragraph 30)

Fortress UK, applying WTO tariffs on imports

5. *The agricultural industry needs clarity as to the Government's long-term vision and future support. We call for the publication of the Agriculture Bill as soon as possible.* (Paragraph 47)

6. *The Government needs to support British farming and agriculture in preparing for business post-Brexit. Defra should consider providing a fund to support our food producing industry to adapt effectively to the challenge ahead.* (Paragraph 48)

7. *The Government should consider what support can be offered to sectors where imports into the UK and exports out of the UK are roughly equal, such as the dairy industry, that can make us more self-sufficient. This would offer these sectors an opportunity to become more productive. It would give people the confidence to invest, keep food prices down and keep farmers in business.* (Paragraph 49)

Trade liberalisation

8. When establishing its own tariffs at the WTO, the Government must give careful consideration to the impact on the UK's agricultural industry. High tariffs on imports would raise the cost for consumers while removing tariffs could lower the cost for consumers but have a devastating effect on the long-term future of the UK's agricultural industry. Such a move could put many UK farmers out of business, which would be detrimental to the rural economy, and render the UK dependent on imported food. (Paragraph 62)

9. The Government has offered no clarity to the agricultural industry on its post-Brexit policy. The Government must offer this clarity and stability so that the industry has the confidence to invest and take advantage of the opportunities offered to the industry post-Brexit. We would like to see the Government offer policies that would stimulate home grown food production. (Paragraph 63)

10. The UK has an international reputation for high animal welfare, environmental and food standards. These must not be sacrificed on the altar of cheap imports. Doing so could undermine the premium British brand and might affect our ability to negotiate trade deals with other countries. We will hold the Secretary of State to his assurances that there will be no compromise on animal welfare, environmental and food standards. (Paragraph 64)

Tariff Rate Quotas

11. *Post-Brexit, the UK will be responsible for setting its own Tariff Rate Quotas. This should be carefully considered as it will have an impact on England, Scotland, Wales and Northern Ireland. We call on the Government to announce these quotas as soon as possible, so that the UK agricultural industry can have trading certainty for 2019 and onwards.* (Paragraph 71)

Regulations and Standards

12. Leaving the Single Market could lead to regulatory divergence. It is not yet clear if the Government intends to maximise UK sovereignty, at the cost of less access, or whether it intends to achieve maximum access, but with the loss of opportunity to create bespoke regulations for the UK's benefit. (Paragraph 85)

13. *The Government must make it clear to industry how it intends to deal with potential regulatory divergence with the EU, and the mechanisms it will put in place to track divergence in the future.* (Paragraph 86)

Geographical indicators

14. Geographical indicators enable UK businesses to add value to their product and to assert provenance and quality. *The Government must ensure that protected geographical indicators are retained in a similar form after the UK leaves the EU.* (Paragraph 91)

Increased Cross Border Administration Paperwork

15. Export certification demands are likely to increase dramatically. We recommend that the Government set out how it intends to increase resources to ensure that trade is not affected by delays in the process. *It is imperative that the Government invest in IT systems to support a more efficient export certification process in order to minimise delays to trade.* (Paragraph 102)

16. *Non-British EU veterinary surgeons are critical to the UK veterinary workforce. The Government must set out how it intends to ensure working rights for non-British EU vets currently working in the UK and to support the veterinary workforce going forward to ensure that it can meet the needs of the UK's food industry in the future.* (Paragraph 103)

Border Inspection Post capacity

17. Any change in our trade arrangements has implications for the smooth movement of goods between the EU and the UK, and could lead to serious disruption to supply chains. A future bespoke agreement must address the costs and delays associated with customs and border controls. (Paragraph 116)

18. *Delays at border inspection posts lead to increased costs, and are a threat to perishable goods. It is imperative that the Government sets out how it intends to ensure that the right IT systems and infrastructure are in place for the import and export of agricultural produce so that businesses can continue to trade smoothly with Europe, including the Republic of Ireland, and the rest of the world.* (Paragraph 117)

Trade Agreements with Non-EU countries

19. On leaving the EU, if there is no customs union, the UK will be able to pursue free trade agreements with non-EU countries. It is essential that the Government identify those countries where resources should be targeted. *The Government must start developing relationships at a high political level with potential trading partners in order to ensure that agreements are signed to the benefit of the UK. The Government must also investigate how it can utilise the expertise within the House of Lords and House of Commons in building relationships and representing the UK overseas.* (Paragraph 127)

20. *While we recognise the huge benefit that trade agreements could bring, these must not at the detriment of the UK's reputation for high animal welfare, environmental and food standards. The UK Government must not allow imports that that have not been produced to the UK's high standards.* (Paragraph 128)

Country of Origin labelling

21. It is essential that consumers be fully informed about the food that they are consuming. Current food labelling under EU regulations is not sufficient. *We recommend that the Government improve country of origin labelling following the UK's departure from the EU. We also recommend that the Government introduce mandatory method of production labelling.* (Paragraph 133)

Formal minutes

Wednesday 7 February

Members present:

Neil Parish, in the Chair

Alan Brown	Mrs Sheryll Murray
Paul Flynn	Angela Smith
Sandy Martin	Julian Sturdy
Kerry McCarthy	

Draft Report (*Brexit: Trade in Food*) proposed by the Chair, brought up and read.

Question put, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 47 agreed to.

Motion made, and Question put, That paragraph 48 stand part of the Report.

The Committee divided.

Ayes, 4	**Noes, 2**
Alan Brown	Paul Flynn
Sandy Martin	Kerry McCarthy
Mrs Sheryll Murray	
Angela Smith	

Question accordingly agreed to.

Paragraph—(*Neil Parish*)—brought up and read, as follows:

"The Government should consider what support can be offered to sectors where imports into the UK and exports out of the UK are roughly equal, such as the dairy industry, that can make us more self-sufficient. This would offer these sectors an opportunity to become more productive. It would give people the confidence to invest, keep food prices down and keep farmers in business."

Question put, That the paragraph be read a second time.

The Committee divided.

Ayes, 4	Noes, 2
Alan Brown	Paul Flynn
Sandy Martin	Kerry McCarthy
Mrs Sheryll Murray	
Angela Smith	

Ordered, That the paragraph be read a second time.

Paragraph (now paragraph 49) agreed to.

Paragraphs 49 to 137 (now 50 to 138) agreed to.

Summary agreed to.

Resolved, That the Report be the Third Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

[Adjourned till Wednesday 21 February at 2.30 p.m.

Witnesses

The following witnesses gave evidence. Transcripts can be viewed on the inquiry publications page of the Committee's website.

Wednesday 1 November 2017

Nick Allen, Chief Executive, British Meat Processors Association; **Jilly Greed**, Co-founder, Ladies in Beef; **Christopher Dodds**, Executive Secretary, Livestock Auctioneers' Association Limited; **Jane Basset**, Sheep Farmer, Peak District — Q1–87

Phil Stocker, Chief Executive, National Sheep Association; **Michael Haverty**, Senior Agricultural Economist, The Andersons Centre; **Chris Mallon**, Chief Executive, National Beef Association; **Dr Phil Hadley**, Agriculture and Horticulture Development Board — Q88–138

Wednesday 15 November 2017

Siân Thomas, Communications Manager, Fresh Produce Consortium; **Raoul Curtis-Machin**, Director of Horticulture, Horticultural Trades Association; **Nick Marston**, Chairman, British Summer Fruits — Q139–204

Sarah Mukherjee, Chief Executive, Crop Protection Association; **Dr Martin Grantley-Smith**, Strategy Director Cereals & Oilseeds, Agriculture and Horticulture Development Board (AHDB); and **Michael Hambly**, Chairman, NFU Crops Board — Q205–277

Wednesday 29 November 2017

Michael Oakes, Chairman, NFU Dairy Board; **Paul Vernon**, Chair, Dairy UK; **Nick Whelan**, Group Chief Executive, Dale Farm; **Ash Amirahmadi**, Senior Vice President of Sales, Arla Foods UK — Q278–327

Edward Barker, Senior Policy Adviser, National Pig Association; **Richard Griffiths**, Chief Executive, British Poultry Council; **Peter Allan**, General Manager, Cargill Meats Europe; **Andrew Saunders**, Agriculture Director, Tulip Ltd — Q328–385

Wednesday 6 December 2017

Sue Davies, Strategic Policy Adviser, Which?; **Kath Dalmeny**, Chief Executive, Sustain; **Tim Martin**, Founder and Chairman, JD Wetherspoon — Q386–461

Andrew Opie, Director of Food and Sustainability, British Retail Consortium; **David Thomson**, CEO, Food and Drink Federation Scotland — Q462–526

Wednesday 20 December 2017

Rt Hon. Michael Gove MP, Secretary of State for Environment, Food and Rural Affairs, and **George Eustice MP**, Minister of State for Agriculture, Fisheries and Food, Department for Environment, Food and Rural Affairs — Q527–659

Published written evidence

The following written evidence was received and can be viewed on the inquiry publications page of the Committee's website.

BRT numbers are generated by the evidence processing system and so may not be complete.

1 38 Degrees (BRT0062)

2 Agricultural Biotechnology Council (BRT0070)

3 Agricultural Christian Fellowship (BRT0057)

4 Agriculture & Horticulture Development Board (AHDB) (BRT0029)

5 AIC Ltd (BRT0026)

6 Association of Licensed Multiple Retailers (BRT0050)

7 Arla Foods UK (BRT0074)

8 Association of Independent Meat Suppliers (BRT0036)

9 British Meat Processors Association (BRT0007)

10 British Retail Association (BRT0061)

11 British Egg Industry Council (BRT0072)

12 British Poultry Council (BRT0048)

13 British Sugar plc (BRT0055)

14 British Veterinary Association (BRT0027)

15 Burges Salmon LLP (BRT0052)

16 Centre for European Studies (CEFEUS), Canterbury Christ Church University (BRT0078)

17 Chartered Institute of Environmental Health (BRT0041)

18 Chartered Trading Standards Institute (BRT0080)

19 Chatham House, the Royal Institute of International Affairs (BRT0058)

20 Compassion in World Farming (BRT0003)

21 Conservative Animal Welfare Foundation (BRT0015)

22 Country Land & Business Association (CLA) (BRT0008)

23 Countryside Alliance (BRT0022)

24 Crop Protection Association (BRT0017)

25 Dairy UK (BRT0059)

26 Department for Environment, Food and Rural Affairs (BRT0042)

27 Diabetes UK (BRT0018)

28 Dr Cecilia Juliana Flores Elizondo (BRT0024)

29 Dr Ludivine Petetin (BRT0056)

30 Dr Mary Dobbs (BRT0077)

31 Eating Better (BRT0047)

32 Export Certifcation Ltd - UK Export Certification Partnership (BRT0075)

33 Farmers' Union of Wales (BRT0069)

34 Farmwel (BRT0032)
35 Food and Drink Federation (FDF) (BRT0063)
36 Fresh Produce Consortium (BRT0023)
37 GAFTA (BRT0084)
38 GM Freeze (BRT0045)
39 G's Fresh (BRT0037)
40 Highland Cattle Society (BRT0083)
41 Hybu Cig Cymru - Meat Promotion Wales (BRT0034)
42 Institute of Development Studies (BRT0064)
43 Jim Taylor (BRT0082)
44 Minister of State for Agriculture , Fisheries and Food (BRT0085)
45 Miss Tessa Burrington (BRT0004)
46 Mr Neil Brooks (BRT0005)
47 Mrs Mary Thornbury (BRT0010)
48 Ms Mary Watt (BRT0009)
49 National Farmers' Union (BRT0030)
50 National Pig Association (BRT0033)
51 National Sheep Association (BRT0021)
52 NFU Scotland (BRT0035)
53 NFU Sugar (BRT0012)
54 Northern Ireland Meat Exporters Association (BRT0066)
55 Northway Mushrooms (BRT0067)
56 Professor David Main (BRT0019)
57 Professor Erik Millstone (BRT0040)
58 Provision Trade Federation (BRT0043)
59 Pwet Food Manufacturers Association (BRT0046)
60 Rare Breeds Survival Trust (BRT0038)
61 Royal College of Veterinary Surgeons (RCVS) (BRT0054)
62 RSPCA (BRT0025)
63 Scottish Salmon Producers Organisation (BRT0044)
64 Sheila Moorcroft (BRT0068)
65 Soil Association (BRT0079)
66 Sue Scott (BRT0006)
67 Susan Hedley (BRT0020)
68 Sustain: The alliance for better food and farming (BRT0039)
69 Tate & Lyle Sugars (BRT0049)
70 Tenant Farmers Association (BRT0081)
71 The Food Foundation (BRT0051)

72 The International Meat Trade Association (BRT0002)

73 The Landworkers Alliance (BRT0060)

74 The Livestock and Meat Commission for Northern Ireland (BRT0013)

75 Timber Trade Federation (BRT0028)

76 Unite the Union (BRT0076)

77 History & Policy Global Economics and History Forum, University of Exeter (BRT0016)

78 Which? (BRT0071)

79 Wine & Spirit Trade Association (BRT0053)

List of Reports from the Committee during the current Parliament

All publications from the Committee are available on the publications page of the Committee's website. The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2017–19

Second Report	Pre-Legislative Scrutiny of the draft Animal Welfare (Sentencing and Recognition of Sentience) Bill 2017	HC 709
First Report	2 Sisters and Standards in Poultry Processing	HC 490 (HC 772)
Fifth Special Report	2 Sisters and Standards in Poultry Processing: Government Response to the Committee's First Report	HC 772
Fourth Special Report	Post-legislative scrutiny: Flood and Water Management Act 2010: Government Response to the Committee's Sixth Report of Session 2016–17	HC 447
Third Special Report	Feeding the nation: labour constraints: Government Response to the Committee's Seventh Report of Session 2016–17	HC 446
Second Special Report	Forestry in England: Seeing the wood for the trees: Government Response to the Committee's Fifth Report of Session 2016–17	HC 445
First Special Report	Food waste in England: Government Response to the Committee's Eighth Report of Session 2016–17	HC 444

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In this report:

- Key indicators
- Top 10 products
- Top 20 Markets
- UK food and drink exports over the last 10 years
- Branded Goods
- Top 5 markets
- UK Branded Goods Food and Drink Export Value vs. Export Growth
- Wheat & Wheat-based Products: 5 Year Trends
- UK Exports of wheat-based goods
- UK Food & Drink Exports and imports Regional Map

View export case studies

Download exports snapshot 2018 Q4

Key Indicators

KEY INDICATORS			
	2017	2018	Change
All food & drink	£22.1bn	£22.6bn	**2.5%**
EU	£13.3bn	£13.9bn	**4.3%**
Non-EU	£8.7bn	£8.7bn	**-0.3%**
EU share	60.3%	61.4%	**1.1pp**
Non-EU share	39.6%	38.5%	**-1.1pp**
Trade balance	-£24.3bn	-£24.0bn	**-1.4%**

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Executive summary

- Headline data indicates a **modest increase in UK food and drink exports**, up 2.5% (y-o-y) to £22.6bn in 2018, compared to growth of 9.7% in 2017.
- **Export growth to EU markets was positive** (+4.3%), whilst exports to non- EU markets declined slightly over 2018 (-0.3%), raising the EU share of exports to 61.4%. Although there has been a fall in exports to the UK's non-EU trading partners, three of the top 20 non-EU markets have shown growth rates exceeding 10% (China, Australia, and Singapore).
- Positively, **the food and drink trade deficit narrowed by 1.4%** in 2018, standing at -£24.0bn, which is £348.0m smaller than the same period in 2017.
- As shown in Figure 1, the overall **value of exports has nearly doubled over the past**

decade, from £13.3bn in 2008 to £22.6bn last year.

- **Beer and salmon have reported consistent negative growth** in 2018. This fall in salmon was mainly **driven by the US** (overall drop of £55bn, or 8,718 tonnes), and was closely followed by France, which saw a 6,406 tonne drop in salmon imports from the UK.
- On the other hand, whisky, chocolate, and cheese, **the UK's top 3 food and drink exports, have all shown growth over 2018** in volume and value. Notably, chocolate and cheese both saw faster growth in export volume over 2018 compared with 2017.

Top 10 products

TOP 10 PRODUCTS				
		Change		
	2018	Value	Value (%)	Volume (%)
Whisky	£4.8bn	**£342.3m**	**7.7%**	**3.0%**
Chocolate	£749.5m	**£32.0m**	**4.5%**	**3.9%**
Cheese	£675.4m	**£60.1m**	**9.8%**	**10.8%**
Salmon	£644.9m	**-£84.6m**	**-11.6%**	**-14.2%**
Wine	£630.4m	**£56.1m**	**9.8%**	**21.3%**
Gin	£614.4m	**£80.1m**	**15.0%**	**11.6%**
Beef	£536.6m	**£35.1m**	**7.0%**	**1.9%**
Beer	£489.2m	**-£36.5m**	**-7.0%**	**-6.3%**
Breakfast cereals	£481.6m	**£52.7m**	**12.3%**	**13.2%**
Pork	£465.5m	**£6.7m**	**1.5%**	**3.2%**

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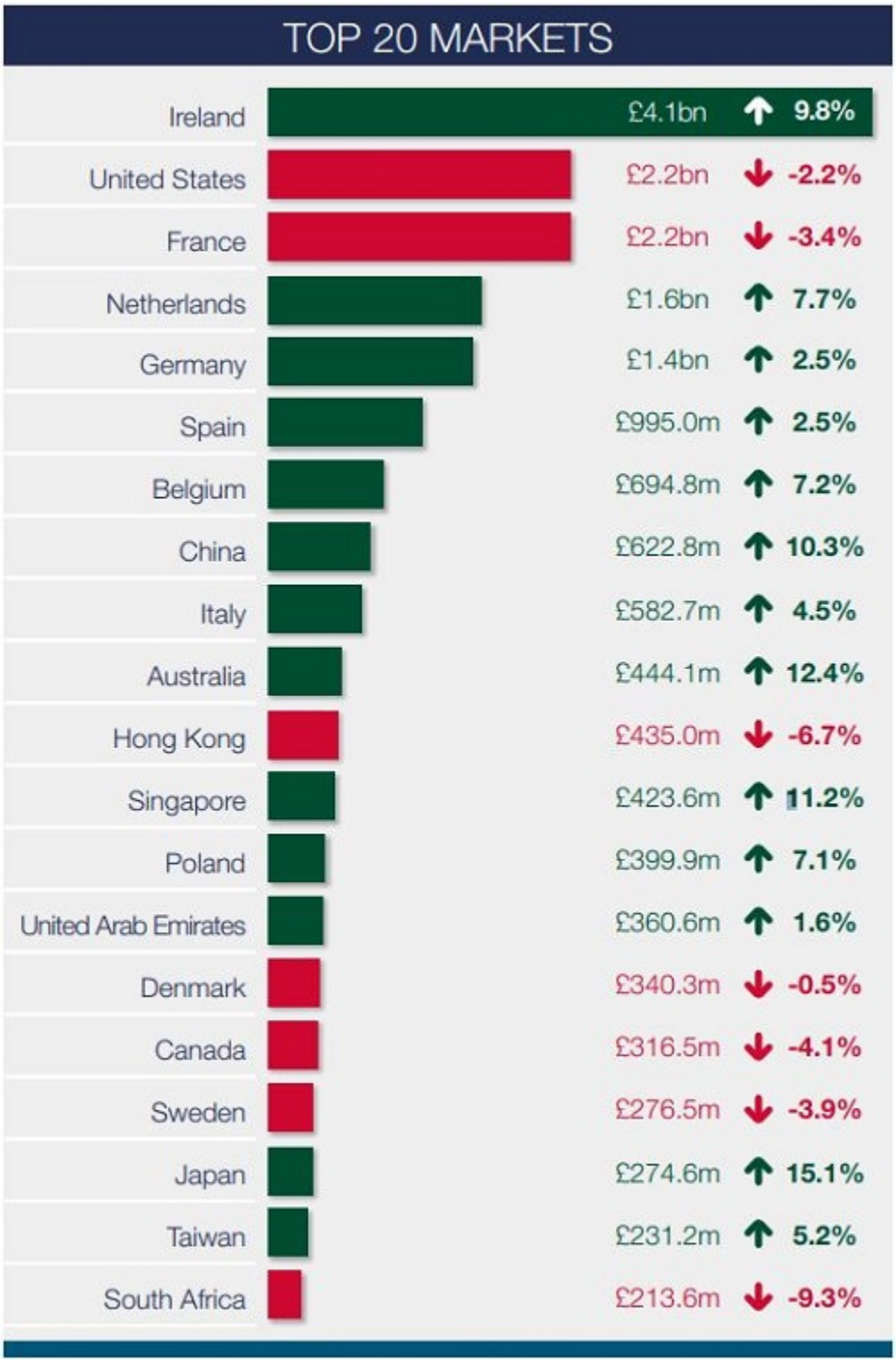
Top 20 markets



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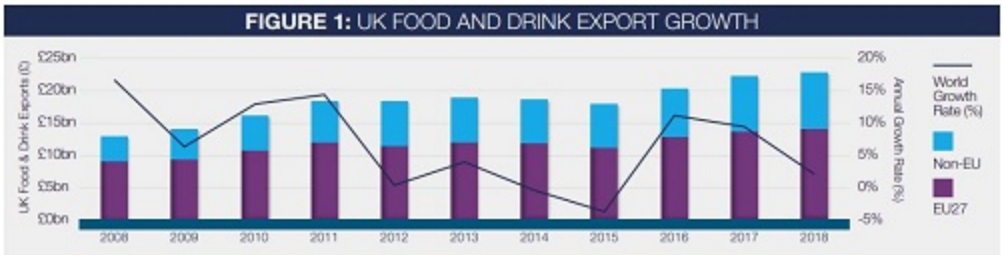
UK food and drink exports over the last 10 years



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FDF Ambition and support for businesses during Brexit

- FDF's industry ambition is to **grow exports of branded food and non-alcoholic drink by a third**, from a 2014 baseline, to reach £6bn by 2020. Since 2014, exports of branded goods have now grown by 27%. **When looking at the last year, exports of branded goods saw negative overall growth** (-0.1%) to £5.8bn against the same period in 2017.
- Though the UK's exports of branded goods are within reaching distance of FDF's export ambition, the dropoff we have seen in 2018 reinforces the need for further dedicated support specific to food and drink exporters
- FDF, supported by supply chain partners, is working with Government to address gaps in export support with the aim of boosting long-term export growth, while supporting food chain businesses as we leave the EU.
- Brexit is a concern for food and drink exporters. In FDF's most recent confidence survey, 30% of members expressed **concern over decreased export profitability**, highlighting the pressure that businesses are under across all parts of their business.
- This is in line with continued concerns over increased input prices, loss of access to EU preferential trade agreements and additional border/customs requirements, which were reported as expected barriers to business success in 2019 by up to 86% of respondents.

Branded Goods

BRANDED GOODS[1]			
	2017	2018	Change
World	£5.8bn	£5.8bn	**-0.1%**
EU	£3.9bn	£4.1bn	**5.0%**
Non-EU	£2.0bn	£1.8bn	**-10.2%**
EU share	66.4%	69.8%	**3.4pp**
Non-EU share	33.6%	30.2%	**-3.4pp**

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Impact of currency on export sales

- Between 2016 and 2017, export values to all major trade partners increased (except for Spain) whereas in 2018, **exports to 7 of our 20 largest export markets reported negative growth**.
- In 2018 **the relative value of the Pound against all major currencies strengthened**, in contrast to 2017 when the value of the Pound reached more than a 10- year low. Export values benefit from currency devaluations, making them globally competitive, although firms importing raw materials will face higher costs of imports.
- Currency devaluation is only one of the contributors to export value growth. UK food and drink exports are seen to be high quality and safe products that consumers trust, with brand promotion leading to increased overseas sales. Better export support services available to UK exporters also play a big part.
- In our research, we have explored the correlation between EU27 exports and the GBP/EUR exchange rate which showed that **a 10% rise in the value of the pound against the euro tends to be associated with a 4% decline in the value of EU27 exports**.

Top 5 markets

TOP 5 MARKETS			
	2017	2018	Change
Ireland	£1.4bn	£1.5bn	**7.2%**
Germany	£515.5m	£523.3m	**1.5%**
Netherlands	£426.1m	£452.7m	**6.2%**
France	£371.8m	£362.4m	**-2.5%**
United States	£201.8m	£214.7m	**6.4%**

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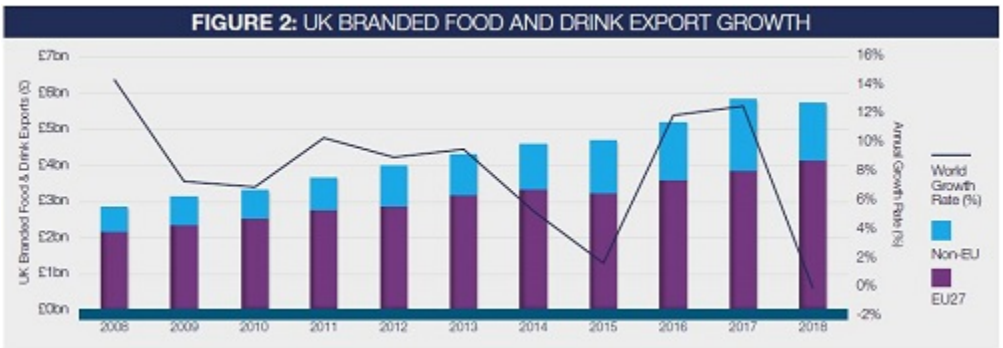
UK Branded Goods Food and Drink Export Value vs. Export Growth



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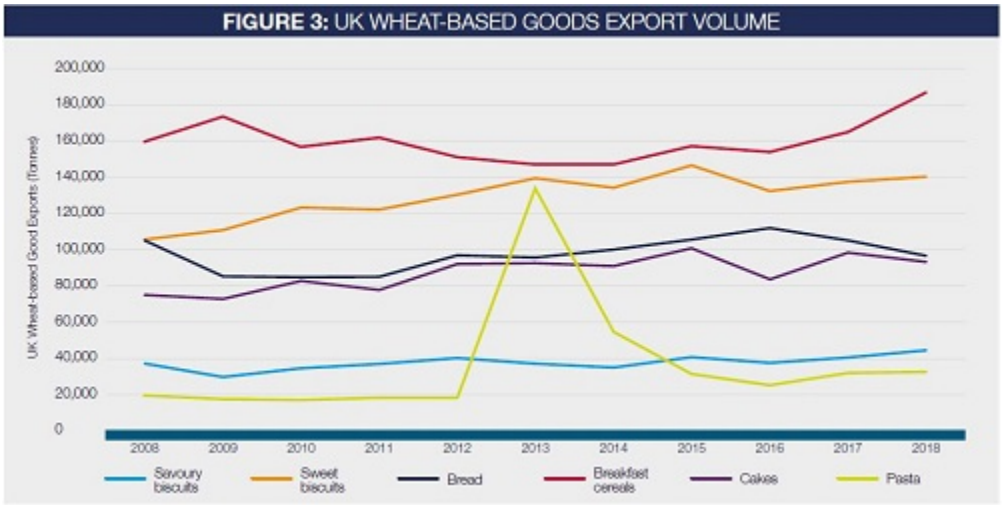
Exports of wheat-based goods

- **Wheat and wheat-based goods** (such as breakfast cereals, sweet biscuits, cakes and breads) **account for around 10% of overall UK food and drink exports**, and are consistently found in the top 50 exported food products.
- Figure 3 demonstrates that the **volume of wheat-based good exports have shown mixed performance over the past decade**, with the slowest growing product being breakfast cereals (16.3% since 2008), and the fastest growing product being pasta (50.7% since 2008). However, the **amount of wheat (as a commodity) and bread being exported has fallen** at an average rate of 17% and 1% respectively per year over the past decade. Overall, the quantity of wheat-based good exports have risen by 16.9% since 2008.
- The table opposite outlines the UK exports of wheat and wheatbased goods over the past 5 years. **Sweet biscuits and breakfast cereals are the top two exported products** in this category, both worth more than £400m in 2018.
- Despite being one of the lower performers (in terms of value), pasta exports have shown the fastest growth over the past 5 years (6.7% CAGR over the past 5 years), when compared with wheat and other wheat-based goods. In contrast, wheat exports themselves have fallen significantly.
- **Between 2012 and 2013, pasta exports saw a notable rise, both in value and volume** (+22% and +617% respectively). This sharp increase was driven by a 113,065 tonne rise (919%) in exports to Ireland. This was followed by a tail-off in demand for UK-produced pasta in 2014.

Wheat & Wheat-based Products: 5 Year Trends



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UK Exports of wheat-based goods

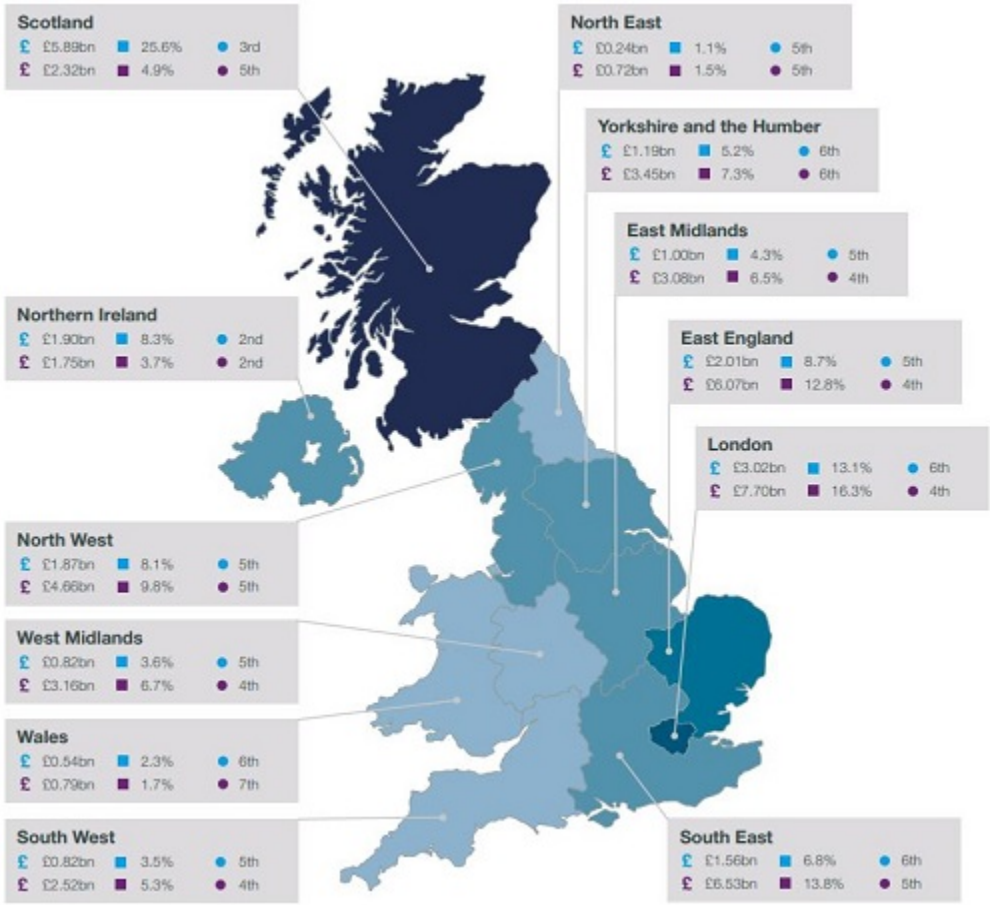
- The **UK's top destination for all wheat and wheatbased good exports is Ireland**, with 35.2% being exported there in 2018. Overall, the EU is the largest buyer of UK wheat-based products, holding a share of 70% of export value in 2018. The US and France are also significant importers of UK-produced bread and biscuits.
- Exports of all products increased in 2018, with the exception of cakes, which decreased by 13%. The **fastest growing product was pasta**, due to a 46% increase in sales to non-EU

countries led by Australia and Hong Kong.

- For cakes, bread and pasta, more than two thirds of export sales are accounted for by the top 5 trading partners. The top 5 markets for these products are almost exclusively EU27 countries (Ireland, France, the Netherlands, Germany, and Belgium). Amongst them, only pasta forms an exception, with 6.9% of UK-produced pasta going to Australia.
- Looking at growth over the past year, **non-EU markets have been a key point of interest, notably the UAE (United Arab Emirates), Hong Kong, and Australia**. The three markets combined account for around 10% of UK wheat-based good exports.

View dataset »

UK Food & Drink Exports and imports Regional Map



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Last reviewed: 25 Mar 2019

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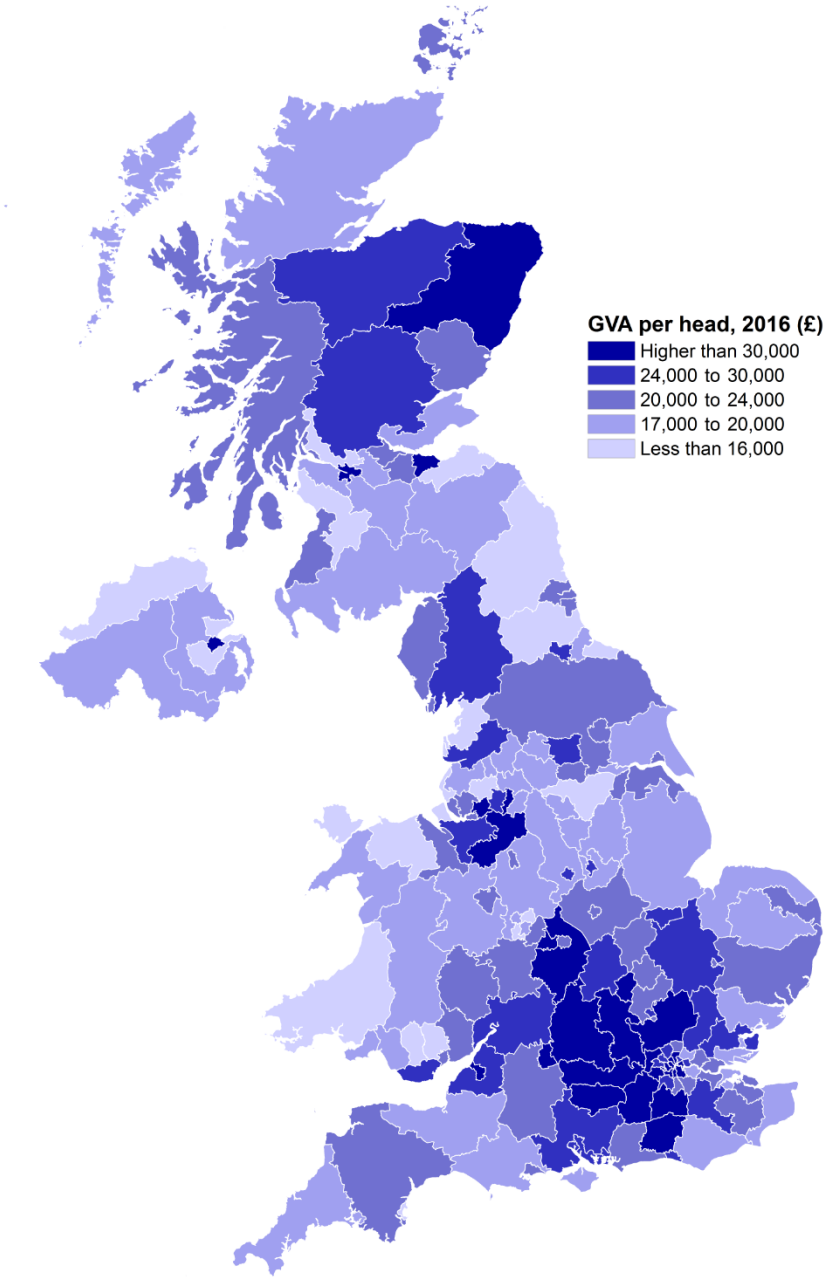
BRIEFING PAPER

Number 05795, 5 September 2018

Regional and local economic growth statistics

By Daniel Harari



Inside:

1. What is economic growth?
2. Regional and country growth
3. Local area growth

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Adjusting for inflation 4

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3.2 Spreadsheet of data for local areas 11

Contributing authors: Jenny Brown (maps)

Cover image copyright: GISCO - Eurostat (European Commission); Administrative boundaries: © EuroGeographics, UN-FAO, Turkstat.

Summary

This briefing paper provides an overview of annual statistics on the economies of the UK's regions and countries as well as local areas. There is analysis of recent economic growth rates, for 2016 as well as since 2010, and 1998. In addition to overall growth rates, figures for economic output per head are included (including in two maps at the back of the briefing) to provide very rough comparisons of living standards by local areas.

Economic output here is measured using Gross Value Added (GVA), which is very similar to GDP. Regional growth figures are adjusted for inflation. Some observations:

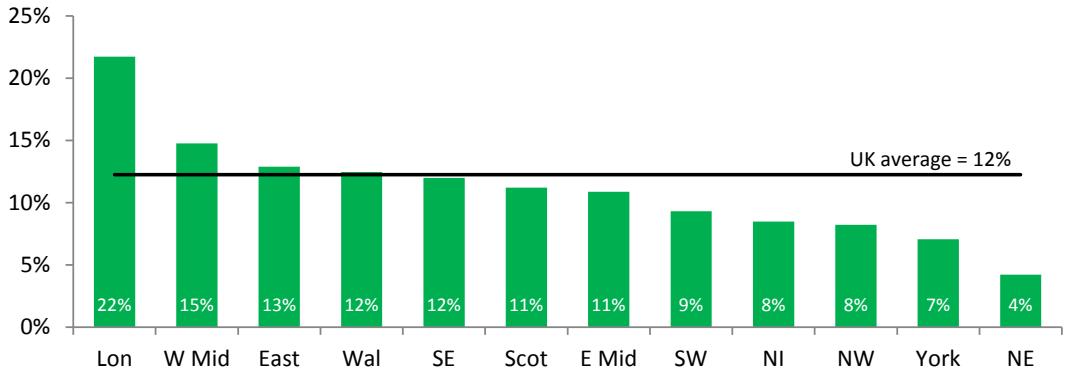
- In 2016, London's GVA of £408 billion accounted for 23% of the UK total (£1,748 billion), with the South East contributing a further 15%.

- London saw the highest annual growth in 2016 of 3.0%, compared with the UK figure of 1.6%. The lowest rate of growth was seen in the North East which contracted by 1.0%.

- Cumulative economic growth from 2010 to 2016 was highest in London at 22%. The second highest rate of growth was in the West Midlands at 15%. The weakest growth recorded was in Yorkshire & the Humber at 7% and the North East at 4%. The UK grew by 12%. The chart below shows figures for all regions and countries.

Cumulative economic growth by UK region/country, 2010-2016

GVA (balanced approach), adjusted for inflation



- In 2016, London had the highest GVA per head, 76% above the UK average and more than double that of 7 of the remaining 11 regions and countries of the UK.

- The top 5 local areas with the highest GVA per head are in (mostly central) London. This at least in part reflects the large numbers of commuters who work there.

- Between 2010 and 2016, Hounslow and Richmond upon Thames (+45%), followed by Warwickshire (+38%) had the biggest increases in GVA per head. The areas which saw the smallest increases in GVA per head were Great Manchester South East and Liverpool (both with a 1% increase). The overall change in UK GVA per head over this time was +19%. These figures are not adjusted for inflation.

- A spreadsheet containing information on 2016 GVA per head and how its changed since 2010 for the local area of your choice (as well as the region/country it is in and the UK) is also available from this briefing paper's landing page.

1. What is economic growth?

When economists talk about how large an economy is, they are usually referring to its total output – the total value of new goods produced and services provided (excluding production costs) in a given time period. This is calculated for the UK using Gross Domestic Product (GDP).

Economic growth is simply the difference in GDP between two periods. For example, if GDP in the first year is £100 billion and in the second is £102 billion, GDP growth, or economic growth, is 2%.

Data availability

Regional and local data are different to national GDP growth figures

At a regional and country or local level, GDP data are not available, but another very similar measure called Gross Value Added (GVA) is. GVA is Gross Domestic Product (GDP) excluding taxes and subsidies on products (so GVA does not include VAT, for example).

These estimates allow us to see where the UK's economic output is being produced. GVA per head also provides us with a crude measure of living standards, enabling comparisons of different parts of the country.

These sub-national GVA figures are published once a year by the Office for National Statistics (ONS), usually in December, for the previous year. For instance, the most recent figures were published on 20 December 2017 and cover the years up to 2016.[1] Headline figures for UK GDP are published on a monthly basis and are available around six weeks after the end of the month concerned.[2]

Adjusting for inflation

The UK's GDP growth figures are usually reported in real (inflation-adjusted) terms.

Until 2017, regional and local GVA figures were only available in cash terms. In other words, they were not adjusted for inflation. In 2017, a new approach to calculating regional and local GVA enabled the ONS to construct a real terms measure of GVA for regions and larger sub-regions.[3]

As precise measures of regional inflation do not yet exist, the ONS has put together an estimate of regional prices and used that to publish its "real terms" estimates of regional GVA growth.[4]

At present, GVA data for local areas are still only available in cash terms.

---

[1] ONS, *Regional gross value added (balanced), UK: 1998 to 2016,* 20 Dec 2017
[2] ONS, Publications related to Gross Domestic Product (GDP)
[3] The ONS states that this new measure is called a "balanced estimate" of GVA: it "balances" two different approaches to calculating GVA into a single estimate
[4] More technically, the ONS uses national deflators for 112 industries to convert regional cash-terms industry GVA into a real-terms measure. GVA from these industries are then added together to get an overall regional GVA figure in real terms.

2. Regional and country growth

2.1 Economic growth

The table below summarises the latest regional and country estimates of overall economic output and growth as measured by Gross Value Added (GVA).[5]

This table includes the small amount of UK economic activity that cannot be attributed to a region (which is offshore oil and gas extraction and activities of UK embassies and forces overseas): so-called extra-regio GVA.

Gross Value Added (GVA) and GVA growth by region/country

Growth in real terms (adjusted for inflation)*

	Total GVA, 2016		Average annual GVA growth (%) in period**				
	£ bn	% UK total	2015	2016	1999-2016	1999-2007	2010-2016
North East	51	2.9%	1.4	-1.0	1.5	2.9	0.7
North West	167	9.5%	2.9	1.3	1.9	3.1	1.4
Yorkshire & Humber	112	6.4%	2.7	0.0	1.5	3.0	0.9
East Midlands	100	5.7%	1.5	0.8	1.6	2.4	1.9
West Midlands	127	7.2%	2.8	1.8	1.5	1.8	2.5
East of England	147	8.4%	3.1	1.6	1.8	2.7	1.9
London	408	23.4%	2.0	3.0	3.1	4.2	3.2
South East	259	14.8%	3.7	0.8	1.9	2.5	2.0
South West	127	7.3%	1.3	2.0	1.8	2.5	1.8
England	*1,498*	*85.7%*	*2.6*	*1.6*	*2.1*	*3.0*	*2.1*
Wales	60	3.4%	2.9	1.9	1.7	2.6	1.8
Scotland	134	7.7%	0.7	1.2	1.9	2.7	1.7
Northern Ireland	37	2.1%	3.0	1.1	1.7	3.3	1.2
Extra-regio***	19	1.1%	0.1	0.0	-5.0	-4.5	-5.2
UK	1,748	100.0%	2.5	1.6	1.9	2.8	1.9

*As prices measures of regional inflation do not exist, these are approximations. See section 1

**Simple annual average of growth rates in periods shown

***Extra-regio refers to output that can't be assigned to region/country, e.g. North Sea oil & gas

Source: ONS, *Regional gross value added (balanced), UK: 1998 to 2016,* Dec 2017

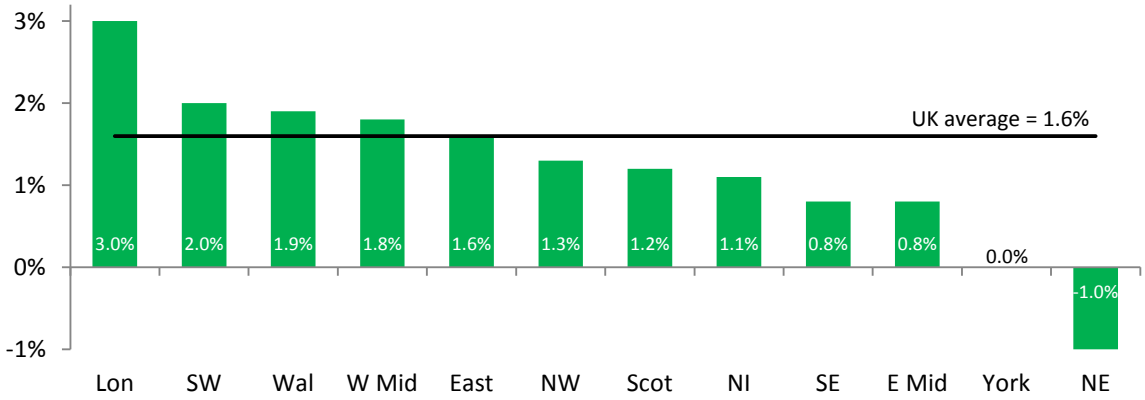
In 2016, London's GVA of £408 billion accounted for 23% of the UK total (£1,748 billion), with the South East contributing a further 15%.

London and the South East account for 38% of the UK economy

London saw the highest annual growth in 2016 at 3.0%, compared with the UK figure of 1.6%. The lowest rate of growth was seen in the North East which contracted by 1.0%.

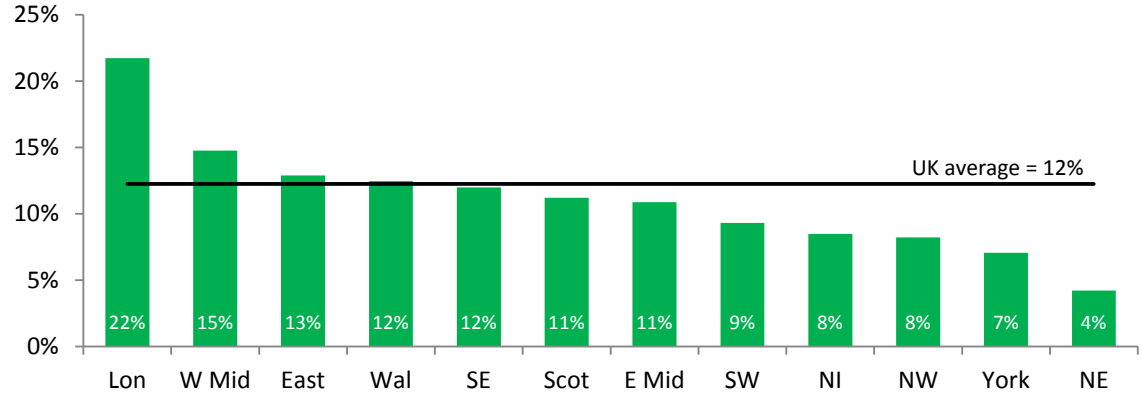
[5] ONS, *Regional gross value added (balanced), UK: 1998 to 2016*, 20 Dec 2017

Economic growth by UK region/country, 2016
GVA (balanced approach), adjusted for inflation



In the recovery from the 2008/09 recession, cumulative economic growth from 2010 to 2016 was highest in London at 22%. The second highest rate of growth was in the West Midlands at 15%. The weakest growth recorded was in Yorkshire & the Humber at 7% and the North East at 4%. The UK grew by 12%. The chart below shows figures for all regions/countries.

Cumulative economic growth by UK region/country, 2010-2016
GVA (balanced approach), adjusted for inflation



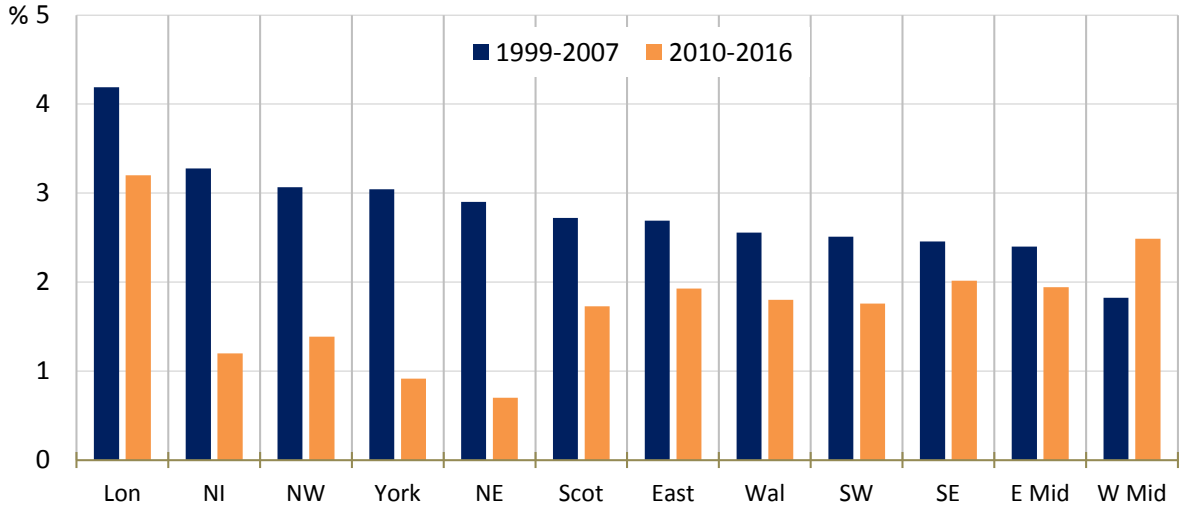
Between 1998 and 2016, London's economy saw, by some distance, its economy expand the most (71%). Slowest total growth over this 18-year period was in Yorkshire and the Humber (29%), the North East and the West Midlands (both 30%).

Almost all areas have experienced slower growth since the financial crisis and recession of 2008/09. The chart below compares average annual economic growth in the regions and countries of the UK during the pre-recession period of 1999-2007 with the post-recession period of 2010-2016.

The only region where recent annual average growth is higher than that of the pre-recession period is the West Midlands. London had the highest average growth rates in both periods. Some regions and countries have seen a particularly notable weakening in their growth performance: the three northern regions of England (the North East, the North West and Yorkshire and the Humber) and Northern Ireland.

Comparison of economic growth by UK regions/countries before and after crisis

Annual average real terms % change during period; ordered by 1999-2007 average



2.2 Economic growth per head

The table below shows the latest regional/country estimates of GVA per head.[6] By taking population into account, this allows us to (very broadly and crudely) compare the standard of living in different parts of the UK.

Gross Value Added (GVA) per head by region/country

Current prices (not adjusted for inflation)

	£	% growth		GVA/head: Index where UK = 100 each year			
	2016	2015	2016	1998	2010	2015	2016
North East	19,218	2.4%	0.7%	74.7	76.6	74.5	73.0
North West	23,068	3.4%	2.9%	86.1	89.4	87.5	87.6
Yorkshire & Humber	20,678	3.5%	1.4%	84.5	82.3	79.6	78.5
East Midlands	21,185	1.9%	2.1%	87.5	81.8	81.0	80.4
West Midlands	21,823	2.7%	3.0%	89.6	81.1	82.7	82.9
East of England	24,041	2.8%	3.0%	97.4	92.1	91.2	91.3
London	46,482	0.9%	3.7%	163.2	172.0	174.9	176.5
South East	28,683	3.1%	1.9%	113.4	110.1	109.8	108.9
South West	23,091	0.9%	3.3%	90.6	90.8	87.3	87.7
England	27,108	2.3%	2.8%	103.1	103.0	102.9	102.9
Wales	19,140	3.7%	3.5%	74.8	71.1	72.2	72.7
Scotland	24,800	0.7%	2.4%	91.9	94.3	94.5	94.2
Northern Ireland	19,997	2.8%	2.8%	78.6	78.0	75.9	75.9
UK (excl extra-regio)	26,339	2.0%	2.9%	100.0	100.0	100.0	100.0

Notes: UK excluding extra-regio refers to output that can be assigned to region/country, i.e. excluding North Sea oil and gas

GVA figures are workplace based but population is residency based. Therefore areas with a large commuter influx generating GVA will have their 'true' GVA per head overstated in these figures

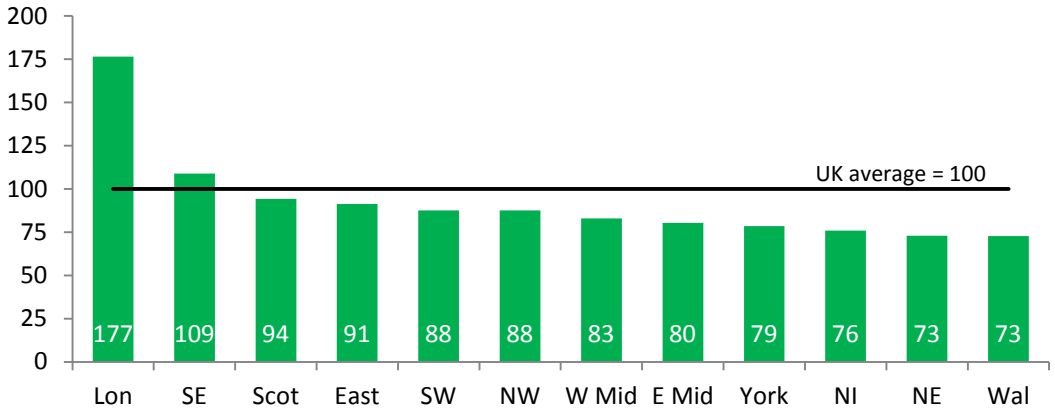
Source: ONS, *Regional gross value added (balanced), UK: 1998 to 2016,* Dec 2017

[6] ONS, *Regional gross value added (balanced), UK: 1998 to 2016*, 15 Dec 2017

London has the highest GVA per head, 76% above the UK average and more than double that of 7 of the remaining 11 regions and countries of the UK. The chart below illustrates the gap between London and the rest of the country.

GVA per head by UK region/country, 2016

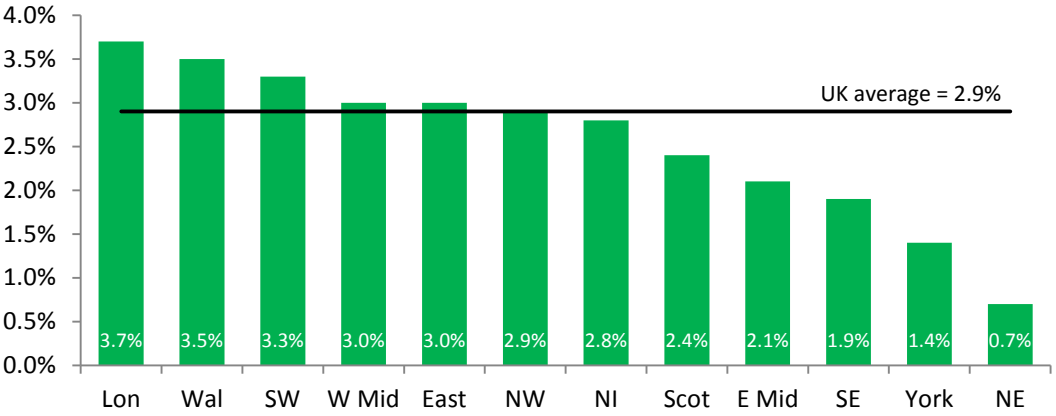
Index, where UK =100



In 2016, London saw the fastest growth in GVA per head (3.7%), followed by Wales (3.5%) and the South West (3.3%). The slowest rates of growth per head were seen in the North East (0.7%) and Yorkshire and the Humber (1.4%). These figures are not adjusted for inflation.

GVA per head growth by UK region/country, 2016

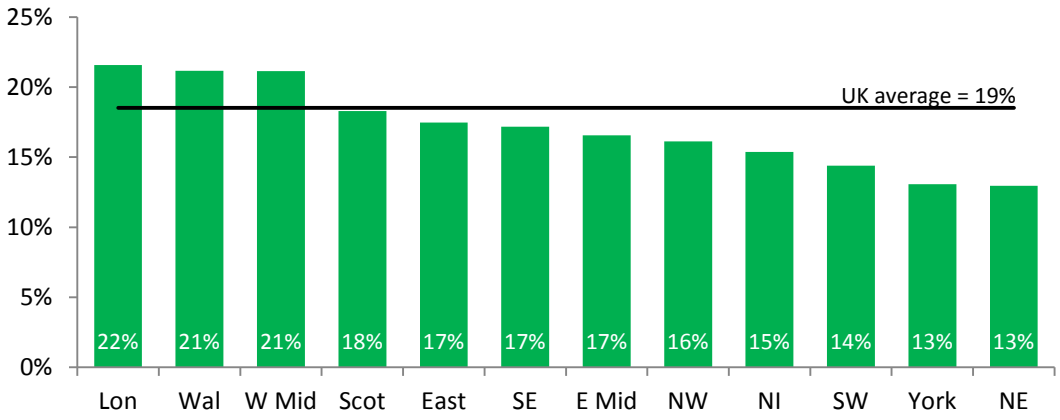
Not adjusted for inflation



Between 2010 and 2016, GVA per head grew fastest in London (22%), followed by Wales and the West Midlands (both 21%). It grew slowest in the North East and Yorkshire & the Humber (both 13%).

Total GVA per head growth by UK region/country, 2010-2016

Not adjusted for inflation



GVA per head in London went from 63% above the UK average in 1998 to 76% above it in 2016 – the fastest growth rate of any region. Over the same period, GVA per head in the West Midlands fell from 10% below the UK average to 17% below it, while the East Midlands fell from 13% below the UK average in 1998 to 20% below in 2016 – the worst performing regions or countries since 1998 on this relative measure.

3. Local area growth

The ONS has also produced workplace-based data for the period 1997-2016 for NUTS2 and NUTS3 areas (these are usually groups of local authority areas).[7] The table below shows the NUTS3 areas with the highest and lowest GVA per head in 2016.[8] None of the local area figures are adjusted for inflation (real-terms data are not available for local areas).

GVA per head in NUTS3 areas, 2016

Rank (out of 173)	Area	£ per head	Index where UK=100
1	Camden and City of London	318,673	1,209.9
2	Westminster	238,506	905.5
3	Tower Hamlets	91,378	346.9
4	Kensington & Chelsea and Hammersmith & Fulham	68,675	260.7
5	Haringey and Islington	46,880	178.0
6	Milton Keynes	46,780	177.6
7	Hounslow and Richmond upon Thames	43,463	165.0
8	Berkshire	41,685	158.3
9	Edinburgh, City of	39,321	149.3
10	Belfast	35,791	135.9
	UK (excl. extra-regio)	**26,339**	**100.0**
164	Northumberland	16,140	61.3
165	Lancaster and Wyre	16,083	61.1
166	Sefton	15,730	59.7
167	Dudley	15,597	59.2
168	North of Northern Ireland	15,488	58.8
169	East Ayrshire and North Ayrshire mainland	15,376	58.4
170	Wirral	15,237	57.8
171	Torbay	14,888	56.5
172	Gwent Valleys	14,759	56.0
173	Isle of Anglesey	13,655	51.8

Source: ONS, *Regional gross value added (balanced), UK: 1998 to 2016,* Dec 2017
Notes: UK excluding extra-regio refers to output that can be assigned to region/country, i.e. excluding North Sea oil and gas

GVA figures are workplace based but population is residency based. Therefore areas with large commuter population generating GVA will have their 'true' GVA per head overstated in these figures, and vice versa

London areas dominate the list of local areas with the highest GVA per head

Some notable figures:

[7] The NUTS (NUTS - Nomenclature of Territorial Units for Statistics) classification is the system used for dividing up the economic territory of the EU for regional policy and statistics purposes. In the UK, NUTS2 areas tend to be counties or groups of counties while NUTS3 areas are local authorities or groups of local authorities. NUTS1 areas are geographic regions, e.g. London, West Midlands, North West etc.

[8] ONS, *UK regional gross value added (GVA), income approach: Dec 2016*, 15 Dec 2016

- The top 5 local areas with the highest GVA per head are in (mostly central) London. This at least in part reflects the large numbers of commuters who work there.

- The Isle of Anglesey had the lowest GVA per head of the 173 local areas, only slightly above half of the UK average.

- 157 of the 173 NUTS3 local areas saw rises in GVA per head in 2016, with Hounslow and Richmond upon Thames (+8.2%) followed by Milton Keynes (+7.1%) seeing the largest increases and Darlington seeing the biggest fall of 2.5%, followed by Lancaster and Wyre (-2.3%). Figures are not adjusted for inflation.

- Between 2010 and 2016, Hounslow and Richmond upon Thames (+45%), followed by Warwickshire (+38%) and Solihull (+36%) had the biggest increases in GVA per head.

- Between 2010 and 2016, the areas which saw the smallest increases in GVA per head were Great Manchester South East and Liverpool (both with a 1% increase) followed by Wolverhampton (+2%). The overall change in UK GVA per head over this time was +19%. Figures are not adjusted for inflation.

3.1 Maps of data for local areas

The maps on the following pages show:

- 2016 GVA per head data for all 173 NUTS3 local areas (this is also on the front page of this briefing).

- Change in GVA per head from 2010 to 2016 for all 173 NUTS3 local areas.

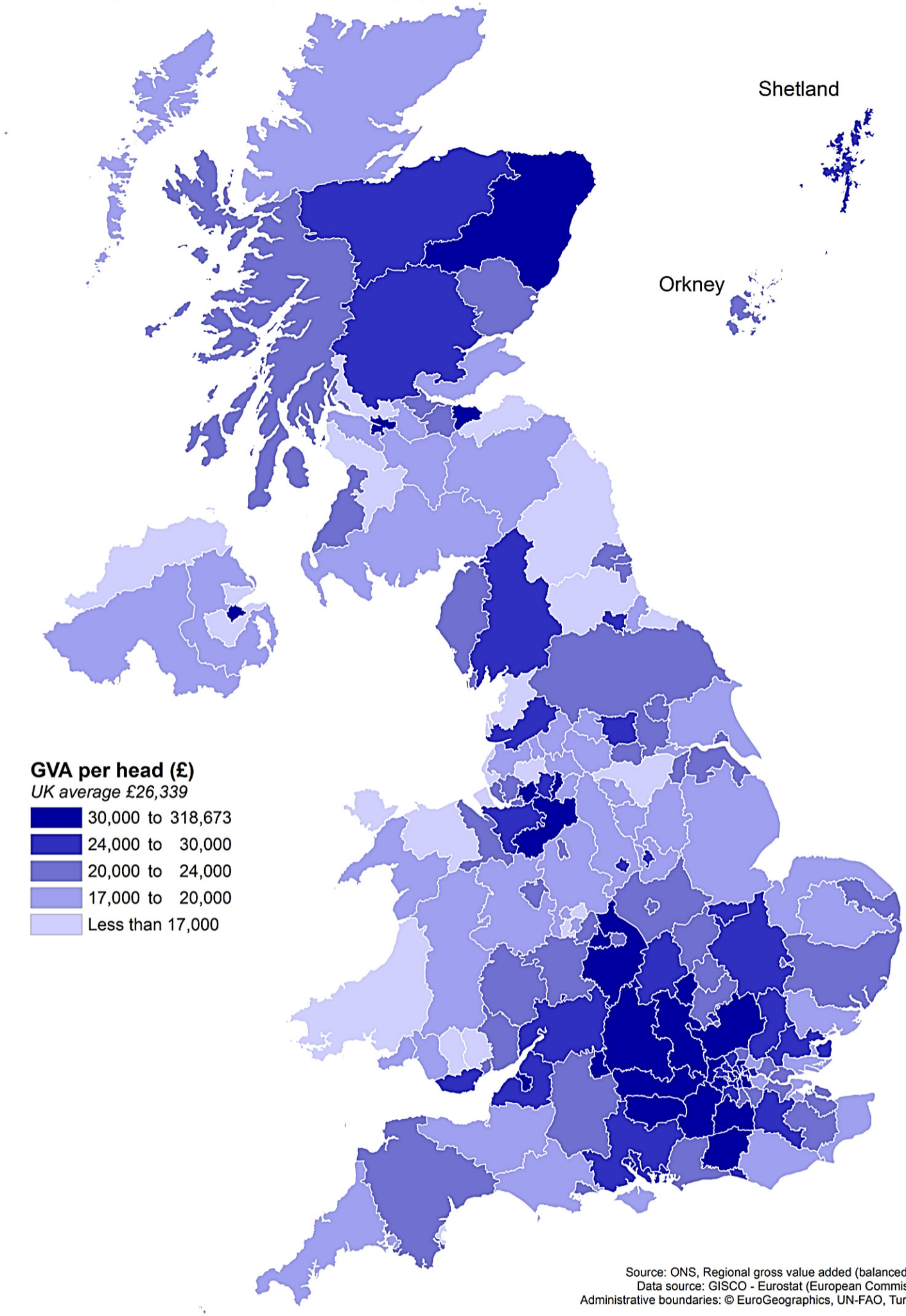
3.2 Spreadsheet of data for local areas

A table and chart showing 2016 GVA per head data and how this has changed since 2010 for the local area of your choice compared with the region/country it is in and the UK is available in an accompanying spreadsheet on this briefing paper's landing page.

Just select your local authority from the list and data for the relevant NUTS3 area is provided.

Economic output per head by local area, current prices, 2016

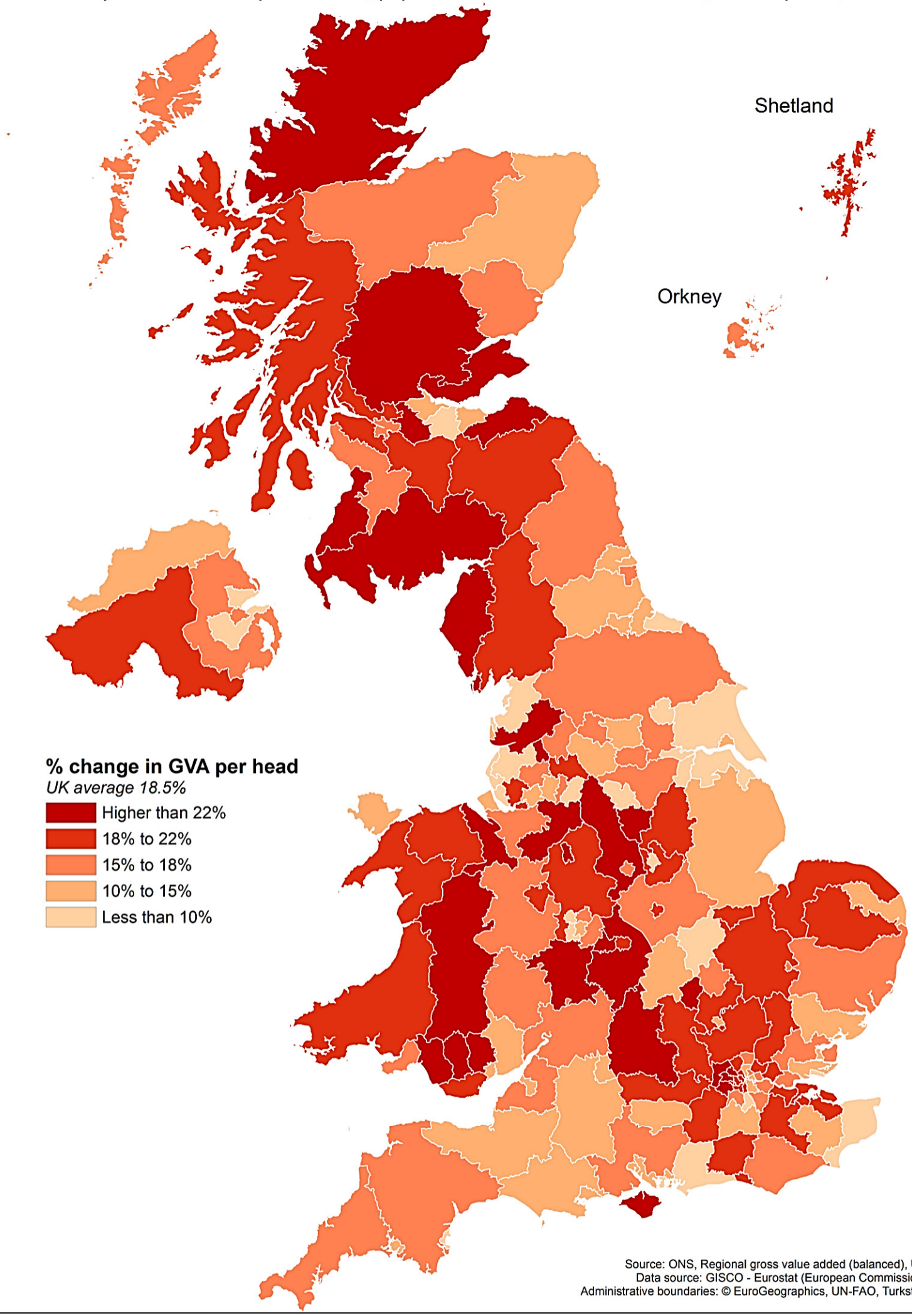
Economic output data are workplace-based, population data are residence-based, for NUTS3 areas



Source: ONS, Regional gross value added (balanced), UK
Data source: GISCO - Eurostat (European Commission)
Administrative boundaries: © EuroGeographics, UN-FAO, Turkstat.

% change in economic output per head by local area, 2010-2016

Economic output data are workplace-based, population data are residence-based, current prices,



Source: ONS, Regional gross value added (balanced), UK
Data source: GISCO - Eurostat (European Commission)
Administrative boundaries: © EuroGeographics, UN-FAO, Turkstat.

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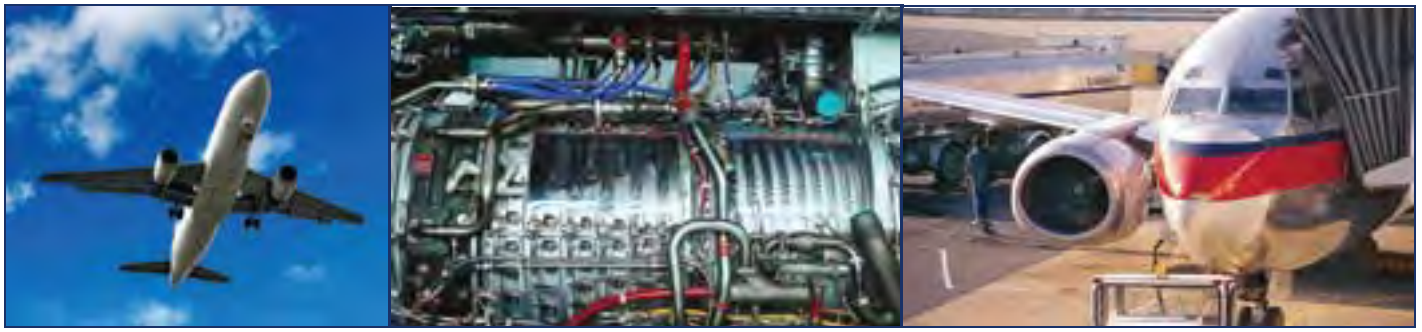
The Rockford Area

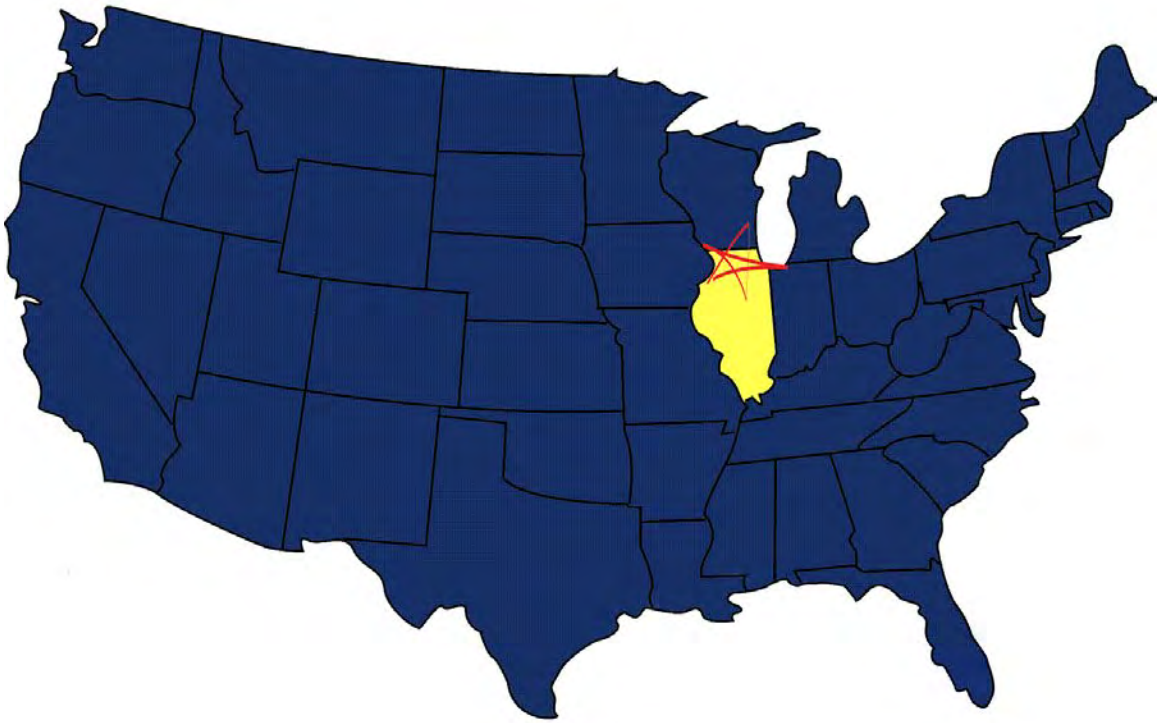
Mid-America's Best International Aerospace Community



Well Connected to the World

In the World, Illinois has:

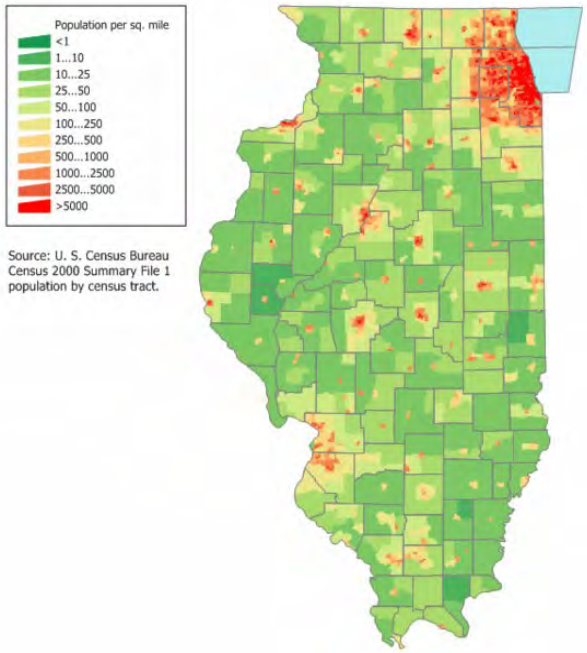
- 2nd busiest airport, and only NA dual hub (O'Hare International)
- 3rd largest multi-modal port system



Well Located with Excellent Access

In the US, Illinois is:

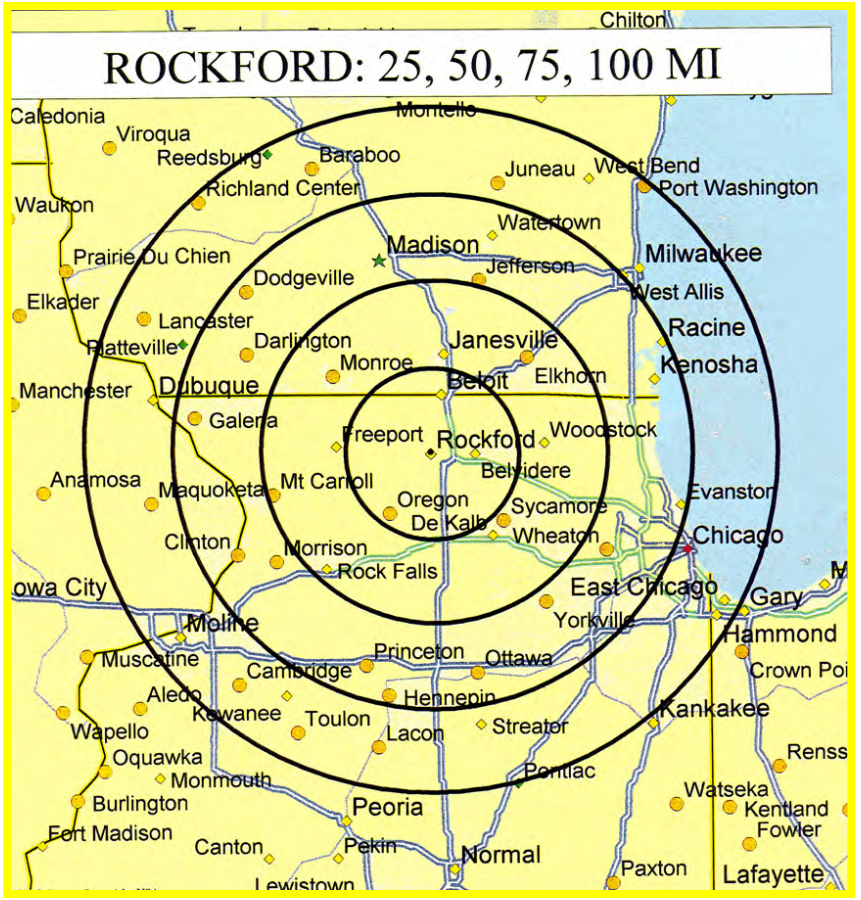
- 1st in interstate & railroad connections
- 5th largest economy
- 5th most populated state
- 5th lowest ETR on new investment
- 7th in Air Cargo Tonnage
- 8th in Aerospace Start-Ups
- 12th in Aviation maintenance employment
- 13th in Aerospace employment
- 14th in technology & innovation



Part of Chicago/Milwaukee Market

A strategic location:

- 800,000+ people within 30-40 minute commute
- One of the fastest growing regions in Illinois
- 60 minutes to O'Hare International
- 90 minutes to Chicago's Center Business District
- 13+ million people within 2-hour drive
- 250 corporate HQs – including 29 Fortune 500 – and 1,500 foreign firms in Chicago.



Rockford is the 2nd largest central city in Illinois!

Well Connected to North America

"I-39 has the distinct advantage of being the only interstate connecting the northern cluster of interstates (I-90, I-94, I-80, I-88) with the central cluster of interstates in Illinois (I-74, I-55, I-70, I-57, I-64)….

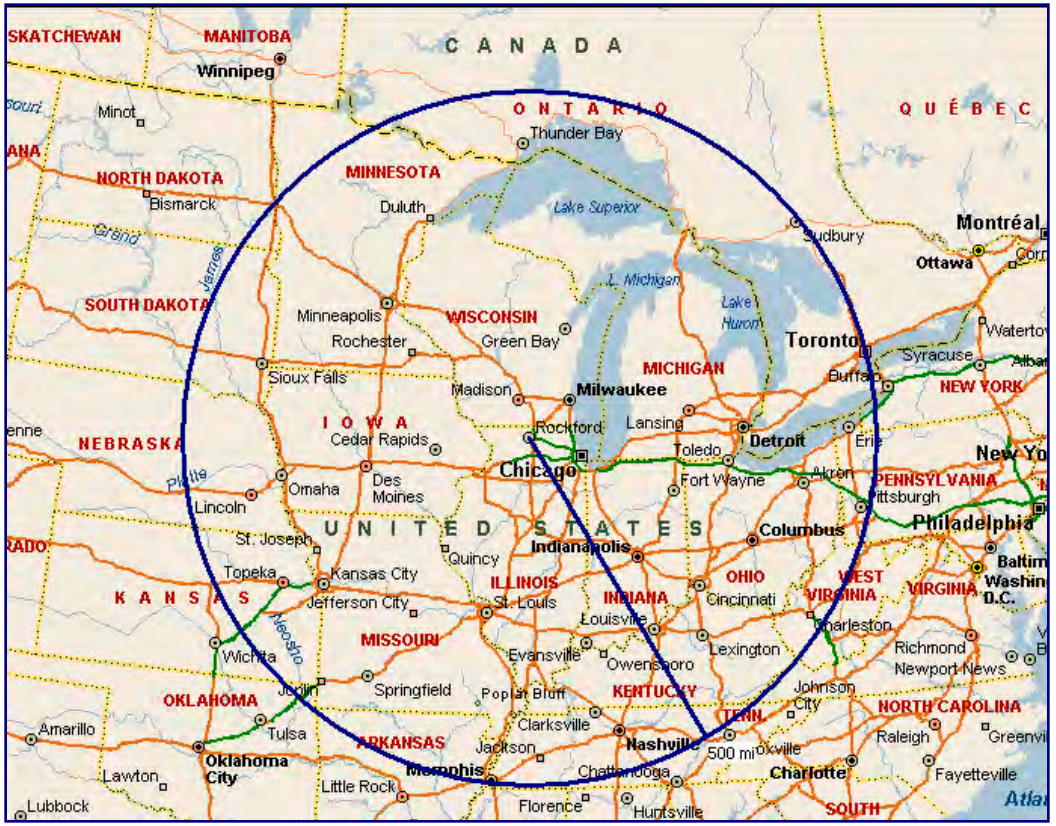
…As a result the highway system of the I-39 corridor is one of the most connected in the country for both domestic and international trade."

--St. Onge Co.

Quick Access to Markets

Strategically located with 500-mile access to:

- Illinois
- Wisconsin
- Minnesota
- Michigan
- Indiana
- Missouri
- Iowa
- Ohio
- Kentucky
- Ontario, Canada



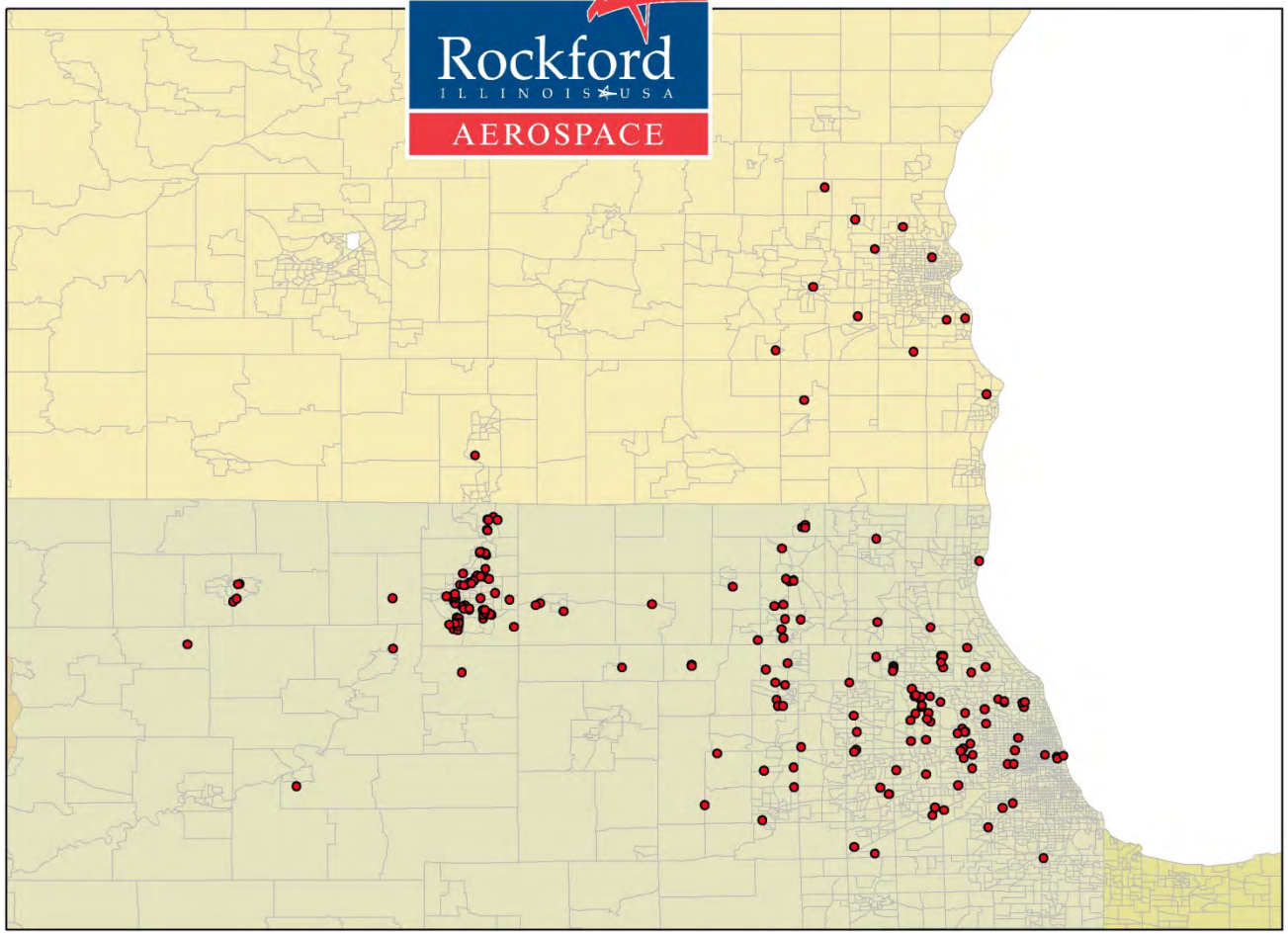
80% of US households within 24-hour drive

Accessible In-Land Port

Integration of Air Cargo, Truck, & Rail Service:

- 24th largest air cargo airport in the U.S.
- Direct Access to 4 interstates
- 4 of 7 class-one railroads
- 60+ motor freight carriers
- UPS' 2nd largest Air Hub in U.S.
- UP's largest Intermodal Facility Global III
- WATCO's multi-product transload facility

Robust Aerospace/Aviation Cluster



Robust Aerospace/Aviation Cluster

200+ companies, including 5 tier-one suppliers, in greater Rockford area supply products to or serve the global aerospace and aviation industry. That makes the region one of the largest clusters in the U.S., attracting new investment & expansions of current companies, including…

UTC Aerospace Systems

FOREST CITY GEAR

KANEY AEROSPACE

EMERY AIR, INC.

GE Aviation

WOODWARD

Esterline

SupplyCore
Worldwide Supplies • Worldwide Support

INGENIUM AEROSPACE

QUEST
BORN TO ENGINEER

B/E AEROSPACE
MANY PARTS. *One* PARTNER.

SJTI
Superior Joining Technologies INC.
Precision Welding • Laser Applications • Special Processes

Clinkenbeard

ENERGY DYNAMICS, INC.

Robust Aerospace/Aviation Cluster

Rockford's cluster demonstrates technological strength in products for military, commercial and space vehicles:

- ***Global Leader*** in design & manufacture of engine control systems
- ***Global Leader*** in electric power generation, distribution and control systems
- Fuel & special fluid pumps
- Gearboxes
- Movement of spare or component parts, globally

Rockford aerospace supply chain provides:

- Advanced materials and composites
- Maintenance, Repair and Overhaul
- Parts & Components distribution and production
- Sheet metal
- Software systems
- Systems design and engineering support
- Tooling
- And other products and services

Additional Aerospace Capabilities

Our diverse aerospace cluster allows for:

- Advanced Manufacturing/production
- Advanced Materials and Composite
- Aviation R&D and Testing
- Continuing Education
- Maintenance Repair Overhaul
  - Structural, turbine/engine
  - Systems: gyros & hydraulics
  - Small structural, turbine/engine
  - Paint
  - Gauges/Calibration
  - Seats & flotation devices
- Parts & Components Warehouse/Distribution & Logistics
- Power Management/Distribution & Engine Control
- Rapid Prototyping
- Sheet metal
- Software systems
- Systems design and engineering support
- Tooling
- And other products and services

Industry Leading Center of Metal Working Excellence

Concentrated Manufacturing Talent above National Average:

- 6.7 x Machinery Manufacturing employment and R&D
- 4.3 x Metals Manufacturing and R&D
- 3 x Transportation Equipment Manufacturing and R&D
- Over 4000 engineers
  - 1.5 x above IL engineers
  - 1.3 x above US engineers
  - Significant Patent Activity

Leading Manufacturing Community in Illinois

- 1st in aerospace manufacturing with 80% of Illinois workforce
- 2nd in manufacturing employment
- 2nd in "on & off" road vehicle manufacturing
- 2nd in industrial machine manufacturing

More than 20% of the Rockford area's workforce is employed in manufacturing, twice the national average.

Rockford Area Aerospace Network

RAAN has been created as a committee of the RAEDC to develop strategic initiatives to impact and improve the aerospace business climate of the Rockford Area, responding to the needs identified by our local aerospace cluster and the key site selection needs of aerospace companies.

RAAN Chairman Jeff Kaney presents a RAAN pin to Ed Bolen, President of the National Business Aviation Association (NBAA).

Cluster Development Strategy

- Build the Cluster / Regions Brand
- Foster Innovation & Technology
- Encourage Supplier Development
- Expand Business Development Activity
- Enhance Workforce Development
- Grow the Cluster

Abundant Educational Opportunities

Over 75 colleges and universities within 90-minute drive, many offering advanced engineering degrees, including aerospace…

ILLINOIS INSTITUTE OF TECHNOLOGY

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

ILLINOIS

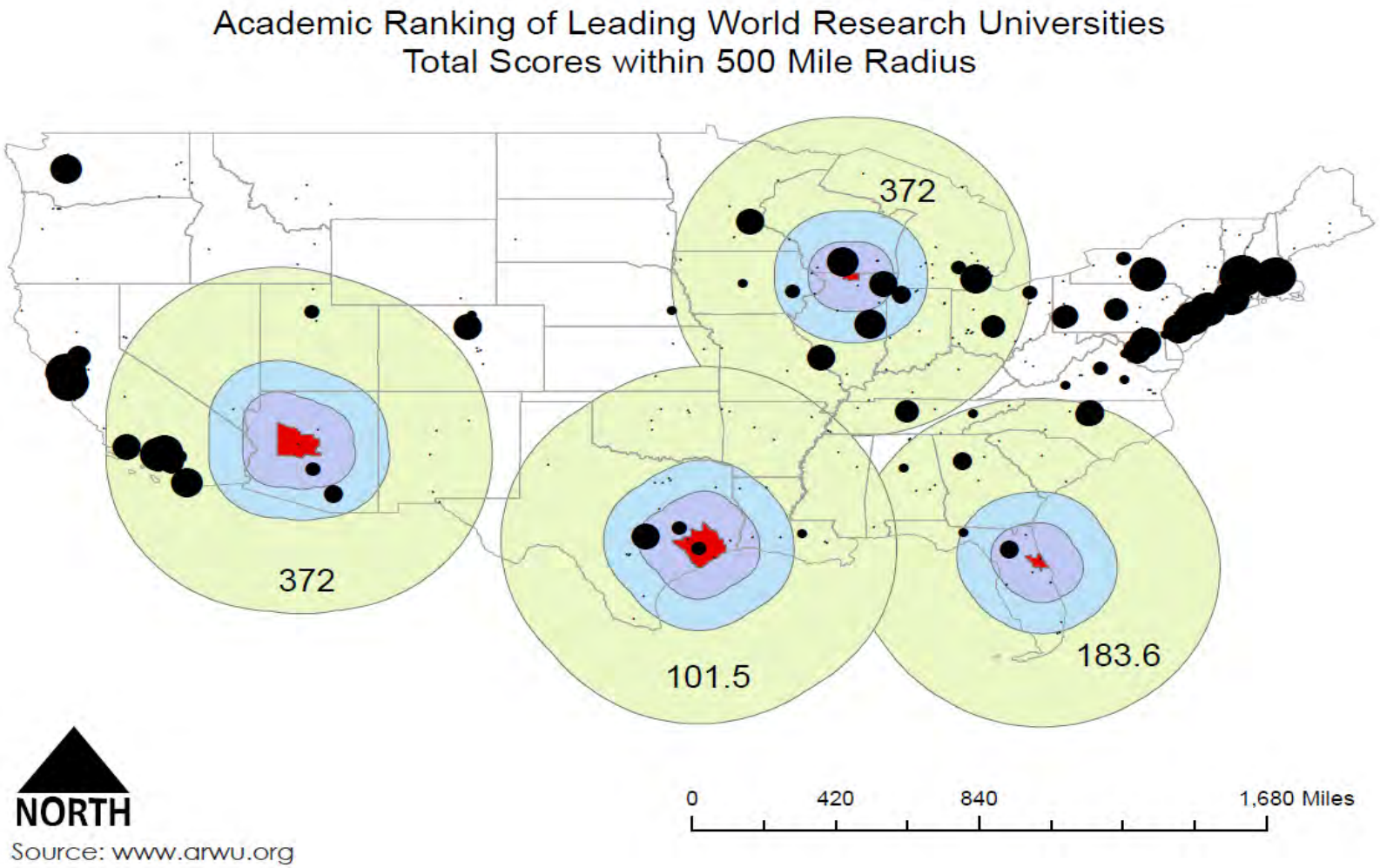
ROCKFORD COLLEGE

Rock Valley College

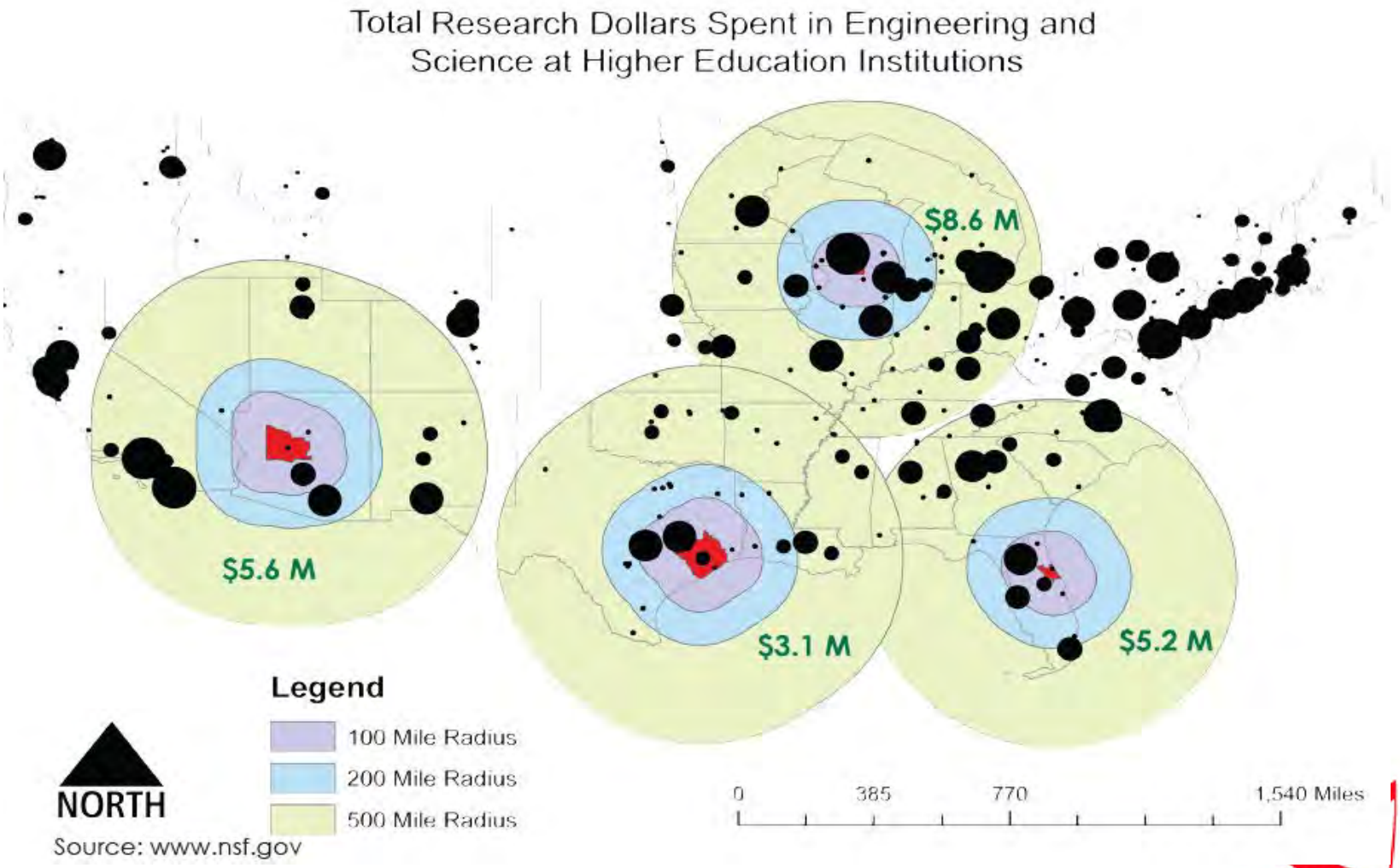
NIU HUSKIES

10.6 million 15-24 year olds within 500 miles

Quality Educational Opportunities



A Living Laboratory



Leading International Airport

The Chicago/Rockford International Airport (RFD)

- 24th largest cargo airport in the US
- One of first in U.S. to get approval for 747-8 operations
- Named best cargo airport in its class in 2012 by Air Cargo World

Modern Facility

- 24/7 FAA Air Traffic Control Tower
- Hard-surface runways
  - 10,000 ft (Primary)
  - 8,200 ft (Secondary)
- Cat II/III Instrument Landing System (ILS)
  - allows landing in near zero visibility conditions
- International Arrival Gate
- U.S. Customs Port of Entry
- De-icing fluid retention and processing facility on-site

Superior Aviation Amenities

Capabilities

- Independent airspace from O'Hare, Midway, Chicago/Gary, Mitchell Field (Milwaukee)
- Accommodates largest aircrafts flying
  - Airbus A380
  - Antonov An-225
  - Boeing 747-8
- Capable of non-stop service to Europe, Africa, Asia, Middle East & South America

Services

- Foreign Trade Zone Benefits (FTZ #176)
- 24/7 customs & federal inspections
- Multiple FBO's = full spectrum of aviation related services
- USDA inspections
- 6,600 acres in Global Trade Park
  - 3,000+ acres of airport land for development
  - 325+ airside acres
  - 2000+ acres for industrial & commercial projects

Multiple Development Opportunities

RFD

Direct Runway Access

Multiple Developed Sites Available

Interstate Access Development

RockAero Park

- 168 acre development at entrance to Chicago Rockford International Airport
- Development Ready
- Interstate/US Highway visibility
- TIF & Enterprise Zone Benefits
- Ideal for non-airside airport uses, corporate, commercial, warehouse & distribution and light manufacturing

Superior Affordable Quality of Life

- Best park district in nation
- 7,000+ parkland acres
- 85 public parks
- 21 public golf courses
- 6 country clubs
- 9 public libraries
- 10 museums
- 12 art galleries
- 1 symphony orchestra
- 4 community theatres
- 2 indoor ice arenas
- 2 water parks
- Ski Resorts
- 9th lowest cost of living in the Midwest

Rockford is home to the Rockford IceHogs AHL hockey team, official affiliate for the NHL Chicago Blackhawks, 2010 Stanley Cup Champions.

Global Focus

- **FTZ** #176
- 9 **Sister Cities**
- **Immigration** Services
- **International Gate at Airport**
- **U.S. Export Assistance Center**
- **Top 4% in ethnic diversity** in Illinois
- **Export growth of 25%** from 2005-2010
- **Illinois SBDC International Trade Center**
- **63rd most export intensive GMP** in the U.S.
- **35+ languages spoken** in Rockford Area schools
- Hosted **6 international trade delegations** in 2011
- Participated in **2 international trade missions** in 2011
- **Immigration through Investment** EB-5 Visa Regional Center
- **100+ companies from 20+ countries** invest in the Rockford Area
- Projected **export growth of 70.5%** by 2020 – 32nd highest in nation.

We welcome you to our growing international region!

Rockford

ILLINOIS USA

ROCKFORD AREA ECONOMIC DEVELOPMENT COUNCIL

Eric D. Voyles
Vice President National Business Development
815-987-8118
evoyles@rockfordil.com

Heathrow

Heathrow destinations list

Find out where you can fly from London Heathrow, and which airlines can get you there. With over 180 destinations in 90 countries, we've a world of direct routes to choose from.

- **See also:** Latest route announcements

Search by destination or country

Select airline: **All**

Destination	Country	Airline	Code	Terminal
Aberdeen	United Kingdom	British Airways	BA	5
Aberdeen	United Kingdom	Flybe	BE	2
Abu Dhabi	United Arab Emirates	British Airways	BA	5
Abu Dhabi	United Arab Emirates	Etihad Airways	EY	4
Abuja	Nigeria	British Airways	BA	5
Accra	Ghana	British Airways	BA	3
Addis Ababa	Ethiopia	Ethiopian Airlines	ET	2
Agadir	Morocco	British Airways	BA	5
Ahmedabad	India	Air India	AI	2
Algiers	Algeria	Air Algerie	AH	4
Almeria	Spain		BA	

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Destination	Country	Airline	Code	Terminal
		British Airways		5
Amman	Jordan	British Airways	BA	5
Amman	Jordan	Royal Jordanian	RJ	3
Amsterdam	Netherlands	British Airways	BA	5
Amsterdam	Netherlands	KLM - Royal Dutch Airlines	KL	4
Ashgabat	Turkmenistan	Turkmenistan Airlines	T5	4
Astana	Kazakhstan	Air Astana	KC	4
Asturias	Spain	Iberia Express	I2	3
Athens	Greece	Aegean Airlines	A3	2
Athens	Greece	British Airways	BA	5
Atlanta	USA	British Airways	BA	5
Atlanta	USA	Delta Air Lines	DL	3
Atlanta	USA	Virgin Atlantic	VS	3
Auckland	New Zealand	Air New Zealand	NZ	2
Austin	USA	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Bahrain	Bahrain	British Airways	BA	5
Bahrain	Bahrain	Gulf Air	GF	4
Baku	Azerbaijan	Azerbaijan Airlines	J2	4
Bali	Indonesia	Garuda Indonesia	GA	4
Baltimore	USA	British Airways	BA	5
Bandar Seri Begawan (Brunei)	Brunei	Royal Brunei Airlines	BI	4
Bangkok	Thailand	British Airways	BA	5
Bangkok	Thailand	EVA Air	BR	2
Bangkok	Thailand	Thai Airways	TG	2
Barcelona	Spain	British Airways	BA	3
Barcelona	Spain	Vueling	VY	3
Basel	Switzerland	British Airways	BA	5
Bastia	France	British Airways	BA	5
Beijing	China	Air China	CA	2
Beijing	China	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Beirut	Lebanon	British Airways	BA	5
Beirut	Lebanon	MEA	ME	3
Belfast City	United Kingdom	Aer Lingus	EI	2
Belfast City	United Kingdom	British Airways	BA	5
Belgrade	Serbia	Air Serbia	JU	4
Bengaluru	India	British Airways	BA	5
Bergen	Norway	British Airways	BA	5
Berlin (Tegel)	Germany	British Airways	BA	5
Berlin (Tegel)	Germany	Eurowings	EW	2
Berlin (Tegel)	Germany	Germanwings	4U	2
Biarritz	France	British Airways	BA	5
Bilbao	Spain	British Airways	BA	3
Billund	Denmark	British Airways	BA	5
Bogota	Colombia	Avianca	AV	2
Bologna	Italy	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Boston	USA	British Airways	BA	5
Boston	USA	Delta Air Lines	DL	3
Boston	USA	Virgin Atlantic	VS	3
Bridgetown	Barbados	Virgin Atlantic	VS	3
Brindisi	Italy	British Airways	BA	5
Brussels	Belgium	British Airways	BA	5
Brussels	Belgium	Brussels Airlines	SN	2
Bucharest (Otopeni)	Romania	British Airways	BA	5
Bucharest (Otopeni)	Romania	Tarom	RO	4
Budapest	Hungary	British Airways	BA	3
Buenos Aires	Argentina	British Airways	BA	5
Cagliari	Italy	British Airways	BA	5
Cairo	Egypt	British Airways	BA	5
Cairo	Egypt	Egyptair	MS	2
Calgary	Canada	Air Canada	AC	2

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Destination	Country	Airline	Code	Terminal
Calgary	Canada	British Airways	BA	5
Cape Town	South Africa	British Airways	BA	3
Cape Town	South Africa	Virgin Atlantic	VS	3
Casablanca	Morocco	Royal Air Maroc	AT	4
Changsha	China	Hainan Airlines	HU	3
Charleston	USA	British Airways	BA	5
Charlotte	USA	American Airlines	AA	3
Chengdu	China	Air China	CA	2
Chennai	India	British Airways	BA	5
Chicago (O'Hare)	USA	American Airlines	AA	3
Chicago (O'Hare)	USA	British Airways	BA	5
Chicago (O'Hare)	USA	United Airlines	UA	2
Chicago (O'Hare)	USA	Virgin Atlantic	VS	3
Chongqing	China	Tianjin Airlines	GS	3
Cologne (Bonn)	Germany	Eurowings	EW	2

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Destination	Country	Airline	Code	Terminal
Cologne (Bonn)	Germany	Germanwings	4U	2
Colombo	Sri Lanka	Sri Lankan Airlines	UL	3
Copenhagen	Denmark	British Airways	BA	5
Copenhagen	Denmark	SAS - Scandinavian Airlines	SK	2
Corfu	Greece	British Airways	BA	5
Cork	Republic of Ireland	Aer Lingus	EI	2
Crete	Greece	British Airways	BA	3
Dallas/Fort Worth	USA	American Airlines	AA	3
Dallas/Fort Worth	USA	British Airways	BA	5
Dallas/Fort Worth	USA	Delta Air Lines	DL	3
Delhi	India	Air India	AI	2
Delhi	India	British Airways	BA	5
Delhi	India	Jet Airways	9W	4
Delhi	India	Virgin Atlantic	VS	3
Denver	USA	British Airways	BA	3

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Destination	Country	Airline	Code	Terminal
Detroit	USA	Delta Air Lines	DL	3
Detroit	USA	Virgin Atlantic	VS	3
Dhaka	Bangladesh	Biman Bangladesh Airlines	BG	4
Doha	Qatar	British Airways	BA	5
Doha	Qatar	Qatar Airways	QR	4
Dubai	United Arab Emirates	British Airways	BA	5
Dubai	United Arab Emirates	Emirates	EK	3
Dubai	United Arab Emirates	Qantas	QF	3
Dubai	United Arab Emirates	Royal Brunei Airlines	BI	4
Dubai	United Arab Emirates	Virgin Atlantic	VS	3
Dublin	Republic of Ireland	Aer Lingus	EI	2
Dublin	Republic of Ireland	British Airways	BA	5
Durban	South Africa	British Airways	BA	5
Dusseldorf	Germany	British Airways	BA	5
Edinburgh	United Kingdom	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Edinburgh	United Kingdom	Flybe	BE	2
Faro	Portugal	British Airways	BA	5
Figari	France	British Airways	BA	5
Frankfurt	Germany	British Airways	BA	5
Frankfurt	Germany	Lufthansa	LH	2
Geneva	Switzerland	British Airways	BA	5
Geneva	Switzerland	Swiss International Airlines	LX	2
Gibraltar	Gibraltar	British Airways	BA	3
Glasgow	United Kingdom	British Airways	BA	5
Grenoble	France	British Airways	BA	5
Gothenburg	Sweden	British Airways	BA	5
Gran Canaria	Spain	British Airways	BA	5
Gran Canaria	Spain	Iberia	IB	5
Gran Canaria	Spain	Iberia Express	I2	5
Grand Cayman	Grand Cayman	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Guangzhou	China	China Southern	CZ	4
Guernsey	United Kingdom	Flybe	BE	2
Halifax	Canada	Air Canada	AC	2
Hamburg	Germany	British Airways	BA	5
Hamburg	Germany	Eurowings	EW	2
Hamburg	Germany	Germanwings	4U	2
Hanoi	Vietnam	Vietnam Airlines	VN	4
Hanover	Germany	British Airways	BA	5
Helsinki	Finland	British Airways	BA	3
Helsinki	Finland	Finnair	AY	3
Ho Chi Minh City	Vietnam	Vietnam Airlines	VN	4
Hong Kong	China	British Airways	BA	5
Hong Kong	China	Cathay Pacific Airways	CX	3
Hong Kong	China	Virgin Atlantic	VS	3
Houston	USA	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Houston	USA	United Airlines	UA	2
Hyderabad	India	British Airways	BA	5
Ibiza	Spain	British Airways	BA	5
Innsbruck	Austria	British Airways	BA	5
Inverness	United Kingdom	British Airways	BA	5
Islamabad	Pakistan	British Airways	BA	5
Islamabad	Pakistan	Pakistan International Airlines	PK	3
Isle of Man	Isle of Man	Flybe	BE	2
Istanbul Ataturk	Turkey	British Airways	BA	5
Istanbul Ataturk	Turkey	Turkish Airlines	TK	2
Jakarta	Indonesia	Garuda Indonesia	GA	4
Jeddah	Saudi Arabia	British Airways	BA	5
Jeddah	Saudi Arabia	Saudia	SV	4
Johannesburg	South Africa	British Airways	BA	5
Johannesburg	South Africa	South African Airways	SA	2

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Destination	Country	Airline	Code	Terminal
Johannesburg	South Africa	Virgin Atlantic	VS	3
Kalamata	Greece	British Airways	BA	5
Karachi	Pakistan	Pakistan International Airlines	PK	3
Kefalonia	Greece	British Airways	BA	5
Kiev (Borispol)	Ukraine	British Airways	BA	5
Krakow	Poland	British Airways	BA	5
Kuala Lumpur	Malaysia	British Airways	BA	5
Kuala Lumpur	Malaysia	Malaysia Airlines	MH	4
Kuwait	Kuwait	British Airways	BA	5
Kuwait	Kuwait	Kuwait Airways	KU	4
La Coruna	Spain	Vueling	VY	3
Lagos	Nigeria	Arik Air	W3	4
Lagos	Nigeria	British Airways	BA	5
Lagos	Nigeria	Virgin Atlantic	VS	3
Lahore	Pakistan	Pakistan International Airlines	PK	3

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Destination	Country	Airline	Code	Terminal
Larnaca	Cyprus	Aegean Airlines	A3	2
Larnaca	Cyprus	British Airways	BA	5
Las Vegas	USA	British Airways	BA	3
Las Vegas	USA	Virgin Atlantic	VS	3
Leeds Bradford	United Kingdom	British Airways	BA	5
Lisbon	Portugal	British Airways	BA	3
Lisbon	Portugal	TAP Portugal	TP	2
Ljubljana	Slovenia	British Airways	BA	5
Los Angeles	USA	Air New Zealand	NZ	2
Los Angeles	USA	American Airlines	AA	3
Los Angeles	USA	British Airways	BA	5
Los Angeles	USA	United Airlines	UA	2
Los Angeles	USA	Virgin Atlantic	VS	3
Luanda	Angola	British Airways	BA	5
Luxembourg	Luxembourg	British Airways	BA	3

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Destination	Country	Airline	Code	Terminal
Luxor	Egypt	Egyptair	MS	2
Lyon	France	British Airways	BA	3
Madrid	Spain	British Airways	BA	5
Madrid	Spain	Iberia	IB	5
Malaga	Spain	British Airways	BA	5
Manchester	United Kingdom	British Airways	BA	5
Manila	Philippines	Philippine Airlines	PR	3
Marrakech	Morocco	British Airways	BA	5
Marseille	France	British Airways	BA	3
Mauritius	Mauritius	Air Mauritius	MK	4
Melbourne	Australia	Qantas	QF	3
Menorca	Spain	British Airways	BA	5
Mexico City	Mexico	Aeromexico	AM	4
Mexico City	Mexico	British Airways	BA	5
Miami	USA	American Airlines	AA	3

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Destination	Country	Airline	Code	Terminal
Miami	USA	British Airways	BA	3
Miami	USA	Virgin Atlantic	VS	3
Milan (Linate)	Italy	Alitalia	AZ	4
Milan (Linate)	Italy	British Airways	BA	5
Milan (Malpensa)	Italy	British Airways	BA	5
Minneapolis	USA	Delta Air Lines	DL	3
Montpellier	France	British Airways	BA	5
Montreal	Canada	Air Canada	AC	2
Montreal	Canada	British Airways	BA	5
Moscow (Domodedovo)	Russia	British Airways	BA	5
Moscow (Sheremetyevo)	Russia	Aeroflot	SU	4
Mumbai	India	Air India	AI	2
Mumbai	India	British Airways	BA	5
Mumbai	India	Jet Airways	9W	4
Munich	Germany	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Munich	Germany	Lufthansa	LH	2
Murcia	Spain	British Airways	BA	5
Muscat	Oman	British Airways	BA	5
Muscat	Oman	Oman Air	WY	4
Mykonos	Greece	British Airways	BA	5
Nairobi	Kenya	British Airways	BA	3
Nairobi	Kenya	Kenya Airways	KQ	4
Nantes	France	British Airways	BA	5
Nashville	USA	British Airways	BA	5
Nassau	Bahamas	British Airways	BA	5
New Orleans	USA	British Airways	BA	5
Newquay	United Kingdom	Flybe	BE	2
New York (JFK)	USA	American Airlines	AA	3
New York (JFK)	USA	British Airways	BA	5
New York (JFK)	USA	Delta Air Lines	DL	3

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Destination	Country	Airline	Code	Terminal
New York (JFK)	USA	Virgin Atlantic	VS	3
New York (Newark)	USA	Air India	AI	2
New York (Newark)	USA	British Airways	BA	5
New York (Newark)	USA	United Airlines	UA	2
New York (Newark)	USA	Virgin Atlantic	VS	3
Newcastle	United Kingdom	British Airways	BA	5
Nice	France	British Airways	BA	5
Olbia	Italy	British Airways	BA	5
Osaka (Kansai)	Japan	British Airways	BA	5
Oslo (Gardermoen)	Norway	British Airways	BA	5
Oslo (Gardermoen)	Norway	SAS - Scandinavian Airlines	SK	2
Ottawa	Canada	Air Canada	AC	2
Palermo	Italy	British Airways	BA	5
Palma	Spain	British Airways	BA	5
Palma	Spain	Iberia	IB	5

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Destination	Country	Airline	Code	Terminal
Palma	Spain	Iberia Express	I2	5
Paris (CDG)	France	Air France	AF	4
Paris (CDG)	France	British Airways	BA	5
Paris (Orly)	France	British Airways	BA	5
Perth	Australia	Qantas	QF	3
Philadelphia	USA	American Airlines	AA	3
Philadelphia	USA	British Airways	BA	5
Philadelphia	USA	Delta Air Lines	DL	3
Phoenix	USA	American Airlines	AA	3
Phoenix	USA	British Airways	BA	3
Pisa	Italy	British Airways	BA	5
Pittsburgh	USA	British Airways	BA	5
Prague	Czech Republic	British Airways	BA	3
Preveza	Greece	British Airways	BA	5
Pula	Croatia	British Airways	BA	3

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Destination	Country	Airline	Code	Terminal
Qingdao	China	Beijing Capital Airlines	JD	3
Raleigh-Durham	USA	American Airlines	AA	3
Reykjavik	Iceland	British Airways	BA	5
Reykjavik	Iceland	Icelandair	FI	2
Rijeka	Croatia	Croatia Airlines	OU	2
Rio De Janeiro (Galeao)	Brazil	British Airways	BA	5
Riyadh	Saudi Arabia	British Airways	BA	5
Riyadh	Saudi Arabia	Saudia	SV	4
Rome (Fiumicino)	Italy	Alitalia	AZ	4
Rome (Fiumicino)	Italy	British Airways	BA	5
Salt Lake City	USA	Delta Air Lines	DL	3
Salzburg	Austria	Eurowings	EW	2
Salzburg	Austria	British Airways	BA	5
San Diego	USA	British Airways	BA	5
San Francisco	USA	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
San Francisco	USA	United Airlines	UA	2
San Francisco	USA	Virgin Atlantic	VS	3
San Jose	USA	British Airways	BA	5
Santiago	Chile	British Airways	BA	5
Santorini	Greece	British Airways	BA	5
Sanya	China	China Southern	CZ	4
Sao Paulo	Brazil	British Airways	BA	5
Sao Paulo	Brazil	LATAM Airlines	JJ	3
Sao Paulo	Brazil	LATAM Airlines	JJ	3
Seattle - Tacoma	USA	British Airways	BA	5
Seattle - Tacoma	USA	Delta Air Lines	DL	3
Seoul	South Korea	Asiana Airlines	OZ	2
Seoul	South Korea	British Airways	BA	5
Seoul	South Korea	Korean Air	KE	4
Seychelles	Seychelles	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Shanghai (Pudong)	China	British Airways	BA	5
Shanghai (Pudong)	China	China Eastern	MU	4
Shanghai (Pudong)	China	Virgin Atlantic	VS	3
Shannon	Republic of Ireland	Aer Lingus	EI	2
Shenzhen	China	Shenzhen Airlines	ZH	2
Singapore	Singapore	British Airways	BA	5
Singapore	Singapore	Singapore Airlines	SQ	2
Singapore	Singapore	Qantas	QF	3
Sofia	Bulgaria	British Airways	BA	5
Sofia	Bulgaria	Bulgaria Air	FB	4
Split	Croatia	Croatia Airlines	OU	2
St Johns	Canada	Air Canada	AC	2
St Petersburg	Russia	British Airways	BA	5
Stavanger	Norway	British Airways	BA	5
Stavanger	Norway	SAS - Scandinavian Airlines	SK	2

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Destination	Country	Airline	Code	Terminal
Stockholm (Arlanda)	Sweden	British Airways	BA	5
Stockholm (Arlanda)	Sweden	SAS - Scandinavian Airlines	SK	2
Stuttgart	Germany	British Airways	BA	5
Stuttgart	Germany	Eurowings	EW	2
Stuttgart	Germany	Germanwings	4U	2
Sydney	Australia	British Airways	BA	5
Sydney	Australia	Qantas	QF	3
Sylhet	Bangladesh	Biman Bangladesh Airlines	BG	4
Taipei	Taiwan	EVA Air	BR	2
Tallinn	Estonia	British Airways	BA	5
Tashkent	Uzbekistan	Uzbekistan Airways	HY	4
Tehran	Iran	British Airways	BA	5
Tehran	Iran	Iran Air	IR	3
Tel Aviv	Israel	British Airways	BA	5
Tel Aviv	Israel	El Al	LY	4

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Destination	Country	Airline	Code	Terminal
Tel Aviv	Israel	Virgin Atlantic	VS	3
Tenerife South	Spain	British Airways	BA	5
Tenerife North	Spain	Iberia	IB	5
Tenerife North	Spain	Iberia Express	I2	5
Tokyo (Haneda)	Japan	ANA	NH	2
Tokyo (Haneda)	Japan	British Airways	BA	5
Tokyo (Haneda)	Japan	Japan Airlines	JL	3
Tokyo (Narita)	Japan	British Airways	BA	5
Toronto	Canada	Air Canada	AC	2
Toronto	Canada	British Airways	BA	5
Toulouse	France	British Airways	BA	5
Tunis	Tunisia	Tunisair	TU	4
Turin	Italy	British Airways	BA	5
Valencia	Spain	British Airways	BA	5
Valletta	Malta	Air Malta	KM	4

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Destination	Country	Airline	Code	Terminal
Vancouver	Canada	Air Canada	AC	2
Vancouver	Canada	British Airways	BA	3
Venice	Italy	British Airways	BA	5
Vienna	Austria	Austrian	OS	2
Vienna	Austria	British Airways	BA	3
Warsaw	Poland	British Airways	BA	5
Warsaw	Poland	LOT Polish Airlines	LO	2
Washington (Dulles)	USA	British Airways	BA	5
Washington (Dulles)	USA	United Airlines	UA	2
Washington (Dulles)	USA	Virgin Atlantic	VS	3
Wuhan	China	China Southern	CZ	4
Xian	China	Tianjin Airlines	GS	3
Zagreb	Croatia	British Airways	BA	5
Zagreb	Croatia	Croatia Airlines	OU	2
Zakynthos	Greece	British Airways	BA	5

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Destination	Country	Airline	Code	Terminal
Zhengzhou	China	China Southern	CZ	4
Zurich	Switzerland	British Airways	BA	5
Zurich	Switzerland	Swiss International Airlines	LX	2

Banned and restricted carriers

Airports are required by the European Commission to provide access to the airlines considered to be unsafe and are not permitted to fly passengers or cargo within the European Community. The current list, and further related information, can be found on the European Commission website.

Banned and restricted carriers

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World Air Cargo Forecast

2018-2037

We issue the biennial World Air Cargo Forecast (WACF) to provide a comprehensive overview of the air cargo industry. The forecast summarizes the world's major air trade markets, identifies major trends, and presents forecasts for the future performance and development of markets, as well as for the world freighter airplane fleet.

Download the full report >

Forecast Highlights

Air cargo has recovered and is on track to grow 4.2% over the next 20 years

Air cargo traffic grew 10.1 percent in 2017, more than double the long-term average growth rate. In the next 20 years, air cargo traffic is expected to more than double and the world freighter fleet will grow by more than 75 percent.

E-commerce will continue to boost air cargo demand

Global retail e-commerce sales were $2.3 trillion in 2017, more than double the $1.1 trillion spent in 2012. With no signs of slowing down, the e-commerce market size is forecast to double again by 2021, reaching nearly $4.9 trillion.

Asia to lead future growth

Asia will continue to lead the world in average annual air cargo growth, supported by faster-growing economies and expanding middle classes. Domestic China, intra–East Asia, East Asia–North America, and Europe–East Asia markets are all expected to grow faster than the world average growth rate, demonstrating that markets within, serving, and connecting to Asia will lead growth in the next decade and beyond.

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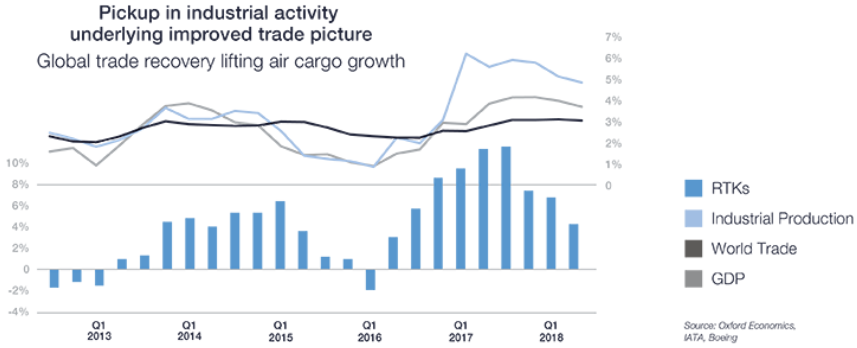
Freighters will continue to carry more than half of the world's air cargo demand

While passenger belly capacity is increasing, freighters maintain a market share advantage for several reasons, which include providing highly controlled transport, direct routing, reliability, and unique capacity considerations (volume, weight, hazardous materials, and dimensions). These factors make freighter operations essential and are driving the forecast for freighters to continue carrying more than half of the world's air cargo in the next 20 years.

Air cargo volumes growing amid international trade surge



Freighters are critical to compete in air cargo markets

China online retail sales have passed $1 trillion

Downloads

WORLD AIR CARGO FORECAST 2018-2037 COMMERCIAL MARKET OUTLOOK 2018-2037 SERVICES MARKET OUTLOOK 2018-2037

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York Aviation LLP
Primary House
Spring Gardens
Macclesfield
Cheshire SK10 2DX

Tel: 01625 614051
Fax: 01625 426159
E-mail: james.brass@yorkaviation.co.uk
www.yorkaviation.co.uk

Tony Freudmann
RiverOak Investment Corp.,
LLC One Atlantic Street,
Suite 703 Stamford,
CT 06901 U.S.A.

13 October 2016

Dear Tony

Freight Demand in the London Area and Manston Airport

Following our conversation the other day regarding the recent report produced by AviaSolutions on the Commercial Viability of Manston Airport, I promised to write to you in relation to our current views on the work undertaken by York Aviation for the Freight Transport Association and Transport for London and entitled *"Implications for the Air Freight Sector of Different Airport Capacity Options"* and published in January 2015. I can confirm that we continue to stand by the content of this report and believe it to be a robust and sensible analysis of the potential future development of the air cargo market in London. This includes our analysis of the growth in the demand for air freight moving forward and the potential constraints facing the market if additional runway capacity is not provided within the London system.

Best regards

[redacted]

James Brass
Partner

AZIMUTH
ASSOCIATES

Ms L. Congdon
York Aviation
Primary House
Spring Gardens
Macclesfield
Cheshire
SK10 2DX

16th October 2017

Dear Louise,

Pincent Masons letter to the Planning Inspectorate

I have recently read the letter from Pincent Masons on behalf of Stone Hill Park, your client, to the Planning Inspectorate dated 11th October. I am writing to you with reference to 1.8.6 of their letter, which states that I have incorrectly cited your work.

On the 3rd of October I had occasion to contact your colleague, James Brass, to check the details of a report you had produced. He replied to me on the 6th October but made no mention of my alleged incorrect citation of your work. Instead it seems you have provided a copy of your report on the matter to a small group of protestors working under the banner of No Night Flights and operating a Facebook page with the name "Manston Pickle". Their posting on the 12th of October says:

> *And did you see the little jibe in the media report in which this appeared (see below) that RSP has misrepresented a report by York Aviation? Who says so? York Aviation says so. Now, we already knew this 'cos a little bird sent the York Aviation report to contacts of ours recently. And, as misrepresentations go, we think it's pretty bare-faced*.

I have to say that I am disappointed that, as a professional courtesy, you would not have contacted me immediately if you felt there had been an error in my understanding of your work. I can assure you that I had no intention of any such discourtesy and, if you would provide me with the details, I will immediately make any corrections necessary.

Since the way you have handled this situation is potentially damaging to my career, I am taking advice from Counsel. I therefore look forward to hearing from you within the next two days.

Yours sincerely,

Sally Dixon

Sally Dixon
MBA PhD MRAeS
01227 772 086
07973 523 898
sally@azimuthassociates.co.uk
www.azimuthassociates.co.uk
17 Island Wall Whitstable Kent CT5 1EP

AZIMUTH
ASSOCIATES

York Aviation

York Aviation LLP
Primary House
Spring Gardens
Macclesfield
Cheshire SK10 2DX
Tel: 01625 614051
Fax: 01625 426159
E-mail: louise.congdon@yorkaviation.co.uk
www.yorkaviation.co.uk

Sally Dixon,
Azimuth Associates,
17 Island Wall,
Whitstable,
Kent CT5 1EP.

17th October 2017

Dear Ms Dixon,

Manston Airport

I am in receipt of your letter of 16th October, to which you requested a response within 2 days. I will deal with the points that you raise.

We were alerted by Pinsent Masons in early September this year to the reliance being placed by yourself, on behalf of RSP, on both our report for the Freight Transport Association (FTA) and also earlier work for Transport for London. Although there had been earlier correspondence (October 2016) regarding our 2015 work for FTA, where we confirmed that we considered it to be *"a robust and sensible analysis of the potential future development of the air cargo market in London ……if additional runway capacity is not provided within the London system"*, we were very surprised to find that:

a) the reports were being presented as primary evidence by RSP in its consultation documentation this summer without any clearance by or notification to ourselves; and

b) that there were repeated instances in your reports where the views expressed in our reports had been selectively and incompletely quoted, without proper context, with conclusions drawn from our work which go beyond those that could reasonably be made when the reports are read and understood in totality.

This view is reflected in Pinsent Masons' letter to the Planning Inspectorate.

When James Brass responded to you in 6th October, he made clear that we now had a conflict of interest in relation to Manston but, nonetheless, he provided you with guidance as to the applicability of our 2004 work for ACI EUROPE. In the circumstances of our engagement by Stonehill Park, it would have been inappropriate at that point to raise the specific areas of concern in relation to the use of our past work.

In terms of your accusation that we have supplied a copy of our report to 'Manston Pickle', I can assure you that we have had no communication with that organisation, nor any knowledge of the report to which they refer, unless it is one of those posted on RSP's website.

As noted in the Pinsent Masons' letter to PINS, we are working on a report which will form part of Stonehill Park's evidence to PINS in due course.

Managing Partner

AZIMUTH
ASSOCIATES

Ms L. Congdon,
York Aviation,
Primary House, Spring Gardens,
Macclesfield, Cheshire SK10 2DX

18th October 2017

Dear Louise,

Manston Airport - Pinsent Masons letter to the Planning Inspectorate

Thank you for your letter dated 17th October. In response to the points you raise I would like to draw your attention to the following:

a) Your statement that the reports written on behalf of RSP did not have your clearance

The York Aviation report I cite is in the public domain and therefore, I believe, does not require your clearance. For clarity, this is:

> York Aviation (2015), *Implications for the Air Freight Sector of Different Airport Capacity Options*. Available from http://content.tfl.gov.uk/air-freight-implications-from-new-capacity.pdf

However, I would remind you that both Tony Freudmann and I spoke to your colleague, James Brass, on the 10th October 2016, specifically to discuss your 2015 report. We subsequently received a letter dated 13th October 2016 confirming that you continued to stand by your report. It was made clear during our discussions that I would be citing your work and you raised no objections at that time. Indeed, Tony Freudmann, in his email to you dated 13th October said, "*Can I ask if you would have a problem with this going into the public domain?*" The reply from James Brass on the same date was, "*No problem from my perspective. It only says what we would say publicly anyway*." I regard that as sufficient clearance, as well as confirmation that it is in the public domain.

In your letter dated 17th October 2017, you make reference to the "earlier" work for Transport for London. **I am unclear as to what this refers and would be grateful for your clarification**. During a heated discussion at a meeting of the Combined Churches of Herne Bay on Monday evening, Ms Ros McIntyre of No Night Flights referred to your involvement in the hard copy report provided to me by Transport for London. Indeed, she was most insistent and I am able to provide the venue's recording of what she alleges. However, there is absolutely no mention of York Aviation contained within the report provided to me by TfL and I was specifically told by them that TfL had produced the report in-house.

For your reference, the TfL report is entitled 'Note on Freight Connectivity' and commences with the sentence:

"This note explains the approach taken to estimating the number of pure freighter air transport movements at the London airports in 2050 under three different scenarios of capacity growth:

- *Maximum use of existing capacity;*
- *2+2+2 - additional runways at each of Gatwick and Stansted;*

Sally Dixon
MBA PhD MRAeS
01227 772 086
07973 523 898
sally@azimuthassociates.co.uk
www.azimuthassociates.co.uk
17 Island Wall Whitstable Kent CT5 1EP

AZIMUTH
ASSOCIATES

- *New 4 runway hub*."

On the 23rd February 2017 I sent a copy of volumes I, II and III of my work to Transport for London and they have made no complaint. **I would be grateful for your clarification that we are discussing the same report.** Ros McIntyre also insisted that **York Aviaton now believe that Stansted has ample capacity for freighters and I would be grateful for your confirmation or rebuttal of her statement** (recording and/or transcript of this is also available at your request).

b) Your claim of selective and incomplete quotations used in my reports

I absolutely refute this allegation **and would ask you to provide specific examples**. My understanding of your 2015 report and your subsequent clarifications is that there will be a substantial shortage of capacity for air freighters in the South East by 2050. This is the point I make, backed up by your report as well as a number of others. I do not use your report for any other purpose. Conclusions about Manston Airport are drawn from my research.

I note from your letter of the 17th October that you are currently working on a report that will form part of Stone Hill Park's evidence to PINS in due course. Since the report is as yet unfinished, **I would be interested to know your position in regard to why Pinsent Masons have drawn the preemptive conclusions detailed in their letter to the Planning Inspectorate dated 11th October 2017**. Indeed, it is surprising that Pinsent Masons have demanded that this evidence is withdrawn from the RSP proposals forthwith without having received the findings from your report or waiting for you to clarify the exact nature of the alleged incorrect citation. For clarity, the Pinsent Masons letter states at 1.8.6 that:

> "*It is worth noting that PSP's aviation consultant, Dr Sally Dixon of Azimuth Associates, has incorrectly cited York Aviation's work in support of its proposals, which York Aviation will be dealing with as part of SHP's evidence to deal with the RSP proposals in the event that they are not withdrawn forthwith*."

I do hope you understand why I am persisting with this matter. A number of agencies have identified that the UK will increasingly suffer economically from a lack of airport capacity in the South East. I believe, based on my research, that the re-opening of Manston Airport could provide much-needed relief, particularly for freighters. Manston Airport is situated in an area of considerable deprivation and the jobs that could result from the airport operation outlined by RSP would do much to address this long-term problem. At a personal level, my reputation is being questioned in a public arena. Your allegations may have serious professional ramifications, which is why I cannot allow them to go unchallenged.

Due to the seriousness of this matter, I would ask that you respond as soon as possible and certainly before Friday 20th October 2017.

Yours sincerely,

[redacted]

Sally Dixon
MBA PhD MRAeS
01227 772 086
07973 523 898
sally@azimuthassociates.co.uk
www.azimuthassociates.co.uk
17 Island Wall Whitstable Kent CT5 1EP

York Aviation

York Aviation LLP
Primary House
Spring Gardens
Macclesfield
Cheshire SK10 2DX
Tel: 01625 614051
Fax: 01625 426159
E-mail: louise.congdon@yorkaviation.co.uk
www.yorkaviation.co.uk

Sally Dixon,
Azimuth Associates,
17 Island Wall,
Whitstable,
Kent CT5 1EP.
19th October 2017

Dear Ms Dixon,

Manston Airport

I am in receipt of your letter of 18th October, to which you requested a response by 20th October. I will deal with the points that you raise.

i. James Brass correctly stated, in October 2016, that, as our work for the FTA was in the public domain, we would have no difficulty with you properly citing it in your work, nor his letter, and that we stood over the conclusions of that work. However, we did not expect that it would be used as a primary consultation document and placed on RSP's website as such, giving the impression that we were working for RSP. This was the reason for the concern that I have expressed.

ii. In relation to the so-called TfL paper on Freight Connectivity, I am unsure what hard copy version was provided to you by TfL but it is quite clear from the Freedom of Information disclosure made by TfL that the note referred to in your proposed DCO application documentation was that prepared by ourselves and to which I refer. The FOI disclosure is at:
https://tfl.gov.uk/corporate/transparency/freedom-of-information/foi-request-detail?referenceId=FOI-0891-1718
You will see that the note is identical to that which you quote and is clearly marked with our logo.

iii. The reports upon which we have expressed concern are indeed Volumes I, II and III as placed on RSP's website. I cannot comment on TfL's views on these reports but at no time did they consult with ourselves in relation to these reports and their reliance on our earlier work.

iv. We have had no communication with Ros McIntyre and cannot comment on any views expressed.

v. In relation to your interpretation of our earlier work, the position remains as set out in my previous letter. This will be set out more fully in our report which you will be able to review in due course.

vi. Whilst our report is not yet finalised, we have, of course, discussed the matters with Pinsent Masons and they reflected our views in their letter to PINS.

vii. Pinsent Masons did not demand that your reports are withdrawn, rather the paragraph quoted states that our report will be part of the evidence to be submitted in the event that RSP's proposal is not withdrawn from the DCO process.

In the light of the formality of the process in which we are engaged, I would suggest that future correspondence should be routed through the correct channels, via PINS as appropriate.

Yours faithfully,

[redacted]

Louise Congdon`
Managing Partner

AZIMUTH
ASSOCIATES

Ms L. Congdon,
York Aviation,
Primary House,
Spring Gardens,
Macclesfield,
Cheshire SK10 2DX

24th October 2017

Dear Louise,

Manston Airport – Transport for London document re-reference

Thank you for your letter dated 19th October. I can confirm that the report provided by Transport for London in response to the FoI request (after our consultation took place) is the same document I cited in my work. The copy I have does not contain your logo and, as previously stated, TfL did not mention that this work was attributable to you.

However, given that I now know this is your work, I will re-reference in all volumes of the Manston Airport reports so that it is clear York Aviation is the author. Since the FoI request puts the document in the public arena I will be able to use the link you provided to complete my referencing.

If the extent of the alleged 'misrepresentation' is the inclusion of your report amongst several other documents on the RSP website under the heading 'External documents', then it is of no substance. If it is a matter of interpretation of your findings, then no doubt this will be examined in more detail when RSP's application is made.

Yours sincerely,

[redacted]

Sally Dixon
MBA PhD MRAeS
01227 772 086
07973 523 898
sally@azimuthassociates.co.uk
www.azimuthassociates.co.uk
17 Island Wall Whitstable Kent CT5 1EP

AZIMUTH
ASSOCIATES

DAP 1916 - Statement of Need: Intended Change to Notified Airspace

This form may be used to provide information to the CAA about an intended change. Once this form is completed then please submit it by clicking the button at the end of this form.

---

1. Change Title

Please enter a title for this intended change, (max 80 characters): *

Manston Airport - Airport Reactivation

2. Change Sponsor Details

Please select the appropriate category and complete. *

- (•) A Company
- ( ) An Unincorporated Association or other body
- ( ) Individual (including sole traders and partnerships)

2a. A Company

Registered Company name (in full) *

RiverOak Strategic Partners Limited

Registered Company Number

10269461

Country of Company Registration

England and Wales

Registered Office Address

16 Charles II Street, LONDON

Postcode

SW1Y 4NW

E-mail

manston@communityrelations.co.uk

Trading name (if applicable)

Trading Address (primary site)

Country

Postcode

Website address

http://rsp.co.uk/

Primary Point of Contact Name *

Tony Freudmann

Telephone *

07785 306 715

E-mail *

tony.freudmann@rsp.co.uk

Secondary Point of Contact Name

Telephone

0800 030 4137

E-mail

manston@communityrelations.co.uk

3. Independent Aviation/Airspace Consultancy

☑ Is an Independent Aviation/Airspace Consultancy involved in this proposal?

Aviation Consultancy

Registered Company name (in full) *
Osprey Consulting Services Ltd

Registered Company Number
6034579

Country of Company Registration
England and Wales

Registered Office Address
Suite 10 The Hub, Fowler Avenue, Farnborough Business Park, Farnborough

Postcode
GU14 7JP

Telephone
01420 520 200

Email
enquiries@ospreycsl.co.uk

Trading Name (if applicable)

Trading Address (primary site)

Country

Postcode

Website address
www.ospreycsl.co.uk

Primary Point of Contact Name *
Lindsay Perks

Primary Contact

☑ Should the CAA use the Independent Consultancy as the primary point of contact for this airspace change proposal?

Telephone *
07900 995 428

Email *
lindsay.perks@ospreycsl.co.uk

Secondary Point of Contact name
Richie Hinchcliffe

Telephone
01609 751641

Email
richie.hinchcliffe@ospreycsl.co.uk

4. Summary of Intended Change

Please use the check boxes below to indicate the nature of the intended change(s): *

- ☐ Flight Information Region (ENR 2.1)
- ☐ Upper Information Region (ENR 2.1)
- ☐ Terminal Control Area (ENR 2.1)
- ☐ Other Regulated Airspace (ENR 2.2)
- ☐ Lower ATS Routes (ENR 3.1)
- ☐ Upper ATS Routes (ENR 3.2)
- ☐ Area Navigation Routes (ENR 3.3)
- ☐ Helicopter Routes (ENR 3.4)
- ☐ Other Routes (ENR 3.5)
- ☐ En-Route Holding (ENR 3.6)
- ☑ Name-Code Designators (ENR 4.4)
- ☐ Prohibited/Restricted/Danger Areas (ENR5.1)
- ☐ Military Exercise/ Training Areas (ENR 5.2)
- ☐ Other Danger/ Hazard (ENR 5.3)
- ☐ Aerial/Sporting/Recreational Activities (ENR 5.5)

- [ ] Bird Migration/Sensitive Fauna (ENR 5.6)
- [x] ATS Airspace (AD-EGXX-2.17)
- [x] Flight Procedures (AD-EGXX-2.22)
- [x] ATCSMAC (AD-EGXX-5)
- [x] Standard Instrument Departure (AD-EGXX-6)
- [x] Standard Arrival Route (AD-EGXX-7)
- [x] Instrument Approach Procedure (AD-EGXX-8)
- [ ] Visual Reference Point .
- [ ] Release of Controlled Airspace .

Please use the check box below to indicate whether this is an administrative change:

- [ ] Does your proposal represent an administrative change to the Aeronautical Information Publication (AIP)?

5. Statement of Need

Please provide a brief 'Statement of Need' expressing explicitly what airspace issue or opportunity you are seeking to address. Your Statement of Need should clearly articulate the current situation, the issue (and the cause of it) to be resolved or the opportunity to be addressed along with any other factors or requirements. *

Introduction:

Prior to closure the aerodrome at Manston had conventional flight procedures that allowed aircraft to land on and take-off from the runway and an Aerodrome Traffic Zone (ATZ) to offer protection to aircraft in the critical stages of flight near the runway. All such measure were removed when the aerodrome closed.

The issues to be addressed:

The Masterplan submitted with the Development Consent Order (DCO) application describes an integrated aviation services hub with an air freight centre, at Manston Airport, capable of handling in excess of 10,000 air freight Air Traffic Movements (ATM) annually. Should the DCO be granted, there will be a need to introduce appropriate flight procedures and airspace to enable safe operations. The procedures will need to comply with Resolution 36/23 ratified by the 36th International Civil Aviation Organisation (ICAO) General Assembly and the UK Future Airspace Strategy (FAS) published by the Civil Aviation Authority (CAA). This involves the introduction of routes and procedures compliant with Performance Based Navigation (PBN) criteria; a State requirement for 2024.

Future Airspace Strategy Implementation (South) (FASI(S)) and London Airspace Management Programme (LAMP) require UK southeast airports to implement PBN in order that the complex interactions between the region's airports are fully considered. The aerodrome sits below Controlled Airspace (CAS), the eastern extensions of the London Terminal Manoeuvring Area (TMA) which contains busy routes into and out of inter alia Heathrow, Gatwick and London City (to/from The Continent). Routes into and out of the future Manston Airport will need to integrate with these London TMA routes at some distance from the Airport.

The airspace solution will seek to provide an appropriate degree of protection to enable the safe management of the Airport associated ATMs in the critical stages of flight; take-off and landing.

Please specify the altitudes (where applicable) affected by your Statement of Need:

- [x] Surface to below 4,000 feet
- [x] 4,000 feet to below 7,000 feet
- [x] 7,000 feet to below 20,000 feet
- [ ] 20,000 feet and above

6. Proposed Dates

Please provide your proposed date for the submission of your change proposal to the CAA. This should be the date on which you are expecting to submit your formal airspace change proposal to the CAA. Please note that your formal airspace change proposal must be submitted alongside all of the supporting documentation required by the CAA to complete our regulatory assessment of the Proposal; consequently the date on which you place in this field should represent the point at which you will have the formal airspace change proposal **and all** of the supporting documentation ready to submit to the CAA. This date is required to assist us with the allocation of the required CAA-resource to your proposal and therefore it is a key date in our planning process. Whilst we will try to accommodate your specified timescales, there may be occassions where it is not possible for us to do so given the large number of projects that are already 'in process' You should also note that any changes to the above date may impact our ability to process your airspace change proposal within your preferred timescales. It should also be noted that from September 2018 any amendments submitted by a Data Originator or ANSP for onward promulgation in the UK IAIP will be subject to the Aeronautical Data Quality Requirements. See Commission Regulation (EU) No 73/2010 (updated by 1029/2014) and CAP 1054: Aeronautical Information Management guidance material for further information. These requirements will be discussed in greater detail during the course of your initial meeting with the CAA.

- [x] Confirmation of Understanding *

Please provide your proposed date for the submission of your change proposal to the CAA. *

29 Jul 2020

Please provide your proposed AIRAC effective date *

AIRAC 13/2021

If this change forms a part of a modular airspace change proposal please provide the relevant title and further information below (Note we will require individual submissions for each module) . *

No

If this change requires the implementation of a Five-Letter Name Code (5LNC) please specify your requirements below: *

Required for RNAV T-Bar Y-Bar IAPs and potential en-route points

Appendix Ns.2.11

625000 630000 635000

170000 165000

YEAR 2 - Road traffic without Proposed Development

YEAR 2 - Road traffic with Proposed Development

Key

Order Limits

Day-time $L_{Aeq, 16hr}$

Aircraft Noise

50 dB LOAEL

63 dB SOAEL

Road Noise

50 dB LOAEL

63 dB SOAEL

Notes:
1. To be read in conjunction with "Environmental Statement Addendum- Potential Effects arising from the use of the Kent County Council Thanet Strategic Transport Model"
2. Road noise predicted for receptors within 1.5km of roads where development traffic is forecast to change road traffic noise by more than 1dB.

0 500 1,000 1,500 2,000 2,500 3,000 m

Scale at A3: 1:55,000

Contains OS data © Crown Copyright and database right 2018

Client

RSP

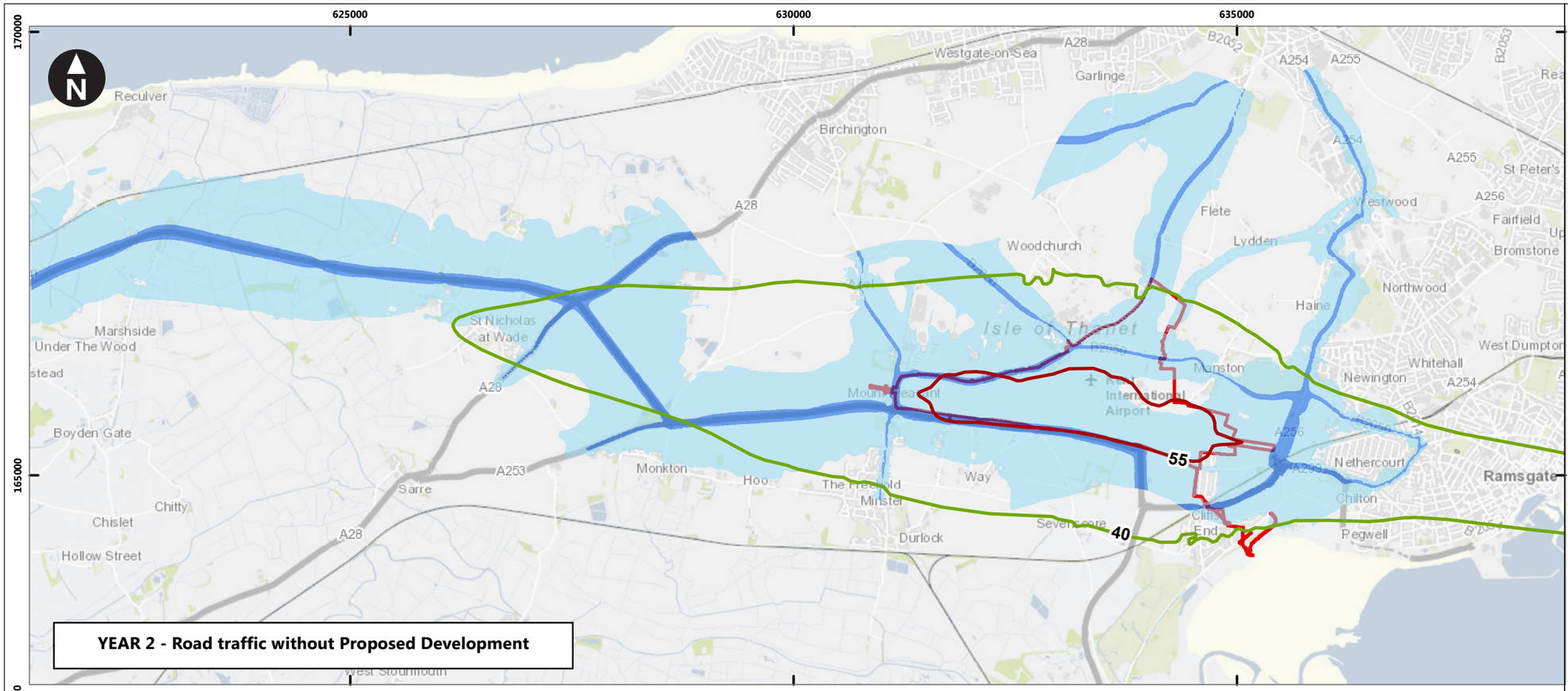
Manston Airport DCO

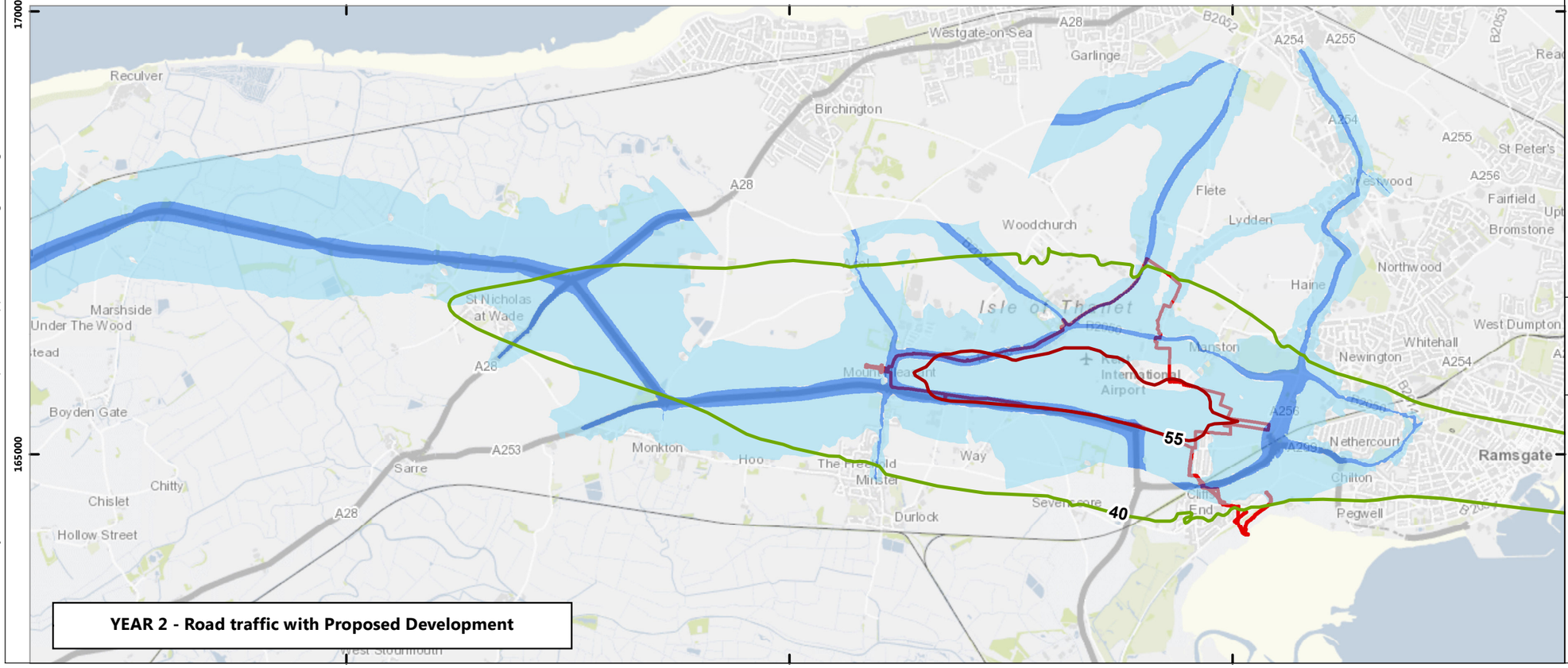
Figure 12.25
Comparison of aircraft and road noise contours – Daytime – Opening Year

May 2019

wood.

\\sal-fs12\shared\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon147.mxd Originator: rahiel.ghani





Key

Order Limits

Night-time L $_{Aeq, 8hr}$

Aircraft Noise

40 dB LOAEL

55 dB SOAEL

Road Noise

40 dB LOAEL

55 dB SOAEL

Notes:

1. To be read in conjunction with "Environmental Statement Addendum-Potential Effects arising from the use of the Kent County Council Thanet Strategic Transport Model"
2. Road noise predicted for receptors within 1.5km of roads where development traffic is forecast to change road traffic noise by more than 1dB.

0 500 1,000 1,500 2,000 2,500 3,000 m

Scale at A3: 1:55,000

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Client

RSP

Manston Airport DCO

Figure 12.26
Comparison of aircraft and road noise contours – Night time – Opening year

May 2019

wood.

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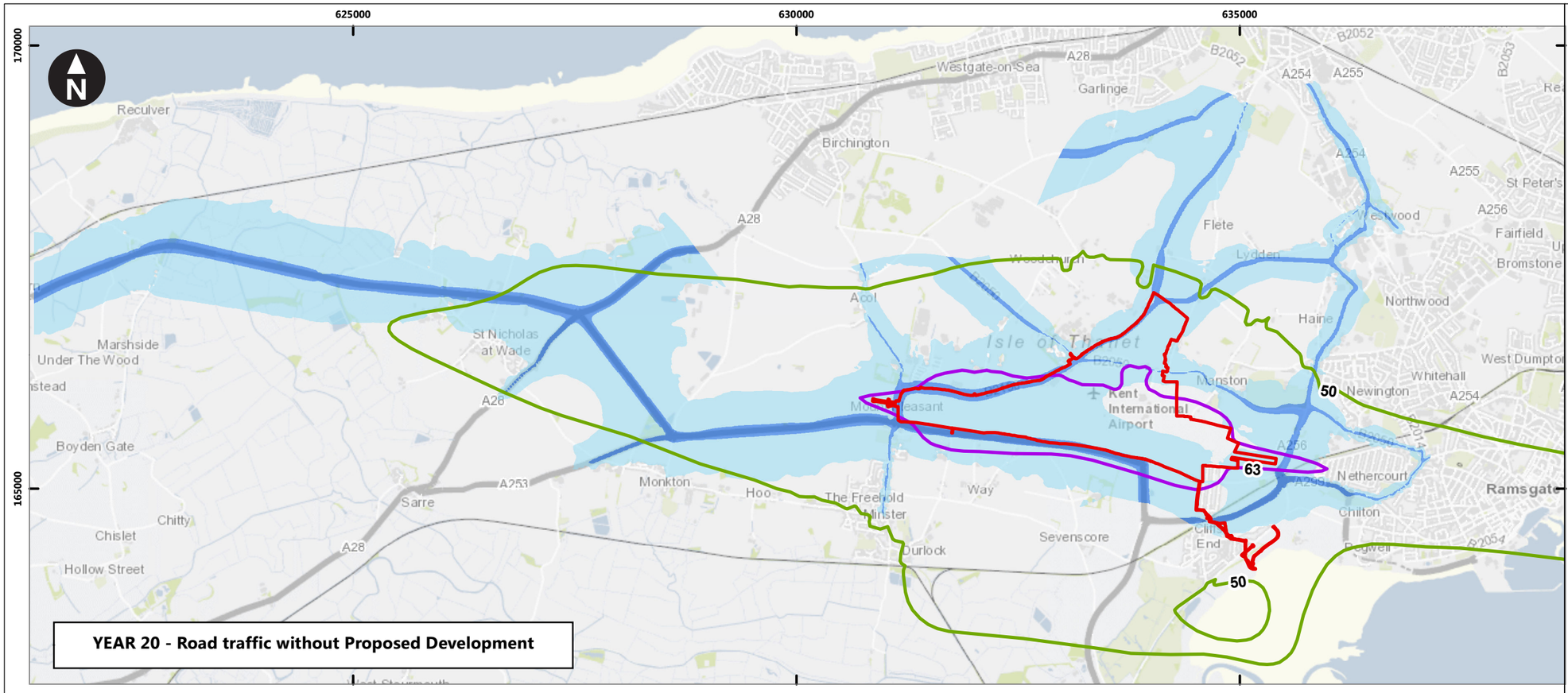

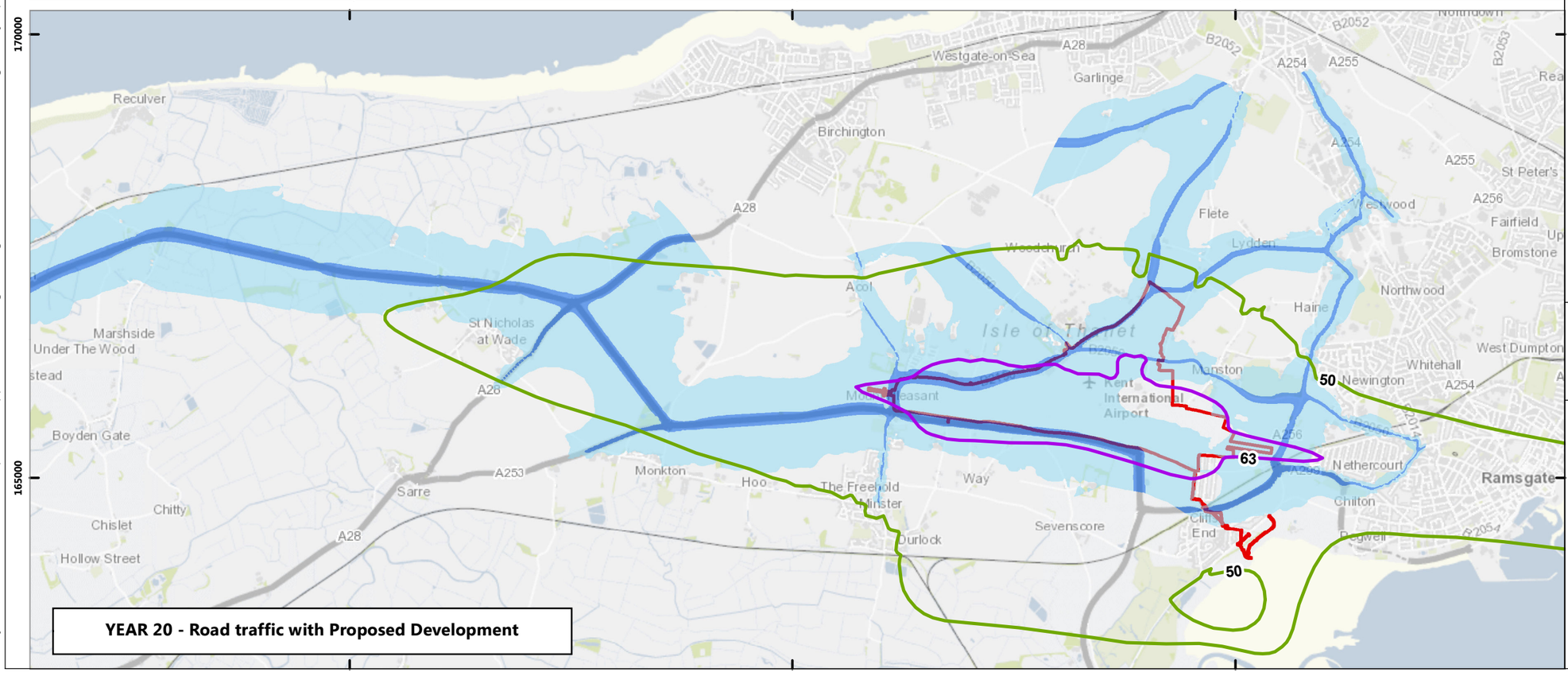

Key

Order Limits

Day-time L $_{Aeq, 16hr}$

Aircraft Noise

50 dB LOAEL

63 dB SOAEL

Road Noise

50 dB LOAEL

63 dB SOAEL

Notes:

1. To be read in conjunction with "Environmental Statement Addendum- Potential Effects arising from the use of the Kent County Council Thanet Strategic Transport Model"
2. Road noise predicted for receptors within 1.5km of roads where development traffic is forecast to change road traffic noise by more than 1dB.

0 500 1,000 1,500 2,000 2,500 3,000 m

Scale at A3: 1:55,000

Contains OS data © Crown Copyright and database right 2018

Client

RSP

Manston Airport DCO

Figure 12.27
Comparison of aircraft and road noise contours – Day time – Year of forecast maximum capacity

May 2019

wood.

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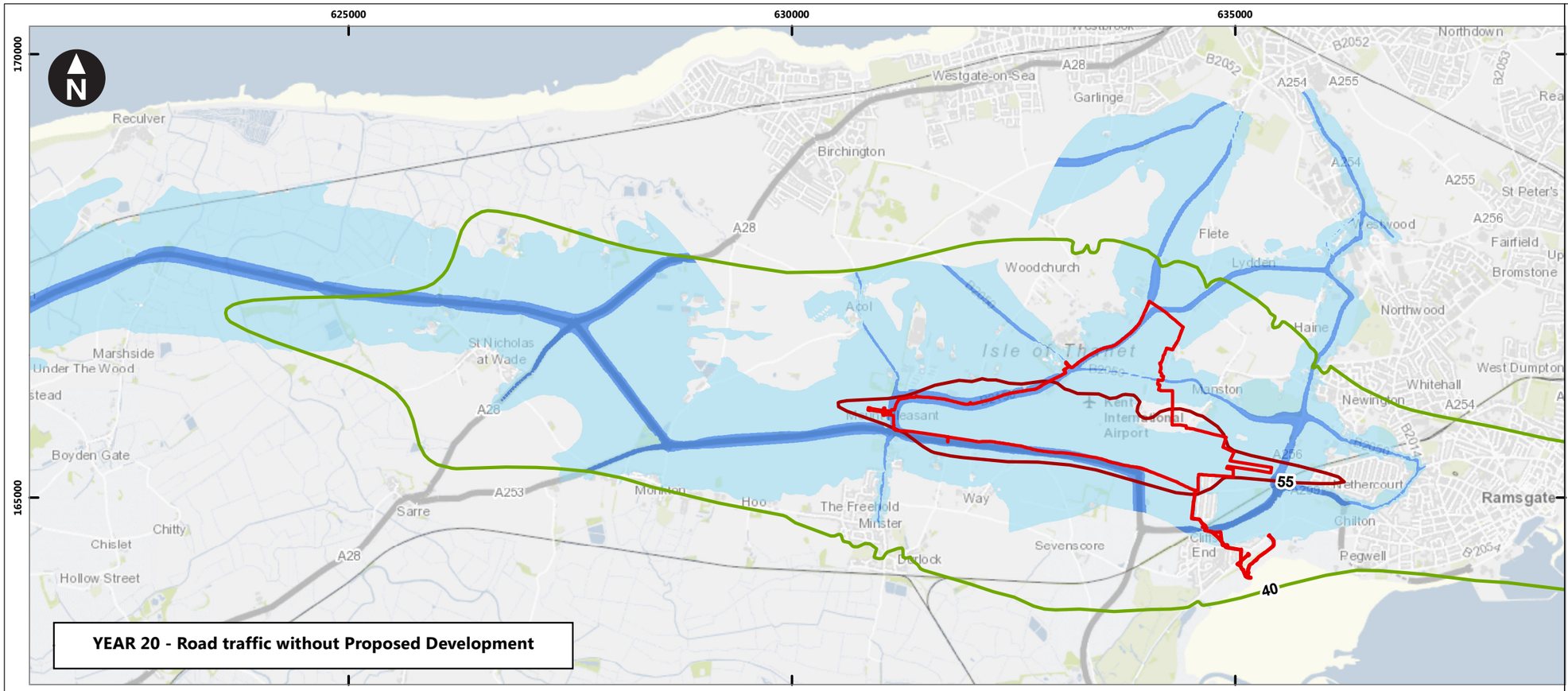

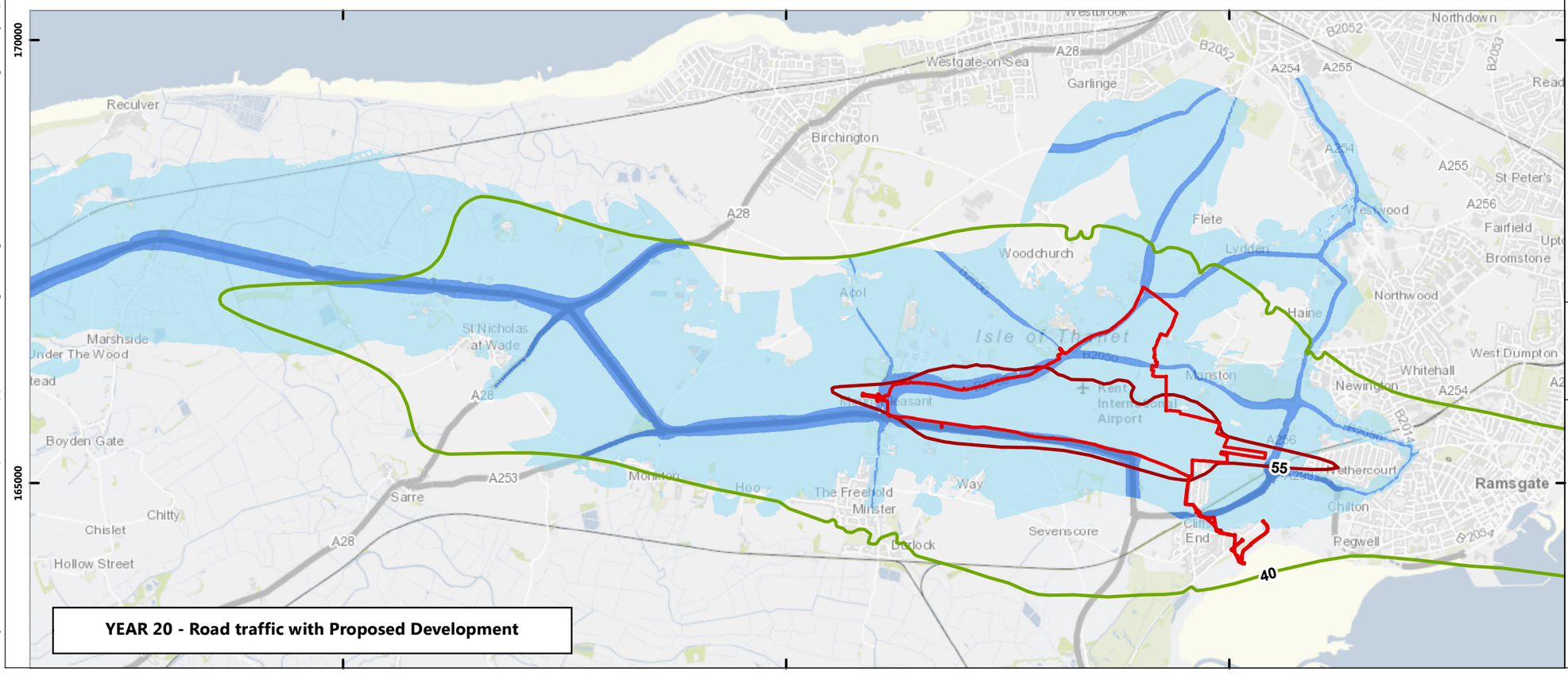

Key

Order Limits

Night-time L Aeq, 8hr

Aircraft Noise

40dB LOAEL

55dB SOAEL

Road Noise

40 dB LOAEL

55 dB SOAEL

Notes:
1. To be read in conjunction with "Environmental Statement Addendum-Potential Effects arising from the use of the Kent County Council Thanet Strategic Transport Model"
2. Road noise predicted for receptors within 1.5km of roads where development traffic is forecast to change road traffic noise by more than 1dB.

0 500 1,000 1,500 2,000 2,500 3,000 m

Scale at A3: 1:55,000

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Client

RSP

Manston Airport DCO

Figure 12.28
Comparison of aircraft and road noise contours – Night time – Year of forecast maximum capacity

May 2019

wood.

H:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon146.mxd Originator: jacqui.parkin

Appendix Ns.2.12

635000
635500
636000
166000
165500
165000

The Leys
Spratling Court Farm
Camping Site
Spratling Street Farm
SPRATLING LANE
50
ST JOHN'S AVENUE
BRISBANE ROAD
WILTON ROAD
LEIGH ROAD
PRESTON
PW
ELM G
HIGHLANDS
B2050
Golf Course
Manston Golf Centre
St Stephens
GREENSOLE LANE
Industrial Estate
DENBIGH R
WENTWORTH DRIVE
AUCKLAND AVENUE
ROSSLAND ROAD
KEITH AVE
Staner Hill
1a
1b
1c
1d
1e
1f
MANSTON ROAD
B2050
A256
4a
4b
4c
4d
4e
4f
4g
2a
2b
2c
2d
2e
2f
2g
2h
3a
3b
3c
3d
3e
MERIDIAN CLOSE
Ozengell Grange
Old Timber Yard Industrial Estate
Superstore
63
55
Runway Approach Lights
Mansfield Villas
WINDSOR ROAD
CANTERBURY ROAD WEST
A299
Ppg Sta
Hollins Bottom
Lord of the Manor Roundabout
Lord of the Manor
CANTERBURY ROAD EAST
WINDERMERE AVENUE
WHINFELL
DRYBECK A
KIRKSTONE AVE
DERWENT AVENUE
BORROWDALE AVENUE
GRASMERE AVENUE
CONISTON AVENUE

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Key

Manston Green Development

Residential dwelling block

Daytime $L_{Aeq,16hr}$

50 dB LOAEL

63 dB SOAEL

Night-time $L_{Aeq, 8hr}$

55dB SOAEL

0 100 200 300 m

Scale at A3: 1:5,000

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Client

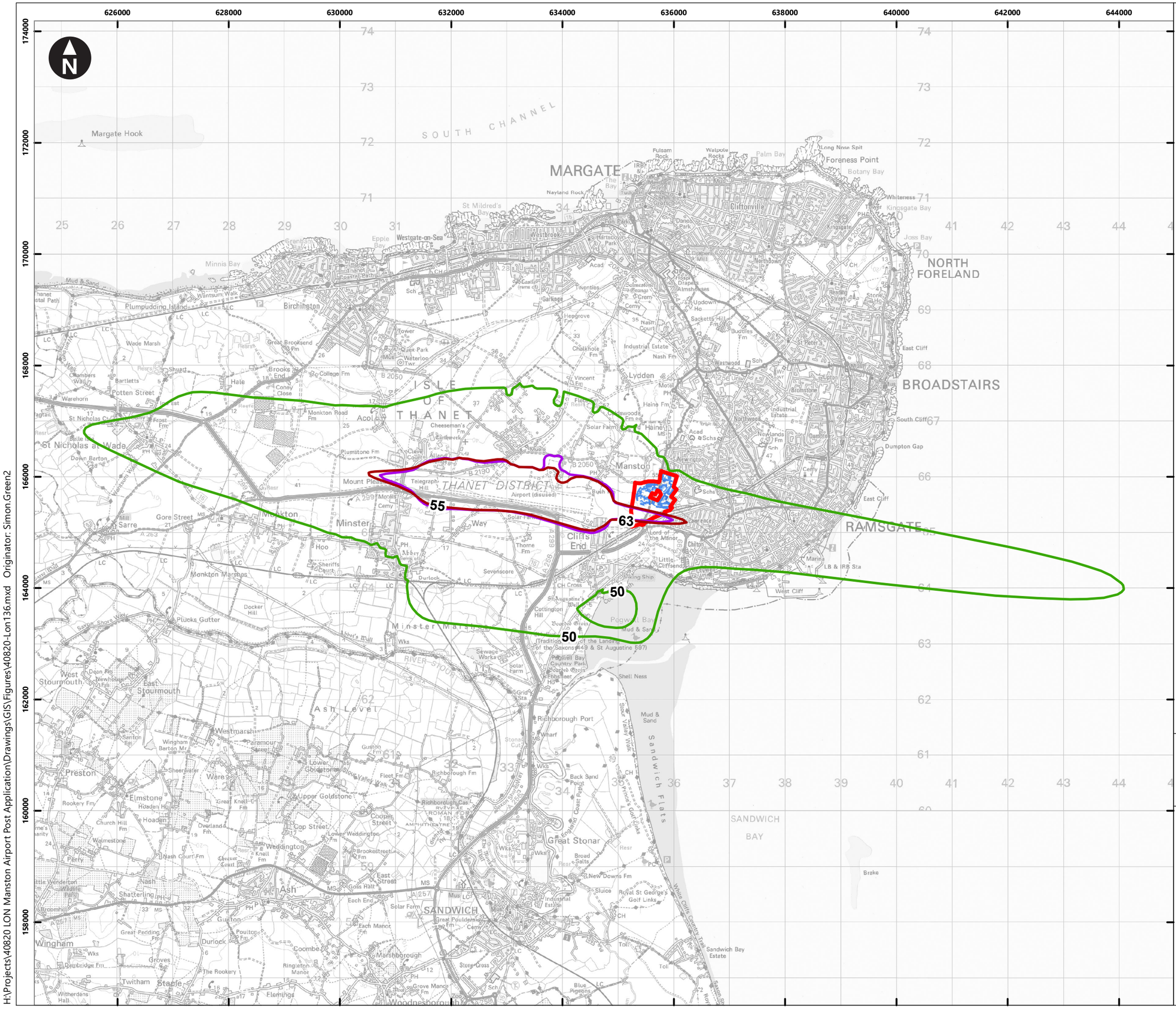
RSP

Manston □irport D□□

Figure Ns.2.12(a)
Manston Green Development

May 2019

wood.



Key

Manston Green Development

Residential dwelling block

Daytime $L_{Aeq,16hr}$

50 dB LOAEL

63 dB SOAEL

Night-time $L_{Aeq,8hr}$

55dB SOAEL

0 500 1,000 1,500 2,000 2,500 3,000 3,500 m

Scale at A3: 1:65,000

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Client

RSP

Manston Airport DCO

Figure Ns.2.12(b)
Manston Green Development

May 2019

wood.

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Appendix OP.2.5 Part 1 Research into Airport Associated Development at Freight Airports

RSP has selected the following four airports in the UK and abroad to illustrate how the relationship between Manston Airport and the Northern Grass is realised at these airports – that is, airport examples where there is land immediately adjoining the main airfield which is used for airport functions or uses associated with the airport's operation. As will be the case at Manston, all the airports selected have a significant air cargo operation operating from them. The four airports are as follows:

1. Stansted Airport, Essex, UK
2. East Midlands Airport, Derby, UK
3. Leige Airport, Belgium
4. John C. Munro Hamilton International Airport, Ontario, Canada

The purpose of the exercise was to establish what the buildings within the airport boundaries were being used for and then to calculate the approximate footprints of these buildings. Total approximate footprints for all buildings were then calculated to illustrate how much floorspace was available at each airport adjacent to the airfield and used for airport related uses. The purpose of the exercise is to demonstrate that the total building footprint proposed within the Northern Grass (105,100m² proposed for B1/B2/B8 uses) is a comparable footprint for this type of development at other airports.

Airport boundaries were drawn around the four airports based on the perceived operational boundary which is not the same as any defined airport boundary within a spatial plan or airport masterplan. Land which is very obviously used for airport functions or uses very clearly related to the airport was included within the boundary and search area.

Maps have been prepared and are provided below to illustrate the buildings within the airport boundaries; the tenants within the buildings (where known) and the approximate footprints for these buildings.

Utilising both Google and Bing online mapping (and "street view" functions on each) the building occupiers were identified via a desktop search. These buildings were plotted on a Google Map against a numbered reference. Where possible, separate occupiers of subdivided buildings were identified. Building tenants were cross-checked against information publicly available online (e.g. company websites). When it was not possible to identify the current occupier of a building, this was noted. For airports outside the UK, access to subscription-type data sources were not available so it was not possible to confirm those buildings currently being marketed for sale or lease. No site visits were carried out to corroborate the information collected.

Building sizes were calculated using approximate polygon footprint boundaries for each building using Google Earth and measuring the areas from that. Sizes are indicative only.

Where zoning data has been provided, this has been informed by the building uses which have been 'grouped' to provide usage patterns.

It is fully recognised that the method for collecting the data used to inform this analysis is only desk-based and approximate. The data sources may not be 100% up-to-date. Nevertheless, the information serves to effectively illustrate the point and give several examples of where what is proposed at Manston Airport and in particular on the Northern Grass by way of land use, location and quantum of development is not unusual when considering existing airports both in the UK or abroad.

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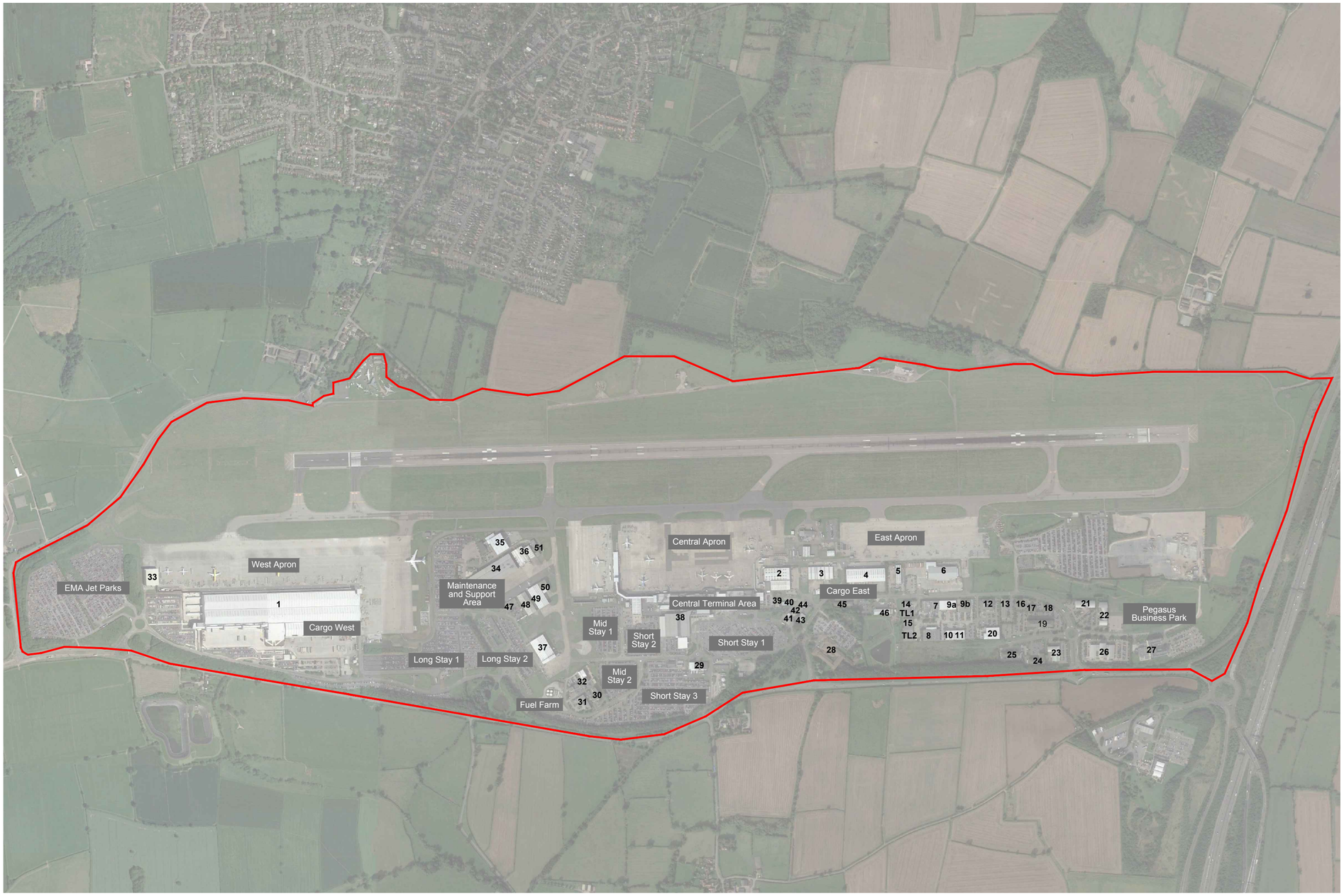
East Midlands Airport
(EMA)



Tenant		Approx. Footprint (m²)
1 -	DHL (Logistics)	67,630
2 -	UPS (Logistics)	5,860
3 -	Norsk Global (Logistics)	3,170
4 -	TNT (Logistics)	5,380
5 -	Swissport	940
6 -	Royal Mail (Logistics)	4,420
7 -	Nikon (Logistics)	2,740
8 -	DHL (Logistics)	2,240
9a -	DHL (Logistics)	890
9b -	DHL (Logistics)	1,180
10-	Nippon Express (Logistics)	910
11-	Avis	910
12-	PKF - Cooper Parry	1,590
13-	UPS (Logistics)	1,040
14-	GOES	590
TL1-	Unknown Occupier	590
15-	Laser Optical Engineering	410
TL2-	Unknown Occupier	1,810
16-	KG Aircraft Rotables	440
17-	Medstrom Healthcare	530
18-	Heavyweight Air Express	360
19-	PWC/HSBC	1,770
20-	Nikon Meteorology	1,790
21-	Pembroke House (Offices)	1,260
22-	Regus (Offices)	1,600
23-	Holiday Inn Express	1,390
24-	Premier Inn	1,110
25-	Osprey House (National Grid)	990
26-	Western Power Distribution	2,720
27 -	Radisson Blu Hotel	3,770
28-	Jurys Inn	6,220
29-	Alpha LSG (Airline Food/Logistics)	1,530
30-	Tui Training	760
31-	Tui East Midlands Training	880
32-	Tui East Midlands Training	1,580
33-	JCB	2,115
34-	BMI	9,260
35-	RVL Group (Aviation Services)	2,965
36-	Air Livery Ltd	2,900
37-	Airbourne Colors (Airplane Painting)	4,040
38-	Central Terminal	32,100
39-	Unknown	350
40-	Unknown	320
41-	BP	545
42-	Hertz	325
43-	Evolution Logistics	410
44-	Air Express	135
45-	Aviation Recruitment Network Ltd + BCT Aviation Maintenance LTD HQ	700
46-	Castle Donnington Fire Station	200
47-	Unknown	750
48-	Unknown	2,200
49-	Unknown	2,700
50-	Unknown	930
51-	Unknown	670
Approximate Total		194,615

Notes

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TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Sizes indicative only.**
Note: Tenant information based on desktop study only.

=Area of Search

N

Client: RSP

Project: Manston Airport DCO

Title: East Midlands Airport - Aerial Site Layout

Status	Scale	Date Created
Final	NTS @ A2	26.04.2019

Task Team Manager	Information Author	Task Information Manager
GD	JB	CJ

Document Number: 019598-RPS-ST-XX-DR-A-09000
Project Code - Originator - Zone - Level - Type - Role - Drawing Number

RPS Project Number	Suitability	Revision
NK019598	S0	P02

Rev	Description	By	Ckd	Date
P02	Issued for submission.	BEM	JB	03.05.19
P01	Issued for review.	BEM	JB	01.05.19

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rpsgroup.com
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

East Midlands Airport (EMA) (see: RPS DR-A-09000)

Building Ref.	Building	Description / Usage	Approx Footprint (m²)
1	DHL	Logistics	67,630
2	UPS	Logistics	5,860
3	Norsk Global	Logistics	3,170
4	TNT	Logistics	5,380
5	Swissport	Cargo/Ground Handling	940
6	Royal Mail	Logistics	4,420
7	Nikon	Logistics	2,740
8	DHL	Logistics	2,240
9a	DHL	Logistics	890
9b	DHL	Logistics	1,180
10	Nippon Express	Logistics	910
11	Avis	Car Hire	910
12	PKF - Cooper Parry	Offices	1,590
13	UPS	Offices (For Logistics?)	1,040
14	GOES	Ground Handling	590
TL1	Unknown Occupier	To Let (2015)	590
15	Laser Optical Engineering	Manufacturing / Offices	410
TL2	Unknown Occupier	To Let (2015)	1,810
16	KG Aircraft Rotables	Manufacturing / Offices	440
17	Medstrom Healthcare	Assumed Offices (Health)	530
18	Heavyweight Air Express	Offices (Cargo Related)	360
19	PWC/HSBC	Offices	1,770
20	Nikon Meteorology	Offices/Manufacturing	1,790
21	Pembroke House	Offices	1,260
22	Regus (Offices)	Offices	1,600
23	Holiday Inn Express	Hotel	1,390
24	Premier Inn	Hotel	1,110
25	Osprey House (National Grid)	Offices	990
26	Western Power Distribution	Offices	2,720
27	Radisson Blu Hotel	Hotel	3,770
28	Jurys Inn	Hotel	6,220
29	Alpha LSG	Airline Food/Logistics	1,530
30	Tui Training	Offices	760
31	Tui East Midlands Training	Offices	880
32	Tui East Midlands Training	Offices	1,580
33	JCB	Airport Operational	2,115
34	BMI	Airport Operational	9,260
35	RVL Group (Aviation Services)	Airport Operational	2,965
36	Air Livery Ltd	Airport Operational	2,900
37	Airbourne Colors (Airplane Painting)	-	4,040
38	Central Terminal	-	32,100
39	Unknown	-	350
40	Unknown	-	320
41	Bp	Petrol Filling Station	545
42	Hertz	-	325
43	Evolution Logistics	Logistics	410
44	Air Express	Logistics	135
45	Aviation Recruitment Network Ltd + BCT Aviation Maintenance LTD HQ	Offices	700
46	Castle Donnington Fire Station	-	200
47	Unknown	Assumed Offices	750
48	Unknown	Airport Operational	2,200
49	Unknown	Airport Operational	2,700
50	Unknown	Airport Operational	930

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Indicative Sizes only.**

Note: Tenant information based on desktop study only.
Note: Usage assumption based on available public information and may not be current

REV- P03 - 03/05/2019 Issued for Review

Key

- Logistics
- Ground Handling
- Offices
- Manufacturing / Offices
- Hotels/Accommodation
- Other Uses/Unknown
- Airside/Airport Operational
- Retail

51	Unknown	-	670
		Approx. Total	**194,615**

Stansted Airport
(STN)

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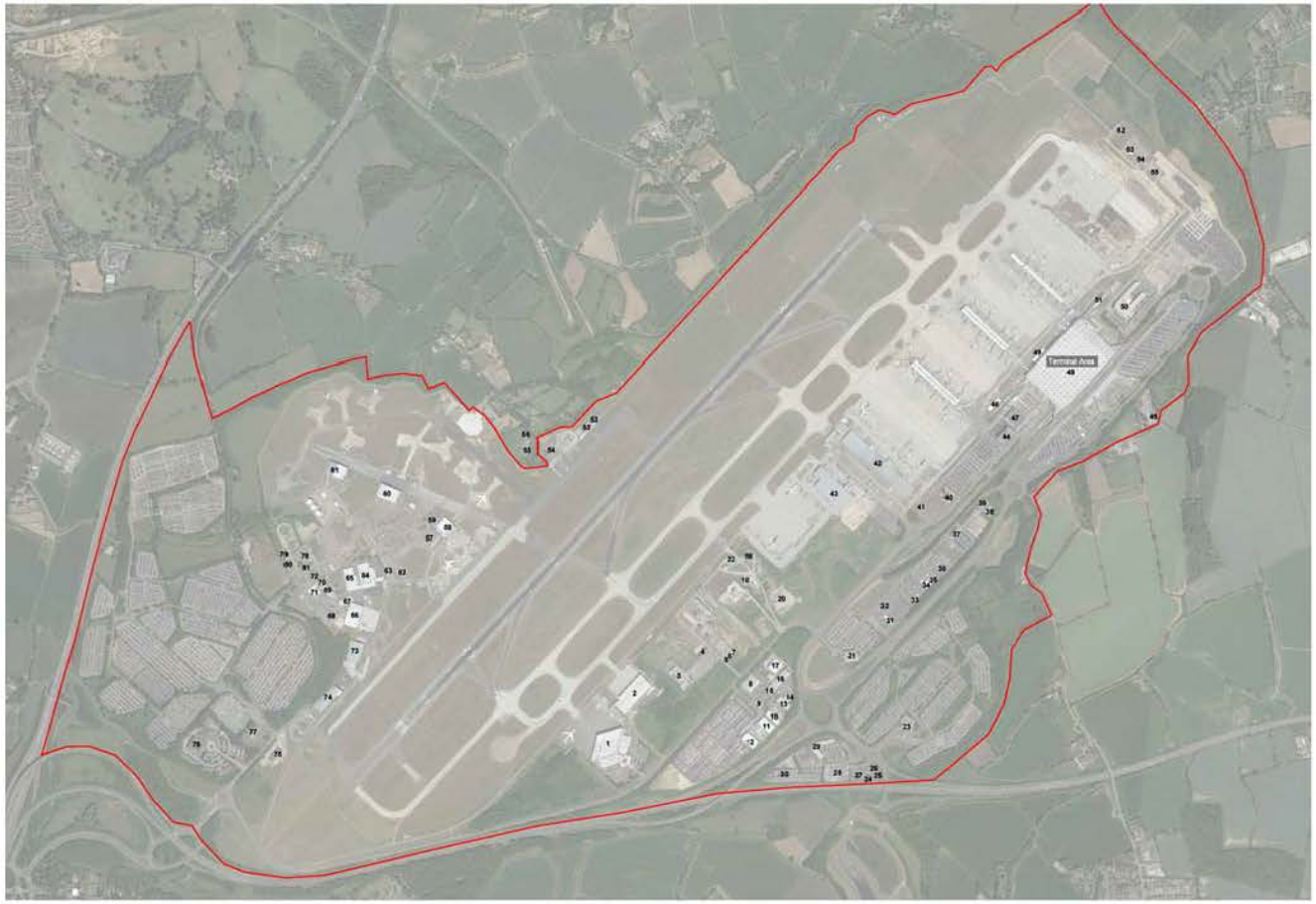

	Tenant	Approx. Footprint (m²)
1 -	Diamond Hangar (Aircraft Maintenance)	19,195
2 -	Ryanair Maintenance	10,260
3 -	Long Road Contractors' Compound	6,765
4 -	Stansted Aerozone	495
5 -	Unknown Occupier	110
6 -	Essex Radio Hire	120
7 -	Unknown Occupier	150
8 -	AEM Ltd	2,775
9 -	Unknown Occupier	735
10 -	Unknown Occupier	1,340
11 -	GT Engine Services	2,360
12 -	Unknown Occupier	2,300
13 -	Airline Services	1,320
14 -	Unknown Occupier	870
15 -	Unknown Occupier	750
16 -	Fistral Impex Ltd Logistics	2,550
17 -	Alpha LSG Logistics	2,220
18 -	Unknown Occupier	310
19 -	Unknown Occupier	440
20 -	Cemex Plant (Not a Building)	7,110
21 -	Endeavour House Serviced Offices	2,010
22 -	Unknown Occupier	400
23 -	Unknown Occupier	325
24 -	Starbucks Coffee	270
25 -	Food and Drink Kiosk	60
26 -	Food/Drink Kiosk	60
27 -	McDonalds Restaurant	470
28 -	PFS (BP)	720
29 -	Holiday Inn Express	2,480
30 -	Premier Inn	3,270
31 -	Car Hire	520
32 -	Car Rental Village Reception	740
33 -	Unknown Occupier	450
34 -	Unknown Occupier	630
35 -	Unknown Occupier	380
36 -	Unknown Occupier	240
37 -	Car Hire	310
38 -	Electrical Substation	420
39 -	Unknown Occupier	310
40 -	NATS Control Tower	790
41 -	Unknown Occupier (Telecoms?)	310
42 -	Stansted Cargo Centre	21,695
43 -	FedEx	15,350
44 -	Hampton by Hilton Hotel	2,280
45 -	Unknown Occupier	140
46 -	Unknown Occupier	1,100
47 -	Enterprise House	3,750

	Tenant	Approx. Footprint (m²)
48 -	Passenger Terminal Building	60,710
49 -	Unknown Occupier	780
50 -	Raddison Blue Hotel	6,690
51 -	Unknown Occupier	1,380
52 -	Unknown Occupier	230
53 -	Unknown Occupier	220
54 -	Training Centre	870
55 -	NATS	260
56 -	Electrical Equipment / Substation	90
57 -	Harrods Aviation	1,930
58 -	Harrods Aviation	4,280
59 -	Harrods Aviation	480
60 -	Fayair	5,120
61 -	Titan Airways	3,740
62 -	Universal Aviation	710
63 -	Control Point No. 1	180
64 -	Inflite The Jet Centre	6,445
65 -	Inflite Engineering Service Ltd	3,610
66 -	Unknown Occupier	4,840
67 -	Unknown Occupier	1,130
68 -	Stansted House Office Building	1,730
69 -	Unknown Occupier	1,160
70 -	Fuel Pumps	160
71 -	Unknown Occupier	1,170
72 -	Unknown Occupier	340
73 -	Unknown Occupier	3,810
74 -	Inflite Executive Jet Centre	4,230
75 -	Unknown Occupier	1,380
76 -	Novotel	5,930
77 -	Car Park Customer Services	260
78 -	Swissport GB Ltd	610
79 -	Cafe	110
80 -	Unknown Occupier	200
81 -	Unknown Occupier	360
82 -	Unknown Occupier	210
83 -	Unknown Occupier	310
84 -	Unknown Occupier	180
85 -	Unknown Occupier	190
	Approximate Total	247,690

Area of Search

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Sizes indicative only.**
Note: Tenant information based on desktop study only.

N

Client: RSP

Project: Manston Airport DCO

Title: Stansted Airport - Aerial Site Layout

Status	Scale			Date Created
Final	NTS	@	A2	26.04.2019

Task Team Manager	Information Author	Task Information Manager
GDD	JB	CJ

Document Number: 019598-RPS-ST-XX-DR-A-09004
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RPS Project Number: NK019598

Suitability: S0

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Rev	Description	By	Ckd	Date
P02	Issued for submission.	BEM	JB	03.05.19
P01	Issued for review.	BEM	JB	01.05.19

rpsgroup.com
MAKING COMPLEX EASY
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

Stansted Airport (STN) (see: RPS DR-A-09004)

Building Ref	Building	Description / Usage	Approx Footprint (m²)
1	Diamond Hangar (Aircraft Maintenan	Airside	19,195
2	Ryanair Maintenance	Airside (entire site)	10,260
3	Long Road Contractors' Compound	Airside (whole site - various temp buildings)	6,765
4	Stansted Aerozone	Community Education Centre	495
5	Unknown Occupier	-	110
6	Essex Radio Hire	-	120
7	Unknown Occupier	-	150
8	AEM Ltd	Electronic instrument manufacturer	2,775
9	Unknown Occupier	-	735
10	Unknown Occupier	-	1,340
11	GT Engine Services	-	2,360
12	Unknown Occupier	-	2,300
13	Airline Services	Ground handling services	1,320
14	Unknown Occupier	-	870
15	Unknown Occupier	-	750
16	Fistral Impex Ltd Logistics	-	2,550
17	Alpha LSG Logistics	-	2,220
18	Unknown Occupier	-	310
19	Unknown Occupier	-	440
20	Cemex Plant (Not a Building)	-	7,110
21	Endeavour House Serviced Offices	-	2,010
22	Unknown Occupier	-	400
23	Unknown Occupier	(assumed car park operator-related)	325
24	Starbucks Coffee	-	270
25	Food and Drink Kiosk	-	60
26	Food/Drink Kiosk	-	60
27	McDonalds Restaurant	-	470
28	PFS (BP)	Includes M&S Simply Food	720
29	Holiday Inn Express	-	2,480
30	Premier Inn	-	3,270
31	Car Hire	-	520
32	Car Rental Village Reception	-	740
33	Unknown Occupier	(assume car hire-related)	450
34	Unknown Occupier	(assume car hire-related)	630
35	Unknown Occupier	(assume car hire-related)	380
36	Unknown Occupier	(assume car hire-related)	240
37	Car Hire	-	310
38	Electrical Substation	-	420
39	Unknown Occupier	-	310
40	NATS Control Tower	-	790
41	Unknown Occupier (Telecoms?)	Airside	310
42	Stansted Cargo Centre	(Airside) Occupiers: Asiana, Cargolux, Martinair, Panalpina, Quatar, Royal Mail, Ruslan Int, Silk Way, TNT, UPS, Serviceair/Swissport.	21,695

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Indicative S**

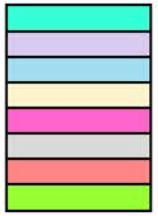
Note: Tenant information based on desktop study only.

Note: Usage assumption based on available public information and may not

REV- P03 - 03/05/2019 Issued for Review

Key

Logistics
Ground Handling
Offices
Manufacturing / Offices
Hotels/Accommodation
Other Uses/Unknown
Airside/Airport Operational
Retail



43	FedEx	Airside	15,350
44	Hampton by Hilton Hotel	-	2,280
45	Unknown Occupier	-	140
46	Unknown Occupier	-	1,100
47	Enterprise House	-	3,750
48	Passenger Terminal Building	Airside	60,710
49	Unknown Occupier	-	780
50	Raddison Blue Hotel	Airside	6,690
51	Unknown Occupier	Presumed Stansted Airport Transit System Depot	1,380
52	Unknown Occupier	Airside	230
53	Unknown Occupier	Airside	220
54	Training Centre	-	870
55	NATS	-	260
56	Electrical Equipment / Substation	-	90
57	Harrods Aviation	Airside	1,930
58	Harrods Aviation	Airside	4,280
59	Harrods Aviation	-	480
60	Fayair	Airside	5,120
61	Titan Airways	-	3,740
62	Universal Aviation	Airside	710
63	Control Point No. 1	Airside	180
64	Inflite The Jet Centre	Airside	6,445
65	Inflite Engineering Service Ltd	Airside	3,610
66	Unknown Occupier	-	4,840
67	Unknown Occupier	-	1,130
68	Stansted House Office Building	-	1,730
69	Unknown Occupier	-	1,160
70	Fuel Pumps	-	160
71	Unknown Occupier	Airside	1,170
72	Unknown Occupier	Airside	340
73	Unknown Occupier	-	3,810
74	Inflite Executive Jet Centre	-	4,230
75	Unknown Occupier	-	1,380
76	Novotel	Hotel	5,930
77	Car Park Customer Services	-	260
78	Swissport GB Ltd	-	610
79	Cafe	-	110
80	Unknown Occupier	-	200
81	Unknown Occupier	-	360
82	Unknown Occupier	Airside	210
83	Unknown Occupier	Airside	310
84	Unknown Occupier	Airside	180
85	Unknown Occupier	Airside	190
		Total	**247,690**

Liège Airport
(LGG)

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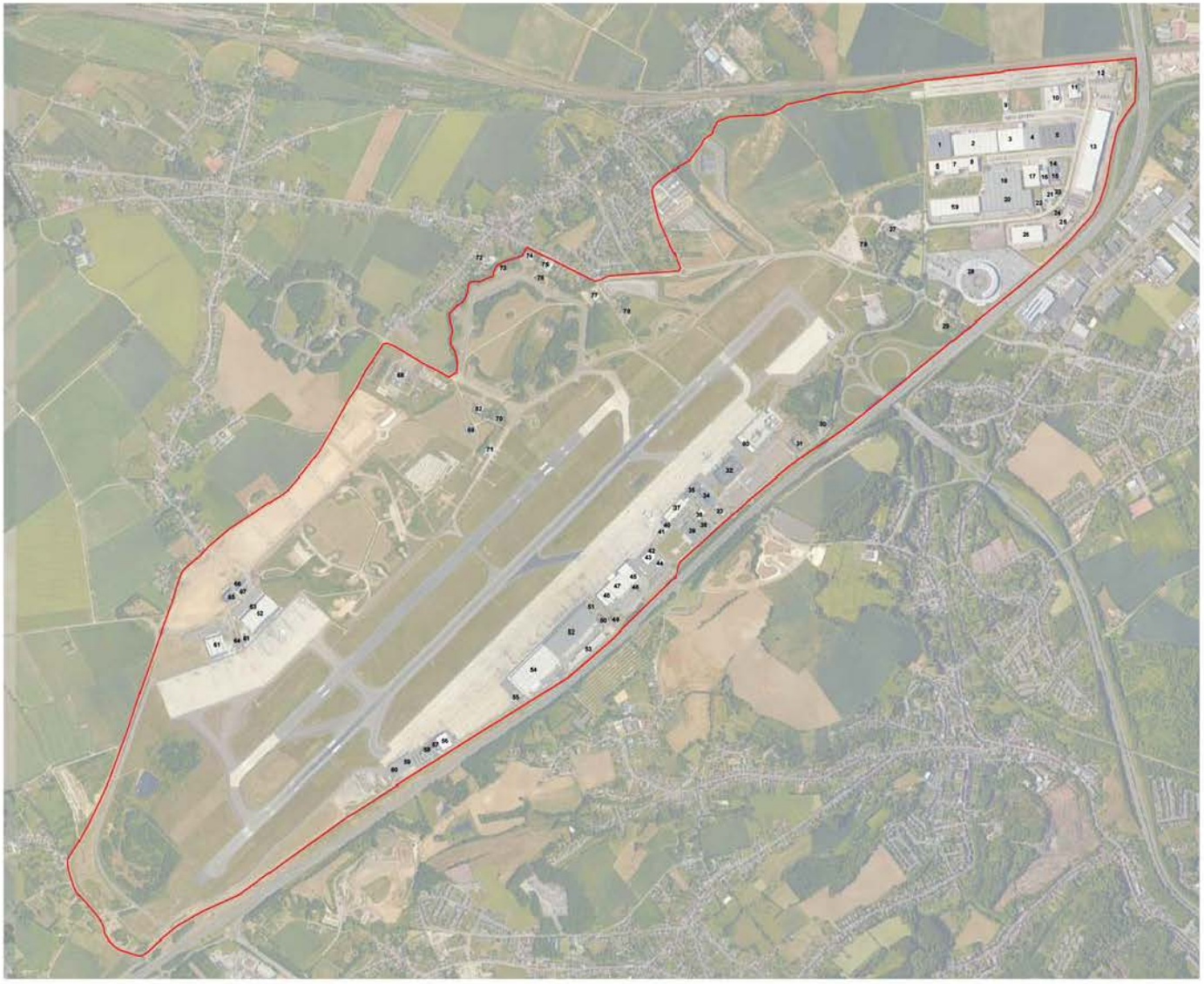

Tenant		Approx. Footprint (m²)
1 -	King Freeze Logistics	9,940
2 -	Weerts Supply Chain S.A./N.V	18,140
3 -	Sud Fresh Logistics	11,990
4 -	Unknown Occupier	7,150
5 -	DHL Express Center	13,135
6 -	STA Logistics	3,120
7 -	TGV Logistics	3,915
8 -	Middlegate Europe Logistics	4,390
9 -	Magentra Logistics	1,055
10 -	Center Competence Forem Logistics	1,665
11 -	Forem Logistics	2,850
12 -	Liegi Intermodal Logistics	730
13 -	Jost Group Logistics	25,860
14 -	ThyssenKrupp Engineering	210
15 -	Coutrez Import/Export	2,030
16 -	Auto Parts Market	2,500
17 -	Douane (Customs)	6,535
18 -	PFS Web Logistics	15,585
19 -	Werts Supply Chain Logistics (WSC)	15,600
20 -	Farnell Components	19,040
21 -	ACL Airshop Cargo Transportation	1,915
22 -	Rademaker Transport	590
23 -	ECDC Logistics	200
24 -	Wurth Logistics	555
25 -	Jost Group Logistics	1,850
26 -	Jost Group Logistics	10,485
27 -	Unknown Occupier	2,250
28 -	VP Park Truckstop	7,820
29 -	Freddy Echer Plant Sales	600
30 -	Flyin Skydiving Center	450
31 -	Liege Park Inn	1,280
32 -	Passenger Terminal	8,500
33 -	Filiere Vianda Bovine Wallonne asbl	1,000
34 -	Honeywell Life Safty S.A.	2,170
35 -	Unknown Occupier	1,960
36 -	Unknown Occupier	1,300
37 -	Unknown Occupier	4,000
38 -	BBR Avocats - Bottin, Baudinet, Rigo	800
39 -	Leonardo Aerospace Security	4,500
40 -	Unknown Occupier	430
41 -	Horse Inn	680
42 -	LACHS Air Cargo Handling	220
43 -	LACHS Air Cargo Handling	2,000
44 -	LACHS Air Cargo Handling	670
45 -	LACHS Air Cargo Handling	4,840
46 -	LACHS Air Cargo Handling	490
47 -	LACHS Air Cargo Handling	6,800

Tenant		Approx. Footprint (m²)
48 -	LACHS Air Cargo Handling	4,050
49 -	Air Traffic Control	300
50 -	TNT European Express Center	270
51 -	TNT	1,215
52 -	TNT	22,400
53 -	TNT	5,790
54 -	TNT	19,560
55 -	TNT	350
56 -	TNT	3,150
57 -	TNT	1,000
58 -	TNT Head Office	1,000
59 -	Fast Forward Freight BVBA	5,000
60 -	KLM Engineering & Maintenance	1,460
61 -	Swissport Cargo Services	6,475
62 -	Aviapartner Liege Cargo Services	12,145
63 -	Heli and Co - Helicopter Transport	270
64 -	Unknown Occupier	1,320
65 -	WideTech Sa Engineering Services	1,770
66 -	Unknown Occupier	1,030
67 -	Unknown Occupier	650
68 -	Unknown Occupier	5,600
69 -	Unknown Occupier	540
70 -	Unknown Occupier	730
71 -	Unknown Occupier	870
72 -	Cabots Park Poultry Farm	4,360
73 -	Unknown Occupier	570
74 -	Unknown Occupier	1,200
75 -	Faillites Info Liquidation Sales	1,540
76 -	Unknown Occupier	465
77 -	Unknown Occupier	1,220
78 -	Unknown Occupier	820
79 -	Unknown Occupier	960
80 -	Unknown Occupier	1,890
81 -	Unknown Occupier	630
82 -	Unknown Occupier	1,170
Total		345,565

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Sizes indicative only.**

Note: Tenant information based on desktop study only.

Area of Search

N

Client: RSP

Project: Manston Airport DCO

Title: Liège Airport (Belgium) - Aerial Site Layout

Status	Scale		Date Created
Final	NTS	@ A2	25.04.19

Task Team Manager	Information Author	Task Information Manager
GDD	BEM	CJ

Document Number: 019598-RPS-ST-XX-DR-A-9001
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RPS Project Number: NK019598

Suitability: S0

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P01	Issued for review.	BEM	JB	01.05.19

rpsgroup.com
MAKING COMPLEX EASY
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

Liège Airport (LGG) (see: RPS DR-A-09001)

Building Ref	Building	Description / Usage	Approx Footprint (m²)
1	King Freeze Logistics	-	9,940
2	Weerts Supply Chain S.A./N.V	-	18,140
3	Sud Fresh Logistics	-	11,990
4	Unknown Occupier	-	7,150
5	DHL Express Center	-	13,135
6	STA Logistics	-	3,120
7	TGV Logistics	-	3,915
8	Middlegate Europe Logistics	-	4,390
9	Magentra Logistics	-	1,055
10	Center Competence Forem Logistics	-	1,665
11	Forem Logistics	-	2,850
12	Liegi Intermodal Logistics	-	730
13	Jost Group Logistics	Occupier of entire building	25,860
14	ThyssenKrupp Engineering	-	210
15	Coutrez Import/Export	-	2,030
16	Auto Parts Market	-	2,500
17	Douane (Customs)	-	6,535
18	PFS Web Logistics	-	15,585
19	Werts Supply Chain Logistics (WSC)	-	15,600
20	Farnell Components	-	19,040
21	ACL Airshop Cargo Transportation	-	1,915
22	Rademaker Transport	-	590
23	ECDC Logistics	-	200
24	Wurth Logistics	-	555
25	Jost Group Logistics	-	1,850
26	Jost Group Logistics	-	10,485
27	Unknown Occupier	-	2,250
28	VP Park Truckstop	-	7,820
29	Freddy Echer Plant Sales	-	600
30	Flyln Skydiving Center	-	450
31	Liege Park Inn	-	1,280
32	Passenger Terminal	-	8,500
33	Filiere Vianda Bovine Wallonne asbl	Flanders beef production regulator (whole building)	1,000
34	Honeywell Life Safety S.A.	Aviation Equipment - satellite comms etc	2,170
35	Unknown Occupier	Airside	1,960
36	Unknown Occupier	-	1,300
37	Unknown Occupier	Airside	4,000
38	BBR Avocats - Bottin, Baudinet, Rigo	Legal Services	800
39	Leonardo Aerospace Security	-	4,500
40	Unknown Occupier	Airside	430
41	Horse Inn	Airside	680
42	LACHS Air Cargo Handling	Airside	220
43	LACHS Air Cargo Handling	Airside	2,000
44	LACHS Air Cargo Handling	Airside	670
45	LACHS Air Cargo Handling	Airside	4,840
46	LACHS Air Cargo Handling	-	490
47	LACHS Air Cargo Handling	Airside	6,800
48	LACHS Air Cargo Handling	Airside	4,050

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Indicative Sizes only.**

Note: Tenant information based on desktop study only.
Note: Usage assumption based on available public information and may not be current

REV- P03 - 03/05/2019 Issued for Review

Key

- Logistics
- Ground Handling
- Offices
- Manufacturing / Offices
- Hotels/Accommodation
- Other Uses/Unknown
- Airside/Airport Operational
- Retail

49	Air Traffic Control	Control tower	300
50	TNT European Express Center	Airside	270
51	TNT	Airside	1,215
52	TNT	Airside	22,400
53	TNT	Airside	5,790
54	TNT	Airside	19,560
55	TNT	Airside	350
56	TNT	Airside	3,150
57	TNT	Airside	1,000
58	TNT Head Office	Airside	1,000
59	Fast Forward Freight BVBA	Airside	5,000
60	KLM Engineering & Maintenance	Airside	1,460
61	Swissport Cargo Services	Airside	6,475
62	Aviapartner Liege Cargo Services	-	12,145
63	Heli and Co - Helicopter Transport	-	270
64	Unknown Occupier	-	1,320
65	WideTech Sa Engineering Services	-	1,770
66	Unknown Occupier	Airside	1,030
67	Unknown Occupier	Airside	650
68	Unknown Occupier	Airside	5,600
69	Unknown Occupier	building not complete (Google Maps 2019)	540
70	Unknown Occupier	building not complete (Google Maps 2019)	730
71	Unknown Occupier	Airside	870
72	Cabots Park Poultry Farm	Includes all buildings off access road	4,360
73	Unknown Occupier	Airside	570
74	Unknown Occupier	Airside	1,200
75	Faillites Info Liquidation Sales	-	1,540
76	Unknown Occupier	Airside	465
77	Unknown Occupier	Airside	1,220
78	Unknown Occupier	Airside	820
79	Unknown Occupier	Airside	960
80	Unknown Occupier	Airside	1,890
81	Unknown Occupier	Airside	630
82	Unknown Occupier	Airside	1,170
		Total	**345,565**

John C. Munro Hamilton International Airport
(YHM)

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Notes

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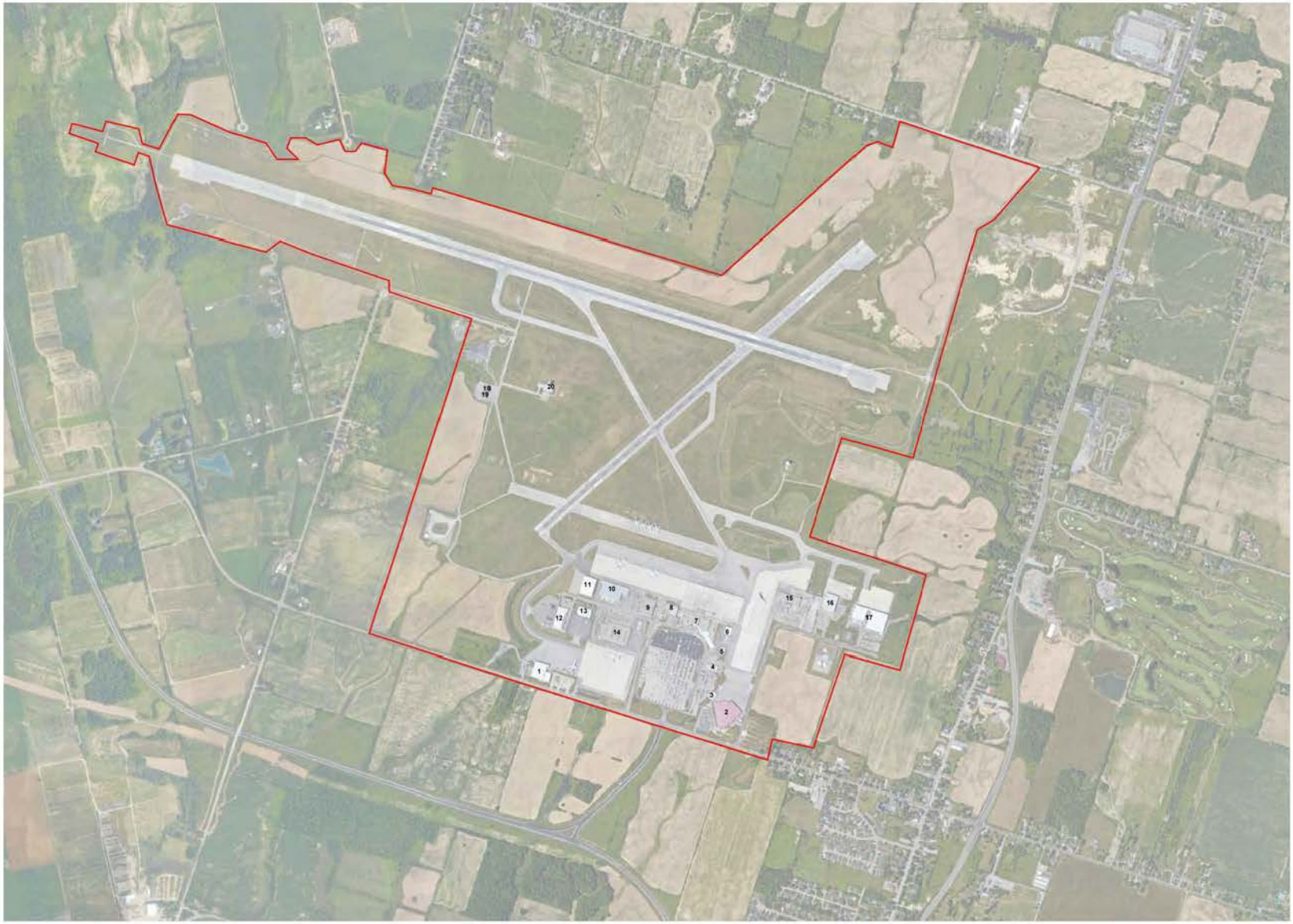

Tenant	Approx. Footprint (m²)
1- KF Aerospace	5,760
2- Canadian Warplane Heritage	9,530
3- Unknown Occupier	590
4- Unknown Occupier	1,030
5- Unknown Occupier	270
6- Unknown Occupier	850
7- Air Terminal Building	8,270
8- Unknown Occupier	2,290
9- Glanford Aviation Ground Handling	4,090
10- Cargojet	6,310
11- Unknown Occupier	3,790
12- Jetport Inc - Business Jets	3,620
13- Transport Canada	2,090
14- Purolator Courier and Shipping Centre	7,980
15- UPS	3,850
16- DHL	4,350
17- Cargojet Maintenance Facility	10,260
18- Unknown Occupier	600
19- Unknown Occupier	520
20- Air Traffic Control Tower	1,220
Total	77,270

TL - Assumed To Let

Area of Search

N

Note: Footprints based on approximate Google Earth data only. **Sizes indicative only.**
Note: Tenant information based on desktop study only.

Client: RSP

Project: Manston Airport DCO

Title: John C. Munro Hamilton International Airport - Aerial Site Layout

Status	Scale	Date Created
Final	NTS @ A2	26.04.2019

Task Team Manager	Information Author	Task Information Manager
GDD	JB	CJ

Document Number: 019598-RPS-ST-XX-DR-A-09002
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RPS Project Number: NK019598

Suitability: S0

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rpsgroup.com
MAKING COMPLEX EASY
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

Hamilton Airport (YHM) (see: RPS DR-A-09002)

Building Ref	Building	Description / Usage	Approx Footprint (m²)
1	KF Aerospace	Airside (entire building)	5,760
2	Canadian Warplane Heritage	-	9,530
3	Unknown Occupier	Airside	590
4	Unknown Occupier	Airside	1,030
5	Unknown Occupier	Airside	270
6	Unknown Occupier	Airside	850
7	Air Terminal Building	Airside	8,270
8	Unknown Occupier	Airside	2,290
9	Glanford Aviation Ground Handling	-	4,090
10	Cargojet	Airside	6,310
11	Unknown Occupier	Airside	3,790
12	Jetport Inc - Business Jets	-	3,620
13	Transport Canada	Airside	2,090
14	Purolator Courier and Shipping Centre	Airside	7,980
15	UPS	Airside	3,850
16	DHL	Airside	4,350
17	Cargojet Maintenance Facility	Airside (entire site)	10,260
18	Unknown Occupier	Airside	600
19	Unknown Occupier	Airside	520
20	Air Traffic Control Tower	Airside	1,220
		Total	**77,270**

TL - Assumed To Let

Note: Footprints based on approximate Google Earth data only. **Indicative**

Note: Tenant information based on desktop study only.

Note: Usage assumption based on available public information and may not

REV- P03 - 03/05/2019 Issued for Revie

Key

- Logistics
- Ground Handling
- Offices
- Manufacturing / Offices
- Hotels/Accommodation
- Other Uses/Unknown
- Airside/Airport Operational
- Retail

hamilton international hi

Airport Land Use Policies

6.3.4 Airside Commercial & Reserve

Airside Commercial activities at Hamilton International encompass a wide range of activities that require direct access to the airside operational areas. These activities include:

- Aircraft ground servicing and support.
- Storage and maintenance.
- Air cargo / courier activities.
- Fixed Base Operations.
- Charter services.
- Flight Training

For airside commercial development, the objectives of the Master Plan are to:

- Reserve adequate land for future expansion of airside related commercial activities with a focus on air cargo and courier operations, hangar and aircraft maintenance facilities.
- Accommodate short-term demand for land within existing airport boundaries without compromising long-term flexibility.
- Provide for landside access to airside commercial development areas from existing arterial roads and the New Highway 6 Airport Expressway.
- Provide sufficient lands adjacent to airport-related commercial development to accommodate opportunities for inter-modal distribution and value added processing.

The priority of airside commercial development will be in the areas of hangar and aircraft maintenance facilities as well as air cargo / courier activities and other activities associated with the air cargo/courier industry. It is not anticipated that there will be significant growth in light general aviation activity.

At present, there is a shortfall of air cargo related commercial development. The *Airport Market Analysis and Land Needs Study* identifies a potential requirement for approximately 42 ha of land development supporting approximately 75,000sm of air cargo/courier facilities[13]. This includes both potential expansions to existing facilities plus the development of new infrastructure. To support the expansion of cargo-related activity, the Airport has identified the need for a cross dock facility which could be leased to multiple tenants. The proposed location for such a facility would be on existing airport land located immediately east of the Apron III, adjacent to the fuel farm.

To meet forecasted long term commercial development requirements, additional lands beyond the present airport boundary will be required. The *Airport Market Analysis and Land Needs Study* identifies a requirement for an additional 114 ha of land. Opportunities to expand the Airport include lands located east of the present airport boundaries and lands located between Runway 12-30 and

Dickenson Road. These lands on the east side of the Airport must be serviced by the appropriate utilities and roads before becoming available for development.

.....

6.3.5 Non-Airside Commercial & Reserve

To support the vision of Hamilton International becoming a major cargo hub and inter- modal facility, the City of Hamilton has proposed that lands within the AEGD accommodate a full range of associated activities such as freight warehousing, distribution, and value added processing. In addition, there are a number of commercial, retailing, and hospitality activities that also benefit from their proximity to an airport.

With respect to non-airside commercial development, the objectives of the Airport Master Plan Update are to:

- Reserve adequate land for future aviation and non-aviation commercial land uses that do not require direct airside access.
- Provide sufficient land to implement innovative cargo development, related distribution and other value-added processing opportunities.
- Provide opportunities for inter-modal activity through direct adjacency between airside and non-airside commercial activities.
- Provide direct access to main transportation networks.
- Provide airport-related commercial development in a manner that is compatible with City of Hamilton's Official Plan.

Under the Airport Master Plan Update, the definition of non-airside commercial development includes those activities that require or benefit from the presence of the Airport, but do not require direct access to the airside. These activities include:

- Freight distribution facilities
- Sort facilities
- Light manufacturing/processing
- High technology industries
- Warehousing
- Commercial offices
- Hospitality services including restaurants, hotels, convention facilities
- Communication activities
- Car rental/servicing facilities
- Flight kitchens
- Gas stations
- Airline support facilities.

In the short to medium term, the development of non-airside commercial development could occur on lands that run adjacent to and west of Highway 6 / Homestead Drive. These lands include the Airport Business Park (24 ha.) and are presently designated under the City's Official Plan for the uses described above. In the longer term, non-airside commercial development has been identified for lands south of Dickenson Road.

With the development of New Highway 6 will arise an opportunity to develop lands south of Airport Road in the vicinity of the New Highway 6 / Airport Access Road intersection. Lands located south of Airport Road, and on either side of the New Highway 6 access should be developed for non-airside commercial development. Under the AEGD, these lands are designated as 'Airport Related Commercial' (ARC) and include uses such as hospitality accommodation, offices, business and finance services.

Under an affiliated company, Tradeport owns a 23 ha parcel of land south of Airport Road and west of the access to New Highway 6. The intention in the long term is to develop this land for commercial uses. In the short term it could be used for remote parking should demand warrant additional capacity.

Under the AEGD airport-related commercial development will be allowed to occur on lands located west of the Airport between New Highway 6 and the existing airport boundary.

6.3.6 General Commercial Reserve

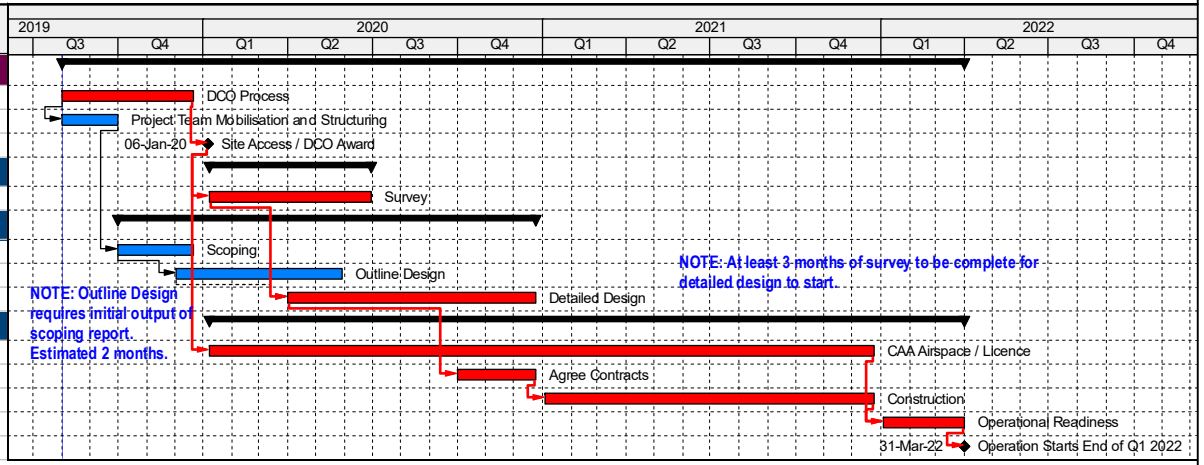
General commercial development describes commercial activities that are not airport related. These activities are directed towards the surrounding community. These activities include:

- Retail and service commercial
- Personal and business services
- Recreational and entertainment facilities
- Restaurants and Taverns
- Hotels and motels
- Cultural, community and institutional uses that do not conflict with commercial intent of designated lands
- Residential as a component of a permitted use.

Manston DCO Examination

Written Question OP.2.6.v. (Programme)

Activity ID	Activity Name	Original Duration	Start	Finish
Manston DCO Examination		663	01-Aug-19	31-Mar-22
A1000	DCO Process	101	01-Aug-19	20-Dec-19
A1030	Project Team Mobilisation and Structuring	42	01-Aug-19	30-Sep-19
A1010	Site Access / DCO Award	0		06-Jan-20
Surveys		122	07-Jan-20	30-Jun-20
A1020	Survey	122	07-Jan-20	30-Jun-20
Design		308	01-Oct-19	24-Dec-20
A1040	Scoping	59	01-Oct-19	20-Dec-19
A1050	Outline Design	116	02-Dec-19	29-May-20
A1060	Detailed Design	187	01-Apr-20	24-Dec-20
Construction		561	07-Jan-20	31-Mar-22
A1090	CAA Airspace / Licence	498	07-Jan-20	24-Dec-21
A1070	Agree Contracts	61	01-Oct-20	24-Dec-20
A1080	Construction	250	04-Jan-21	24-Dec-21
A1100	Operational Readiness	63	04-Jan-22	31-Mar-22
A1110	Operation Starts End of Q1 2022	0		31-Mar-22



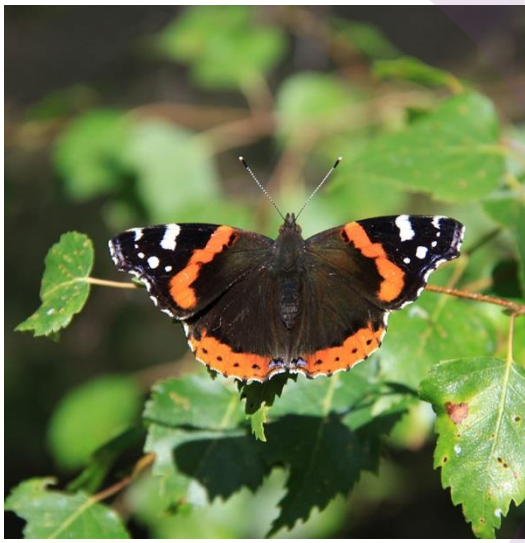
Document Number: NK019598-RPS-XX-XX-PR-Z-00001
Revision: P01
Date: 29-Apr-19 15:39

Remaining Activity
Summary
Critical Activity
Milestone

RiverOak Strategic Partners Limited

Manston Airport Development Consent Order

Environmental Statement Addendum addressing the potential introduction of a Public Safety Zone at Manston Airport



Wood Environment & Infrastructure Solutions UK Limited – May 2019

Report for

George Yarrall
RiverOak Strategic Partners
Audley House
London W1K 6WF
United Kingdom

Main contributors

Poppy Prentice

Issued by

[redacted]
Katie Lidington

Approved by

[redacted]
Nick Hilton

Wood

Floor 23
25 Canada Square
Canary Wharf
London E14 5LB
United Kingdom
Tel +44 (0) 203 215 1610

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Document revisions

No.	Details	Date
1	Draft	May 2019

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1.2 Purpose of this Addendum 3
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3.2 Biodiversity 8
3.3 Freshwater Environment 8
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3.5 Landscape and Visual 8
3.6 Noise and Vibration 8
3.7 Traffic and Transport 9
3.8 Health and Wellbeing 9
3.9 Climate Change 9
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1. Introduction

1.1 Background

1.1.1 In July 2018, RiverOak Strategic Partners Limited (hereafter referred to as 'RiverOak') submitted a DCO Application to re-open Manston Airport (the 'site') as a freight airport. The application seeks to authorise the re-development of Manston Airport as a freight airport (hereafter referred to as the 'Proposed Development') with the capacity to handle a minimum of 10,000 Air Traffic Movements (ATM) annually. It is envisaged that this will provide additional air freight capacity to the UK and serve to relieve pressure from other heavily congested airports in the south-east.

1.1.2 The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) under Part 3 of the *Planning Act 2008*[1] (hereafter referred to as 'the 2008 Act') and therefore required an application to be submitted for a Development Consent Order (DCO) under Section 14 of the 2008 Act. This is further explained in **Chapter 1: Introduction**, **Section 1.5** and **Chapter 3: Description of the Proposed Development** within the ES [APP-033].

1.2 Purpose of this Addendum

1.2.1 Following discussion at the Need and Operations issue specific hearing, it was established that it may be necessary for Thanet District Council (TDC) to declare a Public Safety Zone (PSZ) at some stage in the future. In the event a PSZ is required, its extent and time of establishment would be established in consultation with the Department for Transport (DfT) and the Civil Aviation Authority (CAA).

1.2.2 In broad terms, a PSZ is a strategic planning designation that seeks to minimise risk to people living or working close to airports. This result in a presumption that in planning terms there will be certain restrictions on the development of land close to the end of runways at busy airports. (see **Chapter 2: Manston Airport Public Safety Zone** for further details).

1.2.3 The DfT *Circular 01/2010, 'Control of Development in Airport Public Safety Zones'*[2] states that the PSZ should be calculated based on forecasted numbers and types of aircraft movements fifteen years ahead, in order to allow a reasonable period of stability after their introduction. Given the relatively small number of ATM's and general aviation movements at Manston Airport, it is not likely that the PSZ would be required until 15 years after opening at the earliest.

1.2.4 It is not within the power of the Applicant to declare a PSZ and at the time of writing the ES submitted with the DCO application [APP-033, 034, 035] it was not expected that a PSZ would be required. As such the potential impacts of such a declaration were not considered. This is not to say that safety was omitted rather that it was covered in the context of the Major Accidents and Disasters chapter of the ES (Chapter 17).

1.2.5 In response to previous questions from the Examining Authority (ExA) this addendum to the ES has been prepared and submitted at Deadline 6 in order to consider the potential introduction of a PSZ.

---

[1] *Planning Act 2008 S23(4)(a)-(b) and (5)(a)-(b)* (2008) [online]. Available at: http://www.legislation.gov.uk/ukpga/2008/29/pdfs/ukpga_20080029_en.pdf [Accessed 29/01/2018].

[2] DfT (2010) *Circular 01/2010 Control of Development in Airport Public Safety Zones*, [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/36536/circular.pdf [Accessed 15/04/2019].

1.2.6 The purpose of this document is to provide the Examining Authority (ExA) with a clear understanding of the subsequent implications of introducing a PSZ. As such, any changes to the environmental effects of the Proposed Development are reported in this context. This document relates only to the potential impacts of the introduction of the PSZ and should therefore be read in conjunction with the ES and all previous submissions.

1.3 Structure

1.3.1 The remainder of this document is split into the following chapters:

- **Chapter 2** addresses the requirements for the introduction of a PSZ, summarises the relevant planning policy and outlines the restrictions it imposes;
- **Chapter 3: Scoped-out Environmental Topics**, details the environmental topics which are scoped-out of further assessment and provides justification for this, this includes the following topics:
  - Air Quality;
  - Biodiversity;
  - Freshwater Environment;
  - Land Quality;
  - Landscape and Visual;
  - Noise and Vibration;
  - Traffic and Transport;
  - Health and Wellbeing;
  - Climate Change;
  - Major Accidents and Disasters; and
  - Cumulative Effects.
- **Chapter 4: Historic Environment**, gives a summary of changes and resultant effects for the Historic Environment assessment;
- **Chapter 5: Socio-Economics**, gives a summary of changes and resultant effects for the Socio-Economics assessment; and
- **Chapter 6: Summary**, summarises the contents of this document.

2. Manston Airport Public Safety Zone

2.1 Non-Inclusion in the Environmental Statement

2.1.1 The declaration of a PSZ is a matter for the local authority, the DfT and the CAA to consider and as such does not form part of the DCO application. It is not possible for the applicant to unilaterally declare a PSZ and as such there is no intention to do so.

2.1.2 During the previous operation of the site as Kent International Airport, prior to its closure in May 2014, there was no PSZ in place, as the level of use of the airport was not considered sufficient to merit one being established.

2.1.3 In addition, at the time the ES was written it was not considered likely that a PSZ would need to be declared. To place this in context, a PSZ can be required in the event that an airport exceeds 30,000 ATM's. The ES is based on an ATM forecast of 26,468 cargo and passenger movements which, in itself would not trigger the implementation of a PSZ. Nonetheless with the inclusion of 38,000 General Aviation movements it is now possible that at some time in the future that Thanet District Council (TDC) may wish to consider such a designation.

2.1.4 Consequently, the implications, of introducing a PSZ have now been considered, with the potential effects on individual topic chapters reported here (see **Chapters 3-5** of this document for detailed assessments).

2.2 Planning Policy Overview

2.2.1 PSZs are administrated nationally in accordance with the DfT *Circular 01/2010, 'Control of Development in Airport Public Safety Zones'*[2], it is then the responsibility of the local authority, TDC, to account for PSZs within their local planning policy.

2.2.2 An overview of the policy which is relevant to the introduction of a PSZ is provided within **Table 2.1**; further detail of planning policy relating to the Proposed Development is available in **Chapter 4: Planning Policy Context** within the ES [APP-033].

Table 2.1 Planning Policy Relevant to PSZs

Policy description	Relevance to the assessment
DfT Circular 01/2010[2]	This circular is directly relevant to the assessment as it relates to the control of development at airport PSZ's. The Circular details the restrictions which are imposed upon PSZs i.e. the 1 in 100,000 individual risk contour as calculated based on airport specific forecasts 15 years ahead. The policy is based around the restriction of new or replacement development within the PSZ, with the intention to minimise the population exposed to the risk of an air accident during the take-off and landing phases of flight (paragraphs 2 to 4). There is a general presumption against new or replacement development or changes of use to existing buildings within a PSZ. These types of development could be prohibited depending on the individual policy and application by the local authority. There are exceptions where changes to existing development or new development are not likely to increase the number of people living, working or congregating in the PSZ (paragraphs 10 to 12). Within the circular, consideration is given to a 1 in 10,000 individual risk contour, which is regarded as the maximum tolerable level of individual third part risk. Within this area, the

Policy description	Relevance to the assessment
	Secretary of State wishes to see the emptying of all occupied residential properties and all commercial or industrial properties occupied as normal all-day workplaces. The 1 in 10,000 individual risk contour is located within the redline boundary of the Proposed Development.
Thanet District Council, Thanet Local Plan 2006[3]	This Local Plan is directly relevant to the assessment as if the DfT identify the need to introduce a PSZ then TDC will have the responsibility to account for this within their local planning policy. During previous operations at Kent International Airport there was no PSZ in place. However, the Thanet Local Plan does make reference the potential future requirements of a PSZ (paragraphs 13.58 to 13.60) and states that Kent International Airport is likely to be subject to an assessment regarding a PSZ in 2006 at the earliest. Kent International Airport closed in May 2014.
Thanet District Council, Draft Local Plan to 2031[4]	This Local Plan is directly relevant to the assessment as if the DfT identify the need to introduce a PSZ then TDC will have the responsibility to account for this within their local planning policy. There are a number of policies which relate to increasing public safety however, none which explicitly make reference to a PSZ. The Draft Local Plan does however, acknowledge the necessity to review policy if the airport becomes operational (paragraph 1.44).

2.3 Defining the Extent of the PSZ

2.3.1 At this stage it is not possible to define a PSZ for the site as this is a process that would be completed following the airspace change application that will be finalised following the making of the DCO. As such the predicted extent of the PSZ for the Proposed Development has been drawn based upon PSZs at other UK airports, taking a worst-case approach to defining the limits.

2.3.2 For the purposes of developing a reasonable worst-case scenario a number of PSZ's at UK airports were examined as shown in **Figure 2.1** for the 1 in 100,000 Individual Risk Contour and **Figure 2.2** for the 1 in 10,000 PSZ, the largest of these PSZ's (Stanstead Airport) was used as a proxy for a possible 1 in 100,000 PSZ at Manston. In practice, Stanstead has a much greater number of ATM's than will be the case at Manston and as such this approach is considered to be highly conservative.

2.3.3 The 1 in 10,000 Individual Risk Contour was defined using the same approach and is shown at **Figure 2.3**. The indicative PSZ is shown at **Figure 2.4**.

2.4 Assessment Assumptions

2.4.1 It should be noted that the provisions outlined in *DFT Circular 01/210*[2] are discretionary and it would be for the relevant planning authority to take decisions on the application of that guidance in the context of local needs as well as risk.

2.4.2 For example, there are numerous PSZ's that are designated over urban areas and whilst there is clearly and quite rightfully a desire to minimise risks to populations living and working near airports, it is not universally the case that exiting and necessary development cannot co-exist with PSZ's in certain circumstances.

[3] TDC (2006) *Thanet Local Plan 2006*, [online]. Available at: file://att5-fs7/shared2/Projects/40820%20STH%20Manston%20Airport%20Post%20Application/D%20Design/Examination/00%20Deadlines/Deadline%206/PSZ%20ES%20Addendum/PSZ%20Reference%20Material/LocalplanOct06v3_2-2-1.pdf [Accessed 15/04/2019].

[4] TDC (2018) *Draft Local Plan to 2031 – July 2018*, [online]. Available at: https://www.thanet.gov.uk/wp-content/uploads/2018/11/CD1.1-Draft-Thanet-Local-Plan-Reg-19.pdf [Accessed 15/04/2019].

2.4.3 Nonetheless, for the purposes of this assessment, *DfT Circular 01/2010*[2] has been used as the basis of generating assumptions regarding the potential impact. These are summarised as follows:

PSZ: 1 in 100,000 individual risk contour

2.4.4 In line with *Circular 01/2010*[2] and PSZ restrictions at other airports, the principal feature of the 1 in 100,000 individual risk contour is that there will be no increase in the number of people living, working or congregating in the area.

2.4.5 For the purposes of assessment, it is presumed that permission for new or replacement development within the PSZ will not be granted, particularly residential buildings (houses, mobile homes and caravans).

2.4.6 There are two exceptions to the general presumption, including:

- An extension, alteration or change of use where this is for the benefit of those already living in a property or does not increase the number of people living or working in a property;
- Certain types of new or replacement development which has a low density of people living or working in the PSZ, which may include:
  - Long stay and employee car parking;
  - Warehouse or open storage with a small number or people present on site;
  - Development likely to introduce very few or no people e.g. unmanned structures, building housing plant or machinery and agricultural buildings;
  - Public open space with low intensity use, this excludes children's playgrounds, playing fields or sports grounds;
  - Golf courses, excluding clubhouses; and
  - Allotments;

2.4.7 In addition to the above, the following is also considered:

- Transport infrastructure is considered based on the average density of occupation;
- Planning permission for sites which were not within a PSZ when it was granted will not be withdrawn, if permission expires the above principles will apply; and
- Refusal for planning permission does not warrant automatic compensation; compensation under a purchase notice may apply if the site cannot be put to beneficial alternative use.

1 in 10,000 individual risk contour

2.4.8 In line with *Circular 01/2010*[2] and PSZ restrictions at other airports, the principal feature of the 1 in 10,000 individual risk contour is that people should not be expected to live or have their workplace within such areas.

2.4.9 Certain existing developments with low intensity of use may be acceptable, this may include:

- Long stay and employee car parking;
- Development for housing plant or machinery, where there are no people on site on a regular basis e.g. boiler houses, electrical switch stations and water treatment; and
- Golf courses, excluding clubhouses.

3. Scoped-out Environmental Topics

3.1 Air Quality

3.1.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase aircraft or road traffic construction and operation forecasts assessed as part of the Environmental Impact Assessment. As such, the conclusions contained within the ES [APP-033] remain valid and no additional assessment is necessary.

3.2 Biodiversity

3.2.1 There are no material changes to the Proposed Development associated with the introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ. Mitigation measures required to avoid habitat loss and change will still be implemented and as such, the conclusions contained within the ES [APP-033] remain valid and no additional assessment is necessary.

3.3 Freshwater Environment

3.3.1 There are no material changes to the Proposed Development associated with the introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ. Mitigation measures incorporated into the design to protect sensitive receptors and prevent any potential effects will still be implemented. As such, the conclusions contained within the ES [APP-033] remain valid and no additional assessment is necessary.

3.4 Land Quality

3.4.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not introduce new buildings or alter ground conditions on site. Mitigation measures and good practice techniques recommended to prevent any potential effects will still be implemented.

3.4.2 As such, the conclusions contained within the ES [APP-033] remain valid and no additional assessment is necessary.

3.5 Landscape and Visual

3.5.1 There are no material changes to the Proposed Development which are likely to arise in additional landscape and visual amenity effects associated with the introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ. As such the assessment contained within the ES [APP-034] remain valid and no additional assessment is necessary.

3.6 Noise and Vibration

3.6.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase aircraft or road traffic forecasts assessed as part of the Environmental Impact Assessment. As such, the conclusions contained within the ES [APP-034] remain valid and no additional assessment is necessary.

3.7 Traffic and Transport

3.7.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase construction or operation road traffic forecasts assessed as part of the Environmental Impact Assessment. As such, the conclusions contained within the ES [APP-034] remain valid and no additional assessment is necessary.

3.8 Health and Wellbeing

3.8.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase construction or operation road traffic forecasts assessed as part of the Environmental Impact Assessment. As such, health and wellbeing effects identified which relate to operational noise and air quality are unchanged. As such, the conclusions contained within the ES [APP-034] remain valid and no additional assessment is necessary.

3.9 Climate Change

3.9.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase greenhouse gas emissions associated with the Proposed Development and will therefore not alter the assessment. Mitigation measures being provided within the Carbon Minimisation Action Plan will still be implemented.

3.9.2 As such, the conclusions contained within the ES [APP-035] remain valid and no additional assessment is necessary.

3.10 Major Accidents and Disasters

3.10.1 The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ will not increase the risk of Major Accidents and Disasters and will instead reduce the risk associated with the operational phase by limiting future receptors living, working and socialising in this area. Mitigation measures, including the development of an Emergency Plan will still be implemented.

3.10.2 As such, the assessment and conclusions contained within the ES [APP-035] remain valid and no additional assessment is necessary.

3.11 Cumulative Effects

3.11.1 There The introduction of a 1 in 10,000 Individual Risk Contour and 1 in 100,000 PSZ may restrict development of land at the end of the runway, at the discretion of TDC. There are also no material changes associated with the Proposed Development due to the introduction of a PSZ.

3.11.2 In addition, the consented scheme known as Manston Green, discussed in Chapter 5 below, was considered and assessed as a cumulative scheme within Chapter 18 of the ES [APP-035].

3.11.3 As such, the assessment and conclusions contained within the ES [APP-035] remain valid and no additional assessment is necessary.

4. Historic Environment

4.1 Introduction

4.1.1 Likely significant effects, including the assessment methodology, on the Historic Environment resulting from the construction and operation of the Proposed Development are considered at **Chapter 9: Historic Environment** within the ES [APP-033]. This section considers the potential effects on the Historic Environment associated with the introduction of PSZ.

4.1.2 The designation of a PSZ would not, of itself, give rise to any direct alteration of these heritage assets nor would it introduce any discernible perceptual change in their settings, and consequently no adverse effects are anticipated to arise.

4.1.3 There is, however, a potential for adverse effects on designated heritage assets arising from changes or restrictions to use, that might be required as a result of the designation of the PSZ. These changes could result from restrictions on structural additions, change of use or the need to avoid encouraging large concentrations or gatherings of people within the PSZ.

4.1.4 In addition, where PSZ policy actively discouraged these uses, difficulty in identifying sustainable reuse of historic buildings could lead to neglect and consequential physical damage to these heritage assets. Any such change would, however, be contingent on the exact nature of planning, licencing and other permitting restrictions introduced to support the objectives of the PSZ and it would be possible to mitigate or avoid these effects through alignment of PSZ policy with existing development controls in the conservation area.

4.1.5 The 1 in 10,000 individual risk contour is located within the redline boundary of the Proposed Development, there are no designated heritage assets within this contour at either end of the runway and as a result, no adverse effects are anticipated in this area.

4.2 PSZ: 1 in 100,000 individual risk contour

Easterly PSZ

4.2.1 There are 28 designated heritage assets within the PSZ to the east (28) end of the runway. These comprise:

- 22 listed buildings;
- Albion Place Gardens, Grade II registered park and garden (1001386);
- Ramsgate Conservation Area; and
- Anglo-Saxon cemetery South of Ozengell Grange, Scheduled Monument (1004228).

4.2.2 There are also a number of non-designated buildings which would be considered to hold a degree of heritage significance either intrinsically or through their contribution to the character of the Ramsgate Conservation Area.

4.2.3 As noted in paragraph 4.1.2 above, no perceptual or physical change is anticipated to arise as a result of the introduction of the PSZ.

4.2.4 The exact nature of any planning, licencing and other permitting restrictions which may apply within the PSZ are not defined at this stage. In addition, development that would be restricted by the designation of a PSZ is already restricted by their designation as listed buildings, in addition to

being within the Ramsgate Conservation Area. No adverse effects are anticipated on listed or non-designated buildings in residential use.

4.2.5 The designation of a PSZ is also not anticipated to affect the significance of the Scheduled Cemetery South of Ozengell Grange. This heritage asset is not regularly visited and development that would be restricted by the designation of a PSZ is already restricted by its designation as a scheduled monument.

4.2.6 There are, a number of Grade II listed buildings which are currently in commercial, public, entertainment or food uses. These are:

- Memorial to the Great War (1085348);
- The Castle Hotel (1085380);
- National Westminster Bank (1336670);
- 15, Harbour Street (1068668);
- F Hinds (1356173);
- 29 and 31, Harbour Street (1085382);
- 6, York Street (1086051);
- The Perseverence Dining Room (1281459);
- 10, York Street (1336345);
- 47 and 49, Queen Street (1086084);
- The Rising Sun (1083595); and
- Ramsgate Library (1357573).

4.2.7 These heritage assets draw significance from retention of commercial uses. Such uses contribute to historic interests and preserve architectural features which reflect these designed uses. This contributes to the significance both of these heritage assets and of the Ramsgate Conservation Area.

4.2.8 The introduction of planning controls regarding change of use may affect long-term and sustainable uses for these listed buildings and non-designated historic buildings of similar character within the PSZ.

4.2.9 Public open spaces within the PSZ, including the seafront and Albion Place Gardens would potentially be affected where PSZ controls are implemented that may affect the licencing of public gatherings within these parts of the conservation area, particularly if established and regular public events were to be disrupted.

4.2.10 Any changes to the current commercial and communal use of historic buildings and open spaces within the proposed PSZ could give rise to harm to heritage significance, either as a result of the disruption of historic uses or through physical neglect arising from the inability to identify viable and sustainable reuse. The effect pathway is, however, complex and it is not possible to identify potential effects at the scale of individual listed buildings. Even understanding a more generalised effect is contingent on the exact nature of any restrictions and their implications in the context of the socio-economic situation of the wider area around the PSZ.

4.2.11 Set against these adverse effects, the generally positive effects predicted for the local economy in the socio-economic chapter of the ES [APP-034] would support finding economically viable sustainable uses for these buildings. It is also anticipated that these effects could be minimised or

avoided entirely through the consideration of PSZ policies that would align with existing controls on development in the Ramsgate Conservation Area and use and alteration of listed buildings. In addition, restrictions on replacement development could present a further incentive to retain and refurbish existing buildings.

Westerly PSZ

4.2.12 There are no designated heritage assets within the PSZ to the west (01) end of the runway and as a result, no adverse effects are anticipated in this area.

4.3 Summary of Significant Effects

4.3.1 It will be for TDC to define the application of policy concerning the treatment of heritage assets and their preservation under any future PSZ policy. Nonetheless, PSZ policies at other airports are not known to give rise to substantive restrictions on the types of activity that could lead to the potential harm described above. It seems entirely reasonable to assume that Heritage Assets could continue to be used and preserved in their current state or developed and used in the future such that their significance is not harmed.

4.3.2 For this reason, the introduction of a PSZ does not necessarily give rise or harm to the significance of heritage assets where more general economic benefits such as, providing opportunities for sustainable use of historic buildings and areas and planning controls regarding heritage assets which retain and support existing commercial and communal uses can be considered.

5. Socio-Economics

5.1 Introduction

5.1.1 Likely significant socio-economic effects resulting from the construction and operation of the Proposed Development are considered in **Chapter 13: Socio-Economics** within the ES [APP-034] submitted alongside the DCO application. This section considers the potential effects on Socio-Economics associated with the introduction of a PSZ.

5.1.2 As stated in **Section 2.4**, in line with *Circular 01/2010*[2], the principal feature of the 1 in 100,000 individual risk contour (the PSZ) is that there is a presumption in planning terms that there should be no increase in the number of people living, working or congregating in the area covered by the contour. The 1 in 10,000 individual risk contour is confined to an area within the redline boundary of the Proposed Development. As such this designation would have no Socio-Economic effect and is not considered further in this assessment.

5.1.3 The introduction of a PSZ does have the potential for adverse Socio-Economic effects through restrictions on development which limit the expansion of existing facilities or the introduction of new facilities.

5.1.4 Consequently, consideration has been given to how the introduction of a PSZ may effect social and economic factors, through examination of the existing facilities within the PSZ and of TDC's plans for expansion or introduction of facilities, outlined within the Local Plan[3,3].

5.2 Methodology

5.2.1 This assessment of Socio-Economic effects has identified existing and potential land uses within the worst-case PSZ for the Proposed Development (as defined in **Chapter 2: Manston Airport Public Safety Zone**). his includes community, leisure, commercial and retail facilities, schools, residential dwellings and strategic housing sites. Existing features were mapped and are presented as figures, while potential future development was assessed through a review of the Draft Thanet Local Plan[4].

5.2.2 The potential for these sites to have likely significant effects arising from the introduction of a PSZ designation was then assessed against the PSZ restrictions (outlined in **Section 2.4**). This includes a consideration of location, the surrounding development, capacity of schools, potential for future expansion or the introduction of similar facilities.

5.3 PSZ: 1 in 100,000 individual risk contour

Easterly PSZ

Residential

Future developments

5.3.1 Within the Draft Thanet Local Plan[4], Policy SP13 refers to the Manston Green Strategic Housing Site. Land here has been allocated for up to 785 new dwellings, a minimum of 9 ha of open space, a two-form entry primary school and small-scale convenience retail provision. The PSZ intersects the Manston Green Strategic Housing Site as shown on **Figure 5.5**.

5.3.2 A part of this site known as Manston Green secured planning permission comprising a residential development and new community facilities. However, *Circular 01/2010*[2] states that planning permission for sites which were not within a PSZ when it was granted will not be withdrawn (see **Section 2.4**). As permission for Manston Green has already been granted (planning ref. OL/TH/14/0050), the introduction of a PSZ is considered to have **no likely significant effect**.

5.3.3 Whilst the policy does not affect consented developments, it may affect planning decisions which have not yet been made. It is not clear how TDC would apply the policy and as such, a **likely significant** associated with the section of the Manston Green Strategic Housing Site which has not been subject to a planning application has been reported. In practice, this is a conservative approach given that a proportion of the site has already been consented.

5.3.4 In addition to the above, this area of Ramsgate is densely populated and there are a large number of existing residential dwellings within the PSZ (**Figure 5.5**).

Existing developments

5.3.5 *Circular 01/2010* allows for an extension, alteration or change of use within a PSZ where this is for the benefit of those already living in a property or does not increase the number of people living or working in a property[2] (see **Section 2.4**). As the area covered by these existing dwellings is already densely populated with little open space, it is unlikely that any permission would be sought for large scale alterations to these properties. As such, the introduction of a PSZ is considered to have **no likely significant effect**.

5.3.6 All future permissions are at the discretion of TDC and since smaller changes would be permitted under *Circular 01/2010*, the PSZ is considered to have **no likely significant effect**.

Educational

Future developments

5.3.7 There are no allocated or consented educational facilities east of the runway within the extent of the PSZ. Similarly, to paragraph 5.3.6, any future educational facilities or alterations to existing educational facilities would be at the discretion of TDC under *Circular 01/2010*, the PSZ is considered to have **no likely significant effect**.

Existing developments

5.3.8 There is one school, Chatham & Clarendon Grammar School, located within the PSZ, which has 1,470 pupils and is currently at 171 % of its capacity (860 pupils)[5] (**Figure 5.4**). To compensate this, the school has undergone refurbishment (for example, the conversion of the Cavendish Building to a Sixth Form Centre). The school plans to construct a new STEM block and sports hall on the Chatham House site. It should be noted that the extensions are not considered to be providing additional capacity in terms of school places, and as such, new receptors will not be introduced. Furthermore, the site is physically constrained by Elms Avenue to the west, Clarendon Gardens to the north, Waitrose and associated parking to the south and Clarendon House, Ramsgate Library and residential properties to the east. This makes any extension to facilitate increasing capacity unlikely to occur. In order to accommodate expansion to increase capacity, it is likely that an alternative site with space for development would need to be sought. Consequently, the PSZ is considered to have **no likely significant effect**.

[5] Gov.uk (2018) Chatham & Clarendon Grammar School, [online]. Available at: https://get-information-schools.service.gov.uk/Establishments/Establishment/Details/136382#school-dashboard [Accessed 30/04/19].

Community, leisure, commercial and retail facilities

Future developments

5.3.9 There are no allocated or consented community, leisure, commercial and retail facilities east of the runway within the extent of the PSZ. Similarly, to paragraph 5.3.6, any future educational facilities or alterations to existing educational facilities would be at the discretion of TDC under *Circular 01/2010*, the PSZ is considered to have **no likely significant effect**.

Existing developments

5.3.10 There are 12 existing community or leisure facilities within the PSZ to the east of the runway (**Figure 5.1** and **Figure 5.2**), comprising:

- Three care / nursing homes;
- Osteopath surgery;
- Fire station;
- Ramsgate Library;
- Scout and Guide headquarters;
- Nethercourt Touring Park, including a playground;
- Albion Place Gardens which comprises a waterfall and pond; and
- Indoor / outdoor leisure facility.

5.3.11 There is also a mix of commercial (farming, car parking, storage land, warehouses, workshop, light industry and offices) and retail facilities within the PSZ (**Figure 5.3**).

5.3.12 These existing community, leisure, commercial and retail facilities would be under the PSZ restriction which assumes that development is not permitted where it increases the number of individuals working or congregating within the PSZ[2] (see **Section 2.4**).

5.3.13 All of these facilities fall within the existing urban area of Ramsgate. Dependent on TDC's application of any future policy it seems highly unlikely that there would be any restrictions placed on existing operations as a result of any future PSZ declaration.

5.3.14 In terms of future development, given that existing building densities are already high, any future development would be constrained, and any expansion will be limited to the reconfiguration of existing development as opposed to expansion into new areas. As such, it is not considered that the PSZ would add any additional limitations to future development and as such any declaration of a PSZ in the future would be **unlikely to result in significant socio-economic effects**.

Westerly PSZ

Residential

Future developments

5.3.15 There are no strategic housing site allocations[4] or planning permissions within the westerly extent of the PSZ. Similarly, to paragraph 5.3.6, any future residential development or alterations to existing development would be at the discretion of TDC under *Circular 01/2010*, the PSZ is considered to have **no likely significant effect**.

Existing developments

5.3.16 There are a small amount of existing residential dwellings within the PSZ to the west of the runway as shown in **Figure 5.5**. Given the rural nature of the surrounding area to the immediate west of the site, a vast proportion of these dwellings are in close proximity to the Proposed Development boundary. In addition, properties are located within close proximity to each other. As such, there is little open space and consequently little scope for permissions for large-scale changes to be sought. An introduction of a PSZ is considered to have **no likely significant effect**.

Educational, community, leisure, commercial and retail facilities

Future developments

5.3.17 There are no allocated or consented educational, community, leisure, commercial and retail facilities west of the runway within the extent of the PSZ. Similarly, to paragraph 5.3.6, any future educational facilities or alterations to existing educational facilities would be at the discretion of TDC under *Circular 01/2010*, the PSZ is considered to have **no likely significant effect**.

Existing developments

5.3.18 There are no existing community, leisure or retail facilities, or schools within the PSZ to the west of the runway (**Figure 5.1**, **Figure 5.2**, **Figure 5.3** and **Figure 5.4**), and as such, no further consideration is given to these elements. It should be noted that any future development of facilities of this nature within the PSZ would be at the discretion of TDC.

5.3.19 There are a number of commercial facilities (**Figure 5.3**) that would be under the PSZ restriction, which generally assumes that development is not permitted where it increases the number of people working or congregating in the PSZ[2]. Existing development comprises of warehousing, storage and farming facilities, all of which are stated as development which may be permitted within a PSZ, so long as it only introduces few people to the area (**Section 2.4**). It is assumed that any future development within this area, would be of the same or similar nature as currently exists, either through expansion of the existing facilities or introduction of aligning facilities. As such the PSZ is unlikely to be a limiting factor and considered to have **no likely significant effect**. It should be noted that any future development of facilities of this nature would be at the discretion of TDC.

5.3.20 The westerly PSZ also comprises a farm which includes a residential dwelling and a large area of farmland. This area would be restricted to only allow development which does not increase the number of people living or working in the area. Agricultural buildings are included as development which may be permitted within a PSZ (see **Section 2.4**), so the farm is unlikely to be limited by PSZ restrictions, thus it is considered to have **no likely significant effect**.

5.4 Summary of Significant Effects

5.4.1 It will be for TDC to define the application of policy concerning the treatment of community, leisure, commercial and retail facilities, and their future use under any future PSZ policy. Any future residential development would also be at the discretion of TDC.

5.4.2 Nonetheless, PSZ policies at other airports are not known to give rise to substantive restrictions on the types of activity that could lead to potential harm. It seems entirely reasonable to assume that such facilities could continue to be used and preserved in their current state or developed and used in the future, such that their significance is not harmed.

The introduction of an easterly PSZ would have a **likely significant effect to** the status of the portion of the Manston Green Strategic Housing Site yet to be developed.

6. Summary

6.1.1 This document has been prepared to summarise updates to the ES [APP-033, 034, 035], for the Manston Airport DCO application, accounting for the introduction of a PSZ. It provides a clear understanding of the amendment and the subsequent implications in relation to the previous assessment, through reporting any changes to the previously reported environmental effects of the Proposed Development.

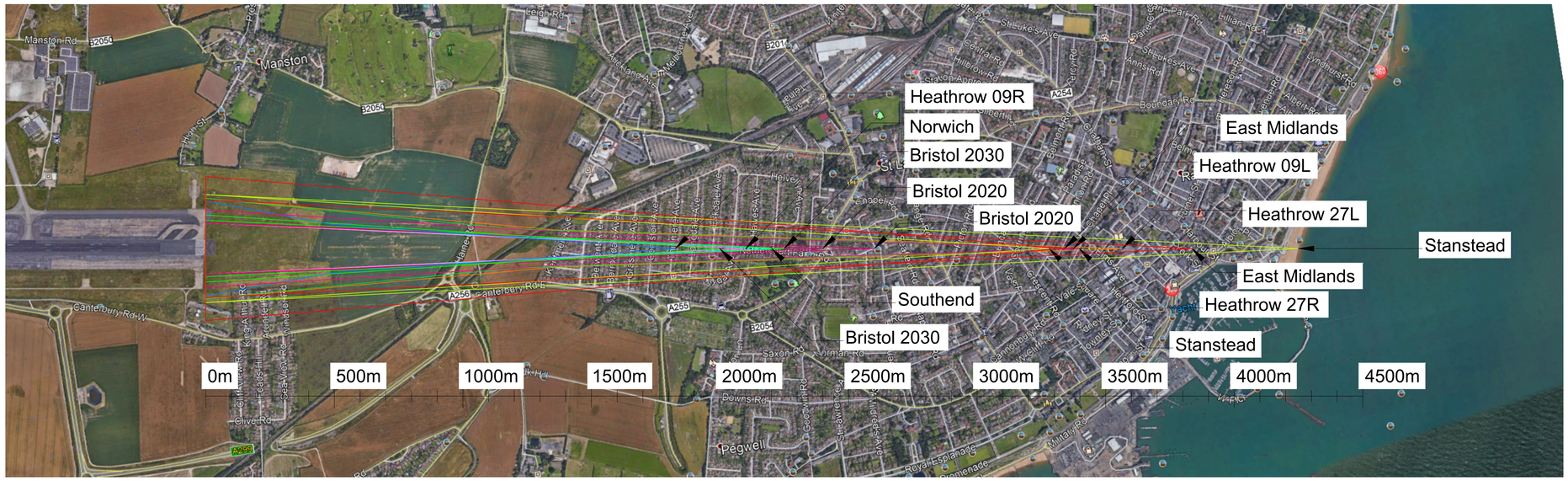
6.1.2 Due to the nature of the PSZ, there are direct links between the Historic Environment (**Chapter 9**) and Socio-Economics (**Chapter 13**) assessments within the ES [APP-033, 034, 035]. As such, these topics have been considered within this document. Other environmental topic chapters of the ES [APP-033, 034, 035] have been scoped-out of further assessment as the introduction of a PSZ does not impact upon their original conclusions.

6.1.3 The introduction of an easterly PSZ would have a **likely significant effect to** the status of the portion of the Manston Green Strategic Housing Site yet to be developed

6.1.4 No other significant environmental effects have been identified and the conclusions contained within the ES [APP-033, 034, 035] remain valid.

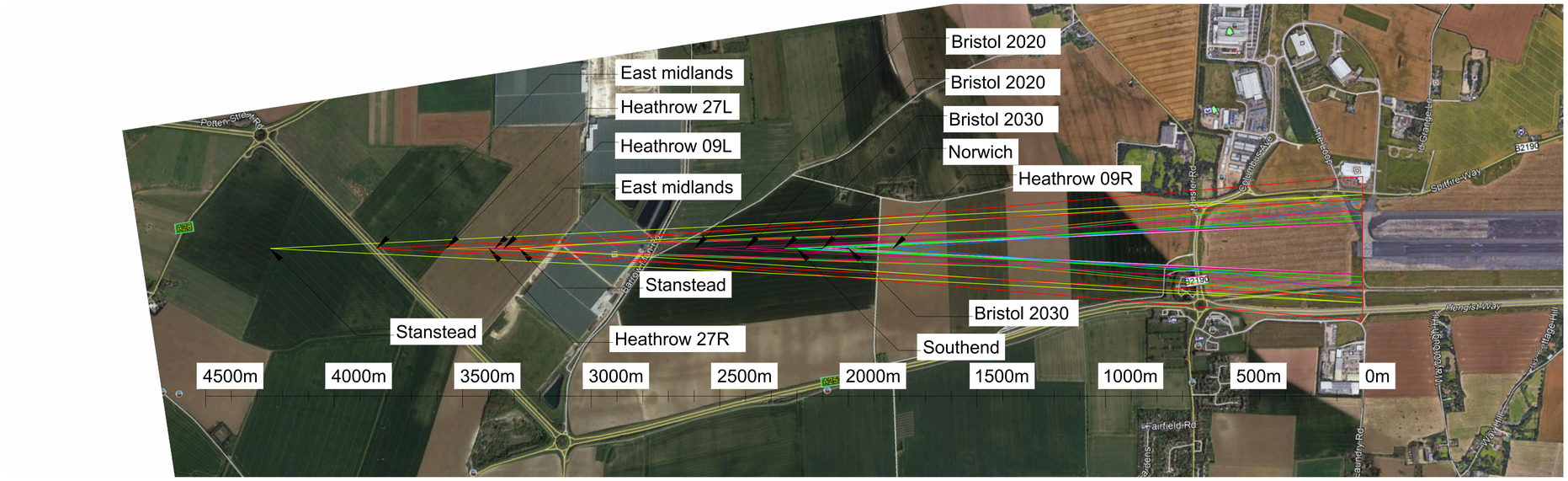
Appendix A
Figures

MANSTON AIRPORT MASTERPLAN DEVELOPMENT CONSENT ORDER
PUBLIC SAFETY ZONES (COMPARISON)
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL



Manston Predicted PSZ East Side

1:5000



Manston Predicted PSZ West Side

1:5000

100m SCALE 1:5000

RSP

Notes

1. Mapping data obtained from google earth

Airport PSZ	Source
Heathrow	Heathrow technical submission volume 2
Stanstead	-
Southend	Proposal to revise the public safety zones at Southend airport - Civil Aviation Authority
Bristol	Bristol international airport master plan 2006-2030
Norwich	Norwich Airport Draft Masterplan July 2017
East Midlands	-

Key 1.100,000 PSZ Contours

- Bristol 2020 PSZ
- Bristol 2030 PSZ
- Heathrow 09R PSZ
- Norwich PSZ
- East Midlands Airport PSZ
- Heathrow 27L PSZ
- Standsted PSZ
- Southend PSZ
- Heathrow 27R PSZ
- Heathrow 09L PSZ

Rev	Description	By	Ckd	Apr	Date
P01	First Issue	HLB	CJ	GDD	01/05/19

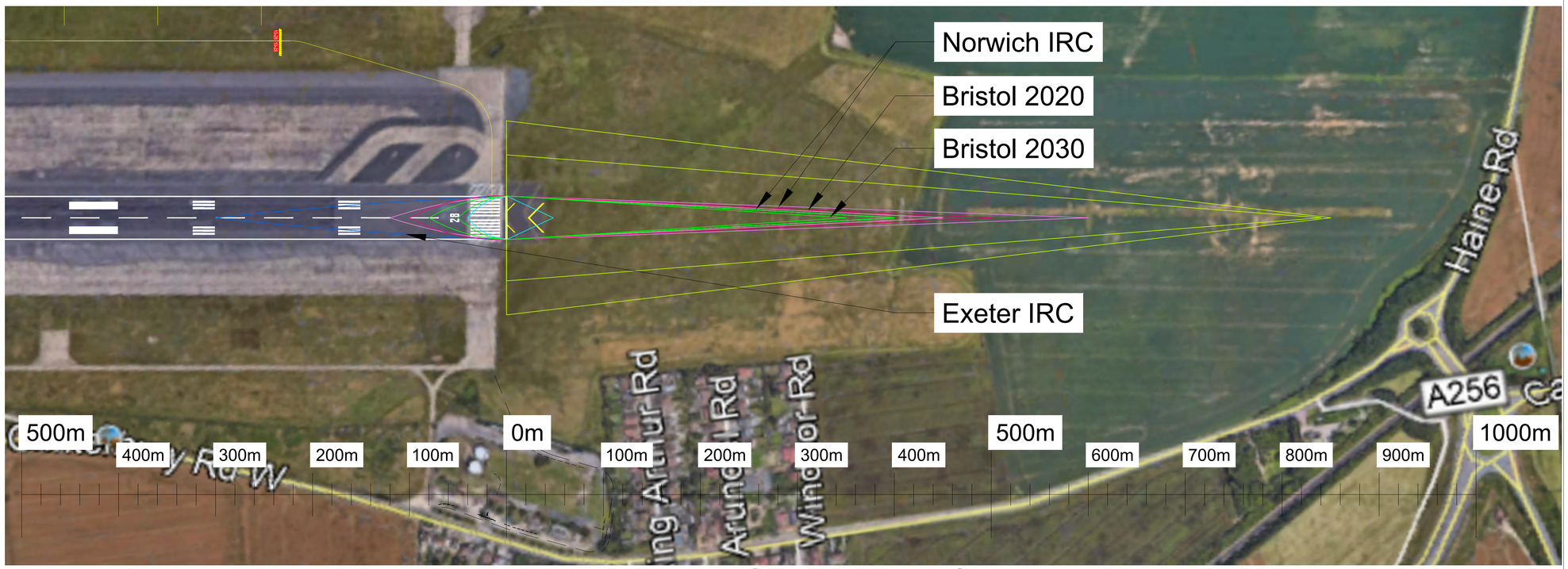
Project MANSTON AIRPORT
DEVELOPMENT CONSENT ORDER

Title PUBLIC SAFETY ZONES
(COMPARISON)
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL

Document Number		Revision
NK019598 - RPS-MES-XX-DR-C- Figure 2.1		P01
Project Number	Originator - Zone - Level - Type - Role - Drawing Number	
Application Number - TR02002		

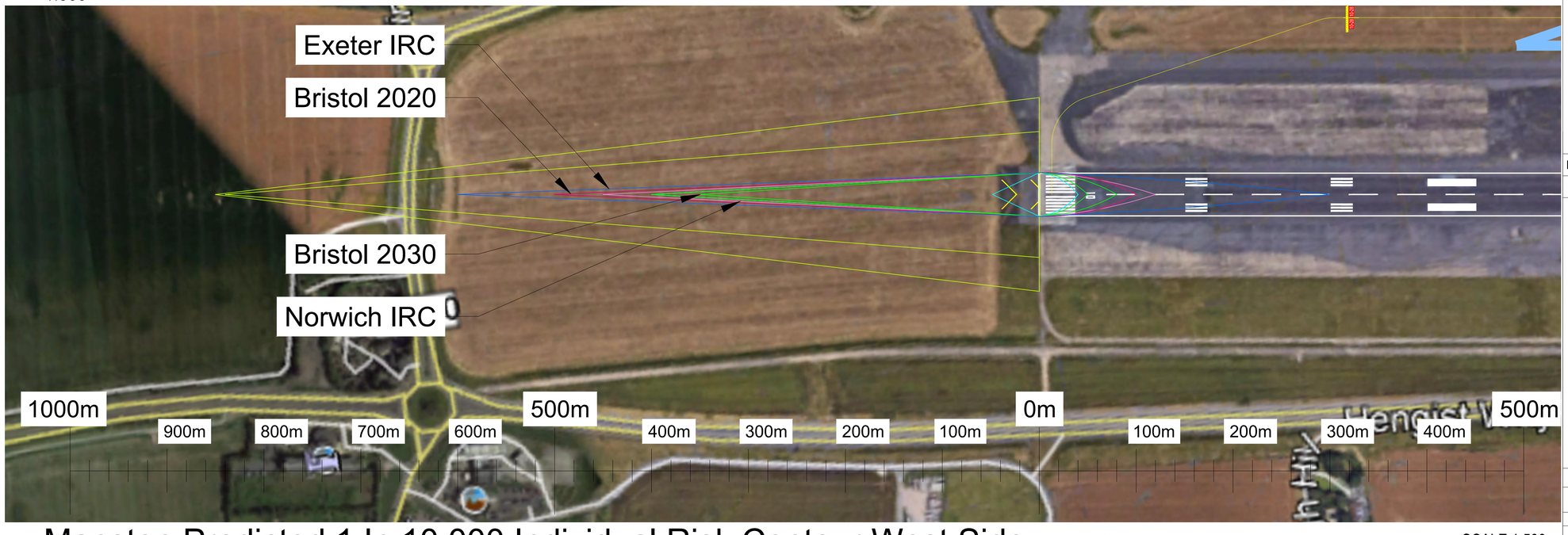
Scale	Sheet Size	Sheet No	Status
1:5000	A3	1 of 1	S. 56

MANSTON AIRPORT MASTERPLAN DEVELOPMENT CONSENT ORDER
1 IN 10,000 INDIVIDUAL RISK CONTOUR (COMPARISON)
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL



Manston Predicted 1 In 10,000 Individual Risk Contour East Side

1:500



Manston Predicted 1 In 10,000 Individual Risk Contour West Side

1:500

100m SCALE 1:500

RSP

Notes

1. Mapping data obtained from google earth

Airport PSZ	Source
Heathrow	Heathrow technical submission volume 2
Stanstead	-
Southend	Proposal to revise the public safety zones at Southend airport - Civil Aviation Authority
Bristol	Bristol international airport master plan 2006-2030
Norwich	Norwich Airport Draft Masterplan July 2017
East Midlands	-

Key

1 IN 10,000 Individual Risk Contour (IRC)

- Bristol 2020 IRC
- Bristol 2030 IRC
- Heathrow 09R IRC
- Norwich IRC
- East Midlands Airport IRC
- Heathrow 27L IRC
- Standstead IRC
- Southend IRC
- Heathrow 27R IRC
- Heathrow 09L IRC

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MANSTON AIRPORT MASTERPLAN DEVELOPMENT CONSENT ORDER
1 IN 10,000 INDIVIDUAL RISK CONTOUR
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL

Manston Predicted 1 In 10,000 Individual Risk Contour East Side

1:500

Manston Predicted 1 In 10,000 Individual Risk Contour West Side

1:500

100m

SCALE 1:500

RSP

Notes

1. Mapping data obtained from google earth

Key

1 in 10,000 Individual Risk Contour (IRC)

Worst case IRC

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Project MANSTON AIRPORT
DEVELOPMENT CONSENT ORDER

Title 1 IN 10,000 INDIVIDUAL RISK CONTOUR
WORST CASE SCENARIO
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL

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MANSTON AIRPORT MASTERPLAN DEVELOPMENT CONSENT ORDER
PUBLIC SAFETY ZONES
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL

Manston Predicted PSZ East Side

1:5000

Manston Predicted PSZ West Side

1:5000

100m SCALE 1:5000

RSP

Notes

1. Mapping data obtained from google earth

Key 1.100,000 PSZ Contours

Worst case PSZ

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DEVELOPMENT CONSENT ORDER

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1:100,000 INDIVIDUAL RISK CONTOUR
WORST CASE SCENARIO
REGULATION 5 (2)(o)
THANET DISTRICT COUNCIL

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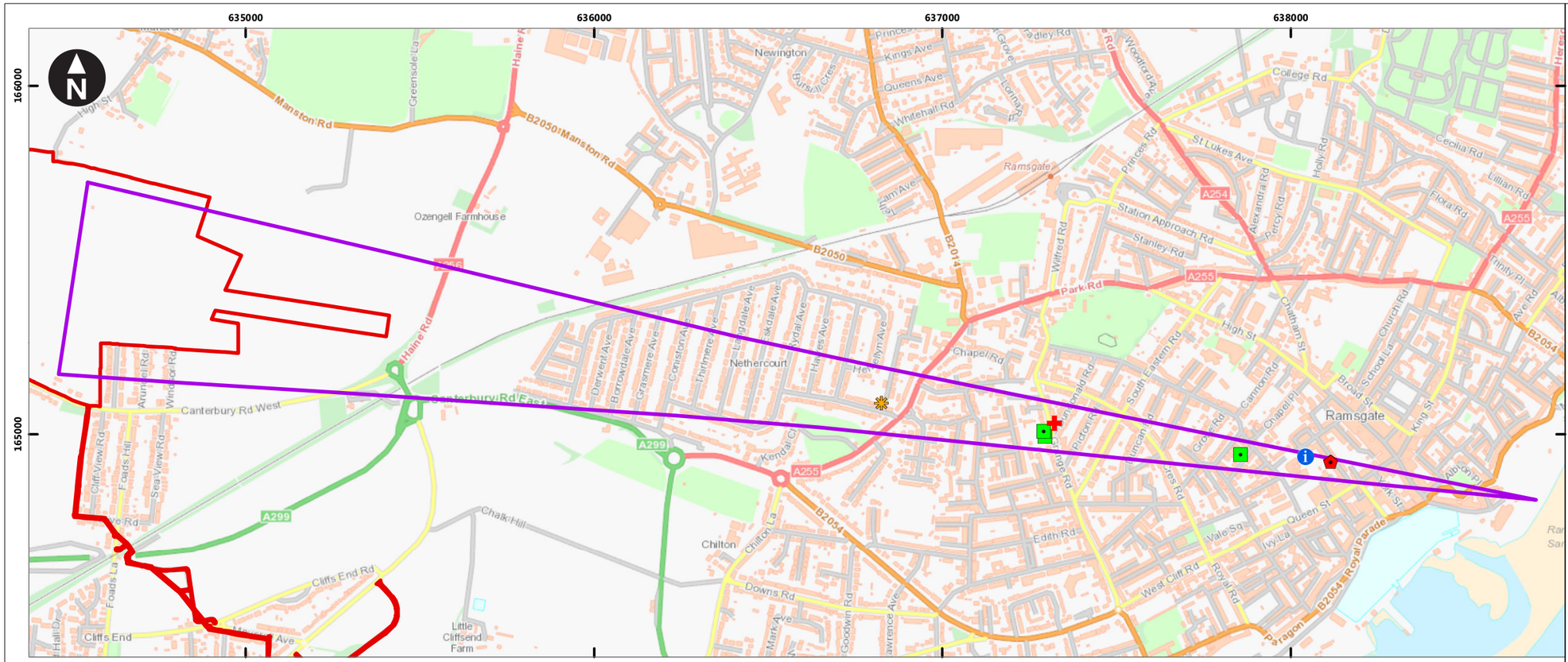

Key

- Order Limits
- Public Safety Zone (PSZ)
- Care / nursing home
- GP surgery / clinic
- Fire Station
- Library
- Community facility - Scout and guide headquarters

0 100 200 300 400 500 600 700 800 m

Scale at A3: 1:14,000

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Client

RSP

Manston Airport DCO

Figure 5.1

Public Safety Zone in relation to community facilities

April 2019

wood.

H:\Projects\40820 LON Manston Airport Post Application\Drawings\GIS\Figures\40820-Lon132.mxd Originator: jacqui.parkin

Key

Order Limits

Public Safety Zone (PSZ)

Indoor / outdoor leisure facility

Playground

Holiday campsite

Waterfall

Pond

0 100 200 300 400 500 600 700 800 m

Scale at A3: 1:14,000

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Client

RSP

Manston Airport DCO

Figure 5.2

Public Safety Zone in relation to leisure facilities

April 2019

wood.

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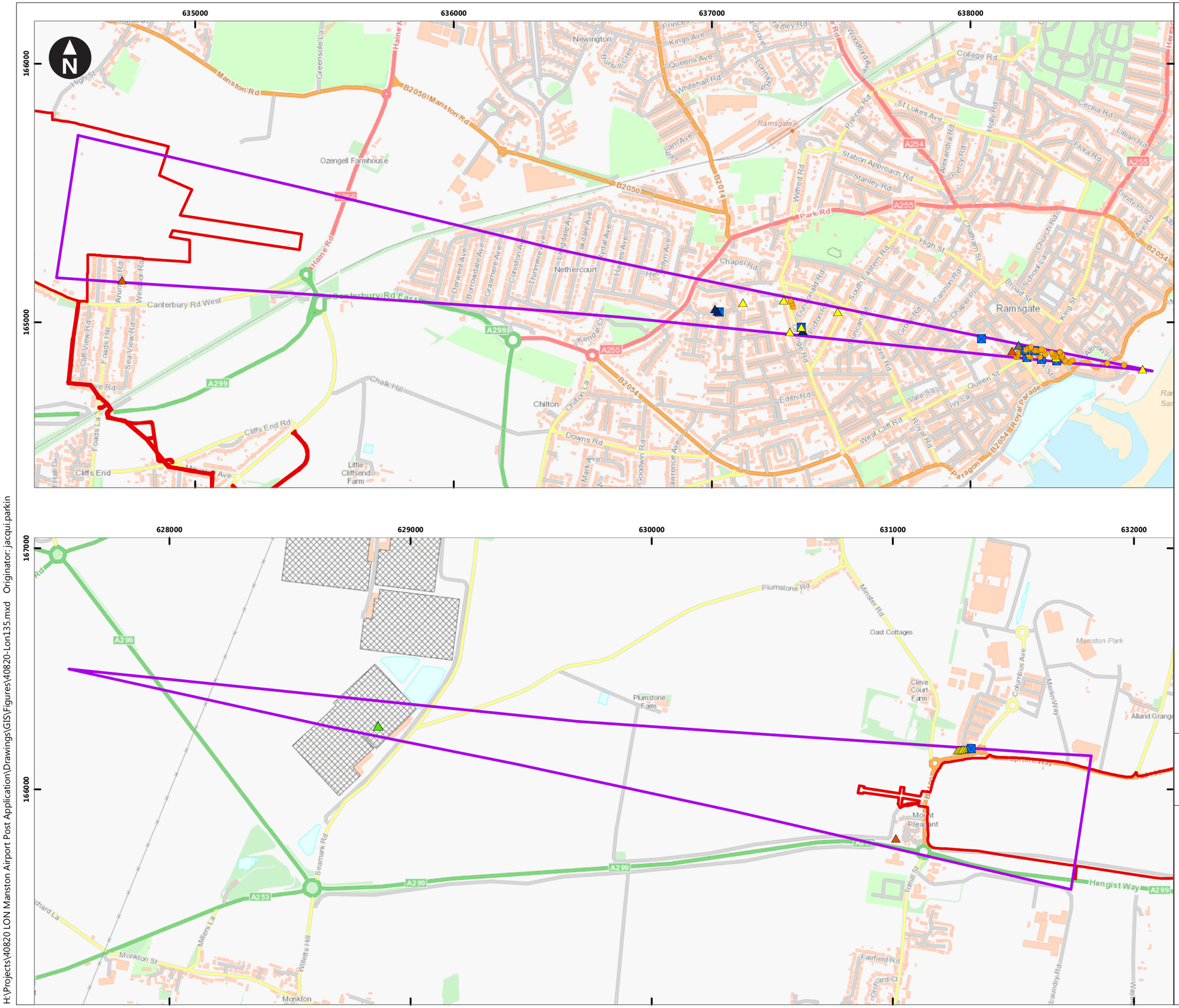

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Figure 5.3

Public Safety Zone in relation to commercial sites and retail

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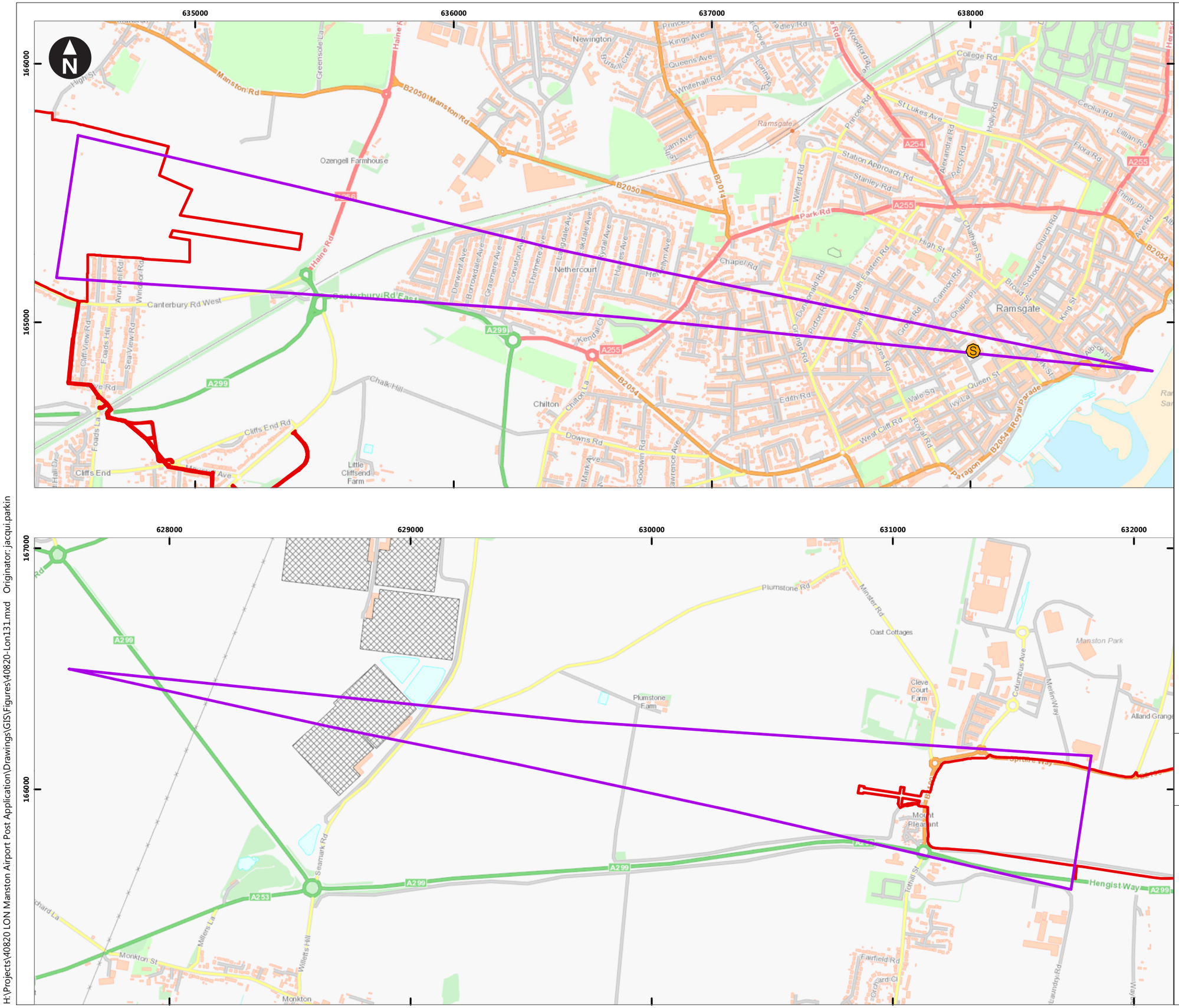

Key

- Order Limits
- Public Safety Zone (PSZ)
- School - Secondary

0 100 200 300 400 500 600 700 800 m

Scale at A3: 1:14,000

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Manston Airport DCO

Figure 5.4
Public Safety Zone in relation to schools

April 2019

wood.

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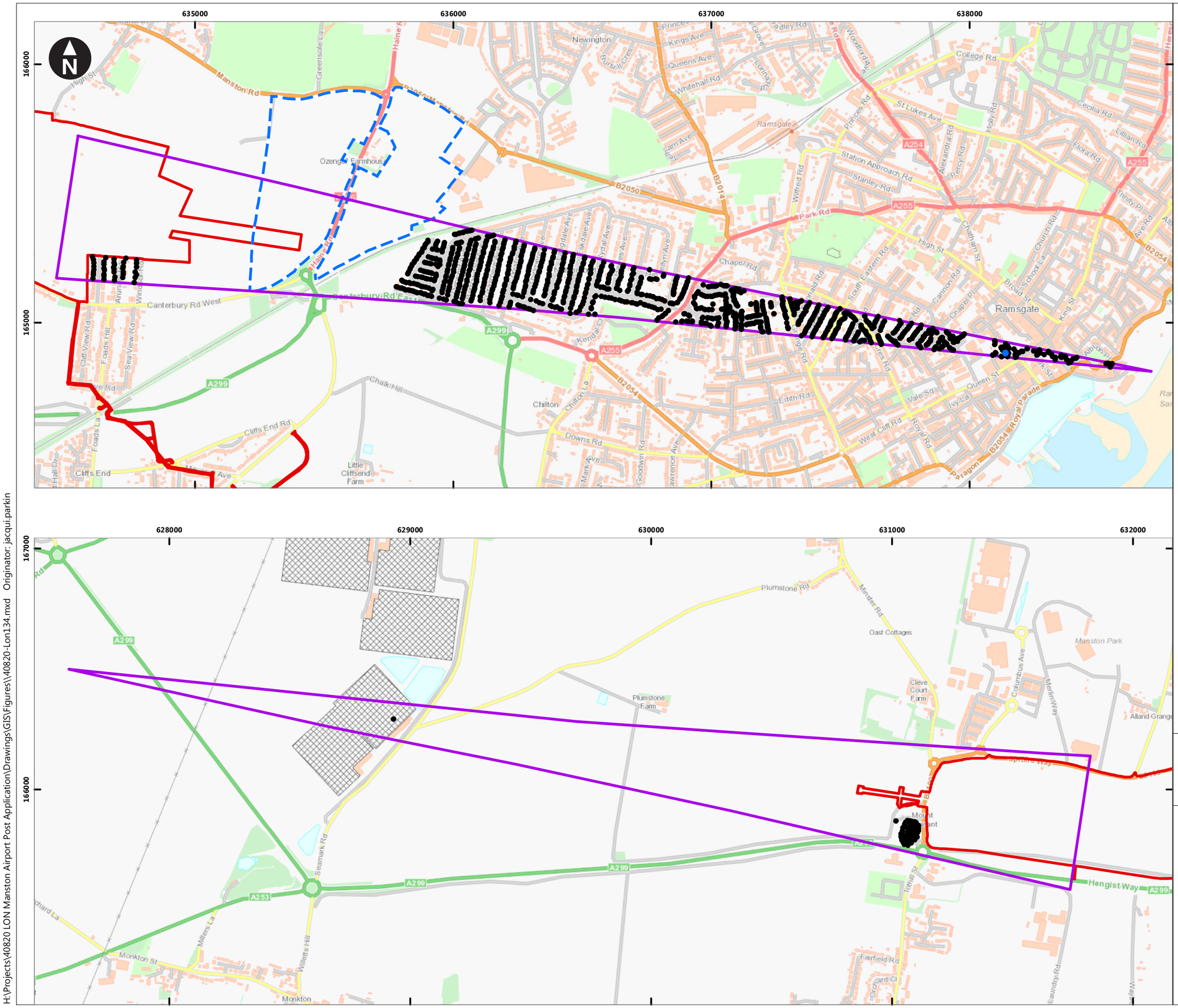

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Safety Regulation Group

Civil Aviation Authority

Licensing of Aerodromes

CAP 168

Civil Aviation Authority

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Revision history

Tenth edition February 2014

This is a complete re-issue due to the format and changes to the numbering convention. It replaces previous editions and is issued as a complete new document.

The main changes to CAP 168 within this amendment comprise:

The incorporation of amendments arising from amendment 11 to ICAO annex 14 Volume 1, as notified by State Letter AN 4/1.2.24-13/20 dated 5 April 2013.

Chapter 2:

- Submission of aerodrome manual amendments prior to the aerodrome audit.
- Low Visibility Procedures (LVPs) content has been rearranged and new guidance material added to provide clarity on the processes involved in LVP operations.
- Aerodrome Safety Management System (SMS) - accountable manager: to provide clarity and to align with the proposed EASA rules on Aerodrome Operator requirements.
- Arresting systems: additional information regarding the use of Engineered Material Arresting System (EMAS).

Chapter 3:

- A significant change to clearway definition in order to align with the proposed rules published in EASA Notice of Proposed Amendment (NPA) 2011-20, Authority, Organisation and Operations Requirements For Aerodromes. Aerodromes are requested to assess the impact of this change on their clearways and inform the CAA should there be a necessity to review the aerodrome licence conditions.
- A number of other changes to Runway End Safety Area (RESA) and Take Off Run Available (TORA) in order to remove obsolete guidance and to align with both ICAO and EASA proposals.
- Withdrawal of appendix 3G as this guidance is now considered obsolete and superseded elsewhere in appendix 3A , and in CAP 683, The Assessment of Runway Surface Friction Characteristics.

Chapter 5: Change from 'Birdstrike' to 'Wildlife Strike', in order to align with ICAO and EASA terminology.

Chapter 6: Guidance on the maintenance of AGL Systems.

Chapter 8: Changes required to reflect the latest guidance on reductions of RFFS.

In addition, several administrative changes have been incorporated throughout this amendment to CAP 168, such as additional glossary items. These were not consulted upon as part of the CAA's consultation 'CAP 168 Licensing of Aerodromes NPA 01/2013' conducted in early 2013.

Eleventh edition January 2019

This is a minor corrective amendment.

- Reinstated Table 6A.1 - Characteristics of obstacle lights and low intensity aeronautical ground lights.
- Figure 6B.1 (PAPI General Arrangement) a correction to the PAPI angle, where associated with an ILS, Unit 1, to 2°.25'.
- Chapter 8 has been amended to reflect previously published in Information Notices:
    - Changes first published in IN 2015/053 incorporated (Changes to the requirements for the training of Aerodrome Rescue and Firefighting Personnel)
    - Changes first published in IN 2016/052 incorporated (EASA ED Decision 2016/09/R: Rescue and Firefighting Services – Remission Factor, Cargo Flights, etc.)
    - Changes first published in IN 2017/031 incorporated (Aerodrome Rescue and |Firefighting Services – Provision of Fire Extinguishing Agents)
    - Appendix 8A (Surface Level Heliports) – Helicopter dimensions table (Table 8A1) has been aligned to the current version of ICAO Annex 14 Vol II (A further amendment to CAP168 may be required if/when the current draft revision of ICAO Annex 14 Vol II is approved)
- References to 'Licence Holder' changed to 'Aerodrome Operator'

Introduction

This document is published in support of the discretionary powers relating to the grant of an aerodrome licence contained in the Air Navigation Order (ANO). The Civil Aviation Authority (Chicago Convention) Directions 2007 require the Civil Aviation Authority (CAA) to ensure that it acts consistently with the obligations placed on the United Kingdom under the Convention on International Civil Aviation, enacted in Chicago on 7 December 1944 (the Chicago Convention). Not all ICAO (International Civil Aviation Organisation) Standards and Recommended Practices (SARPs) and procedures have been fully implemented directly in the ANO. Therefore, where the CAA has discretionary powers to grant a licence, certificate or approval provided it is satisfied as to the suitability of the applicant, the CAA is expected to implement such SARPs through its policy documents such as CAP 168. Where the UK has formally notified ICAO of differences to any of the SARPs in annex 14, these differences are also published in the UK Aeronautical Information Publication (AIP) at GEN 1.7.

The ANO requires that, in the United Kingdom, most flights for the public transport of passengers take place at a licensed aerodrome, or at a Government aerodrome. The Order also makes provision for an applicant to be granted an aerodrome licence subject to such conditions as the CAA thinks fit.

The purpose of this document is to give guidance to applicants and licence holders on the procedure for the issue and continuation of or variation to an aerodrome licence issued under Article 211 of the ANO 2009, and to indicate the licensing requirements that are used for assessing a variation or an application. The document also describes the CAA's aerodrome licensing requirements relating to operational management and the planning of aerodrome development. This document represents the minimum standards necessary to meet the licensing requirement.

Prior to the grant of a licence and for continued licensing, the CAA's Inspectors will visit the aerodrome and determine the extent to which the aerodrome, its facilities and its operational procedures meet the licensing requirements. In making its assessment of an application for or continuation of a licence the CAA will adopt as flexible an approach as is consistent with the achievement and maintenance of a satisfactory level of safety. All aerodromes differ, and to allow the CAA flexibility to deal with the different situations encountered, some specifications are phrased using the word 'should'. This does not mean that compliance is optional but rather that, where insurmountable difficulties exist, the CAA may accept an alternative means of compliance, provided that an acceptable safety assurance from the applicant or licence holder shows that the safety requirements will not be reduced below that intended by the requirement.

Any limiting conditions or mitigating measures, described in the safety assurance, that compensate for any increased risk will take account of the anticipated flying activity and any other non-compliances, including those documented as variations, from licensing requirements that may already exist. Thereafter, the conditions or mitigating measures, and any other non compliances, including variations, will be reviewed by the licence holder and the CAA periodically, in particular when any significant changes in activity or aerodrome development are proposed.

Significant changes in the nature and the scale of flying activity at a licensed aerodrome shall be notified to the CAA as soon as is practicable and be reflected in the pre-audit aerodrome safety report sent to the CAA. Where development work, including changes to the physical characteristics, aerodrome lighting and other visual aids is proposed, the CAA shall be consulted beforehand in accordance with the conditions of the licence and relevant legislation or both.

The CAA places emphasis on the adoption, by licence holders, of safety management systems that describe the safety policy of the aerodrome licence holder, and its application, and operational management, in addition to the physical design and operating standards of aerodromes. Aerodromes will be audited regularly by the CAA.

During an aerodrome audit inspectors from the CAA shall assess the aerodrome's compliance with requirements, audit the aerodrome's management of safety and assess the competence of those responsible for safety. The aerodrome manual and aerodrome safety report are key documents in this process, as is CAP 700, Operational Safety Competences. The inspectors will also appraise the aerodrome's current level of flying, or any anticipated change in activity against the facilities provided, in order to be satisfied that the aerodrome and the airspace, within which its visual traffic pattern is normally contained, are safe for use by aircraft. The inspectors will, as a result of their inspection, produce a report to the licence holder which will list non-compliance items with agreed actions and timescales for rectification. The report will also detail other issues which may affect safety at the aerodrome.

An aerodrome licensed in accordance with aerodrome licensing requirements will normally be suitable for use by Short Take-Off and Landing (STOL) aircraft; there are currently no specific criteria published for aerodromes to be used only by aircraft with a STOL capability. Proposals for the licensing of STOL or helicopter aerodromes should be discussed with the CAA, from which guidance is available.

From time to time the CAA will wish to supplement the guidance or requirements given in this publication, and this shall be in the form of either a safety directive, safety notice, or an information notice. Where applicable, such information will subsequently be included in this publication by amendment.

References in this publication to the Air Navigation Order, regulations and rules of the air are to the Order, Regulations and Rules then in force.

Where a definition is not provided in the Glossary of Terms, the definition provided in ICAO annex 14, volume 1, Aerodrome Design and Operations, will apply unless otherwise stated. Where a requirement is not provided in CAP 168, the relevant SARP in ICAO annex 14, volume 1, Aerodrome Design and Operations, will normally apply. Where an aerodrome licence holder believes that this SARP should not be applied, then this shall be assessed on a case-by-case basis. The relevant annex 14 SARP will form the basis of this assessment. The need for any subsequent amendment to CAP 168 to include the relevant SARP shall also be considered and actioned as appropriate.

An amendment service is provided for this publication, contact details are given on the inside cover of this publication.

Glossary of terms

Accelerate – Stop Distance Available (ASDA) The distance from the point on the surface of the aerodrome at which the aeroplane can commence its take-off run to the nearest point in the direction of take-off at which the aeroplane cannot roll over the surface of the aerodrome and be brought to rest in an emergency without the risk of accident.

Aerodrome A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure or surface movement of aircraft.

Aerodrome beacon An aeronautical beacon used to indicate the location of an aerodrome from the air.

Aerodrome elevation The elevation of the highest point of the landing area. This is the highest point of that part of the runway used for both landing and take-off. See also 'Landing Area'.

Aerodrome Mapping Data (AMD) Data collected for the purpose of compiling aerodrome mapping information for aeronautical uses.

> Note: Aerodrome mapping data are collected for purposes that include the improvement of the user's situational awareness, surface navigation operations, training, charging and planning.

Aerodrome Mapping Database (AMDB) A collection of aerodrome mapping data organised and arranged as a structured dataset.

Aerodrome Reference Point (ARP) The aerodrome reference point is the geographical location of the aerodrome and the centre of its traffic zone where an ATZ is established.

Aerodrome Traffic Zone (ATZ) The airspace specified in Article 258 of the ANO 2009 as being airspace in the vicinity of an aerodrome notified for the purposes of Rule 45 of the Rules of the Air Regulations.

Aeronautical ground light Any light specifically provided as an aid to air navigation other than a light displayed on an aircraft including lights specifically provided at an aerodrome as an aid to the movement and control of aircraft and of those vehicles which operate on the movement area.

Aeroplane A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aeroplane reference field length The minimum field length required for take-off at maximum take-off weight, calculated at MSL, in standard atmosphere conditions and still air, and with zero runway slope. The precise distance will be given in the Flight manual or equivalent data-sheets from the manufacturer.

Aircraft Any machine that can derive support in the atmosphere from the reactions of air other than by the reactions of air against the earth's surface.

Aircraft stand A designated area on an aerodrome to be used for parking an aircraft.

Apron A defined area on a land aerodrome provided for the stationing of aircraft for the embarkation and disembarkation of passengers, the loading and unloading of cargo, fuelling, and for parking.

Balanced field length A runway for which the Accelerate Stop Distance Available is equal to the Take-off Distance Available is considered to have a balanced field length.

Barrette Three or more aeronautical ground lights closely spaced in a transverse line such that from a distance they appear as a short bar of light.

Balked landing A landing manoeuvre that is unexpectedly discontinued at any point below the obstacle clearance altitude/height (OCA/H).

Cleared and Graded Area (CGA) That part of the Runway Strip cleared of all obstacles except for minor specified items and graded, intended to reduce the risk of damage to an aircraft running off the runway.

Clearway An area at the end of the take-off run available and under the control of the aerodrome licence holder, selected or prepared as a suitable area over which an aircraft may make a portion of its initial climb to a specified height.

Cloud ceiling In relation to an aerodrome, cloud ceiling means the vertical distance from the elevation of the aerodrome to the lowest part of any cloud visible from the aerodrome which is sufficient to obscure more than one half of the sky so visible.

Critical area An area of defined dimensions extending about the ground antennae of a precision instrument approach equipment within which the presence of vehicles or aircraft will cause unacceptable disturbance of the guidance signals.

Declared distances The distances declared by the aerodrome authority for the purpose of application of the requirement of the Air Navigation (General) Regulations in respect of aeroplanes flying for the purpose of public transport.

Delethalisation Below ground ramping to buried vertical face of construction designed to reduce risk of damage to aircraft running on cleared and graded area of strip.

Frangibility The ability of an object to retain its structural integrity and stiffness up to a specified maximum load but when subject to a load greater than specified or struck by an aircraft will break, distort or yield presenting minimum hazard to an aircraft.

Heavier-than-air aircraft Any aircraft deriving its lift in flight chiefly from aerodynamic forces.

Helicopter A heavier-than-air aircraft supported in flight by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Heliport An aerodrome or a defined area on a structure intended to be used either wholly or in part for the arrival, departure and surface movement of helicopters.

Holding bay A defined area where aircraft can be held or bypassed in order to facilitate the efficient movement of aircraft.

Hotspot A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

Instrument approach operations An approach and landing using instruments for navigation guidance based on an instrument approach procedure.

There are two methods for executing instrument approach operations:

1. a two-dimensional (2D) instrument approach operation, using lateral navigation guidance only; and
2. a three-dimensional (3D) instrument approach operation, using both lateral and vertical navigation guidance.

Note: Lateral and vertical navigation guidance refers to the guidance provided either by:

1. a ground-based radio navigation aid; or
2. computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these.

Instrument approach operations shall be classified based on the designed lowest operating minima below which an approach operation shall only be continued with the required visual reference as follows:

1. Type A: a minimum descent height or decision height at or above 75 m (250 ft); and
2. Type B: a decision height below 75 m (250 ft).

Instrument runway A runway intended for the operation of aircraft using non-visual aids providing at least directional guidance in azimuth adequate for a straight-in approach.

Intermediate holding position A designated position intended for traffic control at which taxying aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower.

Landing area That part of a movement area intended for the landing and take-off of aircraft.

Landing Distance Available (LDA) The distance from the point on the surface of the aerodrome above which the aeroplane can commence its landing, having regard to the obstructions in its approach path, to the nearest point in the direction of landing at which the surface of the aerodrome is incapable of bearing the weight of the aeroplane under normal operating conditions or at which there is an obstacle capable of affecting the safety of the aeroplane.

Manoeuvring area That part of an aerodrome provided for the take-off and landing of aircraft and for the movement of aircraft on the surface, excluding the apron and any part of the aerodrome provided for the maintenance of aircraft.

Movement area That part of an aerodrome intended for the surface movement of aircraft including the manoeuvring area, aprons and any part of the aerodrome provided for the maintenance of aircraft.

Note: Manoeuvring Area and Movement Area are generic terms intended to describe the 'airside' part of an aerodrome, rather than just those pavements or surfaces on which aircraft movements take place.

Non-instrument runway A runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue in visual meteorological conditions (VMC).

Non-precision approach runway A runway served by visual aids and a non-visual aid(s) intended for landing operations following an instrument approach operation Type A and a visibility not less than 1000 m.

Obstacle All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight, or that stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

Obstacle free zone A volume of airspace extending upwards and outwards from an inner portion of the Runway Strip to specified upper limits which is kept clear of all obstructions except for minor specified items required for air navigation purposes, of low mass and of a frangible mount.

Precision approach runway A runway intended for the operation of aircraft using precision instrument approach aids that meet the Facility Performance requirements defined in ICAO annex 10 appropriate to the Category of Operations. These runways are divided into three categories as follows:

Category I (cat 1) operation
A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation Type B, with a decision height (DH) not lower than 60 m (200 ft) and either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II (cat 2) operation
A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation Type B with a decision height (DH) lower than 60 m (200 ft)but not lower than 30 m (100 ft) and a runway visual range of not less than 300 m.

Category III (cat 3) operation
A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation Type B to and along the surface of the runway and:

A - intended for operations with a decision height (DH) lower than 30 m (100 ft), or no decision height and a runway visual range not less than 175 m.

B - intended for operations with a decision height (DH) lower than 15 m (50 ft), or no decision height and a runway visual range not less than 50 m.

C - intended for operations with no decision height and no runway visual range limitation.

Lower than standard category I operation
A Category I Instrument Approach and Landing Operation using a Category I decision height, with an RVR lower than would normally be associated with the applicable decision height.

Other than standard category II operation
A Category II Instrument Approach and Landing Operation to a runway where some or all of the elements of the ICAO annex 14 Precision Approach Category II lighting system are not available.

Runway A defined rectangular area, on a land aerodrome prepared for the landing and take-off run of aircraft along its length.

Runway end safety area (RESA) An area symmetrical about the extended runway centreline and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway.

Runway holding position A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxying aircraft and vehicles shall stop and hold, unless otherwise authorised by the aerodrome control tower.

Runway incursion Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Runway strip An area of specified dimensions enclosing a runway intended to reduce the risk of damage to an aircraft running off the runway and to protect aircraft flying over it when taking off or landing.

Runway threshold The beginning of that portion of the runway usable for landing.

Runway Visual Range (RVR) The range over which the pilot of an aircraft on the centreline of a runway can see the runway surface markings or the lights delineating the runway or identifying its centreline.

Safety Management System (SMS) A systematic approach to managing safety including the necessary organisational structure, accountabilities, policies and procedures.

Sensitive area An area extending beyond the Critical Area where the parking and/or movement of aircraft or vehicles will affect the guidance signal to the extent that it may be rendered unacceptable to aircraft using the signal.

Shoulder An area adjacent to the edge of a paved surface so prepared as to provide a transition between the pavement and the adjacent surface for aircraft running off the pavement.

Stand See Aircraft Stand.

Stopway A defined rectangular area beyond the end of the TORA, suitably prepared and designated as an area in which an aeroplane can be safely brought to a stop in the event of an abandoned take-off.

Take-off Distance Available (TODA) Either the distance from the point on the surface of the aerodrome at which the aeroplane can commence its take-off run to the nearest obstacle in the direction of take-off projecting above the surface of the aerodrome and capable of affecting the safety of the aeroplane, or one and one half times the take-off run available, whichever is the less.

Take-off Run Available (TORA) The distance from the point on the surface of the aerodrome at which the aeroplane can commence its take-off run to the nearest point in the direction of take-off at which the surface of the aerodrome is incapable of bearing the weight of the aeroplane under normal operating conditions.

Taxiway A defined path on a land aerodrome established for the taxying of aircraft and intended to provide a link between one part of the aerodrome and another, including:

1. Aircraft stand taxilane. A portion of an apron designated as a taxi route intended to provide access to aircraft stands only.
2. Apron taxiway. A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.
3. Rapid exit taxiway. A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimising runway occupancy times.

Taxiway strip An area of specified dimension enclosing a taxiway and intended to protect aircraft operating on the taxiway and to reduce the risk of damage to an aircraft running off the taxiway.

Taxiway holding position A designated position at which taxying aircraft and vehicles may be required to hold in order to provide adequate clearance from a runway or another taxiway.

1. Runway Taxi Holding Position. A Taxi Holding Position intended to protect a runway.
2. Intermediate Taxi Holding Position. A Taxi Holding Position intended to protect a priority route.

Taxiway intersection A junction of two or more taxiways.

Threshold The beginning of that portion of the runway available for landing.

CHAPTER 1

The licensing process

In this chapter the Air Navigation Order and references to Articles of that Order mean the Air Navigation Order 2009. Should that Order be amended or replaced, any reference to the Order or any Article of that Order shall be taken as references to the Order currently in force.

The legal background to aerodrome licensing

1.1 In addition to annex 14, ICAO has published the manual on Certification of Aerodromes, Document 9774, the purpose of which is to provide guidance to States in establishing their regulatory regime so that compliance with the specifications in annex 14 can be effectively enforced. In the UK the term 'licensing' is used rather than 'certification'. Document 9774 is implemented in the Air Navigation Order and CAP 168.

1.2 The Air Navigation Order (ANO) Article 208 requires that, in the UK, specified flights for the purpose of public transport or for the purpose of instruction in flying, take place only at a licensed aerodrome or a Government aerodrome. The grant of an aerodrome licence is governed by Articles 211 and 212.

1.3 The aerodrome manual required under ANO Article 211 shall include information and instructions as specified in Schedule 12 to that Article. Guidance on aerodrome manual production is given in chapter 2 of this CAP.

1.4 The CAA may, if it thinks fit, provisionally suspend or vary any licence pending enquiry into or consideration of the case, and may, on sufficient ground being shown to its satisfaction after due enquiry, revoke, suspend or vary a licence in accordance with ANO Article 228.

1.5 The Civil Aviation Authority Regulations 1991 provide that, where it is proposed to revoke, suspend, or vary a licence otherwise than on the application of the holder, notice of the proposal, together with the reasons for it, will be served on the holder who may within 14 days serve on the CAA a request that the case be decided by the CAA and not by any other person on its behalf.

1.6 Where an application for the grant or variation of an aerodrome licence is refused, or is granted in terms other than those requested by the applicant, a notice will be served stating the reasons for the decision, and the applicant may request within 14 days from the date of service of the notice that CAA review the case.

Charges

1.7 Details of the Civil Aviation Authority's Scheme of Charges (Aerodrome Licensing) made pursuant to section 11 of the Civil Aviation Act 1982 may be obtained from the Aerodrome Standards Department and also at www.caa.co.uk/ors5.

Type of licence

1.8 An applicant may be granted a Public Use aerodrome licence or an Ordinary aerodrome licence. In the case of the former, the hours of availability of the aerodrome must be notified in the United Kingdom Aeronautical Information Publication (UK AIP) and the aerodrome must be available on equal terms and conditions to all persons permitted to use the aerodrome. An Ordinary licence relates only to use of the aerodrome by the holder of the licence and persons specifically authorised by him. The holder of an Ordinary licence is not obliged to notify the hours of availability in the UK AIP but, if he does so, the aerodrome must remain open throughout the notified hours irrespective of traffic requirements. If the hours are not notified, the availability of the aerodrome and its facilities can be shown in the UK AIP as 'by arrangement', but if this is the case then the protection of an Aerodrome Traffic Zone (ATZ) may not be provided.

Application for a licence

1.9 The applicant should either be the owner of the land, or have obtained the landowner's permission for the use of the site as an aerodrome. A proposal to use land as an aerodrome may be subject to the requirements of the Town and Country Planning Acts and applicants are advised to consult the Local Planning Authority before embarking on any such project. The application for planning permission and the request for the aerodrome licence are not interdependent and are made separately. A similar constraint will almost certainly apply to any proposals for aerodrome development. The granting of an aerodrome licence does not absolve the holder from observing other statutory requirements.

1.10 The initial application for an aerodrome licence must be made on form SRG 2002. The completed form should be returned to the CAA together with the appropriate fee, a map showing the aerodrome location and boundaries and a copy of the aerodrome manual (see chapter 2). Additionally, survey data in the form of charts, profiles, sections, evidence of pavement strengths and surface textures etc., relating to the site and its environs, must be provided by the applicant as required by the CAA.

1.11 An application for the variation of a licence must be made in writing by the licence holder, and be accompanied by the appropriate fee, and by the relevant survey and other information where there are any changes in the characteristics of the aerodrome or its environs. A variation to the licence can be requested for a change to the licence holder's details, a change to the licence conditions, or

to Schedule 1 the aerodrome boundary map. A variation in this context means a change or amendment to an existing aerodrome licence.

1.12 A licence will normally remain in force until suspended or revoked, but may be issued for a limited period. In the case of a licence for a period exceeding 12 days but not exceeding 12 months, i.e. a seasonal licence, application must be made on form SRG 2002. In the case of a temporary licence, for a period not exceeding 12 consecutive days, application must be made on form SRG 2003.

1.13 Applications should be submitted in sufficient time to allow for detailed consideration and inspection of the aerodrome before the issue of a licence. The minimum notice required is 60 days from the date a completed aerodrome manual is accepted by the CAA. The interval between application and grant of a licence (or a variation thereto) may depend upon matters within the control of the applicant and no undertaking can be given that the CAA will be able to reach a decision within a particular period.

1.14 A prospective applicant should, in his own interest, consult the CAA before committing himself to expenditure on developing or equipping an aerodrome.

1.15 Application forms are obtainable from the CAA and also in electronic format at www.caa.co.uk/aerodromelicensingforms.

Aerodrome boundaries

1.16 As part of the aerodrome licensing process, the holder of (or applicant for) an aerodrome licence is required to provide a map on a scale not larger than A4 size showing the exact location of the aerodrome, and to delineate on the map the boundary of the aerodrome land. If a licence is granted, this map will form a schedule to the aerodrome licence.

1.17 The aerodrome boundary for licensing purposes should not be confused with boundaries established for other purposes such as the operational boundaries used by local planning authorities, or those used to designate security restricted zones. These other boundaries may be coincident either in whole or in part with the aerodrome licence boundary, but there is no requirement for them to be so.

1.18 The map forming Schedule 1 to the aerodrome licence should show the boundary of the area of the aerodrome set aside for the movement of aircraft requiring the use of a licensed aerodrome, so should include runways, taxiways, aprons and, in most cases, the area adjacent to the terminal building. This is the area that will be audited by CAA Inspectors, and is also the boundary of the area referred to in Condition 3 of the aerodrome licence.

General requirements for the grant of a licence

1.19 Before a licence is granted the CAA will require to be satisfied that the physical conditions on the manoeuvring area, apron and in the environs of the aerodrome are acceptable, and that the scale of equipment and facilities provided are

adequate for the flying activities which are expected to take place. The criteria which will be applied in making this assessment are given in the chapters which follow. The CAA also will require to be satisfied that the applicant for the licence is able to ensure an effective safety management system and, in those activities which are related to the safe operation of the aerodrome, to provide staff who are competent and where necessary, suitably qualified.

1.20 For these purposes the CAA's Inspectors will visit the aerodrome and determine the extent to which the aerodrome, its facilities, equipment and operational organisation meet the licensing requirements. Following the initial grant of a licence, the CAA's Inspectors will visit each aerodrome periodically as part of their audit/inspection programme. The Inspectors will assess compliance with requirements, audit the management of safety, and assess the competence of those responsible for safety. Normally, prior notice will be given to the holder of the licence, but inspections may take place without such prior notice. Inspectors will be 'authorised persons' as defined in the Air Navigation Order and normally will be allocated responsibility for certain aerodromes so that a helpful continuity will develop and improve the value of contacts between them and the management of the aerodrome.

Conditions of licence

1.21 The Air Navigation Order provides that the CAA may grant a licence 'subject to such conditions as the CAA thinks fit ...'. The standard Conditions are shown in the specimen licences at appendix 1A Aerodrome Licence 'Public Use', appendix 1B Aerodrome Licence 'Ordinary' and appendix 1C Temporary Aerodrome Licence "Ordinary'. Additional conditions may be added to a particular licence to take account of the conditions or circumstances at that aerodrome, and when appropriate this method will be considered by the CAA as a means of achieving a satisfactory level of safety by, for example, limiting the type of flying activity which may take place when one or more of the criteria cannot be met.

1.22 It is also a standard Condition of licences that the holder must inform the CAA of changes to data concerning the aerodrome so that appropriate promulgation of the change, and amendment to the UK AIP can be made. Guidance on the aeronautical information to be provided in respect of a licensed aerodrome, and the procedures for promulgating such information is given in chapter 10.

1.23 Aerodrome licence holders should develop procedures that describe the processes by which changes to the physical characteristics, including the erection of new buildings and alterations to existing buildings or to visual aids, are managed. Such procedures should be contained within the aerodrome manual and cross-referenced to other formally accepted or recognised publications, for example CAP 791, Procedures for Changes to Aerodrome Infrastructure.

Change of aerodrome licence holder

1.24 An aerodrome licence is granted to a named 'legal person' (an individual or a company or any other legally constituted authority or body – e.g. local authority, limited liability partnership) who satisfies the CAA that the criteria for licence issue have been met. Once a licence is granted the CAA is obliged to satisfy itself that a licence holder continues to meet licensing requirements. An aerodrome licence is not a saleable asset and cannot be transferred from one person to another.

1.25 If the identity of a licence holder is to change, application for grant of a new licence should be made to the CAA by the prospective licence holder. (Please note: A change in the name only of a licence holding company does not constitute a change of identity; the licence holder should apply to the CAA for a variation of the licence to reflect the name change and provide a copy of the 'Certificate of Incorporation on Change of Name'.)

1.26 If licensed aerodrome operations are to continue during the change, the outgoing licence holder must be in a position to retain responsibility for the operation of the aerodrome until the grant of an aerodrome licence to the new licence holder. In all cases a new aerodrome licence must be obtained from the CAA and the existing licence must be revoked by the CAA, before operations under the new licence holder can begin.

1.27 An application for an aerodrome licence in the name of the prospective licence holder should be completed and returned to the CAA together with the appropriate fee for licence issue. Documentation should be submitted in sufficient time to allow for consideration of the application by the CAA (recommended minimum is 60 days from the date a completed aerodrome manual is accepted by the CAA), and for the provision by the applicant of such further information and documentation as the CAA may require. An aerodrome manual acceptable to the CAA will be required in all cases.

1.28 When it is proposed to make other changes at the time of a change of licence holder (for example changes to personnel in key operational posts) it is prudent to provide the CAA with as much prior notice as possible. The CAA recommends a minimum of 60 days' notice to process the change. However, the interval between application for and grant of a licence may depend on factors outside the control of the CAA (for example matters within the control of the applicant, the outgoing licence holder, or other persons or organisations); therefore no undertaking can be given that the CAA will be able to reach a decision within a particular timescale or by a specific date.

1.29 As with any new application, grant of an aerodrome licence will be subject to the applicant satisfying the CAA on the requirements of Article 211 and Schedule 12 of the Air Navigation Order 2009; and of CAP 168, Licensing of Aerodromes. In addition to the aerodrome characteristics these requirements will include the demonstration of competence by the applicant to secure that the aerodrome and

its airspace are safe for use by aircraft. In assessing an applicant's competence, matters taken into account by the CAA will include:

1. the previous conduct and experience of the applicant;
2. the organisation, staffing and equipment to be provided;
3. the arrangements for the maintenance of the aerodrome and its facilities and equipment;
4. the adequacy of the aerodrome manual; and
5. any other arrangements made including the adequacy of safety management systems.

Change of provider of an air traffic service

1.30 At some licensed aerodromes the Air Traffic Services (ATS) are provided by contracted organisations. Occasionally the contracted organisations will change and the aerodrome licence holder will wish the transition to be as seamless as possible, while maintaining high levels of safety, particularly if continuous operations are to be provided. Aerodrome licence holders are reminded of their responsibilities under ANO Article 211 to secure the aerodrome and airspace especially during the change- over of providers of ATS. Licence holders must be aware of the importance of the initial contract with their chosen ATS provider to ensure that the arrangements for transfer of an ATS contract to another provider is addressed. These arrangements should include processes for the implementation, at the time of transfer, of a Manual of Air Traffic Services (MATS) Part 2 acceptable to the CAA. In this respect and to ensure that there is no immediate negative impact on aerodrome operations, licence holders should consider retaining ownership of the existing, approved, MATS Part 2. Further guidance on how to achieve a seamless transition from one provider of ATS to another may be found in CAP 670, ATS Safety Requirements (available on the CAA website at www.caa.co.uk/CAP670).

Naming of aerodromes

1.31 Aerodrome operational information and other relevant data are notified by the Aeronautical Information Services (AIS) in accordance with international standards and recommended practices specified in ICAO annex 15, European Commission Regulation and any applicable Aeronautical Data Requirements concerning data integrity and assurance specifications.

1.32 In guidance Document 8126 Aeronautical Information Services manual, ICAO requires to be shown in the Aeronautical Information Publication (AIP) of a State, a list of aerodrome and heliport names and ICAO location indicators. The aerodrome name should indicate the name in capitals of the city or town served by the aerodrome, followed by an oblique strike and the name given to the aerodrome by the State concerned, thus LIVERPOOL/John Lennon.

1.33 In aviation safety terms the name of an aerodrome is directly connected with aeronautical communications and flight safety information. Furthermore, certain aerodromes, recognised for their international importance, are notified to ICAO, which in turn publishes details of existing and planned facilities available at the aerodrome in the regional Air Navigation Plan (FACID). It is therefore important for flight planning purposes, including international flights, that the aerodrome name is consistently recognisable, relevant, unambiguous and promulgated accordingly.

1.34 The aerodrome name used in aeronautical information should therefore include the name used in the callsign for air traffic communications (for licensed aerodromes and where applicable, as specified in AD 2.17 or AD 2.18 of the AIP), be representative of its location (the nearest city or town), and should not have the potential to be confused with another aerodrome.

Oversight and licence action

1.35 There may be occasions where aerodromes require greater regulatory oversight by the CAA, for instance where large or complex aerodrome developments are being undertaken, where significant operational changes are taking place or in order to achieve a satisfactory standard of regulatory compliance. Additionally, there may be occasions where the CAA has identified concerns about the safety of aircraft operations at an aerodrome, the maintenance of its facilities, equipment or the aerodrome's organisational structure in meeting CAA licensing requirements. In these circumstances the aerodrome may be identified as requiring 'special attention'.

1.36 In such cases the CAA may provide additional resource, which could involve additional visits by Inspectors, to support the aerodrome so as to achieve the required safety standards and other objectives. The CAA will write to the aerodrome licence holder to explain the reasons for special attention being necessary and will agree the steps needed to return the aerodrome to normal oversight.

1.37 However, there are also occasions when this additional oversight fails to produce the improvements or changes necessary to maintain safety standards. Additionally, there are occasions when the CAA detects unchecked trends in some operations that indicate safety standards are deteriorating. If left unchecked this could lead to a situation whereby the CAA is no longer satisfied as to a licence holder's competence to secure that the aerodrome is safe for use by aircraft.

1.38 With such aerodromes the CAA will take action in a consistent manner that makes it clear to the licence holder what it must do to recover the situation. The CAA will also make clear what the consequences are, should the aerodrome fail to adhere to an agreed recovery plan. In the event that the CAA has observed an adverse trend, which, if unchecked, would lead it to cease to be satisfied as to the competence of the licence holder, the CAA will contact the licence holder to set out the CAA's concerns. This may result in the aerodrome being placed 'on notice'.

1.39 It is important to recognise that every case needs to be judged on the individual circumstances. Examples of what could prompt action include:

1. Level 1 Audit Findings;
2. repetitive Level 2 audit findings, including a failure to identify root causes of audit findings or a 'sticking plaster' approach to findings;
3. significant incidents, together with a failure to investigate properly and deal with the root causes;
4. an increasing number of incidents, indicating an underlying systemic failure;
5. poor management attitude to compliance;
6. a management that prefers solutions that simply address the detail of the audit finding and that is unwilling or unable to put measures in place that address the root cause of non-compliances;
7. unstable/ineffective management. Instability can be caused by changes in structure, personnel, or both.

1.40 The CAA will set out its concerns and request a recovery plan from the licence holder to address the causes of the adverse trend. The recovery plan should provide deliverables that can be measured, including specific timescales. The recovery plan should set out clearly the 'who, what, where and how'. The need for, and adherence to, agreed timescales is particularly important.

1.41 The licence holder will be informed that a failure to deliver, either in terms of quality and/or time, will result in firm regulatory action. This action may include the suspension of the aerodrome licence.

1.42 Where the licence holder completes, to the satisfaction of the CAA, the agreed actions in the recovery plan relating to the adverse trend(s) observed by the CAA, the licence holder will be informed in writing that they are no longer 'on notice'. In most cases the aerodrome will revert to 'special attention' for a period to ensure that the improvements or changes are maintained and then return to normal levels of oversight.

APPENDIX 1A

Aerodrome licence 'public use'

The Civil Aviation Authority (in this licence referred to as 'the CAA') in exercise of its powers under Article 211 of the Air Navigation Order hereby licenses the above-named aerodrome as an aerodrome to be used as a place of take-off and landing of aircraft engaged in flights for the purpose of the public transport of passengers or for the purpose of instruction in flying, subject to the following conditions:

1. The aerodrome is licensed for public use and shall at all times when it is available for the take-off or landing of aircraft be so available to all persons on equal terms and conditions.

2. No aircraft shall take-off or land at the aerodrome unless such fire-fighting and rescue services and such medical services and equipment as are required in respect of such an aircraft in the CAA's publication CAP 168 (Licensing of Aerodromes) are provided there. Such services and equipment shall at all times when the aerodrome is available for the take-off or landing of aircraft be kept fit and ready for immediate turnout.

3. Changes in the physical characteristics of the aerodrome including the erection of new buildings and alterations to existing buildings or to visual aids shall not be made without prior approval of the CAA.

4. The licence holder shall, by the quickest means available, notify the CAA of any material change in the surface of the landing area, or in the obstruction characteristics of the approach, take-off or circuit in relation to the aerodrome.

5. Any public right of way crossing or bordering the landing area shall be adequately sign-posted with notices warning the public of danger from aircraft.

6. The aerodrome is licensed for the take-off and landing of aircraft at night. Such systems of lighting appropriate to the category of runway in use as described in the CAA's publication CAP 168 (Licensing of Aerodromes) shall be in operation at all times when aircraft are taking-off or landing at the aerodrome at night, provided that minor temporary unserviceability, not of a character likely to affect the safety of operations, shall not preclude the take-off or landing of aircraft.

7. The licence holder shall inform the CAA of the times during which the aerodrome is to be generally available for the take-off or landing of aircraft, and of any changes in those times, and whether the aerodrome is to be available by arrangement with the licence holder outside those times. The aerodrome shall be kept available for the take-off or landing of aircraft at all times when, in accordance with the information furnished by the licence holder to the CAA it is notified as being generally available and shall not be used for the take-off or landing of aircraft at any other time, unless it has been notified in accordance

with such information as being available for use by arrangement with the licence holder outside the times when it is generally available and is used pursuant to such arrangement.

8. Without prejudice to condition 1, nothing in this licence shall be taken to confer on any person the right to use the aerodrome without the consent of the licence holder.

9. Expressions used in this licence shall have the same respective meanings as in the Air Navigation Order.

10. 'The Air Navigation Order' in this licence means the Air Navigation Order 2009 and any reference to the Order or to any Article of the Order shall, if that Order be amended or replaced, be taken to be a reference to the Air Navigation Order for the time being in force or the corresponding Article of that Order.

11. This licence shall remain in force until it is varied, suspended or revoked.

APPENDIX 1B

Aerodrome licence 'ordinary'

The Civil Aviation Authority (in this licence referred to as 'the CAA') in exercise of its powers under Article 211 of the Air Navigation Order hereby licenses the above-named aerodrome as an aerodrome to be used as a place of take-off and landing of aircraft engaged in flights for the purpose of the public transport of passengers or for the purpose of instruction in flying, subject to the following conditions:

12. The aerodrome is licensed for use only by the licence holder and by persons specifically authorised by him.

13. No aircraft shall take-off or land at the aerodrome unless such fire-fighting and rescue services and such medical services and equipment as are required in respect of such an aircraft in the CAA's publication CAP 168 (Licensing of Aerodromes) are provided there. Such services and equipment shall at all times when the aerodrome is available for the take-off or landing of aircraft be kept fit and ready for immediate turnout.

14. Changes in the physical characteristics of the aerodrome including the erection of new buildings and alterations to existing buildings or to visual aids shall not be made without prior approval of the CAA.

15. The licence holder shall, by the quickest means available, notify the CAA of any material change in the surface of the landing area, or in the obstruction characteristics of the approach, take-off or circuit in relation to the aerodrome.

    Night use: The aerodrome is licensed for the take-off and landing of aircraft at night. Such systems of lighting appropriate to the Category of runway in use as described in the CAA's publication CAP 168 (Licensing of Aerodromes), shall be in operation at all times when aircraft are taking-off or landing at the aerodrome at night, provided that minor temporary unserviceability, not of a character likely to affect the safety of operations, shall not preclude the take-off or landing of aircraft.

    Or

    Day use only: The aerodrome is not licensed for the take-off or landing of aircraft at night.

16. Any public right of way crossing or bordering the landing area shall be adequately sign-posted with notices warning the public of danger from aircraft.

17. Expressions used in this licence shall have the same respective meanings as in the Air Navigation Order.

18. The 'Air Navigation Order' in this licence means the Air Navigation Order 2009 and any reference to the Order or to any Article of the Order shall, if that Order be amended or replaced, be taken to be a reference to the Air Navigation Order for the time being in force or the corresponding Article of that Order.
    This licence shall remain in force until it is varied, suspended or revoked.

APPENDIX 1C

Temporary aerodrome licence 'ordinary'

The Civil Aviation Authority (in this licence referred to as 'the CAA') in exercise of its powers under Article 211 of the Air Navigation Order hereby licenses the above-named aerodrome (on/from dates) inclusive for the take-off and landing of aircraft engaged in flights for the purpose of the public transport of passengers or for the purpose of instruction in flying, subject to the following conditions:

1. The aerodrome is licensed for use only by the licence holder and by persons specifically authorised by him.

2. No aircraft shall take-off or land at the aerodrome unless such emergency services and equipment as specified in the CAA's publication CAP 168 Licensing of Aerodromes are provided there. Such services and equipment shall at all times when the aerodrome is available for the take-off or landing of aircraft be kept fit and ready for immediate turn-out.

3. Except in an emergency no aircraft shall take-off or land at the aerodrome when any obstruction, vehicle or person is on the part of the aerodrome shown with hatching on the map at schedule 1.

4. Changes in the physical characteristics of the aerodrome including the erection of new buildings and alterations to existing buildings or to visual aids shall not be made without the prior approval of the CAA.

5. The licence holder shall, by the quickest means available, notify the CAA of any material change in the surface of the landing area, or in the obstruction characteristics of the approach, take-off or circuit in relation to the aerodrome.

6. The aerodrome is not licensed for the take-off or landing of aircraft at night.

7. Expressions used in this licence shall have the same respective meanings as in the Air Navigation Order.

8. The 'Air Navigation Order' in this licence means the Air Navigation Order 2009 and any reference to the Order or to any Article of the Order shall, if that Order be amended or replaced, be taken to be a reference to the Air Navigation Order for the time being in force or the corresponding Article of that Order.

9. This licence is only valid while an air traffic control service, or such other air traffic service, as the CAA may have agreed in writing for the purposes of this condition, is being provided at the aerodrome.

CHAPTER 2

The aerodrome manual

Introduction

2.1 Article 211 of the Air Navigation Order (ANO) governs the grant of aerodrome licences by the Civil Aviation Authority. The Article, together with Schedule 12, sets out the requirements for the aerodrome manual within the licensing process. The CAA uses the manual to assess the suitability of aerodrome licence holders and their organisations against the safety-related requirements set out in Article 211(1)(a), (b) and (c) of the Order. The assessment is a continuous process; this is particularly relevant when changes likely to affect safety are proposed or made.

2.2 An application for an aerodrome licence should be accompanied by an aerodrome manual produced in accordance with CAP 168. Once granted a licence, the licence holder is required to maintain the manual in conformity with chapter 2 of CAP 168, and all aerodrome operating staff must have access to the relevant parts of the manual. The term 'operating staff' means all persons, whether or not the aerodrome licence holder and whether or not employed by the aerodrome licence holder, whose duties are concerned either with ensuring that the aerodrome and airspace within which its visual traffic pattern is normally contained are safe for use by aircraft, or whose duties require them to have access to the aerodrome manoeuvring area or apron. The manual will be regarded by the CAA as the primary indication of the standards likely to be achieved by the aerodrome operator. A copy is to be lodged with the CAA. The process for submission of an aerodrome manual is contained in paragraphs 2.22 onwards.

Purpose and scope of the manual

2.3 An efficient management structure and a systematic approach to aerodrome operation are essential. The manual should contain all the relevant information to describe this structure satisfactorily. It is the means by which all aerodrome operating staff are fully informed as to their duties and responsibilities with regard to safety. It should describe the aerodrome services and facilities, all operating procedures, and any restrictions on aerodrome availability.

2.4 Accountability for safety must start at the very top of any organisation. One of the key elements in establishing safe working practices is for all staff to understand the safety aims of the organisation, the chain of command, and their own responsibilities and accountabilities. As safety management principles are applied, the manual should be expanded to describe clearly how the safety of operations is to be managed at all times. To a reader or user of the manual there should never be any doubt about who is responsible, who has the authority, who has the expertise and who actually carries out the tasks described in any section.

2.5 The principal objective of an aerodrome manual should be to show how management will discharge its safety responsibilities. The manual will set out the policy and expected standards of performance and the procedures by which they will be achieved.

Ownership of an aerodrome manual

2.6 The licence holder is responsible for providing the aerodrome manual. It should reflect the requirements and guidance material contained in Civil Aviation Publications and other documents.

2.7 It is the responsibility of the licence holder to be satisfied as to the appropriateness of each provision of the manual to the particular operation, and to make amendments and additions as necessary.

2.8 The safety aim and objectives of the manual and how it is to be used by employees, tenants etc. should be stated in a preface by the licence holder.

2.9 In this format and under the signature of the person with overall responsibility for safety in the company, the manual demonstrates, from the highest level, a commitment to the way in which safety will be managed.

Amendment of the manual

2.10 Responsibility for maintaining the accuracy of the manual should be clearly defined.

2.11 Each copy of the manual should be numbered and a list of holders maintained by the person responsible for the issue of amendments. In the front of each volume there should be an amendment page available for recording the amendment numbers, date of incorporation, signature of the persons amending and the page or paragraph affected.

2.12 Manuscript amendments are not acceptable. Changes or additions should always be the subject of an additional or replacement page on which the amended material is clearly identified.

2.13 Amendments to the manual will be needed either because the document requires to be brought up to date or in response to a request by the CAA. Any amendments or additions must be furnished to the CAA by the licence holder before or immediately after they come into effect.

Form of the manual

2.14 The aerodrome manual is a key document both for the licence holder and the CAA.

2.15 Supported by the Safety Report, it is the safety assurance document for the CAA's licensing process, and a management tool for industry. The manual is the source document describing how operational procedures and their safe management will be delivered. It should contain all such information and instructions as may be necessary to enable the aerodrome operating staff to perform their duties. This must include information and instructions relating to those matters specified in Schedule 12 to the ANO. The CAA will expect the aerodrome manual to be an accurate reflection of the aerodrome's visible safety smanagement system and safety culture. It should show how the aerodrome intends to measure its performance against safety targets and objectives. An aerodrome manual should not just satisfy the CAA's requirements. One of the principal objectives should be to create a medium for promulgating all procedures and information relating to the safe management of the aerodrome. The reader of a manual should be given a clear and unambiguous statement of how safety is developed, managed and maintained on the aerodrome. All safety policies, operational procedures and instructions should be contained in detail or cross-referenced to other formally accepted or recognised publications.

2.16 At larger aerodromes the size and complexity of operations and related procedures may dictate that these procedures could not easily be included in a single document. In such circumstances it is acceptable to identify and reference within the manual the procedures which are not included within it. If this system is to be successful it is essential that any referenced information, documentation and procedures are subjected to exactly the same systems of consultation and promulgation as the manual itself. For many small aerodromes the manual can be both simple and brief as long as it covers procedures essential for satisfactory day-to-day operations. Nevertheless, it is possible to adopt a common format embracing the essential elements that define a safety management system.

2.17 The numbering of pages and paragraphs should be orderly and systematic to facilitate reference. The standard of printing, duplication and binding should allow the manual to be read without difficulty and ensure it remains intact and legible during normal use.

Contents of the manual

2.18 As a general guide, the following paragraphs set out the items which should be included in the manual, although it is recognised that the need to include all items will vary between aerodromes depending on the nature and scale of operations. It is not necessary for all operational procedures to be included in the manual. However, when these are relevant to achievement of policy their location should be clearly referenced within the manual.

Introduction

1. Purposes of the manual.
2. Legal position regarding aerodrome licensing as contained in the ANO.
3. Distribution of the manual.
4. Procedures for distributing and amending the manual and the circumstances in which amendments may be needed.
5. Checklist of Pages.
6. Preface by licence holder.
7. Content Page.
8. Glossary of Terms (other than those included in CAP 168).

Note: This section will contain a short explanation of the general terms used in the manual including job titles and abbreviations.

Technical administration

1. Name and address of aerodrome.
2. Name and address of licence holder.
3. Name and status of the accountable manager.
4. Named Persons:
    a) the name, status and responsibilities of the official in charge of day-to-day operation;
    b) the name, status and responsibility of other senior operating staff;
    c) instructions as to the order and circumstances in which the above-named staff may be required to act as the official in charge;
    d) the name, status and responsibility of staff authorised by the CAA under Article 232 of the Air Navigation Order 2009;
    e) the name, status and responsibilities of the accountable manager.
5. Details of the Aerodrome Safety Management System (see appendix 2C).

Note: This should include an organisation chart supporting the commitment to the safe operation of the aerodrome as well as simply showing the hierarchy of responsibility for safety management.

6. Safety related committees.

Aerodrome characteristics

1. Details of the following:
   a) latitude and longitude of the aerodrome reference point in WGS 84 format;
   b) elevations of:
      - aerodrome;
      - apron.
2. Plans to a scale of 1:2500 showing the position of the aerodrome reference point, layout of the runways, taxiways and aprons; the aerodrome markings and lighting (including PAPI, VASIS or LITAS and obstruction lighting); the siting of navigational aids within the runway strips, and their degree of frangibility. It will not be necessary for these plans or the information called for in the following sub-paragraphs 3. to 6. to accompany all copies of the manual, but they must be appended to the licence holder's master copy and to the copy lodged with the CAA. In the case of copies or extracts provided or made available to operating staff, plans of a scale reasonably appropriate to the relevant duties of the said staff should be provided.
3. Description, height and location of obstacles which infringe the standard protection surfaces, and whether they are lighted.
4. Location, reference number and date of the survey plans from which the data at sub-paragraphs 1. and 2. were derived, and details of the procedures for ensuring they are maintained and updated.
5. Data for, and the method of, calculation of declared distances and elevations at the beginning and end of each Declared Distance.
6. Method of calculating reduced declared distances when there are temporary objects infringing the runway strip, or the approach and take-off surfaces.
7. Details of the surfaces, dimensions, and classification or bearing strengths of runways, taxiways and aprons.

Operational procedures

1. The system of Aeronautical Information Service available and the system that the licence holder uses to promulgate Aeronautical Information Publication (AIP) requirements.
2. Routine aerodrome inspections, including lighting inspections, and reporting including the nature and frequency of these inspections (chapter 3, appendix 3F).
3. Inspecting the apron, the runways and taxiways following a report of debris on the movement area, an abandoned take-off due to engine, tyre or wheel failure, or any incident likely to result in debris being left in a hazardous position.

4. Sweeping runways, taxiways and aprons.
5. Obtaining and disseminating meteorological information, including Runway Visual Range (RVR) and meteorological visibility and local area forecasts (detailed specifications and procedures for RVR assessment in Category I weather conditions using human observers are given in appendix 2A).
6. Protection of runways during low visibility procedures (LVPs) if such operations are permitted (appendix 2B).
7. Measurement and promulgation of water and slush depths on runways and taxiways.
8. Measurement and/or assessment, and promulgation of runway surface friction conditions.
9. Promulgation of information on the aerodrome operational state, temporary withdrawals of facilities, runway closures etc.
10. The safe integration of other aviation activities such as gliding, parachuting and banner towing, operations from unlicensed runways on licensed aerodromes and unmanned aerial systems (UAS).
11. Recording aircraft movements.
12. The control of works, including trenching and agricultural activity, which may affect the safety of aircraft (appendix 2F).
13. The control of access to the aerodrome and its operational areas, including the location of notice boards, and the control of vehicles on the operational areas.
14. Maintaining apron control, including marshaller's instructions.
15. The availability of aviation fuel and its storage, handling and quality control (ANO Article 217 and CAP 748, Aircraft Fuelling and Fuel Installation Management).
16. Complying with regulatory requirements relating to accidents, incidents and Mandatory Occurrence Reporting (MOR). ANO Article 226 and Civil Aviation (Investigation of Accidents and Incidents) Regulations 1996.
17. The removal of disabled aircraft.
18. The aerodrome snow plan.
19. The wildlife hazard control plan.
20. Aerodrome Safeguarding (chapter 4).
21. Runway incursion prevention (appendix 2D).
22. Responsibility for monitoring the third parties operating on the aerodrome (appendix 2E).
23. Procedures for the management of on-aerodrome development and changes to physical characteristics.

Visual aids (reference should be made to chapters 6 and 7)

1. Responsibilities with respect to the aeronautical ground lighting (AGL) system.
2. A full description of all visual aids available on each approach, runway, taxiway and apron. This shall include AGL signs, markings and signals.
3. Procedures for operational use and brilliancy settings of the AGL system.
4. Standby and emergency power arrangements, including operating procedures both in LVPs and during mains failure.
5. Procedures for routine flight inspection of approach lights, runway lights and PAPIs.
6. The location of and responsibility for obstacle lighting on and off the aerodrome.
7. Procedures for recording inspection and maintenance of visual aids and actions to be taken in the event of failures.

Rescue and Fire Fighting Services (RFFS)

1. Policy statement of the RFF category or categories to be provided.
2. Where the Senior Airport Fire Officer (SAFO) or designated watch officers have specific safety accountabilities, these should be included in the relevant chapter of the manual.
3. Policy and procedures indicating how depletion of the RFFS is to be managed. This should include the extent to which operations are to be restricted, how pilots are to be notified and the maximum duration of any depletion.
4. At aerodromes where a higher category is available by prior arrangement, the manual should clearly state the actions necessary to upgrade the facility. Where necessary this should include actions to be taken by other departments.
5. The licence holders' objectives for each RFF category provided should be defined. This should include a brief description of:
   - amounts of media provided;
   - discharge rates;
   - number of foam-producing appliances;
   - manning levels;
   - levels of supervision.

   Note: When the objectives are higher than those set out in CAP 168, chapters 8 and 9, licence holders may also wish to indicate the minimum levels acceptable under their safety policies.

6. Procedures for:
   - monitoring the movement areas for the purpose of alerting RFF personnel;
   - showing how RFF personnel are alerted throughout the range of functions (training, extraneous duties, etc.) and geographical locations from where they may be expected to respond;
   - indicating how the adequacy of the response time capability throughout their functions and locations is monitored and maintained;
   - indicating how RFF personnel engaged in extraneous duties are managed to ensure that response capability is not affected.
7. Where the aerodrome provides specialist equipment such as rescue craft, emergency tenders, hose layers, appliances with aerial capability, etc., details should be included in the manual. Procedures to be followed if these facilities are temporarily unavailable should also be included.
8. Where the aerodrome is reliant upon other organisations to provide equipment which is essential for ensuring safe operation of the aerodrome (perhaps water rescue), policies or letters of agreement should be included in the manual. Where necessary contingency plans in the event of non-availability should be described.
9. A statement describing the processes by which licence holders ensure the initial and continued competence of their RFF personnel. This should include the following:
   - realistic fuel fire training;
   - breathing apparatus training in heat and smoke;
   - First Aid;
   - LGV driving;
   - Low Visibility Procedures, CAP 168, chapter 8, appendix 8B;
   - Health and Safety policy with regard to training of personnel in RPE and PPE.
10. Additional guidance may be found in CAP 168, chapter 8, and CAP 699, Standards for Competence of Rescue and Fire Fighting Service Personnel Employed at UK Licensed Aerodromes;
11. Procedures indicating how accidents within 1000 m of the threshold of each runway are to be accessed. Where other difficult environs exist, the manual should indicate how these are to be accessed.
12. Where licence holders expect the RFF facility to respond to domestic fires or special services, procedures for managing the impact of this upon the normal aircraft RFF response should be included.

13. Where licence holders expect the RFF facility to respond to aircraft accidents landside, the policy should be clearly described. This should include procedures to manage the effects on continued aircraft operations.
14. The availability of additional water supplies following an aircraft accident should be described. Details of the policy to be followed in the event of contractual work which requires isolation or depletion of supplies should be included (work in progress).
15. Where an aerodrome accepts freight aircraft, ambulance flights or movements not required to use a licensed facility, company objectives regarding RFF category should be included.
16. The licence holder's arrangements for ensuring the adequacy of responses in abnormal conditions i.e. low visibility procedures.
17. A policy statement indicating how the licence holder ensures the training and competence of first aid personnel.
18. An indication of the scale of the medical equipment carried. Where medical equipment is held other than on the RFF vehicles a statement indicating its location and how it is to be transported to an incident should be included.

Integrated emergency planning

2.19 The licence holder's arrangements for determining and implementing plans that ensure the integrated management of response to an aircraft incident/accident. These arrangements should take account of the complexity and size of the aircraft operations.

Air traffic services

2.20 Details of the following:

1. the system for the safe management of air traffic operating on the aerodrome or in the airspace associated with it;
2. procedures for the selection of the runway in use and the circuit direction;
3. procedures for noise abatement;
4. procedures for evaluating the suitability for use and availability of the runway(s);
5. procedures for alerting emergency services;
6. except where these are included in documentation associated with an ATSU established at the aerodrome and approved by the CAA.

Communications and navaids

1. Description of and instructions for the use of air/ground and operational ground radio communications where these are not covered in ATC or AFIS manuals.
2. Description of and operating procedures for navigation aids.

Bibliography

2.21 Cross-referenced documentation.

Submission of the aerodrome manual and other required documents

Introduction

2.22 The development, transmission, storage, dissemination and change control of documents is far more efficient and easier by electronic means than with paper copies.

2.23 The aerodrome manual, emergency orders and details of the safety management system, if contained in a separate document(s), should be submitted in electronic form. In order to facilitate assessments of aerodrome developments and the treatment of obstacles, the aerodrome plan may be provided in paper form.

Procedures

2.24 The aerodrome manual and other documents should be submitted in either portable document format[1] (.pdf) or a format that can be viewed using an application within the Microsoft Office software suite (e.g. Microsoft Word).

2.25 Documents must be saved to allow opening, printing, extracting (copy) and commenting without the need to enter a password. Documents received in an unsuitable format may not be accepted.

2.26 The number of pictures and graphics within a document should be kept to a minimum. Every effort should be made to provide large graphics and maps in electronic form; however, if they cannot be viewed clearly on a computer display with a resolution of 800x600 pixels the graphic or map only should be submitted in paper copy form to the address in paragraph 2.33. Electronic signatures are acceptable.

2.27 Submitted documentation must be complete and, if an amendment, not just the amended pages. An amendment should be clearly indicated, for example, using a line in the margin adjacent to the line containing the amendment, underlining new text, and strikethrough of deleted text. Substantial amounts of amended text, e.g. complete new paragraphs or chapters, may be annotated just using a margin line.

2.28 Every document should be controlled according to the version and date of issue/ applicability. All files should be named according to the following convention:

2.29 (Date as YYYYMMDD)(Aerodrome name)(Document name)(Version number)

2.30 For example: 20070122ManpoolAeroManPart1V1.0.pdf

1 Shareware software is available to convert documents into pdf.

2.31 Do not insert spaces or symbols but intuitive abbreviations may be used. An amendment record and list of effective pages should be included in the document and, where applicable, the saved filename of a previously submitted document that is to be replaced should be notified.

2.32 Documents must not contain hyperlinks to other documents or internet/intranet addresses. Large documents may, however, be split into different parts and individual files. The part number should also be indicated in the saved filename, for example:

2.33 20070122ManpoolAeroManPart1V1.0.pdf

2.34 If a required document is split into parts, a list of the parts and, where appropriate, their relationship to each other, should be provided.

2.35 Documentation should be submitted, with suitable notification of the nature of the submission, by email only to the following address: asddocs@caa.co.uk

2.36 The size of individual emails, including file attachments, must not exceed 10Mb. A series of emails may be sent to submit multiple attachments less than this limit. However, where the size of an individual file exceeds 10Mb, the document should be submitted on a CD by post. DVD format is not acceptable. Notification of the content of the CD and any information specified in paragraph 2.30 should be provided in a separate document. A CD should be posted only to the following address:

> Airspace, ATM and Aerodromes, Safety and Airspace Regulation Group, Civil Aviation Authority, Aviation House, Gatwick Airport South, West Sussex RH6 0YR

2.37 Electronic versions or paper copies of required documents should not be submitted directly to an Aerodrome Inspector or CAA Regional Office. The identity of the aerodrome, the sender and his/her position and contact details should be clearly stated in each submission.

2.38 Attachment A provides an example checklist for the submission process, which could be used to accompany each email/CD submission.

2.39 Notification of receipt of a submitted document, its acceptance by the CAA or any deficiencies in the document, will be provided.

2.40 Exemption from this requirement will be considered by the CAA on request.

Attachment A

	Action	Approved By	Date
1	Document completed		
2	Amendments marked, list of effective pages updated		
3	Saved as File name (s):		
4	Where applicable – list of documents (file names and titles), relationships and amendment details:		
5	Document supersedes which document (file name)?		
6	Document submitted to the CAA via: Email (<4Mb only) Post (CD)		
7	Identity and contact details of sender	N/A	
8	Response received from the CAA	N/A	
9	Further action/amendment required? Yes – Go to 1 No – End		

For CAA use only

Email/CD received, content and source verified		
Format checked, amendments marked, file name checked		
Paper attached (YES/NO)		
Document rejected, response sent and reason included		
Document accepted/saved, response sent		

APPENDIX 2A

Runway Visual Range (RVR) assessed by human observers

Foreword

1. Where Instrumented RVR is not available, RVR for the purposes of category I and non-precision instrument approach operations may be assessed by human observer. However, the human observer assessment of RVR is not permitted for category II or category III operations.

2. This appendix sets out the CAA's specifications for establishing and operating RVR reporting systems using human observers.

3. It should be read in conjunction with CAP 746, Requirements For Meteorological Observations at Aerodromes.

Method

4. Where human observer assessment is employed, the observer counts the number of runway lights he can see from a Runway Observation Position (ROP) near the runway and this number is converted to runway visual range. An allowance is made for the differences in light intensity, background, etc., observed from the different viewing positions of the observer and the pilot. Where it is difficult to count runway lights, observations are made on a special row of runway or other lights, set up near the runway.

The Runway Observation Position (ROP)

Siting and number of runway observation positions

5. For RVR observations made in connection with Category I operations, one ROP giving an assessment of the RVR on the runway in the touchdown zone will generally be sufficient.

6. An ROP may be either a structure or vehicle and its location should be determined by the aerodrome operator in consultation with the CAA using the guidance material set out in this appendix.

Lateral position

7. Ideally the ROP should be sited not more than 120 m laterally from the runway centreline. However, for safety reasons it must not be located:

    1. within the runway cleared and graded area;

    2. within taxiway strips;

3. such that a profile of 1 in 10 slope originating at the runway centreline is infringed by the height of the structure or vehicle, including the observer in his observation position.

8. However, as an exception to 2 above it is acceptable to locate the ROP on a taxiway that is inactive when measurements are being taken. Reference should be made to CAP 168, chapter 3, for details of the relevant specifications and criteria.

Longitudinal position

9. The touchdown zone ROP should be located approximately 300 m upwind of the runway threshold. On short runways it is preferable for the ROP to be sited abeam or downwind of the threshold so as to be able to increase the maximum reportable RVR. Care should be taken to ensure that the ROP does not constitute an obstacle infringing the relevant instrument approach surfaces specified in CAP 168.

Position of ROP relative to lights/marker boards

10. The ROP should be sited so as to enable the lights used for assessing RVR to be clearly visible to the observer. The observer eye height should be 5 m above the runway level, this being the maximum practical height for a human observer. The most representative assessment of RVR will be made when counting lights on the opposite side of the runway to that of the ROP, but it is recognised that although this should be the aim, it will not be possible on some runways, for example on undulating runways or where there are many flush edge light fittings on the opposite side. In such cases the order of preference for the selection of lights to be used is shown in paragraphs 20 to 27 below.

11. The ROP should be located so that the vehicle or structure does not obscure a pilot's view of visual aids.

12. In order to ensure that the ROP does not affect the performance of electronic navigation aids, advice on the siting should be sought from the aerodrome telecommunications officer.

Marking and lighting

13. Whether the ROP is a fixed structure or parked vehicle it should be marked and lighted as an obstacle as laid down in CAP 168, chapter 4.

14. In order to ensure that the observer makes his observation from the calibrated position where the ROP is a parked vehicle, the parking position should be clearly and unambiguously marked, so that the vehicle may be correctly positioned each time it is deployed.

Equipment and facilities

Communications

15. The ROP should have direct and preferably discrete communication with ATC in order to facilitate the rapid reporting of RVR changes. It is a requirement that the report reaches the pilot within 30 seconds of an observation being made.

Comfort

16. The ROP, whether permanent or mobile, should have a sufficient degree of comfort so that personnel are not affected by fatigue or poor working conditions.

Transparency of glass surfaces

17. Glass surfaces through which observations are made should be kept clear of precipitation and condensation.

Internal lighting

18. Sufficient light should be available for reporting and recording the observations. Lighting within the ROP should be such that the taking of observations and the visual night acclimatisation of the observer are not adversely affected.

ROP construction

19. Where the ROP is a fixed structure, it should be of minimum dimensions and maximum frangibility consistent with its function.

Lights

Selection of lights to be used for observations

20. The order of preference for selecting lights to be used for observations is, in descending order:

    1. opposite side runway edge lights
    2. opposite side special reference lights
    3. same side runway edge lights
    4. same side special reference lights

21. The CAA will advise the aerodrome operator which lights are to be used for each runway and only that set of lights should be used for observations. Some runway edge light fittings may not be clearly visible to an observer at the side of the runway and a row of special reference lights of similar characteristics to the runway lights but beamed towards the ROP, may be needed. The intensity setting of these reference lights should be automatically set to the same intensity as the runway lights. Reference lights are to be arranged so as not to present a confusing or dangerous appearance to pilots.

22. So as to ensure the accuracy of the assessment it is necessary for the positions of the lights to be used to be accurately determined. Accordingly, they require to be included in the aerodrome survey, the requirements for which are contained in CAP 232, Aerodrome Survey Information, chapter 5.

Creation of RVR conversion table

23. There are two methods available for creating the RVR conversion table, details for both are provided in CAP 746, requirements for meteorological observations at Aerodromes, appendix C:

    1. use of the Gold Visibility Meter;
    2. use of a distance-based methodology.

24. A new conversion table is required to be produced following any alterations or changes to the system, for example when lights have been realigned or relocated, or changes made to supply voltages, or when the ROP has been changed. Any such change invalidates the previous conversion table and RVR reports are not to be passed until a new table is available.

Calibration of runway lights

25. High intensity runway lights with a beamed element, directed along the runway towards the pilot, will result in the intensity of light directed towards the ROP being less than the intensity directed towards the pilot. Consequently a calibration of the lights used will be necessary. This will be carried out from the ROP and from the runway centreline in order to prepare a conversion table. From this table an assessment of the RVR to be experienced by the pilot can be read against the number of lights observed from the ROP. The aerodrome operator should ensure that re-calibrations are carried out at the agreed intervals and that a new table is issued. A re-calibration is to be carried out immediately following any alterations or changes to the system, for example when lights have been realigned, or changes made to supply voltages, or when the ROP site has been changed. Any such change invalidates the previous conversion table and RVR reports are not to be passed until a new table is available.

Maintenance of RVR reference lights

26. Where special reference lights are used they should be maintained to the same standard as the corresponding runway lights so that RVR observers and pilots are viewing lights which have a comparable performance.

Inspection of lights

27. The lights used for RVR observations should be regularly inspected from the ROP, at the correct eye height, through binoculars in clear daylight with the lights set at maximum intensity. This visual inspection should check for subsidence,

damage, misalignment, ageing of bulbs/lenses and obscuration by grass. It is recommended that this inspection is carried out at least monthly.

The observer

Selection and function of the observer

28. The function of the observer needs no particular skill since it consists of identifying and counting lights and reporting this count to ATC. However, since assessment of RVR has a direct bearing on safety and regularity of aircraft operations, observers should be mature and with the ability to carry out their duties conscientiously at all times. The aerodrome operator should ensure that observers understand the importance of correct RVR observations and appreciate that extra vigilance is required when fog is forming or dissipating so that changes are detected and reported as they occur.

Time on duty

29. Duty periods for RVR observers should be arranged so that long periods without an adequate break are avoided. Periodic visits should be made by supervisors to an active ROP to check that the correct procedures are being used and the log is being correctly maintained when this is required of the observer.

Eyesight and hearing requirements

30. Personnel selected for RVR observer duties should have the necessary eyesight (visual acuity and colour perception) and hearing requirements for them to operate on the manoeuvring area. Correcting spectacles or contact lenses should be worn when required.

Operating procedures

Periods when RVR reporting is required

31. The ROP should be manned in accordance with an alerting procedure based on meteorological reports and forecasts which will ensure that a continuous service can be given throughout any operational period during which the meteorological visibility is reported to be 1500 m or less. Assessment and reporting may cease when meteorological visibility is greater than 1500 m and the RVR is greater than the maximum value that can be reported. At some less busy aerodromes it may be sufficient to report RVR only during those periods commencing 15 minutes prior to and during aircraft movements. However, consideration should be given to the need for pilots intending to depart from another aerodrome to have a recent destination RVR report available to them. Under no circumstances should an RVR report be used or passed after the standing down of the observer except

when that report is quoted as part of a full meteorological report which includes a time of origin.

Reporting procedures

Standardisation

32. The UK standard for reporting RVR extends from 0 to 1500 m in the following steps:

- 0 to 400 m in 25 m steps
- 400 to 800 m in 50 m steps
- 800 to 1500 m in 100 m steps

33. Where a system is unable to report the full range of RVR as outlined above, the limitations of the system should be published in the AIP at GEN 3.5.3.

The count

34. The number of lights that can be seen (the count) should be reported to ATC, for example 'four lights'. The report should be read back to the observer by ATC. The count is converted to RVR using the relevant conversion table. An immediate report is to be made whenever there is a change in the count, but if there are no changes, confirmatory reports should be made at 30-minute intervals, or when requested. Similar reports and read-backs should be made if the count is converted to RVR at the ROP.

Low/high RVR values

35. If the RVR is so low that no lights are visible to the observer, he should report this. The RVR in these circumstances should be reported to a pilot as 'less than ..... metres', the actual RVR value quoted being the equivalent of one light. If the visibility is sufficient to enable the observer to see an object at ground level at a distance greater than the light which defines the maximum reportable RVR value, a report of 'RVR greater than ..... metres' should be given.

Effect of light intensity on reporting

36. RVR observations, including those for transmission in meteorological reports, should be made with the lights set at the intensity appropriate to the prevailing conditions. RVR should not be assessed with the lights set at an intensity for which there is no conversion table. If a pilot requests that the lights be reduced in intensity and this results in a setting for which there is no conversion table, the pilot should be advised that RVR is not available at this requested setting.

ATS functions

37. ATS aspects of RVR are described in general terms in Part 1 of the Manual of Air Traffic Services (MATS). Air Traffic Service Units should ensure that aspects

specific to their aerodromes are described in their Part 2 of MATS or local instructions.

Changes to procedures

38. RVR should be observed and reported strictly in accordance with the laid down procedures. However, where local conditions require a departure from the standard procedures, the proposed change should be cleared with the CAA before operational use.

Operating instructions

39. A comprehensive set of operating instructions should be drawn up for the aerodrome and included in the aerodrome manual. The instructions should state clearly who is to be responsible for the various procedures, for example, who will be required to maintain the RVR log. It may be desirable for instructions to be issued to RVR observers in a separate document.

40. The minimum content of the instructions is shown at annex A.

The RVR log

41. RVR and meteorological visibility values that are observed or measured shall be recorded such that the reported RVR and visibility reported at any particular time can be determined. Records shall be made available to the CAA on request.

42. Logs and any other required records are to be collected on the termination of a period of observation and are to be kept by the unit concerned for at least 12 months from their completion, after which time they may be destroyed. Associated records (system calibration; system maintenance; observer medicals etc.) shall still be kept according to their audit requirements.

43. The RVR log shall include the following:

- aerodrome;
- date;
- runway;
- start and finish time for the period of observations;
- the time each observation is logged, expressed in UTC to the nearest minute;
- the actual count expressed as the number of lights observed e.g. 'Four lights', and the corresponding RVR value.

ANNEX A TO APPENDIX 2A ANNEX A TO APPENDIX 2A

Guidance notes on the contents of the aerodrome operations manual relating to RVR observations

1. The following material should be included:

    1. The reason for RVR reports, with emphasis on the contribution to operational safety.
    2. The alerting procedure and meteorological conditions for manning the ROPs.
    3. The positions of the ROPs and, if applicable, which vehicle is to be used at the ROPs, the orientation of the vehicle and the precise position of the observer in relation to the vehicle, for example, sitting in the cab or on the roof.
    4. The routes to be used to reach the ROPs and details of any authorisation or clearance required.
    5. A comprehensive diagram of the runway environment is to be available at the ROP to enable the lights to be positively and individually identified.
    6. The manner in which reports are to be passed to ATS together with an instruction that reports are to be passed immediately.
    7. The method of use of the conversion table.
    8. Specification of UTC as the time to be used and the need to synchronise the ROP clock or observer's watch with ATS.
    9. The action to be taken in the event of partial electrical failure extinguishing certain lights (if appropriate to the aerodrome).
    10. The method of reporting an RVR value greater than, or less than the calibrated values.
    11. An instruction to observers that they should immediately report to ATS anything they see that might affect operational safety. Examples should be given, such as unauthorised persons on the movement area, an airfield lighting fault (particularly those lights used in RVR observations), or something on an aircraft appearing to be unsafe.
    12. Responsibility and instructions for maintaining and preserving the RVR log.
    13. Arrangements for initial and renewal eye tests for observers. A reminder that spectacles or contact lenses must be worn for observation if worn for the test.
    14. The frequency of re-calibration of the RVR lights.
    15. Arrangements for inspection and cleaning of the lights.

APPENDIX 2B

Low visibility operations

Low visibility operations

1. Aircraft operations at aerodromes during reduced visibility or low cloud conditions present additional hazards to aircraft and to other aerodrome users. As visibility reduces, the ability of ATC, pilots, vehicle drivers and other personnel to identify hazards and to take remedial action in a timely manner becomes limited. In conditions of low cloud, the time available for the pilot of an approaching aircraft to visually assess the aerodrome environment is reduced.

2. Low Visibility Operations (LVOs) is a general term used for airside operations in conditions of reduced visibility or low cloud conditions and consists of low visibility safeguarding and low visibility procedures (LVPs).

3. Low visibility safeguarding is the process carried out which prepares the aerodrome for low visibility procedures.

4. Low visibility procedures are the actions carried out by ATC and the aerodrome operator in respect of aircraft operations and vehicle movements. This may include restricted access to the manoeuvring area, the protection of the ILS critical and sensitive areas and a reduced aircraft movement rate.

5. LVPs are required for the following types of operation:

   - Lower than standard category I;
   - Category II;
   - Other than standard category II;
   - Category III;
   - Take-offs below 550 m RVR;
   - Approaches utilising an Enhanced Vision System (EVS) where the actual RVR is below 550 m.

Low visibility safeguarding

6. The point at which LVPs are implemented will vary from one aerodrome to another and will depend on local conditions and facilities available. However, a period of time is required to prepare the aerodrome and, in particular, the manoeuvring area, in readiness for LVPs. The safeguarding measures must ensure that at the point when LVPs are declared to be in force, all actions to protect aircraft operations have been put in place.

7. When the visibility deteriorates to approximately 1000 m RVR and is expected to fall further below 550 m RVR, or the cloud ceiling reduces to 300 ft and is expected to fall further below 200 ft, safeguarding should be initiated. The withdrawal of vehicles and personnel involved in non-essential activities on the manoeuvring area should be initiated. Any temporary work in progress on the movement area should normally cease and the work areas should be vacated and returned to operational condition or clearly marked/lit and notified as unavailable for use. Routine maintenance on visual and non-visual aids should be suspended and the ILS localiser and glide path critical and sensitive areas should be cleared of all traffic.

8. Aerodrome operators, in conjunction with ATC, should develop actions that ensure that, in good time prior to the introduction of LVPs, all airlines and other organisations with manoeuvring area access are notified. This is particularly important where companies exercise control over their own apron areas and maintenance facilities adjacent to the manoeuvring area.

9. Particular attention should be given to the protection of the runway and radio navigational aids. Access to the manoeuvring area should be restricted to essential operational safety vehicles and personnel.

10. The decision to commence or continue work, especially involving construction, when a significant probability for the need to invoke LVPs exists, should take account of the time it will take to cease the work, remove all persons and equipment, and prepare the site for LVPs. Alternatively the planning process employed in the development of major construction projects should detail the control measures that would be implemented should it be deemed necessary to continue both WIP and aircraft operations during LVPs.

Responsibilities with respect to low visibility procedures

11. It is the responsibility of the aerodrome operator to develop and maintain the LVPs used at their aerodrome.

12. Whilst ATC are responsible for advising pilots of the status of LVPs at an aerodrome, it is the responsibility of the aerodrome operator to ensure that all measures required to protect aircraft operations in poor weather conditions are in place.

Declaration of low visibility procedures in force

13. It is essential that the aerodrome operator verifies to ATC that all safeguarding measures are in place before LVPs are declared to be in force by ATC. Similarly, LVPs should be declared as cancelled before the aerodrome operator withdraws any measures. It should be remembered that aircraft established on an approach may have commenced that approach believing that LVPs are in force. All

measures taken to protect the approach aids and runway should remain in place until all such aircraft have completed their approach.

14. At aerodromes that support operations listed in paragraph 5 and in conditions that preclude Category I operations, under no circumstances should LVPs be declared to be in force if the appropriate safeguards for these operations are not fully in place to protect the landing aids and runway.

15. Misunderstandings about the status of LVPs can easily arise during periods when the procedures are being introduced or withdrawn. This is particularly true at aerodromes where LVPs include a phase where preparatory actions are taken prior to the full implementation and declaration of LVPs in force, or where some measures may be left in place during what may be a temporary improvement in the weather conditions so that full LVPs can be re-instituted at short notice should the weather deteriorate again. Procedures should ensure that the status of LVPs is clearly understood by all those that are involved in aerodrome operations. There should be a single point from which definitive information about the current status of LVPs can be confirmed wherever possible.

Low visibility procedures

16. As the RVR deteriorates to lower than 550 m, or the cloud ceiling reduces below 200 ft, low visibility procedures should be fully implemented. (The cloud ceiling criteria of below 200 ft is not required for aerodromes conducting take-offs below 550 m RVR but limited to Category I operations only). The withdrawal of non-essential vehicles and personnel from the manoeuvring area should be completed. Where possible free ranging should have ceased and all activities on the manoeuvring area should be under the direct control of ATC. ATC should apply increased spacing between aircraft to allow additional time for the preceding arriving aircraft to vacate the Localiser Sensitive Area (LSA) or the previous departing aircraft to have overflown the localiser. Interference with the localiser and glide path signal can cause a deviation to an aircraft's flight path requiring a go-around to be flown.

17. The point at which LVPs are to be implemented must be clearly defined in terms of a specific RVR, expressed in metres, or cloud ceiling measurement, expressed as a height in feet, and must be promulgated in relevant notices and documentation to all those persons involved.

18. In order that flying operations may be safely conducted at aerodromes in low visibility conditions, aerodrome operators, in consultation with ATC, should determine the movement rate that they wish to sustain and develop LVPs that will support the desired movement rate. The aircraft movement rate will be dependent on the aerodrome infrastructure including the ground markings and lighting.

19. LVPs will vary with each aerodrome and are subject to acceptance by the CAA prior to inclusion in the aerodrome manual and the Manual of Air Traffic Services Part 2 and their subsequent implementation.

20. In order to protect aircraft operating on the ground in low visibilities, it is essential to prevent unauthorised vehicular traffic from entering the movement area. The area should, where practicable, be fenced and provided with manned controlled entry points. Where unguarded gates are provided, they should be kept locked and inspected regularly to ensure that they remain secure. Where physical closure is not practicable, for example between aircraft maintenance areas and manoeuvring areas, entry points should be manned and where the opening is too wide for visual surveillance, then it should be fitted with intruder detection equipment suitable for operation in low visibility conditions. By protecting the movement area in this manner it should be possible to exclude unauthorised personnel who will not be aware of aerodrome traffic control procedures.

21. Complete protection can be expensive and is sometimes difficult to achieve, particularly on large aerodromes where taxiways cross vehicular traffic routes, and where maintenance areas compete with parking aprons for space. Where it is not practicable to secure the area in the manner recommended, the aerodrome operator shall satisfy the CAA as to the security of the aerodrome's operations in low visibility conditions.

22. When LVPs are in force, only vehicles essential to the aerodrome operation and driven by formally tested and authorised drivers should be allowed onto the manoeuvring area. All such vehicles should be equipped with an aerodrome chart available in the driver's cab clearly showing all taxiways, runways, holding points and vehicle routes marked with their appropriate designation. All drivers should be aware of the action to take in the event that the vehicle should break down or that the driver should become unsure of his position on the aerodrome.

23. In addition, all vehicles operating on the manoeuvring area should be equipped with R/T and the driver required to maintain contact with ATC at all times unless escorted by an operations vehicle equipped with R/T and in contact with ATC at all times. Authorised drivers should be thoroughly briefed and familiar with the aerodrome layout including closed taxiway junctions and runway access points, the meaning of all markings, signs and aerodrome lighting, and where appropriate, standard R/T phraseology. Drivers that are restricted to certain areas of operation should be familiar with the limits of those areas, particularly if they cannot be clearly marked, for example, on the aerodrome surface. Authorised drivers should be checked periodically for competence and knowledge of local instructions.

24. In order to continue unrestricted operations for as long as possible while weather conditions deteriorate, many of the low visibility safeguarding measures are implemented in good time and in certain circumstances before they are absolutely

necessary. The reduction in the aircraft movement rate, which is activated by ATC, should be implemented only when the weather conditions demand it.

25. Rescue and Fire Fighting Service (RFFS) vehicles are essential to aerodrome operations at all times and response and deployment times are of vital concern to aerodrome operators. Although it is unlikely that the RFFS response time will be significantly affected in visibilities down to 200 m, temporary relocation of vehicles to strategic points may be necessary for a very large or complicated aerodrome. In visibilities below 200 m there is greater probability that response times will be affected. Operational instructions and training should be developed in accordance with the guidance in chapter 8.

26. Similarly, because congregations of wildlife are difficult for both ATC or pilots to observe in poor weather conditions, wildlife hazard control operations should not be restricted during LVPs. Processes should ensure that adequate time between movements is afforded to permit wildlife hazard control measures to be implemented. The importance of maintaining a runway inspection regime in sustained periods of LVP implementation is also highlighted. This too should be accounted for when determining the declared movement rate.

27. The risk of an inadvertent runway incursion by an aircraft or vehicle, or aircraft mis-routeing, is increased in low visibility conditions. Wherever possible this risk should be minimised by keeping taxiway routeings as simple as is practicable. This can be best achieved by restricting the available taxiway system wherever possible to a single route from the apron to the runway, with intermediate junctions closed, a clearly defined runway entry point, holding point and a separate exit taxiway and return route for landings or rejected take-offs. All other runway access or crossing points should be closed.

28. This can be achieved by the use of red stop-bars or by a physical barrier as described in chapter 7. Markers used in this manner should either be retro-reflective or augmented by lights of the type described in chapter 4. In this way the procedural control of aircraft and vehicles at complex aerodromes can be simplified. On major aerodromes where traffic is such that several routes are operated simultaneously, a Surface Movement Guidance and Control System (SMGCS) is likely to be required in order to achieve the declared movement rate.

29. ICAO annex 14 currently recommends the provision of Surface Movement Radar (SMR) at aerodromes where operations in RVR less than 400 m take place. However, unless the CAA has approved specific procedures, SMR is a monitoring tool only; SMR enhances existing ATC procedures and its use should not be regarded as the prime method by which collision avoidance can be effected.

Visibility conditions and associated actions

Visibility condition 1:

30. Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, and for ATC to exercise control over all traffic on the basis of visual surveillance.

31. No additional requirements for the protection of ground operations by aircraft are required during visibility condition 1.

Visibility condition 2:

32. Visibility sufficient for a pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, but insufficient for ATC to exercise control over all traffic on the basis of visual surveillance.

33. Actions required in visibility condition 2 are dependent on the dimensions of the manoeuvring area and the position of the control tower. Procedures and visual aids will allow the pilot to determine his position and follow the required route.

34. In the lower ranges of visibility condition 2, the necessary measures might limit the movement rate unless some additional aids are available, such as SMGCS, which may enable a greater movement rate to be achieved safely. Adequate safeguards against runway incursions should be in place, such as limited taxi routeing, surface movement radar and stop-bars or physical barriers at runway access points.

Visibility condition 3:

35. Visibility sufficient for the pilot to taxi but insufficient for the pilot to avoid collision with other traffic on taxiways and at intersections by visual reference, and insufficient for ATC to exercise control over all traffic on the basis of visual surveillance. For taxying, this is normally taken as visibilities equivalent to an RVR of less than 400 m but more than 75 m.

36. In such visibility conditions it is likely further ATC measures, such as block control, to assist aircraft and vehicle movement including RFF vehicles, should be considered.

Visibility condition 4:

37. Visibility insufficient for the pilot to taxi by visual guidance only. This is normally taken as an RVR of 75 m or less.

38. During visibility conditions 3 and 4, Advanced Surface Movement Guidance Control Systems (A-SMGCS), where available, may be used to determine the position of aircraft and vehicles on the manoeuvring area.

Precision instrument approach operations

39. Pilots will expect a precision instrument runway to be fully safeguarded and available for the operations listed in paragraph 5. and any guided take-off, if LVPs are declared to be in force by ATC at the aerodrome.

Review of low visibility procedures

40. The aerodrome operator, in co-operation with ATC and other agencies involved in LVP operations, should regularly review the effectiveness of LVPs. Any need for change should be agreed with the CAA prior to inclusion in the aerodrome manual and the Manual of Air Traffic Services Part 2 and subsequent implementation.

41. LVP table-top exercises should be completed on a regular basis to ensure all stakeholders are familiar with the procedures. They should also be considered for any forthcoming operational changes and development works that may significantly impact on LVPs.

EU-OPS approach operations

42. EU OPS and other national authority regulations may allow approved operators to carry out lower than standard category I or other than standard category II approach operations if certain conditions (specified in EU OPS) are met.

43. Lower than standard category I operations allow operators to carry out a Category I approach but with a lower RVR limit than previously available. The actual RVR limit will depend on a number of factors including the:

- lowest decision height available;
- level of aeronautical ground lighting available including approach lighting;
- ILS specification.

44. Aerodromes which are suitable for lower than standard category I operations should ensure that their LVPs are suitable for the lowest RVR limit possible. Further details of lower than standard category I or other than standard category II approach operations can be found on the CAA website.

45. EU OPS and other national authority regulations may allow approved operators to carry out specified approach operations utilising Enhanced Vision Systems (EVS) which reduce the traditional RVR minima required. Aerodromes that are suitable for the specified approach operations should review their LVPs to ensure they are adequate for aircraft and vehicle operations in such visibilities. Further details of EVS operations can be found on the CAA website.

Additional information

46. Low visibility operations are discussed in greater detail in ICAO Doc 9476 manual of Surface Movement and Guidance Control Systems chapter 5 and ICAO European Doc 013 European Guidance Material on All Weather Operations at Aerodromes.

47. Systems designed to enable movement rates to be sustained are discussed in ICAO Doc 9830 A-SMGCS manual.

Conversion of reported meteorological visibility to RVR

48. At aerodromes where RVR measurements are not made, or in case of unserviceability of RVR measuring equipment, LVPs should include criteria for implementation and withdrawal based on the reported meteorological visibility.

49. Pilots, when converting meteorological visibility to an equivalent RVR, may apply the factors table 2B.1 provides. This method of obtaining RVR is not intended for direct application by aerodrome operators but is included in order to provide assistance for aerodromes at which RVR is not available. The conversion method is not to be applied by aerodrome operators and then provided to aircrew as an RVR.

Table 2B.1

Lighting elements available	RVR = Reported Met Visibility	
	Day	Night
High intensity approach and runway lighting	1.5	2.0
Any type of lighting installation other than above	1.0	1.5
No lighting	1.0	-

APPENDIX 2C

Aerodrome safety management system

Introduction

1. An effective Safety Management System (SMS) is an organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures, and forms the primary safety oversight covering the way an aerodrome manages safety. It also provides an identifiable and easily audited systematic control of the management of safety at an aerodrome. By applying lessons learned, an SMS should aim to make measurable improvements to the overall level of safety.

2. An aerodrome SMS should be commensurate with the size of the aerodrome and the level of complexity of the services provided.

3. Guidance on SMS can be found on the CAA website: www.caa.co.uk/sms.

4. The ICAO SMS framework consists of four components and twelve elements, and where possible, aerodrome licence holders should include or refer to the ICAO SMS elements below. ICAO publishes SMS guidance in Document 9859 Safety Management manual (SMM).

SMS framework

Safety policy and objectives

Management commitment and responsibility

5. An effective safety policy, endorsed by the accountable manager, sets a clear direction for the aerodrome to follow and contributes to all aspects of business and safety performance. The safety policy should include a statement about the provision of adequate resources and show the commitment of senior management to manage safety effectively.

Safety accountability

6. The aerodrome licence holder should identify an accountable manager who is accountable for ensuring that all operational activities can be financed and carried out to the standard required.

Appointment of key personnel

7. The aerodrome licence holder should identify a manager to be the focal point for the implementation and day-to-day maintenance of an effective SMS.

Co-ordination of emergency response planning

8. The aerodrome licence holder should ensure that an emergency response plan provides for the orderly and efficient transition from normal to emergency operations and the return to normal operations. The plan should be properly co-ordinated with the emergency response plans of those organisations it must interface with during the provision of its services. (CAP 168, chapter 9 gives further guidance on emergency planning.)

SMS documentation

9. The aerodrome licence holder should develop and maintain documentation describing the safety policy and objectives, the safety accountabilities and responsibilities of senior managers, the SMS processes and procedures and any outputs from the SMS. SMS documentation may be integrated in the existing aerodrome manual or a separate safety management system manual may be developed.

Safety risk management

Hazard identification

10. The aerodrome licence holder should develop and maintain an effective process to identify safety hazards affecting the operation. Hazard identification should be based on a combination of reactive (using safety data from an event that has happened), proactive (using safety data from a near-miss report) and predictive (actively looking at normal day-to-day operations to see where potential problems could occur) methods of safety data collection.

Safety risk assessment and mitigation

11. The aerodrome licence holder should develop and maintain an effective process that ensures analysis and assessment of the safety risks in aerodrome operations, and should implement any remedial action necessary to maintain risks at a level as low as reasonably practicable. Risk assessments should be reviewed regularly, and when changes occur that may affect the safety hazards or the associated risks.

Safety assurance

Safety performance monitoring and measurement

12. The aerodrome licence holder should ensure that safety performance is measured to determine whether safety measures are effective and to identify where improvement is needed. Self-monitoring such as incident investigation, safety inspections and safety audits is a part of this process.

Management of change

13. The aerodrome licence holder should assess the safety impact of any safety-significant changes upon other procedures and processes, individuals and the operation and organisation as a whole. This should be done in the planning stages of any project, and updated as required.

Continuous improvement of the SMS

14. The aerodrome licence holder should identify and determine the implications of sub-standard performance of the SMS in operation, and eliminate or mitigate such causes.

Safety promotion

Training and education

15. The aerodrome licence holder should ensure all aerodrome personnel and third-party contractors receive safety training as appropriate to their role to ensure they understand their safety responsibilities within the aerodrome's SMS.

Safety communication

16. The aerodrome licence holder should develop and maintain safety communication mechanisms which ensure safety critical information is conveyed effectively and explain why particular safety actions are taken and why safety procedures are introduced or changed.

Accountable manager

17. Schedule 12 of the ANO requires an aerodrome to nominate an accountable manager and include the name and status of the accountable manager in the aerodrome manual.

18. The nominee will often be the chief executive, chief operating officer, board chairman, president, managing director, general manager or similar title; it is not necessary for him/her to be the 'controlling mind' of the organisation. It is possible for an accountable manager to be answerable to and directed by another person or persons, and still retain the appropriate level of authority to ensure that activities are financed and carried out to the standard required. The organisational title of this post is at the licence holder's discretion; however, the person named to the post must be advised to the CAA as the accountable manager.

19. The accountable manager should:

- ensure that all necessary resources are available to operate the aerodrome in accordance with the aerodrome manual. Where a reduction in the level of resources or abnormal circumstances which may affect aircraft safety occurs, the accountable manager should ensure that a corresponding reduction in the level of operations at the aerodrome is implemented as required;
- establish, implement and promote the safety policy; and
- ensure compliance with relevant regulations, licensing criteria and the organisation's Safety Management System.

20. The accountable manager should have:

- appropriate seniority within the organisation;
- an appropriate level of authority to ensure that activities are financed and carried out to the standard required;
- knowledge and understanding of the documents that prescribe relevant aerodrome safety standards;
- understanding of the requirements for competence of aerodrome management personnel so as to ensure that competent persons are in place;
- knowledge and understanding of SMS related principles and practices, and how these are applied within the organisation;
- knowledge of the role of the accountable manager; and
- knowledge and understanding of the key issues of risk management within the aerodrome.

21. The level of technical knowledge and understanding expected of an accountable manager is essentially high level, with particular reference to his/her own role in ensuring that standards are maintained.

22. During periods of absence, the day-to-day responsibilities of the accountable manager may be delegated; however, the accountability ultimately remains with the accountable manager.

APPENDIX 2D

Runway incursion awareness

Introduction

1. Several fatal accidents involving runway incursions have occurred, resulting in significant loss of life. Aerodrome licence holders need to be aware of the potentially catastrophic hazard presented to aircraft by runway incursions and to focus on preventive measures. These include the necessity for effective low visibility procedures and runway taxiway holding position signage to be compliant with CAP 168, which upholds the international standards.

2. Proactive measures should be taken by aerodrome licence holders to reduce the likelihood of a runway incursion occurring and to raise awareness of the hazards associated with runway incursions to all aerodrome users.

3. Runway incursions commonly have multiple causal factors generally involving flight crew, air traffic controllers and airfield operations. Errors that may contribute to runway incursions include:

   - failure to follow a clearance or instruction
   - failure to follow procedures
   - issue of an incorrect clearance, instruction or procedure
   - following an incorrect clearance, instruction or procedure
   - loss of situational awareness
   - use of poor communication techniques
   - poor knowledge of the aerodrome
   - use of inadequate or inappropriate procedures
   - confusing or inadequate aerodrome signage
   - taxiway layout

4. In November 2004, the International Civil Aviation Organisation (ICAO) published a new definition of a runway incursion for use by member states. The ICAO definition has been adopted by EUROCONTROL and the European Action Plan for the Prevention of Runway Incursions (EAPPRI) has been amended to reflect this change. The CAA has also adopted this definition, which is:

   - Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Action to be taken by aerodrome licence holders

5. Aerodrome licence holders should regularly review those areas of their aerodrome SMS relevant to the effectiveness and adequacy of the prevention measures in place at their aerodrome. In doing so, they should ensure that suitable measures are in place, particularly in areas of vulnerability, to minimise the risk of runway incursion. In this review, aerodrome licence holders should consider:

   - to what extent aerodrome visual aids, i.e. aeronautical ground lighting, signs and markings, contribute towards reinforcing situational awareness;
   - whether the aerodrome's visual aids, in conjunction with ATC clearances and instructions, in the vicinity of a runway could mislead pilots and vehicle drivers;
   - whether the layout of any movement areas on the aerodrome could cause confusion 'hot-spots', and how such confusion could be eliminated;
   - whether airside driver training is sufficiently robust, reassessing vital topics such as aerodrome operations; radio communication procedures and phraseology; the use and meaning of visual aids; and familiarisation of aerodrome layout; and
   - how runway safety is maintained during periods of 'work in progress', particularly when contractors who are not familiar with the aerodrome or with aerodrome operations are involved.

6. Aerodrome licence holders should conduct regular 'table-top' exercises attended by representatives of all relevant aerodrome functional areas, whereby runway incursion scenarios can be developed and the effectiveness of potential prevention measures may be assessed. A review of these assessments and other SMS actions may be included in the aerodrome audit process.

7. As a continuing part of this approach, aerodrome licence holders should continue to review the effectiveness and adequacy of the prevention measures in place at their aerodrome and take particular note of the proportion of runway incursions attributed to vehicles.

8. Attention is drawn to the EAPRRI[2]. The action plan suggests certain initiatives and recommendations to mitigate the level of operational risk related to runway incursions, including the establishment of a permanent Local Runway Safety Team (LRST), improved operational procedures and training, together with the development of awareness campaigns. It is likely that a runway safety committee, or similarly named group, may perform the same role as the LRST.

2 Available for download from the EUROCONTROL website at: http://www.eurocontrol.int/runwaysafety/public/standard_page/EuropeanAction.html

9. Aerodrome licence holders, air traffic services providers and other key stakeholders should be especially aware of locations on an aerodrome with a history of, or potential risk for, collisions or runway incursions. These locations have been given the name 'hot spots', their definition being 'a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary'. A hot spot is equally likely to result from:

- poor infrastructure design
- a confusing pavement layout
- inadequate surface navigational facilities
- a deficiency of visual aids; or
- other features that are the responsibility of an aerodrome licence holder as it is from air traffic service and aircraft operators.

10. Additionally, hot spots may be locations that, although fully compliant, are potentially difficult to navigate due to awkward geometry, or where additional awareness is required, such as at runway crossing locations.

11. Hot spots should be notified on the aerodrome chart published in the Aeronautical Information Publication (AIP), and examples of both local and AIP charts are provided. annex 4 will specify that the location of a hot spot is circled on the AIP aerodrome chart and that 'properly annotated' additional information is provided to describe the nature of the potential risk at the hot spot. Publication on the aerodrome chart, supported by explanatory notes if considered helpful, is intended to facilitate pilot awareness.

12. Ideally, an effective LRST will ensure that hot spots do not exist. To achieve this aim, aerodrome licence holders, in conjunction with the LRST, should conduct an assessment to determine whether any hot spots exist currently on the aerodrome. The assessment should also address the potential for air traffic procedures (particularly acknowledged runway incursion causal factors such as the use of conditional clearances and non-standard communications) and other aerodrome operating procedures to create any hot spots. Human factors should be given due consideration in any assessment of hot spots.

13. If hot spots are identified, suitable strategies should be implemented to remove the hazard and, where this is not immediately possible, manage and mitigate risk. These strategies may include:

- awareness campaigns;
- additional visual aids (signs, markings, lights);
- use of alternative routeings;
- construction of new taxiways;

- mitigating against blind spots in the aerodrome control tower;
- publishing the hot spot in the AIP.

14. Some hot spot causal factors can be addressed swiftly but others may take much longer to remove, or it may be impracticable to remove them altogether. Hence, plans for the permanent removal of a hot spot or suitable immediate mitigation measures must be developed and implemented.

15. A new hot spot is most likely to be established as a result of change to the movement area or an operating procedure. An assessment should be conducted before the start of any new work, such as new pavement layout, or the introduction of a new or revised operating procedure, to prevent new hot spots being created inadvertently. Ceasing operations in the affected areas should be considered as mitigation in the case of work in progress.

16. The assessment described above should be repeated periodically to ensure that it remains valid and takes into account current aerodrome operating practice and design.

17. Where the measures to mitigate or remove an identified hot spot will take some time to complete, or it is considered that the publication of a hot spot would benefit pilot awareness, the hot spot should be notified by an appropriate means to air traffic service personnel and pilots using the aerodrome. The NOTAM process should be used for the notification of the short term (i.e. less than 3 months) existence of a hot spot. However, if a hot spot is likely to exist for more than one AIP Air Regulation and Control (AIRAC) publication cycle, it should be notified on the aerodrome chart in the UK AIP as specified in Amendment 54 to ICAO annex 4 and as a warning in the specific aerodrome local traffic regulations section (AD 2.20). The warning should include details of ongoing work to remove, or measures to mitigate, the hot spot, or other information that will help situational awareness.

18. Attention is also drawn to ICAO Doc 9870 manual on the Prevention of Runway Incursions.

19. When reviewing visual aids additional measures should be considered whenever it has been shown that further runway incursion prevention mitigation measures are required. The use of additional measures will depend on the specific circumstances but could include the following:

    1. the use of enhanced stop-bars where the light fittings making up a stop-bar are spaced equally across the taxiway in a line perpendicular to the taxiway centreline at reduced intervals;
    2. the use of stop-bars 24 hours a day in all lighting conditions should be considered as runway incursions are not limited to low visibility conditions;
    3. the use of inset runway guard lights (chapter 6);

4. the use of runway guard lights 24 hours a day in all lighting conditions;
5. the use of a runway ahead marking (as shown in figures 2D.1 and 2D.2) in addition to the mandatory instruction marking (chapter 7). Where possible the runway ahead marking should be located before the mandatory marking as illustrated below and collocated with the CAT II/ III holding position marking (pattern B) where applicable. The actual position of the runway ahead marking will depend on the aerodrome's particular circumstances and layout, and should be decided in consultation with the LRST where appropriate;
6. runway ahead surface markings, size and proportions, should be as described in chapter 7, appendix 7B.

Figure 2D.1 Runway ahead marking – for pattern A holding position and enhanced taxiway centreline marking

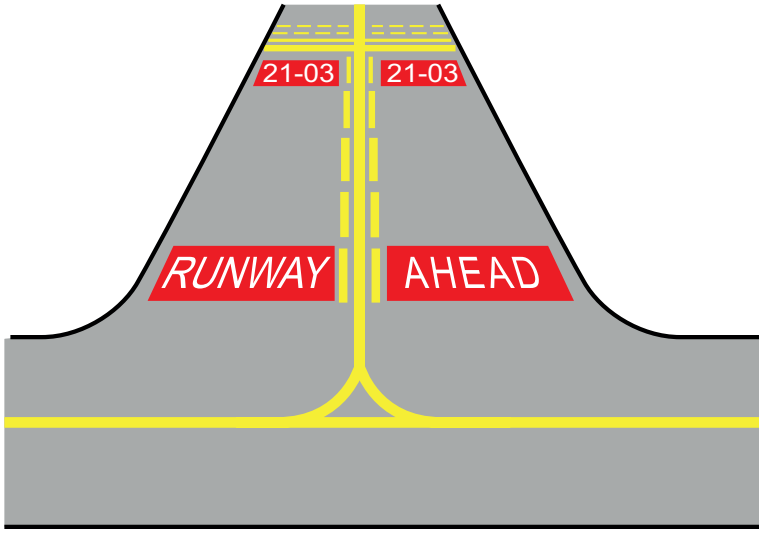


Figure 2D.2 Runway ahead marking – for pattern B (Cat II/III) holding position

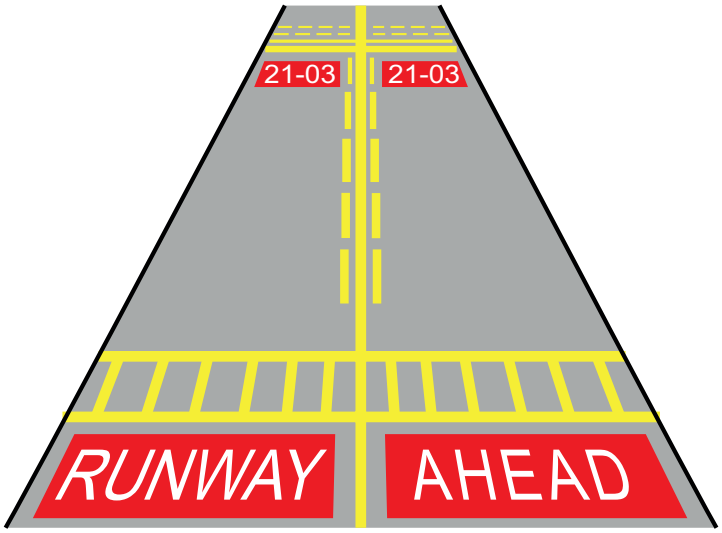
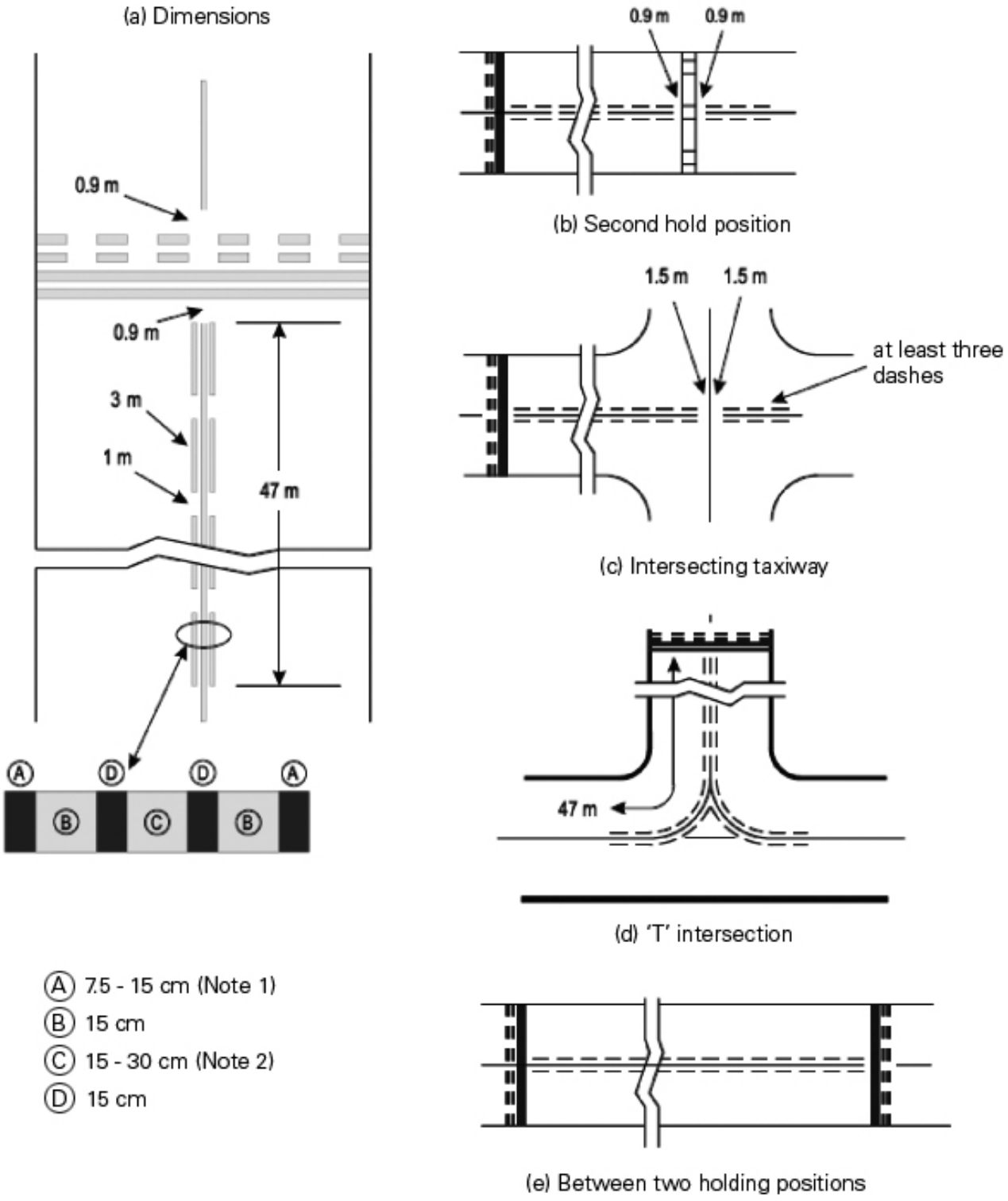


Figure 2D.3 Enhanced taxiway centreline marking



Notes:

1. Black background for contrast on light coloured pavements.

2. Continuous yellow centre line.

APPENDIX 2E

Responsibility for monitoring third parties operating within the boundaries of licensed aerodromes

Introduction

1. The ANO, article 211, requires that an aerodrome be safe for use by aircraft. As part of this, aerodrome licence holders have responsibility for control of those areas, including leased areas within the aerodrome boundary, that are available for aircraft movements requiring the use of a licensed aerodrome. In addition to having responsibilities for areas or services under their direct control, they have responsibilities under the aerodrome licence for areas used or operated by third parties. Examples include tenants and concessionaries under lease or other use agreements, fuel farms sited within the aerodrome boundary and operated by fuel companies, and the provision of Rescue and Fire Fighting Services (RFFS) where the licence holder contracts this to another party.

2. If the operations of third parties give the CAA cause for concern, it would have to take action with the party that it regulates, namely the licence holder. Therefore, licence holders have a responsibility to ensure that contractors and others operate correctly on their aerodromes. This is particularly important in areas that could affect the licence holders' ability to discharge their responsibility for securing the safety of aircraft on their aerodromes and to demonstrate that ability to the CAA.

3. The last reference to responsibilities is not meant to indicate that licence holders have total responsibility; many of these areas have shared responsibilities. The purpose should be to achieve sensible and comprehensive measures for monitoring any activity that could have a negative effect on aircraft safety. The best way to achieve this is to manage safety in a systematic way. It is accepted that aerodrome licence holders, in addition to airlines and aircraft ground handling companies, all share the responsibility for aircraft safety on the aerodrome ramp or apron.

APPENDIX 2F

Work in progress

Introduction

1. Wherever major work affecting operational areas is planned, aerodrome licence holders must be satisfied that unacceptable risks generated by Works in Progress (WIP) have been identified and removed, and that procedures are provided and followed which ensure no adverse impact upon levels of safety.

2. Part of effective safety management in connection with major development or other works lies in timely and comprehensive planning, conducted in consultation with all involved parties, including ATC and users. The aims of such consultation should be the identification of all those measures necessary for the work to be undertaken safely and the early notification to all who need to know of resulting operational changes.

Licensing condition

3. Aerodrome licence holders are required to comply with licence conditions (and the relevant air navigation legislation) concerning changes to, or work in progress, on their aerodrome. These include:

Licence conditions

- Condition 3 – prior approval of CAA is required before any changes are made in the physical characteristics of the aerodrome.
- Condition 4 – the licence holder must notify CAA by the quickest means available of any material change in the surface of the landing area or in the obstruction characteristics of the relevant obstacle limitation surfaces.

Article 211 and schedule 12 of the Air Navigation Order 2009

- Article 211 (5) places a direct legal obligation on the holder of an aerodrome licence to take all reasonable steps to ensure that the aerodrome and its airspace are safe at all times for use by aircraft.
- Article 211 and Schedule 12 require that the aerodrome manual contains procedures for promulgating information concerning the aerodrome's state, and for the control of access, vehicles and work in relation to the aerodrome's manoeuvring area and aprons.

Procedures

4. All parties involved with:

   - WIP;
   - the movement of aircraft and vehicles;
   - the availability of aircraft ground routes;
   - the promulgation of declared distances;
   - the notification and availability of navigation aids and procedures, for example, must work to an agreed programme of works authorisation and management, if the safety of the aerodrome is to be maintained. This programme should set out clearly where responsibilities for the authorisation and implementation of any proposed change to operational facilities lie, the point at which the facilities will be withdrawn or changed and the methods by which such changes will be promulgated.

5. This programme should be formulated only after an assessment of the risks to aircraft safety have been undertaken by the aerodrome licence holder in co-operation with interested parties, and appropriate mitigation measures introduced to keep risks to an acceptable level. Human factors issues should be taken into account in the risk assessment. There will be risks associated with the maintenance task itself, e.g. shift working, length of shift, time pressure etc. as well as those connected to the specific changes, e.g. possible perceptual effects induced by changes to lighting and so on.

6. Before promulgation, practical checks of proposed arrangements must be made by personnel having a comprehensive grasp of the programme and its operational implications, normally the aerodrome operations unit. Where significant changes to markings or lighting are being made, it may be necessary for the aerodrome to conduct a preliminary flight check in order to make sure that the proposals have been correctly implemented and are functioning as intended. It should also be borne in mind that changes to marking or lighting may give different perceptual effects at different times of day or in different weather conditions. Small, apparently insignificant changes can sometimes have unanticipated results.

7. Processes, developed procedures, actions and decisions made should be documented, and relevant documentation must be made available to and, when appropriate, be provided to agencies affected by the change in operations and WIP. Particular consideration should be given to ensuring that all personnel and agencies involved in the operation of aircraft that might be affected by the revised information are aware of the type and extent of WIP and of any operational changes and restrictions that result. All documentation should be retained and made available for audit purposes.

8. Where shift working is in operation it will be necessary to ensure that each shift is properly and fully briefed. The safety management system should ensure a procedure for feedback from the parties involved and the swift implementation of corrective measures if they are necessary. Regular monitoring of contractors is essential to ensure continued safety. Operators should ensure that contractors have made support available outside normal working hours. Particular attention should be paid to the transfer of adequate information at shift or work handover. Ideally, any transfer of information should have a degree of redundancy, e.g. both verbal and written, preferably on a standard document retained for later checking and verification, if necessary.

9. Before implementation, draft operational instructions or other promulgation information should be discussed with those most directly affected, and subjected to checks to ensure that their meaning is clear to potential users.

10. Where work is already in progress, aerodrome licence holders should satisfy themselves that, as far as possible, the above issues are being addressed.

11. Procedures for the control of works should include any or all of the following tasks (this list is not exhaustive):

    1. works permit procedures
    2. relevant safety procedures
    3. restrictions during low visibility conditions
    4. R/T communications
    5. staff briefing
    6. site marking, by day or night, or in low visibility
    7. work on an 'on-off' basis
    8. hot works where relevant
    9. aerodrome operating procedures during the works
    10. emergency procedures
    11. supervisory and contact information
    12. plans and diagrams

Reduced runway length operations

12. Additional hazards may arise when WIP involving a reduction in the available runway distances takes place. In such circumstances, where the runway length available is less than declared in the AIP, it is essential that:

    1. the potential hazards before, during, and on ceasing operations with reduced runway length available and/or WIP are identified and mitigated as necessary in order to assure the safety of aircraft operations;

Note: Hazards may include inappropriate or potentially misleading display of visual aids; inappropriate or potentially misleading availability of navigational aids; adverse environmental impact; risks resulting from adverse or unusual meteorological conditions; and restricted obstacle clearance and wingtip separation distances. It is important to recognise that the hazards that may be identified can cover a wide range of areas, including those that do not pose a risk only to aircraft, for example the potential risk from interaction with jet blast.

2. a revised runway strip, Runway End Safety Area (RESA) and obstacle limitation surfaces, such as the approach and take-off climb surfaces, are implemented, where necessary;

3. a safety zone is established between that area of the runway that is to be used by aircraft and the WIP or unusable runway;

   Note: The location, size and shape of the safety zone are dependent upon the circumstances described above, to provide for items such as runway end safety areas, blast protection and abbreviated or simple approach light systems.

4. markings are provided to indicate clearly the extent of the safety zone, the WIP area and any movement area or roadways that are to be used by persons involved in the WIP and not to be used by aircraft;

5. the presence, activities and movement on or around a runway or taxiway of contracted staff, who may not be as familiar with the aerodrome and aviation practices as expected, are properly managed and controlled;

6. the impact on the ability of the rescue and fire fighting and emergency services to perform their functions is considered and addressed;

7. all operational information is correct, available and promulgated in a timely manner to all relevant parties;

8. roles and responsibilities for operations and tasks associated with the reduction of the runway length available and the WIP are clearly understood and complied with; and

9. wherever practicable, the suitability of a procedure is tested prior to implementation.

13. The aerodrome licence holder is responsible for the co-ordination and management of the opening and closing of the runway (and other movement areas, as necessary) and the WIP. Management of aircraft operations may be contracted out to an independent organisation (e.g. an ANSP) but a tactical decision concerning aircraft operations made by that organisation outside, or that deviate from, the agreed operational procedures, unless of an urgent safety nature, must be adopted only in co-operation with the aerodrome licence holder.

14. The aerodrome licence holder should put in place measures to monitor closely the safety of the aerodrome and aircraft operations during runway WIP such that timely corrective action is taken when necessary to assure continued safe operations. This is particularly important when operational change or unprecedented or unpredicted events occur. Wherever practicable the stakeholders should agree any strategic decisions that might need to be made after operations with reduced runway length available and/or WIP have commenced.

15. Aerodrome licence holders are reminded that they are not permitted to declare a distance exceeding that notified in the AIP without the prior approval of the CAA, see CAP 168 chapter 10.

CHAPTER 3

Aerodrome physical characteristics

Introduction

3.1 This chapter describes the physical characteristics that are taken into account when an aerodrome is to be licensed or when developments are considered. The related safety surfaces which afford protection to aeroplanes taking off, landing or flying in the vicinity of an aerodrome are described in chapter 4.

3.2 The specifications for the individual requirements are interrelated by a two element reference code, described in paragraph 3.5 below.

3.3 In addition, specifications will vary with the designation of a runway as an instrument runway if it is served by one or more non-visual aids to approach and landing or as a non-instrument runway, if it is not so served.

3.4 The use of this system ensures that the facilities and characteristics of an aerodrome are effectively related and match the needs of the aeroplanes for which the aerodrome intends to cater.

Aerodrome (runway) reference code

3.5 To determine the extent of the lateral, longitudinal, and sloping planes of the airspace and ground surfaces surrounding each runway that should be kept free of obstacles, a reference code is established from table 3.1. This code comprises:

1. a number determined by selecting the higher value of declared TODA or ASDA;
2. a letter which corresponds to the wingspan or main gear outer-wheel span, whichever is the more demanding, of the largest aircraft likely to be operating at the aerodrome.

3.6 The determination of a runway's reference code is for the identification of the horizontal and vertical parameters of the surfaces associated with that runway, and is not intended to influence the pavement strength. The CAA will determine the runway reference code in consultation with the aerodrome licence holder.

Table 3.1 Aerodrome reference code

Code element one			Code element two	
Code number	The greater of TODA or ASDA	Code letter	Wing span	Outer main gear wheel span
1	Less than 800 m	A	Up to but not including 15 m	Up to but not including 4.5 m
2	800 m up to but not including 1200 m	B	15 m up to but not including 24 m	4.5 m up to but not including 6 m
3	1200 m up to but not including 1800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1800 m and over	D	36 m up to but not including 52 m	9 m up to but not including 14 m
		E	52 m up to but not including 65 m	9 m up to but not including 14 m
		F	65 m up to but not including 80 m	14 m up to but not including 16 m

Runways

Introduction

3.7 A runway is a rectangular area on a land aerodrome prepared for the landing and taking-off of aeroplanes. Separate criteria apply to a runway serving as a non-instrument runway and to a runway serving as an instrument runway. The ability to meet the criteria will determine what length of runway may be declared for what purpose. The length of runway provided is not directly determined by the code. The aerodrome authority should declare distances for each runway direction. The declared distances are to be approved and promulgated by the CAA.

Width

3.8 Runways both paved and unpaved should have the following minimum widths:

Table 3.2 Runway widths

	Code letter					
Code number	A	B	C	D	E	F
1	18 m	18 m	23 m	–	–	–
2	23 m	23 m	30 m	–	–	–
3	30 m	30 m	30 m	45 m	–	–
4	–	–	45 m	45 m	45 m	60 m

Note: The combinations of code numbers and letter for which widths are specified have been developed for typical aeroplane characteristics.

The width of a precision instrument approach runway should be not less than 30 m where the code number is 1 or 2.

3.9 Where additional runway distances are required for take-off, these may be achieved by adding a starter extension to the beginning of the runway. Provided this extension is not more than 150 m in length, its width shall be reduced to not less than two-thirds of the normal requirement.

3.10 It may be necessary to provide extra width at the end of a runway or starter extension to enable aeroplanes to turn around.

Longitudinal slopes

3.11 The overall longitudinal slope, calculated by dividing the difference in elevation between the runway ends by the length of the runway, should not exceed 1% (1:100) for runways where the code number is 3 or 4 and 2% (1:50) for runways where the code number is 1 or 2.

3.12 Local longitudinal slopes on runways should not exceed:

1. 1.25% (1:80) where the code number is 4;
2. 1.5% (1:66) where the code number is 3;
3. 2.0% (1:50) where the code number is 1 or 2.

3.13 The first and last quarters of runways where the code number is 3 or 4 should not exceed a slope of 0.8% (1:125).

3.14 Longitudinal slope changes along a runway have an effect on the operation of aeroplanes which is in direct ratio to the slope change and inverse ratio to the length of transition between successive slopes. Slope changes should be minimised on new construction and wherever possible on existing runways during the course of major runway maintenance. Slope changes allowable during resurfacing are detailed at appendix 3A.

3.15 Where a slope cannot be avoided, the change between two consecutive slopes should not exceed:

1. 1.5% where the code number is 3 or 4;
2. 2.0% where the code number is 1 or 2.

3.16 The transition from one slope to another should be accomplished by a curved surface with a rate of change not exceeding:

1. 0.1% per 30 m (minimum radius of curvature of 30 000 m) where the code number is 4;
2. 0.2% per 30 m (minimum radius of curvature of 15 000 m) where the code number is 3;
3. 0.4% per 30 m (minimum radius of curvature of 7500 m) where the code number is 1 or 2.

Sight distance

3.17 Where slope changes cannot be avoided they should be such that there will be an unobstructed line of sight from:

1. any point 3 m above the runway to all other points 3 m above the runway within a distance of at least half the length of the runway or 1200 m, whichever is the less, where the code letter is C, D, E or F;
2. any point 2 m above the runway to all other points 2 m above the runway within a distance of at least half the length of the runway where the code letter is B;
3. any point 1.5 m above the runway to all other points 1.5 m above the runway within a distance of at least half the length of the runway where the code letter is A.

Distance between slope changes

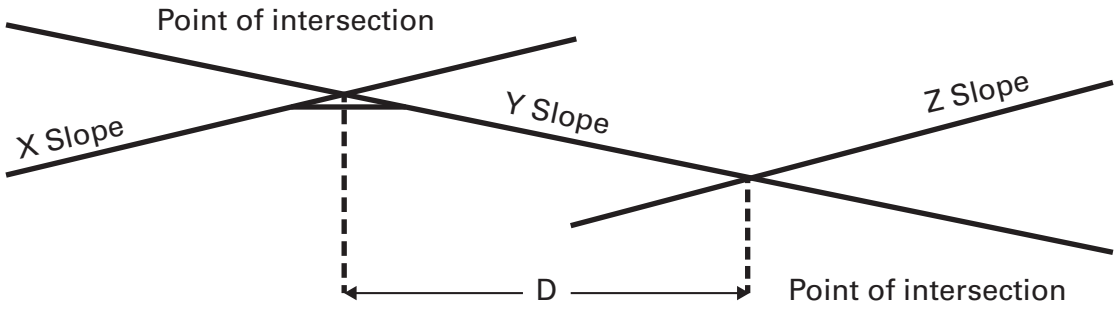
3.18 Undulations or appreciable changes in slopes located close together along a runway should be avoided. The distance in metres between the points of intersection of two successive slope changes should not be less than the sum of the two slope changes in absolute terms multiplied by:

1. 300 where the code number is 4;
2. 150 where the code number is 3;
3. 50 where the code number is 1 or 2.

3.19 The minimum distance between two successive slope changes should never be less than 45 m.

Example:

Figure 3.1



3.20 When the code number is 4 then D should be at least 300 [(X–Y) + (Y–Z)] m where (X–Y) is the absolute numerical percentage value of X–Y, and (Y–Z) of Y–Z.

Assuming	X	=	+1%
	Y	=	-0.5%
	Z	=	+0.5%
Then	X–Y	=	1.5%
	Z–Y	=	1.0%

D should not be less than 300 (1.5 + 1.0) m = 750 m.

Transverse slopes on paved runways

3.21 Rapid drainage of water from a paved runway is assisted by a cambered surface. The surface of a new runway should be cambered. However, a single cross-fall from high to low in the direction of the wind flow most frequently associated with rain may ensure a more rapid drainage of water.

3.22 The transverse slope on either side of the crown should be symmetrical and ideally should be 1.5% (1:66) where the code letter is C, D, E or F, and 2% (1:50) where the code letter is A or B, but in any event should not exceed 1.5% or 2% as applicable, nor be less than 1% except at runway or taxiway intersections where flatter slopes may be necessary. A 1.5% slope should be provided on a straight cross-fall. In the case of a cambered runway when a transverse slope of only 1% exists, the transverse slope on either side of the crown should be symmetrical and ideally should be 1.5% (1:66) where the code letter is C, D, E or F, and 2% (1:50) where the code letter is A or B, but in any event should not exceed 1.5% or 2% as applicable, nor be less than 1% except at runway or taxiway intersections where flatter slopes may be necessary. A 1.5% slope should be provided on a straight cross-fall. In the case of a cambered runway when a transverse slope of only 1% exists, it is recommended that the surface of that runway demonstrates an ability to drain water effectively.

Runway shoulders

3.23 Strong crosswinds may result in significant deviation from the runway centreline. With some large aircraft the wing-mounted engines may overhang the runway edge and there is then a risk of jet blast eroding the surface adjacent to the runway. This can cause dust and the possible ingestion of debris by the engines.

3.24 To overcome the potential problems runway shoulders should be provided for runways where the code letter is D or E, except that this is not necessary where the runway width is 60 m or more. Runway shoulders should be provided for a runway where the code letter is F.

3.25 Runway shoulders should extend symmetrically on both sides of the runway so that the overall width of runway plus shoulders is not less than 60 m where the code letter is D or E, and 75 m where the code letter is F. Shoulders for runways where the code letter is E or F normally should be paved.

3.26 However, for runways where the code letter is F, there may be circumstances where a lesser paved width may be acceptable; for example, where an aerodrome is nominated as an alternate, or where the frequency of operations is very low; in all circumstances the minimum paved width should be 60 m. Where a reduced paved width of 60 m is accepted:

1. the outer unpaved 7.5 m of runway shoulder should be stabilised; the ground is prepared so that there is full grass coverage with no loose gravel or other material. This may include additional materials if the bearing strength and surface of the ground are not sufficient;
2. a programme of inspections of the shoulders and runway should be implemented to confirm its continuing serviceability and ensure that there is no deterioration that could create a risk of FOD or otherwise hazard aircraft operations;
3. as movements of code letter F aircraft increase, the need for full paved width shoulders should be assessed by local hazard analysis;
4. the bearing strength of the shoulders, whether paved or not, should comply with the requirements in chapter 3; paved surfaces should be of an approved PCN classification and unpaved surfaces should be regularly assessed in accordance with chapter 3, paragraphs 3.180 to 3.181.

3.27 The surface of the shoulder that abuts the runway should be flush with the runway surface, and its transverse slope should not exceed 2.5% (1:40).

3.28 Runway shoulders should be so prepared as to be capable of supporting the aeroplanes using the runway without causing structural damage to those aeroplanes. They should also be capable of supporting vehicles such as fire fighting appliances. In some cases, while the bearing strength of the natural ground may be sufficient, special preparation may be necessary to avoid erosion or the ingestion of debris into aircraft engines.

Blast pads and runway ends

3.29 Along with the runway shoulders, the areas at the ends of runways, such as blast pads, stopways and runway turnpads, may be subject to significant blast forces and jet engine vortex effects. Additional paved surface may be used to mitigate the effects of these factors. Aerodrome licence holders should assess such paved surfaces which, if provided, should be able to accommodate the occasional passage of the critical aircraft for runway pavement design. Pavement strength should subsequently take account of the taxying loads of the most critical aircraft and/or the critical axle load of emergency or maintenance vehicles. Where additional paved surface is provided at runway ends, it should have a width equal to the width of the runway plus shoulders.

3.30 Irrespective of whether it is fit for the normal movement of aircraft, the surface should be such that it can withstand the extended blast from aircraft engines that may overhang and the effects of engine inlet forces.

Runway turn pads

3.31 Where the end of a runway is not served by a taxiway or a taxiway turnaround a runway turn pad should be provided, if necessary, to facilitate a 180° turn of aeroplanes.

3.32 Such areas may also be useful if provided along a runway to reduce taxying time and distance for aeroplanes that may not require the full length of the runway.

3.33 The runway turn pad may be located on either the left or the right side of the runway and adjoining the runway pavement at both ends of the runway, and at some intermediate locations where deemed necessary. However, the initiation of the turn would be facilitated by locating the turn pad on the left side of the runway, since the left hand seat is the normal position of the pilot-in-command.

3.34 Where the use of runway turn pads is deemed necessary, they should have the characteristics below:

1. The intersection angle of the runway turn pad should not exceed 30° and the nose wheel steering angle to be used should not exceed 45°.
2. The design of a runway turn pad should be such that, with the cockpit of the most critical aeroplane for which the turn pad is intended over the turn pad marking, the minimum distance between the outer edge of the main wheels of the aeroplane and the edge of the turn pad should be:
    a) 4.5 m where the code letter is D, E, F or C and the turn pad is intended to be used by aeroplanes with a wheel of 18 m or greater;
    b) 3 m where the code letter is C and the turn pad is intended to be used by aeroplanes with a wheelbase of less than 18 m;
    c) 2.25 m where the code letter is B;
    d) 1.5 m where the code letter is A; or

e) where severe weather conditions and resultant lowering of surface friction characteristics prevail, a larger wheel-to-edge clearance of 6 m should be provided where the code letter is E or F.

3. The longitudinal and transverse slopes on a runway turn pad should be sufficient to prevent the accumulation of water on the surface and facilitate rapid drainage of surface water. The slopes should be the same as those on the adjacent runway surface.

4. The strength of a runway turn pad should be at least equal to that of the adjoining runway which it serves, due consideration being given to the fact that the turn pad will be subjected to slow-moving traffic making hard turns and consequent higher stresses on the pavement. Where a turn pad is provided with flexible pavement, the surface would need to be capable of withstanding the horizontal shear forces exerted by the main landing gear during turning manoeuvres.

5. The surface of a runway turn pad should not have surface irregularities that may cause damage to an aeroplane using the turn pad and should be so constructed or resurfaced so as to provide good surface friction characteristics at least equal to that of the adjoining runway.

6. Runway turn pads should be provided with shoulders of such width as is necessary to prevent surface erosion by the jet blast of the most demanding aeroplane for which the turn pad is intended, and any possible foreign object damage to the aeroplane engines. As a minimum, the width of the shoulders would need to cover the outer engine of the most demanding aeroplane and thus may be wider than the associated runway shoulders.

7. The strength of the runway turn pad shoulders should be capable of withstanding the occasional passage of the aeroplane it is designed to serve without inducing structural damage to the aeroplane and to the supporting ground vehicles that may operate on the shoulder.

8. The characteristics of runway turn pad lights are detailed in chapter 6 and runway turn pad markings in chapter 7.

Runway strips

Introduction

3.35 A runway strip is an area enclosing a runway and any associated stopway. Its purpose is to:

1. reduce the risk of damage to an aeroplane running off the runway by providing a graded area which meets specified longitudinal and transverse slopes, and bearing strength requirements; and

2. protect aeroplanes flying over it during landing, balked landing or take-off by providing an area which is cleared of obstacles except permitted aids to air navigation.

3.36 Ideally the whole of a runway strip should be clear of obstacles, but in practice it is recognised that the strip facilitates the installation of visual, surface movement, radio and radar aids, and some of these cannot perform their function if they are sited outside the runway strip. Equipment essential to an approach, landing or balked landing, or equipment required for aircraft safety purposes, is permitted within the runway strip subject to the conditions detailed in paragraphs 3.81 to 3.84.

3.37 Drainage channels, catchpits and other essential design features at aerodromes should not constitute hazards to aeroplanes. Whenever possible, items which are not required to be at ground level should be buried to a depth of not less than 0.45 m.

3.38 Within the graded area of the runway strip, constructions such as plinths, runway ends, paved taxiway edges, etc. should be delethalised, that is, so constructed as to avoid presenting a buried vertical face to aircraft wheels in soft ground conditions in any direction from which an aircraft is likely to approach. To eliminate a buried vertical surface, a slope should be provided which extends from the top of the construction to not less than 0.3 m below ground level. The slope should be no greater than 1:10. Newly constructed features complying with paragraph 3.37 are not required to be delethalised.

3.39 Agricultural crops other than long grass should not be grown within the runway strip since they would either conflict with the requirements of paragraph 3.35 1, provide a wildlife-attractive environment or be a fire hazard. See paragraphs 3.167 to 3.168.

3.40 The total area within the runway strip should be capable of supporting unrestricted access for emergency service vehicles.

Length

3.41 A runway strip should extend beyond each end of a runway and of any associated stopway for a distance of at least 60 m where the code number is 2, 3 or 4, and where the code number is 1 and the runway is an instrument runway. When the code number is 1 and the runway is a non-instrument runway, the distance should be 30 m.

3.42 When a starter extension is provided, the runway strip before the starter extension need only provide for wing overhang plus a safety margin of 7.5 m or 20% of wingspan, whichever is the greater. This distance may need to be increased for other factors, e.g. blast (see figure 3.2).

Width

3.43 The runway strip which encloses a non-instrument runway should extend each side of the centreline and extended centreline of the runway and any associated stopway for a distance of at least:

1. 75 m where the code number is 3 or 4;
2. 40 m where the code number is 2;
3. 30 m where the code number is 1.

3.44 Where there is a non-instrument runway of 10% or greater than the minimum width, the overall width of the runway strip should be increased to provide a distance measured from each edge of the runway of at least:

1. 28 m where the code number is 2;
2. 21 m where the code number is 1.

3.45 The runway strip which encloses an instrument runway should extend each side of the centreline and extended centreline of the runway from 60 m before threshold to 60 m beyond the end of the declared landing distance for a distance of at least:

1. 140 m where the code number is 3 or 4;
2. 70 m where the code number is 1 or 2.

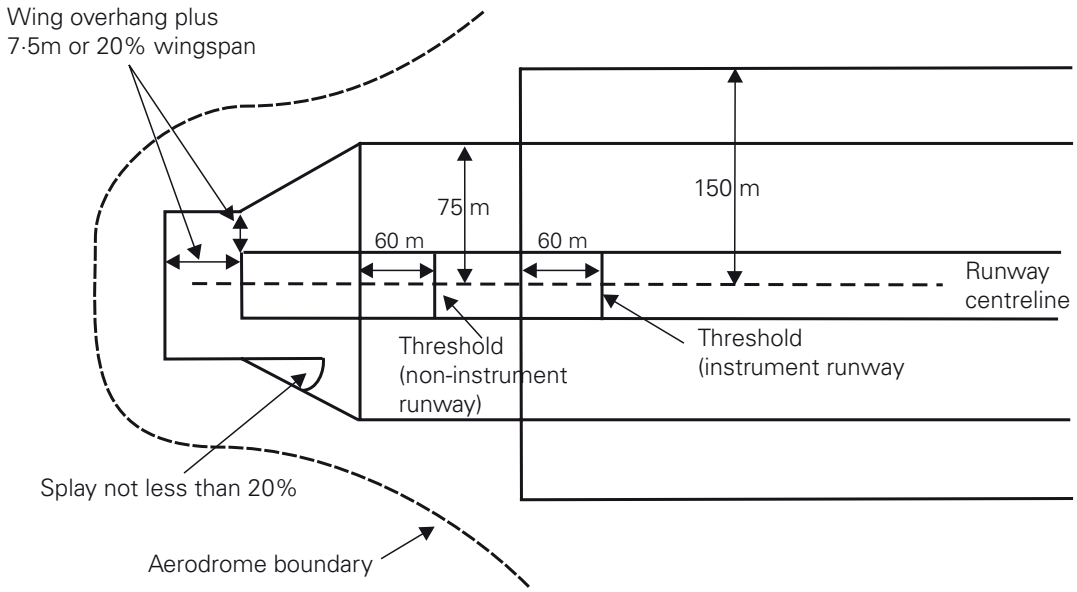
3.46 With the prior approval of the CAA, when the highest value of TODA or ASDA falls in the bottom third of code number 3, the width for a non-precision instrument approach runway strip may be reduced to not less than 105 m either side of the centreline and extended centreline of the runway.

3.47 When the threshold or end of landing distance do not coincide with the ends of a runway, the runway strip enclosing the runway and any associated stopway should extend to the lengths specified in paragraph 3.41 at the widths specified in paragraph 3.43, based on the threshold, end of landing distance or end of stopway as appropriate.

3.48 Near the start of its take-off run an aeroplane will be moving slowly; consequently, the runway strip width up to the beginning of a starter extension may be reduced to provide a distance from each edge of the extension for wing overhang plus 7.5 m or 20% of wingspan of the largest aeroplane, whichever is the greater.

3.49 Thereafter, the width of the runway strip should increase at a splay of not less than 20% each side in the direction of take-off until the full visual strip width is achieved relevant to the runway code number.

Figure 3.2

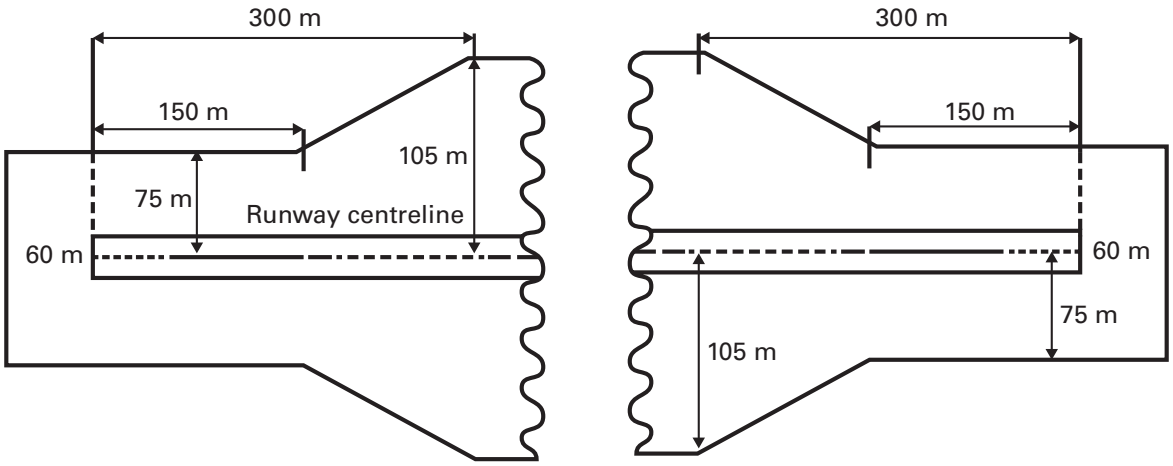


NB: Figure 3.2 does not reflect the reduction of strip width from 75 m to 70 m either side of the runway centre-line, for a Code 3 or 4 runway (in accordance with EASA CS-ADR-DSN Issue 4 effective 8/12/17.

Cleared and Graded Area (CGA)

3.50 The runway strip which encloses a precision instrument runway where the code number is 3 or 4 should be cleared of obstacles and graded for a distance of at least 105 m each side of the centreline from the threshold continuing to the end of LDA. Subject to a satisfactory safety assessment, this distance may be reduced to not less than 75 m each side of the centreline and extended centreline at each strip end, continuing at this width for the first 150 m of runway available for landing in each direction, then increasing uniformly to 105 m from centreline by 300 m.

Figure 3.3



3.51 The runway strip which encloses a precision instrument approach runway where the code number is 1 or 2 should be cleared of obstacles and graded for a distance of at least 45 m each side of the centreline and extended centreline.

3.52 The runway strip which encloses a non-instrument, or a non-precision instrument approach runway, should be cleared of obstacles and graded on each side of the centreline and extended centreline of the runway and any associated stopway for a distance of at least:

1. 75 m where the code number is 3 or 4;
2. 40 m where the code number is 2;
3. 30 m where the code number is 1.

3.53 Where the runway is more than 10% greater than the minimum width, the runway strip should be cleared and graded throughout its length for a distance from each side of the runway of at least:

1. 60 m where the code is 3;
2. 28 m where the code is 2;
3. 21 m where the code is 1.

3.54 Guidance on temporary obstacles within runway strips is in appendix 3B.

Bearing strength

3.55 The runway strip should be flush with the runway, runway shoulder and stopway along their common edges. That part which is required to be graded should be so prepared as to be capable of supporting any aeroplane at maximum certificated weight that the runway is intended to serve, without the aeroplane suffering significant damage. The area before the runway threshold should be

prepared against blast erosion to at least 30 m, in order to protect a landing aircraft from the exposed edge, and to eliminate the effects of jet blast and inlet forces. Where such areas have paved surfaces, they should be able to withstand the occasional passage of the critical aeroplane for runway pavement design.

3.56 The bearing strength may decrease gradually in a transverse direction away from the runway to assist arresting an aeroplane, but rapid transverse changes in bearing strength should be avoided.

Longitudinal slopes

3.57 The longitudinal slope along any portion of a runway strip which is required to be graded should not exceed:

1. 1.5% (1:66) where the code number is 4;
2. 1.75% (1:57) where the code number is 3;
3. 2.0% (1:50) where the code number is 1 or 2.

3.58 Longitudinal slope changes on that portion of a strip to be graded should be gradual. Abrupt changes of slope should be removed.

Transverse slopes

3.59 The transverse slopes on that portion of the runway strip to be graded should avoid the accumulation of water but should not exceed:

1. 2.5% (1:40) where the code number is 3 or 4;
2. 3.0% (1:33) where the code number is 1 or 2;

3.60 except that to facilitate drainage, the transverse slope for the first 3 m outwards from the edge of the runway, runway shoulder or stopway should be negative as measured in the direction away from the runway but should not exceed 5% (1:20).

3.61 The transverse slopes on those portions of the runway strip outside the area to be graded should not exceed an upward slope of 5% (1:20) measured in the direction away from the runway.

Runway End Safety Areas (RESA)

3.62 RESAs are designated areas at each end of the runway intended to minimise the risk of damage to an aeroplane where an aeroplane overruns or undershoots a runway. The RESA is beyond and in addition to the runway strip, as shown in CAP 168, figure 3.11.

3.63 RESAs are required at each end of the runway strip enclosing all runways where the code number is 3 or 4, and instrument runways where the code number is 1 or 2.

3.64 Additionally, RESAs should be considered for non-instrument runways where the code number is 1 or 2, particularly where there are movements by jet aircraft not

using public transport performance factors, or a high proportion of runway-limited movements at the higher weights.

3.65 The minimum requirement for a RESA is 90 m from the end of the runway strip for all code 3 and 4 runways, and code 1 and 2 instrument runways.

3.66 Licence holders should not assume that the minimum distance of RESA will necessarily be sufficient; it is recommended that RESAs extend to at least:

1. 240 m from the end of the runway strip for code 3 and 4 runways;
2. 120 m from the end of the runway strip for code 1 and 2 instrument runways;

3.67 The RESA width should be that of the associated cleared and graded area, with a minimum of twice runway width, symmetrically disposed about the extended centreline of the runway.

3.68 For applicable runways where the RESA does not extend to the recommended distance, as part of their SMS, licence holders should assess the risk of a runway excursion on a regular basis as circumstances change, and implement appropriate and suitable mitigation measures as necessary.

3.69 Further guidance on RESA risk assessments and potential mitigating measures can be found in CAP 168, appendix 3I.

3.70 The surface of a runway end safety area need not be prepared to the same standard as that of the graded area of the associated runway strip. It should enhance the deceleration of aeroplanes in the event of an overrun, but it should not:

1. hinder the movement of rescue and fire fighting vehicles, the effectiveness of the rescue and fire fighting provision; or
2. endanger aircraft in the event of an aeroplane undershooting or overrunning.

3.71 The overall longitudinal slope in a runway end safety area should not exceed a downslope of 5% (1:20), and should be such that no part of the safety area penetrates the approach or take-off climb surfaces. Where the ground in a runway end safety area exceeds a downslope of 5% (1:20), it may be acceptable in the case of an overrun RESA to increase the length of the area beyond that considered to be adequate for the particular circumstances in order to compensate for steeper slopes, up to a maximum of 10% (1:10) gradient.

3.72 Transverse slopes should not exceed 5% (1:20).

3.73 Slope changes and transitions between slopes should be gradual and abrupt changes or sudden reversals of slopes should be avoided.

3.74 Aids to navigation, which because of their function must be placed within a runway end safety area to meet air navigation requirements, should be constructed and sited to reduce the potential hazards (delethalised and frangible) to a minimum and consequential risks to an acceptable level.

Arresting systems

3.75 Research programmes, as well as evaluation of actual aircraft overruns into arresting systems, have demonstrated that the performance of some arresting systems using engineered material is predictable and effective in arresting aircraft overruns. Engineered Material Arresting System (EMAS) may be installed at UK licensed aerodromes as an alternative where a 240 m RESA cannot be achieved.

3.76 The CAA accepts the US Federal Aviation Administration (FAA) performance specification and guidance material as suitable for use in EMAS design in the UK, subject to a suitable safety assessment by each aerodrome on their own circumstances (i.e. where to site the system, dimensions, operating conditions etc).

3.77 EMAS may be located within the runway strip or RESA as determined by the design assessment.

3.78 The CAA will permit an increase in runway declared distances that can be achieved from the installation of EMAS only where installation of EMAS has provided the equivalent to a 240 m RESA and 60 m strip end (a full length EMAS for the design size aircraft).

3.79 Should arresting systems other than EMAS be considered the licence holder needs to be aware of the risks to aircraft and possible increase in rescue and fire fighting provision that their establishment may introduce. Arresting systems may be sited inside the RESA only where their performance and frangibility has been demonstrated. Aerodrome licence holders evaluating such systems should contact the CAA for further advice.

3.80 Soft ground arrester beds are not intended to replace RESA and, therefore, should not be located within the minimum RESA distance.

The siting of aids to navigation within runway strips

3.81 Any aids to air navigation to be sited within a runway strip should be made as light and as frangible as design and function will permit. In this context a frangible object is one which retains its structural integrity and stiffness up to a desired maximum load, but when subjected to a greater load than desired will break, distort or yield in such a manner as to present the minimum hazard to an aeroplane.

3.82 The height of any object which is permitted within a runway strip should be kept to the minimum for the particular site and function of the equipment.

3.83 Objects which are unlikely to aggravate the consequences of a ground swing may be located within the cleared and graded area provided they are frangible, not more than 0.9 m above local ground level, and not closer than 15 m from the edge of the runway. All other permitted objects are to be sited outside this area, and should be so positioned that they do not penetrate a limiting surface sloping upward and outward from the runway centreline at a slope of 1:10.

3.84 The limiting surface at 1:10 referred to in paragraph 3.83 above extends beyond the edge of the runway strip, until either it intersects the inclined plane of the transitional surface rising outwards from the edge of the strip, or until it meets the plane of the inner horizontal surface, and continues at that height until it reaches the point where the transitional surface meets the inner horizontal surface.

Taxiways

3.85 Taxiways should be provided when they are necessary for the safe and orderly movement of aircraft on the ground, or when it is necessary for aircraft to follow a certain path to avoid protected areas or surfaces. When the end of a paved runway is not wide enough to allow an aeroplane to turn around, either the runway should be widened or an entrance/exit taxiway provided at the runway end.

Width

3.86 The width of a taxiway should be such that with the cockpit of the most critical aeroplane for which the taxiway is intended over the centreline, the minimum distance between the outer edge of the main wheels of the aeroplane and the edge of the pavement should be:

1. 4.5 m where the code letter is D, E, F or C and the taxiway is intended to be used by aeroplanes with a wheelbase of 18 m or greater;
2. 3 m where the code letter is C and the taxiway is intended to be used by aeroplanes with a wheelbase less than 18 m;
3. 2.25 m where the code letter is B;
4. 1.5 m where the code letter is A.

3.87 While the changes in direction of taxiways should be as few as possible, where curves are necessary they should be compatible with the manoeuvring capability at normal taxying speed of the most critical aeroplane for which the taxiway is intended. To provide the clearance distances it may be necessary to widen taxiways on the inside of curves to provide a fillet, the amount of widening depending on the wheelbase and track of the critical aeroplane and the radius of curvature of the taxiway centreline. The design of the curve should be such that the intent of paragraph 3.86 is met at all points on the curve. Fillets should be provided as required at junctions and intersections of taxiways with runways, aprons and other taxiways.

3.88 A straight portion of a taxiway should have a width of not less than:

1. 25 m where the code letter is F;
2. 23 m where the code letter is E, or D and the taxiway is intended to be used by aeroplanes with an outer main gear wheel span of 9 m or more;
3. 18 m where the code letter is D and the taxiway is intended to be used by aeroplanes with a main gear wheel span of less than 9 m; or

4. 18 m where the code letter is C and the taxiway is intended to be used by aeroplanes with a wheelbase of 18 m or greater;
5. 15 m where the code letter is C and the taxiway is intended to be used by aeroplanes with a wheelbase of less than 18 m;
6. 10.5 m where the code letter is B;
7. 7.5 m where the code letter is A.

Longitudinal slopes and slope changes

3.89 The longitudinal slopes of taxiways should be kept to a minimum to avoid tracking or handling problems. The longitudinal slopes should not exceed:

1. 1.5% (1:66) where the code letter is C, D, E or F;
2. 3.0% (1:33) where the code letter is A or B.

3.90 Where longitudinal slope changes on a taxiway cannot be avoided, the transition from one slope to another should be accomplished by a curved surface with a rate of change not exceeding:

1. 1% per 30 m where the code letter is C, D, E or F;
2. 1% per 25 m where the code letter is A or B.

Sight distance

3.91 Where a change in slope on a taxiway cannot be avoided, the change should be such that from any point:

1. 3 m above the taxiway it will be possible to see the surface of the taxiway for a distance of at least 300 m from that point where the code letter is C, D, E or F;
2. 2 m above the taxiway it will be possible to see the surface of the taxiway for a distance of at least 200 m where the code letter is B;
3. 1.5 m above the taxiway it will be possible to see the surface of the taxiway for a distance of at least 150 m where the code letter is A.

Transverse slopes

3.92 The transverse slope of a taxiway should be sufficient to prevent the accumulation of water but should not exceed:

1. 1.5% (1:66) where the code letter is C, D, E or F;
2. 2.0% (1:50) where the code letter is A or B.

Taxiway strips

3.93 A taxiway should be enclosed by a strip providing an area clear of objects which may endanger taxying aeroplanes and to reduce the risk of damage to an aircraft

running off the taxiway. The strip should extend on each side of the taxiway centreline throughout the length of the taxiway for a distance of:

1. 55 m where the code letter is F;
2. 47.5 m where the code letter is E;
3. 40.5 m where the code letter is D;
4. 26 m where the code letter is C;
5. 21.5 m where the code letter is B;
6. 16.25 m where the code letter is A.

3.94 The central portion of the taxiway strip should provide a graded area to a distance from the centreline of the taxiway of at least:

1. 30 m where the code letter is F;
2. 22 m where the code letter is E;
3. 19 m where the code letter is D;
4. 12.5 m where the code letter is B or C;
5. 11 m where the code letter is A.

3.95 On taxiway curves, junctions and intersections where extra pavement is provided, a corresponding increase should be made in the width of the taxiway strip and graded area.

3.96 The taxiway graded area should be flush with the taxiway along their common edges and should be maintained free from holes, ditches and debris that could damage an aeroplane or its engines. Special preparation of the graded area such as surfacing will help to avoid erosion by overhanging engines.

3.97 The transverse slope on the graded area of a taxiway strip, taken in conjunction with the transverse slope on the adjacent taxiway, should not be such as to cause a hazard to aircraft and should not exceed an upward slope of:

1. 2.5% (1:40) where the code letter is C, D, E or F;
2. 3.0% (1:33) where the code letter is A or B;

measured relative to the transverse slope on the adjacent taxiway.

3.98 The downward transverse slope of the graded portion of a taxiway strip should not exceed 5% (1:20) measured relative to the horizontal.

3.99 The transverse slope of a taxiway strip beyond that part to be graded should not exceed an upward slope of 5% (1:20) measured in the direction away from the taxiway and relative to the horizontal.

Taxiway holding bays and holding positions

3.100 A taxi-holding position or positions should be established on the taxiway, at the intersection of a taxiway and a runway. At grass aerodromes where taxiways are not provided, aircraft should hold no closer to the runway than the runway holding position sign.

3.101 A taxiway holding position, holding bay, or road-holding position is not to be located closer to the runway centreline than the edge of the relative cleared and graded area of the runway. On precision instrument approach runways this distance may need to be increased to avoid:

1. interference with radio aids;
2. penetration of the obstacle free zone by a holding aeroplane; or
3. a holding aeroplane being accountable in the calculation of Obstacle Clearance Altitude/Height (OCA/H).

Table 3.3 Minimum distance from runway centreline to holding bay, taxi-holding position or road-holding position

Type of runway	Code number			
	1	2	3	4
Non-instrument	30 m	40 m	75 m	75 m
Instrument and take-off	30 m	40 m	75 m	75 m
Precision instrument approach Category I	60 m	60 m	90 m	90 m
Category II			107.5 m	107.5 m
Category III			137 m	137 m

Notes:

1. The distance of 60 m for code number 1 and 2 is based on an aeroplane with a tail height of 8 m, a distance from the nose to the highest part of the tail of 24.6 m and a nose height of 5.2 m holding at an angle of 45° or more with respect to the runway centreline, being clear of the obstacle free zone.
2. The distance of 90 m for code number 3 and 4 is based on an aeroplane with a tail height of 20 m, a distance from the nose to the highest part of the tail of 52.7 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway centreline being clear of the obstacle free zone and not accountable for the calculation of OCA/H.
3. Where holding positions set to the distances above would fall within the ILS sensitive areas, the distances should be increased accordingly.
4. Holding positions must be located outside the CGA (see paragraph 4.4). Note particularly when the hold is not near a runway end.
5. For a precision instrument approach runway, code numbers 3 and 4, the Category 1 distance of 90 m should be increased to 107.5 m when the code letter is F.

Taxiway separation distances

3.102 The minimum distance between a taxiway and other aerodrome features should be as listed in table 3.4 if operational restrictions are to be avoided.

3.103 At aerodromes where these separation distances are not achieved, operational restrictions may include a limitation on the size of aeroplane using a particular taxiway, or the sterilisation of a taxiway when the runway is in use.

Table 3.4 Taxiway minimum separation distances (metres)

Code letter	Distance between taxiway centreline and runway centreline								Taxiway centreline to taxiway centreline	Taxiway and apron taxiway centreline to object (see note)	Aircraft stand taxi-lane centreline to object (see note)
	Instrument runway code number				Non-instrument runway code number						
	1	2	3	4	1	2	3	4			
1	2				3				4	5	6
A	82.5	82.5			37.5	47.5			23.75	16.25	12
B	87	87			42	52			33.5	21.5	16.5
C			168				93		44	26	24.5
D			176	176			101	101	66.5	40.5	36
E				182.5				107.5	80	47.5	42.5
F				190				115	95	55	50.5

Note: These distances may have to be increased on taxiway curves to accommodate the wing sweep of the critical aeroplane.

3.104 Objects essential to the use of a taxiway system which require to be sited closer than shown in table 3.4, column 5, should be kept at such a distance from the edge and at such a height, allowing for taxiway and strip transverse slopes, that the most critical aeroplane cannot strike them while keeping all wheels on the taxiway. Restrictions may be placed on the types of aeroplane which may use a particular taxiway if an object exceeds 0.36 m above the taxiway level within the following distances of the edge of the taxiway:

1. 22 m where the code letter is F;
2. 18 m where the code letter is D or E;
3. 11 m where the code letter is C;
4. 7.5 m where the code letter is A or B.

3.105 Between the distances in paragraph 3.104 and those in column 5 of table 3.4, objects should not exceed 1.5 m in height above taxiway level.

3.106 Acceptance of temporary obstacles near a taxiway will depend on the types of aeroplane using the taxiway. Clearance between an aeroplane wing tip and the temporary obstacle should be not less than 20% of aeroplane wingspan when the aeroplane is in the centre of the taxiway.

Rapid exit taxiways

3.107 Where rapid exit taxiways are provided they should have the specifications detailed in paragraphs 3.108 to 3.112.

3.108 Rapid exit taxiways should be designed with a radius of turn-off curve of at least:

1. 550 m where the code number is 3 or 4;
2. 275 m where the code number is 1 or 2;

3. to enable exit speeds under wet conditions of:
4. 93 km/h where the code number is 3 or 4;
5. 65 km/h where the code number is 1 or 2.

3.109 The radius of the fillet on the inside of the curve at a rapid exit taxiway should be sufficient to provide a widened taxiway throat, in order to facilitate early recognition of the entrance and turn-off onto the taxiway.

3.110 A rapid exit taxiway should include a straight distance after the turn-off curve sufficient for an exiting aircraft to come to a full stop clear of an intersecting taxiway.

3.111 The intersection angle of a rapid exit taxiway with the runway should not be greater than 45° nor less than 25° and preferably should be 30°.

3.112 The locations of rapid exit taxiways along a runway and their speed criteria, along with other guidance on the provision and design of rapid exit taxiways, is given in the ICAO Aerodrome Design manual, Part 2.

Taxiways on bridges

3.113 Where taxiways on bridges are provided, the width of that portion of a taxiway bridge capable of supporting aircraft should be at least the width of the graded area of the taxiway strip, unless a proven method of lateral restraint is provided which is not hazardous to aircraft.

3.114 Access should be provided to allow rescue and fire fighting vehicles to intervene in both directions within the specified response time to the largest aircraft for which the taxiway is intended. If aircraft engines overhang the bridge structure, protection of adjacent areas below the bridge from engine blast should be taken into consideration.

3.115 A taxiway bridge should be constructed on a straight section of taxiway, with a straight section at both ends of the bridge, to facilitate the alignment of aircraft approaching the bridge. As bridge deck temperatures fall faster than pavements, licence holders should be alert to the presence of ice.

Stopways

Introduction

3.116 A stopway is an area on the ground beyond the end of the Take-Off Run Available (TORA) which is prepared and designated as a suitable area in which an aeroplane can be stopped in the event of an abandoned take-off. TORA plus stopway makes up the Accelerate – Stop Distance Available (ASDA) (previously Emergency Distance (ED)).

3.117 A stopway is regarded as being provided for infrequent use and it need not have the same bearing or wearing qualities as the runway with which it is associated.

In some cases the natural surfaces will be adequate while in others some land drainage, ground grading or consolidation or even light paving may be required.

3.118 A stopway may be an economical substitute for what would otherwise have to be provided as paved runway to meet the take-off field length requirements of some aeroplanes, but when comparable field lengths are required in each direction, a stopway will be required at each end. This will require the availability of a longer overall runway strip than would result from extending the runway to meet the take-off field length requirements. The relative difficulties and costs of providing the extra length of runway strip for stopways, or of extending the runway, will normally be the decisive factors in deciding which course to follow.

Bearing strength

3.119 The load-bearing qualities should be sufficient to support the aeroplanes it is intended to serve without causing structural damage to the aeroplanes.

3.120 A stopway should be so prepared or constructed as to allow unimpeded passage by rescue and fire fighting vehicles.

Width

3.121 A stopway should have the same width as its associated runway.

Slopes

3.122 Slopes and slope changes on a stopway, and the transition from runway to stopway, should meet the requirements for the associated runway, except that the limitation of a 0.8% slope for the first and last quarters of a runway where the code number is 3 or 4 need not be applied. The rate of change of slope on a stopway should not exceed 0.3% per 30 m where the code number is 3 or 4, or 0.5% per 30 m where the code number is 1 or 2.

Clearways

Introduction

3.123 A clearway is an area which may be provided beyond the end of the TORA which is free from objects which may cause a hazard to aeroplanes in flight. In conjunction with the runway it provides an area over which an aeroplane can safely transit from lift-off to the required screen height. In certain circumstances it may be an alternative to an increase in runway length (see appendix 3C).

3.124 A clearway need not have bearing strength and may be land or water. It may extend outside the aerodrome boundary only if the aerodrome authority establishes such control that will ensure that the clearway will be kept free from obstacles or that the clearway plane will not be infringed.

Width

3.125 The width of clearway at the end of TORA should be not less than 75 m each side of the extended centreline of the runway, or, in the case of a non-instrument runway, the width of the runway strip. The width should expand linearly in the direction of take-off so that at the end of the Take-Off Distance Available (TODA) it equals the width at origin of the area within which obstacles are to be accounted for in the calculation of regulated take-off weight. This width is taken to be 180 m where the code number is 3 or 4 and 150 m where it is 1 or 2.

Length

3.126 The length of a clearway will be the least of either the distance to the first upstanding obstacle, excluding lightweight, frangible objects of 0.9 m or less in height, or the distance resulting from the application of the criteria in the following paragraphs, subject to an overall limit of 50% of the TORA.

Types of clearway

Normal clearway

3.127 The characteristics of a normal clearway follow from its function, which is to provide an area over which an aeroplane is able to complete its initial climb to the Flight manual specified height above ground level, or above the object that limits clearway. Minor surface irregularities are permitted including isolated depressions such as ditches running across the clearway. The surface will not require special preparation, but abrupt upward changes of slope are undesirable.

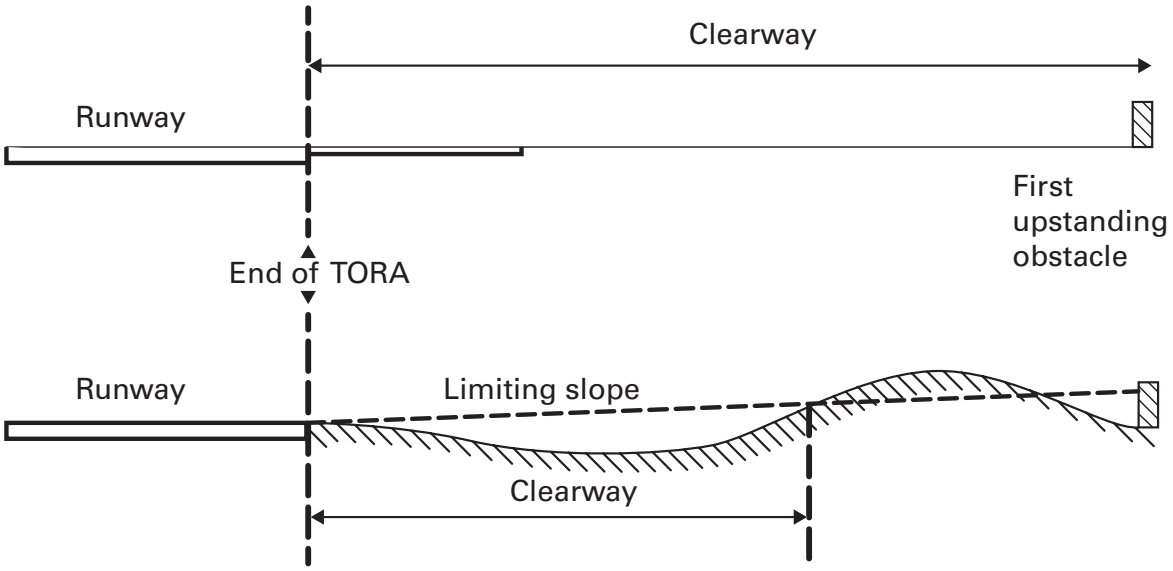
3.128 The length of a normal clearway cannot exceed whichever is the least of either the distance to the first upstanding obstacle (excluding lightweight, frangibly-mounted objects not exceeding 0.9 m above local ground level), or the distance to the point where the ground in the clearway projects above the slopes detailed in paragraph 3.130.

3.129 Within the area either side of the extended centreline of the runway and having the same width as the runway, the slopes, slope changes and transition from runway to clearway should conform to the requirements of the associated runway.

3.130 Over the remainder of the clearway, no part of the ground along any line parallel to the runway centreline should project above a longitudinal slope measured from the surface of the ground at the start of clearway on the line in question, and having an upward slope of:

1. 1.25% (1:80) for runways where the code number is 3 or 4; or
2. 2.0% (1:50) for runways where the code number is 1 or 2.

Figure 3.4



Horizontal plane clearway

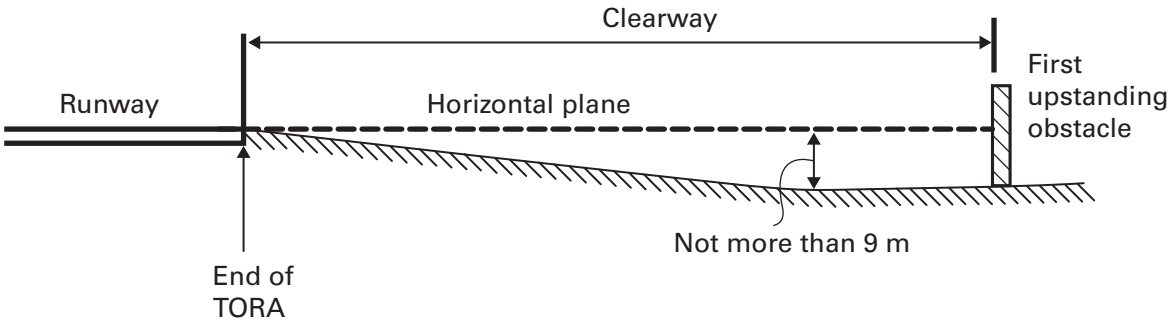
3.131 Except as provided in paragraph3.132, if the ground in the clearway falls at a longitudinal gradient exceeding:

1. 1.25% (1:80) for runways where the code number is 3 or 4; or
2. 2.0% (1:50) for runways where the code number is 1 or 2;

clearway may be declared on the basis of a horizontal plane commencing at runway level at the end of TORA and extending to the first upstanding obstacle, providing that the ground profile is never more than 9 m below the horizontal plane. Lightweight, frangible or frangibly-mounted objects are permitted to infringe the horizontal plane by not more than 0.9 m without affecting the declaration of clearway.

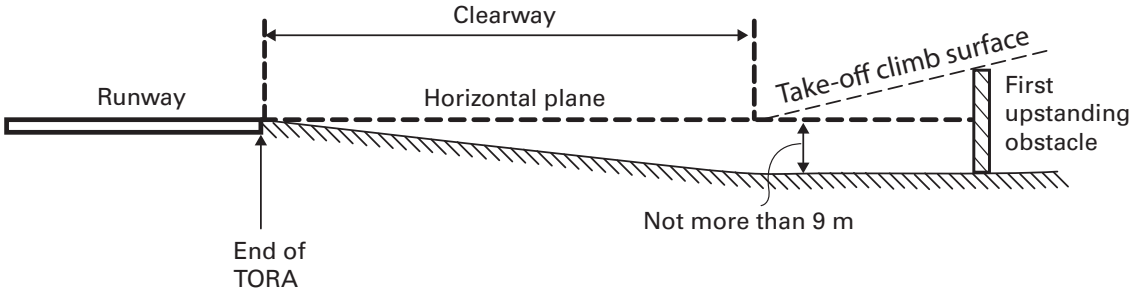
3.132 The elevation at the end of clearway for all gradients of clearway at or less than 1.25% (1:80) for codes 3 and 4 and 2.0% (1:50) for codes 1 and 2 is to be taken as actual ground level at the end of the clearway (i.e. origin of the TOCS). Should the length of the clearway and the gradient combined create a drop of more than 9 m from a horizontal profile taken from the origin of the clearway, then paragraph 3.133 would apply, in principle.

Figure 3.5



3.133 When the ground in the clearway falls to more than 9 m below the horizontal plane described in paragraph 3.132, the length of clearway will not exceed the distance at which the appropriate Take-Off Climb Surface (TOCS) projected downwards from the top of the first upstanding obstacle (other than non-accountable lightweight, frangible objects) intersects the horizontal plane. If the first upstanding obstacle is beyond a distance equal to one half TORA, it need not be taken into account for the calculation of clearway.

Figure 3.6

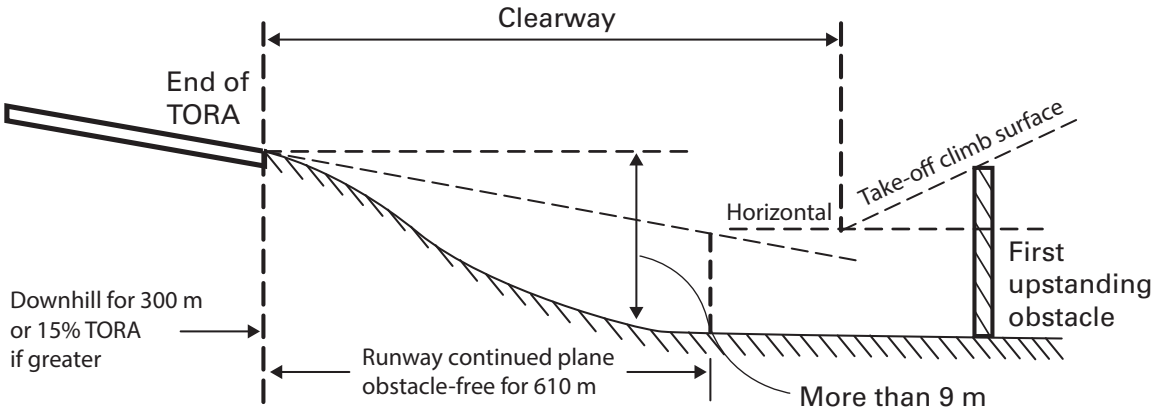


3.134 Horizontal Plane Clearway (HPC) calculated by one of the methods described in paragraphs 3.132 to 3.133 may be additional to normal clearway subject to an overall maximum clearway length of one half of TORA. When HPC is combined with normal clearway, the origin of the horizontal plane will be ground level at the end of the normal clearway.

Runway continued plane clearway

3.135 If the last part of the runway where the code number is 3 or 4 in the direction of take-off has a downward slope over a distance exceeding 300 m or 15% of TORA if this is greater, and the ground in the clearway falls more than 9 m below the elevation of the end of TORA, the clearway plane is a continuation of the last downhill part of the runway or of the mean overall downhill slope of TORA if this is steeper. For clearway to be calculated by this method, the down-sloping clearway plane cannot be penetrated by any obstacle for a distance of 610 m measured from the end of TORA. Beyond this point, clearway is calculated on the basis of a horizontal plane subject to the limits on distance specified in paragraphs 3.131 to 3.134.

Figure 3.7



3.136 Runway Continued Plane Clearway (RCPC) requires both the last part of the runway to slope downhill for the minimum distances specified in paragraph 3.135 and the ground to fall more than 9 m below the elevation of the end of TORA. If the ground in the clearway falls to less than 9 m below the elevation of the end of TORA, the aeroplane can be considered to be in ground effect and clearway may be declared under the terms of paragraph 3.131.

Calculation of the slope of take-off distance available

3.137 When any type of clearway is declared, the elevation of the runway at the start of TORA and the elevation of the far end of the clearway or clearway plane, as appropriate, are to be promulgated for calculating the overall slope of TODA.

Aprons and stands

Introduction

3.138 An apron is a defined area on a land aerodrome which is intended to accommodate aircraft for the purpose of loading or unloading passengers, mail or cargo, refuelling, parking or maintenance.

3.139 An apron may be divided into stands in order to facilitate the safe parking and movement of aircraft and people.

3.140 Separate aprons for long-term parking or maintenance may be necessary to reduce congestion in the main terminal area.

3.141 When an aerodrome is used extensively by helicopters which have skid undercarriages and are therefore obliged to hover-taxi between the apron and the operating areas, provision of a discrete helicopter apron is recommended.

Size

3.142 There should be room enough on the apron to provide for the number and types of aircraft expected to use it with adequate safety margins from obstructions including parked aircraft. The design of the apron should aim at facilitating the movement of aircraft and avoiding difficult manoeuvres which might require undesirable use of excessive amounts of engine thrust, or impose abnormal stress on tyres.

3.143 The dimensions of the apron should be such that the minimum clearance between a manoeuvring aircraft and any obstruction is 20% of wingspan.

3.144 For nose-in push-back stands this safety clearance may be reduced to 4.5 m where a suitably managed guidance system, acceptable to the CAA, is available.

Slopes

3.145 Slopes on an aircraft stand should not exceed 1% in any direction.

3.146 Aprons or stands should not slope down towards the terminal buildings. Where such slopes are unavoidable, special measures should be taken to reduce the fire hazard resulting from fuel spillage.

Aerodrome surface conditions

Introduction

3.147 In conjunction with the specifications for longitudinal and transverse slopes of runways, taxiways and strips, the type of construction and surface characteristics of the runway itself are probably the most important factors in maintaining safe aircraft operations and in alleviating the operational effect of surface contaminants. In particular, aircraft operations can be affected adversely when the movement area has a low surface friction or is contaminated by ice, snow, slush, water, mud, oil or rubber deposits.

3.148 The aim should be to provide in the first instance a runway surface that is clean and has a uniform longitudinal profile and friction levels that will give satisfactory braking action in wet conditions. These issues should be addressed at the time of the design of runways, pavements or subsequent resurfacing. Thereafter it is important to ensure that the surface qualities do not deteriorate below an

acceptable level by undertaking periodic inspection and maintenance. Details of the minimum requirement for periodic monitoring of airfield pavements are given in appendix 3F. Advice on airfield pavement design and maintenance, and runway surface evenness, is given in appendix 3A.

3.149 When the surface is affected by winter contaminants, the procedure in procedures in Information Notice IN-2013/181 should be followed.

3.150 In wet conditions the runway surface state should be reported to pilots as 'damp', 'wet', or 'standing water' as laid down by the CAA in the Manual of Air Traffic Services Part 1 (CAP 493).

Paved surfaces

Runways

3.151 It has been found that, after an initial period, the wet friction characteristics of a runway surface generally remain relatively constant and deteriorate only slowly over a period of time, depending on frequency of use. However, the friction level of a wet runway and thus the braking action available can vary significantly over a short period depending on the actual depth of water on the runway and the characteristics of the surfacing materials. Although there is no meaningful operational benefit to be derived from continually measuring the friction level of a runway in wet conditions, it is essential to monitor the friction level on a regular basis.

3.152 The surface of a new runway or a newly resurfaced runway should be designed and constructed to enable good braking action to be achieved by aeroplanes in wet runway conditions. When a new runway is built or an existing runway resurfaced, the wet surface friction characteristics shall be assessed in order to classify the friction level. Thereafter, the runway should be subject to periodic assessment in order to ensure that the friction level does not fall below an acceptable level. The procedures for runway surface friction assessment along with the friction criteria are given in CAP 683, The Assessment of Runway Surface Friction Characteristics.

3.153 The surface of a new runway or a resurfaced runway should be designed and constructed without irregularities or surface characteristics which would adversely affect the directional control, braking efficiency of anti-skid systems or ride characteristics of an aeroplane. Therefore, in addition to complying with the slope criteria of paragraphs 3.11 to 3.22 and friction criteria in CAP 683, the finished surface should be checked for such irregularities. In particular, the surface should be such that when a 3 m straight edge is placed anywhere in any direction across the surface, there is no deviation greater than 3 mm between the bottom of the straight edge and the surface of the pavement other than when the straight edge crosses the crown of a camber or a drainage channel. Further information can be found in ICAO annex 14 Volume 1, attachment A, paragraph 5.

3.154 Day-to-day operations of aeroplanes may lead to deformation of pavement layers or differential settlement of the pavement foundation, either of which will result in an increase in surface irregularity. Apart from increasing the possibility of control or braking difficulties, a greater depth of standing water can result which may initiate aquaplaning and, if sufficiently deep, can lead to engine water ingestion. Runway surfaces should be maintained so that standing water is avoided and no pool of water deeper than 13 mm can form or be retained on any part of the runway declared as available for take-off or landing. (The significant water depth for engine water ingestion for aeroplanes certified to the requirements of Performance Group A is 13 mm.)

3.155 Brief technical details of various runway surfaces which have been shown to provide the required good wet runway braking action are described in appendix 3A, together with criteria for 'feathering' during runway resurfacing.

Taxiways and Aprons

3.156 The surface of taxiways and aprons should have adequate draining characteristics and should provide good surface friction for aeroplanes using them. The surface of a taxiway should not have irregularities that could cause damage to aircraft.

Stopway

3.157 The surface of a paved stopway should have friction characteristics not substantially less than those of the associated runway and above the minimum friction level stated in CAP 683. It should be kept free from debris and loose material which could damage aeroplanes (see appendix 3E).

Movement area cleanliness

3.158 The surface of the movement area should be inspected at least twice on each day the aerodrome is available for operations, and adequate measures taken to ensure its cleanliness (see appendix 3F).

3.159 The surfaces should be kept free from loose stones, chippings, grit and other debris which might damage an aeroplane or its engines (see appendix 3E).

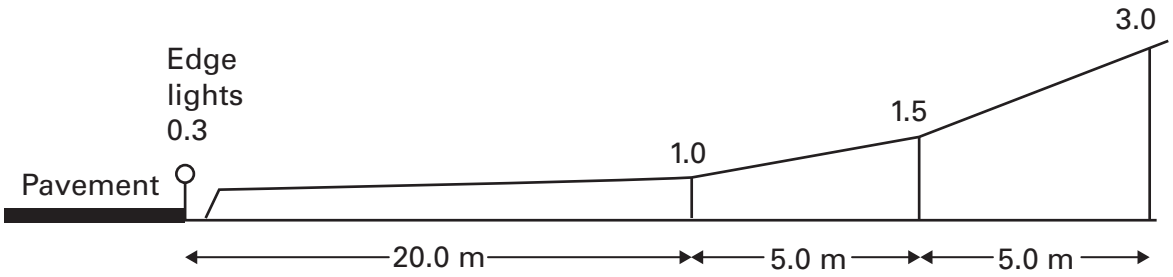
3.160 Contaminants such as mud, oil and rubber deposits lead to a deterioration in the friction value of a surface which could adversely affect aircraft and ground vehicles. The contaminants should be removed as completely as possible particularly from apron stands.

Winter conditions

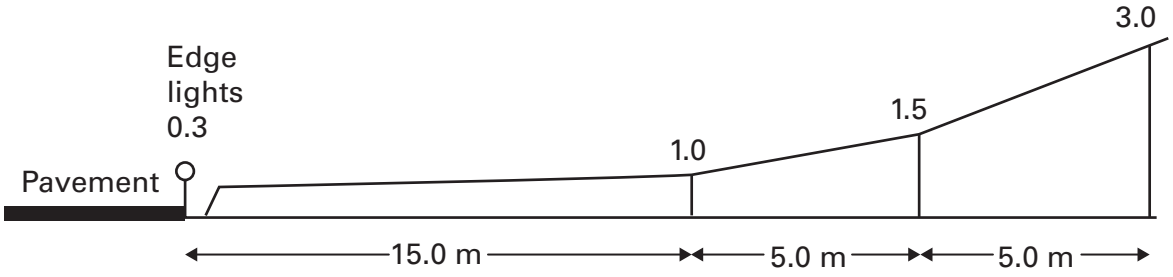
3.161 To allow aircraft movements to take place, snow, slush and ice should be removed from as much of the movement area as is required for safe operations (see appendix 3G). When snow banks remain at the edge of a cleared section of the movement area they should not exceed the profiles given in figures 3.8 and 3.9.

3.162 Aerodromes and airports listed as either a 'regular' or an 'alternate' in the current edition of ICAO Air Navigation Plan – European Region are required to draw up a snow plan in accordance with the National Snow Plan . Other aerodromes can be included in the National Snow Plan on request to the CAA.

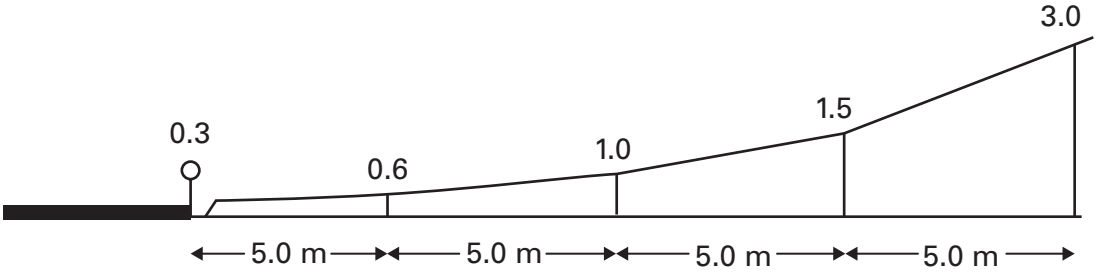
Figure 3.8 Acceptable profile of snowbanks showing maximum height in metres



(i) Runways used by A380

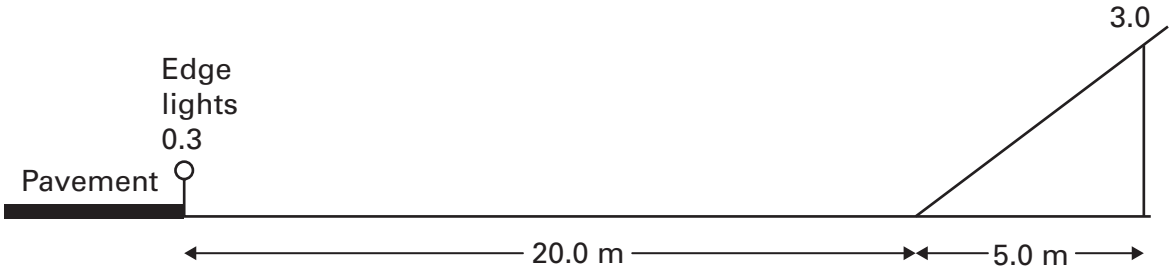


(ii) Runways used by B747, DC10 and L1011

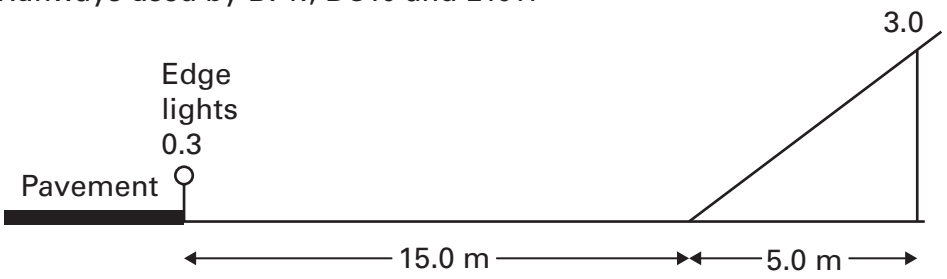


(iii) Runways used by other aeroplanes

Figure 3.9 Acceptable profile of fully cleared snowbanks showing maximum height in metres



(i) Runways used by B747, DC10 and L1011



(ii) Runways used by other aeroplanes

Unpaved surfaces

Runways

3.163 Natural surfaces of unpaved runways should be prepared or treated to remove irregularities which might adversely affect the directional control, braking or riding characteristics of an aeroplane. There should be no irregularities which would allow the collection of surface water or the discontinuity of bearing strength in wet conditions.

3.164 A simple method of assessing the evenness of a natural surface is to drive over it in a suitable vehicle. The surface should not display undue signs (e.g. wheel ruts) of the vehicle's passage and, if the surface is acceptably even, this test should be accomplished without discomfort to the vehicle occupants.

Stopways

3.165 An unpaved stopway should be prepared or constructed so that the braking action is not substantially less than that of the associated runway.

3.166 An unpaved stopway should be made resistant to erosion where it abuts a paved surface, and so prepared or treated as to minimise the hazard to an aeroplane running onto the stopway.

Length of grass

3.167 Within the manoeuvring area on a grass aerodrome the length of grass should not exceed the limits described in CAP 772, Aerodrome Wildlife Strike Hazard Management and Reduction.

3.168 Grass should be grown in accordance with the grass management regime as described in CAP 772 within RESAs, unpaved stopways and the graded area of runway and taxiway strips. To ensure adequate visibility of installed lights and signs, grass in their immediate vicinity should be closely mown. No more grass than is necessary should be closely mown.

Movement area cleanliness

3.169 The surface of the movement area should be inspected at least once on each day the aerodrome is available for operations, and adequate measures taken to ensure its cleanliness.

3.170 The surface should be kept free from loose stones, chippings, grit and other debris which might damage an aeroplane or its engines (see appendix 3E).

Movement area bearing strength

3.171 Pavement forming part of the movement area needs to be of sufficient strength to allow aircraft to operate without risk of damage either to the pavement or to the aircraft. Pavements subject to overload conditions will deteriorate at an increasing rate depending upon the degree of overload. To control this it is necessary to classify both pavement and aircraft under a system whereby the load-bearing capacity of the pavement and the loads imposed by the aircraft can be compared. The method used in the UK is the Aircraft Classification Number – Pavement Classification Number (ACN/PCN) method.

Operational requirements

3.172 All pavements forming part of the movement area should be of adequate bearing strength for the types of aircraft expected to use the aerodrome.

3.173 All pavements should be regularly examined by a suitably qualified person. For further details see appendix 3F. Any pavements which have been subjected to overload conditions should be closely monitored by suitably qualified staff for a period of several weeks or until it is clear that no rapid deterioration of the pavement has been triggered.

Reporting pavement bearing strength

3.174 The ACN/PCN method has been developed by ICAO as an international method of reporting the bearing strength of pavements which leaves States the option to use national methods for design and evaluation. Accordingly, the UK will continue to use criteria developed from the Load Classification Group (LCG) system for pavement design and evaluation, but the results will be converted into units of the ACN/PCN method.

3.175 The ACN/PCN method of classifying the bearing strength of pavements differs from the LCG method in that emphasis is shifted from direct evaluation of the pavement itself to the load imposed on the pavement by the aircraft. In this

respect, the load rating of the aircraft is most significantly affected by the sub-grade support strength of the pavement. ACNs are therefore numbers giving a relative load rating of the aircraft on pavements for certain specified sub-grade strengths. ACN values for most aeroplanes have been calculated by ICAO and are published in Aeronautical Information Publications. The PCN is also a number which represents the load-bearing strength of the pavement in terms of the highest ACN which can be accepted on the pavement for unrestricted use.

3.176 In order to calculate a PCN using the current UK criteria for design and evaluation, the normal method is to identify the aircraft which has the highest Load Classification Number (LCN) which can be accepted on the pavement for unrestricted use. This aircraft is designated as the critical aircraft for the pavement. To convert to the ACN/ PCN method, the ACN of the critical aircraft is notified as the PCN. This PCN value indicates that aircraft with ACNs appropriate to the pavement type and specified sub-grade that are equal to or less than the reported PCN can use the pavement without restriction.

3.177 As an alternative, a PCN can be identified and reported without a technical evaluation of the pavement by means of an assessment of the results of aircraft using the pavement. Providing the type and sub-grade support strength of the pavement are known, the ACN of the most critical aircraft successfully using the pavement can be reported as the PCN.

3.178 A PCN is reported in a five-part format. Apart from the numerical value, notification of the pavement type (rigid or flexible) and the sub-grade support category is also required. Additionally, provision is made for the aerodrome authority to limit the maximum allowable tyre pressure. A final indication is whether the assessment has been made by a technical evaluation or from past experience of aircraft using the pavement.

Overload operations

3.179 Individual aerodrome authorities are free to decide their own criteria for permitting overload operations as long as pavements remain safe for use by aircraft. The PCN value does include a safety factor so that a 10% increase of ACN over PCN is generally acceptable for pavements that are well consolidated and in good condition.

Unpaved surfaces

3.180 The bearing strength of unpaved surfaces cannot usefully be classified. The basic material, its degree of compaction, the quality of the sub-grade, and the drainage characteristics are examples of factors that can cause considerable daily variation in bearing strength.

3.181 After prolonged rain, the condition of an unpaved surface may become such that either further use by aircraft would result in serious damage to the surface or, due to the difficulty of assessing bearing strength, the surface can no longer be

considered suitable for take-off and landing. Where such conditions are likely to occur, a close watch should be kept on the surface and, if in the judgement of the aerodrome operator such action appears necessary, use of the aerodrome should be restricted or the aerodrome closed altogether.

Published details

3.182 Details of individual aerodrome ACN or PCN values are published in the AD 2 section of the UK AIP. See AD 2.12 - Runway Physical Characteristics, Column 4.

3.183 Details of the five elements of the code and an example are shown below:

Example [Letters in brackets refer to explanations]

56 (a)	F (b)	B (c)	X (d)	T (e)

1. The PCN number. Refer to aircraft manufacturer for individual aircraft equivalents.
2. Pavement type for ACN-PCN determination: Code
   - R Rigid pavement
   - F Flexible pavement
3. Sub-grade strength category: Code
   - A High strength: characterised by K

150 Nm/m^3 [3] and representing all K values above 120 Nm/m^3 for rigid pavements, and by CBR[4] = 15 and representing all CBR values above 13 for flexible pavements.

   - B Medium strength: characterised by K

80 Nm/m^3 and representing a range in K of 60 to 120 Nm/m3 for rigid pavements, and by CBR = 10 and representing a range in CBR of 8 to 13 for flexible pavements.

   - C Low strength: characterised by K

40 Nm/m^3 and representing a range in K of 25 to 60 Nm/m^3 for rigid pavements, and by CBR = 6 and representing a range in CBR of 4 to 8 for flexible pavements.

   - D Ultra low strength: characterised by K

20 Nm/m^3 and representing all K values below 25 Nm/m^3 for rigid pavements, and by CBR = 3 and representing all CBR values below 4 for flexible pavements.

4. Maximum allowable tyre pressure category: Code
   - W Unlimited: no pressure limit

3 Nm/m^3 means Newton metres per cubic metre which = 1 pascal, a unit of pressure.

4 CBR means California Bearing Ratio: a simple penetration test developed to evaluate the strength of road subgrades.

- X High: pressure limited to 1.50 MPa
- Y Low: pressure limited to 1.00 MPa
- Z Very low: pressure limited to 0.50 MPa

5. Evaluation method: Code
   - T Technical evaluation: Representing a specific study of the pavement characteristics and application of pavement behaviour technology.
   - U Using aircraft experience: Representing knowledge of the specific type and mass of aircraft satisfactorily being supported under regular use.

The use of block pavers on aerodrome movement areas

3.184 It is recommended that pavers should normally only be used to surface the following categories of aircraft pavements:

1. aircraft stands;
2. low speed taxiways not subject to significant jet blast or propeller wash;
3. aircraft maintenance areas not subject to significant jet blast or propeller wash;
4. helicopter pads.

3.185 Block pavers should normally not be used to surface the following categories of aircraft pavements:

1. runways;
2. areas where aircraft engines are run at high thrust values;
3. high speed taxiways.

3.186 Should aerodrome management wish to depart from these recommendations, they should first discuss this with their aerodrome inspector.

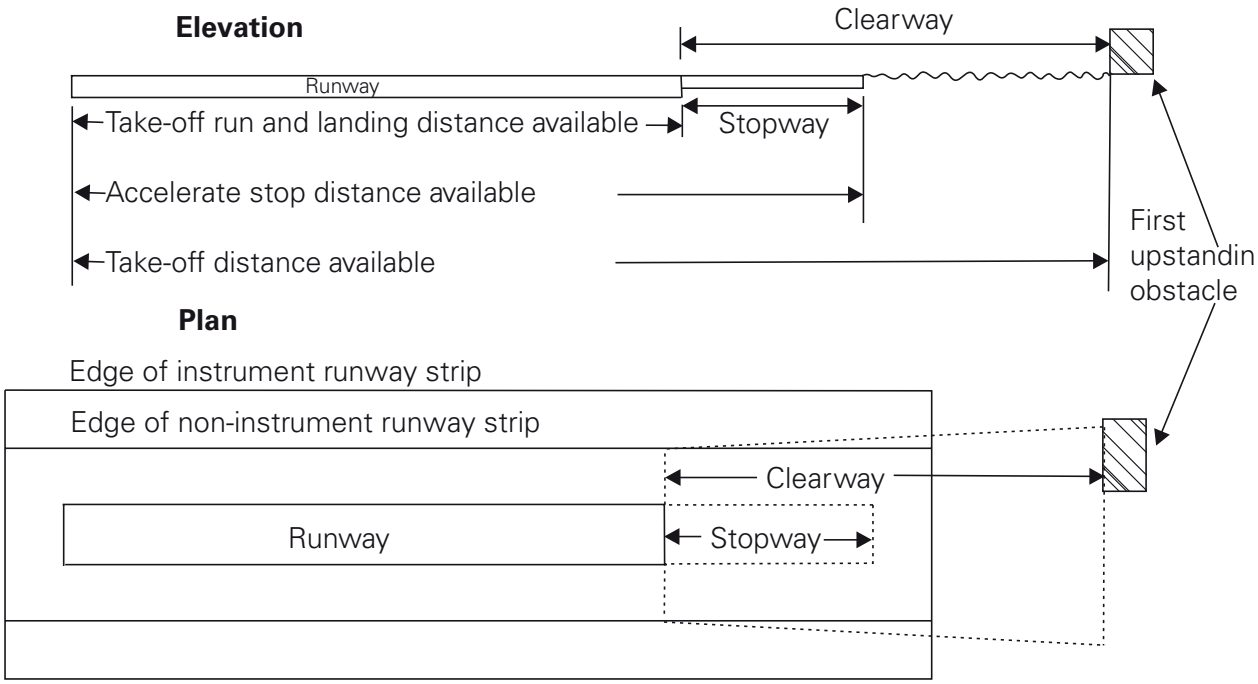
Declared distances

3.187 Aerodrome declared distances constitute the relevant distances for the application of the weight and performance requirements of the Air Navigation (General) Regulations in respect of aeroplanes flying for the purpose of public transport. The distances are illustrated in figure 3.10 and are:

1. TORA. This is the length of runway available and suitable for the ground run of an aeroplane taking-off;
2. ASDA. This is the length of TORA plus the length of any associated stopway;
3. TODA. This is the length of TORA plus the length of any associated clearway;
4. LDA. This is the length of runway available and suitable for the ground landing run of an aeroplane.

3.188 The significance and application of the runway/stopway/clearway concept in relation to aircraft performance is given in appendix 3C.

Figure 3.10



3.189 The TORA, ASDA, TODA and LDA should be measured to the nearest metre for each paved and unpaved runway direction. For this purpose unpaved runways are to be marked. The distances are measured along the centreline of the runway and of any associated stopway and clearway, and should be declared by publication in the UK AIP or in a NOTAM. declared distances may be reduced as outlined in appendix 3B. They may only be increased with the prior agreement of the CAA.

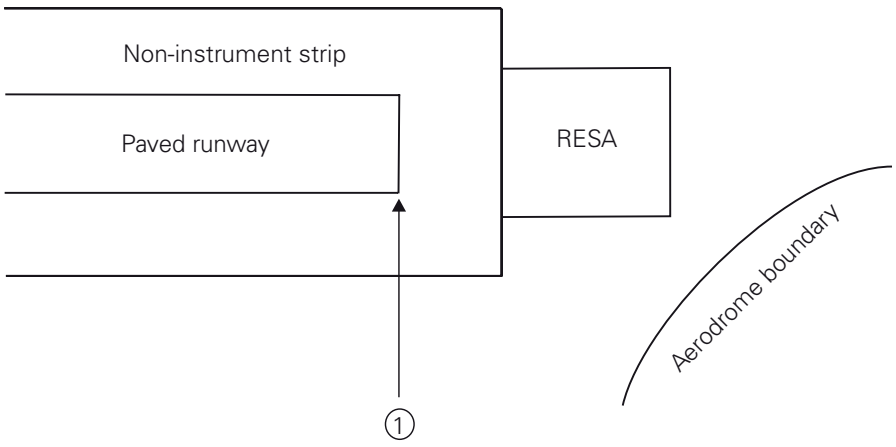
3.190 The intended use of a runway or part thereof for take-off or for landing using either visual or instrument approach procedures will determine the criteria to be applied in measuring the distances which may be declared. Alternatively, the ability to meet the criteria will decide what length of runway may be declared for what purpose. For example, a runway strip should extend beyond the end of a runway or stopway where the code number is 3 or 4 for a distance of 60 m at an overall width of 150 m. However, such a runway should also have a runway end safety area extending beyond the end of the strip for a distance of at least 90 m at a minimum width of twice that of the associated runway. The end of the declared TORA, ASDA and LDA should be adjusted so that the runway end safety area is provided as well as the required strip length and width. If the particular runway is served by an instrument approach procedure, the strip width to be applied when determining LDA will differ from that required for TORA and ASDA. Examples of the application of the various criteria are illustrated in figures 3.11, 3.12 and 3.13.

Threshold displacement

3.191 The threshold is the start of that part of a runway that is declared as available for landing. When the individual requirements for strip width and length, and runway end safety area are met the threshold will normally be located at the start of the runway. However, it may be necessary to account for any of these physical characteristics or an obstacle which cannot be removed and extends above the approach surface (see chapter 4) by displacement of the threshold from the runway end. The amount by which the threshold is displaced will vary with the individual circumstances of each situation, regard being given to:

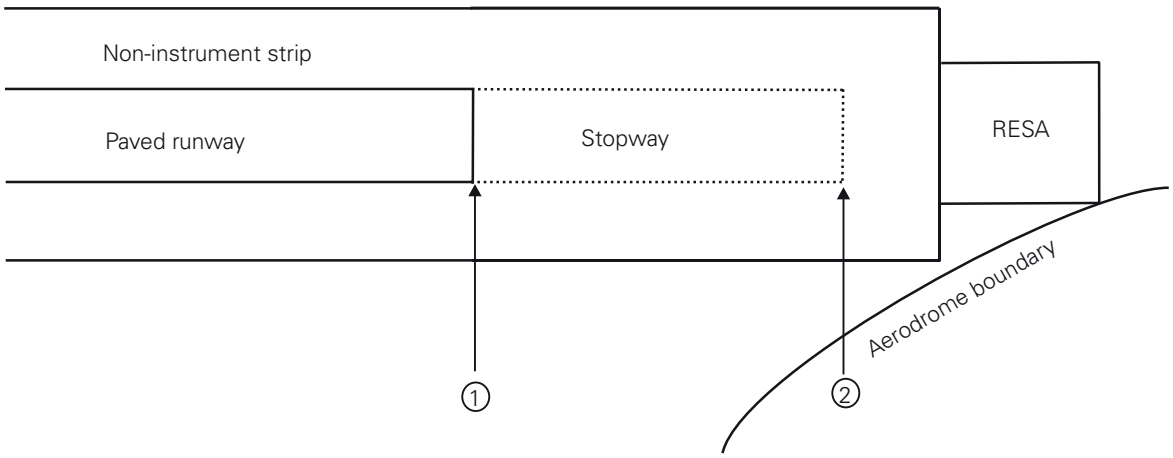
1. the nature, type and level of traffic;
2. whether the runway is an instrument runway or a non-instrument runway, and if it is an instrument runway whether it is a precision instrument approach runway or non-precision instrument approach runway;
3. the position of any obstacle that either affects the RESA or infringes the approach surface, in relation to the threshold and extended centreline of the runway;
4. the amount by which the obstacle penetrates the approach surface, and its significance in the calculation of the obstacle clearance height;
5. the angle of the glidepath or nominal glidepath for an instrument approach procedure and the calculated obstacle clearance height;
6. the limiting visibility and cloudbase conditions under which the runway will be used.

Figure 3.11



1. would be the end of TORA and ASDA (no stopway), and the end of LDA for a non-instrument runway. It would be the start of TORA, ASDA and TODA in the reciprocal direction, and also LDA unless the threshold were displaced because of obstacles in the approach area.

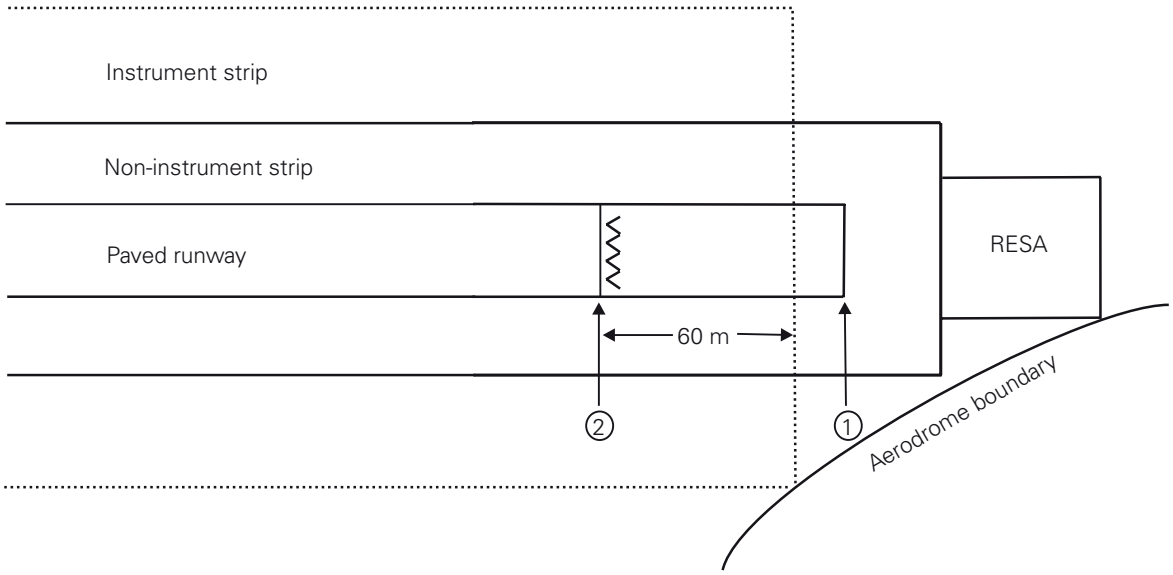
Figure 3.12



Here, in figure 3.12, the runway depicted in figure 3.11 has been supplemented by the provision of stopway.

1. would be the end of TORA and LDA for a non-instrument runway. It would be the start of TORA, ASDA and TODA in the reciprocal direction, and also the start of LDA unless the threshold were displaced because of obstacles in the approach area.
2. would be the end of ASDA, limited by the RESA short of the aerodrome boundary not by the strip width.

Figure 3.13



The runway of figures 3.11 and 3.12 has been extended by paving the declared stopway of figure 3.12 to full runway strength.

3. would be the end of TORA and LDA for a non-instrument runway. It would be the start of TORA, ASDA and TODA in the reciprocal direction, also LDA unless the threshold were displaced because of obstacles in the approach area.

4. would be the end of LDA for an instrument runway, the provision of the required instrument strip becoming the limiting factor, and the start of LDA in the reciprocal direction, subject to the availability of an acceptable obstacle free approach surface.

Declared distances from runway intersections

3.192 Aerodromes make use of intersection take-offs to maintain runway capacity and efficiency. declared distances from a runway intersection shall be calculated from the downwind edge of the taxiway. When defining the downwind edge, note should be taken of possible redundant paved areas at the side of a taxiway. The edge of the taxiway should be used as the start of the projection to the runway for the origin, excluding the redundant area.

3.193 The origin of full-length declared distances is, in most cases, the end of concrete; therefore, following aircraft line-up, the origin is behind the aircraft. An allowance for the length of the aircraft is taken into account when calculating the remaining distance. ICAO publishes the following in annex 6 Part I, chapter 5, paragraph 5.2.8.1: 'In determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the aeroplane prior to take-off.' Aircraft performance manuals make the same calculation for line-up allowance irrespective of where that line-up occurs along the runway. Therefore, flight crews would expect to calculate a similar correction distance at an intersection departure as for a full-length departure, regardless of where the origin is located. The use of the downwind origin as the basis for calculating declared distances from a runway intersection provides consistency with the full-length calculation.

3.194 Figures 3.14–3.16 illustrate how to determine the origin of intersection departures. Aerodrome licence holders should use this method to determine the origin of the TORA, in order to measure the distances for intersection departures accurately. Licence holders should liaise with their Aerodrome Inspector in order to notify intersection take-off distances in the AGA section of the UK Aeronautical Information Publication (AIP). A NOTAM should be issued to cover the period up to publication of the revised AIP entry.

Figure 3.14 Perpendicular runway entrance

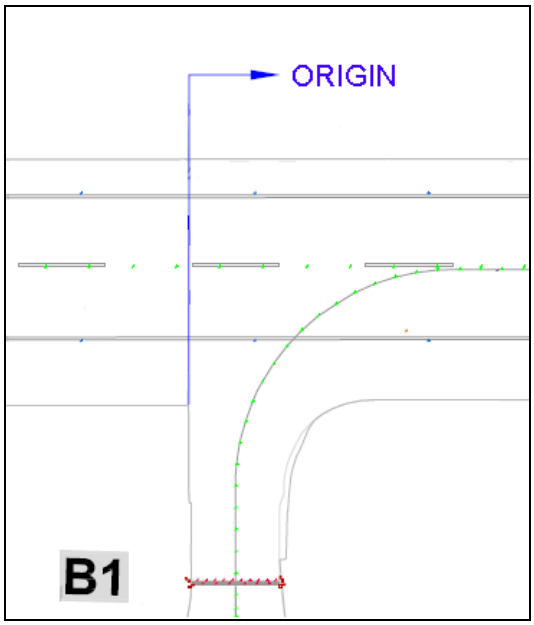


Figure 3.15 Redundant concrete at edge of entrance

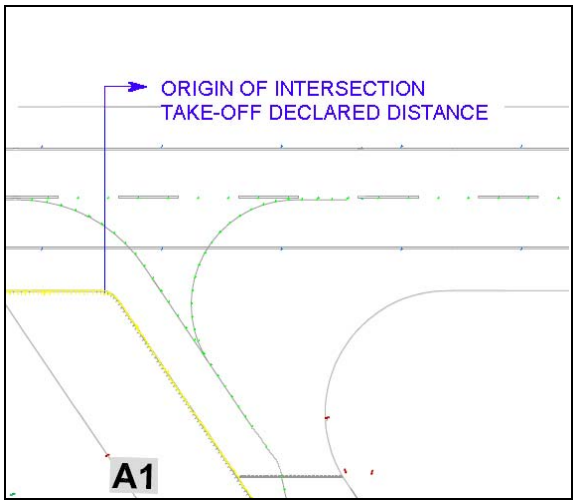
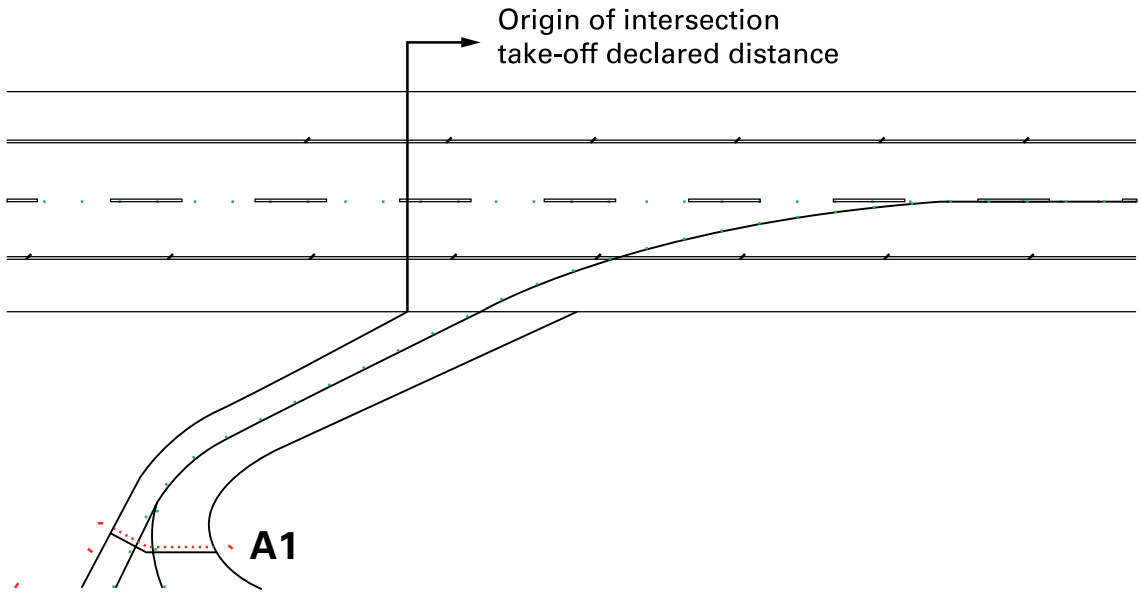


Figure 3.16 Rapid-access taxiway



APPENDIX 3A

Runway surfaces – technical details

Introduction

1. It is essential to ensure that a runway surface is sufficiently well constructed and maintained to stand up to the particular demands of aircraft take-off and landing operations. The principal requirements of a new or resurfaced runway may be summarised as follows:

    1. provide a surface friction level at or above the design objective level defined in CAP 683, The Assessment of Runway Surface Friction Characteristics;
    2. provide an average texture depth of not less than 1 mm;
    3. provide a hard durable surface that will not generate loose materials or contaminants;
    4. provide good rideability;
    5. provide good surface water drainage;
    6. avoid excessive tyre wear;
    7. avoid damage to the surface by aircraft manoeuvring;
    8. provide a stable surface that will not be damaged or removed by jet engine exhaust efflux;
    9. provide a suitable PCN for aircraft operations;
    10. provide an acceptable design life;
    11. meet the geometric criteria defined in chapter 3.

2. Further information can be found in ICAO Doc 9157 Aerodrome Design manual Part 3 Pavements and Doc 9137 Aerodrome Services manual Part 2 Pavement Surface Conditions or FAA Advisory Circular 150/5320-12C Change 8 Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces.

Surfacing materials

3. Brief details are given below of runway surfaces and treatments which have normally been found to provide good friction performance.

4.

Porous friction course

5. Porous friction course is open-graded asphalt laid to a uniform thickness of typically 20 mm with a high void ratio making it pervious. This allows the free penetration of surface water to the underlying layer which must be a densely graded impervious bituminous surfacing shaped to ensure drainage to the sides of the runway.

6. Porous friction course has good riding qualities, due to the close tolerances to which it is laid. Ice formation is retarded on a porous friction course and the thawing of both snow and ice is accelerated. In addition reverted rubber tends to crumble from, rather than stick to, the surface of the friction course.

7. It should be noted that, due to the use of a relatively soft bitumen binder, this can lead to softening of the surface during the first summer after laying. It is also important that the pavement joints are sufficiently porous to allow cross-flow of water.

Pavement Quality Concrete (PQC)

Coarse directional texturing by wire broom or comb

8. This surface texturing is formed in the plastic concrete by drawing a wire broom or purpose-made comb transversely across the surface of the plastic concrete surface at right angles to the runway centreline. During the laying of the concrete, regular measurements of texture depth are made on the coarse-textured slabs.

9. Provided the concrete is sound, grooving treatment wears well. However, when the concrete is old, and the surface seal is broken, exposing the aggregate, some deterioration of the concrete may then occur.

Grooving

10. The transverse grooving of hardened concrete is undertaken by a specialised machine to saw a groove in the surface of the concrete at regular intervals.

Asphalt

11. New or resurfaced runways with an asphalt surface normally do not provide adequate friction levels for aircraft operations immediately after the new surface has been placed. This is because it takes some period of time for the surface film of oils to be removed by traffic and weathering so as to expose the microtexture of the aggregate. For a number of years hot rolled marshall asphalt has been employed to surface runways in the UK where a flexible pavement is required.

12. A design requirement for a new runway surface may include new materials that provide the necessary friction characteristics[5] and offer at least 1 mm macro texture depth without the need for grooving. Such materials as Stone Mastic Asphalt (SMA), Béton Bitumineux Aéronautique (BBA) and Béton Bitumineux à Module Elevé (BBME) are all examples of this type of material. Aerodrome licence holders should satisfy themselves that the performance of any such materials can be demonstrated to meet the requirements set out in paragraph 1.

Coarse textured slurry seal

13. This method involves the application of a coarse-textured bitumen emulsion slurry seal with a graded crush rock aggregate from 3.35 mm down; however, care must be taken to ensure good adhesion of the slurry seal to any surface to which it is applied.

Grooving

14. The asphalt surface course is grooved transversely by a machine incorporating diamond saw blades. Grooving effectively adds macrotexture and there is a mathematical relationship between the width/depth of each groove plus the spacing at which they are cut and the amount of texture this adds. As an average texture depth of 1 mm is recommended by ICAO, a sufficient ungrooved texture depth for a new asphalt surface course should be achieved prior to grooving. It is the responsibility of the aerodrome licence holder to ensure that, should grooving be required, it is specified so that the additional benefit when added to the measured asphalt macrotexture exceeds the recommended minimum and takes local climatic characteristics into account.

Runway ramping during resurfacing

15. In order that operations may continue between periods of runway resurfacing or maintenance, the new surface and temporary ramps should be constructed across the full width of the runway. Before operations recommence, after a period of runway closure, the surface should be inspected to ensure that temporary ramps have been constructed as follows:

    1. the gradient of temporary ramps should not be steeper than 1:100 where the depth of overlay is not greater than 50 mm otherwise the gradient shall not be steeper than 1:200;
    2. the depth of ramp should not exceed 100 mm;
    3. the minimum spacing between successive ramps should be 150 m;
    4. all ramps should be constructed so as to remain stable and durable under aircraft operations;

5 See CAP 683 Assessment of Runway Surface Friction Characteristics and CAP 781 Runway Rehabilitation.

5. wherever possible ramps should be constructed with regard to the prevailing landing and take-off direction. It is undesirable for an aircraft to encounter an up gradient during take-off or landing, particularly in the touchdown zone.

Runway surface evenness and roughness

16. Information regarding runway surface evenness and roughness criteria may be found in ICAO annex 14, Attachment A and the Aerodrome Design manual Part 4 Pavements.

APPENDIX 3B

Temporary obstacles within runway strips

1. It is the responsibility of the aerodrome authority to notify pilots of the existence of all temporary obstacles within a runway strip either through the medium of ATC or by NOTAM. The following paragraphs give guidance on the operational implications of temporary obstacles within runway strips and the limitations which should govern the continued use of the runway.

2. A runway should be withdrawn from service or its length and declared distances restricted if there is an obstacle which cannot be removed within the area which is to be cleared and graded.

3. The amended distances declared as available will have regard for the differences in the area to be cleared for an instrument runway compared with a take-off runway. Thus with an obstacle say 80 m laterally from the runway centreline it may be feasible to reduce the landing distance available on an instrument runway but leave the take-off field lengths unchanged. Alternatively, the instrument procedure might be withdrawn. When the landing distance for an instrument runway is amended, the CAA shall be consulted in order to determine whether consequential amendments are necessary to the instrument approach procedure.

4. Declared distances have a statutory application and it is important that amendments are promulgated as they arise. The CAA may require to verify amended distances. The revised distances must be included in a NOTAM issued to advise pilots of temporary aerodrome conditions. It cannot be assumed that inbound pilots will have had access to the NOTAM and therefore the information should also be passed by R/T.

5. When there is a temporary obstacle within the runway strip but outside the area to be cleared and graded, the continued use of the runway may be permitted subject to the pilots being notified of the obstacle. Every effort should be made to remove the obstacle as soon as possible.

6. Temporary ditches or depressions are acceptable on only one side of the runway within the graded area at any given time. They should not exceed a surface area of 10 m^2 or exceptionally for narrow trenches a surface area of 30 m^2. There should be no earth banks or equipment above the original ground level of the area.

APPENDIX 3C

The use of runway, stopway and clearway – performance aspects

1. The decision to provide stopway or clearway as an alternative to an increased length of runway will depend on the physical characteristics of the site, and the performance requirements of the aeroplane expected to use the runway. Take-off performance is normally the critical factor, but landing requirements are occasionally overriding.

Rules on the amount of stopway or clearway which may be used vary according to the aircraft performance classification

2. The weight and performance requirements of the Air Navigation (General) Regulations require an aerodrome large enough to ensure that, taking account of ambient conditions, i.e. runway slope, surface wind, temperature, aerodrome pressure and altitude, the aeroplane can either be brought to rest or complete the take-off safely in the event of one engine failing during take-off. For the purpose of these notes it has been assumed that the lengths provided at an aerodrome are just adequate for the aeroplane at its proposed operating weight. Under these circumstances there is for each take-off a speed, called the decision speed, at which, if engine failure occurs, the aeroplane may be stopped within the ASDA or continue a take-off with equal safety. If an engine fails below this speed the take-off must be abandoned, while above it the take-off must be continued.

3. The decision speed is not a fixed speed for each aeroplane, but can be selected by the pilot within certain limits to suit the field lengths available at the aerodrome. For example, when the TODA is long and the ASDA is short, a low decision speed may be chosen. As ASDA increases or take-off distance decreases, so the decision speed may be increased. A variety of combinations of ASDA and take-off distance can accommodate a particular aeroplane at a particular weight. Each combination requires its particular length of take-off run which must consist of runway alone.

4. The most familiar case is where the TODA is equal to the ASDA: this is referred to as the balanced field length. When only runway is available, these distances will always be equal to the runway length. It is not essential that a balanced field length should consist of runway alone. Where it does not consist of runway alone, the take-off run required will be less than the ASDA as the balanced field length is then provided as runway plus stopway. If stopway is to be used and the runway is level, and can be used for take-off in both directions as is normally the case, an equal length of stopway would need to be provided at each end. The saving in runway is, therefore, bought at the cost of greater total strip length. If the runway is not level, or take-offs with a tail wind are acceptable, varying lengths of stopway will be required.

5. A decision speed other than that associated with the balanced field length conditions is selected when ASDA and take-off distances are unequal. Normally, only lower values are of interest, since higher speeds will always increase the requirement for stopway although reducing take-off distance requirements. By using lower decision speeds, the ASDA distance required will be reduced, i.e. less stopway required. However, additional clearway will be needed to provide for the increase in the take-off distance required. Exceptionally, the use of higher speeds would be an advantage when obstacles in the take-off area make it necessary to reduce to a minimum the take-off distance required.

6. At some aerodromes it may be expedient to provide both stopway and clearway.

7. Where the nature of the ground is such that stopway can be economically provided, there will be little gain in the substitution of clearway, since this will result in a greater total field length requirement. Where stopway cannot be economically provided and only runway and clearway are practicable, the take-off run available and ASDA will equal the runway length, while clearway will constitute the remainder of the take-off distance available.

8. If field length requirements at a particular aerodrome are critical for an aeroplane in Class 'A', the minimum runway, stopway and/or clearway lengths which can be used may be determined from flight manual performance data, as follows:

    1. If stopway is economically possible, the ASDA lengths to be provided are preferably those for the balanced field length. The runway length is the take-off run required or the landing distance required, whichever is the greater. If the take-off distance/ASDA required is greater than the runway length so determined, the excess may be provided as stopway, usually at each end of the runway (see chapter 3);

    2. If stopway is not to be provided, the runway length required will be the greater of the landing distance required and the ASDA required corresponding to the lowest usable value of the decision speed. The lowest practical value is the speed at which the ASDA required and take-off run required are equal, unless the minimum of the permissible range of decision speeds is higher. The difference between the take-off distance required and the runway length may be provided as clearway, usually at each end of the runway.

General

9. The paragraphs above provide guidance on how the proportions of runway, stopway and clearway may be determined to meet the needs of flight performance. Further information on aircraft flight performance can be obtained from ICAO annex 6 'Operation of Aircraft'.

10. The decision to provide stopway and clearway rests with the aerodrome licence holder; proposals should be developed as part of the aerodrome SMS, in co-operation with relevant airline partners.

APPENDIX 3D

National snow plan including procedures for dealing with winter contamination of aerodrome surfaces

Temporarily removed pending complete revision. IN-2013/181 Winter Operations 2012/2013 Runway Contamination Assessment Trial Report and Ongoing Procedures contains additional guidance pertinent to continuing operations on contaminated runways.

APPENDIX 3E

Aerodrome movement areas – clearance of Foreign Objects and Debris (FOD)

General

1. It is important in the interests of safety and economy to keep runways, taxiways and aprons clear of loose stones or other objects and debris that could cause damage to aircraft or engines, or impair the operation of aircraft systems. Turbine engines are extremely susceptible to damage as a result of foreign object ingestion. Propellers, aircraft skin and tyres have all been damaged as a result of loose stones or debris becoming dislodged by jet blast, slipstream or tyre action. Serious accidents have resulted from tyres being punctured by a metal object on a runway. Grit used on icy runways has led to control surface jamming and wet tar ingestion has led to engine failure. At all times, debris on the movement area of an aerodrome is a potential hazard to aircraft safety. An aborted take-off brought about by an engine failure or a wheel/tyre failure is particularly likely to result in debris being left on the runway.

2. Apart from the safety aspect, unscheduled replacement of parts or components damaged by debris will result in economic penalties for an aircraft operator. Damage to tyres resulting from contact with sharp objects, untreated joints or deteriorating pavement edges are responsible for reduced tyre life. The cleanliness of the surface of the movement area should be a matter of continuous concern and attention to an aerodrome authority.

3. FOD typically falls into two main categories:

    1. that on the runway consists largely of aircraft parts, typically small metal panels or metallic honeycomb structures, and tools, torches and equipment, including wheel chocks;

    2. that on the taxiways and aprons is usually associated with vehicles and smaller items associated with passenger baggage, catering and cargo handling equipment or is from adjacent WIP.

4. All personnel involved in operations on the aerodrome movement area, maintenance hangars and aircraft turnrounds have equal responsibility to ensure that their particular operation does not give rise to FOD. Likewise, every member of staff should act when they detect FOD, either by removing it, should that be safe so to do, or reporting it immediately to the appropriate authority. Above all, FOD should be prevented.

5. Aerodrome and aircraft operators, maintenance and ground handling organisations should include FOD prevention in their induction and continuation training programmes, for all airside, maintenance and hangar staff. Specific procedures for the elimination of the risk of FOD should be implemented and working practices that pose a high risk of providing FOD should be reviewed.

6. Closer co-operation between aerodrome licence holders, aircraft operators and their service partners should be fostered. The topic of FOD should be a standing agenda item for all aerodrome users' committee meetings and internal safety meetings.

7. No proprietary system has yet been proven to be fully effective in the detection and identification of FOD on runways. However, while future developments of such systems should not be discounted, the use of advanced technology should only supplement current methods of inspection.

8. Aerodrome licence holders should regularly review their FOD policy and assure themselves that it remains effective. They should also ensure that any third party operation on the aerodrome can demonstrate a satisfactory level of FOD awareness and that their working procedures do not increase the likelihood of FOD.

Pavement surfaces

9. Particular care is needed in the maintenance of the surfaces of manoeuvring areas, especially where the pavement shows any signs of deterioration or damage. All joint sealants, crack repairs, patching and maintenance works should be stable and permanent even under the influence of aircraft movements, slipstream or jet efflux.

10. Pavements should be adequately sealed and joints properly filled to permit effective sweeping without forming a trap for debris. Runway and taxiway shoulders should also be adequately sealed and care exercised to minimise the risk of ingestion into turbine engines of vegetation, grass cuttings, and debris that can result from erosion of the surface by overhanging turbine engines. It is possible for stones to be thrown onto runways and taxiways during grass cutting or other work on areas adjacent to paved surfaces, and the potential hazard to aircraft that this presents should be minimised by frequent inspections during such activities, sweeping as necessary.

11. Newly surfaced areas can also be sources of hazard from engine ingestion. These areas should not be used by aircraft until the material is no longer susceptible to being picked up by the aircraft wheels or spattered on any part of the aircraft.

Grit and spoil

12. Sand used to clean fuel and oil spillage from aprons is a potential cause of turbine engine and propeller damage and should be removed immediately after use.

13. Where construction is in progress on aerodromes, authorities should, if practicable, prohibit use of the movement area by contractors' vehicles or at least minimise such use by restricting them to marked lanes, particularly when the vehicles are engaged in transporting the types of load from which spillage frequently occurs, e.g. building waste, gravel and fill. Earth and stones adhering to the wheels of such vehicles can also become dislodged and subsequently create a hazard to aircraft using the same areas. Where building construction is in close proximity to the movement area, it is important that some form of screening be provided to prevent sand and small stones being blown onto the movement area by high winds or jet blast. Following the completion of construction the contractor should be required to remove all debris from the surrounding areas and not leave piles of dirt, or rubble, on the aerodrome surface.

Packages and wrappings

14. The widespread use of polythene bags and sheets on aprons is another potential source of damage to engines through ingestion. Suitably covered receptacles for such litter should be provided in sufficient numbers by aerodrome authorities. Similar receptacles should also be provided on all vehicles which use the movement areas on a routine basis.

15. Cargo areas are particularly liable to contamination from loose strappings, nails, wire, paper and wood etc. from crates or containers discarded in the course of handling, in addition to the polythene sheets mentioned above.

Inspection and standards of cleanliness

16. For details of inspection procedures see appendix 3F.

17. Aerodrome authorities should impress the need for apron cleanliness upon those in control of such staff as airline ground handlers, aircraft caterers, fuel suppliers, cleaners and freight agents who have access to the movement area in the course of their duties.

18. Analysis of any debris on the movement area should be undertaken to determine its origin, and the frequency of cleaning operations increased in those areas where contamination is highest. Remedial measures should be taken with those responsible.

Aircraft debris

19. Flight crews are expected to report at once to ATS any incident during take-off or landing which might result in a part of the aircraft's structure becoming detached and left behind on runways or taxiways. Ground engineering staff should also be asked to collaborate by reporting to ATS minor damage to aircraft which may have left debris on runways. Failure to make these reports to ATS could mean that debris remains on the runway for longer than would otherwise be the case, and thus, particularly at night, constitute an avoidable hazard to other aircraft taking off and landing.

20. Whenever debris is reported on the movement area, whenever a take-off is abandoned due to engine, tyre or wheel failure, or whenever an incident occurs that is likely to result in debris being left in a hazardous position, the runway, taxiway or apron as appropriate should be inspected and any debris removed before any other aircraft is allowed to use it.

Equipment for the removal of debris

21. Guidance on suitable equipment for providing clean aerodrome pavement is given in the ICAO Airport Services manual Part 2.

APPENDIX 3F

Aerodrome pavement maintenance and inspection procedures

Introduction

1. Aerodrome pavements to runways, taxiways and aprons are critical to ensure that hazards to aircraft are minimised and to the safe, efficient and economic operation of an aerodrome. As such they represent a significant capital investment that must be preserved in a suitable condition for the particular demands of aircraft operations.

2. Aerodrome pavements are complex structural systems and their performance depends on a large number of variables relating to the unique mix of aircraft operations, pavement materials and environmental conditions at each aerodrome. As with all aerodrome assets, the most effective means of preserving these pavements in a suitable condition is to implement appropriate inspection and maintenance procedures.

3. Aerodrome licence holders should be aware of the importance of timely and disciplined core runway inspections and have suitable procedures to ensure that such inspections are undertaken effectively. Regular inspections should be planned so as to ensure that an appropriate level of vigilance is maintained at all times. These will also improve the level of understanding of the changes under local conditions and allow for maintenance activities to be proactive. The inspections should address the following related items:

    1. inspection of the runway surface condition, including water drainage characteristics;
    2. FOD detection and removal;
    3. aeronautical ground lighting fittings within the pavement including the structural integrity of the fittings;
    4. signage, markings and other visual aids;
    5. cleared and graded areas;
    6. wildlife control and the removal of remains.

4. A runway inspection involves the deliberate entry of an active runway. It is therefore essential that any hazards associated with this activity are identified and addressed so that each agency with an inspection duty has a clear understanding of what is involved and how the task is carried out safely.

5. All personnel with a task that involves entering a runway should clearly understand their responsibilities and the identified hazards. This training should be recorded and a system of review should be established so that new hazards can be identified and new training needs satisfied.

6. The aerodrome licence holder should ensure that the development and use of runway inspection procedures are addressed in the safety management system employed at the aerodrome.

Documentation

7. All aerodrome inspections, maintenance activities and matters arising from such should be formally documented by the aerodrome licence holder and records maintained for future reference.

8. Each inspection should include a reporting mechanism to ensure that appropriate action is taken. Reports should include details of the task(s); any remedial action(s) necessary or taken; should identify the person/agency responsible for undertaking the task and/or further action; and should identify the timescale by which it should be completed.

Daily inspections

9. The movement area should be inspected by aerodrome operations staff at least twice a day, although this may be increased dependent upon the movement rate and duration of operations, but the inspections should be spread over the main times of operational activity.

10. Inspections planned to take place during the hours of darkness may need to be done in a different manner from those undertaken during the daytime, with consideration being given to the presence of vehicles, people, lighting etc. The inspection should check the current suitability for aerodrome operations and the presence of FOD. Inspections may be undertaken from a vehicle travelling at a speed suitable to the task.

Weekly inspections

11. All aerodrome pavements within the movement area should be inspected in more detail at least once a week.

12. The inspection should check the integrity of the aerodrome pavements and should give particular attention to those areas subject to high loads such as departure taxiways, thresholds and high speed operations. High levels of jet blast are known to be a cause for concern. Inspections should be undertaken preferably on foot but may be made from a slow moving vehicle.

Annual inspections

13. All pavements within the movement area should be subject to inspection by a professional qualified engineer at least once a year. Inspections should be undertaken on foot and should cover the whole of the movement area or a statistically significant sample.

Optional inspections

14. Specific additional on-runway inspections, for example, wildlife hazard control or FOD detection, might be undertaken by a single vehicle and should be carried out at an appropriate speed for effective monitoring.

15. Off-runway observations may be taken from various vantage points, such as the edge of the clear and graded area, holding points, taxiways or tracks. Observations should be carried out from a stationary vehicle, with binoculars. These types of inspections may only be possible during daylight hours and, if utilised, should be integrated with the core 'onrunway' inspections.

16. Daily runway lighting checks are normally undertaken in order to identify unserviceable lamps and possible failures of light fittings. It might be possible to incorporate inspections of particular areas of the runway at the same time. These inspections will need to integrate with the other on-runway inspections and be flexible in timing to cater for the variability of the onset of night.

17. Runway walking inspections can provide a more thorough examination of the runway. The number of full walking inspections planned for each year will depend upon the age and use of the runway surface, and the level of operations undertaken at each aerodrome. Suitable opportunities for this type of inspection may include during and after periods of maintenance, when engineering staff are working on the runway.

18. A runway inspection should be conducted in the vicinity of the working area after completion of the works to ensure that tools, machinery and other forms of FOD are not present. This is particularly important after works at night where there is a greater risk of the misplacement of work items.

Detailed pavement inspection and evaluation

19. The inspection procedures described address the functional condition of the surface of the aerodrome pavement but do not consider the structural condition of the pavement construction as a whole. In order to monitor the change in the condition of aerodrome pavements over time, it is recommended that aerodrome authorities establish a formal index to define pavement condition.

20. The pavement structure has a limited operational life that will be related in part to the declared PCN. The ACN/PCN method is described in chapter 3. The aerodrome should review declared PCN values in the light of the functional condition.

21. A detailed pavement inspection of functional condition should normally be undertaken every 2-4 years and a detailed pavement structural evaluation every 5-10 years. However, the frequency will depend on the age, condition and usage of each area.

22. The regular inspection and evaluation of aerodrome pavements can be the first step in establishing a formal management system that will provide significant advantages to aerodromes by improving the ability to predict, plan and budget for future maintenance work. A number of computerised systems are available.

APPENDIX 3G

Care of pavements during winter conditions – improving surface friction by removal of contaminants

(See also ICAO Airport Services manual Part 2 'Pavement Surface Conditions')

Chemical methods

1. Many chemicals that might be used to improve the friction coefficient of a movement area contaminated with ice, snow, slush or associated water are corrosive and harmful to aircraft components. It is, therefore, essential to confirm before using any chemical for this purpose that it has been tested and found harmless to aircraft components and light fittings and that it is acceptable ecologically.

2. Chemicals are best used as anti-icers. They may be in pellet or liquid form but neither is universally satisfactory. Liquids used on a bare pavement can cause a loss of traction; and the pellet form is unsuitable for use on a porous friction course as it results in an uneven spread of anti-icing liquid and pockets of water in the surface layer.

3. When chemicals are used as de-icers the result can be an icy surface covered by melt water, one of the most slippery of surfaces. This can be avoided by using pellet chemicals on a dry icy surface to loosen the ice which should then be removed mechanically.

4. Following the severe winter of 1978–79 considerable frost and ice damage was experienced, mainly to concrete pavements which had hitherto been satisfactory for a number of years. Investigations revealed a link between the use of liquid chemicals for pavement de-icing and the damage reported. Concrete when hardened contains a series of pores or voids which, depending upon the local weather conditions, may be partially or completely filled with water. This water, if it freezes, expands by approximately 9% but is usually safely accommodated by adjacent voids or by relief to the surface. The slower the rate of refrigeration the more safely this process can evolve. If the refrigeration rate is fast, or the surface is already frozen, there is a risk of damage to the pavement.

5. If ice forms on the concrete before a de-icing chemical is applied, it is quite probable that there will be water-filled voids below the surface. The de-icer is subjected to very rapid cooling and the latent heat required to melt the ice is quickly drawn from the nearest available source, which in this case is the pavement. The more concentrated the chemical the more rapid is the refrigeration of the concrete, and the water in the voids may be turned to ice. If the resultant expansion cannot be relieved safely, the concrete surface will be damaged.

6. To reduce the risk of damage, the concrete used in modern pavements is air-entrained. Minute air bubbles are dispersed through the matrix and tend to act as cushions to absorb expansion. This process does not make the surface completely damage proof, so even comparatively new concrete pavements should be treated with care.

7. It is always better to apply chemicals in advance to prevent ice forming. In the event that this cannot be done, the minimum amount of chemical should be used so as to reduce the risk of damage, even if it takes a little longer to remove the ice. As a guide, the maximum rate of spread for undiluted fluids should be 0.35 fluid ozs per square yard, equivalent to 1 kilo per 75 square metres. Records should be kept to determine the actual rate of spread achieved.

8. Whilst the above recommendations are for concrete pavements, bituminous surfaces should also be treated cautiously, especially if they are old. Though surfaces which are in good condition will not be liable to disruption, with age the thermoplastic binder can become brittle and porous, making the pavement vulnerable. Often, a new bituminous surface is laid over an old surface which contained extensive cracks. As time passes, these cracks tend to widen and the cracking is propagated upwards through the new surface and continued frosts aggravate the condition.

Mechanical methods

9. Mechanical methods of clearance should commence as soon as the snow begins to accumulate on the surface. The machinery employed will depend upon the type of snow, whether wet or dry, and the direction and strength of the wind. Normally, runway sweepers should be used first and for as long as they remain effective. Snow ploughs and blowers should supplement the sweepers only when the sweeper cannot efficiently remove the accumulation. The use of vehicles with chains, high speed snow drags and underbody metal scrapers should be forbidden.

Sand/grit

10. Engine turbines will suffer erosion damage if even the finest grain sand is ingested. For this reason, sand should only be used on runways as a last resort. However, if it is necessary to use sand or grit to increase friction on the movement area, it needs to be carefully selected and the supply should be rigidly controlled to ensure that the material meets the specification at paragraph 12. below and is free from soluble salts. Loads containing oversized particles should be rejected, as should any flint-type material.

11. Normally runways should be swept clean of grit as soon as ice has melted but if they are gritted because of the imminent return of freezing conditions, pilots should be warned of the presence of 'dry' grit on the runway. It is particularly important to clear away any slush that is contaminated by grit. Such a combination thrown up by the wheels increases the risk of damage by ingestion.

12. Sand/grit should have an aggregate crushing value of less than 20 when tested in accordance with British Standards BS 812, 1973, Part 3 and be of the following sizes:

Metric	BS 410 sieve	US	% By weight passing
3 mm	1/8 inch	No. 6	100
1 mm	No. 14	No. 16	0 – 20
0.25 mm	No. 52	No. 50	0

13. The use of limestone chippings is not recommended as they do not provide good runway friction qualities and are wasteful in providing a high percentage of fines.

Porous friction course

14. A porous friction course presents a specific problem because of the nature of its construction. If water should be present in the pores of the friction course when freezing takes place, damage may be caused by expansion of the water within the pores, or ice protrusions may form on the surface of the runway as water is forced back onto the surface. To prevent these two possibilities, the principle of anti-icing should be followed using liquid chemicals to provide an even distribution of anti-icing fluid to infiltrate the whole structure. Aerodrome licence holders should satisfy themselves that the use of such chemicals does not breach environmental protection laws.

Ice detectors

15. Ice detectors can provide an accurate assessment of surface conditions and lead to the efficient and cost-effective use of anti-icing or de-icing materials.

APPENDIX 3H

Starter extensions

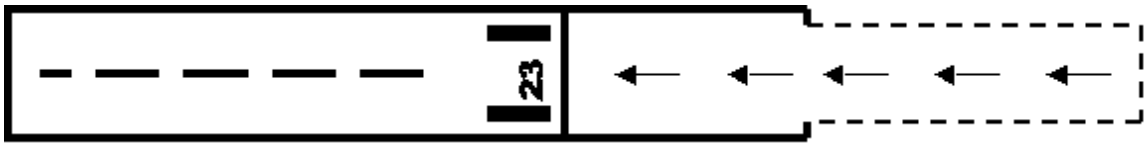
1. There are circumstances where additional declared distances may be provided at the start of the runway. Consequently, the term 'starter extension' was introduced to permit additional runway distances to be utilised for take-off. For the requirements for these additional distances see chapter 3.

2. Starter extensions may be utilised to provide additional runway declared distances. So as to ensure that its purpose cannot be mistakenly interpreted as pre-threshold runway, stopway or clearway, the length of a starter extension is limited to a maximum of 150 m and the width to two-thirds of the normal runway requirement.

   Note: It may be necessary to provide extra width at the end of a starter extension to enable aeroplanes to turn around.

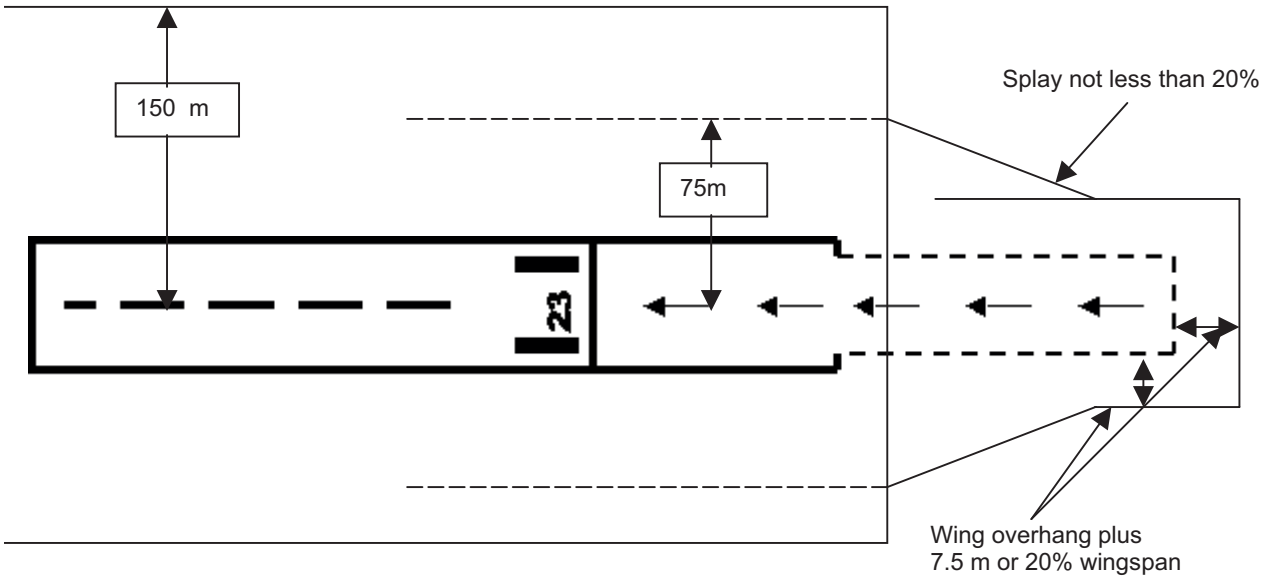
3. To differentiate further between a starter extension and pre-threshold runway, runway edge markings for the pre-threshold runway are to be consistent with those of the post-threshold runway, i.e. solid white lines, while those of the starter extension should be dashed white lines of 15 m length with 15 m spacing between each line. The width of the dashed white lines should be half the width of the centreline marking.

Figure 3H.1 Starter extension and pre-threshold markings



4. Starter extensions should be lit in accordance with the requirements given in chapter 6 with runway strip requirements as shown in chapter 3.

Figure 3H.2 Starter extension safeguarding



5. Aerodrome licence holders should ensure runway declared distances published in the AIP are amended to include starter extensions at the earliest opportunity. To get a full picture of the effect the starter extension has on declared distances, TORA, TODA and ASDA should include the length of any starter extension. Promulgation should follow the example shown below:

AD2.12 – RUNWAY PHYSICAL CHARACTERISTICS

This section should indicate length of full-width runway only. The remarks column could include the description of any starter extensions in use and which runways are affected, e.g. 'Runway 10 has a starter extension of 150 x 30 m. Hard shoulder width at starter extension is 15 m'.

AD2.13 – declared distances

Should a starter extension be utilised, the published TORA, TODA and ASDA should include the starter extension distance. The remarks column should then include a statement along the lines of: 'Runway 10 declared distances include a starter extension of 150 x 30 m'.

APPENDIX 3I

Runway end safety areas (assessment)

Introduction

1. Aerodromes are required to provide Runway End Safety Areas (RESA) for runways as specified in chapter 3. For applicable runways where the RESA does not extend to the recommended distance, as part of their safety management system, licence holders should assess the risk of both a runway excursion and a runway undershoot and implement appropriate and suitable mitigation measures as necessary.

2. For the purpose of this guidance, runway excursions include an overrun or veer off on landing or during an aborted take-off. An aerodrome's assessment of RESA should consider each of these scenarios.

3. The aim of this guidance is to assist licence holders in assessing the level of risk of an aeroplane undershooting or overrunning a runway at their aerodrome and suggest mitigation measures that may be appropriate, both to reduce the likelihood and to reduce the potential effects of an event.

Aeroplane performance

4. In general pilots must calculate the take-off and landing distance required using performance charts/tables provided for each type of aeroplane by the manufacturer. These calculations must take into account the mass and configuration of the aeroplane and operational variables such as the physical characteristics of the runway, the obstacle environment surrounding the runway and environmental conditions such as temperature, pressure, precipitation and the head or tail wind component.

5. For public transport or commercial air transport operations, there is a legal requirement to include a safety margin in the calculations to allow for unforeseen variations in conditions and to provide an assured level of safety. These include an additional safety margin for wet or contaminated runway conditions. It is important to note that non-public transport or non-commercial air transport operations are not legally required to add these additional safety margins.

6. The likelihood of an aeroplane actually undershooting or overrunning a runway and needing the use of a RESA is very low and generally only happens in extreme circumstances.

Risk assessment

7. The risk of an aeroplane undershooting or overrunning a runway involves a large number of variable factors. These factors include prevailing weather conditions, the type of aeroplane (e.g. large jet aircraft, business jet, turboprop), the landing aids available, frequency of use, runway characteristics, the surrounding environment and pilot performance. Many of these factors are completely outside the control of the aerodrome but each of them can make a significant contribution to the overall level of risk. The nature of the hazard and level of risk will be different for each aerodrome and even for each runway direction at any one aerodrome.

8. The risk assessment should be able to:

    1. show that the risk of an undershoot or overrun has been assessed in terms of severity and likelihood;
    2. show that the risk has been mitigated as much as is reasonable and practicable;
    3. show that the level of remaining risk meets the safety standards of the aerodrome licence holder;
    4. provide the aerodrome management with a means of assessing the impact on the undershoot and overrun risk of any future changes to the aerodrome environment or the number or type of aeroplanes using the aerodrome.

9. Licence holders should take into account in their risk assessments, factors such as:

    1. the nature and location of any hazard beyond the runway end, including the topography and obstruction environment beyond the RESA and outside the runway strip;
    2. the types of aeroplane and level of traffic at the aerodrome, and actual or proposed changes to either;
    3. aircraft performance limitations arising from runway length and slope;
    4. aerodrome overrun history;
    5. the percentage of operations not using public transport performance safety factors;
    6. runway surface texture depth, transverse slope and drainage, irregularities that would result in a loss of friction, and the general friction characteristics when the runway is wet;
    7. degradation of runway surface friction which may affect aeroplane braking action due to the presence of contaminants or the accumulation of rubber deposits;
    8. ATC procedural risk mitigation measures to avoid creating conditions that increase the chance of a rushed/unstabilised approach;

9. actual RESA provision and options for enhancement;
10. the type and level of use of navigation aids, such as ILS/RNAV (GNSS) and/or PAPI.

Level of risk

10. There are different methods available to try to assess the overall level of risk. CAP 760, Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases details a suitable risk assessment process. In general the level of risk should be assessed in terms of severity and likelihood so that an overall level of risk can be identified using a suitable risk tolerability matrix. Once the level of risk has been identified, where necessary, suitable risk mitigation measures can be used to reduce the level of risk to an acceptable level either by reducing the severity if the risk actually occurs or reducing the likelihood of the risk occurring.

Severity

11. In most scenarios the level of severity of an aeroplane undershooting or overrunning will depend on the area surrounding the runway. Any improvements to the area surrounding the runway, such as increasing the RESA distance, removing any obstacles, delethalising buried objects, removal of or improvement to the infrastructure surrounding the runway will decrease the severity if an undershoot or overrun actually occurs. The severity of an undershoot or overrun should be assessed in terms of the most realistic scenario and will depend on the hazards surrounding the runway end.

Likelihood

12. Determining the likelihood of an aeroplane undershooting or overrunning a runway is more difficult to assess. Some aerodromes have accumulated data over many years and use this to work out a reasonable likelihood of an undershoot or overrun by comparing the number of events with the number of total movements. However, most aerodromes will not have had previous experience of an event and may choose to use UK or worldwide statistical data from various sources to identify an appropriate level of likelihood.

13. Use of this type of data alone does not take into account the increased risk of an undershoot or overrun from an increase in traffic, new and larger types of aeroplanes using the runway, or changes to the infrastructure or physical characteristics of the runway.

14. Even though there may be a safety margin built into the performance calculations used by operators, the likelihood of an overrun increases as the proportion of the declared distance required for take-off or landing increases. Aeroplanes that do not require the full distance available for either takeoff or

landing effectively have a built-in additional distance that could be used for stopping the aeroplane in addition to any RESA provided. Although the distances required will depend on the actual mass of the aeroplane and the weather conditions on the day, it should be possible to identify aeroplanes that could be described as being more likely to be performance-limited for a particular runway.

15. Depending on the actual conditions (aeroplane mass, temperature, pressure altitude, wind component, runway surface condition and obstacle environment) it may sometimes be necessary for an aircraft operator to reduce or limit the take-off mass of the aeroplane in order to use a particular runway due to the length of the runway. Similarly the mass of the aeroplane on landing will affect the landing distance required and sometimes an aeroplane will not be able to land on a particular runway until the mass is reduced below a specified figure.

16. Under these conditions the aeroplane is performance-limited and needs all the available runway length (taking into account any safety margins added) in order to take off or land. Even though this is acceptable from a performance perspective it does mean the aeroplane is operating at the limit for that runway and there is no excess runway available beyond the included safety margins.

17. To help assess the likelihood of an aeroplane overrunning a runway, licence holders should assess the traffic using their aerodrome to identify what percentage of operations is likely to be performance-limited.

18. An objective assessment of the severity, likelihood and overall level of risk of an aeroplane undershooting, veering off or overrunning a runway will have to be made using all the information available. Depending on the level of risk further mitigation measures to reduce either the severity and/or likelihood of an event happening may need to be considered.

Possible mitigation measures to consider

19. If the risk assessment reveals that the level of risk of an undershoot or overrun is of concern, mitigation measures will be required to reduce the level of risk to As Low As Reasonably Practicable (ALARP). It may be that the cost of a particular mitigation measure is beyond the scope of an aerodrome and will not be feasible; however, it is likely that many mitigation measures will be reasonably practicable and should therefore be considered.

20. The following list outlines some of the measures that may be considered, singly or in combination, to reduce the risks (in terms of severity or likelihood) of an undershoot, veer off and/or an overrun occurring. Mitigation measures that reduce the likelihood of either an undershoot, veer off or overrun include:

    1. Improve the friction characteristics of runway surfaces and/or limit the lowest friction values allowed. CAP 683, The Assessment of Runway Surface Friction Characteristics, specifies the requirements for runway friction. Resurface

and if needed reshape the runway to improve runway surface texture depth, increase transverse slope for rapid drainage and remove any irregularities that would result in a loss of friction. Any surface should be constructed to provide good friction characteristics when the runway is wet and this would include grooving or providing a specific surface friction layer.

2. Improve the friction characteristics of runway surfaces either by maintenance or the removal of contamination or rubber deposits to increase the chances of an aeroplane stopping on the paved surface especially when wet or contaminated.
3. Ensure that a regular assessment and maintenance programme is in place to maintain adequate levels of grip at all times.
4. Ensure that accurate and up-to-date information on weather and the runway state is available to pilots.
5. Upgrade visual and instrument landing aids to improve the accuracy of aeroplane delivery at the correct landing position on runways (including the provision of Instrument Landing Systems and/or PAPIs).
6. Consider RNAV (GNSS) approaches for runways with non-precision approaches.
7. Ensure that touchdown zone markings are correctly located and clearly visible.
8. Install touchdown zone lighting.
9. Install coded runway centreline lights or yellow caution zone edge lights to indicate that the end of the runway is near.
10. In consultation with aeroplane operators and air navigation service providers formulate procedures to help ensure stabilised approaches.
11. In consultation with aeroplane operators and air navigation service providers consider operating procedures or restrictions for severe weather conditions.
12. Ensure the accuracy of any AIP entries with regard to the obstacle environment and declared distances.
13. Ensure an open dialogue between the aerodrome, air navigation service provider and aeroplane operators to raise awareness of the factors that could lead to a runway excursion.
14. Where possible reduce the number of tail wind landings and review any limitations in the use of reverse thrust due to noise abatement requirements.
15. Implement/promote a go-around policy for aircraft that have not touched down by the end of the touchdown zone.
16. During work in progress ensure that any temporarily reduced declared distances are clearly communicated to pilots and that any lighting, signs and markings correspond to the actual declared distances available.

17. During runway rehabilitation projects ensure that accurate information regarding the condition of the runway surface is effectively promulgated to pilots.

21. Mitigation measures that reduce the severity of either an undershoot, veer off or overrun include:

1. Reduce the declared runway distances in order to provide an increased length of RESA. Aerodrome licence holders should consult with their operators to determine what effect a reduction in declared distances would have on their operations. Any increase in the length of a RESA provided will help to reduce the severity of an aeroplane actually undershooting or overrunning a runway and should be considered a high priority wherever possible.
2. Install suitably positioned and designed arresting systems to supplement a RESA where appropriate. Further guidance on suitable arresting systems is available on the CAA website.
3. Minimise the obstruction environment surrounding the runway and in the area beyond the RESA. A reduction in obstructions surrounding the runway should decrease the severity if an aeroplane departs the runway unintentionally. This includes making obstructions frangible wherever possible and making the surrounding areas safe appropriately.

22. The above list is not exhaustive or in any particular order and should complement action by aeroplane operators, designers and aviation regulators. Aerodrome licence holders are reminded of the need to advise the CAA about changes to the physical characteristics of the aerodrome, in accordance with the licence conditions.

Optimising the available RESA

23. It is recognised that improving RESA distance is often difficult. However, it is important to note that incremental gains should be obtained wherever possible, as any gain is valuable. Therefore, whenever a runway project involves construction consideration should also be given to improving the RESA further. This includes:

1. Relocation or realignment of the runway - it may be possible to construct additional pavement at the start of take-off end to make more pavement available to retain the declared distances. The start and end of declared distances can be moved towards the downwind (start of take-off) end, thereby retaining the declared distance and creating space for a longer RESA.
2. In the case where landing RESA is limited and the runway has a displaced landing threshold, examine whether the threshold can be moved (downwind) to increase the RESA.
3. Increasing the RESA provision including land acquisition, improvements to the grading and realigning fences or roads to provide additional area.

4. Improving the slopes in the RESA to minimise or remove downward slopes.
5. Providing paved RESA with known friction characteristics.

Reviewing the risk assessment

24. As part of the aerodrome's SMS, licence holders should review the risk of a runway excursion whenever significant changes occur that would affect either the likelihood or severity of a runway excursion.

25. Changes affecting the level of risk include:

1. changes to the declared distances;
2. new aircraft types;
3. changes to the number of movements;
4. changes to the traffic mix;
5. runway rehabilitation projects;
6. proposed changes or projects involving the surrounding infrastructure;
7. changes to ATC procedures.

CHAPTER 4

The assessment and treatment of obstacles

Introduction

4.1 The effective utilisation of an aerodrome may be considerably influenced by natural features and man-made constructions inside and outside its boundary. These may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken. For these reasons, certain areas of the local airspace must be regarded as integral parts of the aerodrome environment. The degree of freedom from obstacles in these areas is as important in the granting and retention of an aerodrome licence as the more obvious physical requirements of the runways and their associated runway strips, and is determined by survey in accordance with CAP 232, Aerodrome Survey Requirements.

4.2 The method of assessing the significance of any existing or proposed object within the aerodrome boundary or in the vicinity of the aerodrome is to establish defined obstacle limitation surfaces particular to a runway and its intended use. The purpose of this chapter is to define these obstacle limitation surfaces and their characteristics and describe the action to be taken in respect of objects which infringe them. These surfaces are illustrated at figure 4.11. In ideal circumstances all the surfaces will be free from obstacles but when a surface is infringed, any safety measures required by the CAA will have regard to:

1. the nature of the obstacle and its location relative to the surface origin, to the extended centreline of the runway or normal approach and departure paths and to existing obstructions;
2. the amount by which the surface is infringed;
3. the gradient presented by the obstacle to the surface origin;
4. the type of air traffic at the aerodrome; and
5. the instrument approach procedures published for the aerodrome.

4.3 Safety measures could be as follows:

1. promulgation in the UK AIP of appropriate information
2. marking and/or lighting of the obstacle
3. variation of the runway distances declared as available
4. limitation of the use of the runway to visual approaches only
5. restrictions on the type of traffic

4.4 In addition to the requirements described in this chapter it may be necessary to call for other restrictions to development on and in the vicinity of the aerodrome in order to protect the performance of visual and electronic aids to navigation and to ensure that such development does not adversely affect instrument approach procedures and the associated obstacle clearance limits. Details of these restrictions, which are distinct from aerodrome licensing requirements, may be obtained from the CAA.

4.5 Particular attention should also be given to the security of the movement area and access denied to unauthorised persons and/or vehicles.

4.6 Paragraphs 4.8 to 4.49 illustrate how to determine what constitutes an obstacle.

4.7 Paragraphs 4.50 onwards relate to the treatment of obstacles.

Obstacle limitation surfaces

The take-off climb surface

4.8 A take-off climb surface is an inclined plane located beyond the end of the take-off run available or the end of the clearway where one is provided.

4.9 A take-off climb surface is established for each runway direction intended to be used for take-off.

4.10 The limits of a take-off climb surface comprise:

1. an inner edge of specified length, perpendicular to the extended centreline of the runway, at the end of the clearway, when such is provided, but in no case less than:
    a) a distance of 60 m measured horizontally in the direction of take-off beyond the end of the declared take-off run available, where the code number is 2, 3 or 4; or
    b) a distance of 30 m measured horizontally in the direction of take-off beyond the end of the declared take-off run available where the code number is 1.
2. two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the vertical projection of the take-off flight path to a specified final width and continuing thereafter at that width for the remainder (if any) of the length of the take-off climb area;
3. an outer edge parallel to the inner edge.

4.11 The dimensions of the take-off climb surface are specified in table 4.1 and illustrated in figures 4.1 to 4.4. A reduced length may be adopted where this length would be consistent with procedures for the control of departing aeroplanes.

4.12 The elevation of the inner edge is equal to that of the end of the clearway, or clearway plane, on the extended centreline of the runway. Where a clearway is not provided, the elevation is that of the point of intersection of the centreline of the runway and the inner edge.

4.13 In the case of a straight take-off flight path, the slope of the take-off climb surface is measured in the vertical plane containing the extended centreline of the runway. The slope should not be steeper than is specified in table 4.1. Where no object reaches the 2% (1:50) surface slope specified for runways where the code number is 3 or 4, the slope should be reduced until it touches the first immovable object or reaches 1.6% (1:62.5), whichever is the steeper. If the slope is reduced, the length of the surface should be increased to afford protection on the climb to a height of 1000 ft.

4.14 In the case of a take-off flight path involving a turn, the take-off climb surface is a complex surface such that the normal at any point on the flight path centreline is a horizontal line at the same height above surface origin as would have resulted from the application of a straight flight path. The edge of a TOCS may be slewed in the direction of a turn away from the extended runway centreline up to a maximum of 15° splay. The portion of TOCS encompassing the new departure track should be the same shape and dimensions as the original TOCS measured relative to the new departure track. The opposite edge of the TOCS should remain unchanged unless there is another turning departure towards that side also, in which case, the edge may be slewed in that direction too.

4.15 Where a runway is 10% or more than the minimum width, the length of the inner edge of the take-off climb surface is extended so that it is not less than the appropriate strip width. The initial part of the surface is formed by sides drawn from the strip edges parallel to the extended centreline until they intersect the diverging sides of the normal take-off climb surface (see figure 4.4).

Table 4.1 Dimensions and slopes of take-off climb surfaces

Code number	3 or 4	2	1
Length of inner edge	180 m	80 m[1]	[2]60 m
Distance of inner edge from end of take-off run[3]	60 m	60 m	30 m
Divergence (each side)	12.5%	10%	10%
Final width	1200 m [4]1800 m	580 m	380 m
Length	15000 m	2500 m	1600 m
Slope	2% (1:50)	4% (1:25)	5% (1:20)

1 and 2. Where clearway is provided, the length of the inner edge should be 150 m.

3. Where clearway is provided, the inner edge is at the end of the clearway.

4. When the intended track includes changes of heading greater than 15°, the final width of the take-off climb surface for runways where the code number is 3 or 4 is increased to 1800 m.

Figure 4.1 Take-off climb surface associated with a runway where the code number is 3 or 4, also showing slewed TOCS

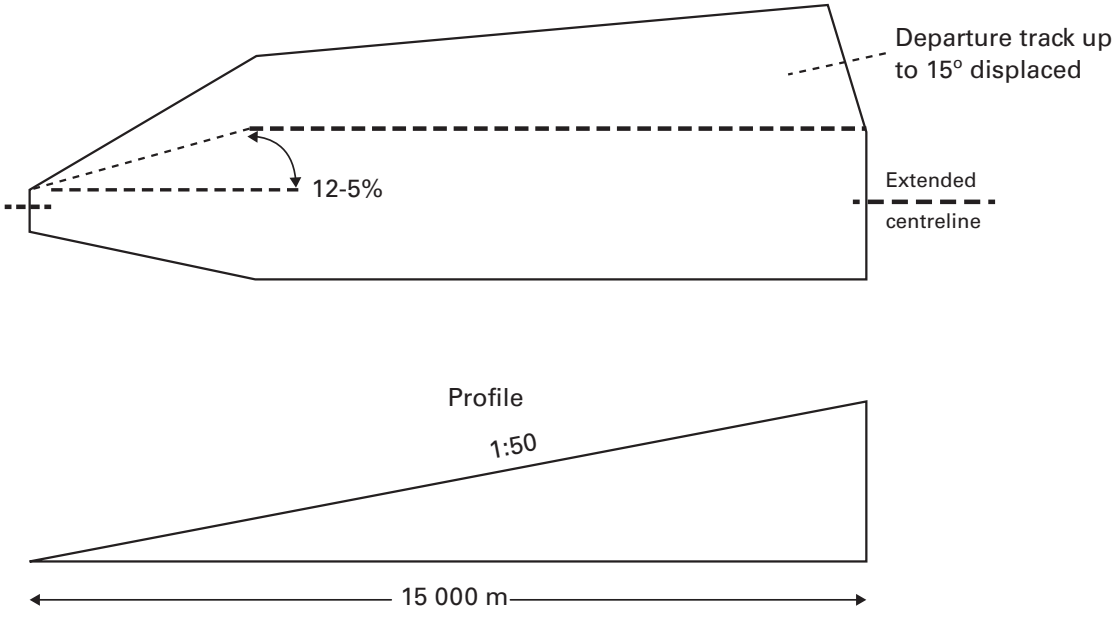


Figure 4.2 Take-off climb surface associated with a runway where the code number is 2

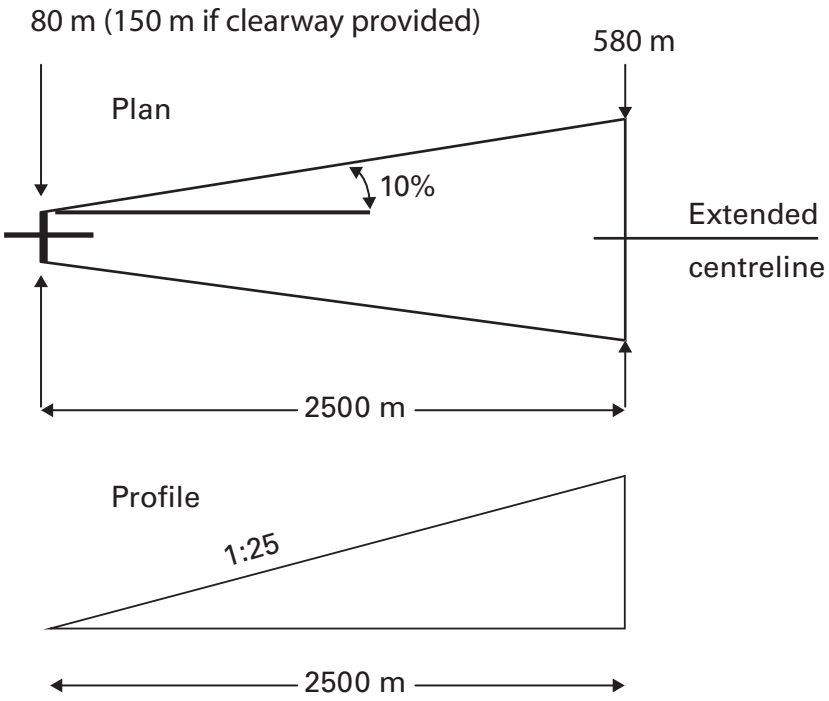


Figure 4.3 Take-off climb surface associated with a runway where the code number is 1

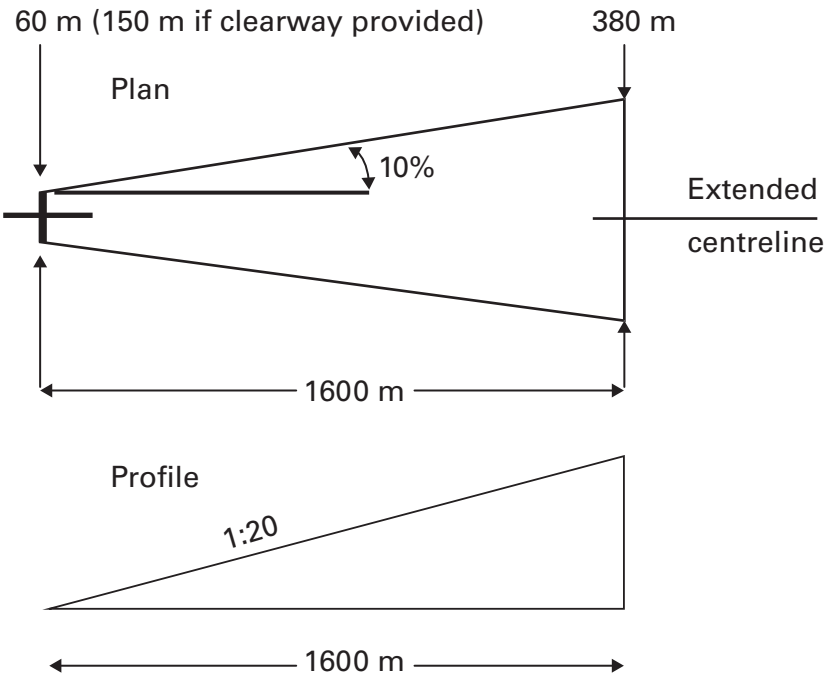
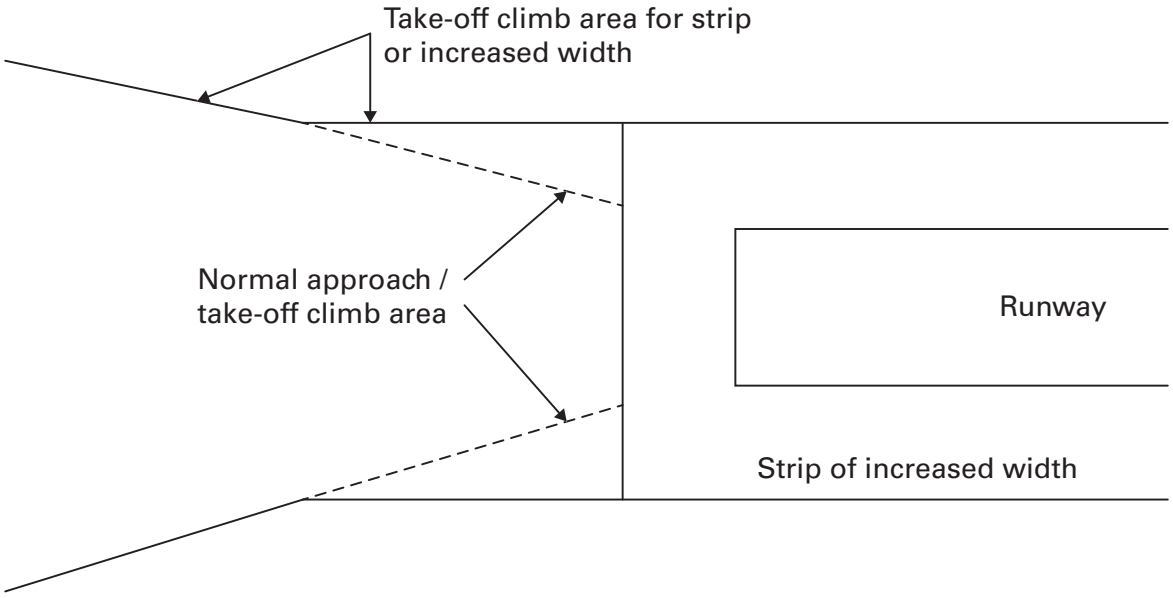


Figure 4.4 Approach/take-off climb surface associated with a runway of substantially more than minimum width



The approach surface

4.16 An approach surface is an inclined plane or combination of planes preceding the threshold.

4.17 An approach surface is established for each runway direction intended to be used for the landing of aircraft.

4.18 The limits of the approach surface comprise:

1. a horizontal inner edge of specified length perpendicular to the centreline of the runway located at a distance of 60 m before the landing threshold, except in the case of non-instrument runways where the code number is 1 and where the distance is 30 m;
2. two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from a line drawn parallel to the extended centreline of the runway;
3. an outer edge parallel to the inner edge.

4.19 The dimensions and slope of the approach surface are specified in table 4.2 and illustrated in figures 4.5 to 4.10.

4.20 The elevation of the inner edge is equal to the elevation of the mid-point of the landing threshold.

4.21 The slope of the approach surface is measured in the vertical plane containing the centreline of the runway. An approach surface for an instrument runway is horizontal beyond the point at which it intersects a horizontal plane 150 m above the threshold elevation.

4.22 Where there is a runway of 10% or more than the minimum width, the length of the inner edge of the approach surface is extended so that it is not less than the appropriate strip width. The initial part of the surface is formed by sides drawn from the strip edges parallel to the extended centreline until they intersect the diverging sides of the normal approach surface. This principle is illustrated at figure 4.4.

Table 4.2 Approach surface slopes and dimensions

	Precision instrument approach runways		Non-precision instrument approach runways		Non-instrument runways			
	Code number		Code number		Code number			
	3 or 4	1 or 2	3 or 4	1 or 2	4	3	2	1
Length of inner edge*	300 m	150 m	300 m	150 m	150 m	150 m	80 m	60 m
Distance before threshold	60 m	60 m	60 m	60 m	60 m	60 m	60 m	30 m
Divergence each side	15%	15%	15%	15%	10%	10%	10%	10%
Length of first section	3000 m	3000 m	3000 m	2500 m	3000 m	3000 m	2500 m	1600 m
Slope of first section	2% (1:50)	2.5% (1:40)	2% (1:50)	3.33% (1:30)	2.5% (1:40)	3.33% (1:30)	4% (1:25)	5% (1:20)
Length of second section	3600 m	2500 m	3600 m					
Slope of second section	2.5% (1:40)	3% (1:33.3)	2.5% (1:40)					
Length of horizontal section	8400 m	9500 m	8400 m					

* The length of the inner edge may be reduced to 210 m for a runway where the Aeroplane Reference Field Length of the critical aeroplane falls into the lower third of code number 3, and where, in the opinion of the CAA, such a reduction is compatible with the use made of the runway.

Figure 4.5 Approach surface associated with an instrument runway where the code number is 3 or 4

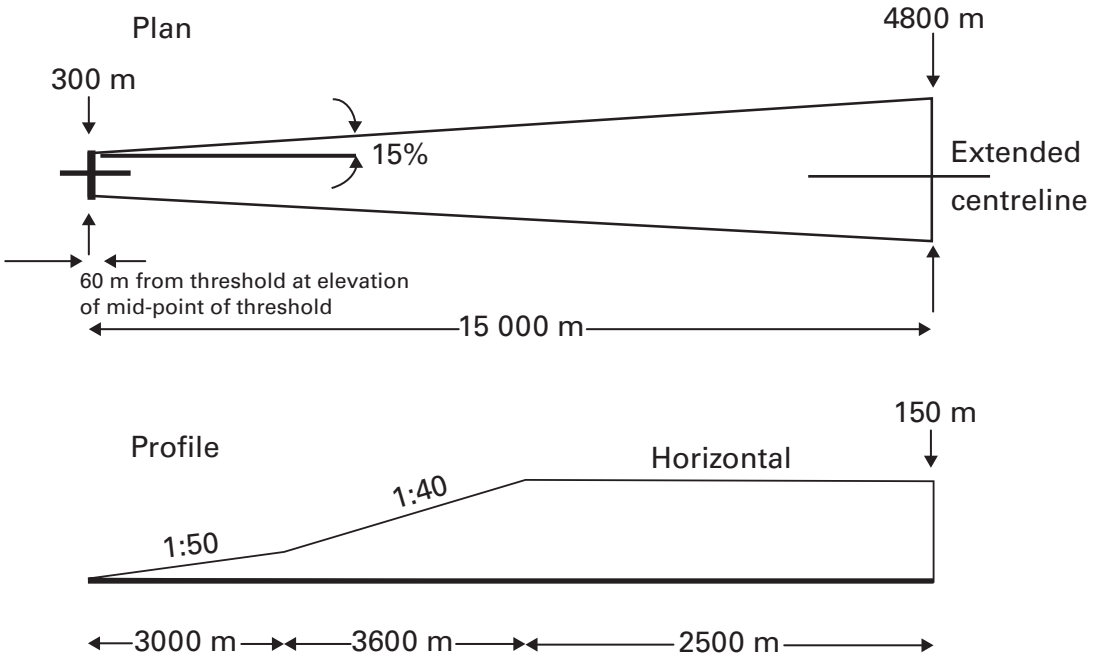


Figure 4.6 Precision instrument approach where the code number is 1 or 2

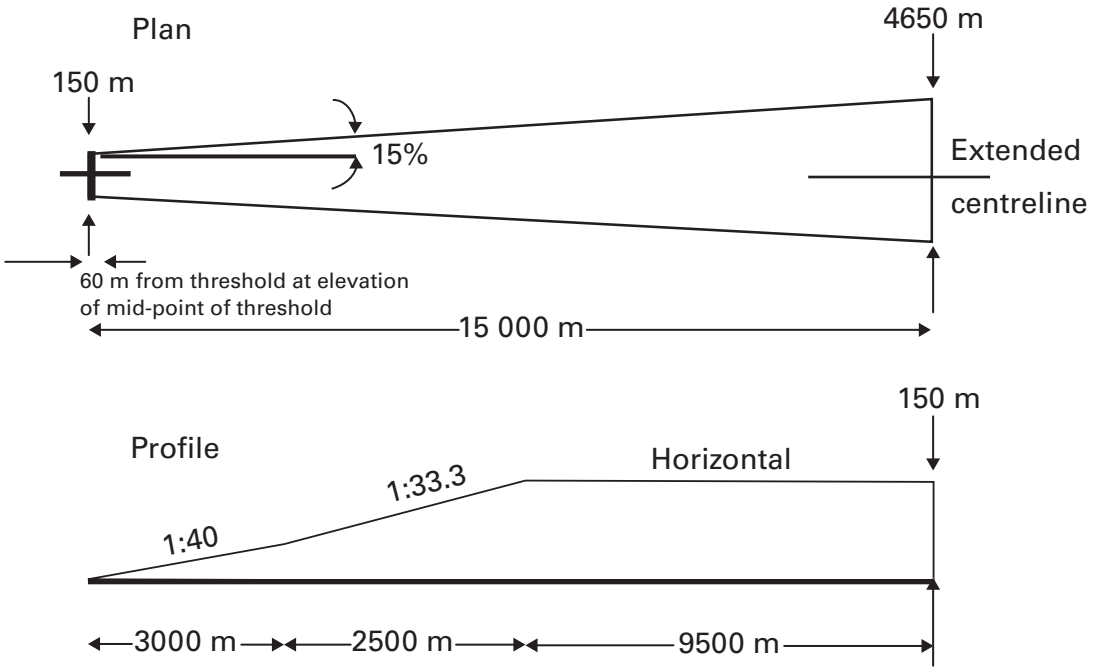


Figure 4.7 Non-precision instrument approach where the code number is 1 or 2

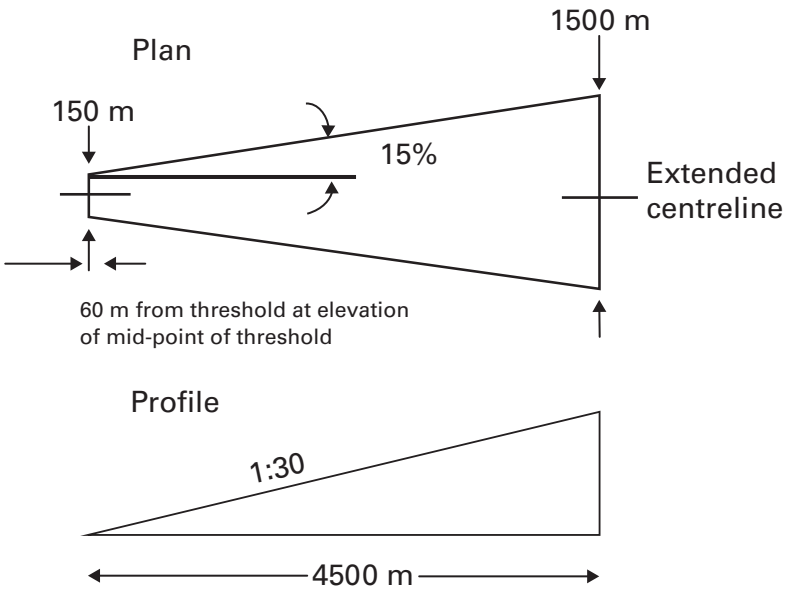


Figure 4.8 Approach surface associated with a non-instrument runway where the code number is 3 or 4

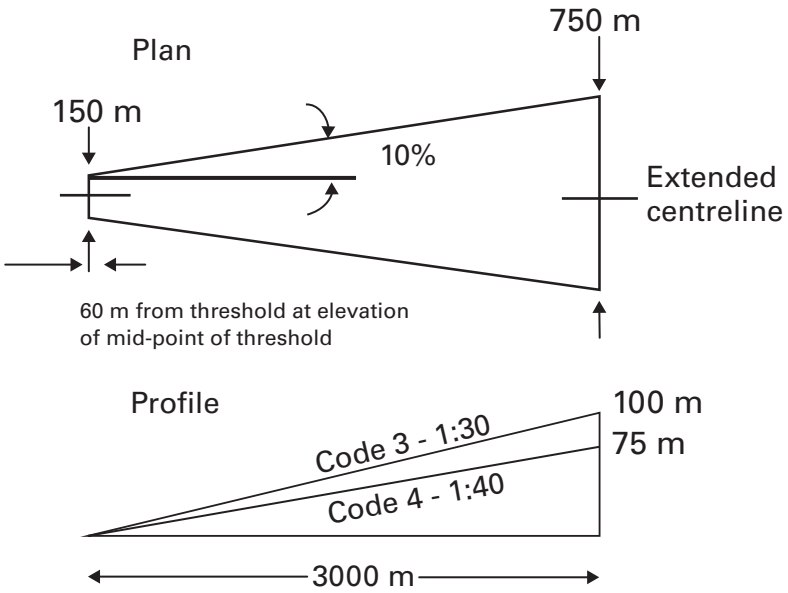


Figure 4.9 Approach surface associated with a non-instrument runway where the code number is 2

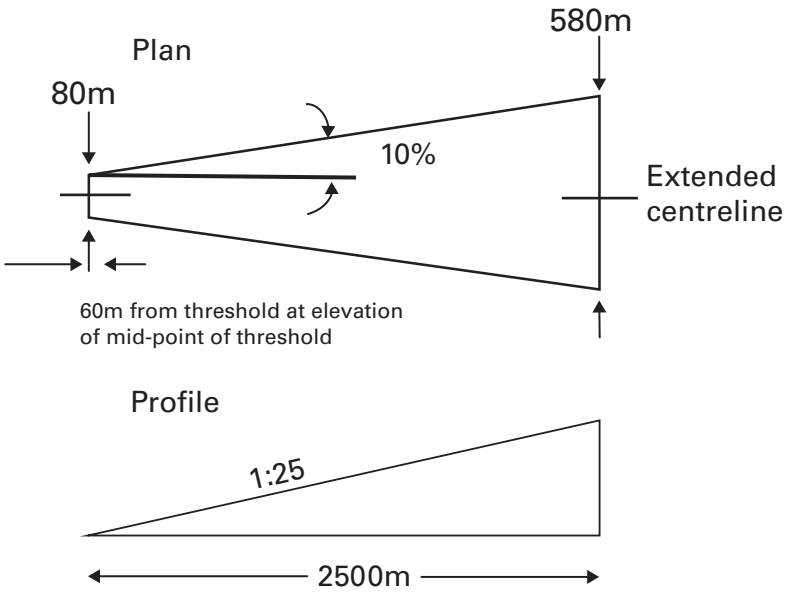


Figure 4.10 Approach surface associated with a non-instrument runway where the code number is 1

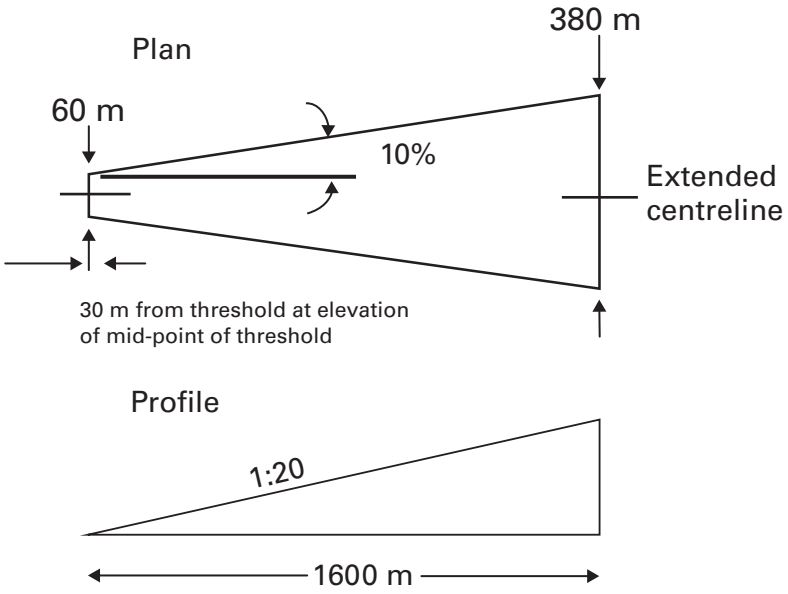
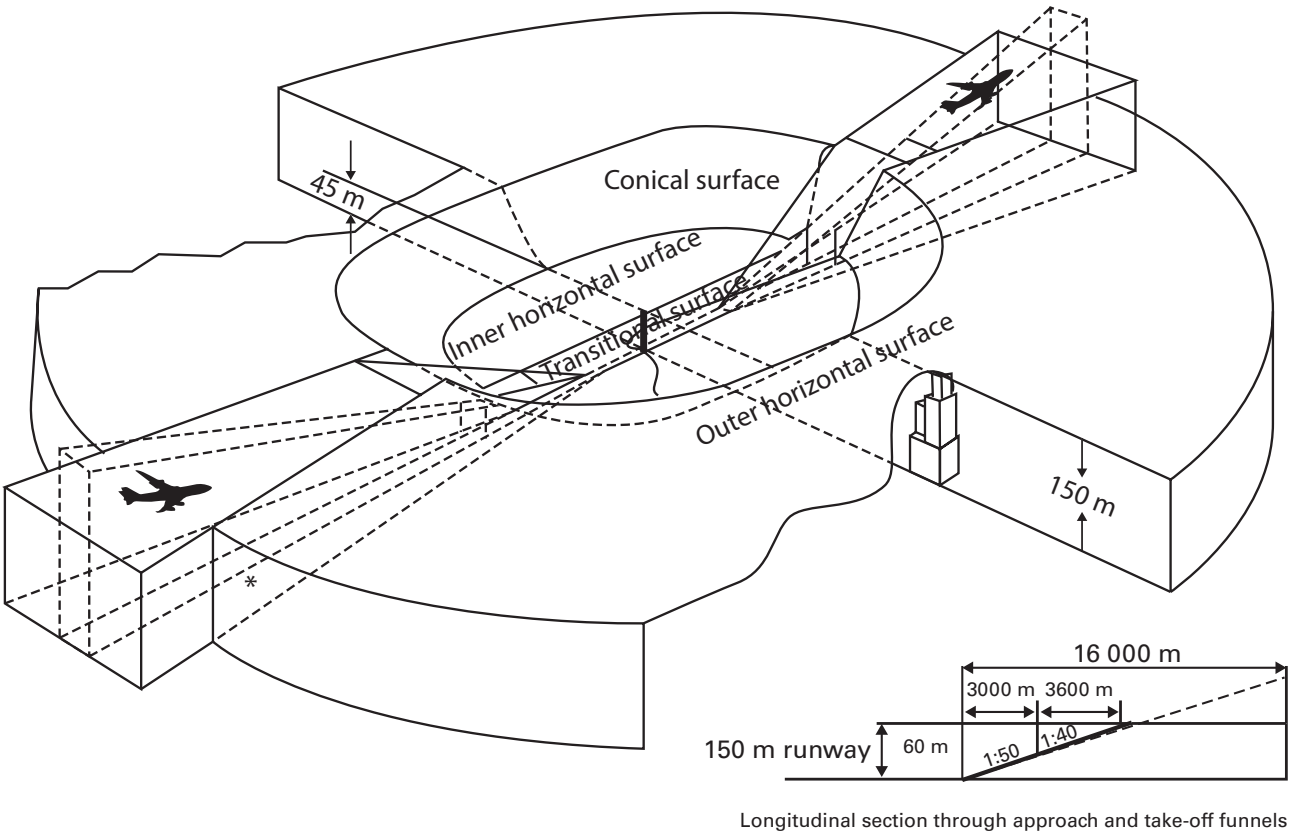


Figure 4.11 Obstacle limitation surfaces for an instrument runway where the main runway is 1800 m or more in length



Note: The take-off funnels are shown in chain-dot line in both views. To assess clarification the verticle scale on this chart is 20 times that of the horizontal scale.

The transitional surface

4.23 A transitional surface is a complex surface sloping up to the inner horizontal surface from the side of the runway strip and from part of the side of the approach surface.

4.24 Transitional surfaces are established for every runway intended to be used for landing.

4.25 The slope of the transitional surface is measured in the vertical plane above the horizontal, and normal to, the centreline of each runway. Where the runway code is 1 or 2 and has a non-instrument or non-precision instrument approach, the slope is 20% (1:5). For all other runways the slope is 14.3% (1:7).

4.26 The elevation of any point on the lower edge of the surface is:

1. along the side of the approach surface, equal to the elevation of the approach surface at that point;
2. along the strip, equal to the elevation of the centreline of the runway opposite that point.

4.27 The outer limit of a transitional surface is determined by its intersection with the plane of the inner horizontal surface.

4.28 An obstacle may be sited in a position that would cause it to infringe the transitional surface only if:

1. it is an aid to navigation;
2. the entire structure complies with the frangibility requirements of obstacles sited within runway strips (chapter 3 refers); and
3. it does not penetrate a surface sloping upward and outward from the centreline of the runway at a slope of 1:10. The elevation of the lower edge of this 1:10 slope is that of the runway centreline at a point where a line drawn to the obstacle is normal to the centreline. The elevation of the upper edge is where the 1:10 surface:
   a) meets the transitional surface, or where no such intersection occurs;
   b) is equal to the elevation of the inner horizontal surface, and continues at this height until it meets the point where the transitional surface intercepts the inner horizontal surface.

The inner horizontal surface

4.29 An inner horizontal surface is a horizontal plane located above an aerodrome and its vicinity. It represents the level above which consideration needs to be given to the control of new obstacles and the removal or marking of existing obstacles to ensure safe visual manoeuvring of aeroplanes in the vicinity of the aerodrome.

4.30 An inner horizontal surface is established for every aerodrome.

4.31 The inner horizontal surface is contained in a horizontal plane located 45 m above the elevation of the lowest runway threshold existing or proposed for the aerodrome.

4.32 The limits of the inner horizontal surface are established as follows:

4.33 Where the main runway is 1800 m or more in length, circles of radius 4000 m are described centred on the strip ends of the runway. These circles are joined by common tangents parallel to the runway centreline to form a racetrack pattern. The boundary of this pattern is the boundary of the inner horizontal surface.

4.34 Where a main runway is less than 1800 m in length, the inner horizontal surface is circular and is centred on the mid-point of the runway. The radius is 4000 m except in the case of non-instrument runways where the code number is 1 or 2. For these runways the radii are 2000 m and 2500 m respectively.

4.35 Where an end of a subsidiary runway more than 1800 m long is less than 3000 m from any point on the periphery of the surface constructed in accordance with paragraph 4.33 or 4.34, the dimensions of the surface are modified. A circle of

radius 3000 m is described centred on the strip end of the subsidiary runway and this is joined by common tangents to the pattern already established.

4.36 Where the inner horizontal surface is at any point lower than an approach surface or take-off climb surface the inner horizontal surface is the obstacle limitation surface at that point.

The conical surface

4.37 A conical surface is a surface sloping upwards and outwards from the periphery of the inner horizontal surface. It represents the level above which consideration needs to be given to the control of new obstructions and the removal or marking of existing obstructions so as to ensure safe visual manoeuvring in the vicinity of an aerodrome.

4.38 A conical surface is established for every aerodrome.

4.39 The slope of the conical surface measured in the vertical plane above the horizontal is 5% (1:20).

4.40 The outer limits of the conical surface are contained in a horizontal plane located 105 m above the inner horizontal surface except where the code number of a non-instrument runway is 2 or 1. In these cases the plane is located 55 m above the inner horizontal surface where the code number is 2 and 35 m above the inner horizontal surface where the code number is 1.

The outer horizontal surface

4.41 An outer horizontal surface is a specified portion of a horizontal plane around an aerodrome beyond the limits of the conical surface. It represents the level above which consideration needs to be given to the control of new obstacles in order to facilitate practicable and efficient instrument approach procedures, and together with the conical and inner horizontal surfaces to ensure safe visual manoeuvring in the vicinity of an aerodrome.

4.42 An outer horizontal surface is established for every aerodrome where the main runway is 1100 m or more in length.

4.43 The outer horizontal surface extends from the periphery of the conical surface to a minimum radius of 15 000 m from the aerodrome reference point when the main runway is 1860 m or more in length and to a minimum radius of 10000 m where the main runway is 1100 m or more but less than 1860 m in length.

The Obstacle Free Zone (OFZ)

4.44 An OFZ is intended to protect aeroplanes from fixed and mobile obstacles during Category I, II or III operations when approaches are continued below decision height and during any subsequent missed approach or balked landing with all

engines operating normally. It is not intended to supplant the requirement of other surfaces or areas where these are more demanding.

4.45 The limits of the OFZ where the code number is 3 or 4 are described below and illustrated at figure 4.12. It is designed to protect an aeroplane with a wingspan of up to 60 m which has descended below a height of 100 ft, and has been correctly aligned with the runway at that height by visual reference to the runway or approach lighting. The length of runway enclosed is based on an assumption that a go-around is initiated not later than the end of the touchdown zone and that a further 900 m distance is sufficient for the pilot to make any necessary changes of the aircraft configuration and to achieve a positive rate of climb of at least 3.33% with a deviation from track contained within a 10% splay either side of centreline. When an aeroplane's wingspan is greater than 60 m or its performance is worse than the basis used in defining the surfaces, the OFZ will need to be redesigned or operations for the particular aeroplane restricted. Conversely a narrower OFZ may be acceptable if the wingspan of the aeroplanes at a particular aerodrome is limited to less than 60 m.

4.46 The limits of the OFZ where the code number is 1 or 2 are described in paragraph 4.49, and illustrated in figure 4.13. The rationale is similar to that detailed in paragraph 4.45 except that the maximum wingspan is reduced to 30 m, the rate of climb on missed approach increased to 4%, and the origin of the balked landing surface is at the upwind end of the runway strip.

4.47 An OFZ is established for each precision instrument approach Category II or III runway and shall be maintained during operations conforming to those categories. An OFZ should be established for precision instrument approach Category I runways, and should be maintained during operations conforming to this category.

4.48 The limits of the OFZ where the code number is 3 or 4 comprise:

1. a portion of the instrument approach surface commencing at its inner edge at a width of 60 m on each side of the extended centreline of the runway and extending at this width for a distance of 1500 m away from the direction of landing, and with an outer edge parallel to the inner edge. This distance shall increase to 77.5 m for code F runways;
2. a portion of the runway strip extending to 60 m on each side of the runway centreline from a distance of 60 m before threshold to a distance of 1800 m beyond threshold. This distance shall increase to 77.5 m for code F runways;
3. a balked landing surface with:
    a) an inner edge coincident with the upwind edge of the area described at 2 above, with an elevation of the centreline of the runway at that point;
    b) two sides originating at the outer extremities of the inner edge and diverging uniformly at 10% each side from the extended centreline of the runway;

c) an outer edge parallel to the inner edge and located in the plane of the Inner Horizontal Surface;

d) a slope of 3.33% (1:30) measured in the vertical plane containing the centreline of the runway.

4. side surfaces which slope upwards at 33.3% (1:3) measured in a vertical plane normal to the centreline of the runway:

a) from the sides of that portion of the approach surface described at paragraph 4.48 1. to a height equal to the plane of the inner horizontal surface, with the elevation of any point on the lower edge equal to the elevation of the approach surface at that point;

b) from the sides of the area described at paragraph 4.48 2 to a height equal to the plane of the inner horizontal surface, with the elevation of any point along the lower edge equal to the elevation of the centreline of the runway opposite that point;

c) from the sides of the balked landing surface described at paragraph 4.48 3 to a height equal to the plane of the inner horizontal surface with the elevation of any point on the lower edge equal to the elevation of the balked landing surface at that point.

4.49 The limits of the OFZ where the code number is 1 or 2 comprise:

1. a portion of the instrument approach surface commencing at its inner edge at a width of 45 m on each side of the runway centreline and extending at this width for a distance of 1500 m away from the direction of landing, and with an outer edge parallel to the inner edge;

2. a portion of the runway strip extending to 45 m on each side of the runway centreline from a distance of 60 m before threshold to a distance of 60 m beyond the end of the landing distance available;

3. a balked landing surface with:

a) an inner edge coincident with the upwind edge of the area described at paragraph 4.49 2, with an elevation equal to that of the centreline of the runway at that point;

b) two sides originating at the outer extremities of the inner edge and diverging uniformly at 10% each side from the extended centreline of the runway;

c) an outer edge parallel to the inner edge and located in the plane of the inner horizontal surface;

d) a slope of 4% (1:25) measured in the vertical plane containing the centreline of the runway.

4. side surfaces which slope upwards at 40% (1:2.5) in a vertical plane perpendicular to the centreline of the runway:

   a) from the sides of that portion of the approach surfaces described in paragraph 4.49 1 to a height equal to that of the plane of the inner horizontal surface, with the elevation of any point on the lower edge equal to the elevation of the approach surface at that point;

   b) from the sides of the area described at paragraph 4.49 2 to a height equal to that of the plane of the inner horizontal surface, with the elevation of any point along the lower edge equal to the elevation of the centreline of the runway opposite that point;

   c) from the sides of the balked landing surface described at paragraph 4.49 3 to a height equal to that of the plane of the inner horizontal surface with the elevation of any point on the lower edge equal to the elevation of the balked landing surface at that point.

Figure 4.12 OFZ for category I, II and III operations where the code number is 3 or 4 (not to scale)

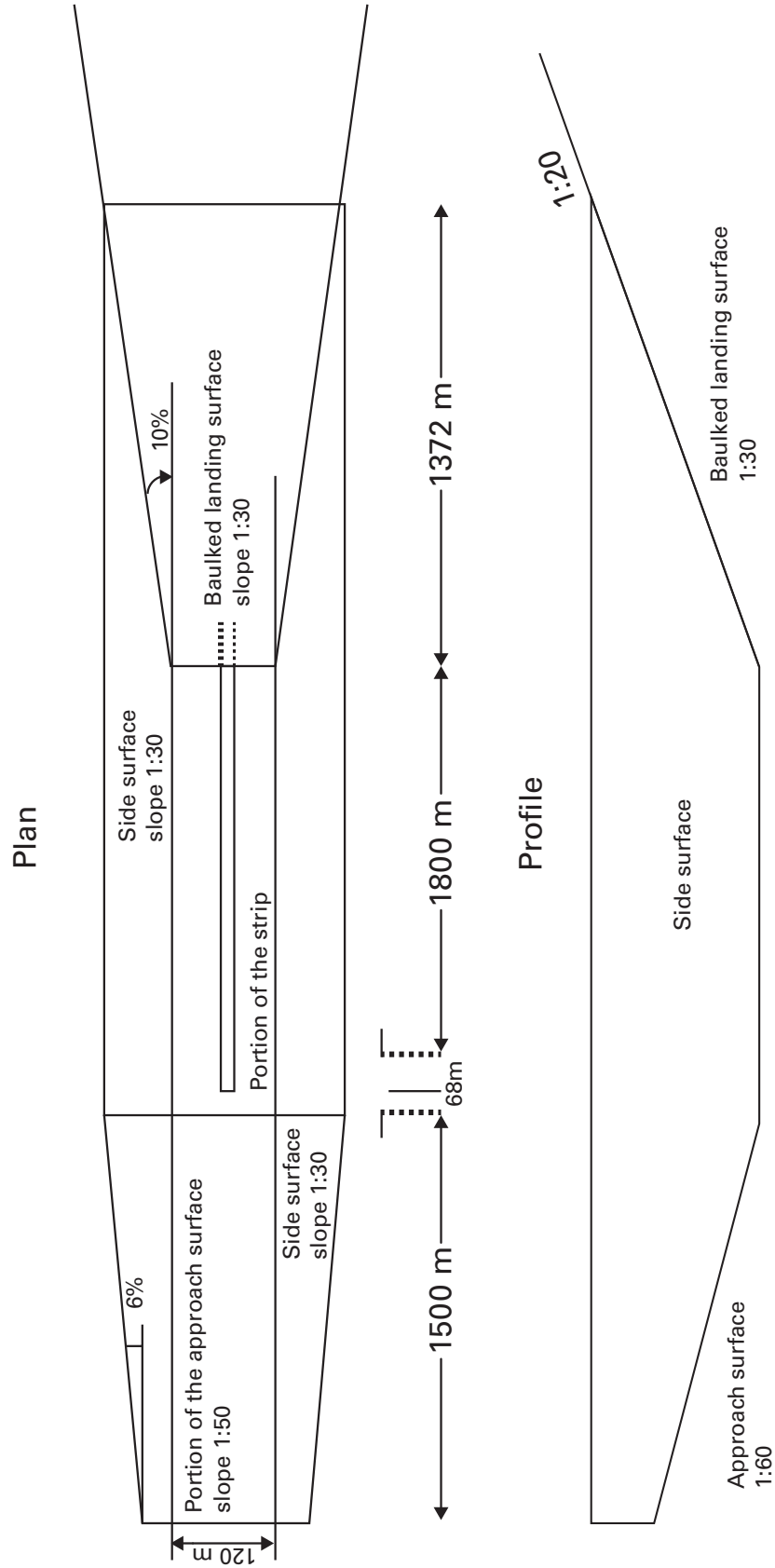
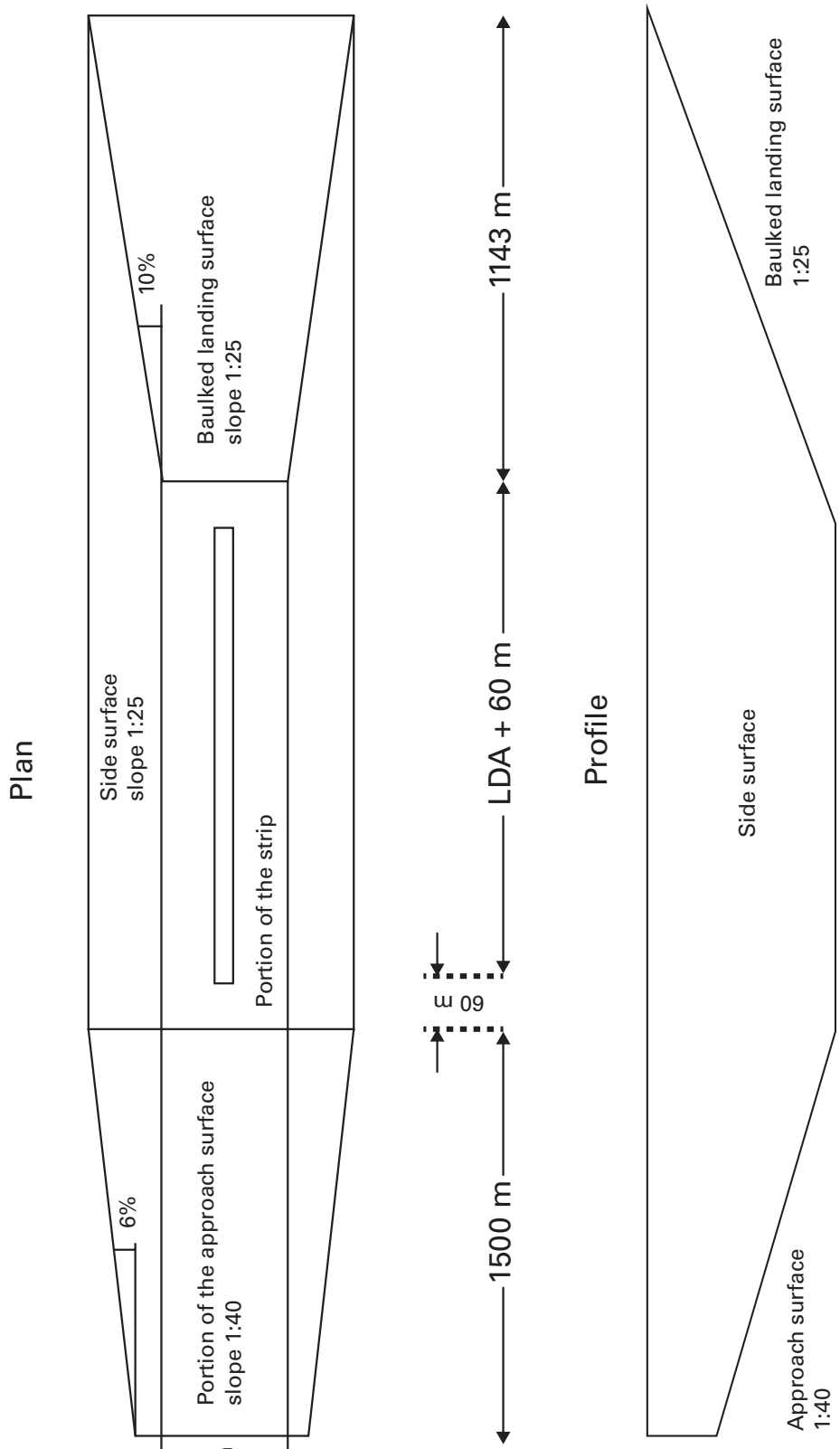


Figure 4.13 OFZ for category I operations where the code number is 1 or 2 (not to scale)



Restriction and removal of obstacles

4.50 New objects or additions to existing objects should not extend above an approach surface, above a transitional surface or above a take-off climb surface, except when in the opinion of the CAA the new object or addition would be shielded by an existing immovable object.

4.51 New objects or additions to existing objects should not extend above an inner horizontal surface, a conical surface or an outer horizontal surface, except when in the opinion of the CAA the object would be shielded by an existing immovable object or it is determined that the object would not adversely affect the safety or significantly affect the regularity of aircraft operations.

4.52 Existing objects above an approach surface, transitional surface, take-off climb surface, inner horizontal surface or conical surface should as far as practicable be removed, except when in the opinion of the CAA the object is shielded by an existing immovable object.

4.53 In guidance material in ICAO annex 14 Volume 1, all roads are considered to be obstacles extending to 4.8 m above the crown of the road. Similarly, railways, regardless of the amount of traffic, are considered to be obstacles extending 5.4 m above the top of the rails. On receipt of an acceptable safety assessment that considers the maximum possible height of the obstacle and has assessed, as far as practicable, future development of the surrounding infrastructure, the CAA may use its discretion in accepting lower values for mobile and fixed obstacles.

4.54 Objects which do not penetrate an approach surface to a new runway or a proposed runway extension but which would nevertheless adversely affect the optimum performance of visual or non-visual aids should be removed.

4.55 Anything which may, in the opinion of the CAA, endanger aircraft on the movement area must be removed. Except for those objects or vehicles on essential aerodrome duties which, because of their function, must be positioned within the runway strip (but outside the cleared and graded area) to meet air navigation requirements, any object or vehicle situated on a runway strip which may endanger aircraft must be removed.

4.56 No object, whether fixed or mobile, is to be permitted to penetrate the OFZ during the use of a runway for landing in Category I, II or III operational conditions, except essential visual aids which are frangibly mounted.

4.57 No object, whether fixed or mobile, is to be permitted to penetrate the balked landing surface of an OFZ established for Category II or III operations. Where this surface intercepts the Basic ILS missed approach obstacle clearance surface, the latter becomes limiting. The Basic ILS missed approach surface is a 2.5% (1:40) slope commencing 900 m after the landing threshold, at the same elevation as the threshold.

4.58 Confirmation that the extended OFZ balked landing surface is obstacle free up to the height where it intersects with the Category I ILS missed approach surface will normally be necessary only when the OFZ is initially established. Thereafter, the normal safeguarding procedures, as well as observance of the conditions of the aerodrome licence, will ensure that either the extended OFZ missed approach surface will remain obstacle free or that proposed constructions which might infringe the surface are referred to the CAA for consideration.

4.59 Objects which would endanger aircraft in the air are not permitted in a clearway.

4.60 Essential aids to navigation, providing they are frangible and do not exceed 0.9 m above ground level or the clearway plane, as appropriate, are acceptable.

4.61 Objects which would endanger aircraft on the ground are not permitted in a stopway or runway end safety area. When it is essential for approach light fittings to be situated in a stopway, they must be frangible and not exceed 0.46 m in height.

4.62 Where there are transverse or longitudinal slopes on a strip or clearway the inner edge of a take-off climb surface or an approach surface may lie partly or wholly below the level of the ground in the strip or clearway. It is not necessary that the strip or clearway should, in such cases, be graded to conform with the inner edge of the take-off climb or approach surface.

4.63 Because of the difficulty of recognition, special restrictions must be applied to elevated wires and their supports. Where no other object penetrates a given obstacle limitation surface, overhead wires and their supports should not penetrate a surface passing through the top of the highest existing object and parallel to the established surface for a distance of 1500 m from the runway threshold. The shielding criteria at paragraphs 4.64 to 4.67 do not apply to the shielding of overhead wires.

Shielding of obstacles

4.64 The principle of shielding is employed when a substantial and permanent object or natural terrain already penetrates an obstacle limitation surface. When it is considered that such an obstacle is permanent, objects of equal or lesser height around it may, at the CAA's discretion, be permitted to penetrate the surface.

4.65 Acceptance by the CAA of obstacle limitation surface penetrations using the shielding principle will always be subject to close scrutiny of the operational implications. Existing obstacles will be regarded as shields only when there is no prospect of their removal or destruction.

4.66 An object, building, structure or terrain which is accepted as a shielding obstacle and which penetrates an approach or take-off climb surface will create two shielding planes (see figure 4.14). The first plane is horizontal at the elevation of the top of the obstacle, and extends from the obstacle in the direction away from the runway. The second plane extends from the top of the shielding obstacle, towards the runway with a negative slope of 10%. The width of these

planes will be the width of the obstacle (measured in the plane normal to the extended centreline of the runway at the obstacle), decreasing with sides parallel to the sides of the relevant protecting surface (see figure 4.15), until the point where these projected lines converge, or intersect the take-off climb surface or the approach surface. Thus either the profile or plan view may take the form of a truncated triangle (see figures 4.14 and 4.15). Where the take-off climb surface and the approach surface are not coincident it may be necessary to adopt a different angle of convergence, between the two surfaces.

Figure 4.14

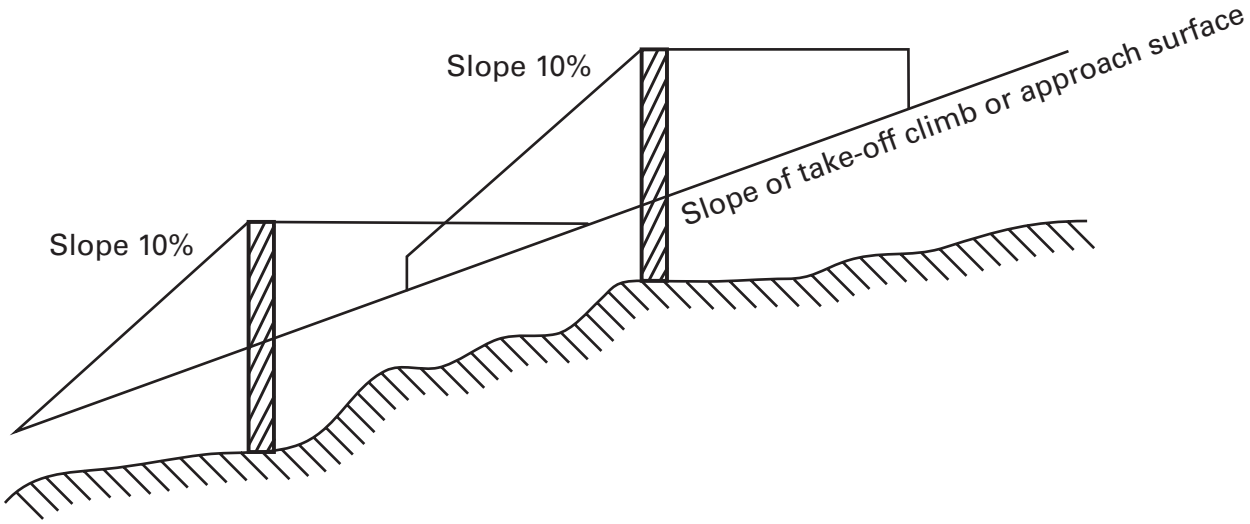
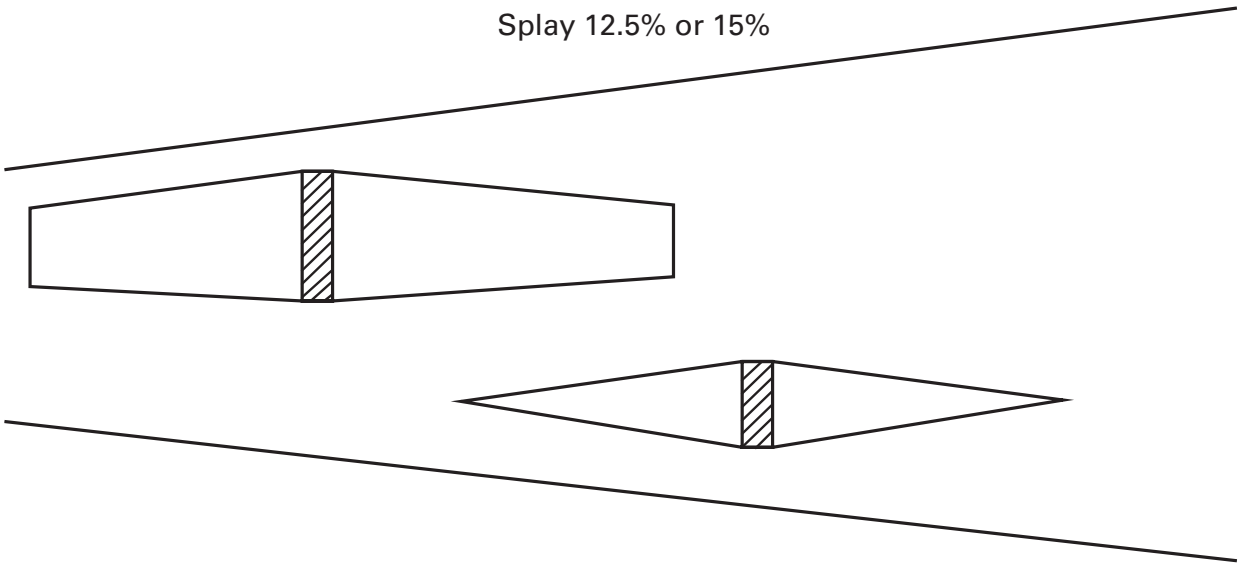
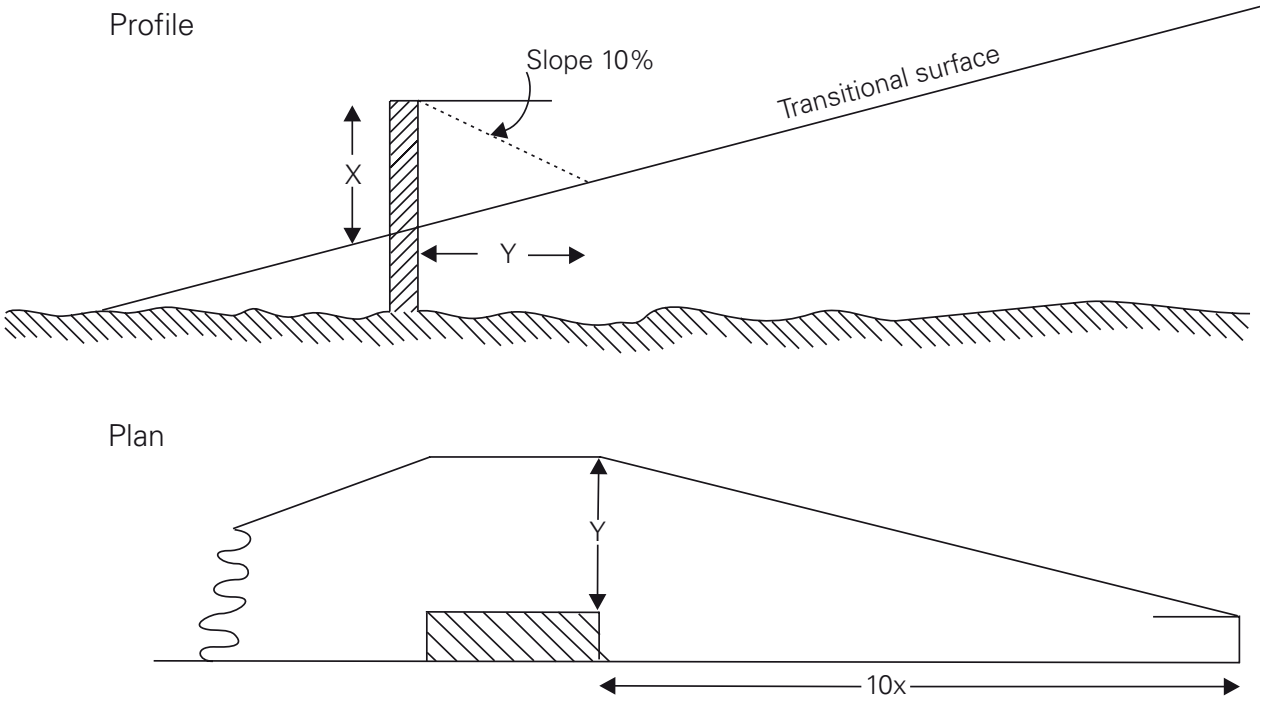


Figure 4.15



4.67 A permanent obstacle which penetrates a transitional surface may be regarded as shielding any other obstacles which lie beneath a negative slope of 10% extending from the top of the obstacle except that no obstacle can be considered as shielded that is situated closer to the runway than the shielding obstacle (see figure 4.16).

Figure 4.16



Aerodrome safeguarding

4.68 Detailed guidance is incorporated in CAP 738, Safeguarding of Aerodromes.

4.69 Aerodrome licence holders should take all reasonable steps to ensure that, through safeguarding, the aerodrome and its airspace are safe at all times for use by aircraft. To enable this, procedures should be established to manage the safeguarding process. Details of the following should be included in the aerodrome manual:

1. accountability with regard to safeguarding and a system for recording consultations, including a method for seeking advice on issues of OLS infringements and, if officially safeguarded, call-in procedures;
2. procedures for notifying planning authorities of objections;
3. procedures for consulting the aerodrome's ATC provider to ensure development has no electromagnetic/line of sight issues, either temporary or permanent;
4. procedures for assessing and monitoring the wildlife hazard risk;

5. procedures for evaluating potential impacts on instrument approach procedures;
6. procedures for promulgating infringements in the UK Aeronautical Information Publication (AIP), if appropriate.

4.70 It is recognised that the need to include all items will vary between aerodromes depending on the nature and scale of operations.

Marking and lighting of obstacles and unserviceable surface areas

General

4.71 The following paragraphs contain details of the requirements for the marking and lighting of obstacles on and near aerodromes and for the standards applicable to en route obstacles. The latter is provided for the information of licence holders and to assist them should they be consulted, or their advice sought, on the lighting and marking of obstacles in the vicinity of the aerodromes but beyond the obstacle limitation surface boundaries.

4.72 The responsibility for marking and lighting obstacles on or near aerodromes must be determined between the aerodrome licence holder and the owners of the structures. The CAA is not concerned with the allocation of responsibility but may withhold, suspend, vary or withdraw a licence if the following requirements for lighting and/or marking are not met.

4.73 Licence holders are responsible for ensuring that all obstacles on the movement area are lit and/or marked as required, irrespective of ownership.

4.74 All objects which extend to a height of 150 m or more above ground elevation are regarded as obstacles and shall be lit in accordance with ANO Article 219. Other objects of a lesser height may be assessed as hazards to aviation and also treated as obstacles. They should be marked and/or lit as detailed in the following paragraphs.

Objects to be marked or lit

4.75 Indicating the presence of obstacles by marking or lighting is intended to reduce the hazards to aircraft operating at low level or moving on the surface.

4.76 Objects which are deemed by the CAA to be en route obstacles should be marked and/or lit.

4.77 Other objects inside (and outside) the obstacle limitation surfaces should be marked and/or lighted if an aeronautical study indicates that they could constitute a hazard to aircraft (this includes adjacent to visual routes, e.g. waterways, or highways). Wind turbines, whether on, near or away from the immediate vicinity of an aerodrome, which are deemed to be obstacles, should be marked and/or lit accordingly.

Wind turbines

4.78 The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.

4.79 When lighting is deemed necessary, medium intensity obstacle lights should be used. In the case of a wind farm, i.e. group of two or more wind turbines, it should be regarded as an extensive object and the lights should be installed:

1. to identify the perimeter of the wind farm;
2. respecting the maximum spacing between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;
3. so that, where flashing lights are used, they flash simultaneously; and
4. so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located.

4.80 The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.

4.81 Further information is available in CAP 764, CAA Policy and Guidance on Wind Turbines and ICAO annex 14 Volume 1, chapter 6, Paragraph 6.4.

4.82 Objects which are deemed by the CAA to be aerodrome obstacles should, if not removed, be marked and if the aerodrome is used at night, lit except that:

1. obstacles that are sufficiently conspicuous by their shape, size or colour need not be marked;
2. objects which technically are aerodrome obstacles, but which are deemed to be shielded by other obstacles , need not be marked or lit;
3. immovable obstacles or terrain which extensively obstruct an aerodrome circuit area need not be marked or lit providing appropriate terrain avoidance procedures have been established;
4. an obstacle which the CAA considers to be of no operational significance need not be marked or lit.

4.83 Vehicles and other mobile objects, excluding aircraft, on the movement area of an aerodrome are obstacles and should be marked and, if the vehicles and aerodrome are used at night or in conditions of low visibility, be lit. Aerodrome licence holders may exempt aircraft servicing equipment and vehicles used only on aprons from this provision provided that they are adequately conspicuous.

4.84 Elevated aeronautical ground lights on aerodromes should be made conspicuous by day by a suitable form of marking.

Marking of obstacles

4.85 Fixed obstacles that are sufficiently conspicuous by their shape, size or colour need not be otherwise marked.

4.86 Fixed obstacles that require marking should be conspicuously coloured. If this is not practicable, markers or flags should be displayed on or above them.

4.87 No fixed obstacle need be marked if it is lit.

4.88 A fixed obstacle should be coloured to show a chequered pattern if it has essentially unbroken surfaces and its projection on any vertical plane equals or exceeds 4.5 m in both directions. The pattern should consist of rectangles with sides of not less than 1.5 m and not greater than 3 m.

4.89 A fixed obstacle should be coloured to show alternating contrasting bands if:

1. it has essentially unbroken surfaces and has one dimension, horizontal or vertical, greater than 1.5 m, and the other dimension, horizontal or vertical, less than 4.5 m; or
2. it is of skeletal type with either a vertical or horizontal dimension greater than 1.5 m.

4.90 The bands should be perpendicular to the longest dimension and have a width the dimensions of which are in accordance with table 4.3 (see figure 4.17).

4.91 A fixed obstacle should be coloured in a single conspicuous colour if its projection on any vertical plane has both dimensions less than 1.5 m.

Table 4.3 Marking band widths

Longest dimension			
Greater than	Not exceeding	Band width	
1.5 m	210 m	1/7 of longest dimension)	or 30 m whichever is less
210 m	270 m	1/9 of longest dimension)	
270 m	330 m	1/11 of longest dimension)	
330 m	390 m	1/13 of longest dimension)	
390 m	450 m	1/15 of longest dimension)	
450 m	510 m	1/17 of longest dimension)	
510 m	570 m	1/19 of longest dimension)	
570 m	630 m	1/21 of longest dimension)	

Figure 4.17(a) Basic marking patterns

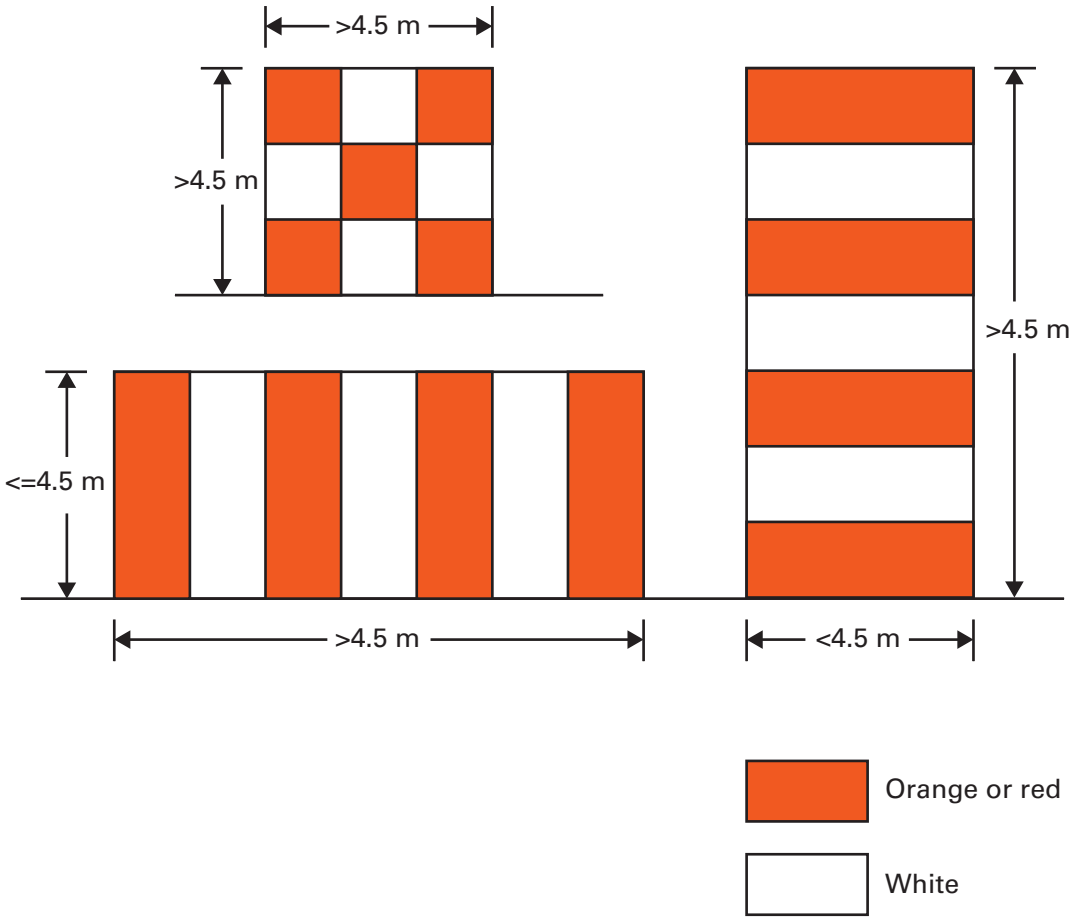
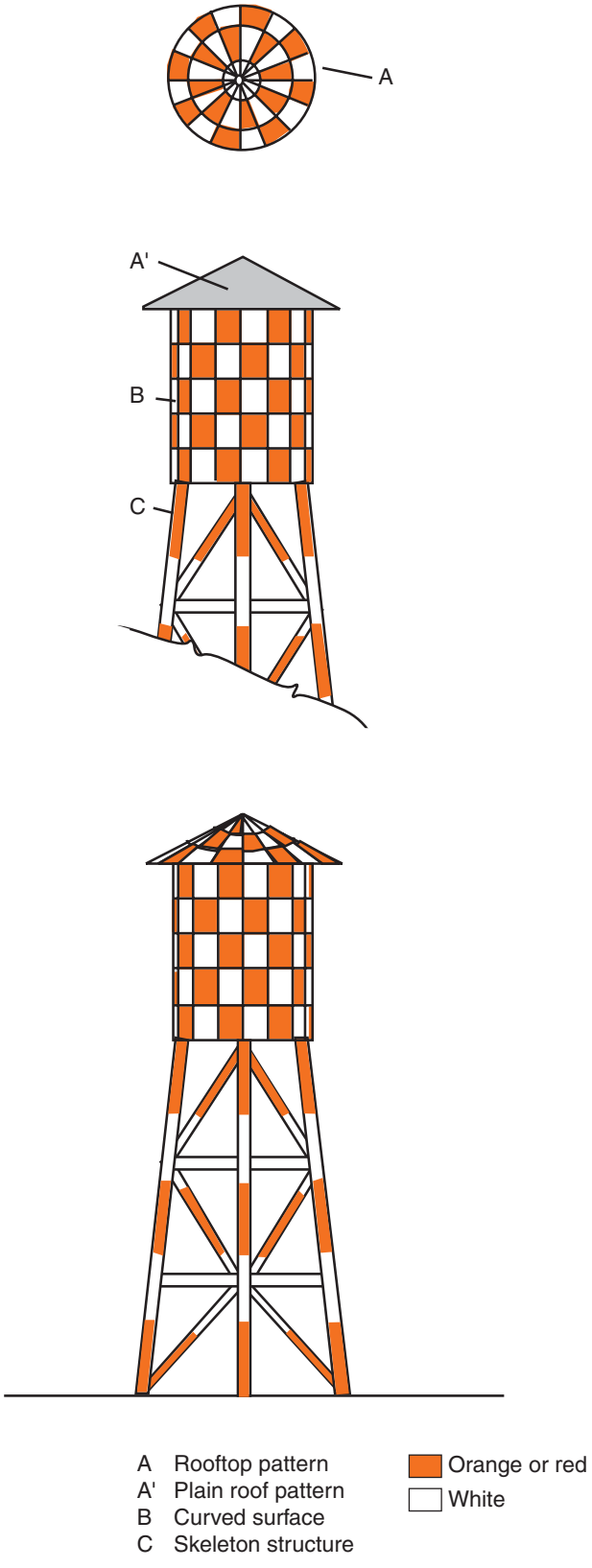


Figure 4.17(b) Marking of tall structures



4.92 All mobile obstacles that require marking should be conspicuously coloured or carry markers or flags (see also paragraph 4.95).

4.93 En route obstacles are not normally marked but may be marked in accordance with the preceding sub-paragraphs if local authorities so wish.

Colouring

4.94 The colours used for marking fixed obstacles should contrast with the background against which they will be seen. Where practicable, orange and white or red and white should be used for chequers and bands, and red or orange used for small objects as defined at paragraph 4.91. The chequers/bands on the extremities of the obstacle should be of the darker colour (see figure 4.17).

4.95 When mobile obstacles are marked by colour, a single distinctive conspicuous colour should be used.

Use of markers

4.96 Markers displayed on or adjacent to obstacles should be located in conspicuous positions so as to retain the general definition of the object without increasing the hazard it presents. The markers should be coloured either orange and white or red and white to contrast with the background.

Use of flags

4.97 Flags used to mark obstacles, including temporary obstacles to taxying aircraft, should be displayed around, on top of, or along the highest edge of an object, but must not increase the hazard presented by the object they mark. Flags should be displayed at least every 15 m and:

1. for fixed obstacles, flags should be not less than 0.6 m on each side and be orange in colour or a combination of two triangular sections, one orange or red and the other white, in order to give the maximum contrast;
2. for mobile obstacles, flags should be not less than 0.9 m on each side, consisting of a chequered pattern of squares in the manner illustrated in figure 4.17 and having sides not less than 0.3 m. The chequers should be coloured orange and white, or red and white except where such colours merge with the background.

Marking of unserviceable surface areas

4.98 Markers as described in chapter 7 should be used to delineate an unserviceable portion of the paved movement area. Unfit areas on paved taxiways and runways should be marked with white crosses as described in chapter 7.

4.99 When the portion is sufficiently small as to be bypassed safely by aircraft, flags or traffic cones may be used to outline its limits.

4.100 Marker boards alternating with flags or cones, as described in paragraph 4.9.3 of chapter 7, should be used to delineate an unserviceable portion of a grass aerodrome.

Lighting of obstacles

4.101 Obstacle lights should be used to indicate the existence of objects which are to be lit as follows:

1. Low intensity steady red obstacle lights should be used on obstacles less than 45 m high, except that medium intensity steady red lights should be used to light such obstacles as an elongated structure, an obstacle in the outer area of the approach or high ground adjacent to the aerodrome circuit. There are two types of low intensity obstacle lights for fixed obstacles: Group A and Group B (see table 6A.1).
    a) Low intensity Group A lights should be used for obstacles on the movement area where Group B lights may cause dazzle.
    b) Low intensity Group B lights should be used away from the movement area or in areas on the movement area with high levels of background illuminance.
2. Medium intensity red steady obstacle lights should be used on obstacles between 45 m and less than 150 m in height.
3. Medium intensity steady red obstacle lights should be used to indicate the presence of:
    a) an obstacle if its height is 150 m or more; or
    b) a tower supporting overhead wires, cables etc. of any height where an aeronautical study indicates such lights to be essential for recognition of the presence of the obstacle.

4.102 However, where an aeronautical study conducted by the CAA concludes that greater conspicuity of the obstacle through the use of a higher specification light is required, the use of a high intensity flashing white obstacle light will be considered by the CAA.

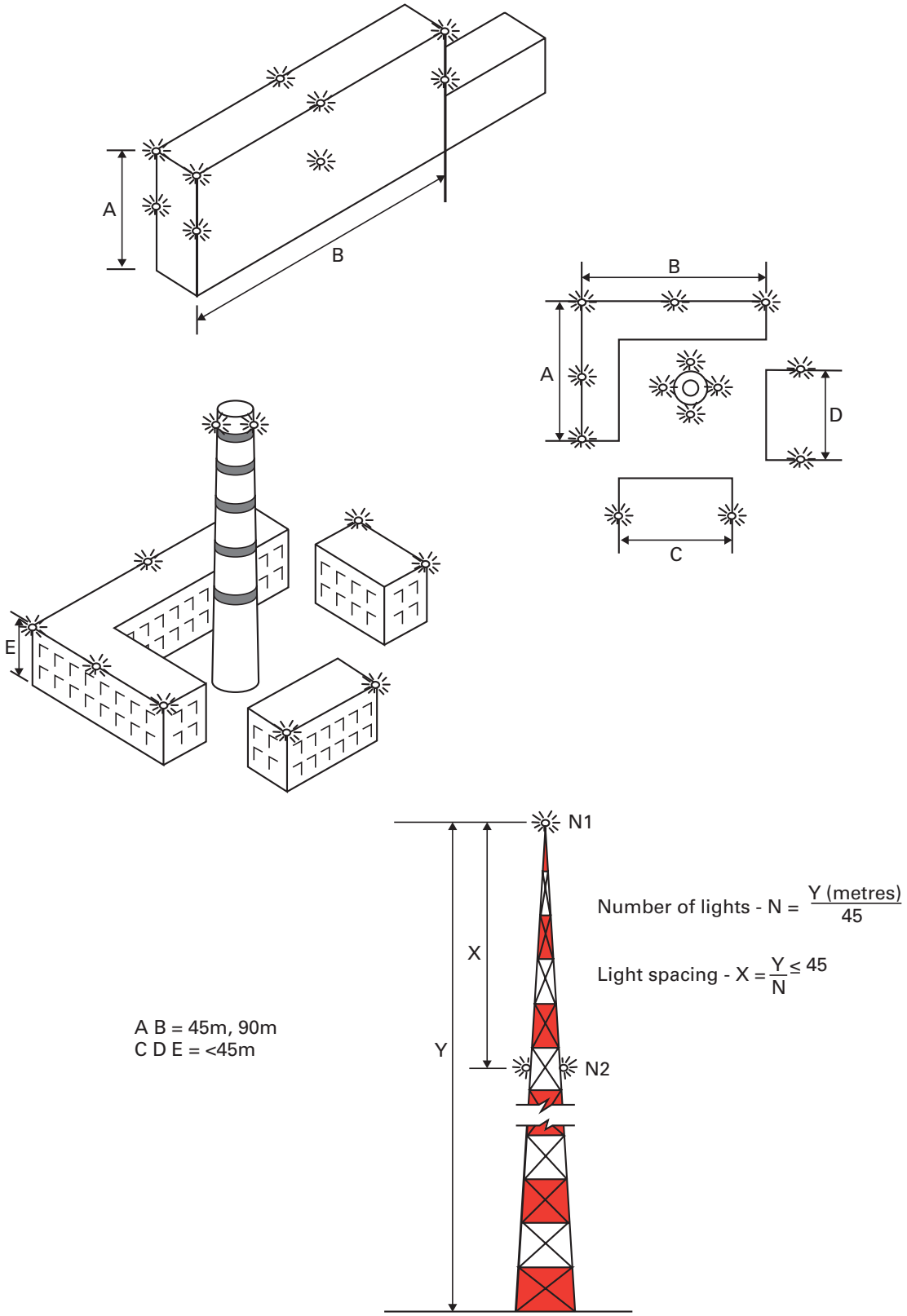
4.103 The combination of white and red obstacle lights should not be used at the same time to light an obstacle.

Location of obstacle lights (figure 4.18)

4.104 The top light

1. Except in the case of a chimney or other similar structure, one or more lights should be located at the top of the obstacle. The lights should be so arranged as to indicate the highest points or edges of the obstacle relative to the obstacle limitation surface. If two or more edges are of the same height, the edge nearest the flight path should be lit. On facing sides of groups of obstacles, lights may be omitted with the approval of the CAA, and the group treated as one solid obstacle.
2. In the case of a chimney or other similar structure, the top light should be placed between 1.5 m and 3.0 m below the top in order to reduce the effects of discolouration or corrosion from the exhaust fumes.
3. In the case of a guyed tower or antenna where it is not possible to locate an obstacle light on the top because of the weight of equipment involved, such a light should be located at the highest practicable point acceptable to the CAA.
4. In the case of a wind turbine, obstacle lights should be installed on the highest point of the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.

Figure 4.18 Lighting of objects

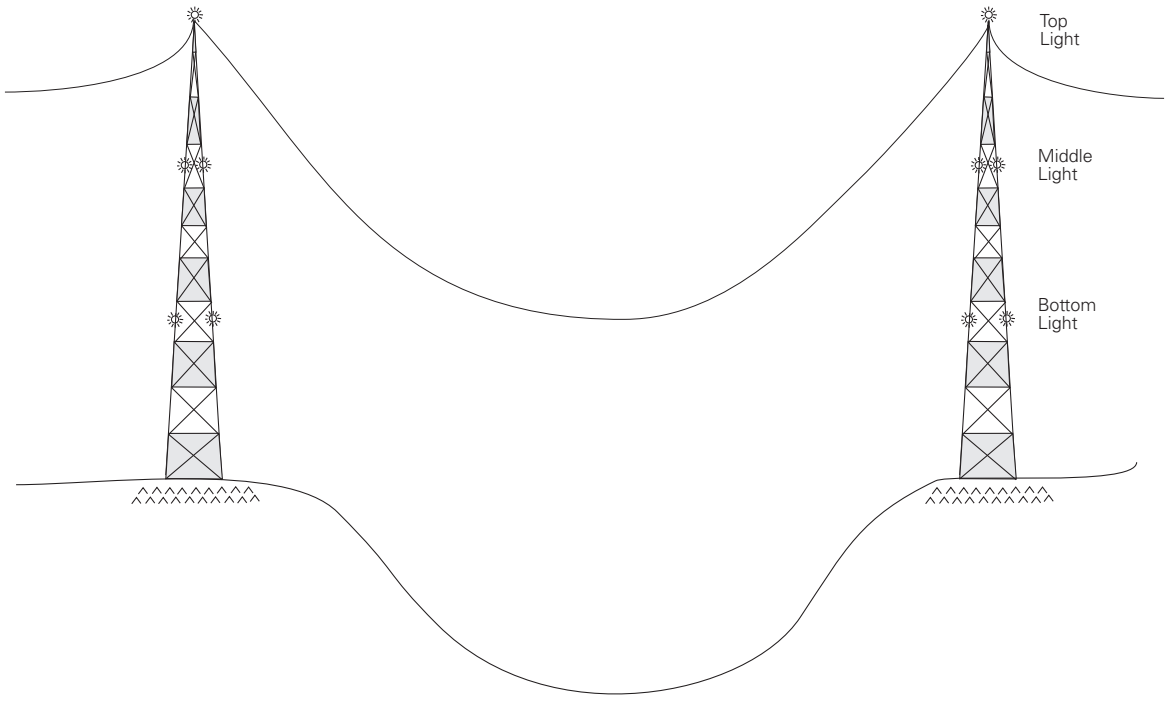


Intermediate lights

4.105 Where the top of an obstacle is more than 45 m above the level of the surrounding ground, additional lights should be provided at intermediate levels. These additional lights should be spaced as equally as practicable between the top light and ground level as follows:

1. when low or medium intensity obstacle lights are used the spacing should not exceed 52 m;
2. where deemed necessary by an aeronautical study, the spacing of high intensity flashing white obstacle lights on an obstacle other than a tower supporting overhead cables or wires should not exceed 105 m;
3. where obstacle lights are used on a tower supporting overhead wires or cables (figure 4.19) they should be located at three levels:
   a) on the top of the tower;
   b) on the tower at the lowest level of the catenary of the wires or cables; and
   c) at approximately mid-way between these two levels.
4. at each level the lights should be arranged to give full cover in azimuth.

Figure 4.19 Example of intermediate lighting



Lighting of unserviceable parts of the movement area

4.106 Unserviceable parts of the movement area of an aerodrome used at night should be lit as follows:

1. to delineate unsafe areas, lights should be spaced at intervals of not more than 7.5 m;
2. to close off unserviceable sections of runways or taxiways, lights should be spaced at intervals of not more than 3 m.

Note: The normal runway and taxiway lighting within the unserviceable area should be suppressed.

4.107 A light used to mark unserviceable parts of the movement area should consist of a steady red light of sufficient intensity to ensure conspicuity, considering adjacent lights and the general level of illumination against which it would normally be viewed. It should have a minimum intensity of not less than 10 cd.

Lighting of vehicles

4.108 The responsibility for marking and lighting vehicles used on the movement area must be determined between the licence holder and the operators of the vehicles. Licence holders are responsible for ensuring that vehicles on the movement area are lit and/or marked as required, irrespective of ownership.

4.109 The specification for yellow flashing vehicle obstacle lights is given in chapter 6, appendix A, table 6A.1. Strobe lighting is unacceptable. Obstacle lights for 'Follow-me' vehicles only shall have characteristics described in figure 6A 19.

4.110 The lights specified should be fitted at the highest point of the prime mover vehicle.

4.111 The highest point of trailers should be fitted with steady red lights of not less than 10 cd.

4.112 Obstacle lights on vehicles should be switched on whenever the vehicles are within the movement area; however, the number of vehicles displaying flashing lights should be restricted to the operational minimum.

4.113 Aerodrome ambulances, fire and rescue appliances should, in addition, carry blue flashing lights for use while carrying out emergency duties.

4.114 In conditions where emergency vehicles not normally based at an aerodrome are called upon for assistance, flashing blue lights, where fitted, should be operated within the movement area.

Light characteristics (see chapter 6, appendix A, table 6A.1)

Low intensity obstacle lights

4.115 On fixed obstacles, low intensity lights should be steady red and omni-directional.

Medium intensity obstacle lights

4.116 Medium intensity obstacle lights should be steady red light.

High intensity obstacle lights

4.117 High intensity obstacle lights should be flashing white lights.

Replacement of lamps

4.118 Unserviceable lamps should be replaced as soon as possible and in any event within 24 hours. Periodic replacement of all lamps is advisable – the active life being deemed to be 80% of the rated lamp life. Where such preventive maintenance cannot be arranged, tungsten lamps may be underrun on voltage down to a minimum of 90% of rated voltage, provided that the specified output can be met. This procedure should increase lamp life to about 400% of the rated lamp life. When this procedure is used, preventive replacement should be carried out after the increased interval. The requirements for periodic change of lamps may, however, be varied or waived where fittings having acceptable performance and proved life are used.

Note: NOTAM action should be taken to promulgate unserviceabilities.

Periods of illumination of obstacle lighting

4.119 High intensity flashing white obstacle lights should be lit at all times throughout the day and night.

4.120 Steady red medium and low intensity obstacle lights should be lit:

1. on and adjacent to an aerodrome from 30 minutes before sunset to 30 minutes after sunrise during the hours of availability notified in the UK AIP or by NOTAM;
2. on en route obstacles from 30 minutes before sunset to 30 minutes after sunrise. Should switching present problems, these lights may remain lit continuously.

CHAPTER 5

Wildlife strike risk hazard management for aerodromes

Introduction

5.1 Wildlife, birds especially, waterfowl, birds in flocks and other forms of wildlife, have the potential to cause significant damage to airframes and engines, especially turbine engines, and therefore their presence on an aerodrome and its immediate flight paths should be deterred. All reasonable measures should be taken to address those features on the aerodrome that may attract wildlife, control the existence wildlife on the aerodrome, and, where practicable, in the vicinity of the aerodrome to prevent bird flightlines across the aerodrome and its approach and departure routes.

5.2 In accordance with rules proscribed by EASA, the aerodrome operator shall:

1. assess the wildlife hazard on and in the vicinity of the aerodrome;
2. establish means and procedures to minimise the risk of collision between wildlife and aircraft at the aerodrome; and
3. notify the appropriate authority if a wildlife assessment indicates conditions in the vicinity of the aerodrome are conducive to a wildlife hazard problem.

5.3 Guidance material on current best practice for all aspects of wildlife control is detailed in CAP 772, Aerodrome Wildlife Strike Hazard Management and Reduction.

Wildlife control management

5.4 A Wildlife Management Plan (WMP) should be developed in order to:

1. assess the potential wildlife strike risk;
2. reduce wildlife infestation on the aerodrome as much as practicable;
3. implement a safeguarding system to identify and, where possible, address existing and planned developments within 13 km of the aerodrome that may have the potential to increase the wildlife strike risk;
4. monitor and assess wildlife strike or wildlife strike events; and
5. strive to improve the effectiveness of the plan through ongoing evaluation by competent personnel.

5.5 Details of, or reference to, the wildlife management plan should be included in the aerodrome manual.

CHAPTER 6

Aeronautical Ground Lighting (AGL)

Basic licensing requirements

General information

6.1 AGL provides flight crew with location, orientation and alignment information in adverse visibility conditions and at night. table 6.1 outlines the minimum prescribed scales of AGL needed in order to satisfy the aerodrome licensing requirement in respect of low visibility and night operations; it also highlights those elements of AGL equipment considered by the CAA to be operationally desirable for a particular operation. The type of lighting is specified according to the runway approach category and take-off (T/O) minima. Where the prescribed scale cannot be provided for an instrument runway, there may be a consequential penalty on operational minima (UK AIP AD 1.1.2 Aerodrome Operating Minima, paragraphs 4.2 to 4.5.2). The components, listed in table 6.1, are described in the succeeding paragraphs in the order in which they will be seen by a pilot approaching an aerodrome. The characteristics of the lights and their overall height limits are detailed in appendix 6A.

6.2 AGL for precision instrument approach runways should be high intensity so that it is usable by day and night. Low intensity may be used for other runways, but high intensity lighting is strongly recommended for non-precision instrument approaches and should be provided where there are public transport passenger operations.

6.3 AGL requirements for lower than standard category I and other than standard category II approach operations can be found in EU-OPS.

Table 6.1 AGL – minimum licensing requirements

	Day or night operations					Night only operations			Notes	Text ref
	App Cat II & III	T/O RVR <400	App Cat I	T/O RVR 400–800	App N/P Instrument	T/O RVR 800–1200	App Non-Instrument	T/O >1200		
Equipment	Scale L1		Scale L2		Scale L3		Scale L4			
Aerodrome Beacon	O	–	R	–	R	–	R	–		Para 6.18 to 6.22
Approach										Para 6.22 to 6.37
HI C/L 5-bars	R	–	R	–	–	–	–	–		
Supplementary	R	–	–	–	–	–	–	–		
Simple	–	–	–	–	R	–	O	–	1	
Sequenced strobe	–	–	–	–	–	–	–	–		
Approach Slope										Para 6.38 to 6.52
PAPI	R	–	R	–	O	–	–	–	2	
HI (A)PAPI	–	–	–	–	R	–	O	–	2	
LI (A)PAPI	–	–	–	–	–	–	R	–	2, 4	
Runway										Paras 6.2, 6.53 to 6.89
HI edge, threshold, end	R	R	R	R	R	O	–	–		
LI edge, threshold, end	–	–	–	–	–	R	R	R	3, 4	
HI C/L	R	R	O	O	–	–	–	–		
Touchdown zone	R	–	O	–	–	–	–	–		
Stopway	R	R	R	R	R	R	R	R		
Taxiway										
Centreline	R	R	O	O	–	–	–	–		Para 6.90 to 6.123
Edge	–	–	R	R	R	R	O	O	4, 5	
Illuminated Signs	R	R	R	R	R	R	O	O		
Stop bars	R	R	R	R	–	–	–	–		
Runway Guard	R	R	R	R	R	R	–	–		
Obstacle	R	R	R	R	R	R	R	R	6	Chap 4 Para 4.71 to 4.120
Alternate Input Power Supply	R	R	R	R	O	O	O	O		Para6.137
Illuminated Wind Sleeve	R	R	R	R	R	R	R	R		Chap 7 Para 7.10

R = Required, O = Operationally desirable, C/L = Centreline, HI = High Intensity, LI = Low Intensity,

NP = Non Precision, App = Approach

Notes:

1. May not be required where aerodrome used by day only and high intensity runway edge lighting installed, or when used at night in good visibility, or when sufficient guidance is provided by other visual aids. Where, at an aerodrome licensed for night use, the direction of approach is not evident from the configuration of the approach and runway lighting, an illuminated white landing T as described in chapter 7, should be provided either in the signals square or adjacent to the runway.
2. At aerodromes used by day only, by public transport aeroplanes carrying passengers on scheduled journeys or by public transport aeroplanes exceeding 5700 kg MTWA carrying passengers on other than scheduled journeys, the runway most frequently used, whether paved or unpaved, should be equipped with visual approach slope guidance. All runways used for public transport passenger operations should be equipped with PAPI.
3. Electric runway edge lighting should be provided for all operations by public transport aeroplanes carrying passengers on scheduled journeys or by public transport aeroplanes exceeding 5700 kg MTWA carrying passengers on other than scheduled journeys. Paraffin flares may be used for runway edge lighting in Scale L4 for other operations.
4. Low intensity systems are suitable only for night time use.
5. Not normally required where HI C/L provided.
6. Runway Guard Lights are required for take-off in RVR < 1200 m day or night.

6.4 A luminous intensity control system is required for all high intensity lighting. It will also be needed in most cases for low intensity (A)PAPI.

6.5 These requirements are derived from the Standards and Recommended Practices detailed in ICAO annex 14 and are intended to cater for the full range of operations that might reasonably be expected at a particular aerodrome. They should not be confused with the minimum requirements for specific aeroplane operations as described in other documents such as EU–OPS (Subpart P) and CAP 789, Requirements and Guidance Material for Operators.

6.6 Any proposed modification to an AGL system or any work that requires the approval of the CAA (under the terms of the aerodrome licence) should be notified to the CAA.

6.7 Additional guidance on the purpose and significance of AGL may be found in the Visual Aids Handbook, CAP 637.

Periods of display of aeronautical ground lighting

6.8 Aeronautical ground lighting should be displayed at least 15 minutes before the estimated time of arrival of any aircraft and until at least 15 minutes after the actual time of departure of any aircraft as follows:

By day:

- High intensity systems, where installed on the runway to be used, whenever the visibility is less than 5 km and/or the cloud base is less than 700 ft.

By night:

- Irrespective of weather conditions.

6.9 Aerodrome beacons and obstacle lighting should be displayed at night whenever the aerodrome is available for use.

Dangerous and confusing lights

6.10 The ANO states that a person shall not exhibit in the UK any light which is liable to endanger aircraft taking-off or landing or which is liable to be mistaken for an aeronautical light.

6.11 A light may endanger aircraft when:

1. the intensity causes glare in the direction of an approaching aircraft;
2. the colour (e.g. advertising signs) causes it to be mistaken for an aeronautical light;
3. viewed from the air, lights make a pattern (e.g. a row of street lights) similar to an approach or runway lighting pattern;
4. the overall amount of illumination near the approach to a runway detracts from the effectiveness of the AGL, particularly in poor visibility.

6.12 Lasers are a source of special concern because even brief exposure to the light from such devices can cause temporary blindness. Guidance on the use of lasers with regard to aviation safety has been produced by the CAA and is contained in CAP 736, Guide for the Operation of Lasers, Searchlights and Fireworks in United Kingdom Airspace.

6.13 The licence holder should ensure that arrangements exist whereby local planning authorities may receive appropriate advice about the lighting implications of planning applications before such applications are determined.

6.14 Particular attention should be paid to lights in the following areas:

1. For instrument approach runways
   - A rectangular area 750 m on each side of the centreline and extended centreline of the runway extending to a distance of 4500 m before the threshold.
2. For non-instrument runways

- An area 220 m wide equally disposed about the centreline of the runway and increasing in width along the extended centreline from 220 m at the threshold to 950 m wide at a distance of 3000 m from the threshold.

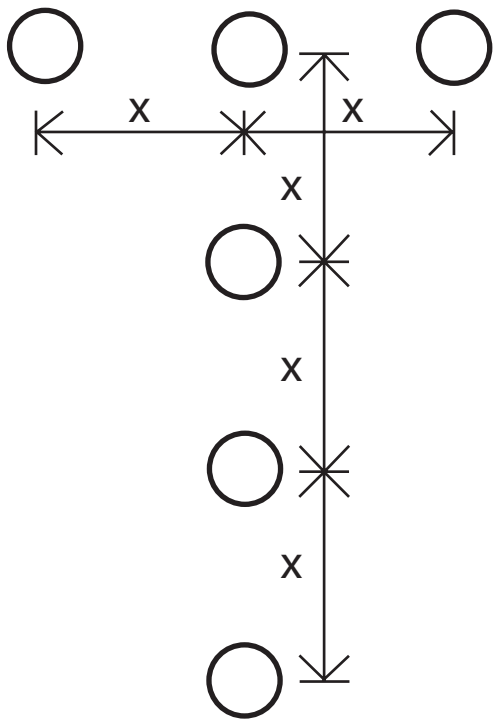
AGL for helicopter night landing training

6.15 Where helicopter night landing training is conducted at an aerodrome, a six-light proportional T (see figure 6.1) may be provided. The lights of the proportional T should be omni-directional, white and useable from a distance of 4 nm.

6.16 When positioned on an aerodrome with a fixed wing runway also in use, the proportional T should be sited so as to permit safe parallel approaches, to avoid obstructions and to minimise noise nuisance.

6.17 If provided, a proportional T must be notified to the CAA and included in the Permission to display AGL. Procedures for the use of the proportional T should be included in the aerodrome manual.

Figure 6.1 Proportional 'T'



Note: It is recommended that the dimension x should be 10 m.

Aerodrome beacon

6.18 An aerodrome beacon is intended to assist pilots in locating and/or identifying an aerodrome at night and should be provided at all aerodromes licensed for night operations except where the CAA considers such provision unnecessary.

6.19 Exemption from the requirement above will be assessed according to the type of operations conducted at the aerodrome, the conspicuity of the AGL pattern in relation to background lighting patterns and levels, and the availability of other aids with which to locate the aerodrome at night. As a general principle, an aerodrome beacon is required at an aerodrome where visual approaches are conducted at night or where night flying training is carried out. However, at major aerodromes located in a control zone where aircraft are positioned using radio navigation aids and ATC procedures are in force, the requirement may be waived if the CAA is satisfied that there can be no possibility of confusion with other aerodromes nearby.

6.20 The characteristics of aerodrome beacons are described in appendix 6A; there are two main categories as follows:

1. Identification beacon – An identification beacon is intended for use where aerodromes in the same vicinity operate at night and confusion could arise as to the identity of the airfield in question. The beacon flashes a two letter morse code symbol in green identifying the airfield.
2. Location beacon – A location beacon is intended for use at aerodromes where the local terrain or the pattern and level of background lighting is such that it might be difficult for a pilot to identify the AGL pattern when outside the circuit area but where no other airfield operates in the same vicinity at night. There are two types of location beacon.
    a) Location beacon pattern 'A' – a beacon flashing alternately green and white. A pattern 'A' location beacon is intended for use in those geographic areas where high background light levels persist (such as urban areas).
    b) Location beacon pattern 'B' – a white flashing light. A pattern 'B' location beacon is intended for use in those geographic areas where low background light levels are found.

6.21 The type of aerodrome beacon and any associated morse code symbol to be provided at an aerodrome will be determined by the CAA. However, where a requirement for an aerodrome location beacon is determined, the aerodrome may provide instead an aerodrome identification beacon.

6.22 An aerodrome beacon should be situated on a part of the aerodrome where the level of local background lighting is low and so that it is visible from all directions of approach. The site chosen should be such that the beacon will not cause a hazard by impairing the vision of flight and ground crews engaged in carrying out their duties nor cause any interference with other visual or radio aids.

Approach lighting and circling guidance lights

6.23 Approach lighting provides alignment, roll guidance and limited distance-to-go information for the visual completion of an instrument approach. Circling guidance lights provide orientation with the runway for traffic outside the approach area, e.g. in the aerodrome circuit.

High intensity coded centreline and crossbar approach lighting system

6.24 The standard approach lighting system consists of a 900 m coded line of white lights, on the extended centreline of the runway, and five crossbars at 150 m intervals. The bars decrease in width towards the runway threshold, lines through the outer lights of the bars converging to meet the runway centreline 300 m upwind from threshold. The illustration at figure 6.2 shows the plan view for precision instrument approach operations. Vertical setting angles are contained in table 6A.2 and the associated Notes, and in figure 6A.1.

6.25 Terrain or other constraints may limit the length or type of approach lighting that can be installed to less than that specified. In such circumstances, a lesser length is acceptable but will normally incur a penalty on aerodrome operating minima. Whatever length is installed should be appropriate to the approach procedure and specified pattern.

6.26 Approach lighting for newly equipped precision instrument approach runways should have the characteristics specified in figure 6A.1. The light performance requirements for Category III operations are given in table 6A.2.

6.27 Five stages of luminous intensity are required for this type of approach lighting.

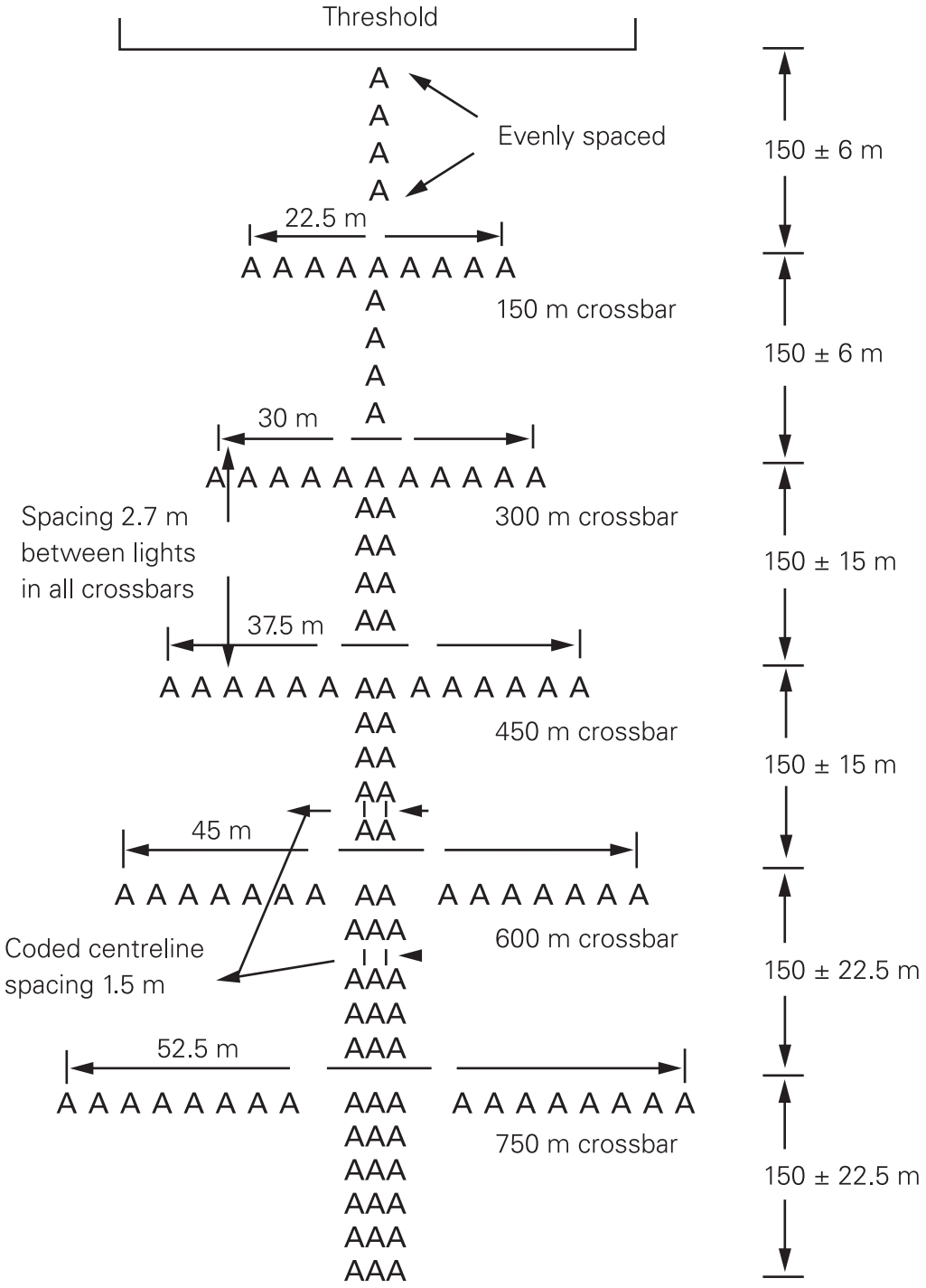
Supplementary approach lighting

6.28 Supplementary approach lighting required for Category II and III operations consists of:

1. two additional white lights on each side of the centreline light forming barrettes along the inner 300 m of the approach centreline, the lights in each barrette being spaced 1.2 m apart; and
2. red side row barrettes of four lights spaced 1.5 m apart on each side of each centreline barrette over the inner 270 m of the approach lighting system. The lateral gauge of the barrettes should be equal to that of the Touchdown Zone (TDZ) lighting. The pattern is illustrated in figure 6.3 and the light characteristics are specified in figure 6A.2.

6.29 Three stages of luminous intensity are required for this part of the system.

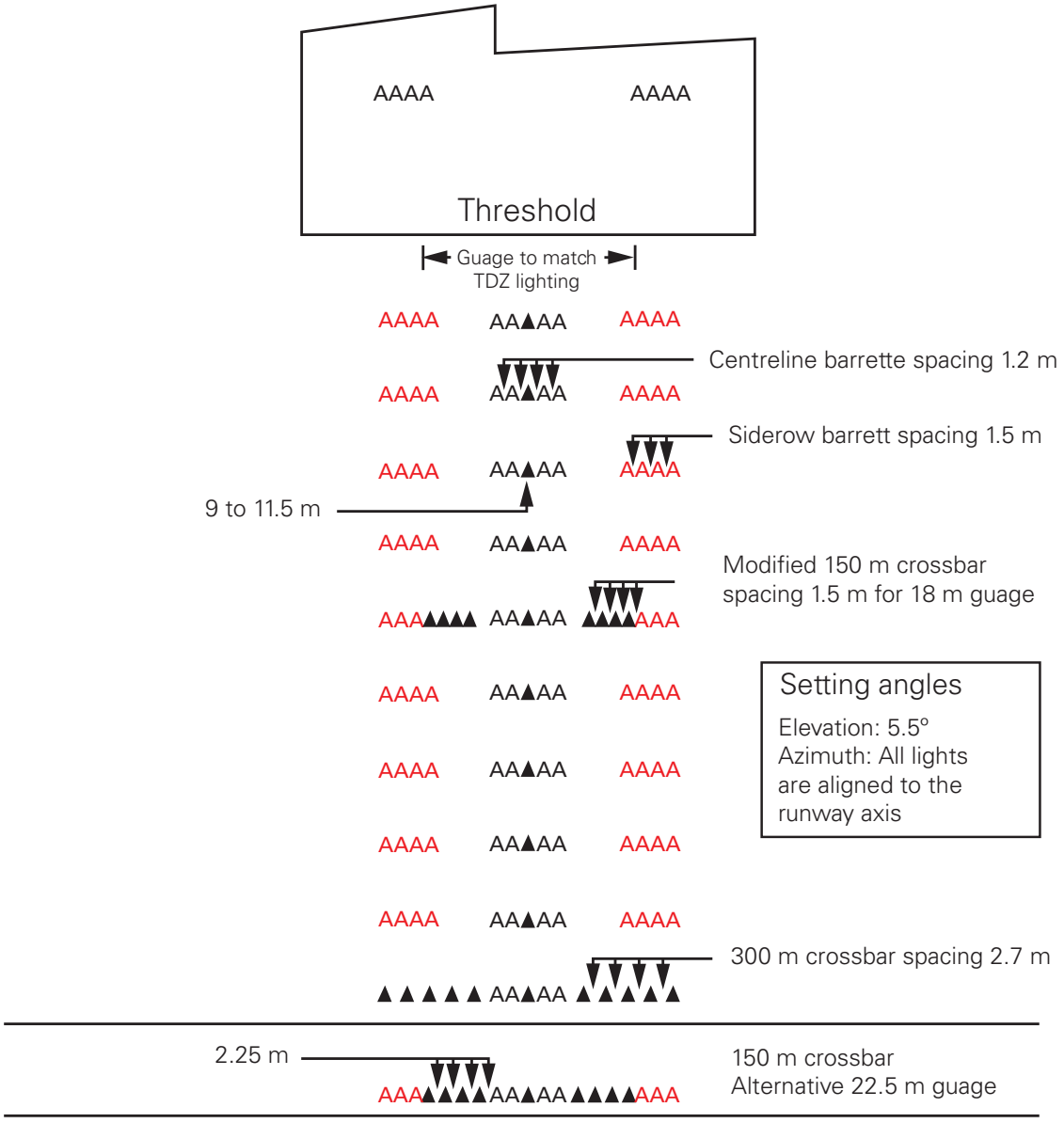
Figure 6.2 High intensity coded centreline and crossbar approach lighting system



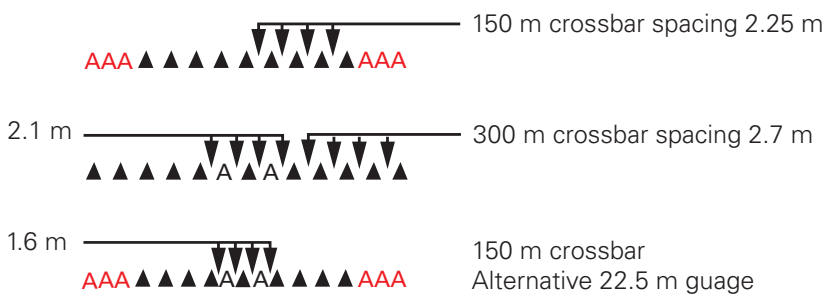
Note:

See paragraph 3.5.1 for profile limits and table 6A 2 note 3, and figure 6A 1 for elevation setting angles.

Figure 6.3 Supplementary approach lighting system



Spacing of crossbar lights when centreline barrettes are omitted

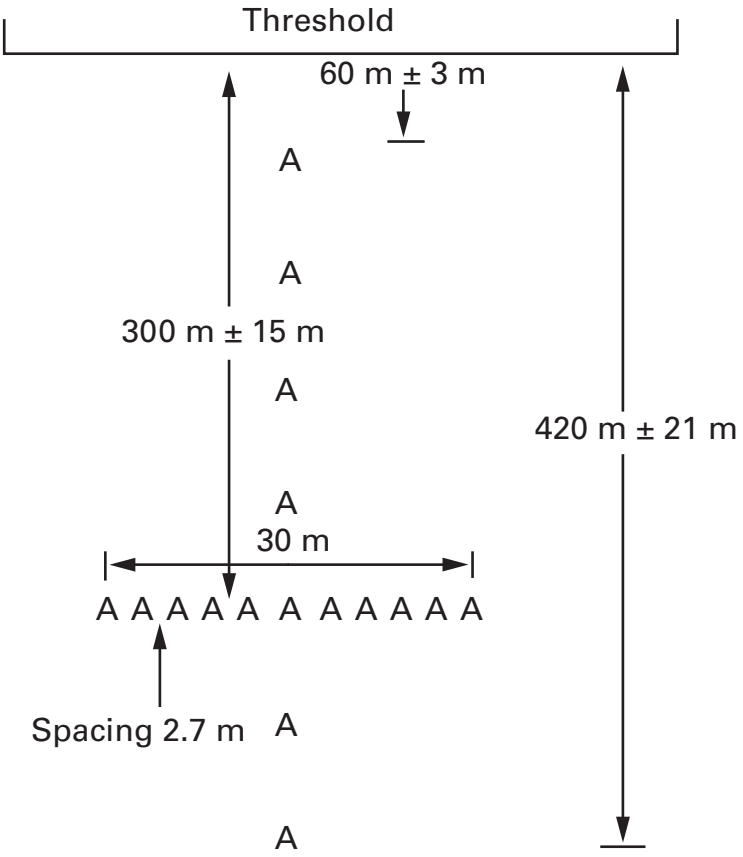


▲ : These lights are in circuit with the HI 5 bar approach system

Simple approach lighting system

6.30 The system consists of a row of lights, white for high intensity and red for low intensity, on the extended centreline of the runway at 60 m intervals for a distance of at least 420 m from the runway threshold, with a crossbar 30 m in width at 300 m from the threshold. The pattern is illustrated in figure 6.4 and the light performance requirements are given in figure 6A.1 for HI lights and table 6A.1 for LI lights.

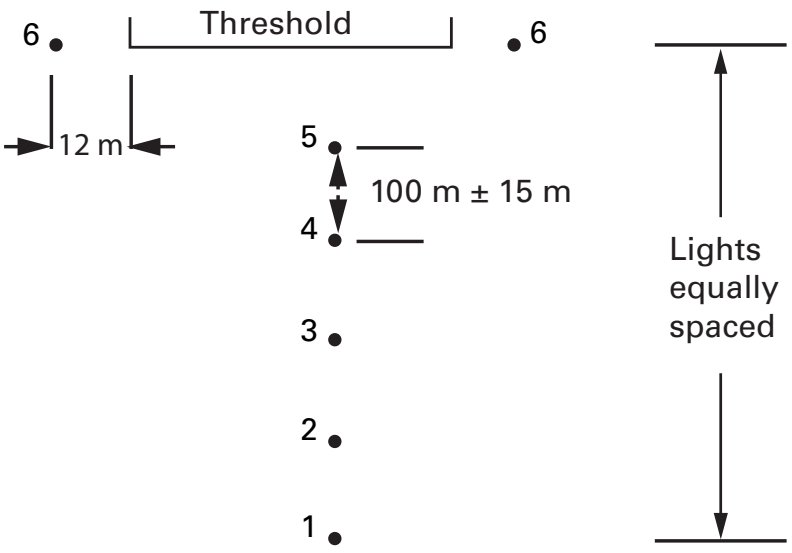
Figure 6.4 Simple approach lighting system



6.31 A high intensity system should have five stages of luminous intensity.

6.32 Sequenced capacitor discharge (strobe) approach lighting is an alternative means of providing simple approach and circling guidance lighting. This system should consist of seven omni-directional strobe lights, five of them located on the extended runway centreline and the other two at the runway threshold as shown in figure 6.5. The light performance requirements are given in table 6A.1.

Figure 6.5 Sequenced strobe approach lighting



Note: The number indicates order of the pulse sequence

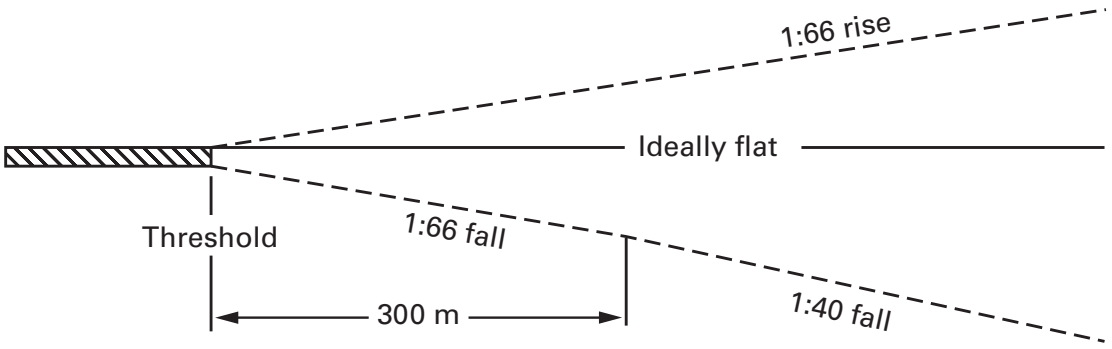
6.33 The objective is to provide a continuous ripple along the length of the extended centreline. The duration of each discharge should not exceed 200 milliseconds and the next discharge in sequence should commence within 1.2 seconds of the initiation of the previous discharge. Adjustment to the discharge duration and trigger rate should be made in order to achieve the optimum ripple effect without any breaks.

6.34 The strobe approach lights shall be independently switched from the rest of the AGL.

Approach lighting profile and obstacle protection

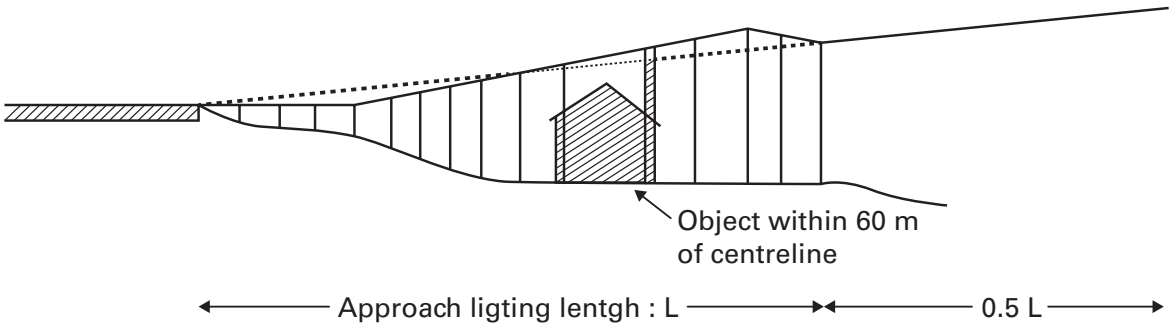
6.35 Ideally, all the approach lights should lie in a horizontal plane at the same level as the runway threshold. However, this is seldom achievable because of terrain undulations or obstacles in the approach area. The profile of the centreline lights should not exceed the limits shown at figure 6.6. The lateral gradient of the lights in each crossbar should not be greater than 1:80 with the mid-point in the plane of the centreline lights. Excessive gradients may cause misleading perspective and height cues, and changes of gradient within the length of the system may result in an uneven sequence of the lights when seen from the approach. To keep these effects to a minimum, successive changes in profile gradients should be as few as possible and not exceed 1:60.

Figure 6.6 Approach light centreline profile limits



6.36 An approach light plane is established to ensure that objects do not obscure or distort the lighting pattern observed from an aircraft on the approach. The plane, or more commonly a series of planes, contains the lights comprising the system and extends from the threshold to 1.5 times the length of the installation at a width of 120 m equally disposed about the extended centreline of the runway. Beyond the outer end of the approach lights the gradient of the plane contains the threshold and the outermost lights.

Figure 6.7 Approach light plane



Circling Guidance Lighting

6.37 Circling guidance lighting should be provided where visual approaches to the aerodrome or flying training take place at night. It should also be provided in special circumstances; e.g. where obstacles affect visual manoeuvring, in which case high intensity lighting may be specified if a daylight capability is necessary. The omni-directional component of runway edge lights will normally provide sufficient orientation to a pilot flying in the aerodrome circuit. If the presence of such a component is insufficiently conspicuous, guidance should be provided by any of the following systems:

1. separate lights adjacent to the runway;
2. omni-directional red low intensity approach lights;
3. omni-directional white sequenced strobe approach lighting; or

4. runway alignment beacons, flashing white or red on the runway extended centreline.

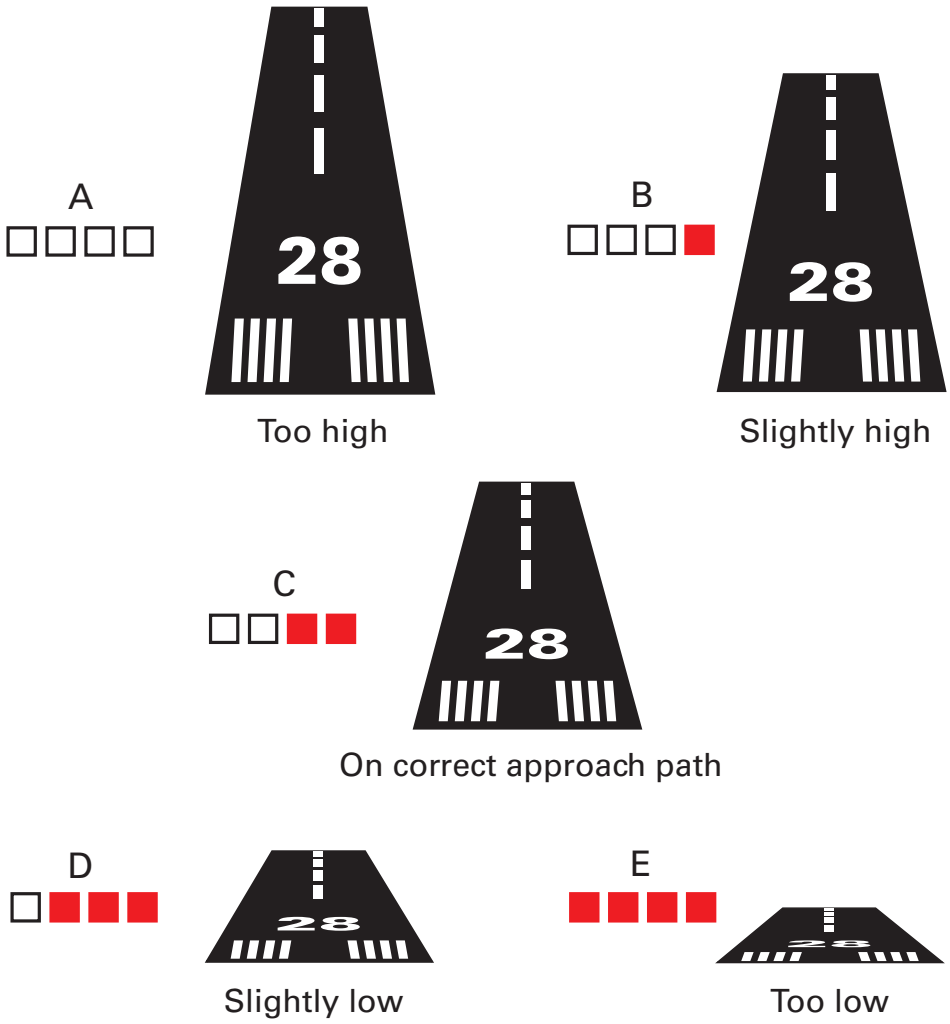
Approach slope indicators

General

6.38 Approach slope indicators provide flight crew with information on the achieved approach angle, as well as giving clearance over approach obstacles.

6.39 The basic system is the PAPI. In certain circumstances (see table 6.1), less than the full system may be provided. These abbreviated systems are prefixed 'A'. The units are normally installed on the left hand side of the runway, viewed from the approach; a right hand installation is permitted if it is not practicable to position them on the left or if a second set is required. Details of the installation criteria for (A)PAPI and its required setting angles are given in appendix 6B.

Figure 6.8 Typical PAPI system



6.40 The units direct a beam of light, red in the lower half and white in the upper, towards the approach. They are set at different elevation angles so as to give a combination of red and white for an on-slope signal, all-red if the aircraft is too low, and all-white if it is too high (see figure 6.8). A transition zone will be perceived between the red and white sectors of each unit. PAPI units have a perceived transition of approximately three minutes of arc and are known as sharp transition units.

6.41 The siting and elevation settings of approach slope indicators installed on runways served by ILS should be such that the visual approach slope conforms as closely as possible to the ILS glidepath.

6.42 Systems required for day and night use should consist of high intensity units with a luminous intensity control.

6.43 The CAA should be consulted before any approach slope indicator is installed or repositioned. The following information should be provided:

1. the number and type of units, their proposed location and angular settings;
2. any difference in elevation between the runway threshold and the proposed sites of the individual units, enabling siting adjustments to be made for any longitudinal or transverse slope, see figure 6B.2; and
3. either a survey of the obstacle clearance surface shown at figures 6B.1 or 6B.3, as appropriate, or other evidence that the surface is not infringed by any object.

Precision Approach Path Indicator (PAPI)

6.44 PAPI consists of four sharp transition units located as a wingbar, preferably on the left side of the runway. If roll guidance is required and is not provided by other visual means, four units should be positioned on each side of the runway so that the wingbars appear opposite each other. Siting data are contained in appendix 6B, together with information on elevation setting angles.

6.45 Each unit provides discrete information. Two factors important to the reliability of the system are therefore the number of lamps per unit and the knowledge that the lamps are working when required. Units should have two or more lamps, and the lamps may, if convenient, be interleaved. In this case the interleaving should be between lamps and not luminaires (see 'Interleaving of AGL Electrical Circuits'). PAPI installations should be equipped with a monitoring system which will detect lamp failure so that flight crew may be advised and the failure investigated and remedied without delay.

6.46 Lenses must be kept clean to produce a usable signal. In certain meteorological conditions condensation may form on either side of the lenses when the units are not in use. This will degrade and distort the signal to an unacceptable extent for some time after the system is switched on. The problem can be overcome either by running the lamps at very low power while the unit is not in use, or

by operating low powered heaters fitted to the units. Where neither of these provisions is made, the units should be selected to full luminous intensity for at least 15 minutes, or other such period recommended by the units' manufacturer, before they are required for use.

(A)PAPI

6.47 (A)PAPI consists of two sharp transition units located as a wingbar, preferably on the left side of the runway. A high intensity system should be used for Scale L3. That for Scale L4 may be high or low intensity. Low intensity units are of limited use by day, having a range of about 3 km. Each unit should have at least two lamps. Siting data and information on setting angles are contained in appendix 6B.

6.48 (A)PAPI systems are not suitable for approach paths in excess of 4 degrees in elevation and for public transport passenger jet operations (see table 6.1).

Luminous intensity control requirements for approach slope indicators

6.49 PAPI, and high intensity (A)PAPI should have at least five luminous intensity stages: 100%, 30%, 10%, 3% and 1%.

6.50 An additional 80% stage may be added to conserve lamp life if the manufacturer so advises. An 80% setting is normally adequate for daylight use except when approaches are made towards a low sun.

6.51 A luminous intensity control is not essential for low intensity systems, but at least two stages (100% and 30%) are desirable since the units are often considerably brighter than the runway edge lights. This applies particularly to PAPI/(A)PAPI at low intensity where a further 10% stage is advisable in most cases.

Unserviceability of (A)PAPI systems

6.52 PAPI and (A)PAPI installations should be withdrawn from service if one unit is found to be unserviceable, except where installations are on both sides of the runway, in which case only the affected side should be withdrawn. However, when PAPI is installed for scales L3 and L4 and either of the outside units become unserviceable, the two central units may be used temporarily as an (A) PAPI without altering the setting angles.

Runway and stopway lighting

6.53 Runway threshold, end and edge lighting are intended to define the usable extent of the runway – not the declared distances. For low visibility operations, centreline lighting is added in order to provide alignment and some distance-to-go information by colour coding; touchdown zone lighting is added in order to improve texture and perspective and to give flight crew an indication of the area within which a balked landing must be initiated if it is to be contained within the OFZ. Stopway lights delineate the stopway. The cabling for these lights should be buried.

6.54 The characteristics of the lights, including height limits, are detailed at appendix 6A, and layouts are shown at figures 6.9 and 6.10. Setting angles are given in table 6A.1, table 6A.2 and figures 6A.3 to 6A.10.

6.55 High intensity lights should have five luminous intensity stages. Low intensity lighting needs only one setting.

Runway edge lighting

6.56 Runway edge lights consist of two parallel rows of lights equidistant from the runway centreline. They should be located along the edges of the area declared for use as the runway. A licence holder seeking a variation to this requirement will need the approval of the CAA; this should be sought before proceeding with any planning or other work.

6.57 On runways of up to 50 m in width, the longitudinal spacing of the lights should be 60 m ± 6 m. Where the width of the runway exceeds 50 m, a closer longitudinal spacing as determined by the CAA may be required dependent upon the nature of operations and other visual aids serving the runway. The lights on opposite sides of the runway should be on lines at right angles to the centreline, as shown at figure 6.9. Where uni- or bi-directional light units are used at aerodromes and visual approaches to the airfield or flying training take place at night, an omni-directional light should be provided at each alternate position in order to provide circling guidance.

6.58 Runway edge lights should be white except in the following instances:

1. On a precision instrument approach runway without centreline lighting, yellow lights should be installed on the upwind 600 m or one third of the lighted runway length available, whichever is the less. This section is known as the yellow caution zone and gives visual warning of approaching the runway end. If centreline lights are installed subsequently, the yellow caution zone lights should be replaced with white lights.
2. Where a threshold is displaced, the lights between the beginning of the runway and the displaced threshold should show red in the approach direction.
3. One or two omni-directional blue lights may replace or supplement the edge lights to indicate an exit taxiway.

6.59 Scale L4 lighting may comprise fixed or portable lights. The location of portable lights should be marked permanently. The power for electric edge lights should be provided preferably by mains or locally-generated electricity, but battery powered lights are acceptable provided that the battery lives are adequate for the duration of night flying operations. Gooseneck paraffin flares are acceptable as edge lights subject to the proviso of table 6.1, Note 3, but electric lighting should be used in such a pattern for the threshold and runway end.

Runway threshold and runway end lights

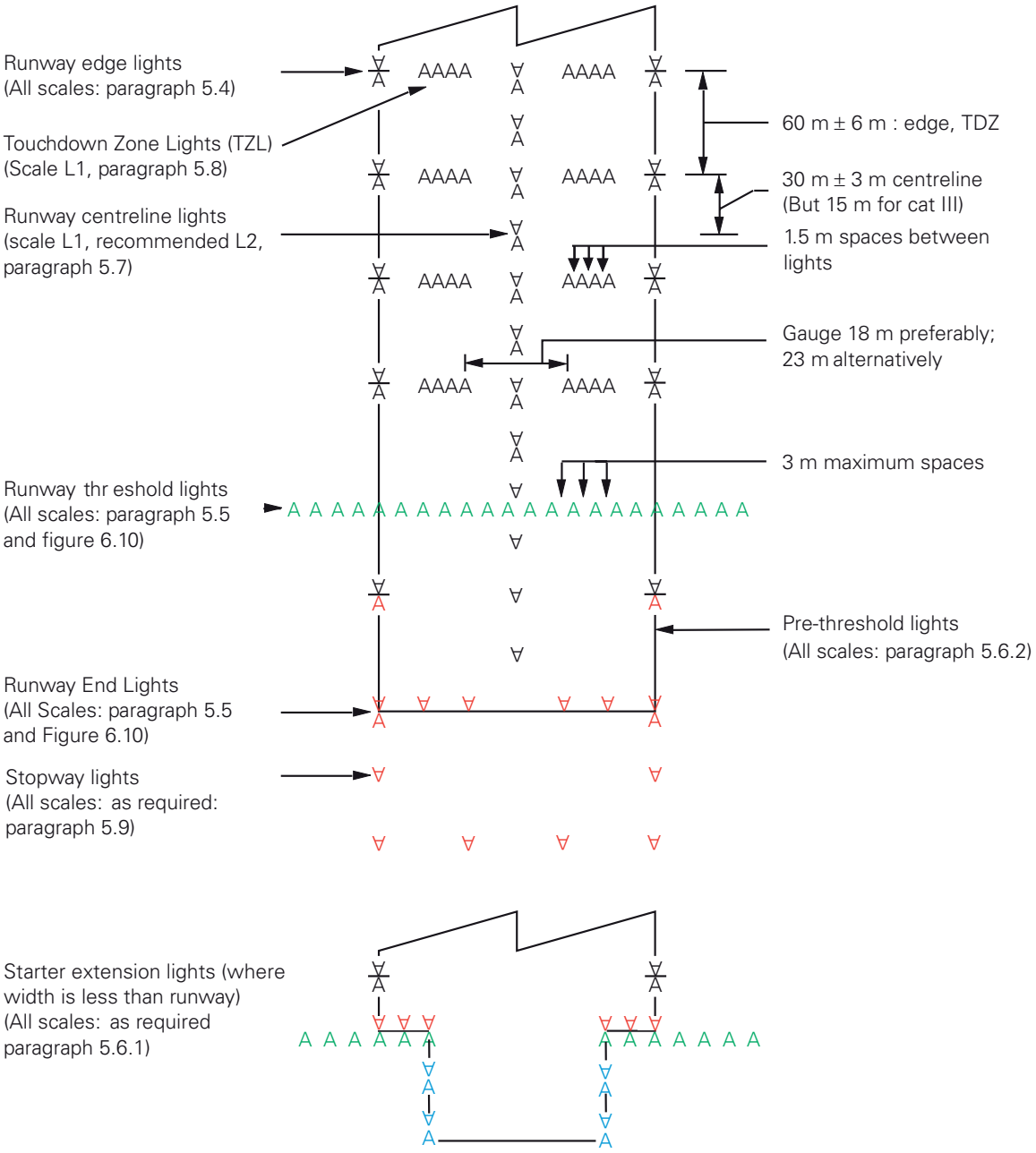
6.60 Runway threshold lights are green and indicate the start of the available landing distance. Runway end lights are red and delineate the extremity of the runway that is available for manoeuvring – not the declared distances. The characteristics of these lights are detailed in appendix 6A.

6.61 Figure 6.10 shows the layouts permitted according to circumstances.

6.62 Threshold wingbars should be provided for Scales L1 and L2, and for other Scales where the threshold is displaced. They are recommended for Scales L3 and L4 in the interests of added conspicuity.

6.63 Threshold lights should have luminous intensity compatible with that of the runway edge lights.

Figure 6.9 Runway lighting



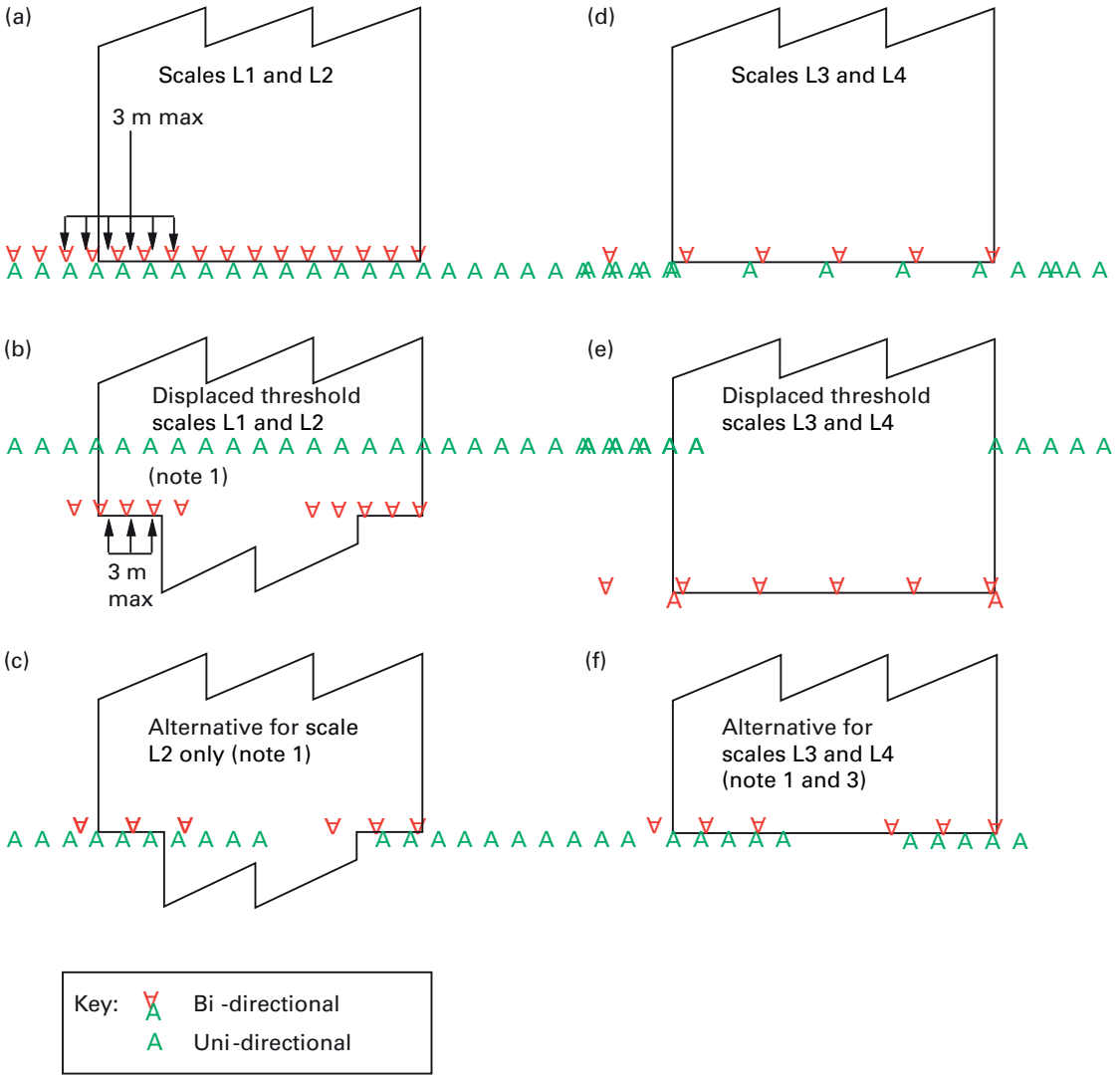
Notes: 1. Not to scale

2. Approach lighting, and colour-coding of centreline and edge lights are omitted for clarity

KEY:

- Bi-directional light
- Uni-directional light
- High intensity bi-directional light with low-intensity omni-directional component
  or
  Low-intensity omni-directional light

Figure 6.10 Runway threshold and runway end lighting



Notes:

1. The centre gap, which is designed to allow the use of elevated lights where a stopway exists, should not exceed half the runway width. Number of threshold lights will be dependent on runway width with light spacing 3 m maximum.
2. Uni- or bi-directional lights should be used, except for portable lights in Scale L4 which may be omni-directional.
3. Wingbar lights may be used to provide added conspicuity.

Starter extension lighting

6.64 A starter extension which is narrower than its associated runway should have blue edge lighting.

6.65 A pre-threshold runway of the same width as its associated runway should have edge lighting showing red on approach and white in the opposite direction with longitudinal spacing as for the runway edge lights.

Runway centreline lights

6.66 White runway centreline lights are required for take-off in RVR below 400 m and for precision instrument approach runways Category II and III. They extend from the threshold of the runway to 900 m from the upwind runway end, then the following 600 m should be alternate white and red lights, and the final 300 m to the runway end, all red lights. Where the end of TORA/LDA does not coincide with the runway end, the section of red lights should be extended to the runway end. The circuits for the white and red lights should be arranged so as to preserve the colour coding in the event of a circuit failure. The spacing between centreline lights should be 30 m except that for Category III operations and for take-off in RVR below 400 m, the spacing should be 15 m. The layout of runway centreline lights is illustrated at figure 6.9.

6.67 For Category II operations, centreline lights with characteristics meeting the requirements in table 6A.2 should be set to give maximum luminous intensity at 3° above the horizontal.

Touchdown Zone Lights (TDZ)

6.68 Touchdown zone barrettes symmetrically disposed either side of the runway centreline should extend from the threshold for a distance of 900 m or to the midpoint of the runway, whichever is less. Each barrette has four white lights spaced not more than 1.5 m apart, the innermost lights being not less than 9 m nor more than 11.5 m either side of the centreline. The longitudinal spacing between barrettes should be 60 m ±6 m. The lateral gauge of the barrettes should be equal to that of the Supplementary Approach lighting red side row barrettes. The layout of the touchdown zone lights is illustrated in figure 6.9.

6.69 A setting angle of 3° should be used for Category II operations. For Category III operations using Category II lighting, the TDZ lights should be set to give their maximum luminous intensity at 5.5° above the horizontal. Newly constructed or re-equipped runways for Category III operations should have TDZ lighting with the characteristics specified in figure 6A.5.

Simple touchdown zone lights

6.70 The purpose of simple touchdown zone lights is to provide pilots with enhanced situational awareness in all visibility conditions and to help them to decide whether to commence a go-around if the aircraft has not landed by a certain point on the runway. It is essential that pilots operating at aerodromes with simple touchdown zone lights be familiar with the purpose of these lights.

6.71 Except where TDZ lights are provided in accordance with paragraphs 6.68 to 6.69, at an aerodrome where the approach angle is greater than 3.5 degrees and/or the landing distance available combined with other factors increases the risk of an overrun, simple touchdown zone lights should be provided.

6.72 Simple touchdown zone lights shall be a pair of lights located on each side of the runway centreline 0.3 m beyond the upwind edge of the final touchdown zone marking. The lateral spacing between the inner lights of the two pairs of lights shall be equal to the lateral spacing selected for the touchdown zone marking. The spacing between the lights of the same pair shall not be more than 1.5 m or half the width of the touchdown zone marking, whichever is greater. (See figure 11.)

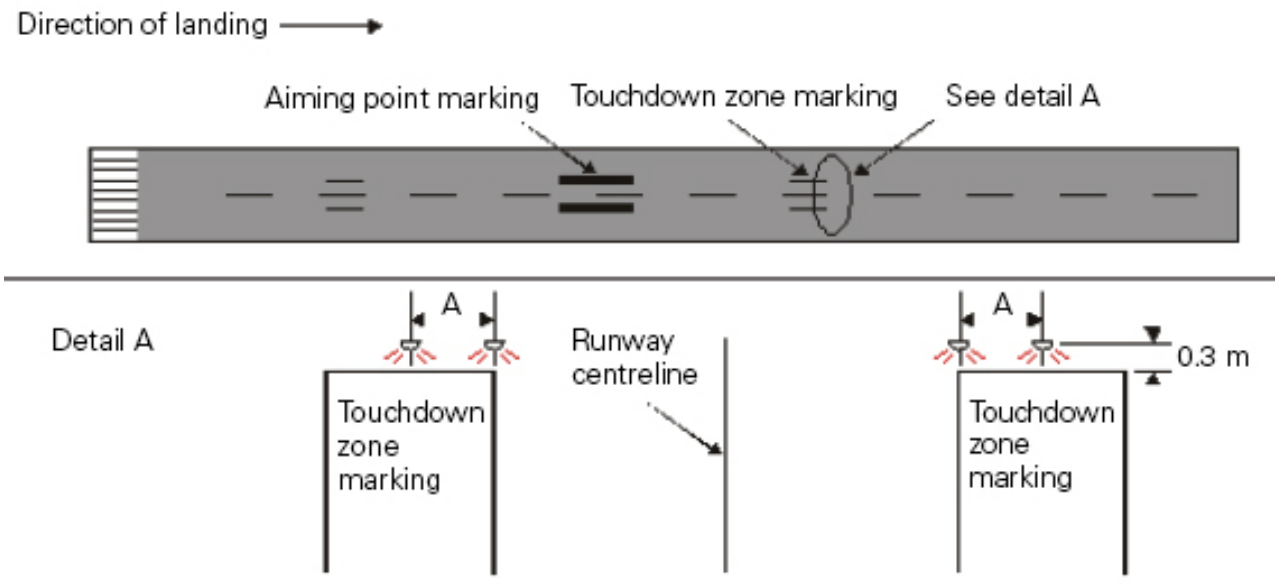
6.73 Where provided on a runway without TDZ markings, simple touchdown zone lights should be installed in such a position that provides the equivalent TDZ information.

6.74 Simple touchdown zone lights shall be fixed unidirectional lights showing variable white, aligned so as to be visible to the pilot of a landing aeroplane in the direction of approach to the runway.

6.75 Simple touchdown zone lights shall be in accordance with the specifications in appendix 6A figure 6A 5.

6.76 As a good operating practice, simple touchdown zone lights should be supplied with power on a separate circuit to other runway lighting so that they may be used when other lighting is switched off.

Figure 6.11 Spacing between the lights of the same pair



Note: Dimension A is 1.5 m or half the width of the touchdown zone marking, whichever is greater.

Rapid exit taxiway indicator lights

6.77 The purpose of rapid exit taxiway indicator lights (RETILs) is to provide pilots with 'distance to go' information to the nearest rapid exit taxiway on the runway, to enhance situational awareness in low visibility conditions and enable pilots

to apply braking action for more efficient roll-out and runway exit speeds. It is essential that pilots operating at aerodromes with runways displaying RETILs be familiar with the purpose of these lights.

6.78 RETILs may be considered for all paved runways, but their use is enhanced on runways used in RVR less than 400 m and/or where the traffic density is heavy.

6.79 RETILs should be located on the runway on the same side of the runway centreline as the associated rapid exit taxiway, in the configuration shown in figure 6.12. In each set the lights should be located 2 m apart and the light nearest the runway centreline shall be displaced 2 m from the runway centreline.

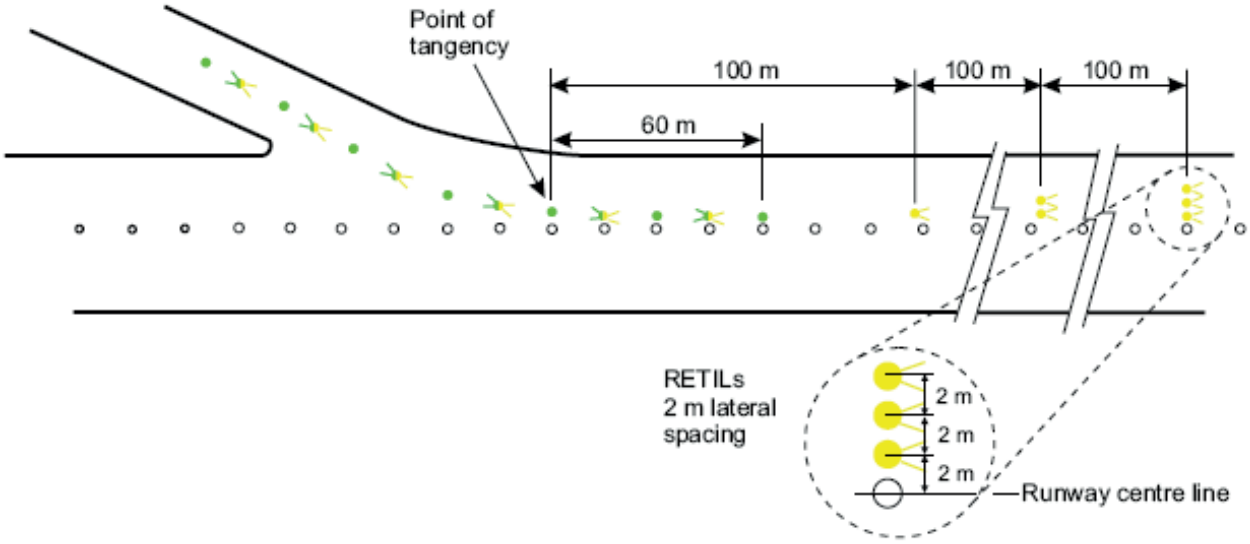
6.80 Where more than one rapid exit taxiway exists on a runway, the set of RETILs for each exit should not overlap when displayed.

6.81 RETILs shall be fixed unidirectional yellow lights, aligned so as to be visible to the pilot of a landing aeroplane in the direction of approach to the runway, and in accordance with the specifications given in figures 6A.6 and 6A.7.

6.82 RETILs should not be displayed in the event of any lamp failure or other failure that prevents the display of the light pattern depicted in figure 6.11 in full.

6.83 RETILs should be supplied with power on a separate circuit to other runway lighting so that they may be used when other lighting is switched off.

Figure 6.12 Rapid exit taxiway indicator lights



Runway turn pad lighting

6.84 Runway turn pad lights should be provided for continuous guidance on a runway turn pad intended for use at night and in RVR conditions less than 400 m, to enable an aeroplane to complete a 180° turn and align with the runway centreline.

6.85 Runway turn pad lights should normally be located on the runway turn pad marking, except that they may be offset by not more than 0.30 m where it is not practicable to locate them on the marking.

6.86 Runway turn pad lights on a straight section of the turn pad marking should be spaced at intervals of not more than 15 m, while the spacing for lights on the curved sections of the turn pad should not exceed 7.5 m.

6.87 Runway turn pad lights should be uni-directional fixed lights showing green with beam dimensions such that the light is visible only from aeroplanes on or approaching the turn pad. The characteristics of runway turn pad lights are given in figures 6A.12, 6A.13 and 6A.14.

6.88 Taxiway edge lights on a runway turn pad should be placed at uniform longitudinal intervals not exceeding 30 m.

Stopway lights

6.89 The end of any stopway associated with a runway used at night should be marked with four uni-directional red lights equally spaced across the width of the stopway. The edges of the stopway should be marked by pairs of similar red lights at a uniform spacing not exceeding 60 m. The layout is illustrated in figure 6.9.

Taxiway lighting

Taxiway edge lighting

6.90 Blue lighting is used to indicate the edge of a taxiway and should be installed on paved taxiways where centreline lighting is not provided. However, retroflective edge markers may be used instead of edge lights for Scale L4. The lights should be placed in pairs, one on each side of the taxiway on lines at right angles to the centreline except at junctions. The spacing of the lights on straight sections and curves of radius 150 m or greater serving runways with Scale L2 lighting should not exceed 30 m. On taxiways serving runways with Scale L3 and L4 lighting, the spacing should not exceed 60 m but should preferably be no greater than 45 m. On curves of radius less than 150 m, the lights should be located on radii passing through points on the taxiway centreline spaced at one fifth the radius of the curve of the centreline. On small fillets less than 15 m radius at the taxiway edge, a minimum spacing of 3 m should be used.

6.91 Taxiway edge lighting may be used to augment centreline lighting where aircraft are required to negotiate difficult curves.

6.92 The edges of turning and holding areas should be marked with blue lights.

6.93 The characteristics of elevated taxiway edge lights are given at table 6A.1.

Taxiway centreline lighting

6.94 Green taxiway centreline lights are used to provide centreline guidance on taxiways and aprons and when entering or vacating a runway. The characteristics of centreline lights required for day/night use in RVRs of less than 400 m are given at figures 6A.12 to 6A.14. A three stage luminance intensity control should be provided. Low intensity centreline lights are suitable for night use only and are not intended to support operations in RVRs of less than 400 m; their characteristics are given in figures 6A.15 and 6A.16. Where occasional take-off movements take place in RVRs less than 400 m, taxiway edge lighting supplemented by centreline marking may exceptionally be approved by the CAA.

6.95 The effectiveness of taxiway centreline lights is dependent upon the slant visibility from the cockpit, the distance between successive lights and their luminous intensity. Therefore, the light spacing should be designed to correspond with the minimum RVR in which operations are intended as given in table 6.2:

Table 6.2 Taxiway Centreline Light Spacing

Taxiway	Minimum RVR	
	< 350 m	> 350 m
Straight	15 m	30 m
Curved	7.5 m	15 m

Note: Spacing may be altered by up to ±10% to facilitate pavement design.
For operations in RVR less than 350 m, the reduced spacing for curved sections should extend 60 m before the start and 60 m beyond the end of the curves; for operations in RVR of 350 m or greater, this distance is reduced to 30 m.

6.96 On runways equipped with ILS, taxiway centreline lights located within the ILS critical/sensitive area or the OFZ should be colour coded to show alternate green/ yellow in both directions. The colour coding should commence with a green light close to the runway centreline and end with a yellow light at the perimeter of the ILS critical/sensitive area or the lower edge of the side surface of the OFZ, whichever is the farther from the runway. At rapid exit taxiways the lead-off lights should commence adjacent to the runway centreline at least 60 m before the intersection with the exit taxiway curvature. At all other taxiway/ runway intersections the lead-off lights should commence at least 30 m before the intersection. The section of lighting running parallel to the runway centreline should be offset transversely by 0.75 m ±0.15 m.

Stop-bars

6.97 Stop-bars are intended to help protect the runway against inadvertent incursions. A stop-bar consists of a single row of flush or semi-flush inset lights installed

laterally across a taxiway showing red towards the intended direction of approach.

6.98 Stop-bars should be provided at all runway taxi-holding positions and intermediate taxi-holding positions intended for use in RVR conditions less than 800 m, unless procedures have been agreed with the CAA to limit the number of aircraft either on the manoeuvring area or on final approach within 5 nm to one aircraft at any given time.

6.99 Stop-bars installed at taxiway/runway intersection should be uni-directional and show red towards the direction of approach to the runway. Stop-bars installed at intermediate taxi-holding positions may be bi-directional where the holding position is intended for use in each direction. Stop-bars installed at runway taxi-holding positions and intermediate taxi-Holding positions should be independently switchable; all other stop-bars protecting the runway as described in appendix 2B should be permanently illuminated during LVO. Where there is more than one stop bar associated with a taxiway/runway intersection, only one should be illuminated at any given time.

6.100 An independently switchable stop-bar should consist of a stop-bar interlocked with a section of taxiway centreline lead-on lighting beyond the stop-bar. The section of interlocked taxiway centreline lead-on lighting should, wherever practicable, be at least 90 m in length. The interlock should be designed to meet the requirements at paragraph 6.221.

6.101 The light fittings making up a stop-bar shall be spaced equally across the taxiway in a line at right angles to the taxiway centreline at intervals of no greater than 3 m. They should be positioned coincident with any associated taxiway holding position marking so as not to obscure or interfere with the integrity of the marking. The outer lights of the stop-bar should be located on the edges of the taxiway. However, at holding positions where a flight crew's view of the stop-bar might be obscured, the stop-bar should be extended beyond the edge of the taxiway by the addition of four omni-directional elevated lights, two placed on each side of the taxiway along the stop-bar axis at intervals equal to the spacing of other lights making up the stop-bar. Stop-bars installed at taxiway/runway intersections not used in Low Visibility Operations in order to protect the runway against inadvertent incursions should be located no closer to the runway than the distances laid down at chapter 3, table 3.3.

6.102 The characteristics of lights, including elevated side lights used in stop-bars, are given in figures 6A.12 to 6A.16.

No entry bar

6.103 A no entry bar should be provided across a taxiway which is intended to be used as an exit only taxiway to assist in preventing inadvertent access of traffic to that taxiway.

6.104 A no entry bar should be located across the taxiway at the end of an exit only taxiway where it is desired to prevent traffic from entering the taxiway in the wrong direction.

6.105 A no entry bar should consist of unidirectional lights spaced at uniform intervals of no more than 3 m showing red in the intended direction(s) of approach to the runway.

6.106 A pair of elevated lights should be added to each end of the no entry bar where the in-pavement no entry bar lights might be obscured from a pilot's view, for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft.

6.107 The intensity in red light and beam spreads of no entry bar lights shall be in accordance with the specifications in ICAO annex 14, Volume I, appendix 2, AGL Characteristics, figures A2-17 and A2-19., as appropriate.

6.108 Where a wide beam fixture is required, the intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications of ICAO annex 14, Volume I, appendix 2, AGL Characteristics, figures A2-17 and A2-19.

6.109 The lighting circuit shall be designed so that:

1. no-entry bars are switchable selectively or in groups;
2. when a no-entry bar is illuminated, any taxiway centreline lights installed beyond the no-entry bar, when viewed towards the runway, shall be extinguished for a distance of at least 90 m; and
3. when a no-entry bar is illuminated, any stop bar installed between the no-entry bar and the runway shall be extinguished.

Taxiway guidance and control systems

6.110 At aerodromes where operations take place in RVR less than 400 m or where ground movement requirements are complex, a taxiway guidance and control system should be installed, except where aircraft movements are limited in accordance with the procedure outlined at paragraph 6.98. The system should operate by selective switching of the taxiway centreline lights so that individual sections or routes are illuminated, each terminating at a lighted stop-bar.

Runway guard lights

6.111 Runway Guard Lights are a visual aid intended to caution flight crews or vehicle drivers that they are about to enter a runway. runway guard lights should be provided on all taxiways/runway intersections associated with a runway intended for use in RVR less than 1200 m. The system consists of two units, one located on each side of the taxiway at the distance given in paragraph 6.112 (configuration A), aligned so as to be visible to the pilot, or vehicle driver,

approaching the holding position. Each unit comprises a pair of alternately illuminating yellow lamps which operate at between 30 and 60 cycles per minute, with periods of light illumination and suppression equal and opposite in each case. The lights should be in operation whenever the RVR is less than 1200 m and be switched independently of any stop-bar lights.

6.112 Runway Guard Lights should not exceed a height above which their presence may endanger aircraft and should meet frangibility requirements in appendix 6A. They should be located on each side of the taxiway as close as possible to the pavement edge and adjacent to the Runway Taxi-Holding Position closest to the runway, normally the non-instrument runway holding point. Where additional Runway Taxi-Holding Positions are provided, such as for Category II and III operations, additional runway guard lights should be provided and illuminated when that holding position is in use.

6.113 Where runway guard lights are operated in good visibility conditions at night, the luminous intensity may be reduced to 30% but the signal characteristics specified in paragraph 6.111 must be retained.

6.114 On wide throat taxiways used in low visibility conditions when enhanced conspicuity of the taxiway/runway intersection is required, an alternative form of runway guard light may be used (Configuration B). This consists of a row of inset lights equally spaced at no more than 3 m intervals across the taxiway at the distance from the runway centreline specified in paragraph 6.112 above, aligned so as to be visible to the pilot or vehicle driver approaching the holding position. The lights should have the characteristics described at paragraph 6.111 above but adjacent lights should be alternately illuminated and alternate lights should be illuminated in unison. This alternative form of Runway Guard Light should not be collocated with a stop-bar. The light performance characteristics are given in figure 6A.12 for LI lights and 6A.17 for HI lights.

Figure 6.13 Runway guard lights

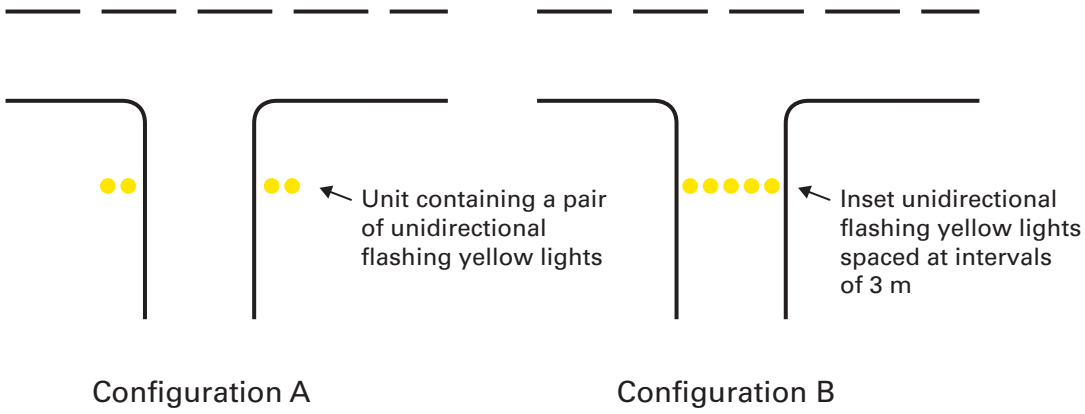
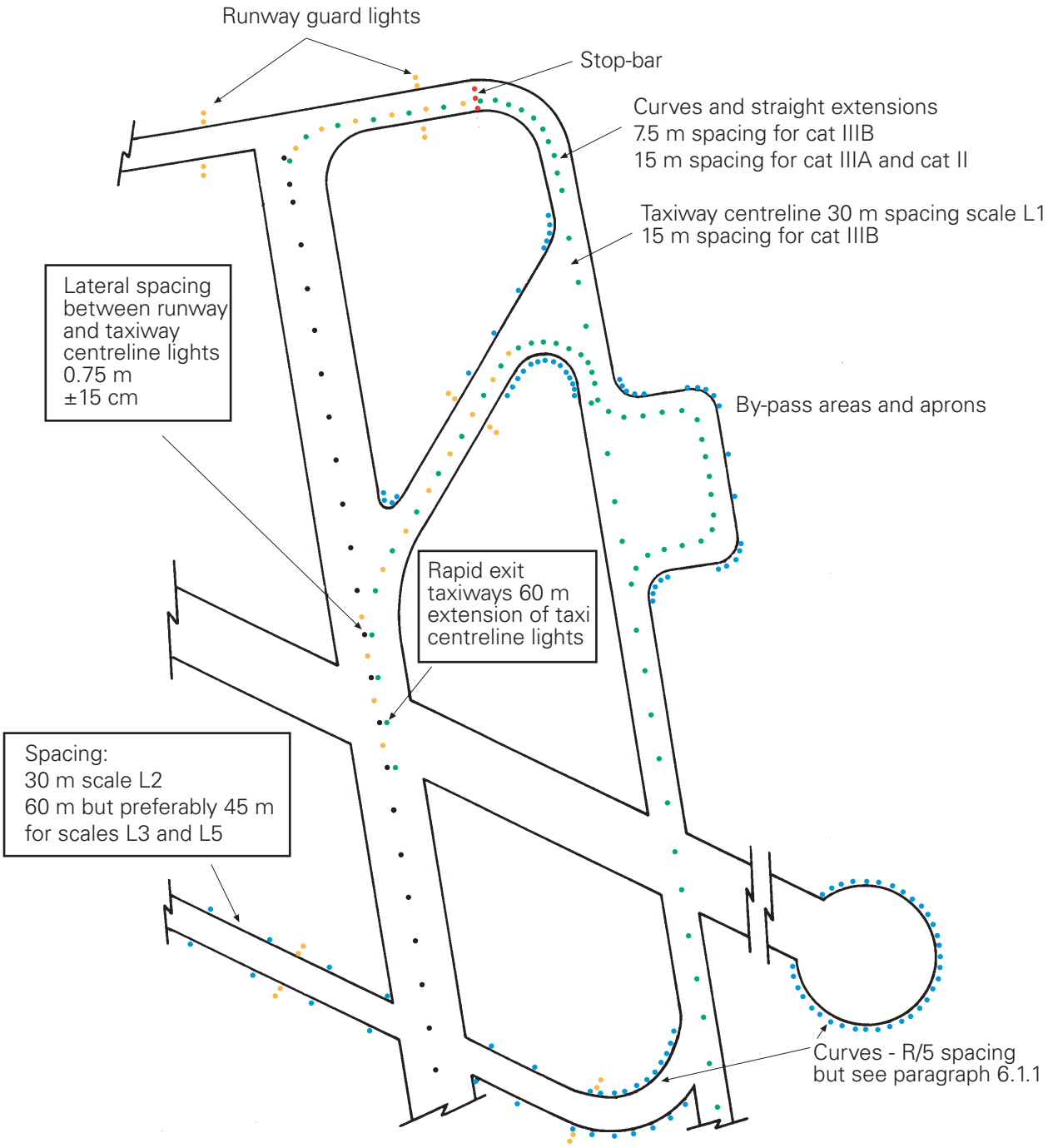


Figure 6.14 Taxiway lighting



Road-holding position lights

6.115 Road-holding position lights should be provided at the intersection of all roads with runways used in visibility less than 1200 m. The lights should be located 1.5 m from the edge of the left side of the road and adjacent to the road-holding position marking and sign described in chapter 7.

6.116 The road-holding position light should consist of either:

1. a red/green traffic light where a controlled crossing exists; or
2. an amber light system meeting the characteristics of runway guard lights at a point where caution should be exercised.

6.117 The road-holding position light beam shall be uni-directional and aligned so as to be visible to the driver of a vehicle approaching the holding position. The intensity of the light beam shall be adequate for the conditions of visibility and ambient light in which the use of the holding position is intended, but shall not dazzle the driver.

6.118 Road-holding position lights should always be accompanied by a road-holding position sign such as that illustrated at figure 7.40 and, where appropriate, an instruction or cautionary notice.

Signs

6.119 The requirements for the lighting of signs are detailed at chapter 7.

Retroflective taxiway edge markers and centreline studs

6.120 Retroflective edge markers or centreline studs either together or separately may be used instead of taxiway edge lights for Scale L4 and, if agreed by the CAA, on other taxiways that are used infrequently. Edge markers should not exceed 0.36 m in height. Centreline studs should not exceed 25 mm in height.

6.121 Edge markers should have a minimum viewing area of 150 cm^2 and be blue in colour; centreline studs should be green, and have a minimum viewing area of 20 cm^2.

Unpaved taxiway routes

6.122 If taxiing is confined to specific routes but the taxiway is not paved, the routes should be either edged with blue portable lights spaced not more than 60 m apart and laid out as for normal taxiway edge lighting, or marked with taxiway edge markers, spaced not more than 30 m apart. At the discretion of the CAA, apron floodlighting may be accepted as sufficient illumination of taxiways in the vicinity of the apron.

Aerodromes without specific taxiway routes

6.123 Where specific taxiway routes are not provided on grass aerodromes, the lighting requirement may be met by white lights marking the boundary of the

manoeuvring area. The lights should be spaced not more than 90 m apart and emit a minimum of 10 candelas.

Apron lighting and visual docking guidance systems

Apron lighting

6.124 The edges[6] of aprons should be marked with blue lights in accordance with the specifications given in paragraph 6.121. Where aerodrome licence holders consider that blue edge lights are not required, advice should be sought from the CAA.

6.125 Apron floodlights should be located so as to provide adequate illumination on all apron areas, with a minimum of glare to pilots of aircraft in flight and on the ground, aerodrome and apron controllers, and personnel on the apron. The arrangement and aiming of floodlights should be such that an aircraft stand receives light from two or more directions to minimise shadows.

6.126 The spectral distribution of apron floodlights shall be such that the colours used for aircraft marking connected with routine servicing, and for surface and obstacle marking, can be correctly identified.

6.127 The average illuminance should be at least the following:

1. Aircraft stand:
    a) Horizontal illuminance - 20 lux with a uniformity ratio (average to minimum) of not more than 4 to 1; and
    b) Vertical illuminance - 20 lux at a height of 2 m above the apron in relevant directions.
2. Other apron areas:
    a) Horizontal illuminance - 50% of the average illuminance on the aircraft stands with a uniformity ratio (average to minimum) of not more than 4 to 1.

Visual Docking Guidance Systems (VDGS)

6.128 A VDGS providing both azimuth and stopping guidance should be installed when it is necessary to indicate, by a visual aid, the precise positioning of an aircraft on a stand.

6.129 VDGS should meet the requirements specified in ICAO annex 14, chapter 5.

Obstacle lighting

6.130 Details of this lighting are given in chapter 4.

6 For the purposes of this paragraph, 'edge' means the extremity of any apron beyond which the wing tip to object separation distance for the largest aircraft that can use the apron is not assured.

Control of AGL luminous intensity

6.131 AGL incorporating high intensity lights may be used in varying visibility and ambient lighting conditions. In certain conditions, inset supplementary approach lighting at displaced thresholds and touchdown zone lighting at higher luminous intensity settings can cause unacceptable levels of glare to flight crew lining up for take-off. The final choice of AGL luminous intensity setting rests with the flight crew; therefore, except for obstacle lighting, the luminous intensity of AGL that has an output of more than 150 candelas directed towards an approaching aircraft should be individually and independently controllable in accordance with the luminous intensity stages detailed in Table 6.3.

Table 6.3 Luminous intensity control stages

Lighting	Stages	
	Minimum	Recommended
High intensity approach and runway systems, PAPI and High intensity (A)PAPI, except for supplementary approach lighting in Scale L1	100%, 30%, 10%, 3%, 1% (see Note 1)	Additionally 0.3%
Supplementary approach	100%, 30%, 10%	
Taxiway centreline and stop-bars	100%, 30% Additionally 10% for HI	
Low intensity systems and taxiway edge exceeding 5 candelas output	–	100%, 30% (see note 2)

Notes:

1. Unless the manufacturer recommends otherwise, an 80% PAPI and 30% (A) PAPI luminous intensity may be used to increase lamp life.
2. An additional 10% setting for low intensity (A)PAPI is also advisable.

Typical luminous intensity settings

6.132 It is essential that the various services that make up the AGL present a well-balanced and even pattern to flight crew; hence the provision of an additional ability to select pre-set combinations of luminous intensity settings with one switch may be of benefit. table 6.4 details typical combinations of AGL luminous intensity settings. The luminous intensity settings outlined at table 6.4 provide guidance on the typical settings required for various ambient light and weather conditions; however, local operating requirements may dictate variations to the settings noted.

6.133 A luminous intensity control is not essential for low intensity systems, but at least two stages (100% and 30%) are desirable. An additional 10% stage is advisable for low intensity PAPI/(A)PAPI systems.

6.134 The luminous intensity stages not only attempt to provide the most appropriate settings according to ambient light and visibility conditions, but also take into account the different light outputs for each type of AGL. The optimum overall pattern for approach and runway lighting should be in the order of a 2:1 balance, which is reflected in the average light output requirements in candela of the lights (see appendix 6A). It is therefore essential that the light output and alignment of every light is correct in order to achieve the optimum overall lighting pattern.

Notes:

1. Change setting at 600 m RVR when visibility is deteriorating and at 800 m RVR when visibility is improving. When the runway edge luminous intensity is set to less than 10%, the IRVR system is unable to provide a reading. When the observed visibility deteriorates to less than 1500 m, the runway edge lights should be set to 10% or greater.
2. Low intensity may be used at 30% if conditions warrant; low intensity and high intensity may be used together or independently; high intensity should be set at 3% except that where there is little or no extraneous lighting, it may be operated at 1% or 0.3% if available and conditions warrant.
3. When used for taxiway guidance/control (stop-bars) system purposes, otherwise not required.
4. Settings other than 100% should be used as indicated when available.
5. 80% may be used if available.
6. Where required.
7. Where taxi guidance signs capable of being illuminated are installed, they should be lit at night and whenever the weather conditions are C or D during the day.

6.135 An IRVR system will not display a reading if the runway edge lighting luminous intensity is set to less than 10%; therefore, when the observed visibility deteriorates to less than 1500 m, the runway and approach lighting luminous intensity should be set to a minimum of 10%.

Luminous intensity balance considerations for coloured lighting

6.136 Colour filters reduce the light output. The best balance between coloured and white lights may be obtained by either of the following means:

1. Separate electrical AGL circuits with luminous intensity controls for the different elements so that the green threshold and red runway end lighting may be selected at one or two steps higher than the white edge lighting.
2. Higher output lights or the use of increased wattage lamps in the existing lights for the coloured lighting. With this method the whole system can remain on a common AGL circuit, but care has to be exercised in order to

ensure that the increased heat generated by higher wattage lamps does not damage the colour filters or aircraft tyres.

Alternate input power supply for AGL systems

6.137 At least one alternate input power supply should be provided for scales L1 and L2 including internally lit mandatory signs where appropriate, and is recommended for other scales. Table 6.5 details the maximum time interval to be achieved between failure of the normal source of supply and the restoration of individual services Maximum Switchover Time (MTS) when in the associated visibility conditions. A MTS of one second can be achieved by automatic changeover either:

1. between two incoming power supplies and a closed ring system; or
2. between a diesel generating set supplying the load with reversion to the normal supply on failure of the generating set.

6.138 MTS is the time required for the actual intensity of a light measured in a given direction to fall from 50% and recover to 50% during a power supply changeover, when the light is being operated at intensities of 25% or above.

6.139 Where the power supply to an aerodrome is provided by two separate grid sources, one of them may be considered as an alternate input power supply if common failure modes in addition to that expected with a grid and standby generator design do not exist and the simultaneous loss of both supplies can be shown to be only a remote possibility.

6.140 If no alternate power supply is available, the aerodrome authorities should notify the effect by NOTAM. The NOTAM action should be taken by only one source on the aerodrome. ATS should notify flight crew on initial RTF contact and by ATIS when possible. Flight crews can then be expected to follow the appropriate instructions in their operations manual. Routine checks should be carried out on AGL input power supplies.

6.141 Where there is no alternate power supply to support lighting to Scales L3 and L4, portable emergency lighting should be available in sufficient numbers for the minimum runway lighting pattern to be provided in the event of an AGL input power failure.

6.142 Licence holders should put in place procedures that will ensure that emergency lighting provided in accordance with paragraph 6.141 will be in operation within 15 minutes of any loss of the input power supply.

Table 6.5 Alternate power supply – maximum switchover time

Runway	Aids requiring power	Maximum switchover time
Precision instrument approach Categories II and III (Scale L1)	Approach lighting	1 second
	Runway edge	15 seconds
	Runway threshold and end	1 second
	Runway centreline	1 second
	Runway touchdown zone	1 second
	All stop-bars for Category III	1 second
	Runway guard lights	1 second
	Category II stop-bars at taxi holding positions	1 second
	Other stop-bars	15 seconds
	Essential taxiway, mandatory signs	15 seconds
	Obstacle	15 seconds
	PAPI	15 seconds
Precision instrument approach Category I (Scale L2)	Approach lighting	15 seconds
	Runway edge	15 seconds
	Runway threshold and end	15 seconds
	Essential taxiway lights and mandatory signs	15 seconds
	Obstacle	15 seconds
	PAPI	15 seconds
Non-precision instrument approach (Scale L3)	Approach lighting	15 seconds
	Runway edge	15 seconds
	Runway threshold and end	15 seconds
	Obstacle	15 seconds
	PAPI and (A)PAPI	15 seconds
Take-off runway intended for use in runway visual range conditions less than 800 m	Runway edge	
	Runway end	1 second*
	Runway centreline (where fitted)	1 second
	All stop-bars	1 second
	Essential taxiway	15 seconds
	Obstacle	15 seconds

* 1 second where no runway centreline lighting provided and when threshold and end lighting are on same circuit as edge lighting.

Control and monitoring of aeronautical ground lighting

General requirements

6.143 At the majority of aerodromes the AGL should be controlled remotely from an ATC VCR. In such a case, a remote monitoring facility should also be provided in the VCR where an adequate assessment of the serviceability of the AGL cannot be made by other means.

6.144 In the absence of a VCR and/or remote control facilities, the AGL should be switched directly from its power source (in most cases the constant current regulator (CCR)). The AGL should be verified as operationally serviceable by means of a visual inspection and/or indications from the AGL equipment. Where operationally significant, this information should be notified immediately to the AGL operator and, where necessary, flight crew.

6.145 The control of an AGL system from beyond the boundary of a licensed aerodrome will only be approved by the CAA for the sole use of the emergency services. Where this type of control is desired, an operational requirement proposed by the aerodrome authority and supported by the emergency services involved should be submitted in the first instance to the CAA.

6.146 When in use, the operational status of the AGL system should be continuously monitored. An appropriate means of detecting an AGL system failure or fault and other serviceability information should be provided. The AGL system serviceability information should be provided to the AGL operator in a simple but accurate and concise way, so that if necessary the user may pass a report to flight crew. The report should enable flight crew to determine whether the AGL meets their current operational flight requirements or not.

6.147 The design of the control and monitoring system should be kept as simple as possible. It should be ergonomically sound, easy to operate, simple to understand, unambiguous and it should be configured so as to prevent accidental mis-selection of the AGL. The remote control and monitoring facilities provided for ATC use shall be approved by the CAA under Article 169 of the ANO. Further guidance on the manner in which serviceability information may be presented in remote control facilities in ATC VCRs can be found in CAP 670, ATS Safety Requirements.

6.148 The complexity of the AGL control and monitoring system will depend upon the operational requirements of the aerodrome concerned. In many cases, the control facilities can be simple, requiring only hardwired switches and relays to meet the functional requirements of the AGL system. However, aerodromes with increasingly more complex taxiway routeing systems and heavy volumes of traffic find that programmable electronic systems provide the capability and flexibility needed. Moreover, the gradual reduction in cost of programmable electronic systems may permit a better overall system to be installed to cater for routine maintenance and future modifications.

6.149 The AGL control and monitoring system should:

1. be suitable for the aerodrome, and be adaptable to changes in an aerodrome's physical characteristics (layout, installations, etc.) or operational procedures;
2. be inspired by safety in such a way that allows for the redundancy of equipment or elements which are critical for failsafe design;
3. have a high dependability;
4. be capable of communicating with other related systems, as required.

6.150 Where software is used for the purpose of control or monitoring of the AGL, the following aspects shall be addressed:

1. through analysis of the potential hazards introduced by the software to perform system functions, target safety integrity levels shall be specified for each software function. The chosen software design and build tools, and operating system, shall be shown to be appropriate for the production of the software to achieve the target safety integrity levels;
2. known hazardous software states shall be either removed or mitigated by the total system design; and
3. documented evidence shall be produced to demonstrate accomplishment of the target safety integrity levels.

6.151 The requirements for software in safety-related ATS systems are contained in CAP 670, ATS Safety Requirements.

6.152 Commercial-off-the-shelf (COTS) systems may provide a cost and time-effective solution for the design of a part or even the whole AGL system. COTS includes all types of software and electronic or electrical processing equipment and may also be applied to luminaires and other hardware. The following conditions in addition to paragraph 6.150 shall be satisfied where a COTS product is being considered for AGL safety-related applications:

1. the scope of the design specification for the COTS product shall include the purpose for which it is intended to be used;
2. the COTS product shall be designed, manufactured and tested to an appropriate standard or to a level consistent with the safety-related aspects of its application;
3. the functionality of the COTS product shall conform to the applicable safety requirements;
4. any changes or user-defined modifications to the COTS product shall be made under a suitable configuration change control system;
5. proof of 1 to 4 above can be provided and submitted to the CAA.

Control equipment

6.153 The control equipment should:

1. provide a clear layout with efficient ergonomics to support simple and safe handling;
2. facilitate the switching on or off of the AGL;
3. facilitate the switching of luminous intensity settings of the AGL;
4. facilitate alarm handling (visual and audible);
5. if necessary for complex aerodrome layouts, provide programmable inputs (for example taxiway routeing).

6.154 Where an operational requirement exists for the simultaneous selection of AGL for more than one runway, the potential hazards of incorrect selection should be identified and, where appropriate, suitable interlocks and alert/warning devices should be provided.

6.155 Where stop-bars and associated runway lead-on/off lighting are installed, a separate selector panel and associated monitoring display should be incorporated into the air controller's position in order to provide for the operational control of these services. However, where the air controller has direct and ready access to the main AGL control panel, the CAA may approve the operational control of these services from the main panel.

Monitoring equipment

6.156 The task of the monitoring function is to indicate the actual operational state of the AGL system and to detect a failure of the control and monitoring system itself. The monitoring equipment should:

1. provide information concerning the operational status of the AGL system and should display it at all times. The information required is determined by the provisions of paragraph 6.165 to 6.169 but would typically include the following:
   a) AGL on or off;
   b) AGL performance, e.g. luminous intensity correct or within tolerance and lamp failure.
2. notify the existence of an alarm by appropriate visual and aural means.

6.157 Where used, a hard-wired mimic display panel should depict the individual systems and layout of the AGL by way of a representative lighted display corresponding in pattern colour and orientation to the systems installed on the aerodrome. The detail of pattern and layout of the mimic display should reflect the complexity of the AGL installations and should be capable of providing timely information to ATC staff on the status of each circuit of those systems and of any associated taxiway guidance system. The selection of any AGL (or part thereof)

should illuminate the corresponding display on the mimic panel only when the selected service is activated and verified as serviceable.

6.158 The requirements of paragraph 6.157 should also be applied to the use of a visual display unit for the control and/or monitoring of the AGL, including touch-screen devices. The software aspects are outlined at paragraphs 6.150 to 6.152.

6.159 An audio-visual alarm should be provided in order to draw the attention of the AGL operator to any disparity between the AGL selection and the corresponding verification, whenever a selected AGL fails, fails to activate or fails to meet the requirements set out in table 6.6. The audio alarm should be capable of being temporarily suppressed while the visual indication of the fault should remain on both the control panel and monitoring display panel, where these are separately located, until the fault is cleared. Subsequent failures should reactivate the audio alarm even when the fault has not been cleared fully. The aspects to consider for a monitoring display are:

1. if the indicator is on, the AGL is on and serviceable;
2. if the indicator is off, the AGL is off;
3. if the indicator is active (i.e. flashing) and accompanied by an audible alert, the AGL serviceability state has changed.

6.160 The reporting to flight crew of the serviceability of the AGL, the AGL operator needs to be able to state whether the AGL is in one of the following states: serviceable, downgraded, or failed. Therefore, where a new system is installed or significant modification is carried out on an existing system, the AGL control and monitoring system should be capable of determining and indicating which of the aforementioned states applies. For existing AGL control and monitoring systems, a method of reporting such states should be implemented. Using existing indications and a look-up table is one method that may be suitable. The status of the AGL will probably differ according to visibility conditions and other factors; therefore, the status report (or look-up table) should reflect these factors. Further guidance on the assessment of AGL serviceability and the presentation of this information is provided in CAP 670, ATS Safety Requirements.

6.161 Consideration should be given to the provision of an intermediate warning level that indicates a degradation of performance of the AGL and the likelihood of further degradation to alarm level. In the event of a warning level being achieved, action may be taken to prevent an alarm state being reached.

6.162 Verification of AGL performance should be derived from a device that is designed to monitor the true status of the services selected. Any such device should be proved to be satisfactory to the CAA. For constant current series circuits, an acceptable means of providing verification of luminous intensity is the detection of the true root mean square (RMS) current within the primary series circuit. table 6.6 indicates the logarithmic current values and tolerances for serviceable AGL using such a device. This type of verification does not however provide an assurance that the AGL meets the photometric requirements outlined at appendix 6A. Therefore, the integrity of this verification method should be augmented by the adoption of a maintenance regime that incorporates the measurement of the photometric characteristics of the AGL while in service.

6.163 Technical serviceability information about the AGL system other than that required to meet the requirement of paragraph 6.146 need not be displayed or trigger alerts at ATC or other operational positions.

6.164 All operationally significant events, alarms or failures should be recorded and retained for at least 30 days. The content of a hard copy record may be restricted to error and principal switching messages if no circumstances occurred that might require an investigation into the AGL system integrity, condition or state during the period. However, magnetic, optical or electronic storage should contain all monitored data.

AGL fault conditions

6.165 An AGL system fault exists if:

1. there is a difference between a requested status and the actual status of the AGL; or
2. a malfunction of a significant component or function is detected; or
3. the result of a measurement is not within the specified tolerance.

6.166 Unserviceable light fittings should not be permitted to alter the basic pattern of the AGL system, which should always give adequate guidance. For AGL in use in RVR less than 400 m, no two adjacent light fittings should be unserviceable.

6.167 Where a stop-bar fails to function and is required for use, the stop-bar and the associated section of taxiway should be withdrawn from service until the fault is rectified.

6.168 In the event of a failure that disables the control equipment, the AGL should assume a pre-determined fail-safe condition. Reversion should normally be to the last set selection where that is a safe condition.

6.169 In the event of restoration following a system or power failure, the AGL should be restored to the same status as that which prevailed before the failure or to a safe pre-set condition and there should be no loss of logging facilities.

Maintenance of AGL systems

General

6.170 The Electricity at Work Regulations 1989 encompass all work carried out on AGL and other electrical installations in and around aerodromes. Under certain circumstances the Electricity Safety, Quality and Continuity Regulations 2002 may also apply. As these are Statutory Instruments, compliance with them is mandatory. The equipment and system shall be shown to be electrically safe by means of demonstrated compliance with recognised Standards and Approvals and shall comply with all Health and Safety and personal safety requirements in this respect. This includes the compliance with the Low Voltage Directive 2006/95/EC where applicable.

6.171 A maintenance policy should be produced and followed that addresses the safety of personnel engaged in the maintenance of AGL constant current series circuits. The maintenance policy should address the following aspects:

1. the organisation, roles and responsibilities;
2. the maintenance philosophy, that includes and takes account of:
    a) the maintenance objectives;
    b) the operational requirements;
    c) the maintenance resources.
3. a maintenance schedule and procedures, which include:
    a) planned, controlled, conditional and corrective maintenance programmes;
    b) post-maintenance activities;
    c) the modification or upgrading of equipment.
4. specific safety procedures;
5. the management of records and documentation;
6. the provision of spares, tools and test equipment;
7. inspections.

6.172 The maintenance of AGL equipment should consider the objectives of aerodrome operations and address the impact on such operations while maintenance activities are being carried out. In addition, during periods of maintenance, or equipment failure, it may be necessary to operate AGL circuits on local control at the remote power centres, thus removing control from ATC while the work is being carried out. A procedure for local operation should be agreed with ATC before local switching of AGL circuits commences. A record of all maintenance operations should be kept, including periods when local operation of a circuit or power centre is under the control of maintenance staff. A log book should be provided at each power centre for this purpose and

retained for at least three years after the date of the last entry. All log books, together with installation drawings and operating and maintenance manuals, should be available for examination during licensing inspections.

6.173 By assessing the performance of each light on a regular basis and targeting maintenance on the under-performing light, the overall performance of the installation can be considerably improved. Targeting work on those lights that are under- performing ensures that maximum benefit can be obtained from maintenance activity, thereby minimising wastage and enabling maintenance expenditure to be optimised.

6.174 The conventional AGL maintenance strategies of block change, or change on failure, have been shown to be inadequate with many of the lamps failing to meet the required standard either immediately or shortly after the maintenance activity. Lamps and associated equipment do not age at a uniform rate and consequently only limited benefit is achieved from a routine block change. On the other hand, if the performance of individual lights is allowed to decay until lamp failure occurs, then each light will be operating below the required standard for a substantial percentage of its life. Both strategies result in the possibility of entering LVPs with the installation operating below the required serviceability levels. Routine and regular targeted maintenance procedures are essential if this scenario is to be avoided.

6.175 The performance of lights can change rapidly, especially at large aerodromes with high movement rates. Therefore, it is important to assess performance accurately on a regular basis and act upon the information collected. The frequency with which such assessments should be undertaken is dependent upon the type and age of the installation, maintenance policy adopted, movement rates and prevailing weather conditions. Typically, a weekly survey, with associated maintenance, has been found to be adequate for a major aerodrome.

6.176 Changing the light fitting will not always ensure the required performance is achieved since the luminous intensity of the beam is dependent on the total electrical and optical system. The importance of maintaining the primary series circuit current is only a single factor in the system and additional work may be required at specific locations, for instance a faulty transformer or a slightly dirty lens can reduce output by up to 50%. A single application of de-icing fluid to a runway can reduce the light output of centreline lights by up to 70%.

Maintenance objectives

6.177 The maintenance of AGL should have, as its objective, that during any period of operations all AGL equipment is serviceable but that, in any event, the serviceability levels detailed in table 6.7 should be regarded as the absolute minimum for the operation intended.

Table 6.7 Minimum percentage of serviceable light fittings

AGL	Landing		Take-off	
	Category I	Category II/III	RVR <800m	RVR >800m
Approach beyond 450 m	85%	85%		–
Approach inner 450 m	85%	95%		–
Runway threshold	85%	95%	–	–
Runway end	85%	85%	85%	75%
Runway edge	85%	95%	95%	85%
Runway C/L where fitted	85%	95%	95%	85%
TDZ where fitted	85%	90%	–	–

6.178 The objectives contained in table 6.7 specifically target precision instrument approach runways and operations in low visibility. For precision instrument approach runways the CAA expects the aerodrome authority to provide evidence that the performance of the associated AGL meets the requirements for all weather operations, which include table 6.7. One method of providing such evidence is to carry out regular measurements of the photometric performance (i.e. the luminous intensity, beam coverage and alignment) of the AGL when in service.

Maintenance practices

6.179 Persons should be protected against dangers that may arise from contact with live parts of the installation. Only limited protection against overcurrent and open circuit can be provided therefore no work should be undertaken on live AGL constant current series circuits unless adequate provisions are made to ensure the safety of personnel.

6.180 Approach and runway lighting patterns are designed for viewing from the air. At ground level the pattern may appear to be perfect, but small errors in the setting of lights may present a ragged and apparently incomplete pattern to flight crew. If local circumstances permit, maintenance staff should be given the opportunity to view the AGL from the air.

6.181 The overall performance of AGL can be dramatically improved and maintained with the introduction of an adequate cleaning regime. The nature of their general location makes inset fittings particularly susceptible to the presence of dirt, dust, moisture and the effects of heavy loads. Staining of the glassware and rubber deposits can considerably reduce the light output of these lights and reductions of the order of 50% are not uncommon. The periodicity of AGL cleaning will depend upon environmental and operating conditions but typically AGL on runways that are subjected to a heavy traffic density should be cleaned at least once per week, and other AGL should be cleaned at least once every two weeks.

6.182 A routine ground inspection of all AGL systems where practicable should be made daily or before use as appropriate and any defects remedied as soon as practicable. All deficiencies and associated remedial action should be logged and the system should again be inspected before use after remedial action.

6.183 As an aid to maintenance it is recommended that each AGL location be marked with an identification number where practicable, large enough to be legible from a passing vehicle (e.g. 27/A/14 refers to light fitting No 14 of circuit A on runway 27) as follows:

1. lights in paved areas – numbers painted with white road paint adjacent to the light fitting;
2. lights in grassed areas – numbers painted on the light fitting;
3. pole or mast mounted lights – numbers painted on plates attached to the poles or masts.

6.184 An up-to-date set of drawings showing the AGL layout, light fitting location numbers and cable routeing, along with operating and maintenance manuals containing adequate information for the safe operation and maintenance of the AGL system should be provided at all appropriate sites.

6.185 Where AGL and equipment is installed on private land, rights of access should be maintained in order that regular maintenance may be carried out.

6.186 If the process detailed in paragraph 6.178 is carried out on a regular and adequate basis, individual lamp conformance can be assessed and therefore a lamp could be changed or cleaned on an individual basis and only when necessary. Where it is not possible to perform this level of maintenance, AGL lamps should be replaced in groups as part of a planned change programme based on the length of operating time or an observed deterioration. Lamps should be changed after 90% of nominal life at maximum luminous intensity (operating time at other luminous intensity levels being ignored). Any observed deterioration of an AGL pattern should be promptly corrected. The replacement of AGL lamps only on failure should be a last resort.

6.187 The insulation value of a primary series circuit may decrease by a very significant amount before any operational effect on the AGL is noticed; however, in this case there would be a much greater risk of harm to maintenance or installation persons. Therefore, a device should be provided to measure the insulation value of the primary series circuit with an error of not greater than 10%. The measurement should be performed as part of the routine maintenance or by using an automatic facility. Where an automatic measurement facility is provided, the measurement shall be done at a rate of not less than once per hour. Remedial action should be taken where the insulation between primary and secondary series circuits and between primary series circuit and earth falls

below 30 M ohms. The insulation properties of secondary series circuit cables should be checked on a regular basis and when an insulation failure is suspected. The resistance between secondary series circuit and earth should be not less than 5 M ohms.

6.188 Adequate spares should be held on site in order to support the complete AGL system maintenance procedures. An appropriate parts control system should be instigated in order to ensure that the correct parts are available and used when replacements are carried out. Components such as lenses may appear to be identical but may have substantially different photometric performance.

6.189 Licence holders should adopt maintenance practices to minimise the potential for intergranular corrosion of aluminium alloy light fittings. Corrosion may be initiated by the use of high alkaline property cleaning fluids, which may damage or destroy the passivated layer protecting the fitting from corrosion.

6.190 To minimise future cracking of aluminium alloy light fittings due to intergranular corrosion, licence holders should prevent the contact of fluids with a high acidic or alkaline property (PH less than 4 to greater than 8.5) with aluminium alloy parts of AGL fittings. Licence holders should address the potential for corrosion where there is an essential operational need to use a fluid with a high acidic or alkaline property in the vicinity of AGL and a suitable alternative with a more neutral solution cannot be found.

6.191 Mechanical loading may affect the structural integrity of AGL fixtures and fittings while in service, and may also exacerbate the effects of corrosion. Accordingly:

1. staff should look for the effects of poor installation, especially with regard to debris entrapment between fitting, seating ring and base, and rectify as necessary;
2. replacement components should, where possible, form a part of a bespoke or homogenous assembly, and attention should be paid to the compatibility and suitability of materials;
3. seating rings should be designed and constructed to the same tolerances as the AGL fitting. If signs of wear exist, the stud location and load transfer surfaces should be jig-checked and discarded if found to be out of tolerance.

6.192 BS 3224 (1988) Part 5, Light Fittings for Civil Land Aerodromes, was withdrawn following concerns raised by independent research into the impact loads suffered by inset runway assemblies. The following process should be adopted:

1. a maintenance inspection regime, where appropriate, designed to take into account the following:
    a) aircraft traffic volume;
    b) location of assemblies;
    c) age of assemblies;

d) chemical usage; and

e) previous maintenance history.

2. a risk assessment for inspection periods based on sub-paragraphs a) and b) above should be developed and modifying factors applied in respect of the other three sub-paragraphs;

3. aircraft traffic volume should be expressed in terms of total ATMs i.e. including both take-off and landings;

4. location of assemblies should be defined in terms of structural risk. It may be appropriate to consider dividing the runway into three zones defined as high, medium and low equating to the touchdown area, parts of the runway where more than, say, 50% of traffic vacates and all other areas.

6.193 The maintenance procedures detailed in this paragraph should be adopted as a minimum requirement and take paragraph 6.192 into account. Additional maintenance may be needed following extreme weather conditions, where high incidence of vandalism occurs or following agricultural work within the area bounded by the approach system. A competent engineer should assess the AGL maintenance requirements and augment the minimum requirements in scope and frequency where necessary. The minimum maintenance procedures are as follows:

1. Daily: A visual inspection of the AGL should be undertaken. Unserviceabilities should be recorded and appropriate remedial action taken;

2. Six-monthly (or more often as indicated by risk assessment): check and take remedial action as required to ensure that:

   a) the alignment of all elevated lights is within tolerance. If hinged masts are used with alignment carried out at ground level, the checking procedure should include the mast settings when reinstated;

   b) primary series circuit current levels at all luminous intensity settings comply with the levels and tolerances given in table 6.6. Actual values and the type and serial number of the test instrument used should be noted in the maintenance log. It is desirable that a percentage of secondary series circuit currents should be checked;

   c) all AGL control and monitoring facilities are serviceable;

   d) all earth connections are satisfactory;

   e) the insulation resistance of all primary series circuits is satisfactory ;

   f) the structural integrity of the assembly is satisfactory.

3. At regular intervals: On specific installations, maintenance in accordance with the manufacturer's recommendations should be carried out and remedial action taken where required. Photometric checks, if appropriate, should be carried out in accordance with traffic density and AGL performance.

Notes:

1. Additional alignment checks to elevated lights should be carried out after severe storms, heavy snowfalls and after work that could have affected light alignment has been carried out in their vicinity.
2. Wood poles supporting approach lights should be inspected and tested before climbing. They are now considered to be an obsolescent mounting method and lighter, frangible, hinged masts are preferred.

6.194 All maintenance activities should be recorded in a suitable log. Maintenance and flight check records should be retained for at least three years at the aerodrome for use by maintenance staff and for examination during licensing inspections.

6.195 All test equipment, alignment devices and protective clothing should be calibrated/checked or replaced at intervals recommended by the manufacturer and the results recorded in the maintenance log.

Photometric requirements

6.196 The maintenance objectives for AGL are detailed in paragraph 6.177 and table 6.7. The objectives are specified in terms of the maximum number of unserviceable lights at any one time. A light should be deemed unserviceable if its average luminous intensity is, for any reason, less than 50% of the average luminous intensity specified in the relevant isocandela diagram at appendix 6A, or the brightest part of the beam is not within the specified main beam area.

6.197 AGL maintenance should be focused on assuring maximum availability of lights that are of the correct intensity and alignment. The most effective means to determine this is through photometric measurement and visual assessment.

6.198 It should be the aim for AGL to meet or exceed the average luminous intensities specified in the isocandela diagrams. Where this is not possible, the aerodrome licence holder should establish and maintain the best AGL photometric performance achievable, taking into consideration the following factors:

1. the design performance of the lights when new;
2. the aerodrome traffic type and density; and
3. the prevailing weather conditions (including whether anti-icing or de-icing procedures are used).

6.199 With the use of photometric measurement within a robust maintenance programme, it should be possible to achieve and maintain a demonstrable performance level of at least 70% of the specified minimum. Where movement rates are high and aircraft types heavy, even if this level cannot be continuously achieved, AGL maintained in this way should display a significantly improved, balanced pattern of lights, which is of value to pilots.

Checking of (A)PAPI systems

6.200 (A)PAPI serviceability gives rise to additional considerations as moisture or dirt on the lenses will diffuse the beam and can result in a white signal being emitted at all angles of elevation. To prevent this potentially hazardous situation from occurring, additional measures should be adopted as follows:

1. On a daily basis, particular attention should be paid to the following items with respect to (A)PAPI systems:
   a) all lamps are serviceable and evenly illuminated;
   b) there is no apparent damage to units;
   c) the change from red to white is coincident for all elements of a unit;
   d) the heating facilities are functioning correctly;
   e) all lenses are clean.
2. The vertical alignment of each (A)PAPI unit should be checked once every week to a tolerance of ±1 minute of arc and should be verified by inspection with a suitable instrument and flight check at least twice every year. Clinometers are intended to be used for a quick check that the installation has not been disturbed and should not be used for alignment adjustments. Small alignment errors can be observed according to the time of day, weather and other environmental conditions and will normally require no adjustment; however, where a significant difference is noted (probably on only one unit, a consistent error on all units usually indicates a clinometer calibration error) the unit may be adjusted using a clinometer but must be checked using a suitable instrument and flight checked as soon as possible. Clinometers should be calibrated annually or as recommended by the manufacturer or when an error is suspected.
3. At weekly intervals the (A)PAPI system should be inspected internally and cleaned, lenses should be polished and anti-misting fluid applied if appropriate.
4. High intensity units that have no permanently-on lens heaters should be operated for 15 minutes at maximum luminous intensity or as recommended by manufacturers in order to disperse moisture. In low intensity units, moisture clearance by this method takes much longer and it is more practical to inspect the units. Operational procedures should allow for moisture dispersal or removal before use.
5. Some units are supplied with integral lens heaters. These should be run continuously if there is any possibility of condensation occurring. Alternatively, high intensity lamp units may be operated continuously at low luminous intensity (typically a primary series circuit current level of 1.5A RMS is set) when not in operational use; such units are ready for immediate use. Routine daily checks should include serviceability of the permanent heat system.

6. Units without permanently-on lens heaters cannot be guaranteed free from moisture at switch-on, so allowances should be made for such warm-up period as the unit manufacturer recommends.

6.201 The integrity of (A)PAPI systems is of the utmost importance, and a unit should be considered unserviceable if:

1. it has less than half of its originally specified minimum average luminous intensity; or
2. it has an elevation setting error exceeding ± 1 minute of arc; or
3. its physical condition, on inspection, is in question, e.g. if a filter glass is cracked.

Checking of AGL system input power supply

6.202 A check of an alternate input power supply to the AGL system (where provided) operating under full load should be made at least once each month. Where the alternate input power supply is provided by independent generators, they should be run for at least 15 minutes under full load when carrying out this check.

6.203 Where automatic switch-over is provided for the AGL system input power supplies, a check of the switching system should be made in addition to those checks contained in paragraph 6.202 in order to ensure that the switchover times required at table 6.5 can be met.

6.204 A log should be kept detailing each check undertaken. Switch-over times and generator running times should be noted along with any action taken to ensure that the requirements are met.

AGL flight checks

6.205 All approach and runway AGL on an instrument runway shall be flight checked in accordance with appendix 6C at least once every six months.

6.206 All approach and runway AGL on runways other than those applicable in paragraph 6.205 shall be flight checked in accordance with appendix 6C at least once every 12 months.

6.207 An (A)PAPI system shall be flight checked in accordance with appendix 6D at least once every six months.

6.208 Commissioning flight checks of new AGL installations, including A(PAPI), shall be conducted prior to their operational use. The CAA may choose to participate in or conduct such checks.

6.209 AGL flight checks shall be conducted by competent persons, holding appropriate flight crew qualifications. The aerodrome licence holder should ensure that such persons are competent.

6.210 The aerodrome licence holder should ensure that the results of flight checks, which may be subject to audit by the CAA, are evaluated and actioned accordingly.

6.211 Runway lighting deployed on a temporary basis, including (A)PAPI and approach lighting where appropriate, should be flight checked daily prior to being used at night. This procedure should be adopted for each subsequent deployment.

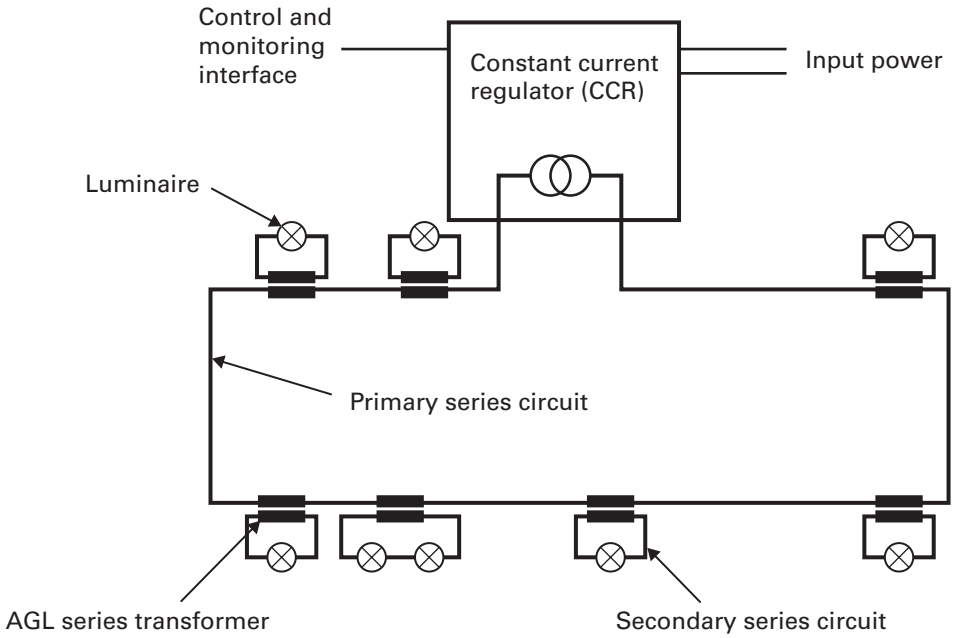
Installation of AGL systems

General

6.212 An AGL system should normally comprise a single control and monitoring installation and several constant current series circuits. The following elements make up a typical constant current series circuit (see figure 6.13):

1. a constant current regulator (CCR);
2. a primary series circuit, which includes:
   a) primary cable;
   b) AGL series transformer(s) (may be known as isolating transformer).
3. a secondary series circuit, which includes:
   a) secondary cables;
   b) the light fitting or other devices.

Figure 6.14 Typical AGL constant current series circuit



6.213 Aerodrome licence holders should contact the CAA for approval requirements associated with the design and installation of AGL systems.

6.214 Where an electrical installation is of a low-voltage type (e.g. the control and monitoring equipment) – but excluding the secondary series circuits – the current BS 7671:2008 IEE Wiring Regulation requirements should be applied. However, BS 7671:2008 is not wholly appropriate for the electrical installation of the constant current series circuit, therefore special consideration should be given to this type of installation to ensure the correct operation of the equipment and the safety of personnel involved in the installation, operation and maintenance of the AGL system.

6.215 Parallel circuits should be used only when there are few fittings in the circuit and accurate luminous intensity balance is not critical, e.g. a short taxiway or blue edge lighting of a paved area.

Earthing

6.216 The equipment in the control and distribution centres should be bonded to earth in accordance with BS 7671:2008.

6.217 Primary series circuits shall not be earthed and all attempts to work on these circuits when live shall be prevented. In an ideal installation it should be unnecessary to earth the secondary series circuits; however, the installation environment, repairs and wear and tear do not provide an assurance that the installation is ideal. On the other hand, if earthing of the secondary series circuits is provided, there is no guarantee of the safety of personnel who happen to come into direct or indirect contact with a live circuit. Certain equipment failure modes (e.g. double earth faults and isolating transformer primary-secondary shorts) could present a potentially hazardous situation for maintenance personnel even if the equipment is apparently earthed. Therefore, whether or not it is the practice to earth the secondary series circuit, care shall be taken to ensure that adequate protection from electric shock is provided.

6.218 Where provided, earth connections should be measured to be no greater than 6 ohms in order to provide protection from electric shock.

6.219 Where shielded cable is used in a constant current series circuit (for EMC purposes), the shield should be continuous throughout the loop and earthed at the ends of the primary series circuit within the CCR. Cable shields also provide some protection against insulation deterioration due to high voltage stress and it is recommended that the shield be earthed at every practicable point.

6.220 Where a counterpoise is provided (for protection against lightning) it may be used as an earth source for AGL installations if no suitable alternative exists and it meets the requirement of paragraph 6.210. Care should be taken to ensure that, in the event of a lightning strike, the connection of equipment to a counterpoise will not cause unacceptable damage to the AGL.

Interleaving of AGL electrical circuits

6.221 The configuration of the electrical circuits (constant current series circuits) that make up the AGL system should be designed so that a failure of a single circuit will not cause a total lack of guidance. One means of providing a continuity of service is to incorporate interleaving techniques where alternate lamps (or as necessary to provide the required guidance information) are controlled by different CCRs. However the minimum requirement is as follows:

1. Two separate interleaved circuits for each of the following systems:
   a) approach lighting on precision instrument approach runways;
   b) supplementary approach lighting;
   c) HI runway edge, threshold and end lighting. See Note 1 below and Note 1 of table 6.5;
   d) HI runway centreline lighting;
   e) touchdown zone lighting;
   f) for each stop-bar (sub-paragraphs 3., 4. and 5. below refer);
   g) HI taxiway centreline lighting (including runway lead-on and lead-off lighting but excluding systems with route switching or block control where the failure of a lighting circuit would not present a flight crew with a hazardous situation in low visibility).

Notes:

1. Threshold lighting should be on independent interleaved circuits.
2. Where technically desirable, threshold and end lighting may be served by the same circuits as runway centreline lighting provided that any operational penalty suffered as a result of loss of use of the runway at night where both centreline circuits fail, is acceptable to the aerodrome operator.
3. One separate circuit for each of the following systems:
   a) HI simple approach lighting;
   b) approach lighting on non-precision instrument approach runways;
   c) LI runway edge, threshold and end lighting;
   d) PAPI or (A)PAPI but see paragraph 6.45;
   e) taxiway and apron edge lighting.
4. Stop-bars and associated taxiway lead-on lighting should be on separate circuits so that a loss of one of these facilities will not affect the serviceability of the other. In addition the stop-bar and lead-on lighting circuits should be interlocked so that the stop-bar and lead-on lighting cannot be illuminated simultaneously. Verification of the stop-bar and lead-on lighting selection should be provided. However, the design of the interlocked stop-bar and lead-

on lighting should be such that a failure of the stop-bar circuit cannot cause the lead-on lighting to illuminate.

5. Where stop-bars and taxiway centreline lighting are interlocked to provide block switching and verification of the stop-bar selection is provided, stop-bars at intermediate taxi-holding positions need not be interleaved.

6. Stop-bars at runway holding points should consist of two separate interleaved circuits. Other stop-bars should be interleaved where no taxiway centreline lighting is provided.

7. Runway guard lights may be served by the taxiway lighting circuits other than those for stop-bars provided that the requirements of paragraph 6.112 and 6.114 are met. Verification that the runway guard lights are operating is required.

6.222 Where interleaved circuits are provided, alternate lights should normally be connected to the same circuit. However, care must be taken in the design of interleaved circuits to ensure that in the event of the failure of one or more circuits, a recognisable pattern and any colour coding is retained.

6.223 Interleaved circuits may be provided for the services listed in paragraph 6.221 in order to increase integrity or to overcome a technical difficulty. However, approach slope indicator installations should be limited to two circuits per runway end.

6.224 Where a runway is used also as a taxiway and both taxiway and runway lighting are provided, the lighting circuits shall be interlocked in order to prevent the selection of both systems simultaneously.

6.225 The interleaving criterion is still applicable where individual or addressable AGL switching is installed.

Electromagnetic Compatibility (EMC)

6.226 The AGL system and its components shall conform to the Radio and Telecommunications Terminal Equipment Directive 1999/5/EC. It shall not cause radiated or conducted electromagnetic interference to other systems such as information technology equipment (ITE), or radio navigational aids that may be located on or near the aerodrome, or that may use the same power supply. All equipment included in the electrical installations shall have immunity to electromagnetic phenomena and electromagnetic fields such as from radio transmitters, transients on power lines, atmospheric discharges etc.

6.227 An aerodrome movement area is generally considered an uncontrollable electromagnetic environment. EMC levels (emission and immunity limits) should be assessed in order to ensure that existing or expected disturbance levels will not increase when new equipment is installed and that such equipment is sufficiently immune. Shielded cables in the constant current series circuits are recommended in order to achieve EMC. When installing new equipment or

undertaking development, the new infrastructure should not alter significantly the local magnetic field density. This is especially critical in areas where aircraft hold prior to departure.

Constant Current Regulators (CCRs)

6.228 In order to provide the AGL operational luminous intensity, the CCR should have a range of output current steps in accordance with table 6.6. The CCR should maintain the required constant current output regardless of variations of the AGL constant current series circuit load and be capable of a luminous intensity change without interruption of the output current.

6.229 The calculated AGL constant current series circuit load should not exceed the CCR rating. The CCR shall be matched to the constant current series circuit load by selection of the appropriate output load tap (if available) to provide the required power efficiency and power.

6.230 Independent input and output disconnecting devices should be provided that remove any power to the CCR and to the primary series circuit. An appropriate method of preventing the re-energising of the CCR or primary series circuit should be provided. The design features of this requirement should consider the following safety aspects:

1. assurance of no voltage or current in the CCR or primary series circuit;
2. mechanical disablement (e.g. key switch mechanisms, padlocks etc.);
3. an indication of the disconnection.

6.231 The CCR output disconnecting device should short the input of the primary series circuit. As an extra precaution against induced currents in the primary series circuit the conductors may be earthed. The disconnected output terminals of the CCR may also be shorted together and earthed.

6.232 The CCR should incorporate output open circuit protection that disconnects the power to the primary series circuit in the event of an open circuit occurring. The protection device should not operate during normal switching operations.

Warning: This requirement will not prevent the electric shock hazard that exists when a live circuit is intentionally disconnected.

6.233 The CCR should incorporate output overcurrent protection that disconnects the power to the primary series circuit in the event of an overcurrent occurring in order to prevent damage to equipment.

6.234 It should be possible to reset the protective devices locally, but only after the cause of the operation of the protective device has been identified and any fault is cleared. Remote setting of protective devices shall not be provided for.

Installation of AGL cables

6.235 The installation of an AGL constant current series circuit involves the laying of cables in operational areas of an aerodrome. The cables should be directly buried in the earth, laid in pre-installed ducts or conduits, or, for secondary cables, laid in saw cuts. It is considered best practice to bury cables to a depth of at least 0.30 m and to separate cables of different circuits by sufficient margin in order to eliminate possible EMC problems. Cables that cannot be hidden and are exposed, especially those that are not within the confines of the aerodrome, should be armoured or protected by conduit.

6.236 Cables should not be directly buried under paved areas, roadways, rail tracks, or ditches. In these areas the cable should be installed in concrete-encased ducts or in suitable strength conduit at a minimum depth of 0.45 m below the finished grade.

6.237 All cables installed shall be tested for continuity. Any faults indicated by these tests shall be located and repaired before any further testing is performed. The insulation of all control cables shall be measured using a suitable instrument designed to apply a d.c. or ultra low frequency (0.1 Hz) voltage of at least 1000 V. Where voltage with respect to earth is less than 150 V, the resistance shall be 100 k ohms or greater; where the voltage with respect to earth is between 150–300 V, the resistance shall be 200 k ohms or greater; and where the voltage with respect to earth is greater than 300 V but less than 600 V the resistance shall be 400 k ohms or greater. Where provided, earth and bonding connections shall be tested and verified as correct.

6.238 The primary series circuit shall be subjected to a high-voltage insulation test (dielectric strength test). The primary series circuit shall withstand a d.c. test voltage of 1.5 times the maximum circuit rating applied between the primary series circuit and earth for at least 5 minutes. The maximum circuit rating should include the insulation rating of the cables, connectors and AGL series transformers. The CCR and lightning arresters should not be connected when carrying out the test. Wherever possible, these tests should be performed when the ground is thoroughly wet, since tests may pass during dry weather but fail after a heavy rainfall. An air gap of at least 100 mm should exist between bare conductors and earth. The insulation at each end of the cable and the cable sheath for a distance of at least 300 mm from the end of the cable should be clean and dry.

6.239 The insulation leakage current in microamperes for each complete primary series circuit shall be measured at the same time as the highvoltage tests and shall not exceed a calculated value based on the following:

1. 2μ A for each AGL series transformer;
2. 1μ A for each 100 m of cable (this value includes allowances for a nominal number of connectors and splices).

6.240 A temperature compensation factor should be incorporated in the calculation. The values given above are for an ambient temperature of 20°C. For an increase in temperature of 10°C, the leakage current will double. If the leakage current exceeds the value calculated, the circuit shall be sectionalised and the tests repeated for each section. Defective elements shall be located and repaired, or replaced until the entire circuit meets the required criteria. Ambient temperature and weather conditions shall be recorded at the time of each test.

6.241 Cable should not be installed if:

1. it has been kinked;
2. the shield (if fitted) has been damaged;
3. the surface of the sheath or jacket has been damaged so that the insulation properties have been degraded;
4. it shows signs of cross-sectional distortion.

6.242 Where accessible, including at each cable end, joint or connection, all cables should be labelled with an appropriate, indelible and secure identification mark.

APPENDIX 6A

Aeronautical ground lighting characteristics

General

1. The characteristics of low intensity AGL and of en route obstacle lighting can be found at table 6A.1. The requirements for the upgrade of existing systems to Category III Standard are at table 6A.2. figures 6A.1 to 6A.18 show the photometric characteristics and beam coverage of high intensity AGL that all newly installed lights should display.

2. A light is considered to have failed if its average luminous intensity is, for any reason, less than half of the minimum average luminous intensity specified in the relevant isocandela diagrams of this appendix. Where more than one light is used in a unit, the unit is considered to have failed if its light output is similarly reduced.

3. Only AGL conforming to the specified colours should be displayed to flight crew and vehicle drivers (see paragraphs 29 to 38 for colour specifications and a means of verification).

4. The importance of adequate maintenance cannot be over-emphasised. The average intensity should never fall below 50% of the value shown in the figures and it should be the aim of aerodrome licence holders to maintain a level of light exceeding the specified minimum intensities.

Construction and height of lighting fittings

5. All AGL fittings should be of such construction and height that their presence does not endanger aircraft.

6. Elevated fittings should be of lightweight construction and frangible, and if mounted on supports these should also be frangible. Where approach lights are mounted on high supports, the top 4–6 m should be made frangible. The following provision shall apply:

7. Elevated approach lights and their supporting structures should be frangible except that, in that portion of the approach lighting system beyond 300 m from the threshold:

    1. where the height of a supporting structure exceeds 12 m, the frangibility requirement applies to the top 12 m only; and

    2. where a supporting structure is surrounded by non-frangible objects, only that part of the structure that extends above the surrounding objects needs to be frangible.

8. Within the manoeuvring area, elevated fittings should be conspicuous.

9. Elevated light fittings should not exceed 0.36 m in height above the adjacent pavement level. In stopways and clearways used for routine manoeuvring (e.g. as entry or exit taxiways) the lights should be flush with the pavement. Otherwise, the fittings in these areas should not exceed the following dimensions:

    1. 0.46 m above ground level in stopways;
    2. 0.9 m above local ground level in clearways.

10. Inset fittings should be capable of bearing the loads imposed by any aircraft normally using the aerodrome when landing, taking off or taxying. The contours and temperature of the top surface of the light fitting should not cause damage to aircraft undercarriage components, especially tyres.

11. The projection of an inset fitting above the surrounding surface should not exceed:

    1. 16 mm within 7.5 m either side of the runway centreline except that inset approach lights in this area and taxiway lights crossing a runway or leading to a runway centreline may project 25 mm;
    2. 19 mm between 7.5 m from the runway centreline to 3 m from the runway edge except that inset approach lights in these areas may project 32 mm and taxiway lights crossing or leading to a runway centreline may project 25 mm;
    3. 38 mm within 6 m of the runway end or within 3 m of the runway edge;
    4. 32 mm for displaced threshold lights;
    5. 25 mm in taxiway surfaces.

12. Inset fittings should be secured in the surface so as to prevent accidental extraction. It is particularly important that stable mountings are provided so that the beam spread angles are maintained within the tolerances detailed in the appropriate table.

Aerodrome beacons

13. Aerodrome beacons should be omni-directional and have a minimum effective flash luminous intensity equivalent to not less than 2000 cd in white. The light distribution of the beam should be such that it is clearly visible from 10 km between 1° and 45° above the horizon on a clear night. The flash rate should be fixed as follows:

    1. coded beacons – 6 to 8 words per minute;
    2. non-coded beacons – 20 to 30 flashes per minute.

    Note: At locations where a high level of ambient background lighting persists, it may be necessary to increase the effective flash luminous intensity in order to meet the above parameters.

Instrument runways and associated taxiways

14. Figures 6A.1 to 6A.18 of this appendix give the characteristics of lighting to be used for new installations. table 6A.2 gives the minimum characteristics of lights in existing systems if they are to be made acceptable for Category III operations. When practicable, it is recommended that lights with the characteristics detailed in table 6A.2 be replaced by lights with characteristics shown in figures 6A.1 to 6A.10.

15. Figures 6A.12 to 6A.16 give details of characteristics for taxiway centreline and stop-bar lights.

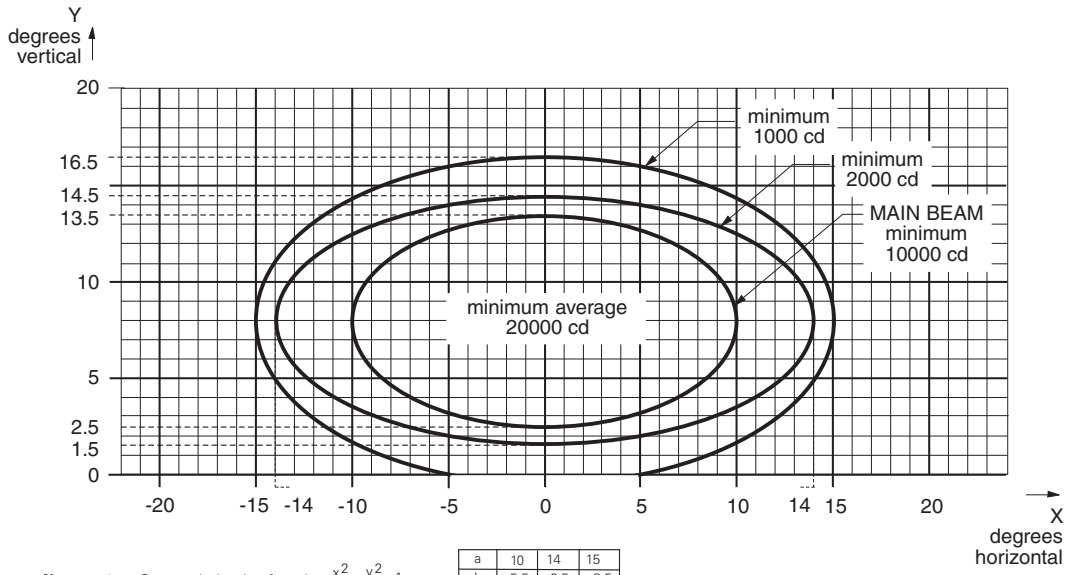
Table 6A.2 Characteristics of high intensity aeronautical ground lights

Light	Colour	Minimum beam coverage (degrees) (note 1)		Ratio of average intensity	Minimum average intensity in specified colours Cd x 10^3 (note 2)	Isocandela diagram reference
		Horizontal	Vertical			
1	2	3	4	5	6	7
Approach centreline and crossbars	White	20	8	2	20	6A.1
Approach side row	Red	15	7	0.5	5	6A.2
Threshold	Green	11	5.5	1	10	6A.3
Threshold wing bars	Green	15	7	1	10	6A.4
Touchdown zone	White	9	5	0.5	5	6A.5
Runway centreline 30 m spacing	White/red/yellow	9	5	0.5	5 (note 5)	6A.6
Runway centreline 15 m spacing	White/red/yellow	9	5	0.25 to 0.5 (note 2)	2.5 (notes 2, 5)	6A.7
Runway end	Red	11	5.5	0.25 to 0.5	2.5	6A.8
Runway edge 45 m wide	White Yellow Red	11 11 11	5.5 5.5 5.5	1 0.4 0.15	10 10 10	6A.9
Runway edge 60 m wide	White Yellow Red	13 13 13	6 6 6	1 0.4 0.15	10 10 10	6A.10

Notes:

1. Throughout the beam coverages the luminous intensity at maximum output should not be less than half the average luminous intensity and should not exceed the average luminous intensity by more than 50%.
2. A luminous intensity of 5 kilocandelas, intensity ratio 0.5, should be used for Category III operations.
3. Alignment tolerances have not been included in the beam spread angles given in Columns 3 and 4.
4. Where inset lights are used instead of elevated lights, e.g. on a runway with a displaced threshold, the luminous intensity requirements can be met by installing multiple fittings of lower intensity at each position.
5. Values given are for white light.
6. Beam coverages quoted are for the extremities of an ellipse.

Figure 6A.1 Isocandela diagram for approach centreline light and crossbars (white light)



a	10	14	15
b	5.5	6.5	8.5

Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

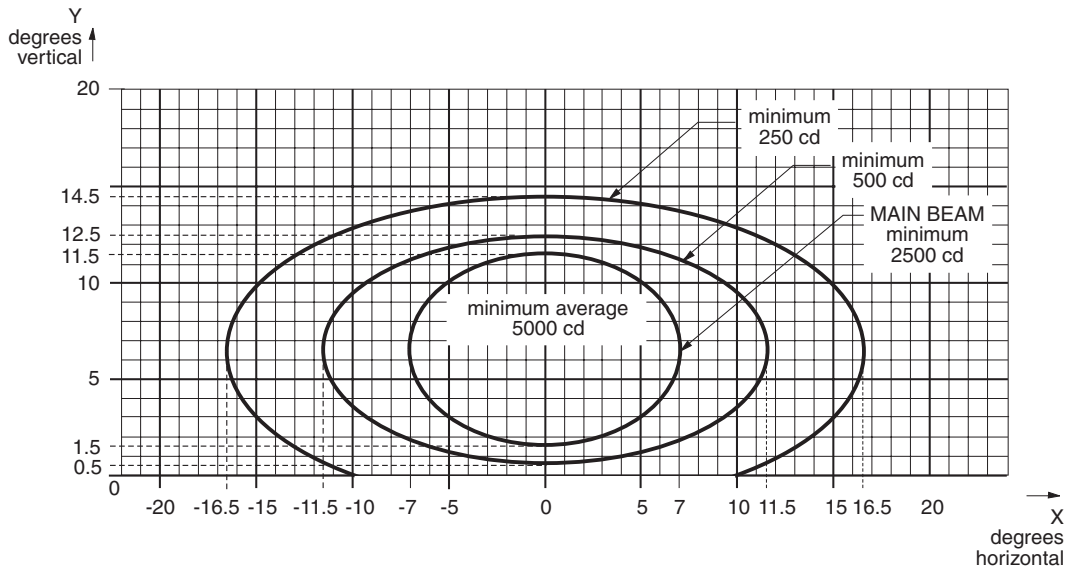
2 Toe-in 2 degrees any light in crossbars beyond 22.5 m from centreline

3 Vertical setting angles of the lights shall be such that the following vertical coverage of the main beam will be met:

distance from threshold	vertical main beam coverage
threshold to 315 m	0 - 11
316 m to 475 m	0.5 - 11.5
476 m to 640 m	1.5 - 12.5
641 m and beyond	2.5 - 13.5 (as illustrated above)

4 See collective notes for Figures 1 to 11

Figure 6A.2 Isocandela diagram for approach side row light (red light)



a	7.0	11.5	16.5
b	5.0	6.0	8.0

Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

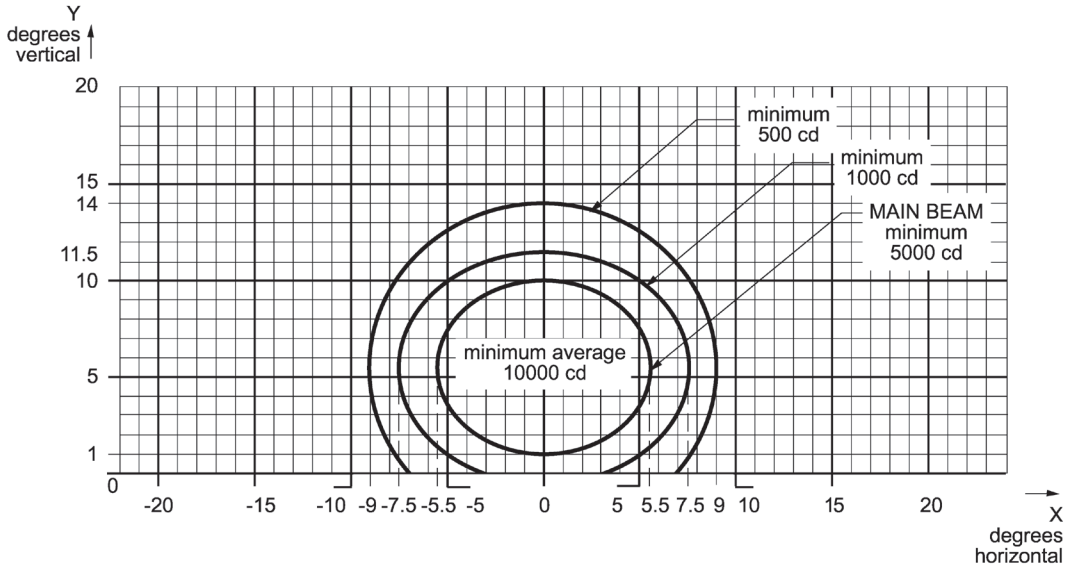
2 Toe-in 2 degrees

3 Vertical setting angles of the lights shall be such that the following vertical coverage of the main beam will be met:

distance from threshold	vertical main beam coverage
threshold to 115 m	0.5° - 10.5°
116 m to 215 m	1° - 11°
216 m and beyond	1.5° - 11.5° (as illustrated above)

4 See collective notes for Figures 1 to 11

Figure 6A.3 Isocandela diagram for threshold light (green light)



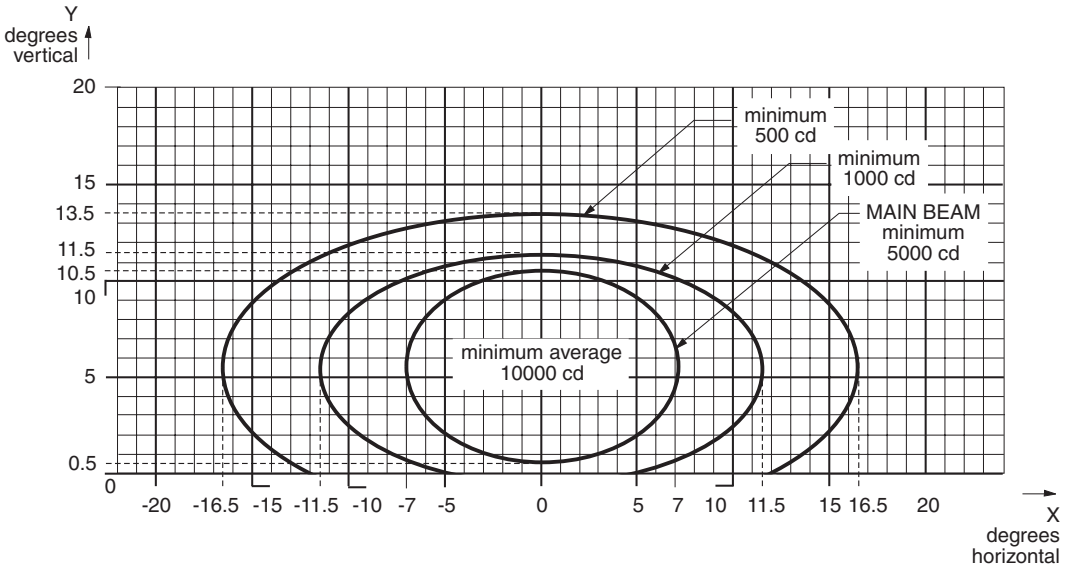
Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.5	7.5	9.0
b	4.5	6.0	8.5

2 Toe-in 3.5 degrees

3 See collective notes for Figures 1 to 11

Figure 6A.4 Isocandela diagram for threshold wing bar light (green light)



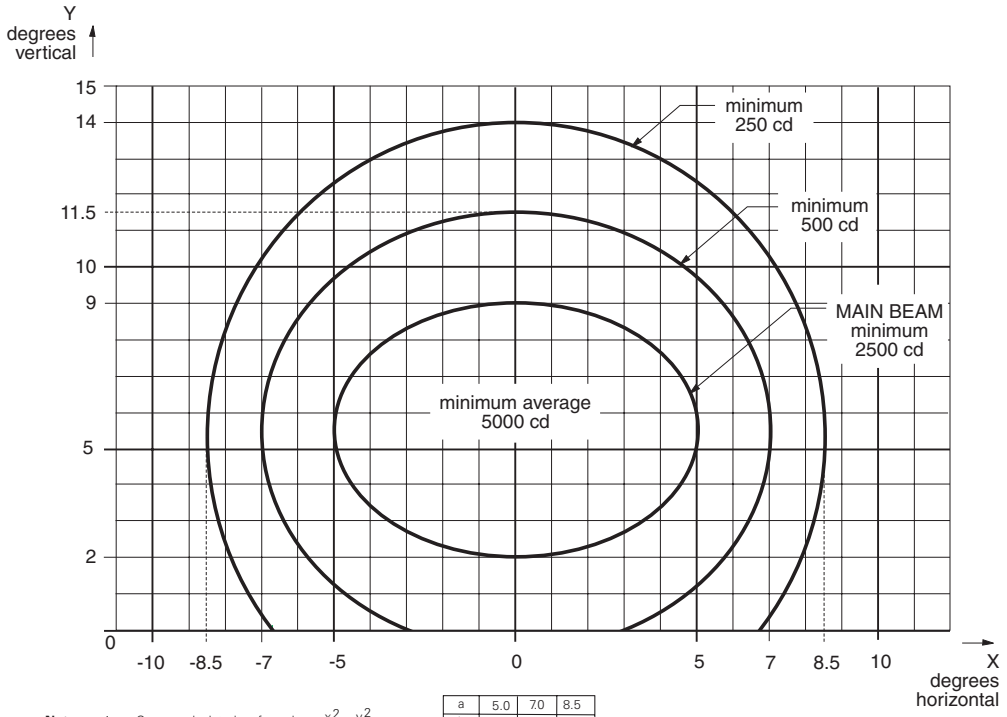
Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	7.0	11.5	16.5
b	5.0	6.0	8.0

2 Toe-in 2 degrees

3 See collective notes for Figures 1 to 11

Figure 6A.5 Isocandela diagram for touchdown zone light (white light)



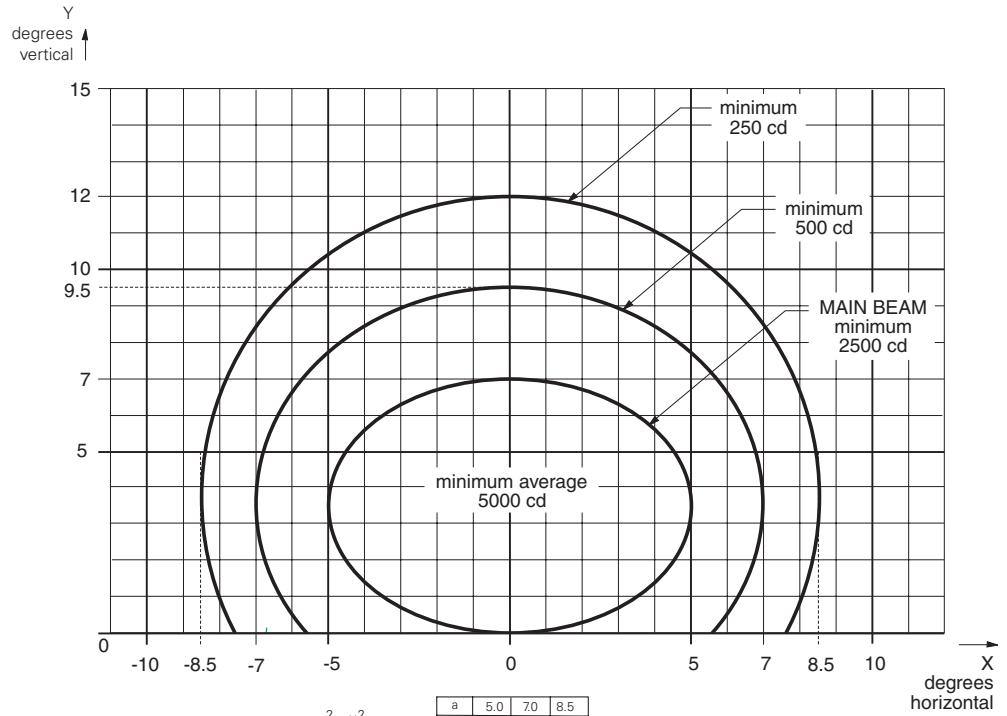
a	5.0	7.0	8.5
b	3.5	6.0	8.5

Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

2 Toe-in 4 degrees

3 See collective notes for Figures 1 to 11

Figure 6A.6 Isocandela diagram for runway centreline light with 30 m longitudinal



a	5.0	7.0	8.5
b	3.5	6.0	8.5

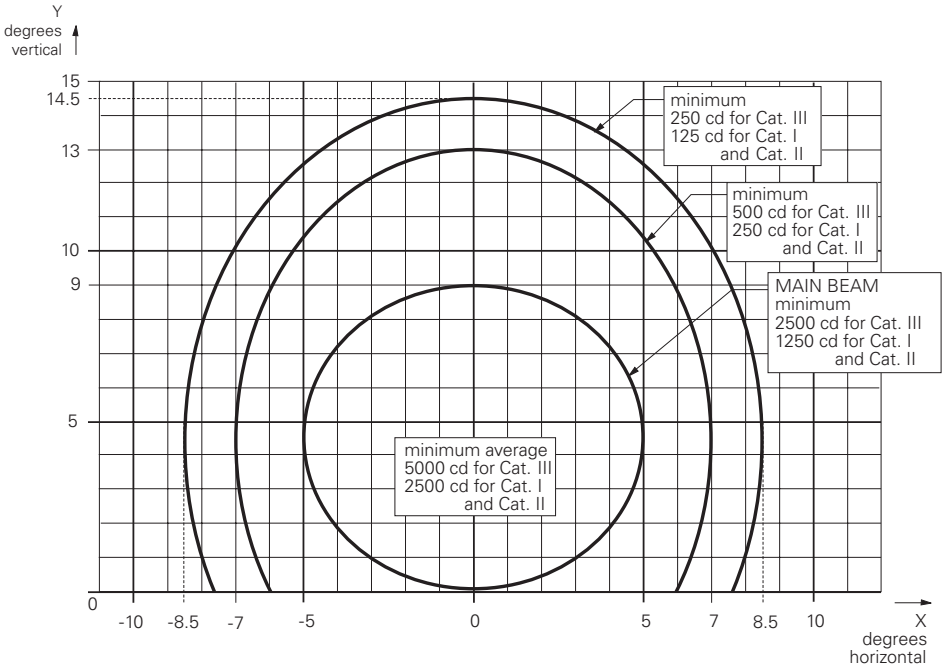
Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

2 For red light multiply values by 0.15

3 For yellow light multiply values by 0.40

4 See collective notes for Figures 1 to 11

Figure 6A.7 Isocandela diagram for runway centreline light with 15 m longitudinal



a	5.0	7.0	8.5
b	4.5	8.5	10

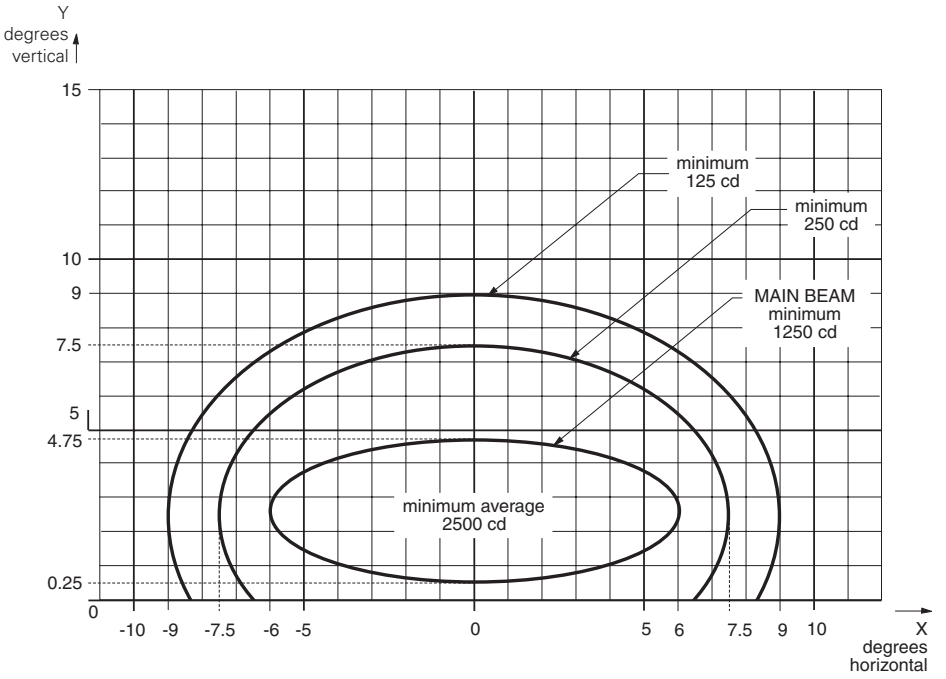
Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

2 For red light multiply value by 0.15

3 For yellow light multiply value by 0.4

4 See collective notes for Figures 1 to11

Figure 6A.8 Isocandela diagram for runway end light (red light)

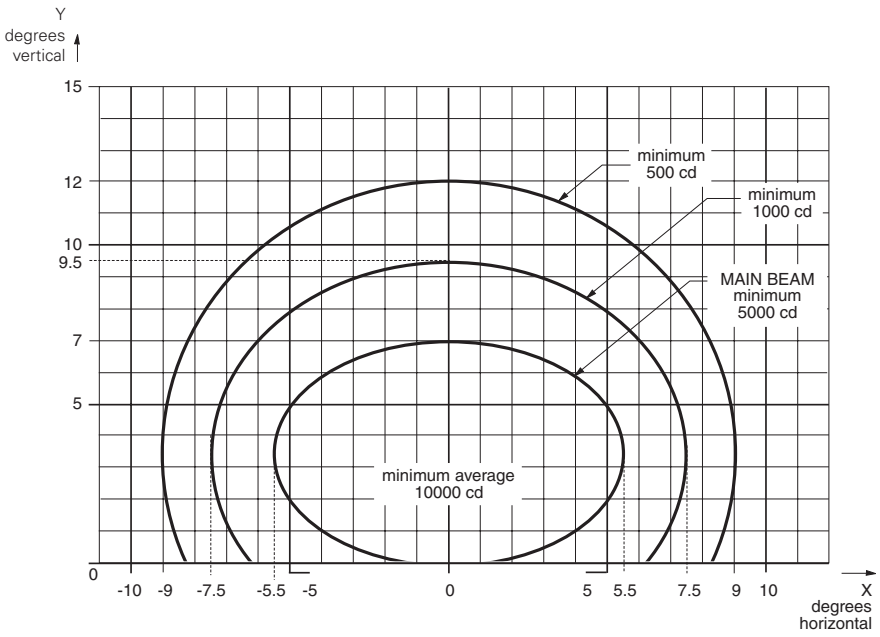


a	6.0	7.5	9.0
b	2.25	5.0	6.5

Notes: 1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

2 See collective notes for Figures 1 to 11

Figure 6A.9 Isocandela diagram for runway edge light where width of runway is 45 m



Notes:

1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.5	7.5	9.0
b	3.5	6.0	8.5

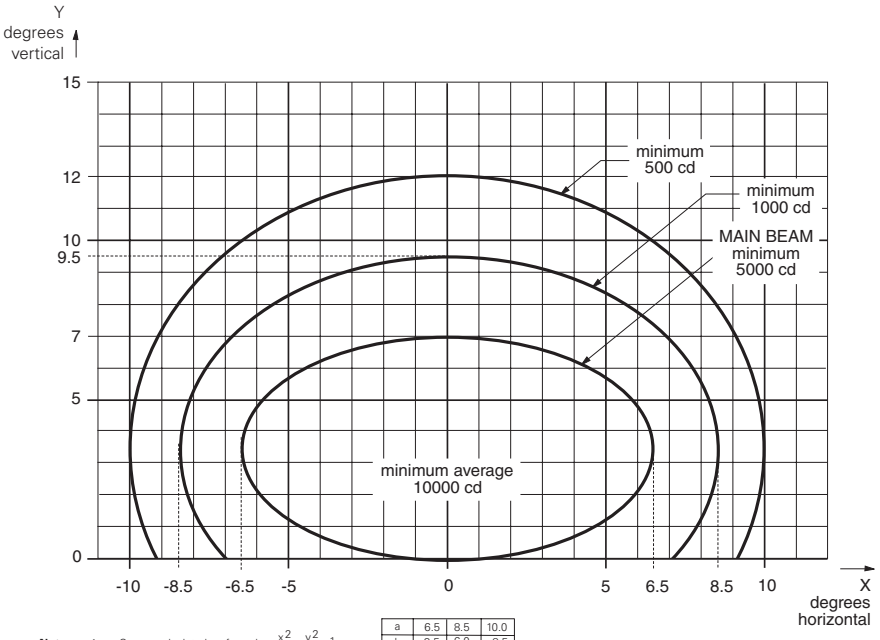
2 Toe-in 3.5 degrees

3 For yellow light multiply values by 0.4

4 For red light multiply values by 0.15

5 See collective notes for Figures 1 to 11

Figure 6A.10 Isocandela diagram for runway edge light where width of runway is 60 m



Notes:

1 Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	6.5	8.5	10.0
b	3.5	6.0	8.5

2 Toe-in 4.5 degrees

3 For yellow light multiply values by 0.4

4 For red light multiply values by 0.15

5 See collective notes for Figures 1 to 11

Figure 6A.11 Grid points to be used for the calculation of average intensity of approach and runway lights

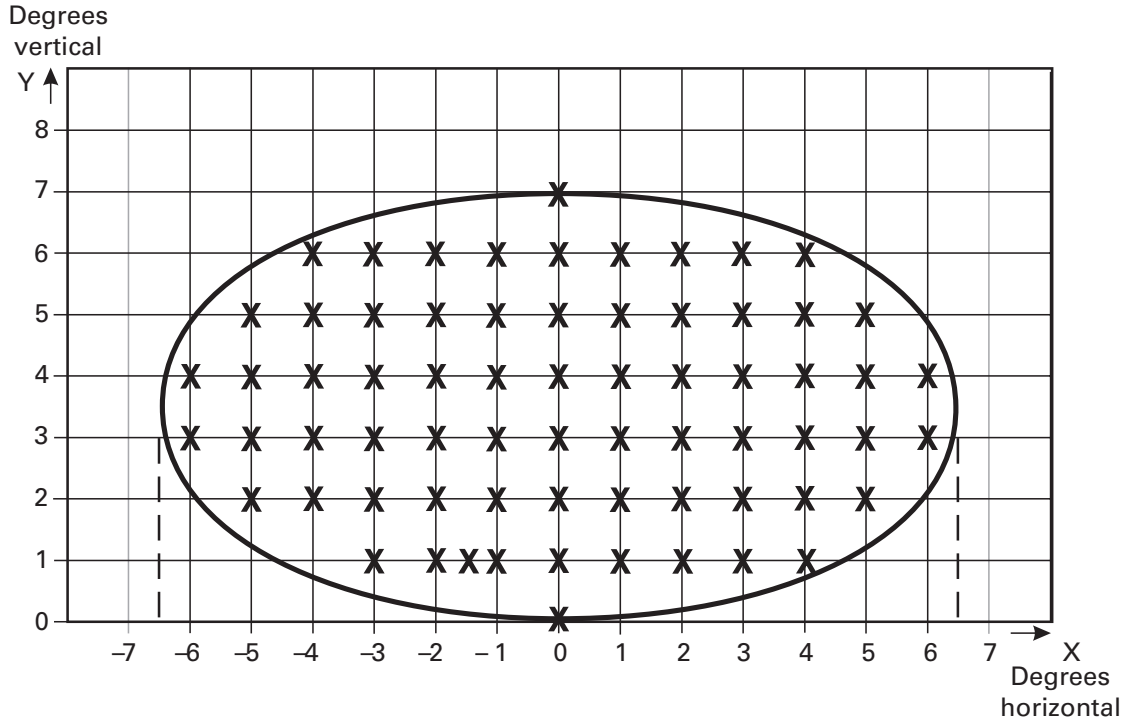
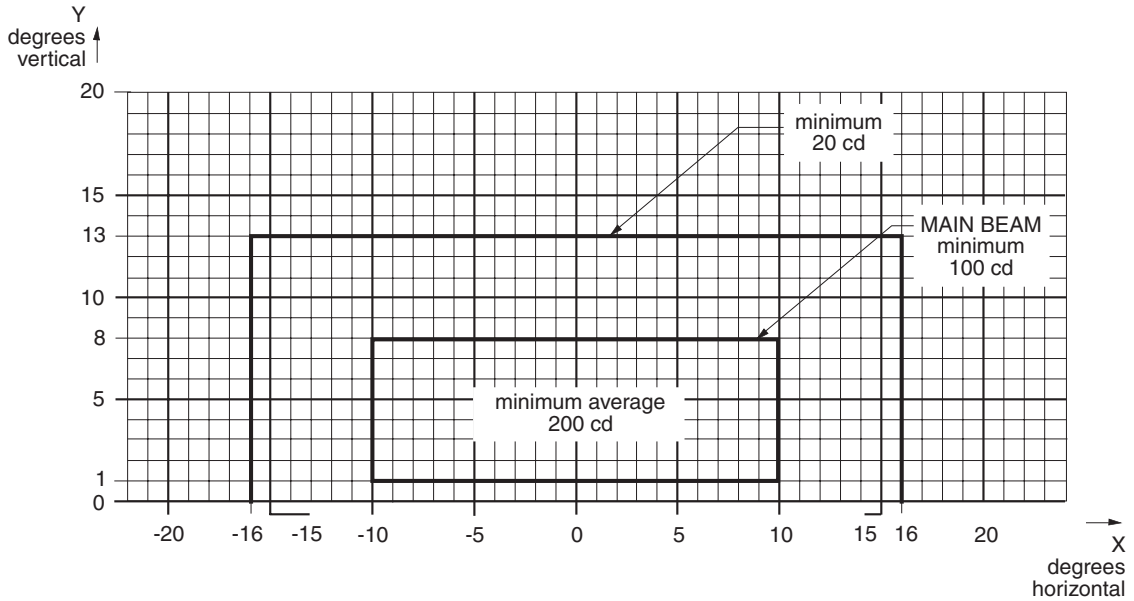


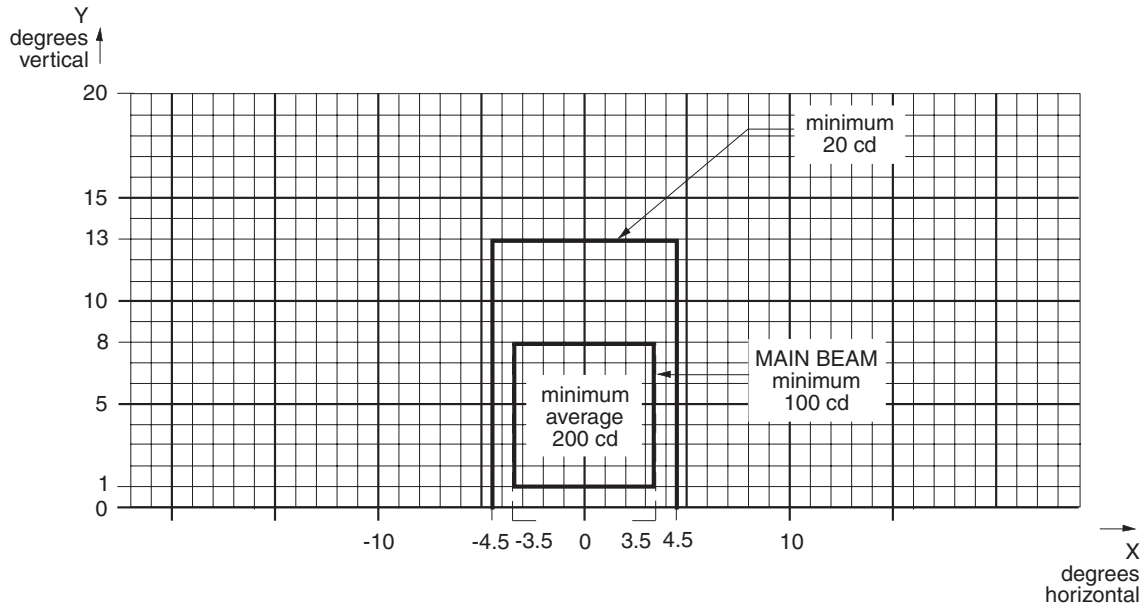
Figure 6A.12 Isocandela diagram for taxiway centreline (15 m spacing), turn pad lights and stop-bar lights in straight sections intended for use in runway visual range conditions of less than a value of the order of 350 m where large offsets can occur and for low-intensity runway guard lights (configuration B).



Notes: 1 These beam coverages allow for displacement of the cockpit from the centreline up to distances of the order of 12 m and are intended for use below and after curves

2 See collective notes for Figures 12 to 17

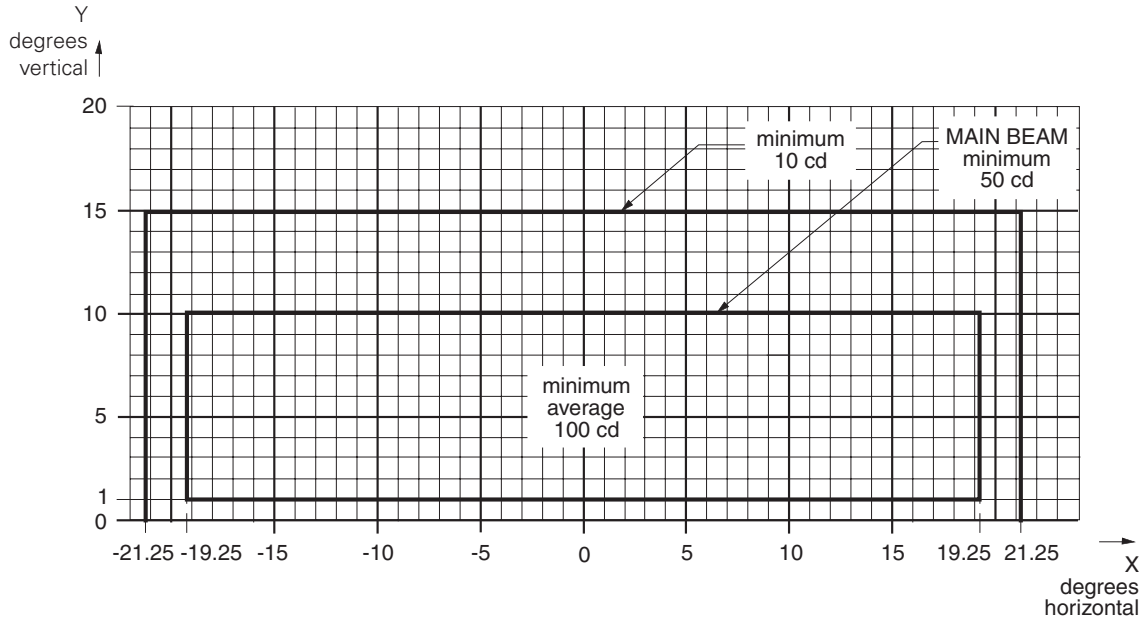
Figure 6A.13 Isocandela diagram for taxiway centreline (15 m spacing), turn pad lights and stop-bar lights in straight sections intended for use in runway visual range conditions of less than a value of the order of 350 m



Notes: 1 These beam coverages are generally satisfactory and cater for a normal displacement of the cockpit from the centreline of approximately 3 m

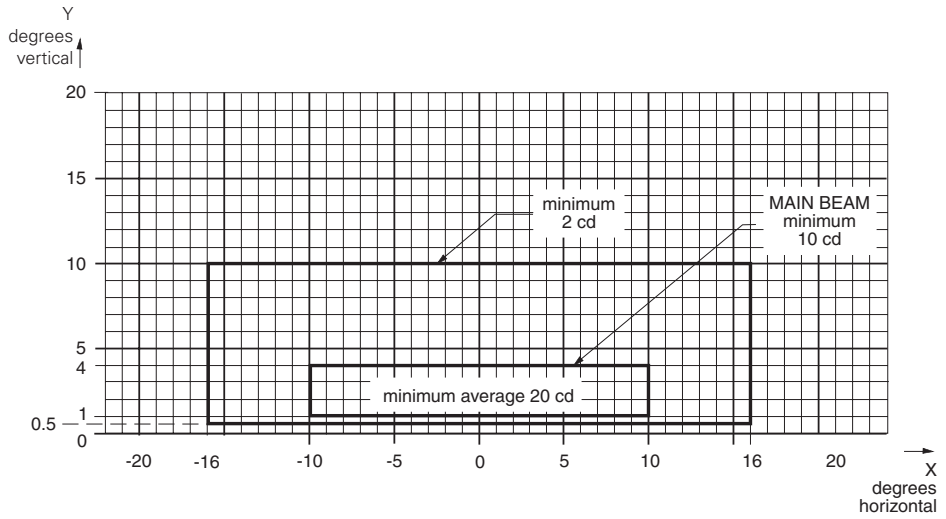
2 See collective notes for Figures 12 to 17

Figure 6A.14 Isocandela diagram for taxiway centreline (7.5 m spacing), turn pad lights and stop-bar lights in curved sections intended for use in runway visual range conditions of less than a value of the order of 350 m



Notes: 1 Lights on curves to be toed-in 15.75 degrees with respect to the tangent of the curve
2 See collective notes for Figures 12 to 17

Figure 6A.15 Isocandela diagram for taxiway centreline (30 m, 60 m spacing) and stop-bar lights in straight sections intended for use in runway visual range conditions of the order of 350 m or greater

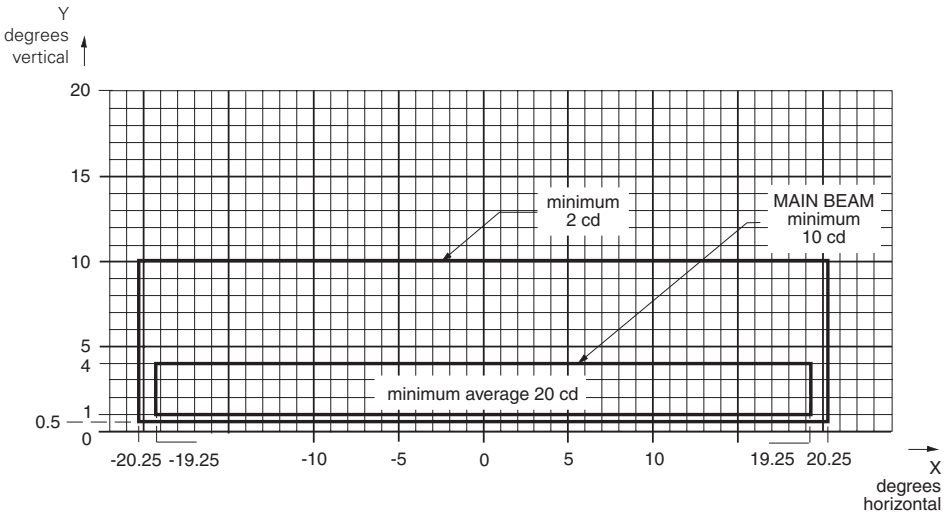


Notes: 1 At locations where high background luminance is usual and where deterioration of light output resulting from dust, snow and local contamination is a significant factor, the cd-values should be multiplied by 2.5

2 Where omni-directional lights are used they shall comply with the vertical beam requirements in this figure

3 See collective notes for Figures 12 to 17

Figure 6A.16 Isocandela diagram for taxiway centreline (7.5 m, 15 m, 30 m spacing) and stop-bar lights in curved sections intended for use in runway visual range conditions of the order of 350 m or greater.



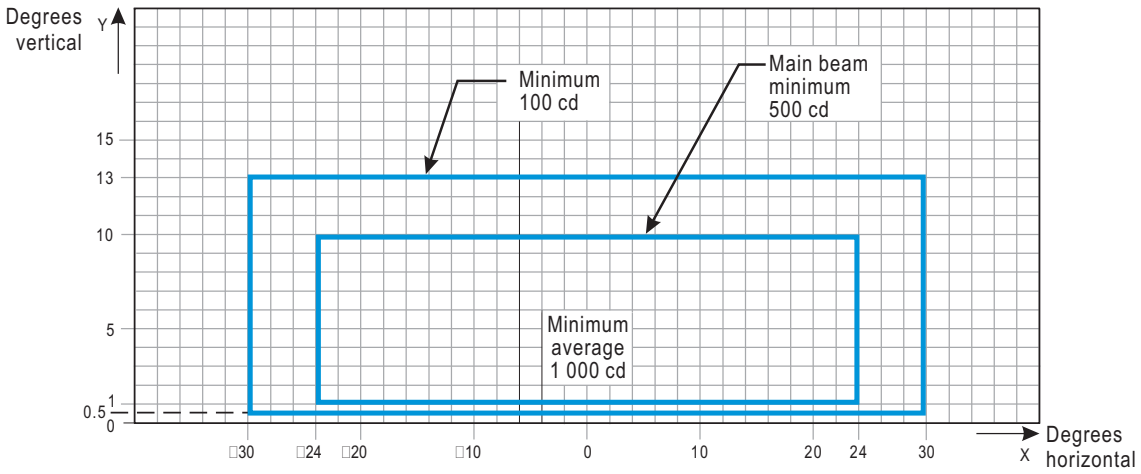
Notes: 1 Lights on curves to be toed-in 15.75 degrees with respect to the tangent of the curve

2 At locations where high background luminance is usual and where deterioration of light output resulting from dust, snow and local contamination is a significant factor, the cd-values should be multiplied by 2.5

3 These beam coverages allow for displacement of the cockpit from the centreline up to distances of the order of 12 m as could occur at the end of curves

4 See collective notes for Figures 12 to 17

Figure 6A.17 Isocandela diagram for high-intensity runway guard lights (configuration B)



Notes: 1 Although the lights flash in normal operation, the light intensity is specified as if the lights were fixed for incandescent lamps.

2 See collective notes for Figures 12 to 17.

Figure 6A.18 Grid points to be used for the calculation of average intensity of taxiway centreline and stop-bar lights

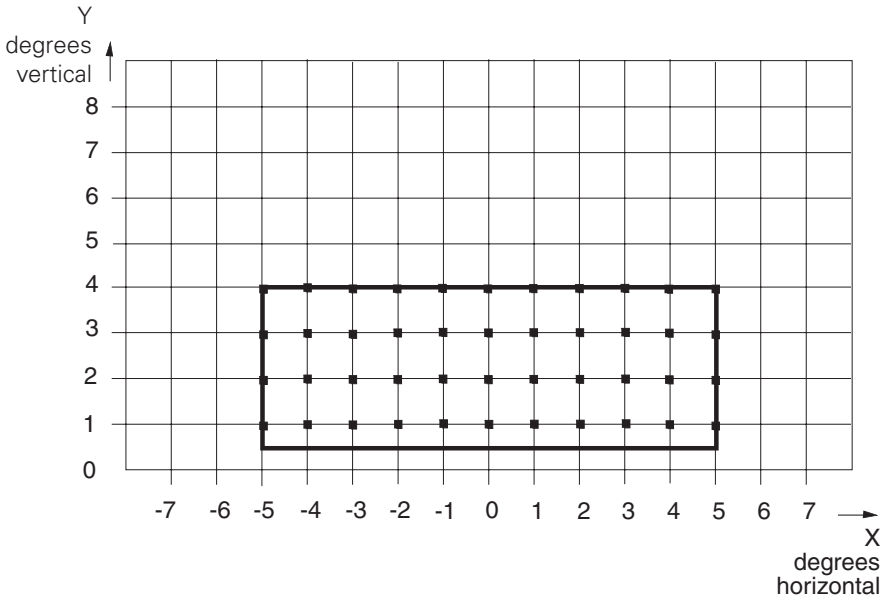
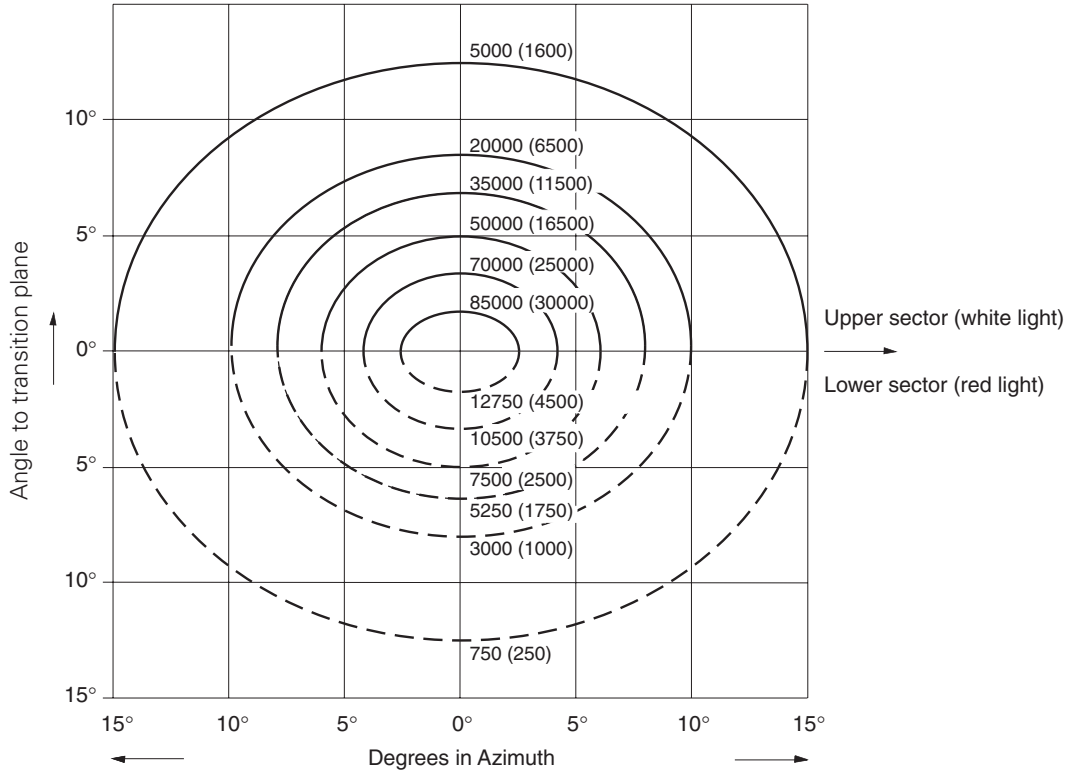


Figure 6A.19 Light intensity distribution of PAPI and (A)PAPI



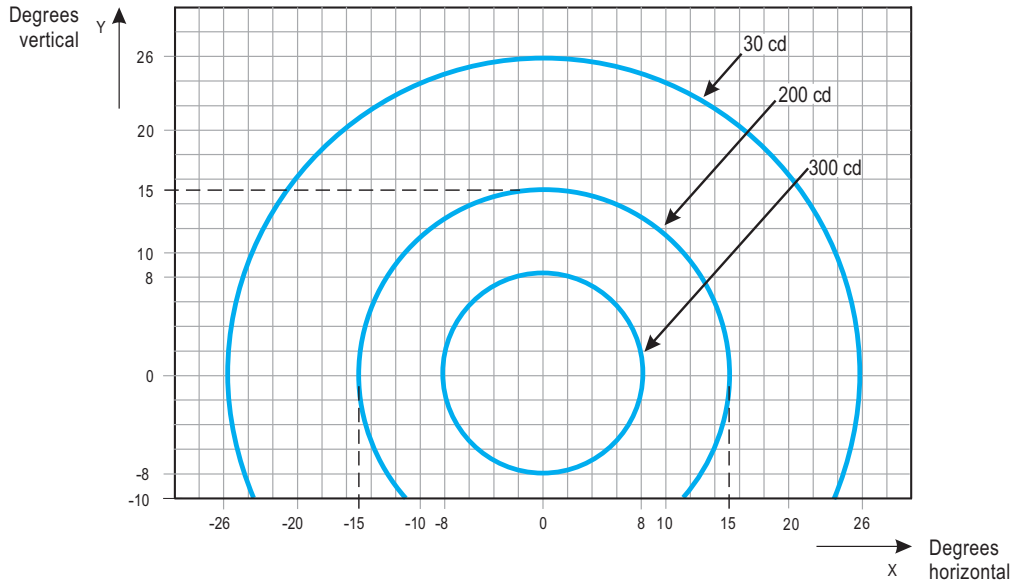
Notes: 1 These curves are minimum intensities.

2 Luminous intensities are in candelas as measured by a detector subtending an angle not greater than 5′ of arc.

3 The unit shall appear at a distance of 2 km to exhibit the two signal colours separated by an angular difference of not more than 3′ of arc.

4 Intensity values shown in brackets are for APAPI.

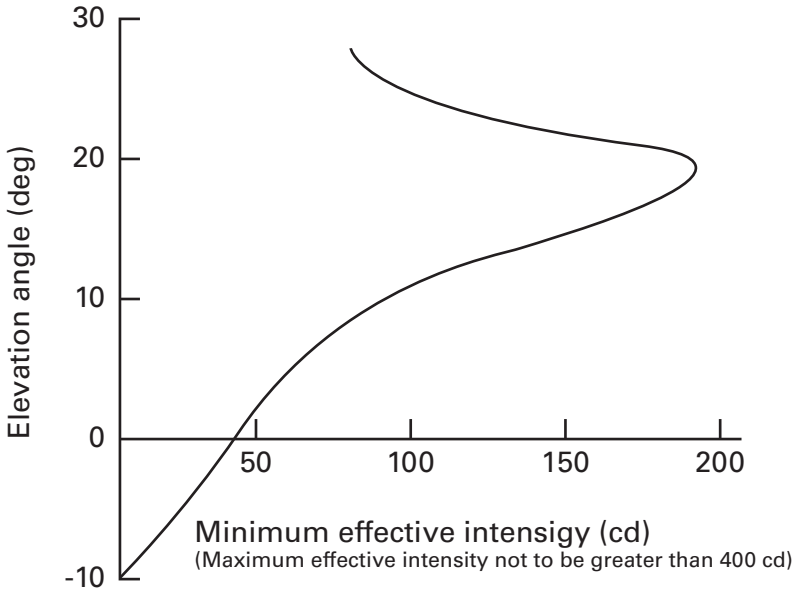
Figure 6A.20 Isocandela diagram for each light in low-intensity runway guard lights (configuration A)



Notes: 1 Although the lights flash in normal operation, the light intensity is specified as if the lights were fixed for incandescent lamps.

2 The intensities specified are in yellow light.

Figure 6A.21 'Follow me' vehicle obstacle light



Photometric characteristics

Collective notes for figures 6A.1 to 6A.11

16. The ellipses in each figure are symmetrical about the common vertical and horizontal axis.

17. On the perimeter of and within the ellipse defining the main beam in figures 6A.1 to 6A.10, the maximum light intensity value shall not be greater than three times the minimum light intensity value measured in accordance with paragraph 18.

18. Figures 1 to 20 show the minimum allowable light intensities. The average intensity of the main beam is calculated by establishing grid points as shown in figure 6A.11 and using the intensity values measured at all grid points located within and on the perimeter of the ellipse representing the main beam. The average value is the arithmetic average of light intensities measured at all considered grid points.

19. No deviations are acceptable in the main beam pattern when the lighting fixture is properly aimed. The light unit shall be installed so that the main beam is aligned within ± 1.2 degrees of the specified requirement.

20. Average intensity ratio. The ratio between the average intensity within the ellipse defining the main beam of a typical new light and the average light intensity of the main beam of a new runway edge light shall be as follows:

Approach centreline and crossbars	Figure 6A.1	1.5 – 2.0
Approach side row	Figure 6A.2	1.5 – 1.0
Threshold	Figure 6A.3	1.0 – 1.5
Threshold wing bar	Figure 6A.4	1.0 – 1.5
Touchdown zone	Figure 6A.5	0.5 – 1.0
Runway centreline (longitudinal spacing 30 m)	Figure 6A.6	0.5 – 1.0 (white light)
Runway centreline (longitudinal spacing 15 m)	Figure 6A.7	0.5 – 1.0 for cat III (white light)
		0.25 – 0.5 for cat I, II (white light)
Runway end	Figure 6A.8	0.25 – 0.5
Runway edge (45 m runway width)	Figure 6A.9	1.0 (white light)
		0.4 (yellow light)
		0.15 (red light)
Runway edge (60 m runway width)	Figure 6A.10	1.0 (white light)
		0.4 (yellow light)
		0.15 (red light)

21. The beam coverages in the figures provide the necessary guidance for approaches down to an RVR of 150 m and take-offs down to an RVR of 100 m.

Collective notes for figures 6A.12 to 6A.20

22. Figures 6A.12 to 6A.16 show candela values in green and yellow for taxiway centreline lights and runway guard lights and in red for stop-bar lights.

23. On the perimeter of and within the rectangle defining the main beam in figures 6A.12 to 6A.16, the maximum light intensity value shall not be greater than three times the minimum light intensity value measured in accordance with paragraph 24.

24. Figures 6A.12 to 6A.16 show the minimum allowable light intensities. The average intensity of the main beam is calculated by establishing grid points as shown in figure 6A.17 and using the intensity values measured at all grid points located within and on the perimeter of the rectangle representing the main beam. The average value is the arithmetical average of the light intensities measured at all considered grid points.

25. No deviation is acceptable in the main beam when the lighting fixture is properly aimed.

26. Horizontal angles are measured with respect to the vertical plane through the taxiway centreline except on curves where they are measured with respect to the tangent to the curve.

27. Vertical angles are measured from the longitudinal slope of the taxiway surface.

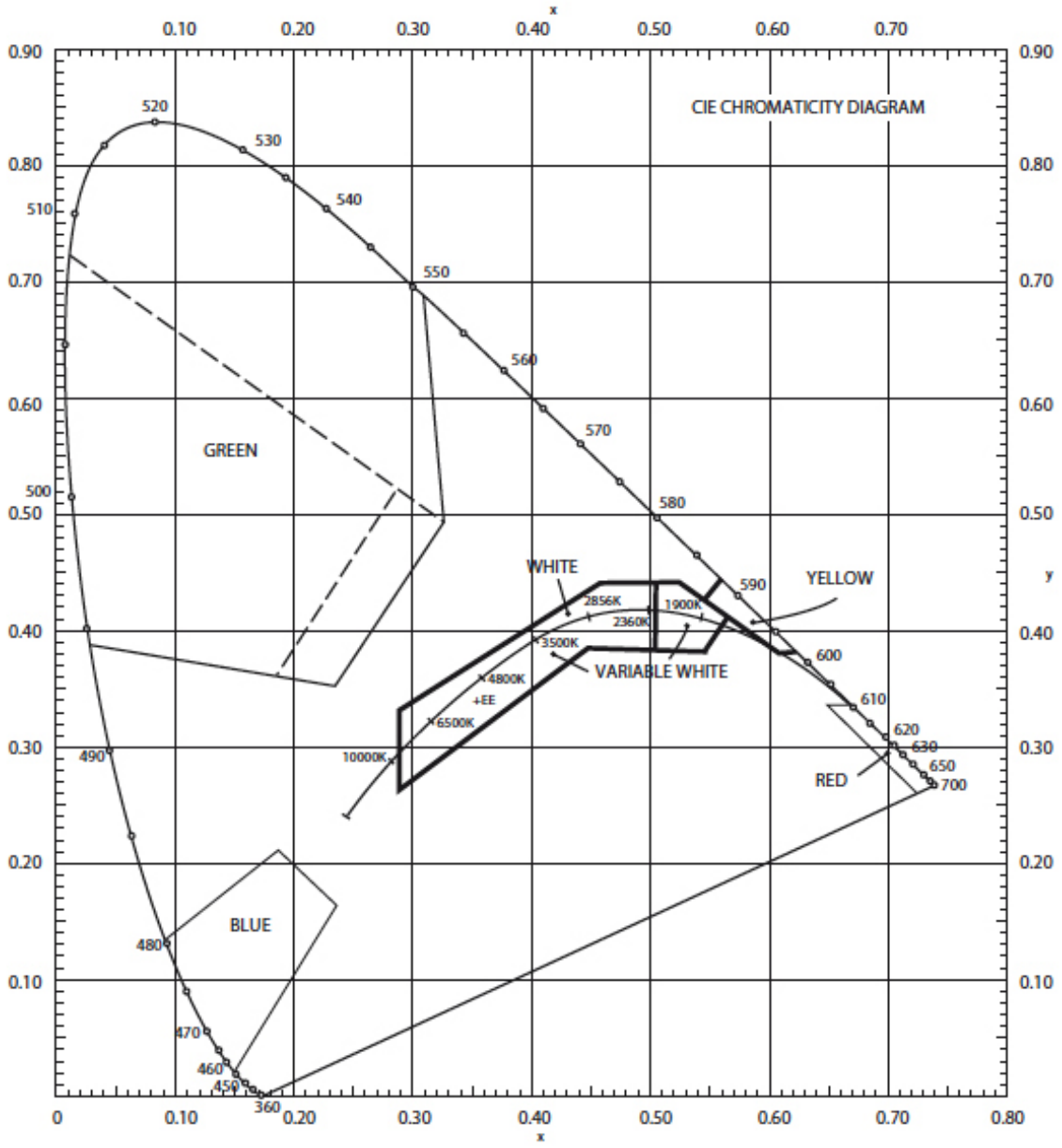
28. The light unit shall be installed so that the main beam is aligned within ± 0.5 degree of the specified requirement.

Colour requirements for AGL

General

29. The colour of light signals is an important characteristic of the guidance provided by the AGL. It is incumbent upon aerodrome licence holders to ensure that wherever a light signal depends on colour to provide essential information, the lighting equipment employed displays no misleading signals within the equipment beamspread or at any angle within the intended viewing segment.

Figure 6A.22 Colours for aeronautical ground lights



30. The colour change associated with light fittings employing dichroic filters, when measured in the high intensity part of the beam, is generally still within the appropriate colour specification. However, depending on the layout of an aerodrome, it is possible for flight crew or a vehicle driver to see incorrect colour signals when viewing a light signal from large offset angles. An example of the problem occurs where a stop-bar is installed on a wide taxiway leading onto a runway in such a manner that it is intended that the stop-bar should be seen when approached at an acute angle. In such situations it is possible for the stop-bar to display yellow rather than red light.

31. The colour of AGL should be verified by the manufacturer as being within the boundaries of figure 6A.20 by measurement at five points within the area

bounded by the innermost isocandela curve (isocandela diagrams 6A.1 to 6A.18 refer), with operation at rated current or voltage as follows:

1. in the case of elliptical or circular isocandela curves, the colour measurements should be taken at the centre and at the horizontal and vertical limits;
2. in the case of rectangular isocandela curves, the colour measurements should be taken at the centre and the limits of the diagonals (corners);
3. the colour of the light should be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion;
4. a measurement of colour co-ordinates for the outermost isocandela curve should be made by the manufacturer and recorded for review and judgement of acceptability by the aerodrome authority;
5. where lights may be viewed and used by flight crew from directions beyond that of the indicated isocandela curve (e.g. stop-bars at wide taxi-holding positions), the aerodrome authority should make a visual assessment of the actual application and, if necessary, require a check of colour shift at angular ranges beyond the outermost isocandela curve; and
6. the signal colours for (A)PAPI and AGL having a colour transition sector should be measured at points, as indicated above, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.

Chromaticities

32. The chromaticities of AGL shall be within the following boundaries: CIE Equations (see figure 6A.20).

a)	Red	
	Purple boundary	y = 0.980 – x
	Yellow boundary	y = 0.335
b)	Yellow	
	Red boundary	y = 0.382
	White boundary	y = 0.790 – 0.667x
	Green boundary	y = x – 0.120
c)	Green	
	Yellow boundary	x = 0.360 – 0.080y
	White boundary	x = 0.650y
	Blue boundary	y = 0.390 – 0.171x
d)	Blue	

	Green boundary	y = 0.805x + 0.065
	White boundary	y = 0.400 – x
	Purple boundary	x = 0.600y + 0.133
e)	White	
	Yellow boundary	x = 0.500
	Blue boundary	x = 0.285
	Green boundary	y = 0.440
	and	y = 0.150 + 0.640x
	Purple boundary	y = 0.050 + 0.750x
	and	y = 0.382
f)	Variable white	
	Yellow boundary	x = 0.255 + 0.750y
	and	x = 1.185 – 1.500y
	Blue boundary	x = 0.285
	Green boundary	y = 0.440
	and	y = 0.150 + 0.640x
	Purple boundary	y = 0.050 + 0.750x
	and	y = 0.382

33. Where dimming is not required, or where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:

- Yellow boundary y = 0.726 – 0.726x
- White boundary x = 0.650y
- Blue boundary y = 0.390 – 0.171x

34. Where increased certainty of recognition is more important than maximum visual range, green signals should be within the following boundaries:

- Yellow boundary y = 0.726 – 0.726x
- White boundary x = 0.625y – 0.041
- Blue boundary y = 0.390 – 0.171x

Discrimination between lights

35. If there is a requirement to discriminate yellow and white from each other, they should be displayed in close proximity of time or space as, for example, by being flashed successively from the same beacon.

36. If there is a requirement to discriminate yellow from green and/or white, as for example on exit taxiway centreline lights, the y co-ordinates of the yellow light should not exceed a value of 0.40.

Note: The limits of white have been based on the assumption that they will be used in situations in which the characteristics (colour temperature) of the light source will be substantially constant.

37. The colour variable white is intended to be used only for lights that are to be varied in intensity, e.g. to avoid dazzling. If this colour is to be discriminated from yellow, the lights should be so designed and operated that:

1. the x co-ordinate of the yellow is at least 0.050 greater than the x co-ordinate of the white; and
2. the disposition of the lights will be such that the yellow lights are displayed simultaneously and in close proximity to the white lights.

APPENDIX 6B

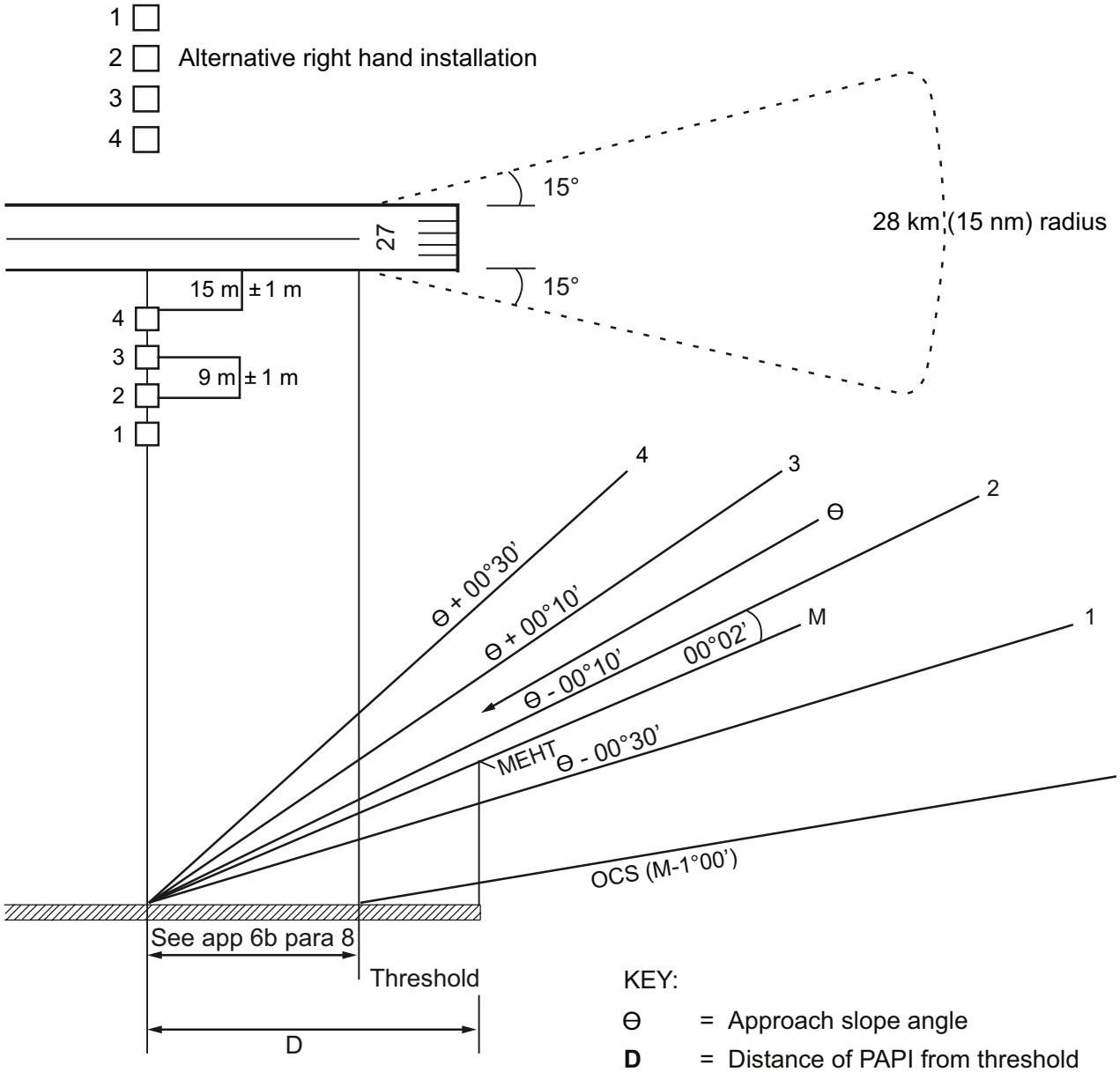
PAPI: Siting and setting angles

Layout and elevation setting angles

1. The PAPI system comprises a four-unit wing bar normally located in a line at right angles to the runway. The unit nearest the runway is set higher than the required approach angle, with progressive reductions in the setting of the units further outboard. The arrangement of the units is shown at figure 6B.1, together with the standard differential setting angles. Each unit should contain three light projectors.

2. The difference between the setting angles is normally 20 minutes of arc. This value may be varied where PAPI is used in conjunction with ILS (see paragraph 11) and where approach angles are steeper than 4° (see paragraphs 20 and 21).

Figure 6B.1 PAPI: General arrangement



KEY:

Θ = Approach slope angle
D = Distance of PAPI from threshold
MEHT = Minium Eye Height over Threshold
M = Angle determining MEHT
OCS = Obstacle Clearance Surface

EXAMPLE: Settings for a 3° approach:

Unit Number 1 = 2°30'
2 = 2°50'
3 = 3°10'
4 = 3°30'

If the PAPI is associated with ILS, the setting for 3° approach should be:

Unit Number 1 = 2°25'
2 = 2°45'
3 = 3°15'
4 = 3°35'

Distance from threshold

3. The distance of PAPI from the runway threshold will depend upon the following:

    1. the need to provide adequate wheel clearance over threshold of a non-instrument or non-precision instrument approach runway for all types of aircraft for which the runway is intended, having due regard to the length of runway available for stopping the aircraft;
    2. obstacle clearance considerations;
    3. the operational requirement that PAPI be compatible with the instrument glidepath down to the minimum possible range and height for the types of aircraft for which the runway is intended; and
    4. any difference in elevation between the PAPI units and the runway threshold.

    Note: The CAA should be consulted on the application of these variables in each case. With regard to 4. above, it is recommended that the procedure described at paragraph 12., sub-paragraph 4., is adopted for ease of checking.

Wheel clearance and Minimum Eye Height over Threshold (MEHT)

4. Wheel clearance over threshold should take account of the eye-to-wheel height of the most demanding aircraft when it is at the lowest possible on-slope signal from the PAPI. The MEHT will be agreed in consultation with the CAA.

5. The angle which establishes the MEHT is two minutes of arc less than the setting angle of the unit defining the lower on-slope boundary (see figure 6B.1). Where a runway is not equipped with ILS, MEHT should provide the wheel clearances specified in table 6B.1. The MEHT is the combination of the eye-to-wheel height and the wheel clearance.

Table 6B.1 Wheel clearance over threshold for PAPI and (A)PAPI

Eye-to-wheel height of aeroplane in the approach configuration Note 1	Desired wheel clearance Notes 2, 3 (metres)	Minimum wheel clearance Note 4 (metres)
(1)	(2)	(3)
up to but not including 3 m	6	3 (Note 5)
3 m up to but not including 5 m	9	4
5 m up to but not including 8 m	9	5
8 m up to but not including 14 m	9	6

Notes:

1. In selecting the eye-to-wheel height group, only aeroplanes meant to use the system on a regular basis shall be considered. The most demanding among such aeroplanes shall determine the eye-to-wheel height group.

2. Where practicable the desired wheel clearances shown in column (2) shall be provided.
3. The wheel clearances in column (2) may be reduced to no less than those in column (3) where an aeronautical study indicates that such reduced wheel clearances are acceptable.
4. When a reduced wheel clearance is provided at a displaced threshold it shall be ensured that the corresponding desired wheel clearance specified in column (2) will be available when an aeroplane at the top end of the eye-to-wheel group chosen overflies the extremity of the runway.
5. This wheel clearance may be reduced to 1.5 m on runways used mainly by lightweight non turbo-jet aeroplanes.

Obstacle clearance considerations

6. The nominal approach angle should be such that flight crew of an aeroplane receiving the lowest on-slope signal will clear all obstacles in the approach area by a safe margin. To achieve this an Obstacle Clearance Surface (OCS) is established which should not be penetrated by any object.

7. The OCS for PAPI is a plane 1° below the angle of the lower boundary of the on-slope signal. figure 6B.1 shows that for a normal approach angle of 3° the OCS will be 2°48′ – 1° = 1°48′. The surface extends to 15° either side of the runway edge out to a distance of 28 km (15 nm).

8. The OCS originates at the same level as the units but at the following distances downwind of them:
   1. 90 m where the LDA is 1200 m or greater;
   2. 60 m where the LDA is 800–1199 m;
   3. 30 m where the LDA is less than 800 m.

Compatibility of PAPI with ILS

9. PAPI should be sited so that its on-slope signal conforms as closely as possible with that of the ILS glidepath. The variables that need to be considered are fluctuations of the ILS glidepath and the different eye-to-aerial height of various types of aeroplane.

10. An ILS glidepath has a tolerance of ±.075 of the nominal glidepath angle for a Category I or II system and of ±.04 for a Category III. For a nominal 3° glideslope the tolerances are ± 13.5 and ± 7.2 minutes of arc respectively. The standard PAPI settings define a glideslope within 10 minutes of arc and can therefore show a variation from a nominal ILS glideslope that is operating within its tolerances.

11. Flight crew's eye-to-aerial height varies considerably with aeroplane type and will affect the minimum range to which PAPI and ILS harmonisation is achieved.

In order to allow for the full range of public transport aircraft, harmonisation is enhanced by widening the on-slope sector from 20 minutes to 30 minutes of arc. The ILS glidepath angle may vary, so it is desirable to check the calibrated ILS GP angle against the PAPI settings and to change the latter if necessary. Such changes should be referred to the CAA for approval before they are implemented.

Procedure for establishing the distance of the PAPI wing bar from the runway threshold

12. When the required approach angle and associated unit setting angles have been determined, the parameters outlined at paragraph 3. are applied as follows:

    1. In order to provide the appropriate wheel clearance over the threshold of a non-instrument or non-precision instrument approach runway, the distance of PAPI from the threshold is established by adding the approach configuration eye-to-wheel height of the most demanding aeroplane using the runway to the required threshold wheel clearance and dividing the result by the tangent of angle M in figure 6B.1 or 6B.3 as appropriate.
    2. Where ILS is installed the PAPI should be sited upwind of the effective ILS glidepath origin by a distance that is dependent upon the range of eye-to-aerial heights of the aeroplanes using the runway. For a 3° approach angle and no difference in elevation between the ILS and PAPI signal origins the distances are as follows:

        a) All aeroplanes including B747 67 m;

        b) All aeroplanes excluding B747 35 m;

        c) All aeroplanes excluding B747 and A300 6 m.

    3. The OCS origin is determined in accordance with the requirements of paragraph above and the surface (see figures 6B.1 for PAPI and 6B.3 for (A)PAPI) examined in order to confirm the absence of infringements. If the surface is penetrated but the offending object cannot be removed, the vertical extent of the infringement is divided by the tangent of the OCS angle, and the PAPI relocated that much further from the threshold. Alternatively, where a prescribed approach angle is not critical, it may be increased by the angular extent of the infringement. In some circumstances a combined displacement and angular increase may be the best solution.
    4. A height difference between threshold and unit lens centres exceeding 0.3 m will require a siting adjustment as follows:

        a) In figure 6B.2 the uncorrected visual aiming point is shown as the distance D_1 from the threshold. The nominal siting of PAPI would be on a line at right angles to the runway centreline at this distance, the units being P_1, P_2, P_3 and P_4.

b) The height difference between the threshold T_h, and the lens centre of the highest of the units (Pn) at the nominal sites P_1 to P_4 is determined. The following formula will determine the revised distance from threshold D_2:

i) $D_1 + (T_h - P_n) \cot Ø = D_2$

c) where Ø is the setting angle of the unit at site P_2, less 2 minutes of arc (cot Ø can be taken as 20 for a 3° approach).

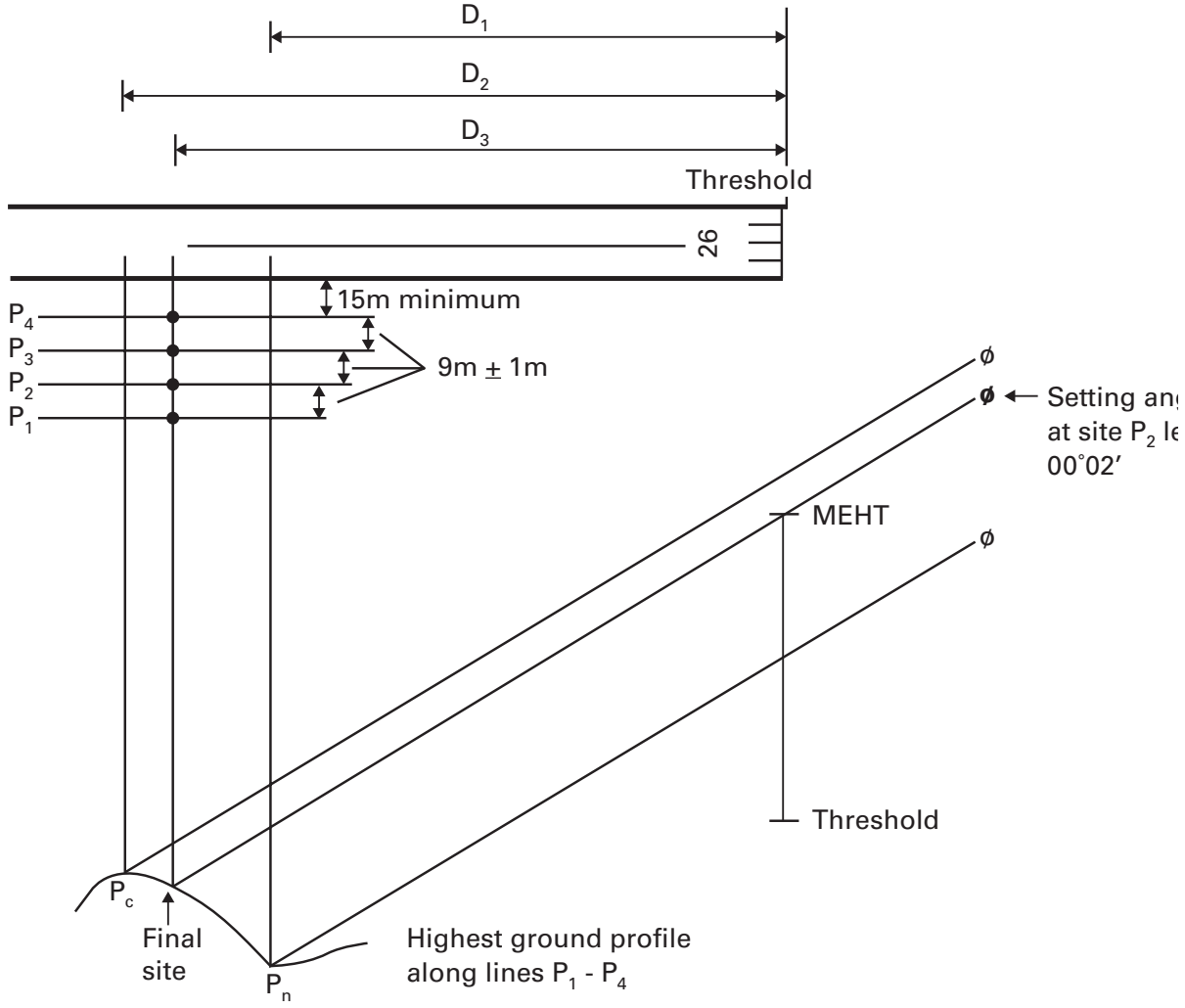
d) The highest unit level at distance D_2, (P_c) is compared with P_n. If the difference is 0.3 m or more, the final siting, D_3, is determined as follows:

i) $D_2 + (P_n - P_c) \cot Ø = D_3$

e) The MEHT resulting from the level of unit P_2 at D_3 is checked to ensure that it achieves the original target.

13. Further guidance is contained in the ICAO Aerodrome Design Manual Part 4 Visual Aids (Doc 9157 – AN/901).

Figure 6B.2 PAPI siting – principle of compensation for different ground heights



Installation

14. PAPI units should be mounted as close to ground level as practicable but overall height should never exceed 0.9 m. The units of a wing bar should all lie in the same horizontal plane, but where crossfalls make this impracticable within the 0.9 m constraint, the height difference between adjacent units should preferably not exceed 55 mm. Where even this tolerance cannot be achieved, a maximum gradient of 1.25% across the bar can be accepted provided that it is uniform.

15. The spacing between units (see figure 6B.1) will normally be 9 m ± 1 m, except that a spacing of not less than 6 m between units may be used with agreement of the CAA where there is insufficient strip width to accommodate all four units at 9 m spacing.

16. The inner edge of the unit nearest the runway should be 15 m ± 1 m from the runway edge. Units should not be closer than 14 m to any taxiway, apron, or another runway.

17. Firm stable bases are essential for PAPI units, and concrete should be used. Bases should be either depressed below ground level and covered with a suitable infill or flush fitted. The edges of bases should be constructed in the manner prescribed at chapter 3 paragraph 3.37.

Initial checking of elevation angles

18. Setting angles are checked using a theodolite or equivalent device. Errors in excess of 1 minute of arc should be corrected.

19. After installation, angular errors caused by settling of the bases may occur. Therefore, the angles should initially be checked daily using a clinometer or equivalent device and, if necessary, adjusted using a theodolite. The interval between checks may be extended progressively to once a week as greater stability becomes evident. However, special checks should be made in the event of heavy frost or rain or a significant change of weather such as the end of a drought, since angular variations are possible at such times.

Variations of PAPI differential settings with increasing approach angle

20. As approach angles steepen, wider differential settings are needed between units in order to facilitate approach slope capture and flyability.

21. Those differential settings that have been found to be satisfactory are:

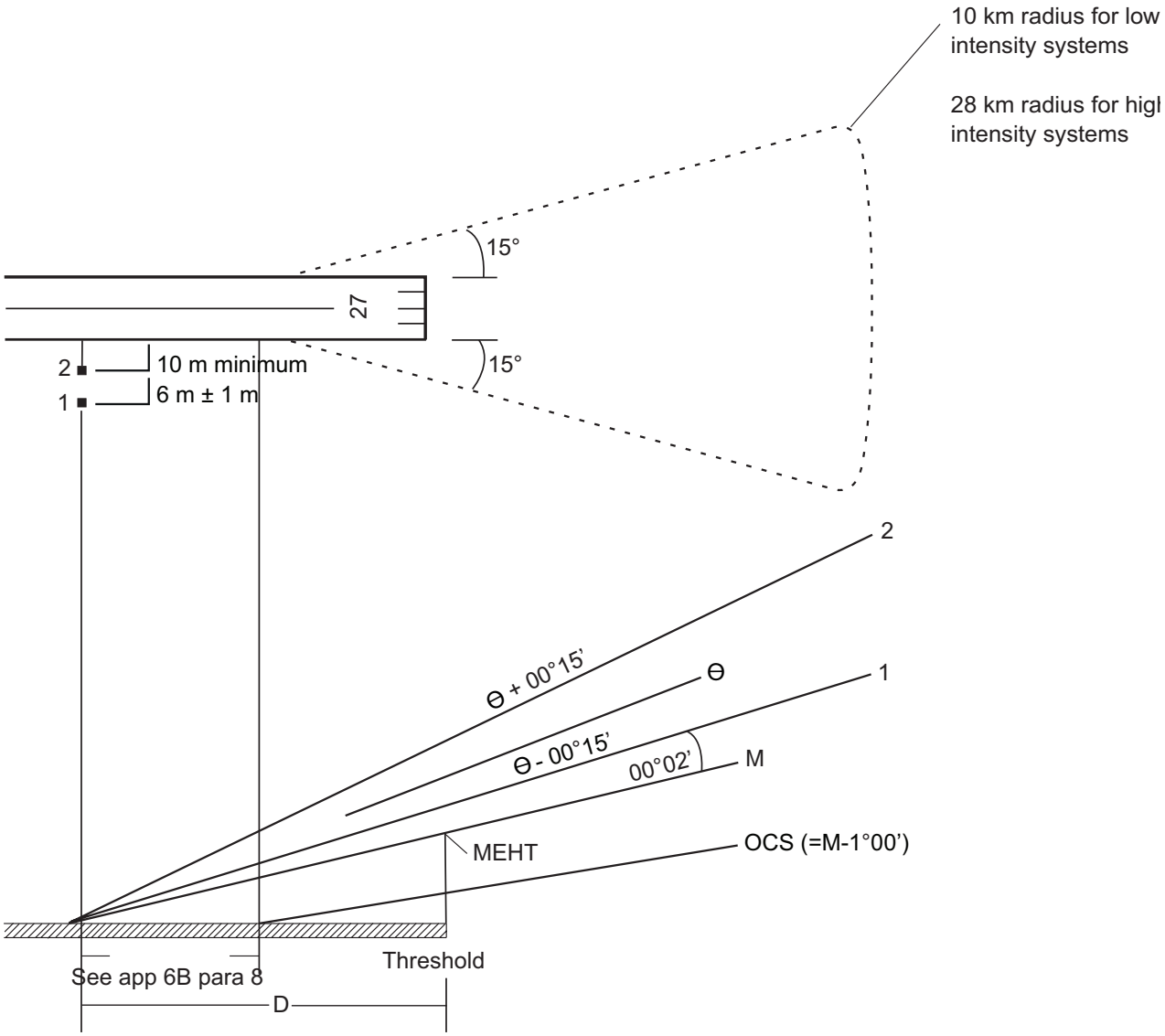
Approach angle	Differential setting angle
2° – 4°	00°20′ (except for ILS)
4° – 7°	00°30′
over 7°	01°00′

(A)PAPI

22. The calculations for the siting and the setting criteria of (A)PAPI are the same as for PAPI, with the following exceptions:

1. two units are used normally spaced 6 m apart, the inner unit at least 10 m from the runway edge. (See figure 6B.3 for siting adjustments.);
2. the differential setting between the units is 0°30′ i.e., the approach angle ø± 15′;
3. the MEHT datum angle M is 0°02′ below the setting angle of unit No. 1;
4. the OCS is 1° below the angle M, and for low intensity units extends only to 10 km.

Figure 6B.3 (A)PAPI general arrangement



KEY:

Θ = Approach angle
D = Distance of APAPI from threshold
MEHT = Minium Eye Height over Threshold
M = Angle determining MEHT
OCS = Obstacle Clearance Surface

EXAMPLE: 4°.00' approach settings:

Unit Number 1 = 3°45'
2 = 4°15'

Notes:

1. For simplicity in presentation this procedure is written as a series of steps, but with flight experience it should be possible to combine some of them and complete an inspection with fewer approaches.
2. These checks should not be carried out in weather conditions worse than cloud ceiling 1500 ft and visibility 10 km.

APPENDIX 6C

Procedure for the routine flight inspection of approach and runway lights

Approach lighting pattern

Check 1

1. Carry out a normal approach from the Final Approach Fix (FAF) or at least 5 nm starting with all approach lights at the maximum luminous intensity setting. Check that a uniform pattern is presented to an aircraft on the normal approach path. Flight variations should be made about the approach path. Small variations in elevation and azimuth should not produce any noticeable change in the intensity of the lights. Large variations will produce a progressive reduction in intensity as the aircraft leaves the area of primary cover of the lights. These changes in intensity should be similar for all lights. Ragged changes are normally caused by incorrect setting angles of individual units, and a note of these should be made for subsequent checking on the ground.

Check 2

2. During the approach call for progressive reductions in luminous intensity down to the minimum setting. Check that all lights respond correctly and simultaneously to the setting changes. With all approach lights set at a suitable luminous intensity setting (the lowest at which the individual lights are discernible is normally best) check that all the individual lights are illuminated. Note and record all outages and misalignments.

Supplementary approach lights (when installed)

Check 3

3. Repeat checks 1 and 2 above for supplementary approach lighting.

Check 4

4. Repeat with approach and supplementary approach lighting combined.

Runway edge, threshold and end lights

Check 5

5. With edge, threshold and end lights at maximum luminous intensity, check that a uniform pattern is presented to an aircraft taking off, landing and going around. Check that there is a progressive and even reduction in the intensity of the lights as the aircraft leaves their area of primary cover.

Check 6

6. From the downwind leg check that all omni-directional runway lights are visible and that they clearly define the runway edges.

Check 7

7. During a normal approach, initially with the runway lights at maximum intensity, call for progressive reductions in the light intensities down to the minimum setting. Check that all lights respond correctly and simultaneously to the setting changes. At a low luminous intensity setting, carry out a low go-around and check for any light outages or misalignments.

Runway centreline lights

Check 8

8. Repeat checks 5 and 7 above for the runway centreline lights.

Touchdown zone lights

Check 9

9. Repeat checks 5 and 7 above for touchdown zone lights.

Complete check of approach and runway lighting

Check 10

10. With all approach and runway lights set at the luminous intensity levels appropriate to the conditions prevailing (see table 6.4) carry out a normal approach. Check that a balanced lighting system is presented to flight crew. Call for luminous intensity adjustments appropriate to other conditions and check that the intensity balance is maintained. Check that the colour of the AGL corresponds to that expected.

11. Check visibility of illuminated wind sleeve and landing T where installed.

Obstacle lights

Check 11

12. Check obstacle lighting on or in the immediate vicinity of the aerodrome for outages.

Location/identification beacon

Check 12

13. Check that the beacon is clearly discernible at a range appropriate to the conditions, and that the coding/flash rate is correct.

Dangerous/confusing lights

Check 13

14. Check for dangerous or confusing lights.

CIVIL AVIATION AUTHORITY

Aeronautical Ground Lighting Flight Inspection Report (Simple)

(This form is to be completed during or immediately after the flight)

Aerodrome_____ **Runway**_____

	PAPI		Transition			APAPI	
☐	W	W	W	W	☐	W	W
☐	W	W	W	R	☐	W	R
☐	W	W	R	R	☐	R	R
☐	W	R	R	R			
☐	R	R	R	R			

Range (FAF) _____ nm

Intensity Changes

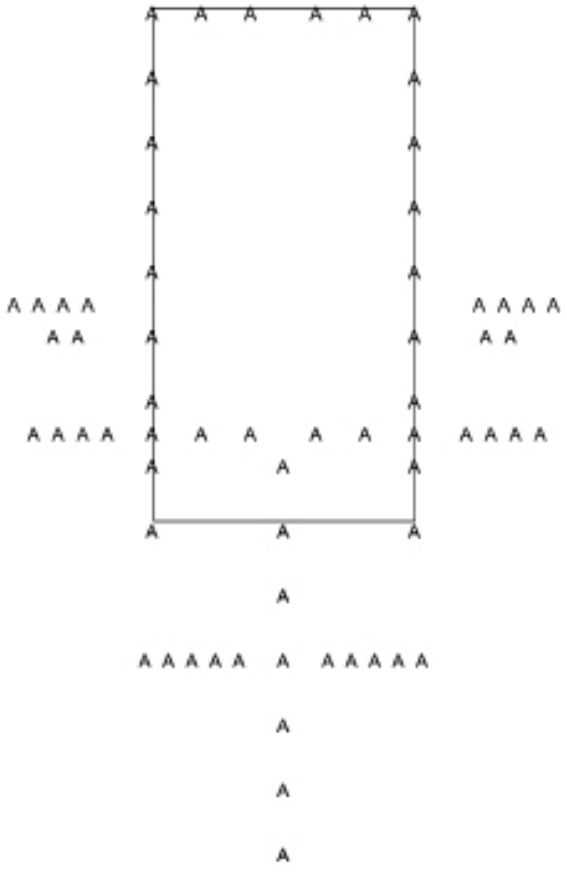
- ☐ 100%
- ☐ 80%
- ☐ 30%
- ☐ 10%
- ☐ 3%
- ☐ 1%
- ☐ OFF

Continuous Assessment

	Low	On-slope	High
Intensity	☐	☐	☐
Alignment	☐	☐	☐

Overall Assessment

- ☐ Approach/Runway Balance
- ☐ Circling Guidance
- ☐ Approach
- ☐ Strobe
- ☐ Threshold
- ☐ Runway Edge
- ☐ Stop-end
- ☐ Windsleeves
- ☐ Beacon
- ☐ Obstacle



Inspected by _____ **Date**_____

CA 1593 E (Part 1)
170430

CIVIL AVIATION AUTHORITY

Aeronautical Ground Lighting Flight Inspection Report (CAT I)

(This form is to be completed during or immediately after the flight)

Aerodrome_____ **Runway**_____

PAPI Transition **ILS Correlation**

☐	W	W	W	W	☐
☐	W	W	W	R	☐
☐	W	W	R	R	☐
☐	W	R	R	R	☐
☐	R	R	R	R	☐

Range (FAF) _____ nm

Intensity Changes

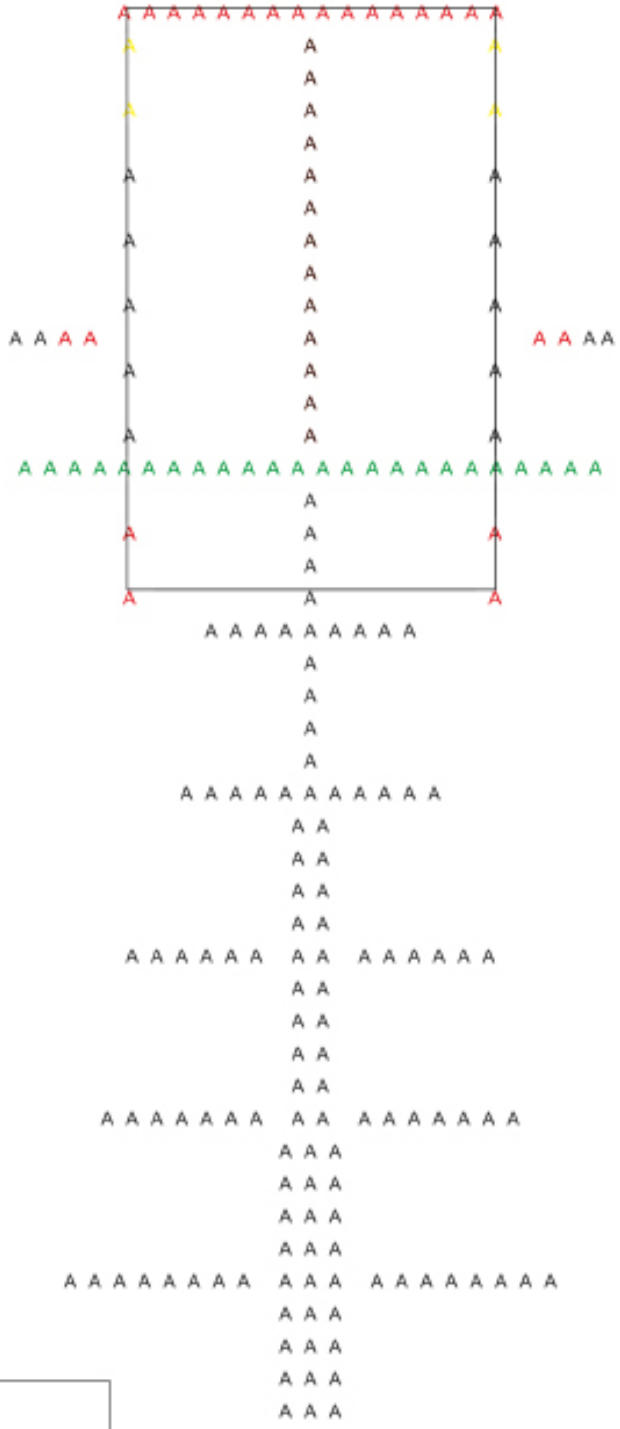
- ☐ 100%
- ☐ 80%
- ☐ 30%
- ☐ 10%
- ☐ 3%
- ☐ 1%
- ☐ OFF

Continuous Assessment

	Low	On-slope	High
Intensity	☐	☐	☐
Alignment	☐	☐	☐

Overall Assessment

- ☐ Approach/Runway Balance
- ☐ Circling Guidance
- ☐ Approach
- ☐ Threshold
- ☐ Runway Centreline
- ☐ Runway Edge
- ☐ Runway Centreline Coding
- ☐ Stop-end
- ☐ Windsleeves
- ☐ Beacon
- ☐ Obstacle



Inspected by _____ **Date**_____

CA 1560 E (Part 2)
170400

CIVIL AVIATION AUTHORITY

Aeronautical Ground Lighting Flight Inspection Report (CAT II/III)

(This form is to be completed during or immediately after the flight)

Aerodrome_____ **Runway**_____

PAPI Transition **ILS Correlation**

☐	W	W	W	W	☐
☐	W	W	W	R	☐
☐	W	W	R	R	☐
☐	W	R	R	R	☐
☐	R	R	R	R	☐

Range (FAF) _____ nm

Intensity Changes

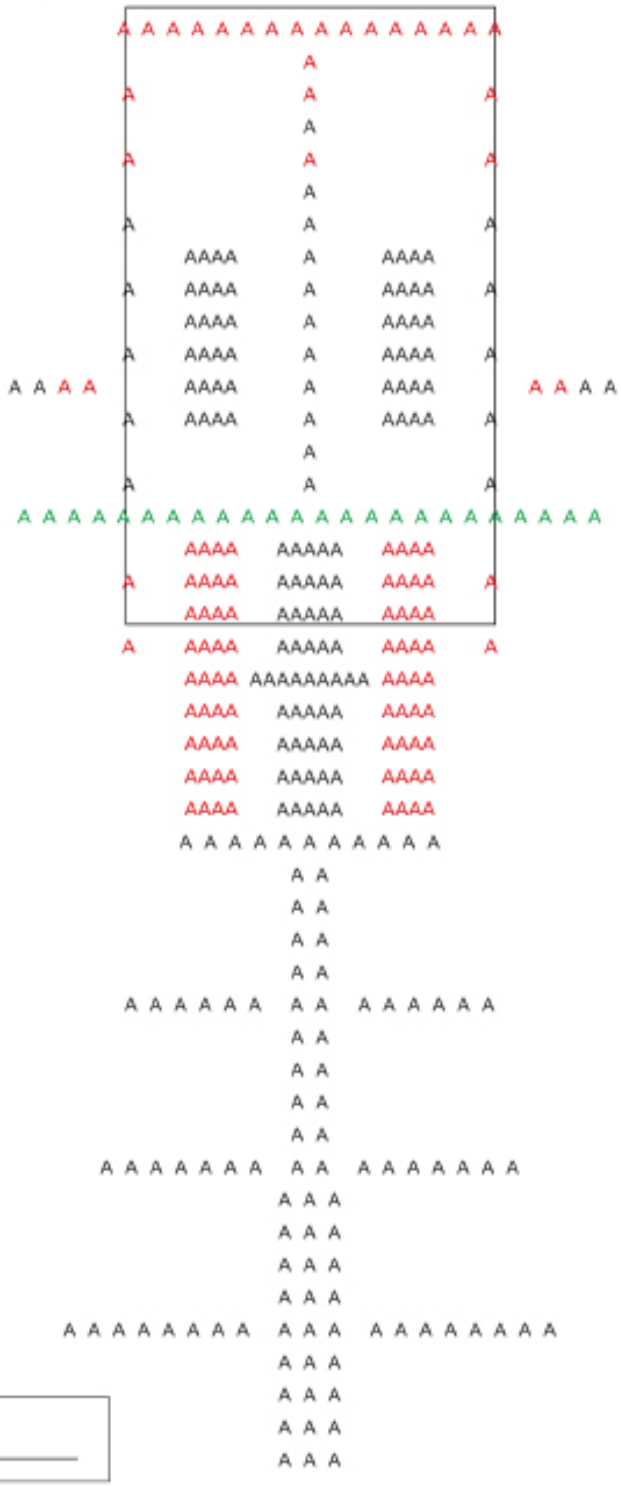
- ☐ 100%
- ☐ 80%
- ☐ 30%
- ☐ 10%
- ☐ 3%
- ☐ 1%
- ☐ OFF

Continuous Assessment

	Low	On-slope	High
Intensity	☐	☐	☐
Alignment	☐	☐	☐

Overall Assessment

- ☐ Approach/Runway Balance
- ☐ Circling Guidance
- ☐ Approach
- ☐ Supplementary
- ☐ Threshold
- ☐ Touchdown Zone (TDZ)
- ☐ Runway Centreline
- ☐ Runway Edge
- ☐ Runway Centreline Coding
- ☐ Stop-end
- ☐ Windsleeves
- ☐ Beacon
- ☐ Obstacle



Inspected by _____ **Date**_____

CA 1560 E (Part 3)

Notes:

1. High intensity units may be checked by day at intensities of 30% or higher. Checks should be completed at dusk or night for lower intensities and for low intensity units. However, care must be exercised when checking obstacle clearances at night.
2. These checks should not be carried out in weather conditions worse than cloud ceiling 1500 ft and visibility 10 km.

APPENDIX 6D

Procedure for the flight inspection of PAPI and (A)PAPI

Effective range

Check 1

1. At a range of approximately 7.5–9 km and height about 1500 ft QFE check the effective range. In daylight the difference between the red and white lights should be clearly discernible at a minimum of 7.5 km in good visibility.

Colour changes

Check 2

2. Commence an approach from 7.5 km flying level at 1000 ft QFE and check that the units are evenly illuminated and that signal changes from red to white are sharp. Check also that the colour change sequence is even. Where PAPI is on both sides of the runway check that the colour change of corresponding opposite units is coincident.

   Note: In reduced visibility it may be necessary to carry out this check at closer range in which case the height will have to be reduced. The minimum practicable height is 500 ft.

Check 3

3. Commence an approach from about 5 km and acquire an on-slope signal. Continue the approach, descend until 4 reds (or 2 reds in the case of (A)PAPI) are just visible. Then climb until 4 whites (or 2 whites) are visible. Return to on-slope and continue to a point close to the threshold. The colour changes should be consistent with change in height and permit easy correction of approach height and angle.

Luminous intensity settings

Check 4

4. Make a normal approach from approximately 7.5 km starting at about 1000 ft QFE. Maintain an 'on-slope' indication and during the approach call for progressive reductions in intensity of the units. Check that all units change intensity correctly and simultaneously.

Table 6A.1 Characteristics of obstacle lights and low intensity aeronautical ground lights

Lighting system (purpose of the light fitting)		Colour	Beam coverage (degrees) average		Minimum setting intensity (candelas)	Elevation projection angle (degrees)	Remarks
			Horizontal	Vertical			
1		2	3	4	5	6	7
1	Low intensity approach	Red	Omni-directional	+5 to +8 0 to +15	200 50	-	
2	Low intensity runway edge	White	Omni-directional	±4	200	4.0	Elevated fittings
3	Low intensity runway edge (battery)	White	Omni-directional	±4 to ±8 +8 to +8	50 10	4.0	Portable elevated fittings
4	Low intensity threshold	Green	Omni-directional	±4	100	4.0	Elevated fittings
5	Low intensity threshold (battery)	Green	Omni-directional	±4	40	4.0	Portable elevated fittings
6	Low intensity runway end	Red	Omni-directional	±4	100	4.0	Elevated fittings
7	Low intensity runway end (battery)	Red	Omni-directional	±4	18	4.0	Portable elevated fittings
8	Taxiway edge	Blue	Omni-directional	0 to 6 6 to 75	2 0.2	3.5	
9	Stopway	Red	Omni-directional ± 6.5	0 to +15	100	-	
10	Runway guard lights	Yellow	Omni-directional ± 15	0 to +15	200	-	30 to 60 cycles per minute with periods of light suppression and illumination equal and opposite in each case

Lighting system (purpose of the light fitting)		Colour	Beam coverage (degrees) average		Minimum setting intensity (candelas)	Elevation projection angle (degrees)	Remarks
			Horizontal	Vertical			
1		2	3	4	5	6	7
11	Low intensity obstacle (group A)	Red	Omni-directional	0 to +30	10	-	Steady
12	Low intensity obstacle (group B)	Red	Omni-directional	+5 to +8 0 to +15	200 50	-	Steady
13	Vehicle obstacle	Yellow	360°	±10° (note 1)	40	-	Flash rate 60 to 90 minute. Maximum intensity not to exceed 400 Cd
14	Medium intensity obstacle	Red	Omni-directional	±4°	2000 ±20%	-	Steady
15	High intensity obstacle	White	120°	3	200 000 day 20 000 dusk 2000 night	0	40 flashed per minute (notes 2, 3, 4)
16	Simple sequenced approach	White	Omni-directional	0 to + 15	5000	-	Elevated fittings. Flash sequence 1 per second per unit

Notes:

1. The coverage requirement for 'follow me' vehicles only is illustrated in figure 6A.21.
2. Where an intermediate high intensity obstacle light is fitted, the angle should be 3° for a light less than 92 m agl, 2° for a light between 92 m and 122 m agl, and 1o for a light between 122 m and 151 m agl.
3. If more than one light is fitted, the lights should flash simultaneously.
4. Lights should flash sequentially if indicating overhead wires or cables.

Compatibility with non-visual aids

Check 5

5. Where an instrument glidepath is available carry out an instrument approach maintaining the glidepath, or in the case of a radar approach, following ATC instructions. Check that the PAPI indicates 'on-slope' from a range of 7.5 km to close in to the threshold. The ILS glidepath should be near the lower limit of the PAPI 'on-slope' signal if an aeroplane with a small eye-to-aerial height is used. The person inspecting the system should carry a diagram of the installation to facilitate recording any observed deficiencies.

Obstacle check

Check 6

6. Fly sufficiently low from 7.5 km so as to be just within the all-red indication and check that there is clearance from obstacles throughout the horizontal coverage of the beam.

FLIGHT CHECK: PAPI/APAPI **Aerodrome:**.....

Runway designation				Date	Day/Dusk/Night
Effective range (km)				Time GMT	Weather
Colour change: Red-to-White (Level run 1000 ft QFE from 7.5 km)				Aircraft Registration:	W/V Visibility
Intensity balance of individual units (and of Left and Right sides if applicable)				Captain	Cloud Turbulence
Intensity check	100%			NOTES:	
	80%				
	30%				
	10%				
	3%				
	1%				
	< 1%				
Integration with non-visual aids					
Synchronisation L–R (if applicable)					
Obstacle clearance				Inspected by:	
Fitting type					

	L					R			
	1	2	3	4		4	3	2	1
	0	0	0	0		0	0	0	0
	1	1							
	2	2							
	3	3							
	4	4							

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CHAPTER 7

Aerodrome signals, signs and markings

Introduction

7.1 Aerodrome signals, signs and markings provide guidance and information to pilots and assist them in complying with the Rules of the Air Regulations 2008. All signals, signs and markings should be repainted, cleaned or replaced as soon as their conspicuity is degraded.

7.2 Colour specifications for paints can be found in British Standard Specification 381C 'Colours for Specific Purposes'. The individual specifications are 356 Golden Yellow, 557 Light Orange and 537 Signal Red. Colour specifications for signs and surface markings are given at figures 20 and 21; those for reflective materials are prescribed in BS873 Part 6 or its successor.

7.3 Licensed aerodromes should meet the requirements for signals, signs and markings described in this chapter. Such signals as are prescribed by the rules are marked with an asterisk (*) in the following paragraphs, and they are allowed a dimensional tolerance of 10%.

7.4 Any marshalling service provided should comply with rule 62.

Signals

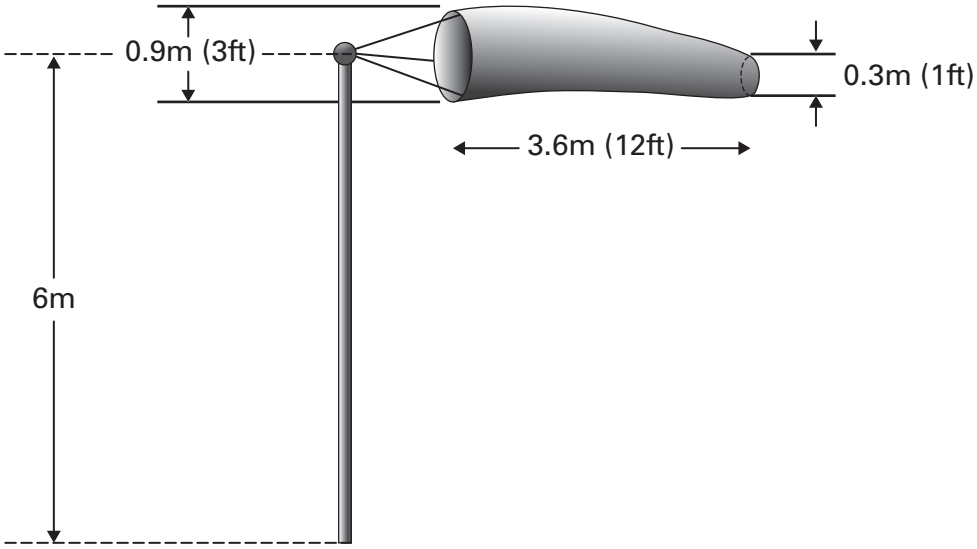
7.5 An aerodrome should display at least one wind sleeve and the signals described in these paragraphs, as appropriate, except that a landing T, signals area, or signals on a signals mast, need not be displayed at an aerodrome which is available only to radio-equipped aircraft at which an ATC or flight information service is available. An aerodrome used extensively by non-radio-equipped aircraft should display the name of the aerodrome in letters at least 3 m high.

7.6 Where appropriate, an aerodrome should have a signal lamp capable of producing white, red and green lights, to make the signals specified in rule 61. Pyrotechnic lights or flares should also be available for the same purpose.

Wind sleeves

7.7 At least one wind sleeve of the following dimensions should be provided at an aerodrome:

Figure 7.1 Wind sleeve dimensions



7.8 Wind sleeves should be coloured so as to give maximum contrast with their background. At aerodromes which accept non-radio aircraft, the location of at least one wind sleeve should be emphasised by a white circular band 7.5 m in diameter and 0.6 m wide around the base of the mast.

7.9 Wind sleeves should be so positioned on the aerodrome as to be visible from the approaches to all runways and be free from the effects of any disturbances caused by nearby objects. They should be sited so that at least one sleeve is visible from each take-off position and so that they meet the requirements in chapter 3 of this publication.

7.10 An illuminated wind sleeve is intended to provide flight crew, at night, both in the air and on the ground with a clear indication of wind speed and direction. Aerodromes licensed for the landing and take-off of aircraft at night should provide at least one illuminated wind sleeve. The illuminated wind sleeve shall be lighted by methods so that it is fit for purpose, ensuring that it is conspicuous by day and by night from the landing and take-off threshold and ensuring that from an observer's standing position on ground level there is no glare at a range of 25 m or more.

7.11 The usefulness of any visual aid is determined largely by its size, conspicuity and location. Given conditions of good atmospheric visibility, the maximum distance at which the information available from an illuminated wind sleeve can be usefully interpreted is 1 km. Thus, in order that a pilot may make use of this information while on approach, the wind sleeve should be sited no farther from the runway threshold than 600 m. Obstacle criteria excluded, the ideal location is 300 m along the runway from the threshold and laterally displaced at 80 m from the runway centreline. This means, in effect, that only those aerodromes where the thresholds are less than 1200 m apart can meet the minimum requirement

with a single unit. Most code 3 and 4 aerodromes will require two or more units suitably sited in order to provide the best possible coverage.

7.12 The final choice of unit numbers and location will depend on a variety of factors which will vary from aerodrome to aerodrome. However, when deciding on the most appropriate location, account should be taken to ensure that the wind sleeve is:

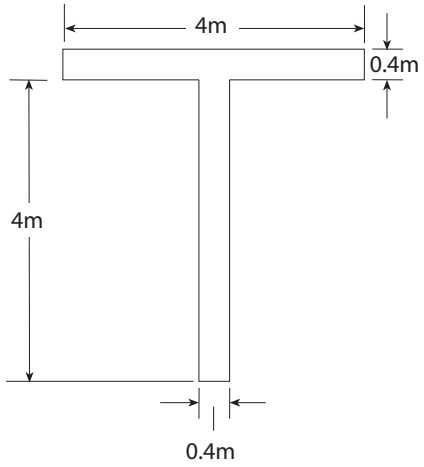
- outside the cleared and graded area of the runways and taxiways and beneath the 1:10 obstacle surface;
- clear of the OFZ and ILS critical/sensitive areas where appropriate;
- preferably not more than 200 m lateral displacement from the runway edge;
- preferably between 300 m and 600 m from the runway threshold measured along the runway;
- in an area with low background levels of illumination;
- visible from the approach and take-off positions of all licensed runways;
- free from the effects of air disturbance caused by nearby objects.

Signals Area

7.13 When required, the signals specified below should be displayed in a signals area. This area should be a square with internal sides measuring 12 m, bordered by a white strip 0.3 m wide and should be visible from the air from all directions. Where appropriate the signals area should be illuminated at night. (See Note 1 to table 6.1.)

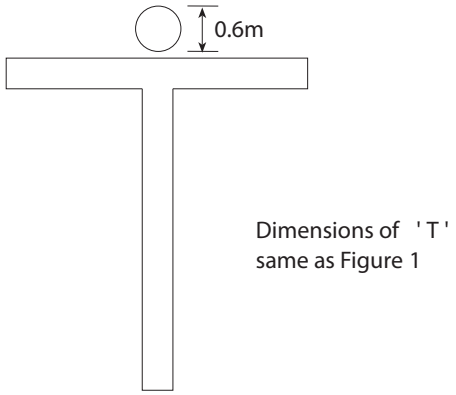
7.14 A white landing T as shown in figure 7.2 signifies that aeroplanes and gliders taking off or landing shall do so in a direction parallel with the shaft of the T and towards the cross arm, unless otherwise authorised by the appropriate air traffic control unit.

Figure 7.2 Landing direction



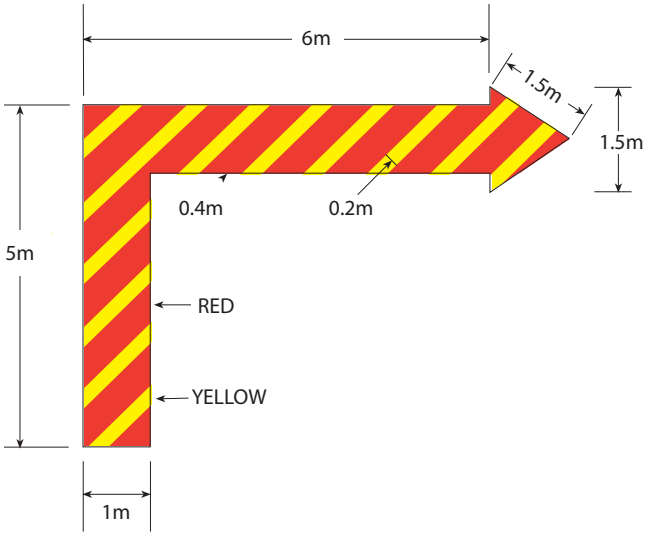
7.15 A white disc as shown in figure 7.3 of 0.6 m diameter displayed alongside the cross arm of the T in line with the shaft of the T signifies that the direction of landing and take-off do not necessarily coincide.

Figure 7.3 Landing/take-off direction



7.16 A red and yellow striped arrow as shown in figure 7.4 the shaft of which is at least 1 m wide placed along the whole or not less than a total of 11 m of two adjacent sides of the signals area and pointing in a clockwise direction signifies that a right-hand circuit is in force.

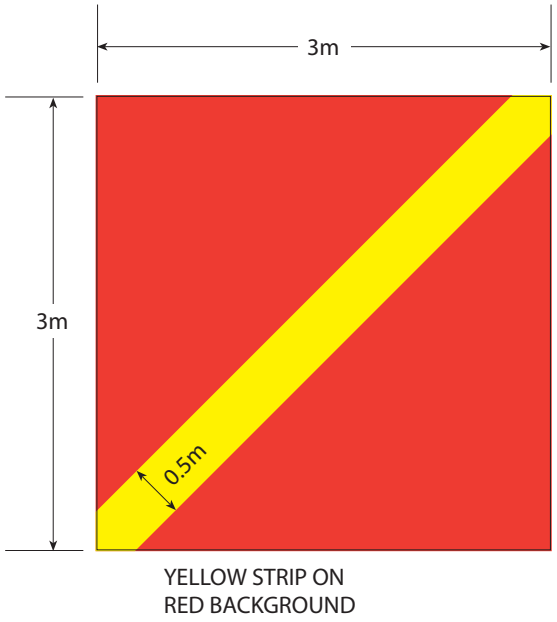
Figure 7.4 Right-hand circuit



7.17 A red panel of 3 m square when displayed in conjunction with yellow diagonal stripes has the following meaning:

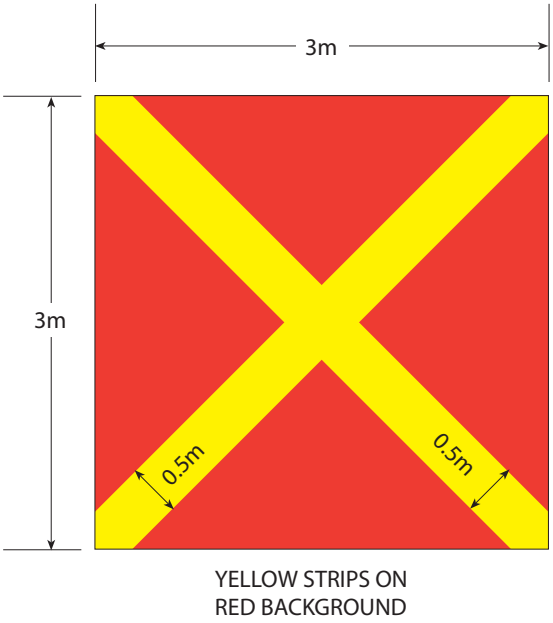
1. a yellow diagonal stripe at least 0.5 m wide as shown in figure 7.5 signifies that the state of the manoeuvring area is poor and pilots must exercise special care when landing.

Figure 7.5 State of nanoeuvring area



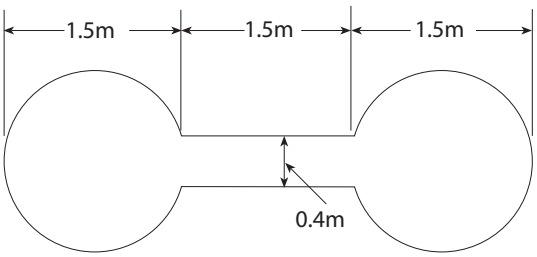
2. yellow stripes at least 0.5 m wide along each diagonal as shown in Figure 7.6 signify that the aerodrome is unsafe for the movement of aircraft and that landing is prohibited.

Figure 7.6 Aerodrome unsafe



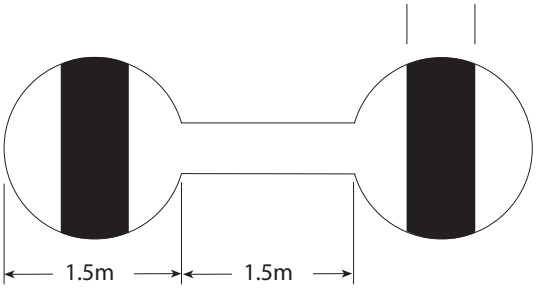
7.18 A white dumb-bell as shown at figure 7.7 signifies that movements of aeroplanes and gliders on the ground shall be confined to paved, metalled or similar hard surfaces.

Figure 7.7 Restricted ground movement



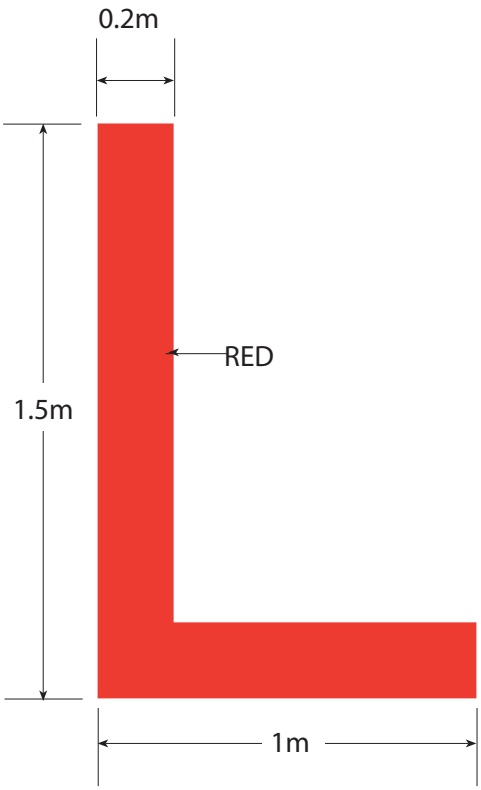
7.19 A black stripe as shown at figure 7.8 of 0.6 m width, placed across each disc of the dumb-bell at right angles to its shaft signifies that aeroplanes and gliders taking off or landing shall do so on a runway but that movement on the ground is not confined to paved, metalled or similar hard surfaces.

Figure 7.8 Unrestricted ground movement



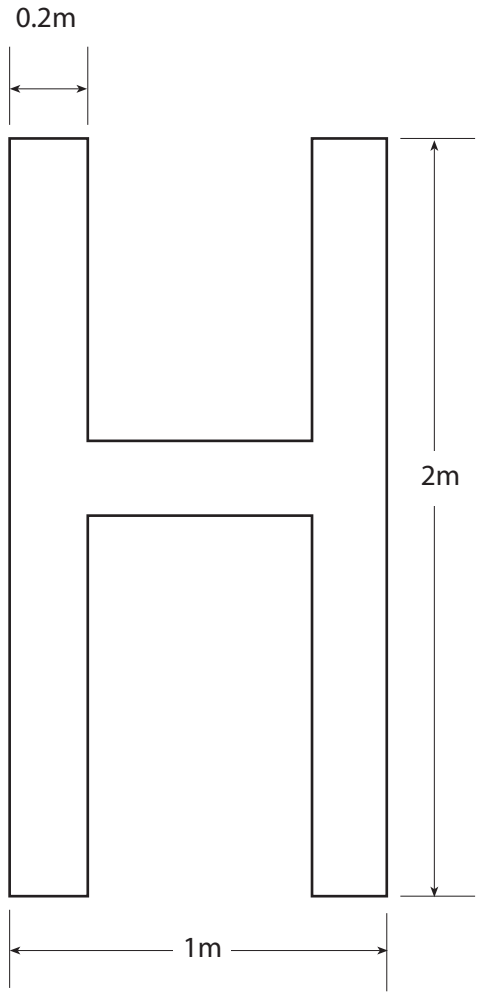
7.20 A red letter L as shown in figure 7.9 displayed on the dumb-bell signifies that light aircraft are permitted to take off and land either on a runway or on the area designated by the marking specified in paragraph 7.118.

Figure 7.9 Designated light aircraft operating area



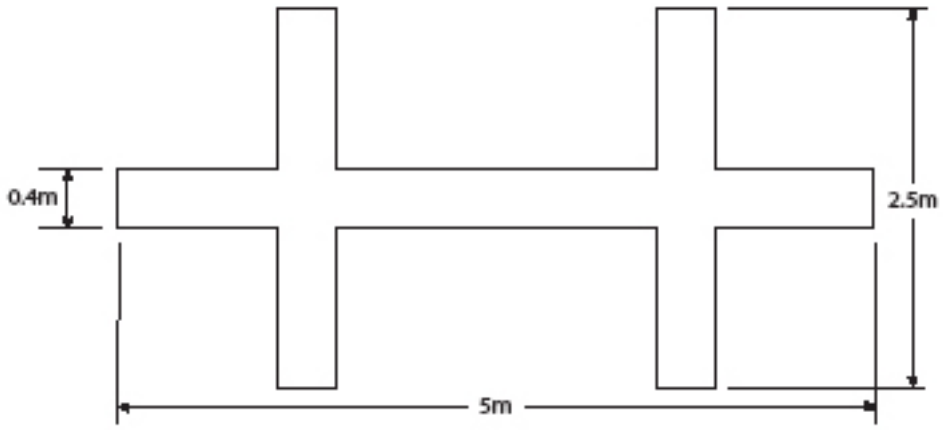
7.21 A white letter H as shown in figure 7.10 signifies that helicopters shall take off and land only within the area designated by the marking specified in paragraph 7.117.

Figure 7.10 Helicopter landing area



7.22 A white double cross as shown at figure 7.11 signifies that glider flying is in progress.

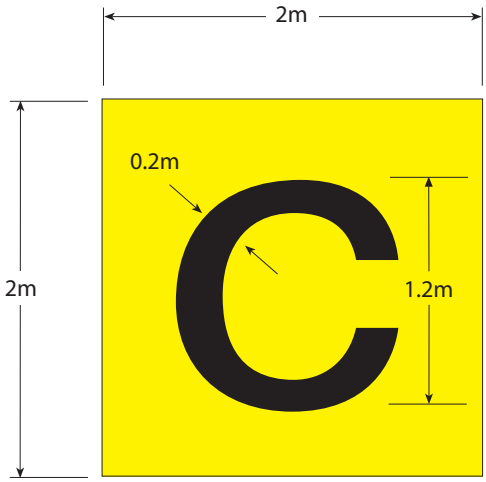
Figure 7.11 Glider flying in progress



Signals visible from the ground

7.23 A black letter C against a yellow background as shown at figure 7.12 indicates the place at which a pilot can report to the air traffic control unit or to the person in charge of the aerodrome.

Figure 7.12 Reporting point



7.24 Black arabic numerals in two-figure groups and, where parallel runways are provided the letter or l L (left), LC (left centre), RC (right centre) and R (right), placed against a yellow background, indicate direction for take-off or the runway in use.

7.25 A checkered flag or board 1.2 m by 0.9 m containing 12 equal squares, 4 horizontally and 3 vertical coloured red and yellow alternately, signifies that aircraft may move on the manoeuvring area and in accordance with the permission of the air traffic control unit at the aerodrome.

7.26 A black ball 0.6 m in diameter suspended from a mast signifies that the directions of take-off and la not necessarily the same.

7.27 Two red balls each 0.6 m in diameter, disposed vertically one above the other, 0.6 m apart and susp from a mast, signify that glider flying is in progress at the aerodrome.

7.28 A rectangular green flag of not less than 0.6 m side flown from a mast indicates that a right-hand c force.

Taxi guidance signs

7.29 Taxi guidance signs are divided into two categories, namely mandatory signs and information sign

7.30 Variable message signs as specified in annex 14 Volume 1 paragraph 5.4 are not currently permitte UK.

Mandatory signs

7.31 The following mandatory signs should be provided on the manoeuvring area of an aerodrome in c identify by a sign any location beyond which an aircraft or vehicle should not proceed unless autho ATC. Mandatory signs display white characters on a red background. Except for the provisions of pa 7.36 , Mandatory signs should not be accompanied by information signs.

7.32 Internally lit mandatory signs should be provided with an alternative power source in accordance w requirements of chapter 6.

Runway taxi-holding position signs

7.33 Runway taxi-holding position signs identify the designated taxi-holding position (as determined in accordance with chapter 3) associated with a particular runway and consist of the runway designat white on a red background as illustrated at figure 7.13. Figure 7.14 Illustrates some typical runway t holding position sign layouts. The number of signs required at each runway taxi-holding position is at paragraph 7.78.

7.34 Where the runway is equipped with ILS, the runway taxi-holding position should be established at of the critical/sensitive area in order to protect the ILS when in use. The signs associated with ILS ru taxi-holding positions should be annotated CAT I, CAT II, CAT III, CAT II/III or CAT I/II/III as appropriat illustrated in figure 7.13 (b), (c), (d) and (e) except that where the non-instrument runway taxi-hold and the CAT I runway taxi-holding position are collocated, the CAT I annotation is not used (see figu 7.13 (a)). Where the ILS runway taxi-holding position is at such a distance from the runway that it w hinder the expeditious flow of traffic in VMC, a non-instrument runway taxi-holding position shoul established closer to the runway as illustrated in figure 7.14 (E), (f) and (g).

7.35 Where a runway is served by more than one taxiway, the runway taxi-holding position sign should accompanied by a taxiway location sign (described at paragraph 7.44) In order to assist in identifyi holding position, as illustrated at figure 7.14 (B), (c) and (d). The taxiway location sign should be po outboard of the runway taxi-holding position sign.

Figure 7.13 Examples of mandatory signs for aircraft surface movements

(a) Visual runway taxi-holding position sign Denotes the visual taxi-holding position and also the ILS CAT I holding position where the visual and CAT I holding positions are co-located.	(i)	
	(ii)	
(b) Cat I runway taxi-holding position sign Denotes the ILS CAT I taxi-holding position only where a visual taxi-holding position is established closer to the runway in order to expidite traffic flow.	(i)	
	(ii)	
(c) CAT II runway taxi-holding position sign Marks the ILS CAT II taxi-holding position - a visual taxi-holding position may be established closer to the runway where it is necessary to expidite traffic flow.	(i)	
	(ii)	
(d) CAT III runway taxi-holding position sign Marks the ILS CAT III taxi-holding position - a CAT II taxi-holding position and a visual taxi-holding position may be established closer to the runway where it is necessary to expidite traffic flow.	(i)	
	(ii)	
(e) Combined runway taxi-holding position sign Marks the taxi-holding position where the ILS CAT I holding positions are co-incident. A visual taxi-holding position sign may be established closer to the runway where it is necessary to expidite traffic flow.	(i)	
	(i)	
	(ii)	
(f) Intermediat taxi-holding position sign Marks a holding position established to protect a priority route.		
(h) No entry sign		

Note:

1. The signs at (i) should be used where the taxiway is in the vicinity of one extremity of a runway and the taxiway normally serves only the runway direction concerned. The signs at (ii) should be used where the taxiway normally serves both runway directions.
2. Where a runway taxi-holding position serves more than one runway, the sign layout at figure 7.18 should be used.
3. Sign dimensions are give in appendix 7A.
4. Mandatory signs may also be provided as markingsif required

Figure 7.14 Typical runway taxi-holding position signs and associated taxiway marking

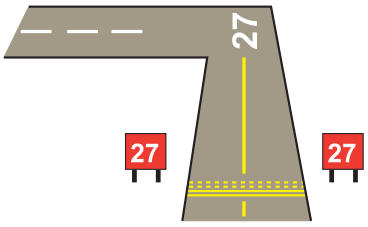


Fig 7.14 (a)

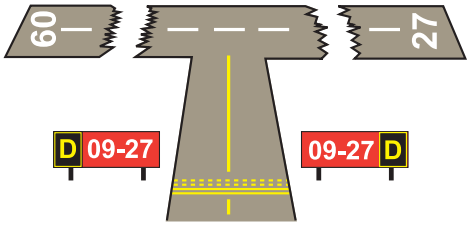


Fig 7.14 (b)

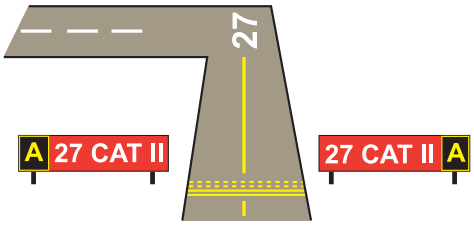


Fig 7.14 (c)

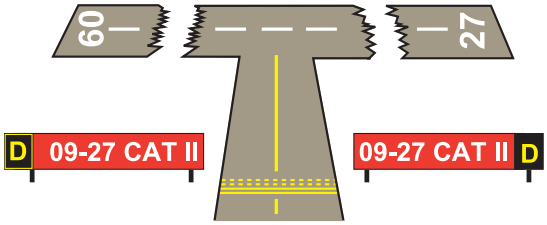


Fig 7.14 (d)

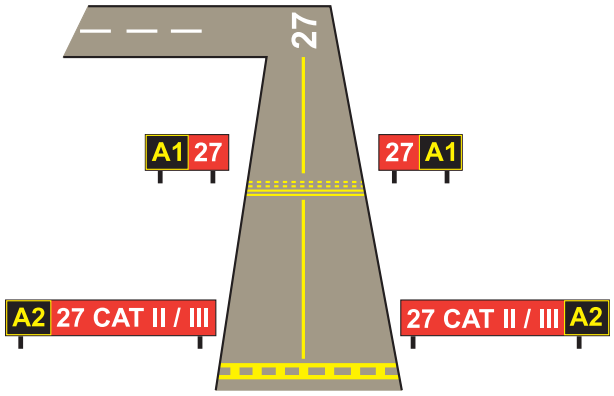


Fig 7.14 (e)

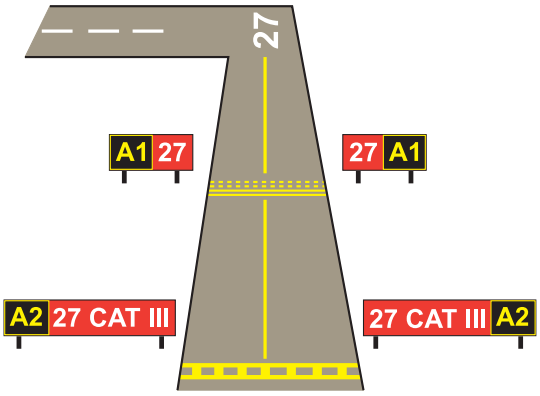


Fig 7.14 (f)

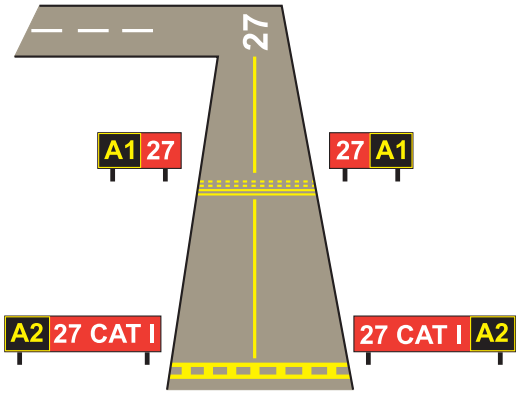


Fig 7.14 (g)

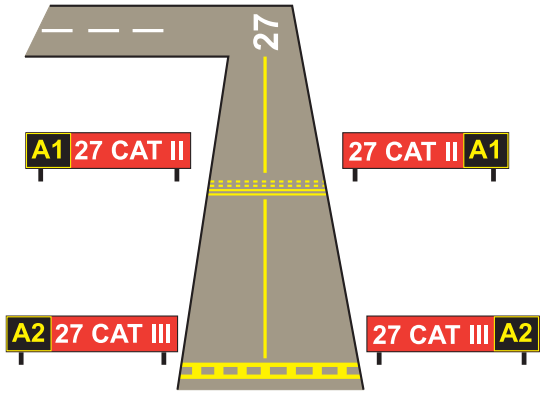


Fig 7.14 (h)

The diagrams illustrate typical signs associated with various runway taxi-holding positions on taxiway 'A' leading to the threshold of runway 27 and on taxiway 'D' leading to an intermediate taxiway entrance to runway 09-27.

Note 1: The signs at intermediate taxiway entrances as shown at figures 7.14 (b) and (d) above are handed to show a left turn is required to reach the threshold of runway 09 and a right turn to reach the threshold of runway 27.

Note 2: At grass aerodromes the runway taxi-holding position sign, which marks that point beyond which aircraft should not proceed without the approval of ATC, should be sited no closer to the runway centreline than the distances specified in table 3.3.

Intermediate taxi-holding position signs

7.38 Where it is considered necessary to locate taxi-holding positions other than at runway/taxiway intersections – for example at taxiway/taxiway intersections in order to protect a priority route – the holding position should be identified by a single sign located wherever practicable on the left side of the taxiway. The sign consists of a combination of the letter designating the taxiway and a number identifying the hold position e.g. A1, A2, B2 etc. in white on a red background. An example of an intermediate taxi-holding position sign is shown at figure 7.13 (F).

No entry signs

7.39 Where part of an aerodrome is restricted to one-way traffic or is withdrawn from use, no entry signs, as illustrated at figure 7.13 (g), should be located on both sides of the mouth of the area showing in the direction from which entry is prohibited.

Information signs

7.40 The following information signs should be provided where there is an operational need to provide additional guidance to pilots manoeuvring aircraft on the ground.

Taxiway location signs

7.41 Taxiway location signs should be used to identify individual taxiways.

7.42 All in-use taxiways should be designated by a letter of the alphabet - alpha, bravo, charlie, etc. - However, the letters oscar, india and x-ray are not used. As far as possible the allocation of designation letters should follow a logical pattern eliminating the possibility for confusion. Where there are more taxiways than letters of the alphabet, double letters should be used to designate short taxiway stubs between a runway and parallel taxiway or between a taxiway and adjacent apron. An example of a taxiway layout is shown at figure 7.15.

7.43 Taxiway Location Signs bear the taxiway designation letter in yellow on a black background surrounded by a yellow border, as illustrated at Figure 7.16 (a)(i).

7.44 Taxiway location signs should be positioned at the approach to a taxiway intersection.

7.45 At a complicated intersection, taxiway location signs should also be located at each exit from the intersection in order to provide confirmation that the correct route is being followed. They may also be placed at intermediate positions along a very long taxiway. Examples of the layout of taxiway location signs at different types of intersection are shown at figure 7.17.

7.46 Where a taxiway location sign is collocated with a runway taxi-holding position sign, as described at paragraph 7.36, The character identifying the taxiway should be accompanied by an arabic numeral as illustrated at figures 7.14 (e), (f), (g) and (h) and 7.16 (a) (ii) in order to identify individual taxi-holding positions.

Taxiway ending sign

7.47 Where a taxiway ends at an intersection other than an intersection with a runway, a yellow diagonal marker is overlaid on the appropriate taxiway location sign as shown in figure 7.16 (G).

Figure 7.15 Example: designating taxiway

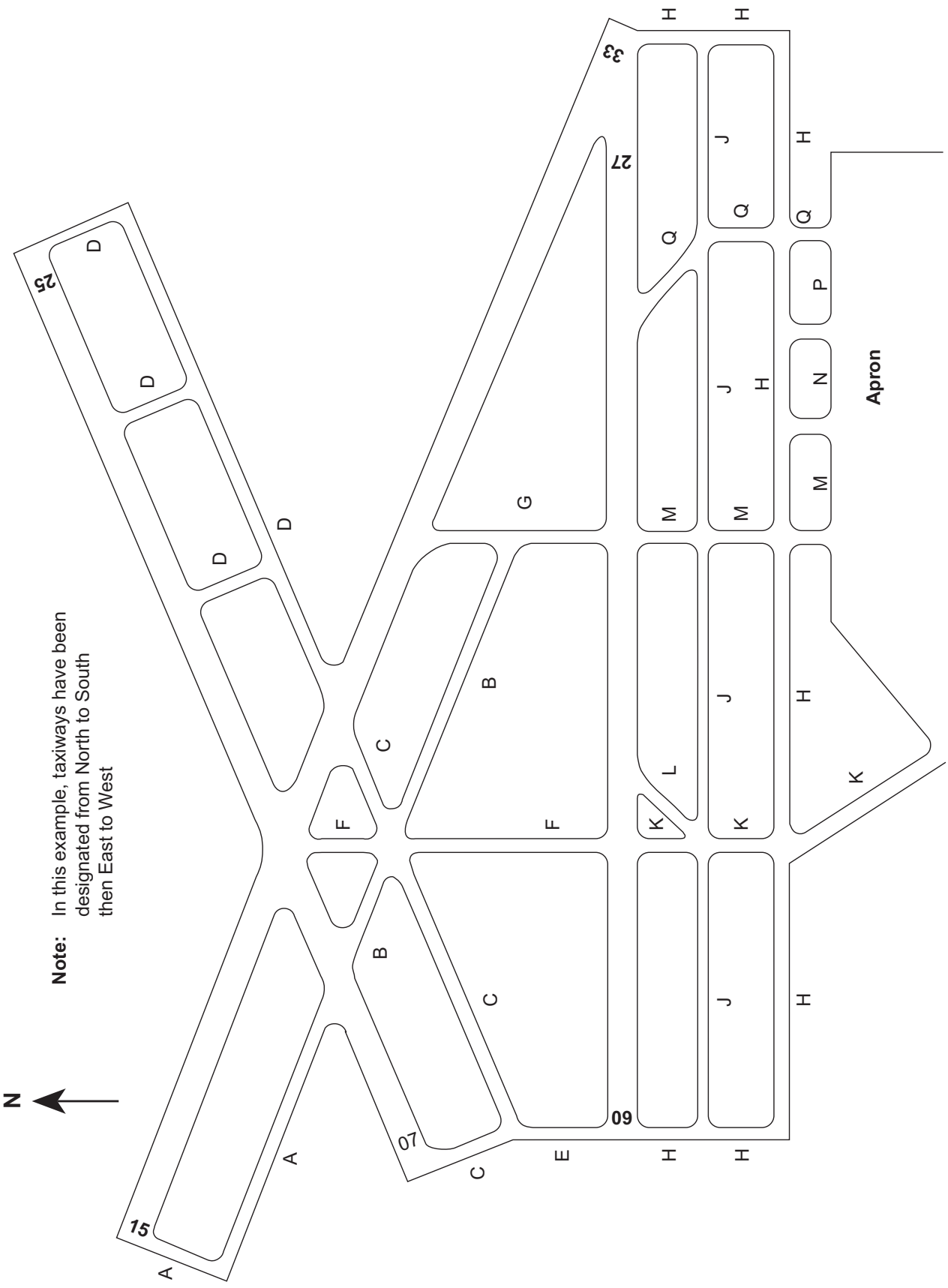


Figure 7.16 Examples of information signs

Runway location sign

7.48 Where runways intersect and the possibility of confusion could arise, runway location signs should be placed at the edge of a runway as shown in figure 7.19. These signs stand independently of other signs and bear the runway designation in yellow on a black background surrounded by a yellow border as shown at figure 7.16 (B).

Runway vacated sign

7.49 Where it is considered necessary for pilots to report runway vacated, a taxiway location sign as illustrated at figure 7.16 (a) should be used to indicate to the pilot the position at which the report should be made. The sign would normally be located on the reverse side of ILS runway taxi-holding position sign or at the edge of the cleared and graded area for non-instrument runways, and correspond in designation with the taxiway location sign identifying the runway taxi-holding position.

Direction signs

7.50 Direction signs located at the approach to a taxiway intersection indicate the direction of taxiways leading out of that intersection. These signs bear the letter designating each taxiway leading out of the intersection along with an arrow oriented to illustrate the direction and degree of the turn. The designation letter and the arrow are black on a yellow background as shown at figure 7.16 (c). Direction signs should be accompanied by a taxiway location sign. However, an individual direction sign may be located adjacent to a runway edge in order to indicate a particular runway exit point. Examples of the layout of signs at taxiway intersections are shown at figure 7.18.

Destination signs

7.51 Destination signs such as those illustrated at figure 7.16 (d), (e) and (f) should be used where it is determined that the combination of location and direction signs would not provide adequate guidance to a destination. Destination signs should not be accompanied by location or direction signs. Common abbreviations used for inbound destinations are:

- APRON general parking, servicing and loading areas
- GEN AV general aviation
- STANDS aircraft stands
- FUEL areas where aircraft are fuelled or serviced
- TERM gate positions at which aircraft are loaded or unloaded
- CIVIL areas set aside for civil aircraft
- MIL areas set aside for military aircraft
- PAX areas set aside for passenger handling
- CARGO areas set aside for cargo handling
- INTL areas set aside for handling international flights
- HELI helicopter parking

Apron signs

7.52 Stand identification signs (also known as stand number indicator boards) should be provided where practicable, to identify the aircraft parking stand from the taxiway centreline. Such signs should be clearly visible from the cockpit of an aircraft prior to entering the aircraft stand.

Character size, spacing and style

7.53 The character size to be used for letters and numbers is determined by the type of operation that the sign is intended to support and is prescribed at table 7.1. Where a taxiway location sign is located jointly with a mandatory sign, as described at paragraph 7.35, the character size shall be that of the mandatory sign and where an information sign contains 10 or more characters, 0.2 m characters may be used in the manner illustrated at appendix 7a, figure 7a.9.

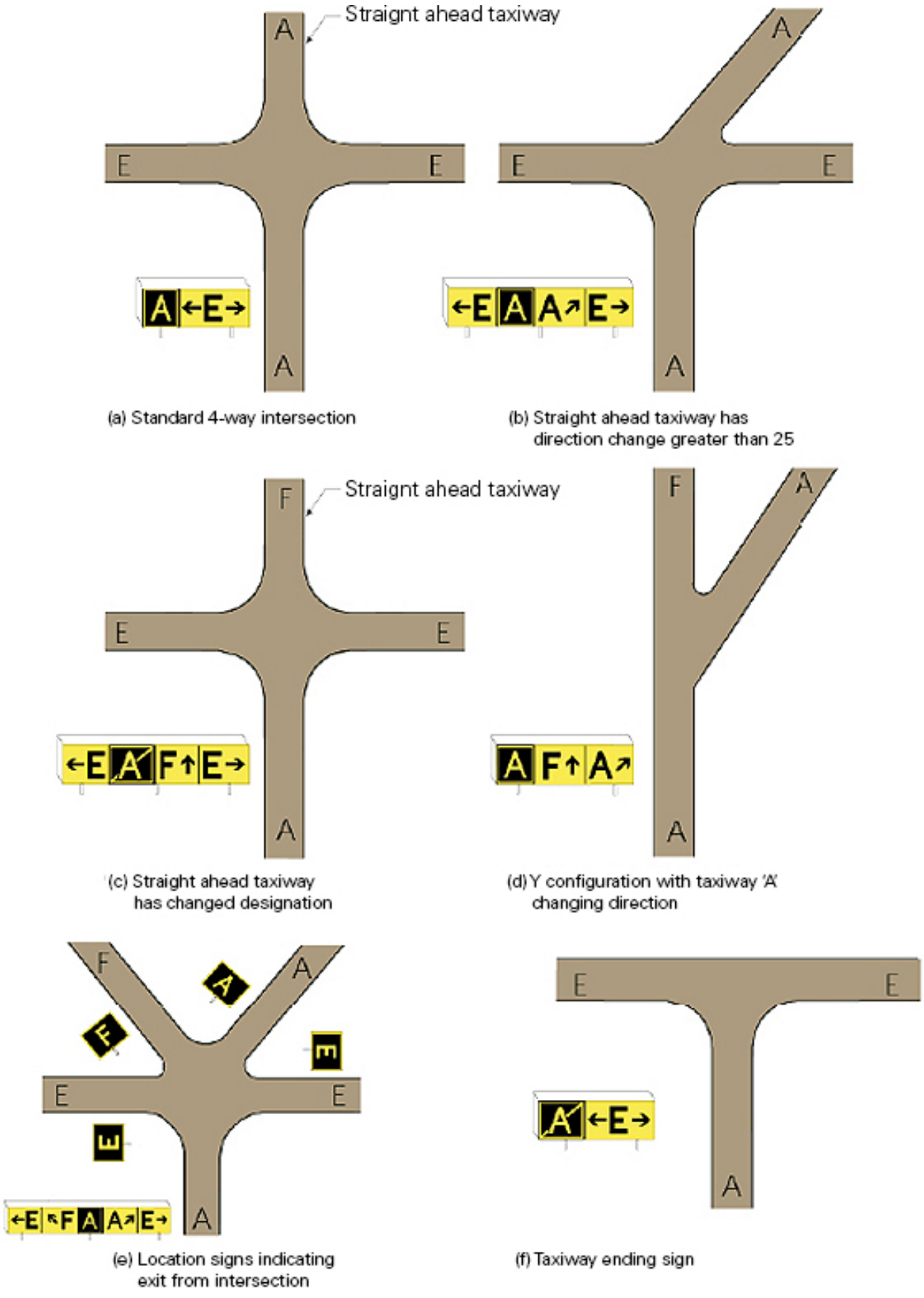
7.54 Where the conspicuity of the inscription on a mandatory instruction sign needs to be enhanced, the outside edge of the white inscription may be supplemented by a black outline. The black outline should be 10 mm in width for runway code letters 1 and 2, and 20 mm in width for runway code letters 3 and 4, as shown in figure 7.17.

Figure 7.17 Enhanced mandatory instruction sign

Example of sign face

Example of unlighted sign face

Figure 7.18 Examples of taxi guidance signs at taxiway intersections

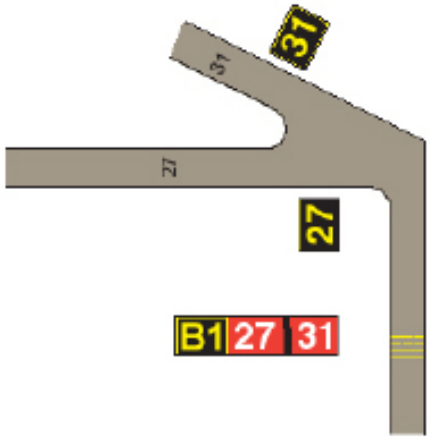


Notes:

1. Signs are laid out as shown above, i.e. From left to right in a clockwise manner. Left turn signs are on the left of the taxiway location sign, right turn signs on the right, except in situations corresponding to (a) and (f) above where the double arrow direction sign is inboard of the taxiway location sign. Adjacent signs are separated by a black vertical delineator.
2. Double arrow direction signs are used only at simple intersections such as those illustrated at figure (a) and (f) above.

Figure 7.19 Examples of use of runway location signs and signs at runway taxi-holding positions serving more than one runway

(a) Taxiway entrance at intersection to two runways



(b) Taxiway entrance at intersection of two runway ends

Notes:

1. Taxi-holding position signs installed at intersections such as those illustrated above are used in the manner shown.
2. Runway location signs for runways 31 and 13 are positioned in this example on the right side of the runway in order to avoid confusion.

Table 7.1 Signs character size

Operations conducted in RVR of	Character size			
	Mandatory signs		Information signs	
	Height mm	Stroke width mm	Height mm	Stroke width mm
800 m or more	300	48	200	32
< 800 m	400	64	300	48

7.55 The character size to be used for other characters is as follows:

1. DOTS – Where a dot is employed on a sign such as that illustrated in figure 7.16 (e), the diameter of the dot shall be equal to the stroke width of the other characters employed, as illustrated in appendix 7A, figure 7A.6.
2. HYPHENS – Where a hyphen is employed on a sign such as that illustrated at figure 7.13 (a), (b), (c), (d) and (e) it shall have the same stroke width as the other characters employed but the length shall be equal to 1/3 of the height of the other characters, as illustrated in appendix 7A, figure 7A.6.
3. ARROWS – Where an arrow is employed on a direction or destination sign, it shall have the same stroke width and height of the other characters employed. The style and proportions of the arrow shall conform to the detail in appendix 7A, figure 7.A.6.
4. DIAGONAL LINES
   a) Where diagonal lines are used to separate symbols such as cat II/III they shall be of the same stroke width and height as other characters used. Overall size and proportions are shown at appendix 7A, figure 7A.6.
   b) Where diagonal lines are used on taxiway ending signs, as illustrated at figure 7.16 (g), the stroke width of the diagonal shall be equal to 3/4 of the stroke width of the character. The size of the break between the diagonal and the character should be approximately 1/2 the character stroke width.

7.56 The space between individual characters making up a sign shall be determined as outlined at appendix 7A, table 7A–1.

7.57 The style and proportions of characters used shall be those given at appendix 7A.

7.58 Roman numerals as illustrated at appendix 7A, figure 7A.6 shall be used on category I, II and III signs.

Face size

7.59 The face size of taxi guidance signs shall conform to the proportions and layout as illustrated at appendix 7A, figure 7A.1.

Borders and delineators

7.60 Signs having a black background shall be provided with a yellow border, as shown in figure 7.16 (a), (b) and (g), equal in width to 1/2 of the character stroke employed. Otherwise no provision is made for borders. The yellow border shall be included in the overall dimensions of the face size described at paragraph 7.60.

7.61 Where signs of the same background colour are joined together (or where a sign with a yellow border adjoins a sign with a yellow background) the signs shall be separated by a black vertical delineator as illustrated in figures 7.18 and 7.19. The black vertical delineator separating adjoining signs shall have a width of three quarters of the width of the character stroke employed, but shall not reduce the overall visible face size.

Illumination of signs

7.62 The minimum levels of average luminance for lit signs used in support of operations conducted in RVR less than 800 m day or night are listed at table 7.2. Facility should be provided to increase these levels by a factor of up to 2 where a sign is located in an area where the background luminance at night exceeds 200 cd/m^2. The method of calculating average sign luminance is described at paragraph 7.74.

7.63 All signs (including yellow borders required by paragraph 7.61) used in support of operations in RVR less than 800 m day or night should be internally lit, except that where only departures take place in such conditions or where aircraft movements are restricted to one at a time in the manner prescribed in chapter 6, signs may be externally lit in the manner prescribed in paragraph 6.8.

7.64 Signs used in support of operations in RVR of 800 m or greater at night should be illuminated as follows:

1. Where operations are conducted in RVR 800–1500 m at night, signs may be either internally or externally lit. Where signs are externally lit they should be provided with a dedicated source of light which conforms to the following requirements:

    a) only white light shall be used and the light source shall be shielded so as to avoid dazzle or glare to pilots using adjacent areas;

    b) the light source shall be so positioned that it provides an even distribution of light over the whole sign face without any unwanted reflection of the light source;

    c) the light source, including any shielding and support equipment, shall be so positioned that no part of the face of the sign is obscured from the view of those for whom the sign is intended.

2. Where operations are conducted at night but only when the visibility is 1500 m or greater, signs need not be provided with a dedicated source of

light provided that the sign face is manufactured from materials that conform to the colour code prescribed in this section for Taxi Guidance Signs and have photometric qualities equal to or better than those prescribed at BS873 Part 6 table 1. The chromaticity co-ordinates for such materials are prescribed at BS873 Part 6 table 4.

Table 7.2 Minimum average sign luminance
(signs used in support of operation rvr less than 800 m)

Colour	Luminance cd/m^2
Red	30
Yellow	150
White	300
Green	45

Notes:

1. The method of calculating average sign luminance is described at Figure 7.22. The Red luminance value should be between 10% and 20% of that of the White.
2. The average luminance level should not exceed three times the minimum average.

7.65 The colour specification for signs is prescribed at Figure 7.20 (internally lit) and Figure 7.21 (externally lit).

Figure 7.20 Colours of luminescent or transilluminated (internally illuminated) signs and panels

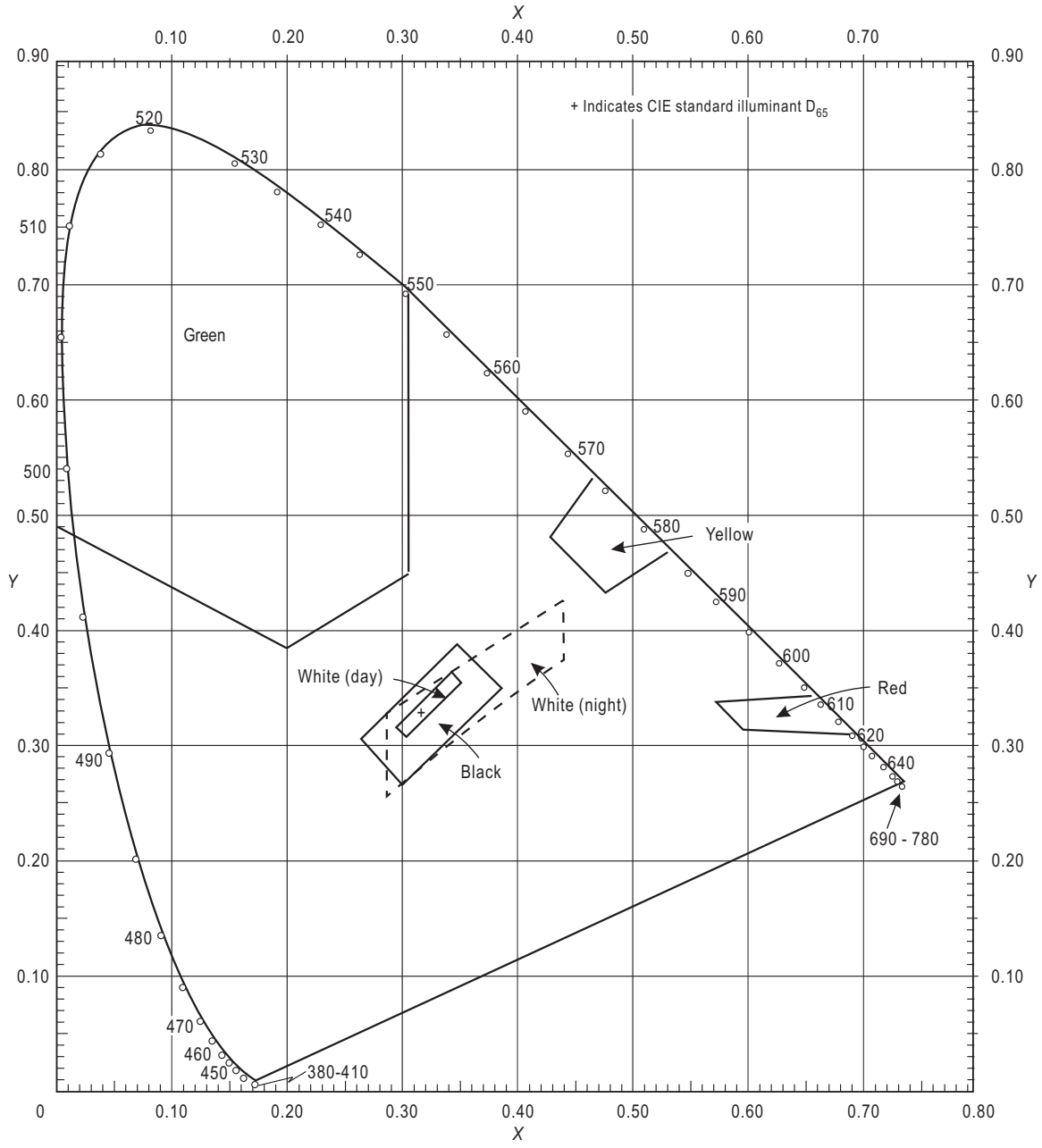
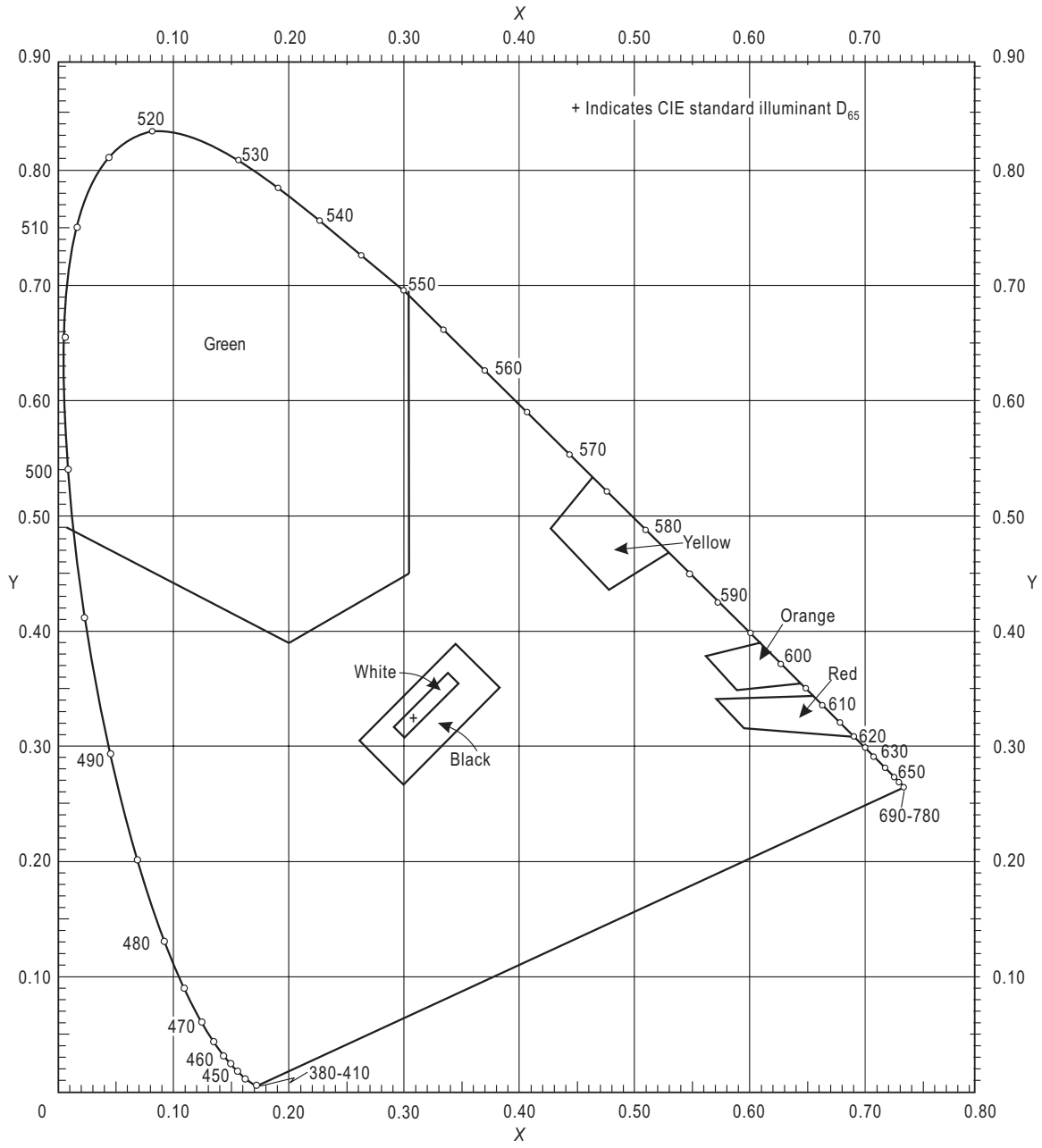


Figure 7.21 Colours for surface markings and externally lit signs



7.66 All lighted signs shall be equipped with a suitable disconnect plug so designed as to ensure that in the event that the sign is torn from its base, the power source is safely isolated.

7.67 Power for the illumination of internally-lit signs may be provided from adjacent constant current series circuits if the required electrical capacity is available. This type of installation may provide the selection of different luminous intensity settings; however, care must be taken to ensure that the signs are lit at all required times of operation. In this case, the luminous intensity settings should correspond to that of taxiway centreline and stop-bars as indicated in chapter 6 tables 6.3 and 6.4. Care should also be taken to ensure that the constant current power supply is not adversely affected by the additional (and electrically different) load created by signage and that the illumination requirements are met.

Construction

7.68 Taxi guidance signs shall be frangible but nevertheless capable of withstanding wind loads of up to 60 m/sec (a suitable means of test is described at BS 3224 Part 1 paragraph 5.3.2) without sustaining damage. Where a sign or series of collocated signs is so constructed that part of the supporting or retaining structure appears as a frame surrounding the face, the size of the sign should be adjusted where necessary in order to ensure that the frame does not cover any part of the face and that the requirements of paragraph 7.61 are met. Signs constructed in this manner should not display a frame to the face of the sign greater than 45 mm in width; the colour of this frame should be black.

7.69 Where a number of signs are collocated, for example at a taxiway intersection or at a taxi-holding position, the signs should be secured in a single common structure with black vertical delineators outlining the extent of each sign as described at paragraph 7.62.

7.70 Where individual signs are made up of adjoining single character plates held together in a common frame, care must be taken to ensure that the method of construction does not lead to degradation of legibility at night either by light leakage between adjacent plates or by blanking caused by the location of frame members designed to hold the plates in place. Upright frame members designed to secure single character plates on the same sign should, where visible on the sign face, display the same colour as the sign background. Signs constructed in this manner must conform to the character spacing requirements at paragraph 7.56.

7.71 Except where signs are mounted back to back, the rear of a sign constructed in the form of a box should comply with the requirements in chapter 4 and for marking fixed obstacles. Normally a single conspicuous colour, preferably orange or yellow, will suffice.

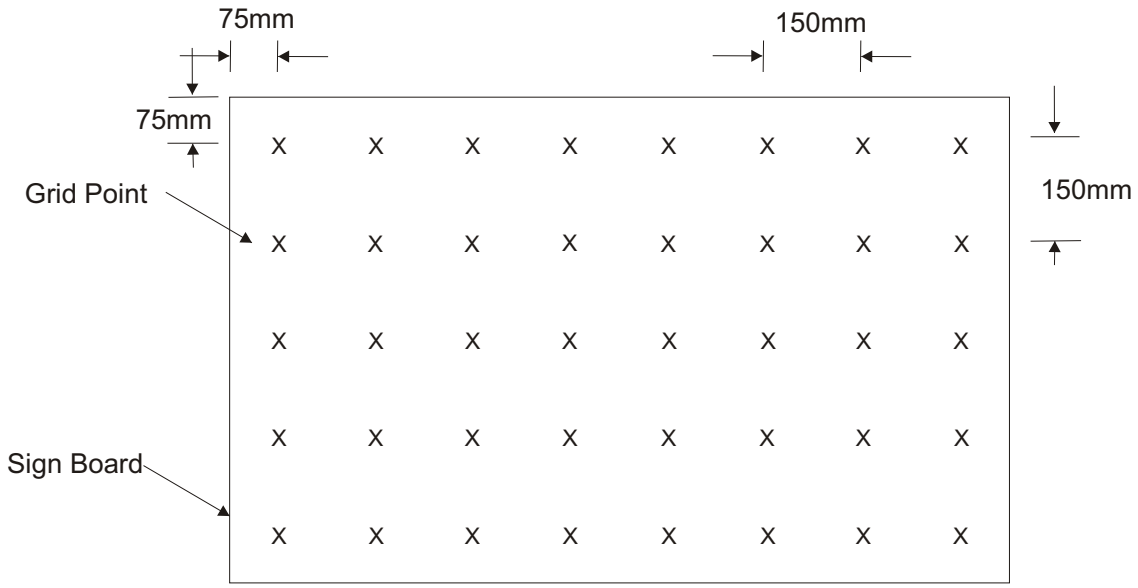
7.72 Sign faces should be made of materials that can withstand sustained temperatures within the range –40 to +55 degrees celsius, relative humidity

from 10 to 90% and altitudes of up to 2000 m without detriment to performance or durability. The material chosen should not be capable of reflecting external light to the extent that the readability of the sign is adversely affected.

7.73 In order to determine conformance with the requirements of paragraphs 7.63 to 7.68, the average luminance of a sign should be calculated in the following manner:

1. Starting at the top left corner of the sign face establish a reference grid point at 75 mm from both the left edge and the top of the sign face.
2. Construct a grid pattern as illustrated in figure 7.22 based on the reference grid point established at paragraph 7.73 1., ensuring that the rows of grid points are correctly aligned parallel to both the top and left edge of the sign face. Where the edge of the sign is between 225 mm and 150 mm away from the last grid point, add a further row and/or column 75 mm away from the edge of the 150 mm grid.
3. Measure the luminance levels at each grid point established in paragraphs 7.73 1 and 2, ensuring that the area used for each individual measurement does not exceed that prescribed by a circle of diameter 30 mm centred on the grid point.
4. For mandatory signs and taxiway location signs, the luminance value of the character should be measured at a minimum of 5 well-spaced points within each character and these values used to compute the average luminance for white or yellow characters.
5. In calculating average luminance and inspecting for uniformity, the luminance value measured on any character should be deleted from the calculation. Grid points within 75 mm of the edge of the sign should be excluded from the calculation. The ratio between points 75 mm apart should not exceed 1.25 to 1. In order to achieve uniformity of signal, the luminance value should not exceed a ratio of 1.5 to 1 between adjacent grid points and 5 to 1 between the maximum and minimum values over the whole face.
6. Measurements made for compliance with the sign colour specifications should be made at the same grid points and over the same areas as specified at paragraph 7.73, sub-paragraphs 1 to 3.
7. Where a curved-faced sign is submitted for evaluation the surface should be assumed to be flat and the grid formatted in the same manner described above.

Figure 7.22 Means of calculating average luminance of a sign



7.74 Throughout the test, the intended lamp type and power supply shall be used. Where different lamp types are available, each option shall be tested. Similarly, where different power supply options are available, the sign shall be tested with each power supply type. The provision of power for the test shall take into consideration the power factor and loading that may be typically encountered at an aerodrome installation. Any combination of lamp and power supply type for a sign that fails to conform to the illumination requirements shall be reported to the CAA and not be used at a licensed aerodrome.

7.75 Where two or more modules are housed in a single sign box, each module should be evaluated as a separate sign face. The ratio between the average luminance level of modules of the same colour and type should not exceed 1.5 to 1.

Siting

7.76 Taxi guidance signs should be sited so as to comply with the criteria laid down in chapter 3 . They should normally be positioned at right angles to the runway or taxiway centreline but may be toed-in where appropriate in order to provide for maximum legibility e.g. where signs are located on or close to a bend in the taxiway.

7.77 Runway taxi-holding position signs installed in support of operations in RVR less than 1500 m should be sited on both sides of the taxiway as illustrated in figure 7.14. Where a runway is used only in visibility conditions of 1500 m or greater the Runway taxi-holding position may be identified by a single Runway taxi-holding position sign located wherever practicable on the left side of the taxiway.

7.78 Mandatory signs should be located in line with the surface marking used to define the associated Holding Position described in this chapter.

7.79 Information signs should be located, whenever practicable, on the left side of a taxiway or runway and so positioned as to give adequate time for a pilot to make use of the information provided.

Markings

General

7.80 Markings provide perspective information, alignment guidance, location, and runway and threshold identification.

7.81 Markings shall be white for runways and yellow for taxiways. Black outlining (at least 150 mm in width) should be provided where there is insufficient background contrast. Colour specifications for paved surface markings are detailed at Figure 7.21.

7.82 All markings on paved runways should have friction values not less than the friction assessment Minimum friction level for the surrounding runway. Markings on aprons and taxiways should be made with materials having similar wet friction qualities to those of the surrounding paved surfaces.

Markings on paved runways

7.83 Centreline marking should be provided on all paved runways and consists of lines 30 m apart throughout the length of the runway. At runway intersections, the marking of the major runway should be continued and that of the subsidiary runway should be interrupted. The dimensions of the marking are shown at table 7.3.

Table 7.3 Runway centreline and threshold markings – dimensions

	Runway C/L marking			Threshold marking								
Runway width m	Length of and distance between each mark m	Width m		Number of stripes		Length of stripes m	Width of and distance between stripes m		Width of centre gap m		Character height m	
						W	X		Y		Z	
		P	NP	P	NP		P	NP	P	NP	P	NP
45	30	0.9	0.45	12	6	30	1.8	1.8	3.6	22.5	15	15
30	30	0.9	0.45	8	6	30	1.8	0.9	3.6	20.0	15	12
23	30	0.45	0.3	6	6	24	1.8	0.6	3.6	16.0	12	9
18	30	0.45	0.3	4	4	24	1.8	0.3	3.6	15.0	12	9

P = Precision Instrument approach runway

NP = Non-Precision instrument approach runway

7.84 Runway edge markings should be provided on all precision instrument approach runways and also on those other paved runways where there is insufficient contrast between the runway and the shoulders. Edge marking should also be provided where the declared or available runway width is less than the apparent total width e.g. the central 30 m of a 45 m runway and where runway edge lighting lies outside the declared width of the runway. Runway edge marking should consist of two parallel lines, one placed along each edge of the runway with the outer edge of each line marking the declared edge of the runway. The lines should be 0.9 m wide where the runway is 30 m or more in width and 0.45 m wide on narrower runways. Edge markings should be interrupted at runway intersections. Where edge lights are located along the extremity of the declared runway width, the edge marking may be located inboard of the edge lights in order to avoid painting light fittings.

7.85 A runway designator comprising a two-figure group showing the magnetic heading to the nearest whole ten degrees, should be located at each threshold. In the case of parallel runways, a white letter (L – Left or R – Right) is added to the designator. The dimensions and patterns are shown at appendix 7B, figures 7B.1 and 7B.2. Examples of layout are shown at figure 7.23.

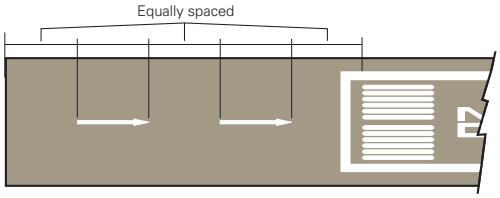
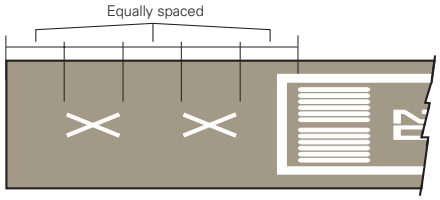
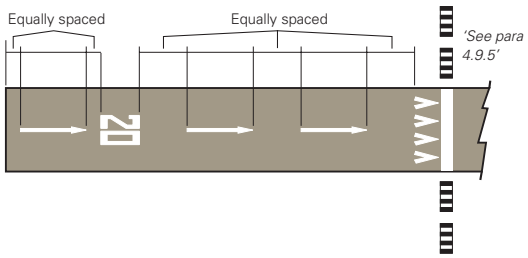
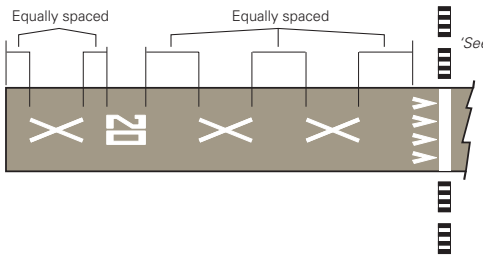
7.86 Runway threshold markings should be provided according to the status of the runway, as shown at figure 7.23. The dimensions of threshold markings are given in table 7.3.

7.87 Aiming Point (AP) and Touchdown Zone (TDZ) markings conforming to those illustrated at figure 7.24 and located at the positions detailed in figure 7.25 should be provided on all precision instrument approach runways and on those other runways where additional conspicuity of the touchdown zone is desirable. An Aiming Point marking should be provided on paved non-instrument runways where there is no visual approach slope guidance.

7.88 A temporarily displaced threshold should be marked as illustrated in figure 7.23.

7.89 Where a starter extension does not extend to the full length of the available pavement, the starter extension marking, as illustrated in figure 7.23(e) may be used.

Figure 7.23(a) Paved runway threshold markings

Type of threshold	Precision instrument approach runways
1	
2(i)	
2(ii)	
2(iii)	
3(i)	
3(ii)	

Key:

1 Not displaced.

2 Permanently displaced or temporarily displaced for more than six months.

(i) Pre-threshold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft and unsuitable as stopway.

(iii) Pre-threshold area of runway fit for use by aircraft as a stopway, but not for normal movement of aircraft.

3 Temporarily displaced for six months or less. (Runway designator is NOT moved.)

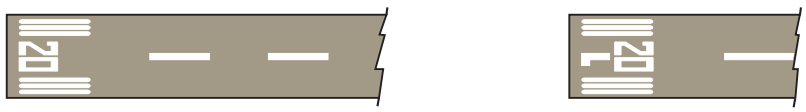
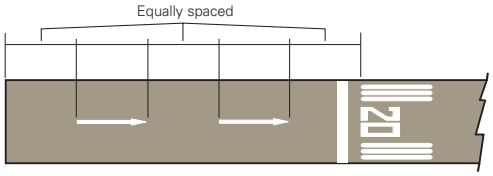
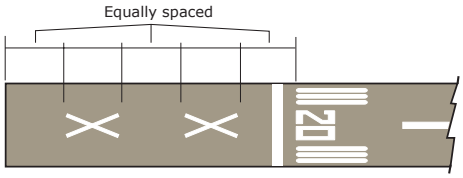
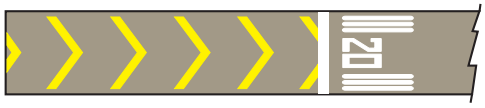
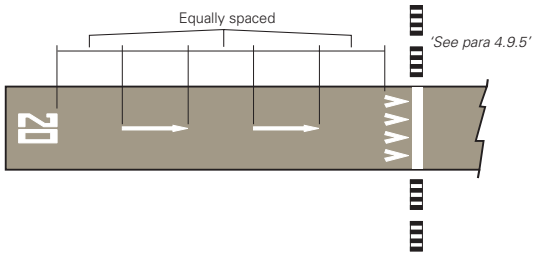
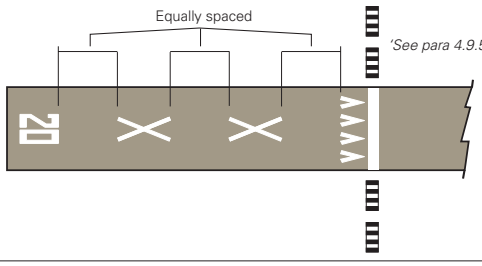
(i) Pre-threhold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft.

Note:

1 Overall dimensions are given at figure7.23(d).

Figure 7.23(b) Paved runway threshold markings

Type of threshold	Non-precision instrument approach runways, non-instrument runways where the LDA is 1200M or greater and where thresholds require emphasis
1	
2(i)	
2(ii)	
2(iii)	
3(i)	
3(ii)	

Key:

1 Not displaced.

2 Permanently displaced or temporarily displaced for more than six months.

(i) Pre-threshold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft and unsuitable as stopway.

(iii) Pre-threshold area of runway fit for use by aircraft as a stopway, but not for normal movement of aircraft.

3 Temporarily displaced for six months or less. (Runway designator is NOT moved.)

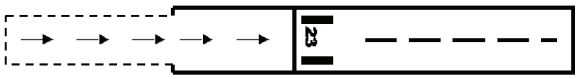
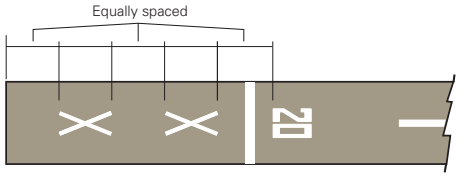
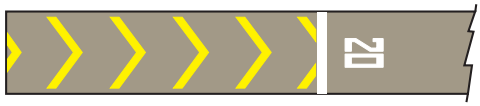
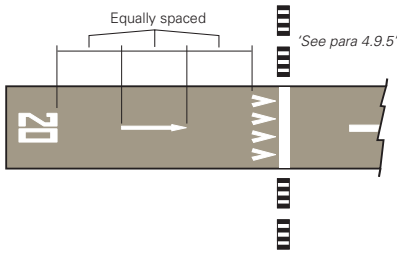
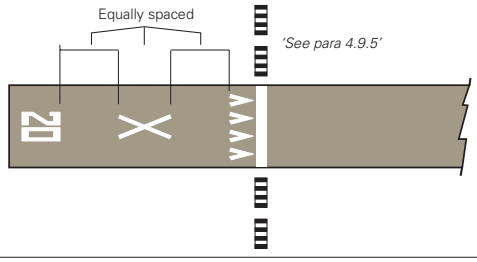
(i) Pre-threshold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft.

Note:

1 Overall dimensions are given at figure 7.23(d).

Figure 7.23(c) Paved runway threshold markings

Type of threshold	Non-instrument runways where the LDA is < 1200M
1	
2(i)	
2(ii)	
2(iii)	
3(i)	
3(ii)	

Key:

1 Not displaced.

2 Permanently displaced or temporarily displaced for more than six months.

(i) Pre-threshold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft and unsuitable as stopway.

(iii) Pre-threshold area of runway fit for use by aircraft as a stopway, but not for normal movement of aircraft.

3 Temporarily displaced for six months or less. (Runway designator is NOT moved.)

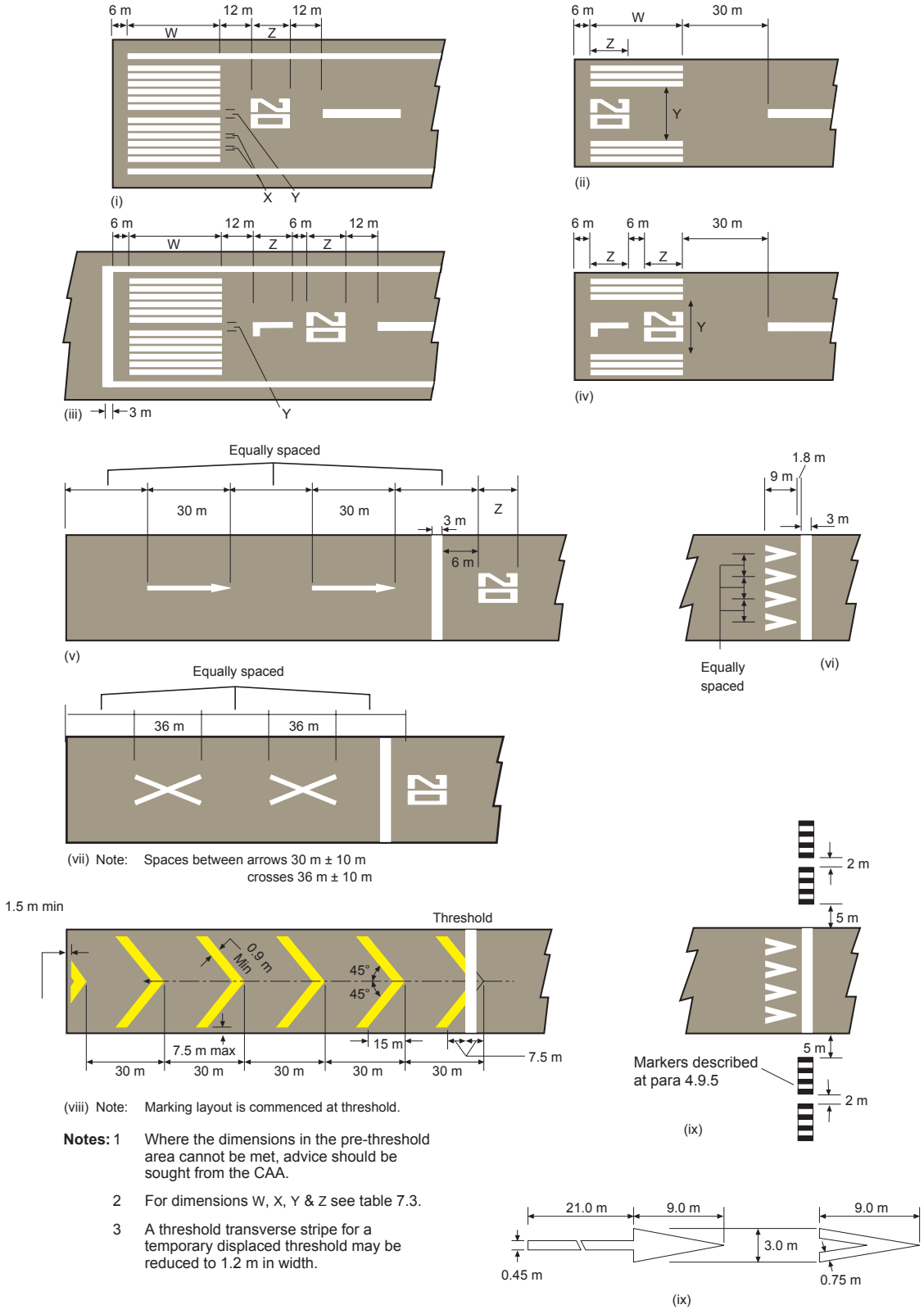
(i) Pre-threshold area of runway fit for movement of aircraft.

(ii) Pre-threshold area of runway unfit for movement of aircraft.

Note:

1 Overall dimensions are given at figure7.23(d).

Figure 7.23(d) Threshold markings dimensions



Notes: 1 Where the dimensions in the pre-threshold area cannot be met, advice should be sought from the CAA.

2 For dimensions W, X, Y & Z see table 7.3.

3 A threshold transverse stripe for a temporary displaced threshold may be reduced to 1.2 m in width.

Figure 7.23(e) Starter extension markings

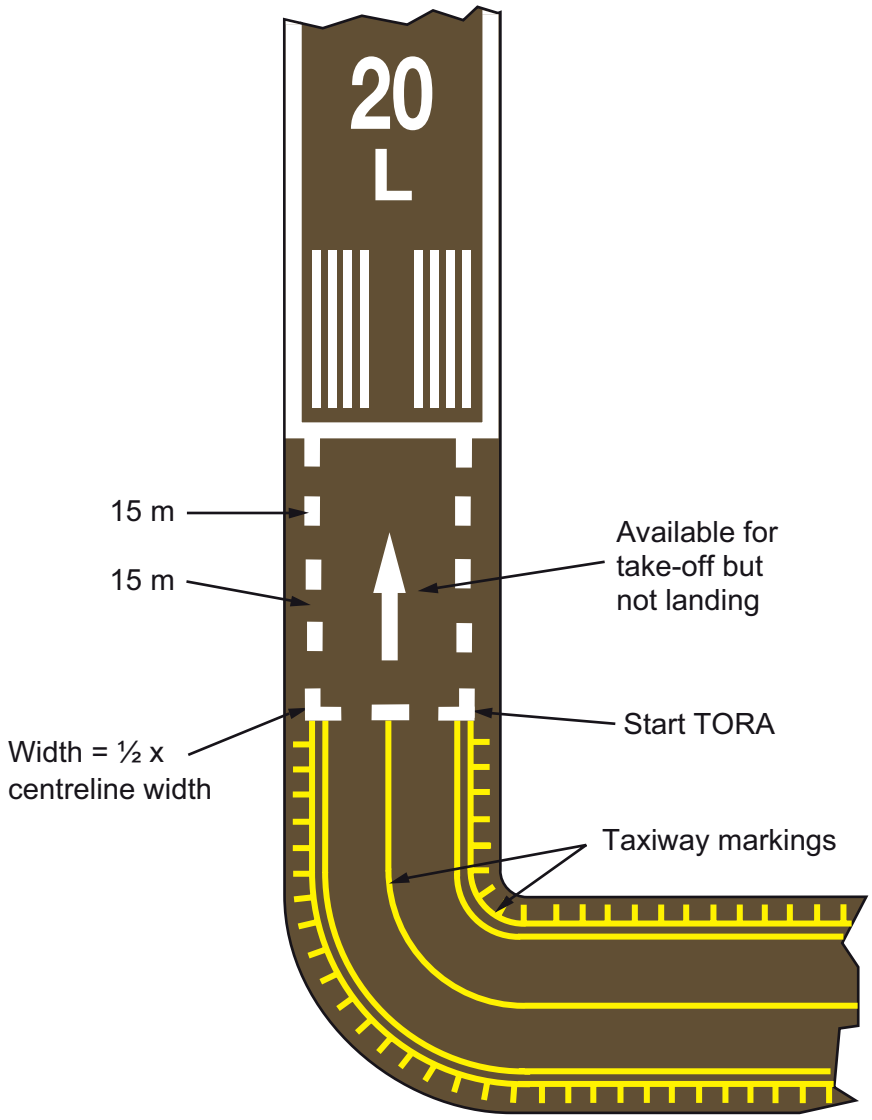
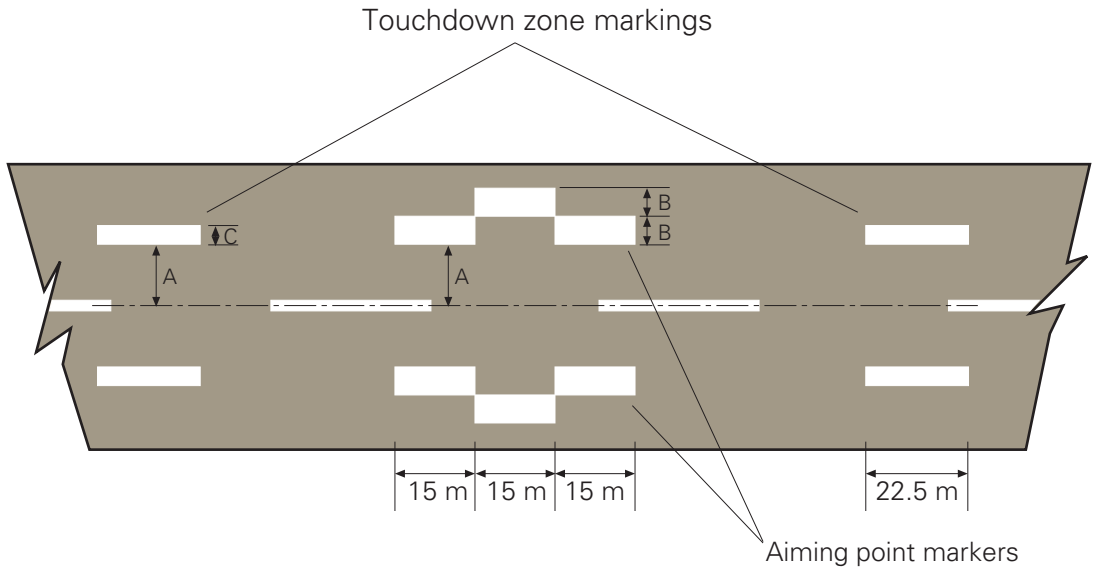


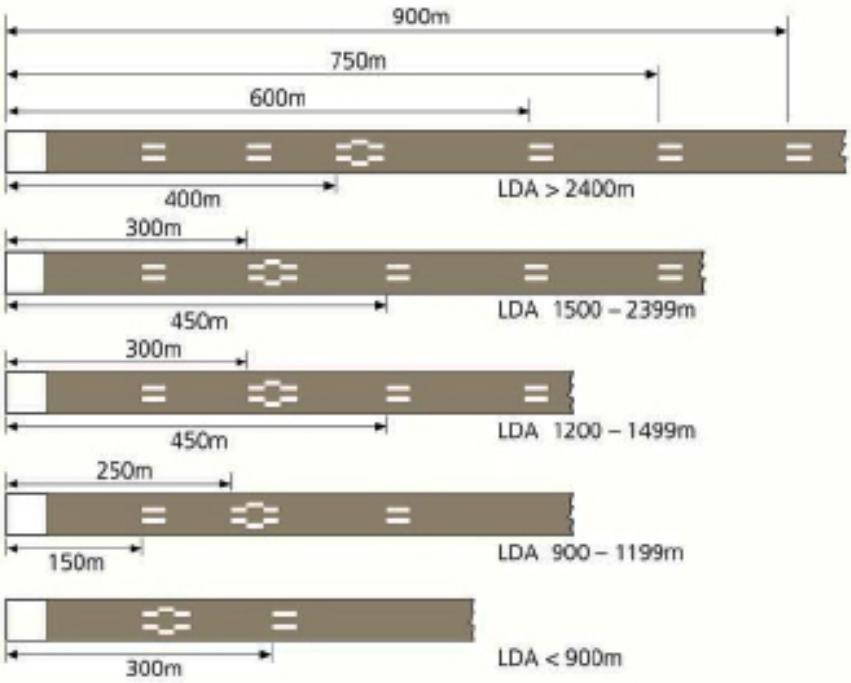
Figure 7.24 Aiming point and touchdown zone markings – dimensions



Runway width (metres)	Distance (A) Runway centreline to marker (metres)	Marker width B (metres)	Marker width C (metres)
45	9	55	3
30	3	50	3
23	5	25	15
18	3	25	15

Note: For runways in excess of 45 m, contact your aerodrome inspector .

Figure 7.25 Paved runways – location of touchdown zone and aiming point markers



Distance between Thresholds/ Declared LDA metres	Location of TDZ markers distance in metres from Threshold	Location of AP marker distance in metres from Threshold
> 2400	150, 300, 600, 750 and 900	400
1500 – 2399	150, 450, 600 and 750	300
1200 – 1499	150, 450 and 600	300
900 – 1199	150 and 450	250
<900	300	150

Notes:

1. Where the runway is served by an instrument approach at both ends, use distance between thresholds to determine the location of the TDZ markings. The distance between the last TDZ marks serving each landing direction should be not less than 300 m.
2. Where PAPI is provided, the beginning of the Aiming Point (AP) Markers shall be coincident with the PAPI approach slope origin. However, if the difference in distance between the PAPI location and that depicted in the applicable diagram above will not, as agreed mutually with the CAA, result in a significant reduction in safety, it is acceptable to leave existing AP markers in their present position.

Runway turn pad markings

7.90 Where a runway turn pad is provided, a runway turn pad marking should be provided for continuous guidance to enable an aircraft to complete a 180° turn and align with the runway centreline. These markings should be yellow.

7.91 A runway turn pad marking should be at least 150 mm in width and continuous in length. The marking should be curved from the runway centreline into the turn pad. The radius of the curve should be compatible with the manoeuvring compatibility and normal taxying speeds of the aircraft for which the runway turn pad is intended. The intersection angle of the turn pad marking with the runway centreline should not be greater than 30°.

7.92 The runway turn pad marking should extend parallel to the runway centreline marking for at least 60 m beyond the point of tangency where the code number is 3 or 4, and for at least 30 m where the code number is 1 or 2.

7.93 The runway turn pad marking should guide the aircraft in such a way as to allow a straight portion of taxying before the point where the 180° turn is to be made.

7.94 The design of the curve allowing an aircraft to negotiate a 180° turn should be based on a nose-wheel steering angle not exceeding 45°. The design should be such that, when the cockpit of the aircraft remains over the runway turn pad marking, the clearance distance between any wheel of the aircraft landing gear and the edge of the runway turn pad should be not less than specified in chapter 3.

7.95 Where a runway turn pad is provided, the runway side stripe marking should be continued between the runway and the runway turn pad.

Day markers for snow-covered runways

7.96 Type 'C' markers as illustrated at Figure 7.30 should be used to indicate the threshold, end and usable width of a snow-covered runway. The spacing of markers along the sides of the runway should be at intervals of not more than 100 m. Markers may not be needed where elevated runway edge lighting is installed. Where necessary the threshold should additionally be marked with Runway Threshold Marker Boards and positioned as illustrated in figure 7.23(d).

Markings on unpaved runways

7.97 Where aircraft performance considerations necessitate the notification of field lengths for a grass aerodrome, the boundaries of unpaved runways and stopways should be delineated by runway edge markers visible from an aircraft on the approach at a range of at least 2 km. Delineation should be effected by either of the following methods:

1. white, flat, rectangular markers flush with the surface, 3 m long, 1 m wide and spaced at intervals not exceeding 90 m; or
2. frangible markers single-coloured to contrast with their background and firmly secured to the surface spaced at intervals not exceeding 90 m; the height of the markers should not exceed 360 mm.

7.98 Where frangible markers are used to delineate the boundaries of unpaved runway, or other areas within the runway clear and graded area, whether

temporary or otherwise, such markers should be lightweight. Whilst ballast may be required to ensure stability of the markers, aerodrome operators should ensure that the units retain their frangibility, taking into account the types of aircraft that commonly use the runway.

7.99 Runway edge markers should be arranged in pairs on opposite sides of and equi-distant from the centreline.

7.100 The corners of an unpaved runway or stopway should be indicated by additional markings placed at right angles to and adjoining the appropriate longitudinal markers.

7.101 The threshold of an unpaved runway should be marked with a designator showing the magnetic heading to the nearest whole ten degrees. Spacing and dimensions are given at appendix 7B, table 7B.1. Elevated markers used to indicate a displaced threshold should be located as wing bars as illustrated at figure 7.23 and figure 7.32.

7.102 A temporarily displaced threshold should be marked in the manner illustrated at figure 7.23. However, the chevrons and displacement arrows may be omitted.

7.103 An unpaved runway should be provided with centreline marking if the runway edge marking is not easily seen during take-off or landing.

7.104 Where landings and take-offs are not confined to marked runways and the aerodrome boundary is not readily apparent, boundary markers should be provided.

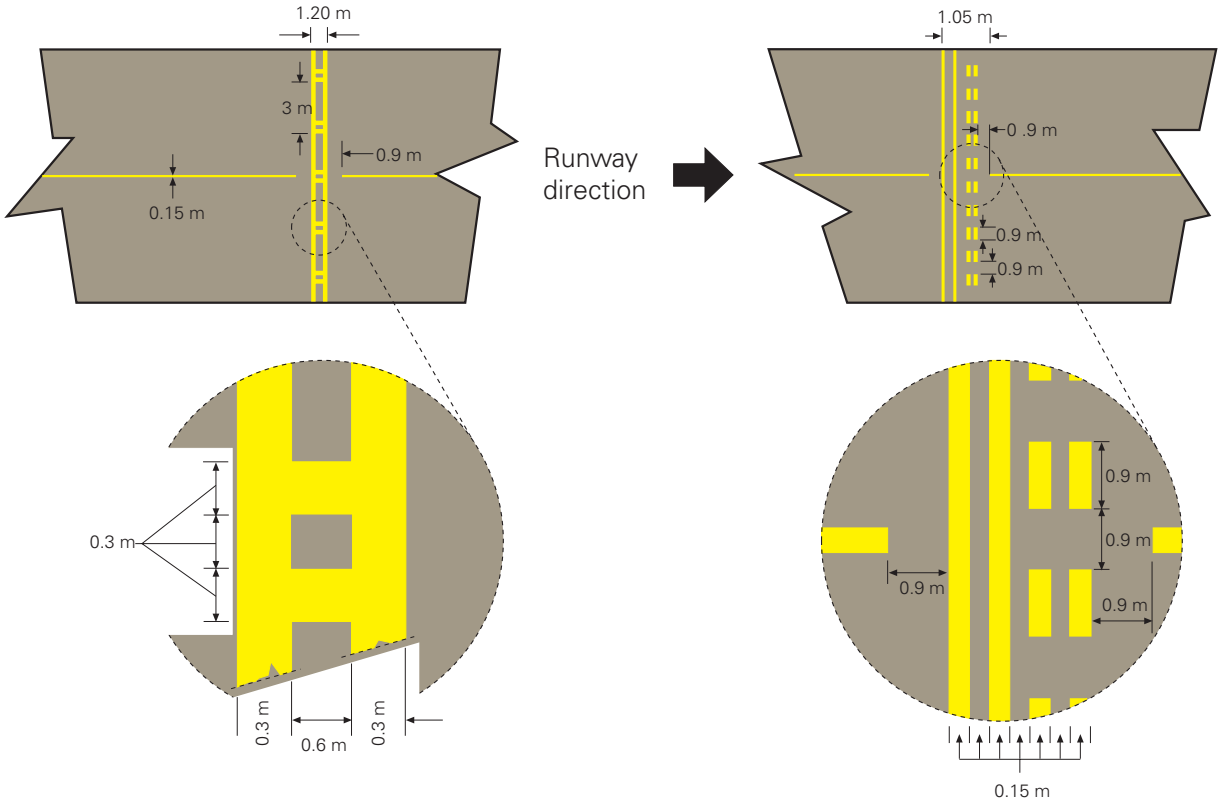
Taxiway markings

7.105 The centreline of paved taxiways serving precision instrument approach runways and other taxiways where the route is difficult to follow should be marked by a continuous yellow line 0.15 m wide, so as to provide guidance between the runway and aircraft stands. Where the taxiway leads onto or off the runway, the yellow line should be curved into the nearside of and 0.75 m ± 0.15 m from the runway centreline, except at the runway threshold where the yellow line should be discontinued at the edge of the runway in the manner illustrated at figure 7.28. When a taxiway crosses a runway, the centreline may be continued across the runway, interrupted as necessary for the runway markings. At taxiway intersections the taxiway centrelines should be intersected in the manner illustrated at figure 7.27. At rapid exit taxiways the taxiway marking should commence adjacent to the runway centreline at least 60 m before the intersection with the exit taxiway curvature. At all other taxiway/runway intersections the lead-off lines should commence at least 30 m before the intersection.

7.106 Runway taxi-holding positions should be established in accordance with the requirements of chapter 3 on each taxiway serving a runway. On each taxiway the runway taxi-holding position closest to the runway should be marked as

shown in figure 7.26 pattern 'A'. Other runway taxi-holding positions where provided on the same taxiway but farther from the runway should be marked as shown at figure 7.26 pattern 'B'.

Figure 7.26 Runway taxi-holding position marks



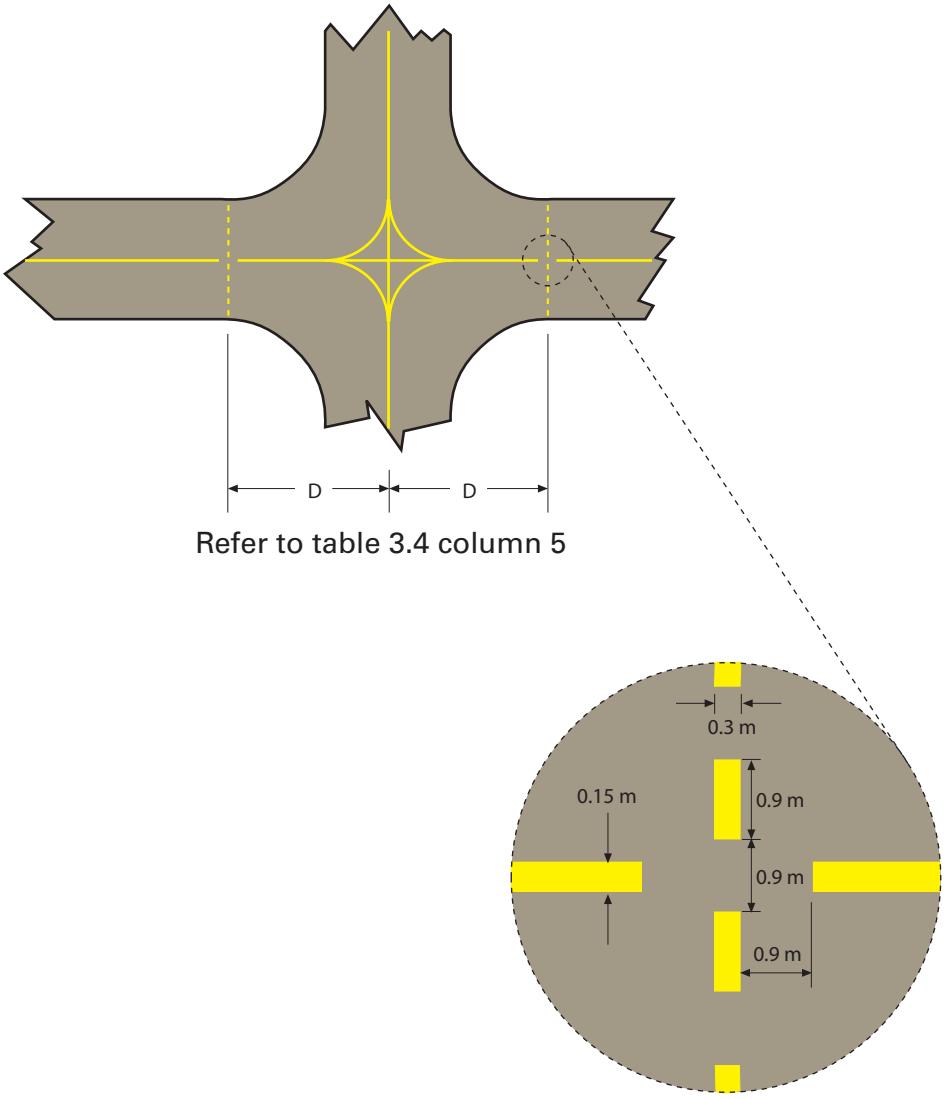
Notes:

1. The runway taxi-holding position marking should be positioned at right angles to the taxiway centreline marking.
2. No part of the runway taxi-holding position marking should be closer to the runway than the appropriate distance as determined by use of table 3.3.

7.107 Intermediate taxi-holding position markings as illustrated in figure 7.27 should be displayed wherever it is intended to locate an Intermediate Ttaxi-holding position.

7.108 Where it is necessary to define the outer edges of a taxiway, e.g. where a paved taxiway shoulder has a bearing strength less than that of the main taxiway or where a taxiway lies adjacent to a paved area not intended for use as a taxiway, the outer edges of the taxiway should be marked as illustrated in figure 7.28. The mark should be so positioned that the inner edge of the mark represents the outer edge of the taxiway.

Figure 7.27 Intermediate taxi-holding position marking

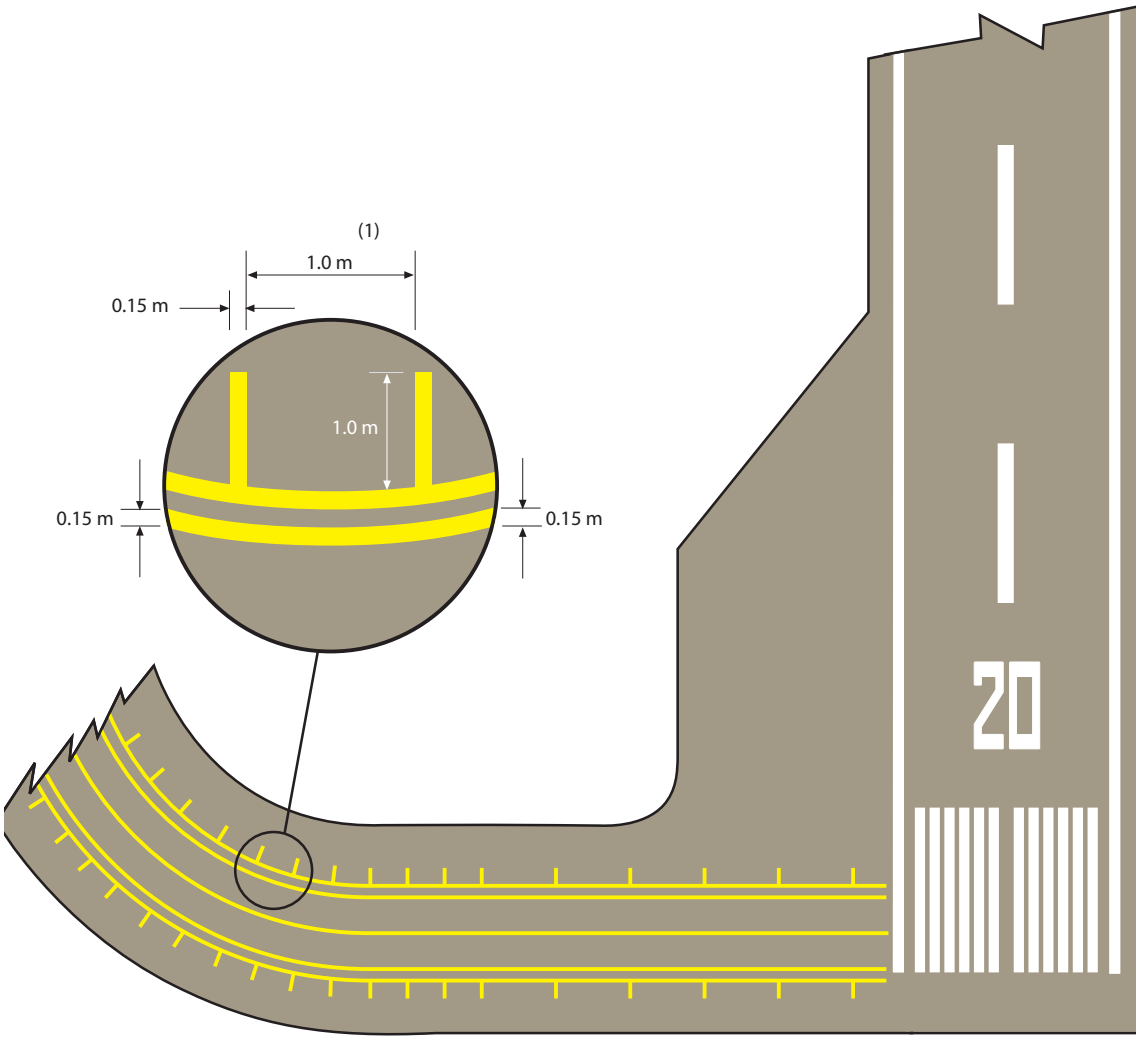


Note: an intermediate taxi-holding position marking should be placed at right angles to the taxiway centreline and in such a position so as to ensure that the minimum separation distances outlined in column 5 of table 3.4 (In chapter 3) are achieved.

7.109 On taxiways or aprons where it is impracticable to install an information sign, the information should be displayed in the form of a marking on the pavement positioned so as to be legible from the cockpit of an approaching aircraft. The markings should conform to the illustrations at appendix 7C.

7.110 Where it is necessary to define the edges of an unpaved taxiway, suitable frangible markers, such as linlaners, coloured blue, should be provided. If used at night, suitable retro-reflective material should be applied.

Figure 7.28 Taxiway edge marking



7.111 Where it is considered necessary, as part of an aerodrome's runway incursion prevention measures, to denote the proximity of a runway holding position, enhanced taxiway centreline markings may be provided. Where provided, an enhanced taxiway centreline marking shall extend from the runway holding position Pattern A (as defined in figure 7.29, enhanced taxiway centreline marking) to a distance of up to 47 m in the direction of travel away from the runway or to the next runway holding position, 7 m distance.

7.112 Where provided, enhanced taxiway centreline marking shall be installed at each taxiway/runway intersection.

7.113 Where provided, an enhanced taxiway centreline marking shall extend from the runway-holding position pattern A to a distance of up to 45 m (a minimum of three (3) dashed lines) in the direction of travel away from the runway or to the next runway-holding position, if within 45 m distance.

7.114 Where provided:

1. An enhanced taxiway centreline marking shall extend from the runway-holding position pattern A to a distance of up to 47 m in the direction of travel away from the runway (see figure 2D.3).
2. If the enhanced taxiway centreline marking intersects another runway-holding position marking, such as for a precision approach category II or III runway, that is located within 47 m of the first runway-holding position marking, the enhanced taxiway centreline marking shall be interrupted 0.9 m prior to and after the intersected runway-holding position marking. The enhanced taxiway centreline marking shall continue beyond the intersected runway-holding position marking for at least three dashed line segments or 47 m from start to finish, whichever is greater.
3. If the enhanced taxiway centreline marking continues through a taxiway/taxiway intersection that is located within 47 m of the runway-holding position marking, the enhanced taxiway centreline marking shall be interrupted 1.5 m prior to and after the point where the intersected taxiway centre line crosses the enhanced taxiway centre line. The enhanced taxiway centre line marking shall continue beyond the taxiway/taxiway intersection for at least three dashed line segments or 47 m from start to finish, whichever is greater.
4. Where two taxiway centrelines converge at or before the runway-holding position marking, the inner dashed line shall not be less than 3 m in length.
5. Where there are two opposing runway-holding position markings and the distance between the markings is less than 94 m, the enhanced taxiway centreline markings shall extend over this entire distance. The enhanced taxiway centreline markings shall not extend beyond either runway-holding position marking.

Mandatory instruction markings

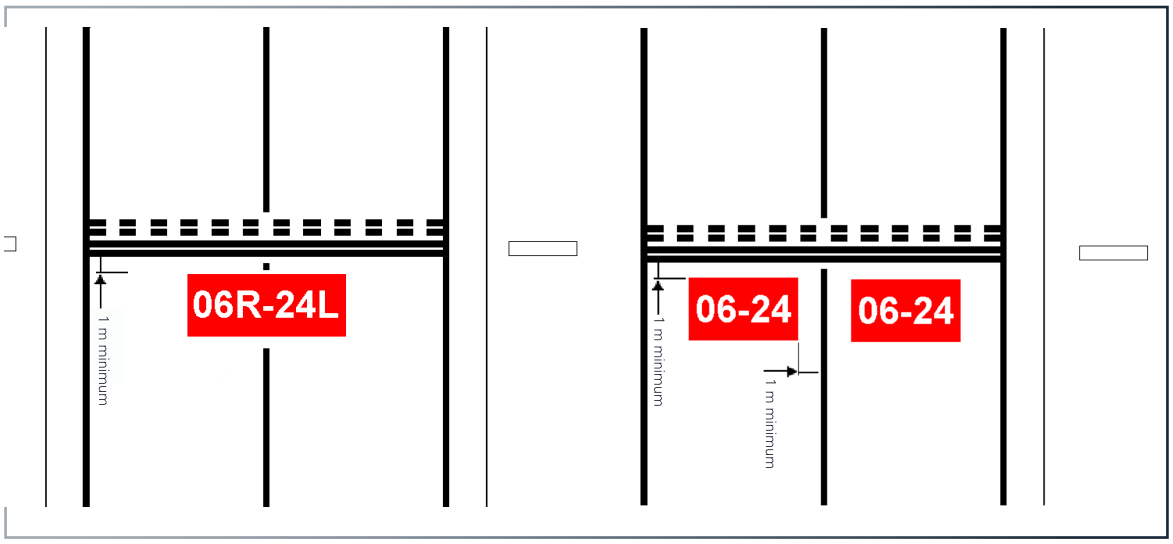
7.115 Where operationally required, such as on wide taxiways, or to assist in the prevention of a runway incursion, a runway taxi-holding position sign may be supplemented by a mandatory instruction marking in the form of a runway designation marking. This marking should also be used where it is impractical to install a mandatory instruction sign.

7.116 Where required, the mandatory instruction marking on taxiways with code letters A-D should be located across the taxiway equally placed about the taxiway centreline and on the holding side of the runway-holding position marking as shown in figure 7.30(a). For taxiways where the code letter is E or F, the marking should be located on both sides of the taxiway centreline marking and on the holding side of the runway-holding position marking as shown in figure 7.30(b). In both cases the distance between the nearest edge of the

marking and the runway holding position marking or the taxiway centreline marking should be not less than 1 m.

7.117 The character height should be 4 m for inscriptions where the code letter is C, D, E or F, and 2 m where the code letter is A or B.

Figure 7.30 Mandatory Instruction Marking



Apron markings

7.118 Unless marshalling guidance is available, aircraft stand markings should be provided on a paved apron. Markings should be located so as to provide the obstacle clearances specified in chapter 3 when the nose wheel follows the stand marking. Aircraft stand markings may include items such as stand identification, lead-in line or arrow, turn bar, turning line, alignment bar, stop line and lead-out line, as are required by the parking configuration and to complement other parking aids. These markings should be yellow.

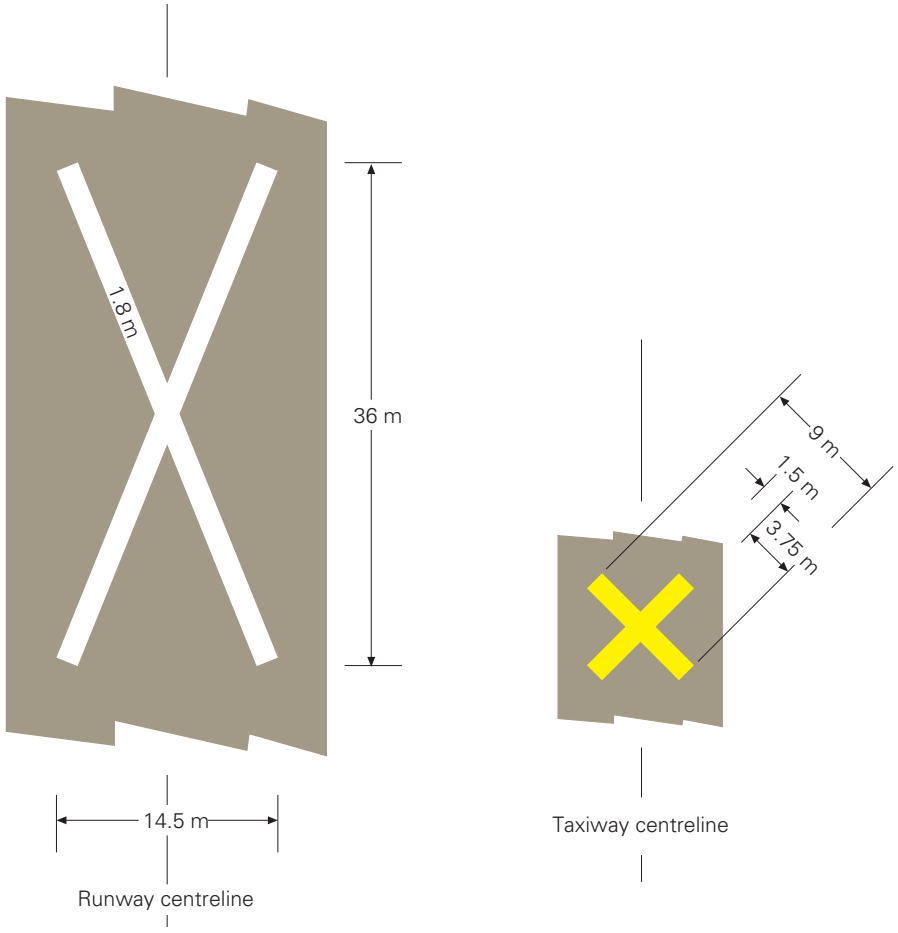
7.119 Apron safety lines and other markings should be provided as required to define the areas intended for use by ground vehicles and other aircraft servicing equipment, etc., to provide safe separation from aircraft. They should include items such as wing tip clearance lines and service road boundary lines, vehicle parking and no parking areas, pedestrian routes and airbridge operating areas as required by the parking configurations and ground facilities. Markings should be of colours that do not conflict with markings used by aircraft and should be maintained so as to retain their conspicuity.

7.120 Examples of markings are provided in CAP 637, Visual Aids Handbook. appendix 7C of this chapter provides guidance on the dimensions of markings.

Markings of unfit areas

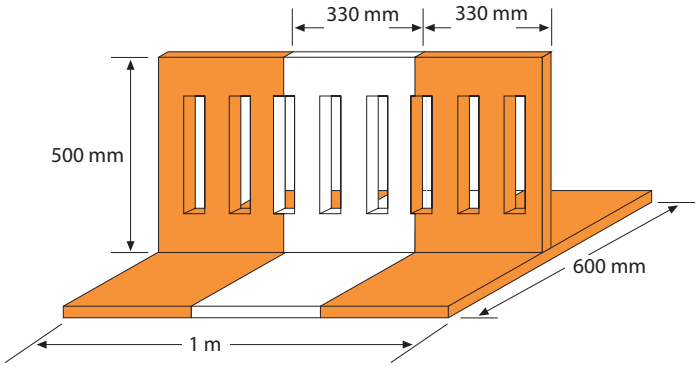
7.121 One or more crosses as illustrated at figure 7.31 should be used to mark runways or taxiways declared as unfit for the movement of aircraft. The crosses should be spaced at intervals of not more than 300 m except where they form part of the marking for a displaced runway threshold when the spacing at figure 7.23 applies.

Figure 7.31 Closed runway and taxiway markings



7.122 Type 'A' ground markers as illustrated in figure 7.32, spaced not more than 15 m apart, signify the boundary of that part of a paved runway, taxiway or apron unfit for the movement of aircraft.

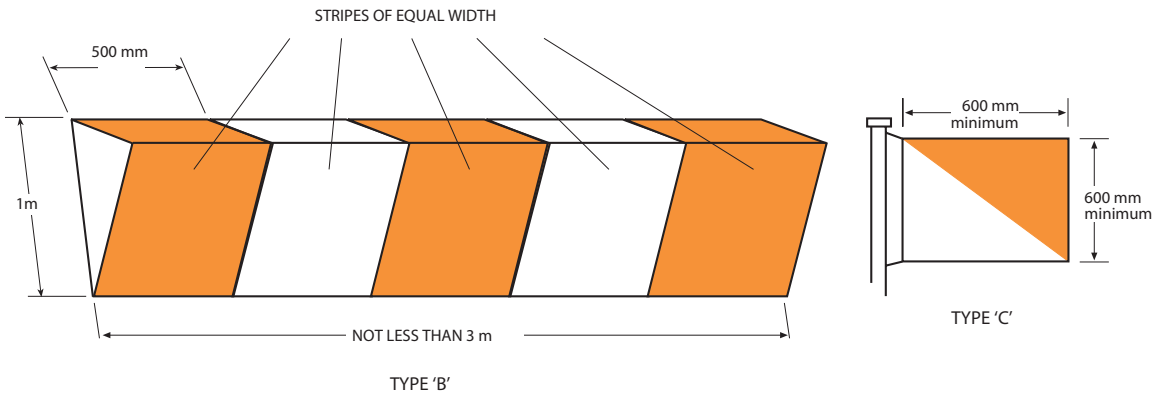
Figure 7.32 Bad ground marker type 'A'



7.123 Areas on unpaved manoeuvring areas that are unfit for the movement of aircraft should be marked by one or more crosses as specified in figure 7.31 and bounded by ground markers type 'B' alternating with type 'C' illustrated at figure 7.33. The type 'C' marker should also be used to mark the usable portion of a snow covered runway and should be located where runway edge lighting would normally be expected. The distance between successive type 'C' markers therefore should not exceed 60 m.

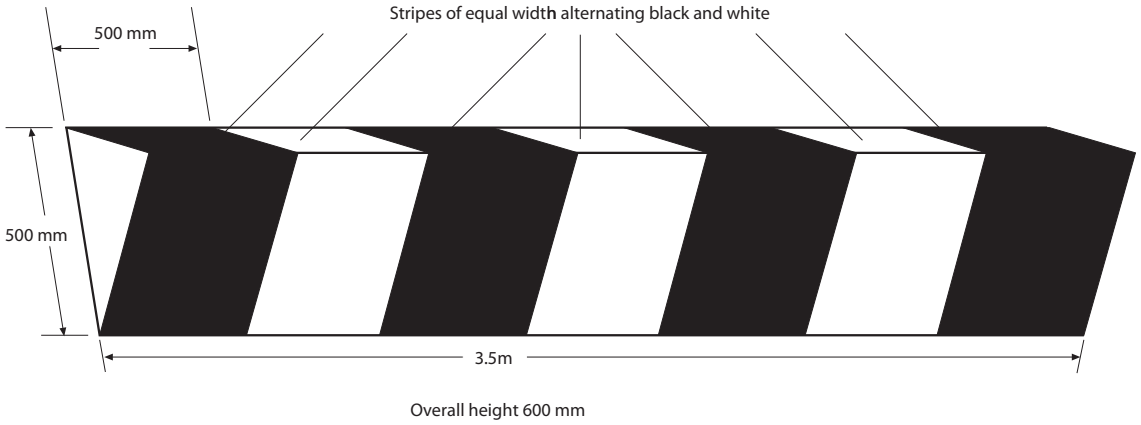
7.124 Alternatively, cones may be used to denote such areas. Cones should be at least 0.5 m in height and red, orange or yellow, or any of these colours in combination with white. Whilst ballast may be required to ensure stability, aerodrome operators should ensure that cones retain their frangibility.

Figure 7.33 Bad ground markers types 'B' and 'C'



7.125 Where a runway threshold is temporarily displaced, or where a threshold is insufficiently conspicuous (e.g. snow covered runway) the threshold should be marked with the boards illustrated at figure 7.34 (in addition to the pavement markings), positioned in accordance with the illustrations at figure 7.23.

Figure 7.34 Runway threshold marker board

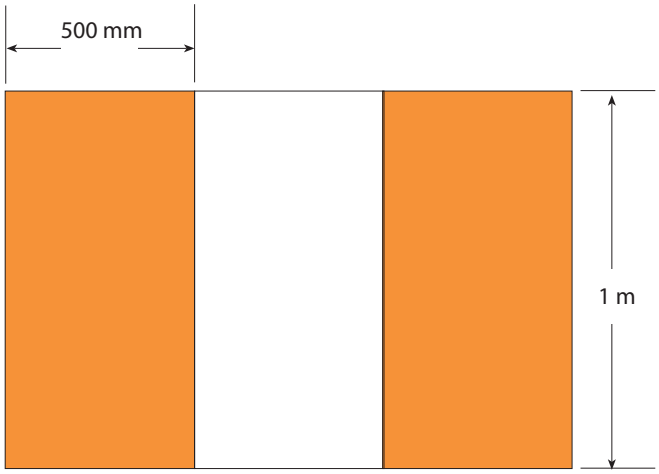


7.126 When a runway or taxiway, or portion thereof, is permanently closed, all normal runway and taxiway markings should be obliterated.

Other markers

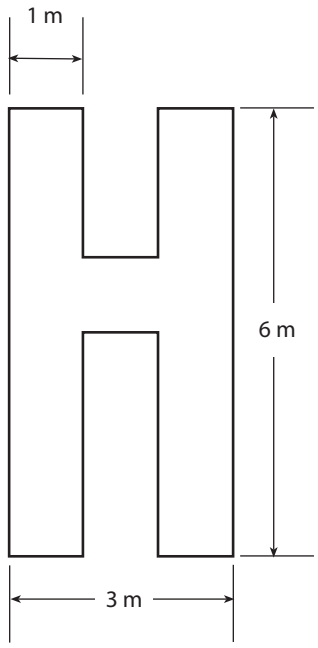
7.127 An aerodrome boundary that is insufficiently conspicuous should be delineated by orange and white striped markers either as illustrated in figure 7.35 or as specified in paragraph 7.124. Spacing should not exceed 45 m.

Figure 7.35 Aerodrome boundary marker



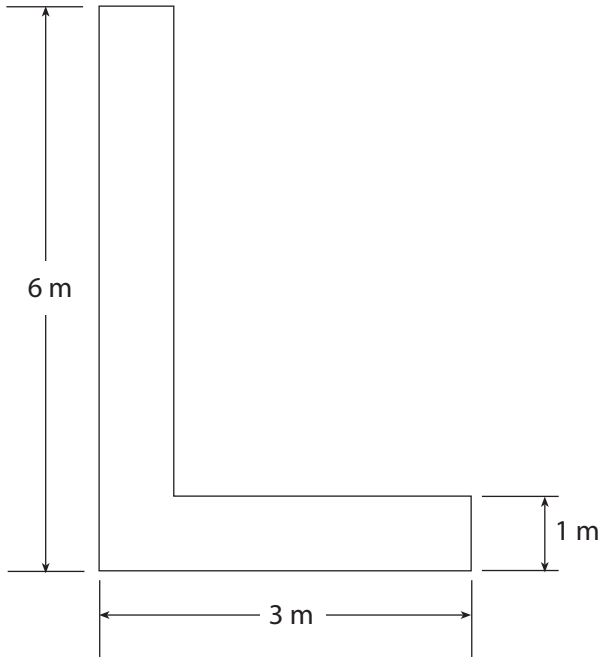
7.128 A white letter H as illustrated in figure 7.36 indicates a part of the manoeuvring area to be used only for the take-off and landing of helicopters.

Figure 7.36 Helicopter landing area mark



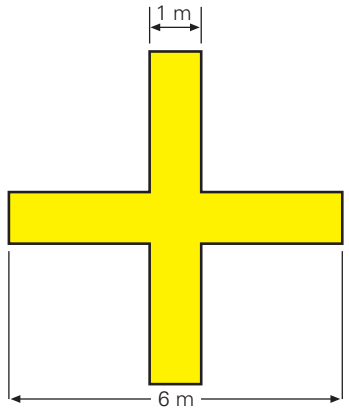
7.129 A white letter L as illustrated in figure 7.37 indicates a part of the manoeuvring area to be used only for the take-off and landing of light aircraft.

Figure 7.37 Light aircraft landing/take-off area mark



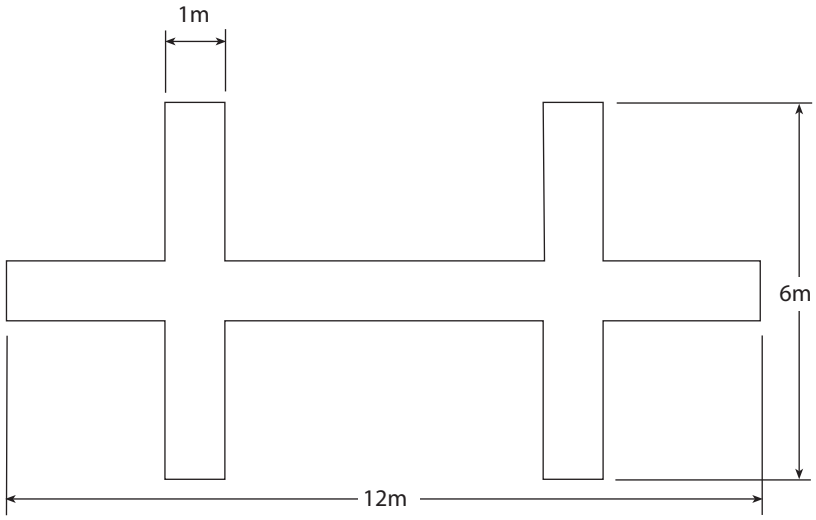
7.130 A yellow cross of dimensions illustrated in figure 7.38 indicates that tow ropes and similar articles towed by aircraft are to be dropped only in the area in which the cross is placed.

Figure 7.38 Yellow cross



7.131 A white double cross as illustrated at figure 7.39 indicates an area to be used only for the taking off and landing of gliders.

Figure 7.39 White double cross – dimensions



7.132 A white landing T as specified in paragraph 7.14 or 7.15, placed at the left hand side of the runway when viewed from the direction of landing indicates the runway to be used.

Road signs and markings

7.133 Road signs and markings used on aerodrome movement areas should, where practicable, conform with:

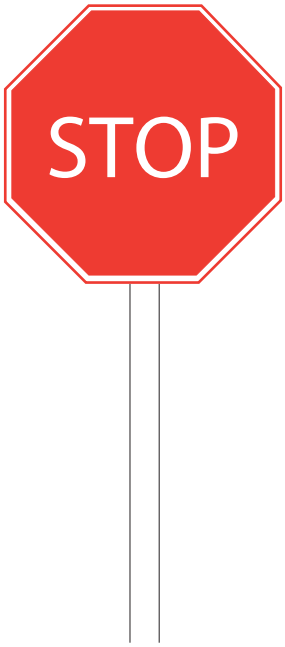
- Statutory Instrument 2002 No. 3113 – The Traffic Signs Regulations and General Directions 2002;
- Statutory Instrument 1997 No. 2400 – The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997;
- Statutory Instrument 1998 No. 901 – The Pelican and Puffin Pedestrian Crossings General (Amendment) Directions 1998.

Road-holding position sign

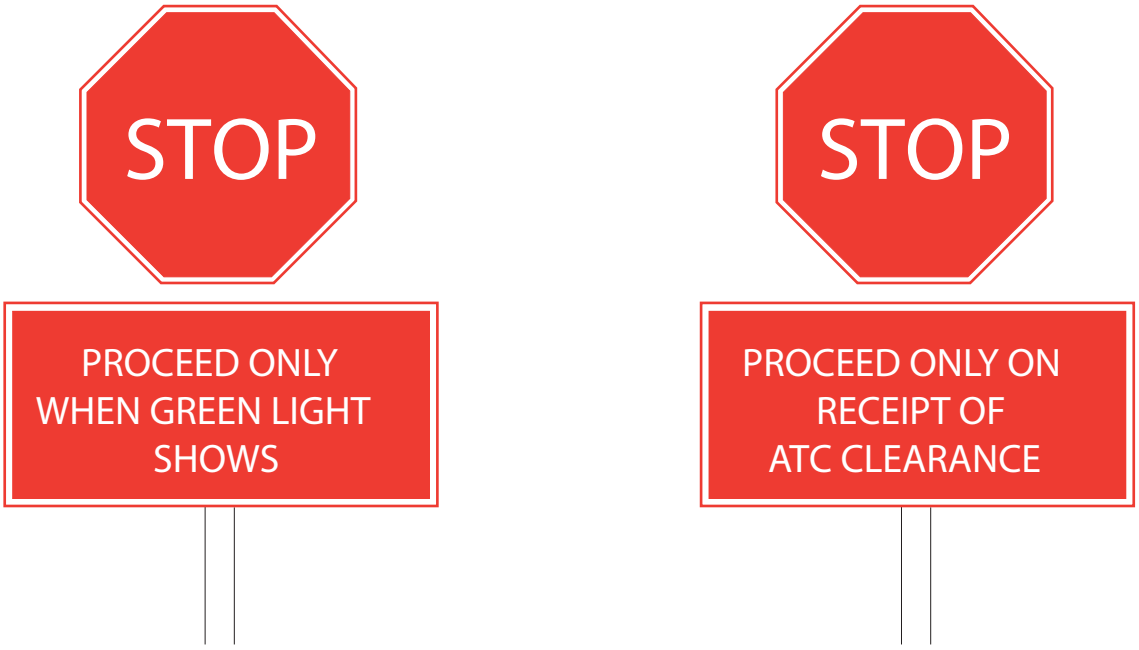
7.134 Whenever a route intended for vehicular traffic use intersects a taxiway or a runway, a road-holding position sign should be located not closer to the appropriate taxiway or runway than the distances notified in chapter 3 and 1.5 m from the defined edge of the vehicular traffic route.

7.135 The road-holding position sign should combine a standard road traffic 'STOP' sign with, where appropriate, an instruction on how the driver of a vehicle should proceed. Examples of road-holding position signs are illustrated at figure 7.40.

Figure 7.40 Road-holding position signs (not to scale)



(a) Standard stop sign



(b) Stop sign with supplementary instructions

Note: For dimensions see 'The Traffic Signs Regulations and General Directions 1994'

APPENDIX 7A

Taxi guidance signs style and proportion of characters, sign layout and face size

Characters, sign layout and face size

1. This appendix details the style and proportions of the characters to be employed on and the layout and face size of taxi guidance signs.

2. The characters are shown at appendix 7A, figures 7A.2 to 7A.6 for a 50 mm letter height. The characters may be enlarged to the desired letter height by any conventional enlarging process and the letters will remain in the proper proportion. However, any errors and inconsistencies in the space and character stroke width introduced as a result of enlargement will have to be corrected to reflect the requirements of tables 7.1 and 7A.1. A 5 mm grid has been superimposed on the letters to facilitate the enlarging process. For example, to obtain 300 mm letter height, enlarge the grid squares to 30 mm.

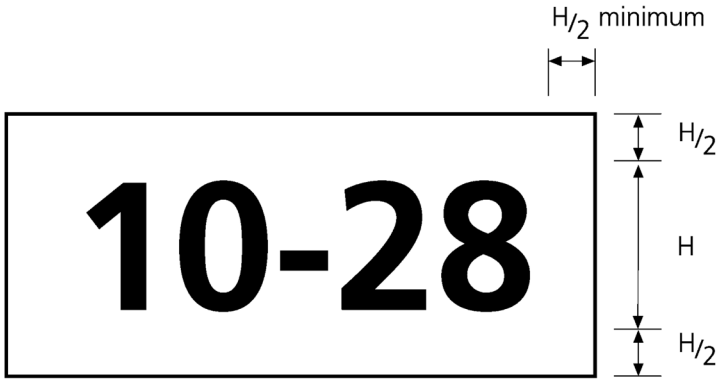
3. A set of spacing tables is provided at table 7A.1. These tables give the letter and numeral width by direct reading for several standard letter heights. In addition, the dimension for space between any combination of letters or numerals may be obtained through a two-step process described in the table. This space is the distance measured horizontally between the extreme right edge of the preceding letter and the extreme left edge of the following letter. No part of these letters may extend into this space.

4. The width of a word or name may be readily determined by adding the sum of the letter widths to the sum of the spaces between letters.

5. All characters having an arc at the top or bottom are extended slightly above or below the grid lines. This is in accord with accepted practice for rounded letters.

6. Sign face size shall be determined in the manner shown in figure 7A.1.

Figure 7A.1



7. Examples of sign layout and face size proportions are given in figures 7A.7 to 7A.10.

Notes:

1. Vertical dimensions may be increased by up to H/10 in order to accommodate construction tolerances.
2. Horizontal dimensions are a minimum. H/2 may be increased in order to allow flexibility in manufacture of a range of standard frames and enclosures.

Figure 7A.2 Sign characters proportions and style

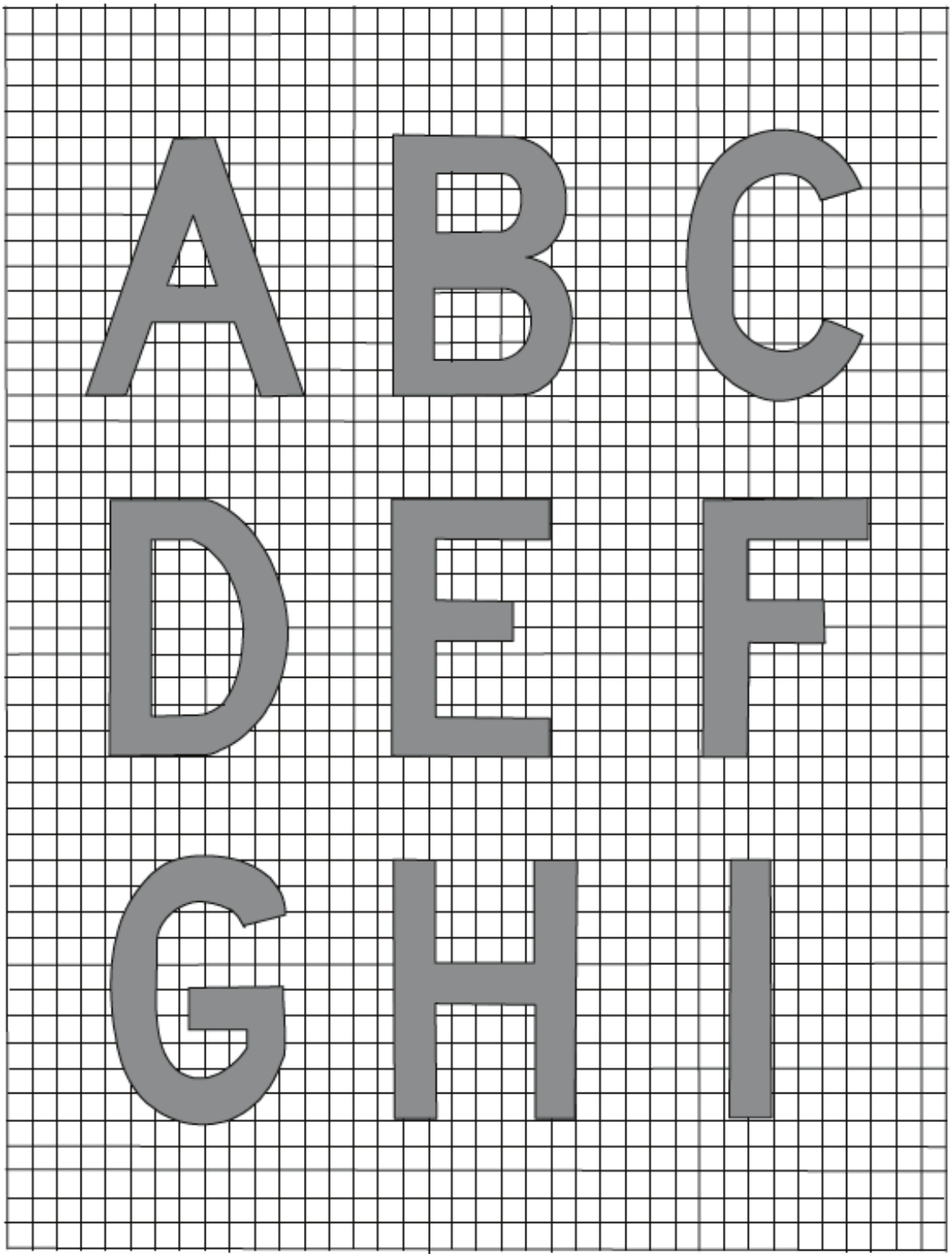


Figure 7A.3 Sign characters proportions and style

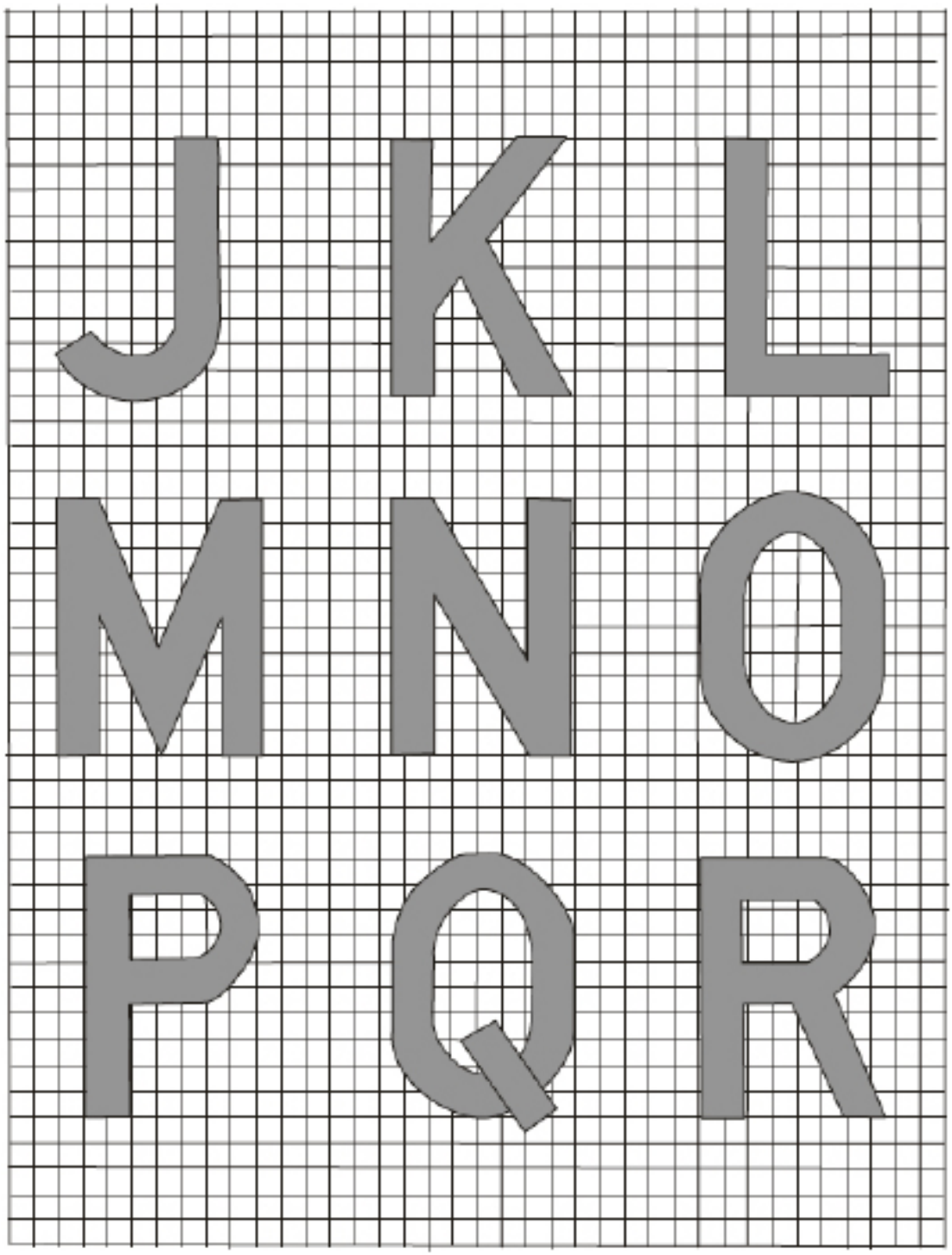


Figure 7A.4 Sign characters proportions and style

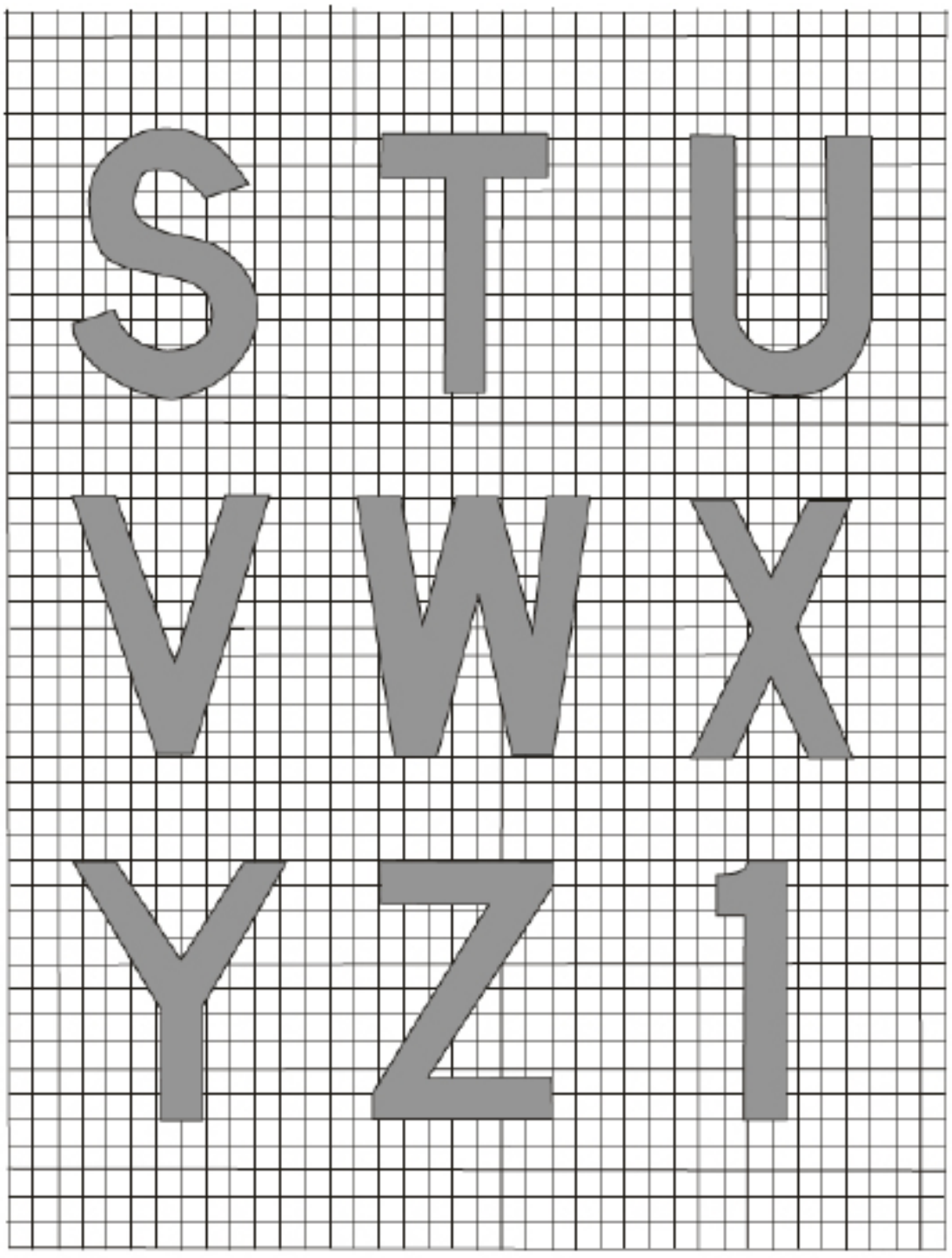


Figure 7A.5 Sign characters proportions and style

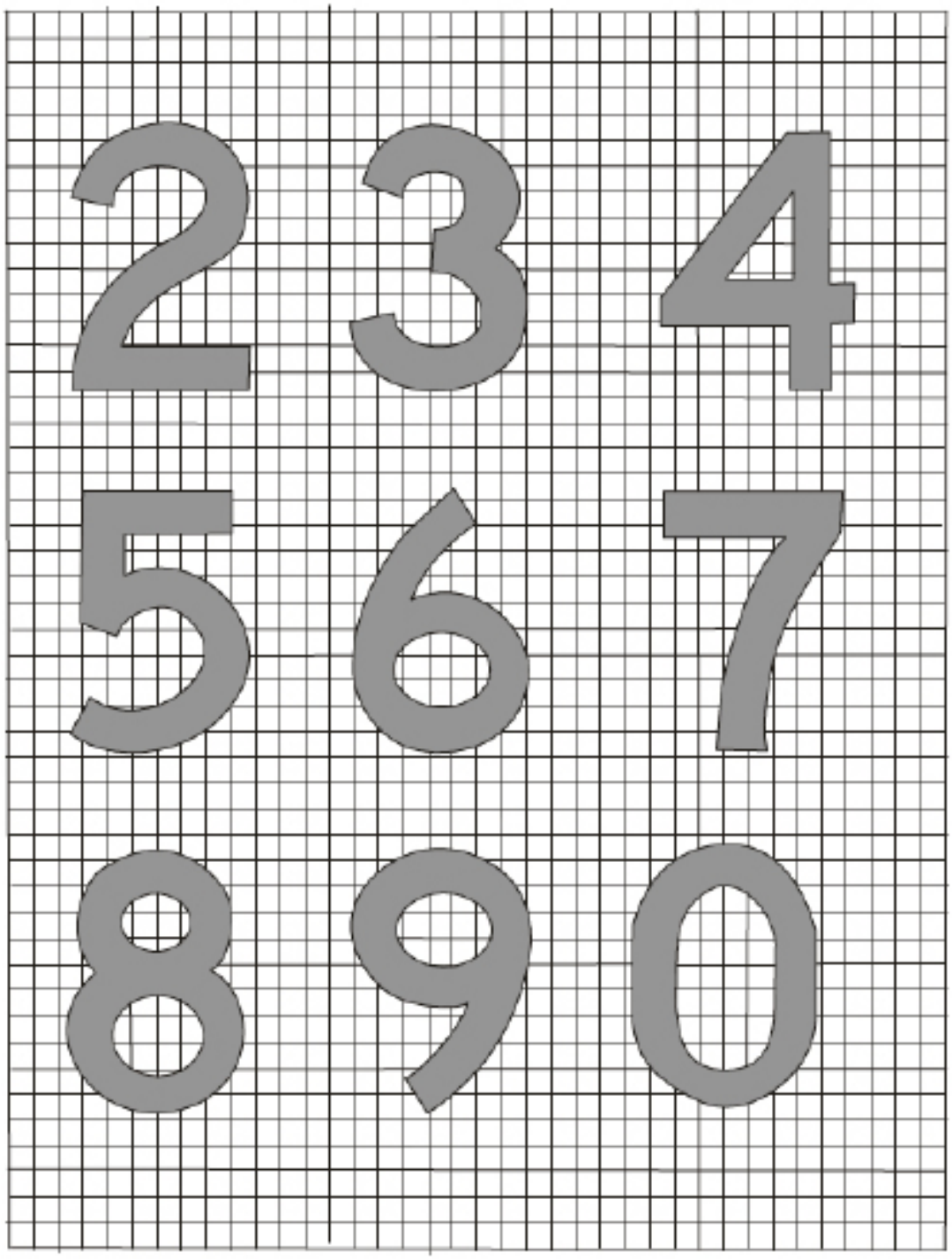


Figure 7A.6 Sign characters proportions and style

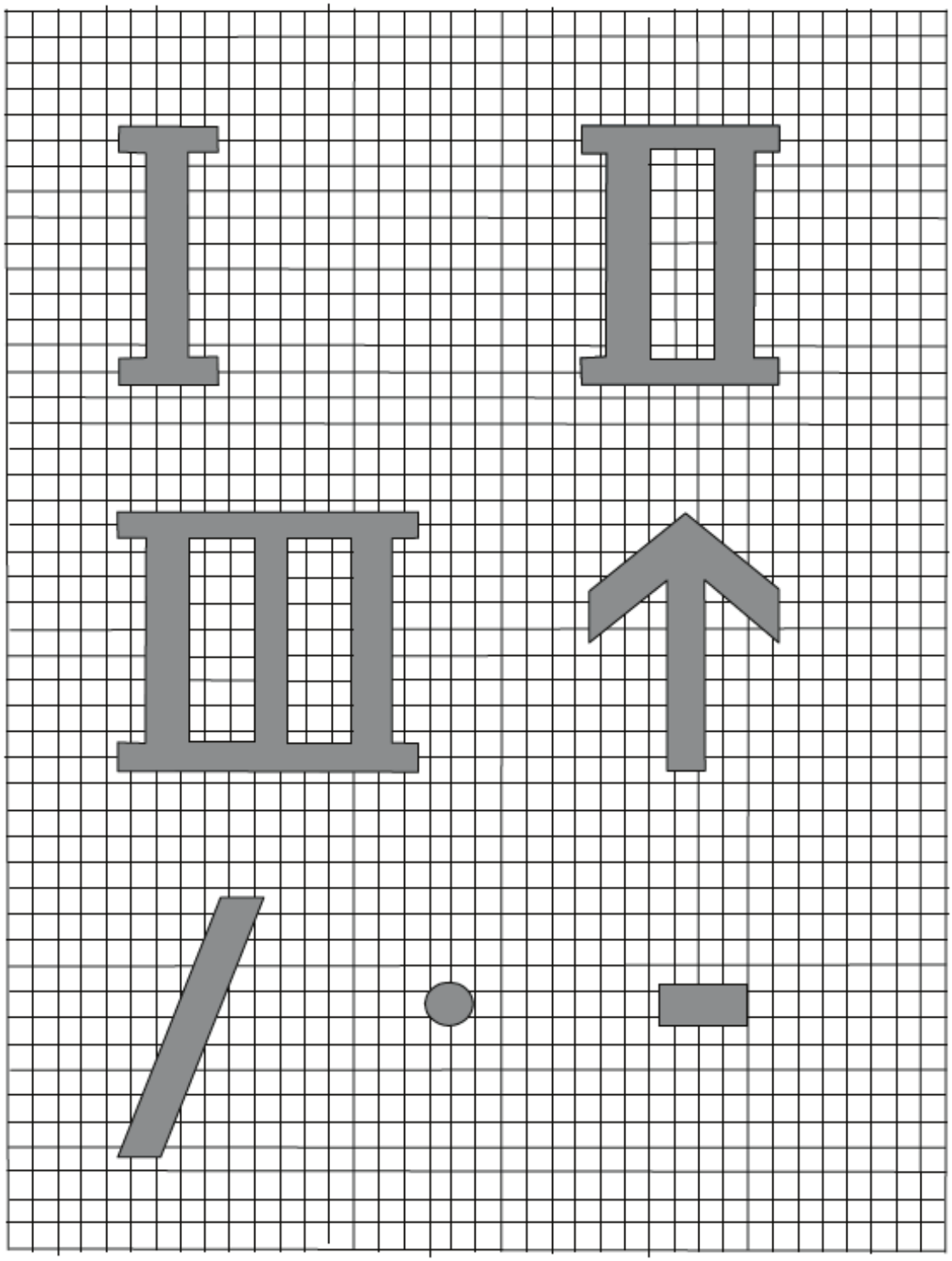


Table 7A.1(a) Letter and numeral widths and space between letters or numerals

Letter to letter code number			
Preceding Letter	Following letter		
	B, D, E, F, H, I, K, L, M, N, P, R, U	C, G, O, Q, S, X, Z	A, J, T, V, W, Y
	Code number		
A	2	2	4
B	1	2	2
C	2	2	3
D	1	2	2
E	2	2	3
F	2	2	3
G	1	2	2
H	1	1	2
I	1	1	2
J	1	1	2
K	2	2	3
L	2	2	4
M	1	1	2
N	1	1	2
O	1	2	2
P	1	2	2
Q	1	2	2
R	1	2	2
S	1	2	2
T	2	2	4
U	1	1	2
V	2	2	4
W	2	2	4
X	2	2	3
Y	2	2	4
Z	2	2	3

Table 7A.1(b) Letter and numeral widths and space between letters or numerals

Numeral to numeral code number			
Preceding numeral	Following number		
	1, 5	2, 3, 6, 8, 9, 0	4, 7
	Code number		
1	1	1	2
2	1	2	2
3	1	2	2
4	2	2	4
5	1	2	2
6	1	2	2
7	2	2	4
8	1	2	2
9	1	2	2
0	1	2	2

Table 7A.1(c) Letter and numeral widths and space between letters or numerals

Space between characters			
Code number	Letter height (mm)		
	200	300	400
	Space (mm)		
1	48	71	96
2	38	57	76
3	25	38	50
4	13	19	26

Table 7A.1(d) Letter and numeral widths and space between letters or numerals

Width of letter			
Letter	Letter height (mm)		
	200	300	400
	Width (mm)		
A	170	255	340
B	137	205	274
C	137	205	274
D	137	205	274
E	124	186	248
F	124	186	248
G	137	205	274
H	137	205	274
I	32	48	64
J	127	190	254
K	140	210	280
L	124	186	248
M	157	236	314
N	137	205	274
O	143	214	286
P	137	205	274
Q	143	214	286
R	137	205	274
S	137	205	274
T	124	186	248
U	137	205	274
V	152	229	304
W	178	267	356
X	137	205	274
Y	171	257	342
Z	137	205	274

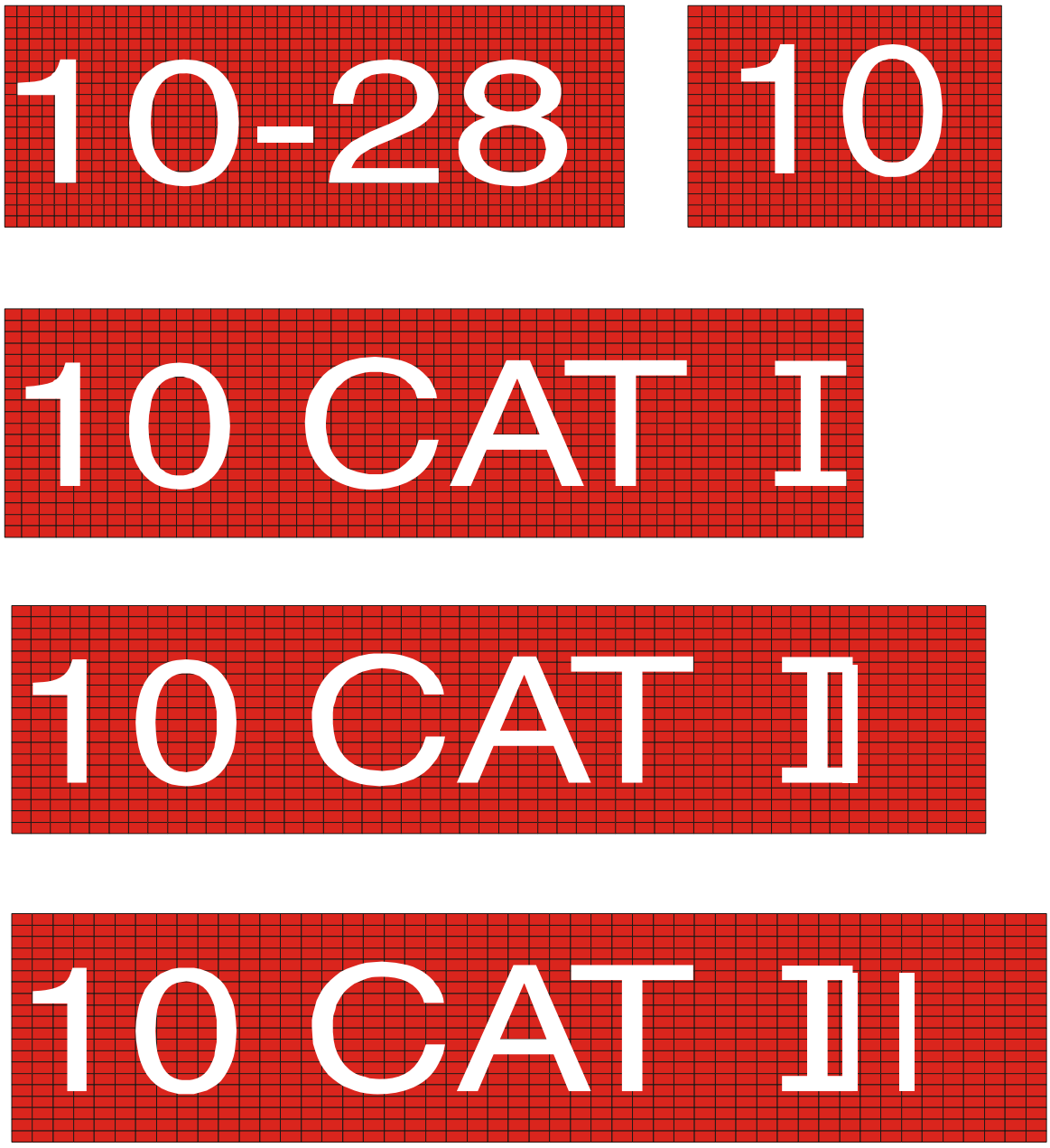
Table 7A.1(e) Letter and numeral widths and space between letters or numerals

Width of numeral			
Numeral	Numeral height (mm)		
	200	300	400
	Width (mm)		
1	50	74	98
2	137	205	274
3	137	205	274
4	149	224	298
5	137	205	274
6	137	205	274
7	137	205	274
8	137	205	274
9	137	205	274
0	143	214	286

Instructions

1. To determine the proper space between letters or numerals, obtain the code number from table 7A.1(a) or (b) and cross-refer to table 7A.1(c) as appropriate to establish the letter height for that code number.
2. The space between words or groups of characters forming an abbreviation or symbol should be equal to half of the height of the characters used except that where an arrow is located with a single character such as 'A', the space may be reduced to not less than one quarter of the character height in order to provide a good visual balance.
3. Where a numeral follows a letter or vice versa use code 1.
4. Where a hyphen, dot, or diagonal stroke follows a character or vice versa use code 1.

Figure 7A.7 Sign face size proportions and layout



Notes:

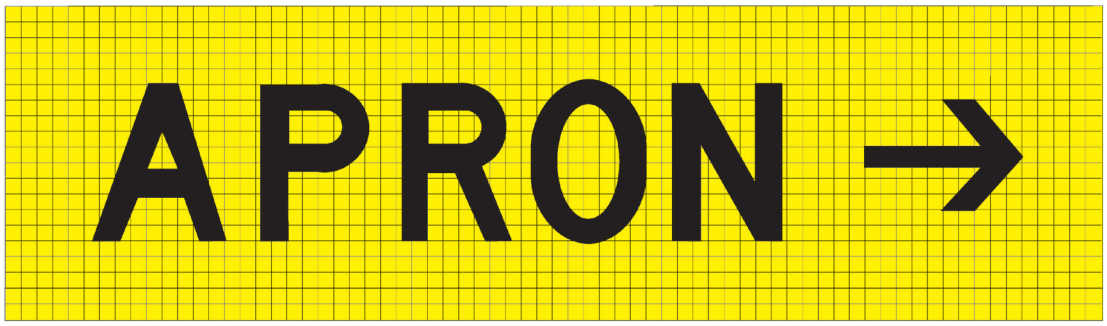
1. The grid is shown only for the purpose of illustrating sign face and character proportions and should not show on a completed sign face.
2. For correct spacing between characters/symbols refer to table 7A.1.

Figure 7A.8 Sign face size proportions and layout

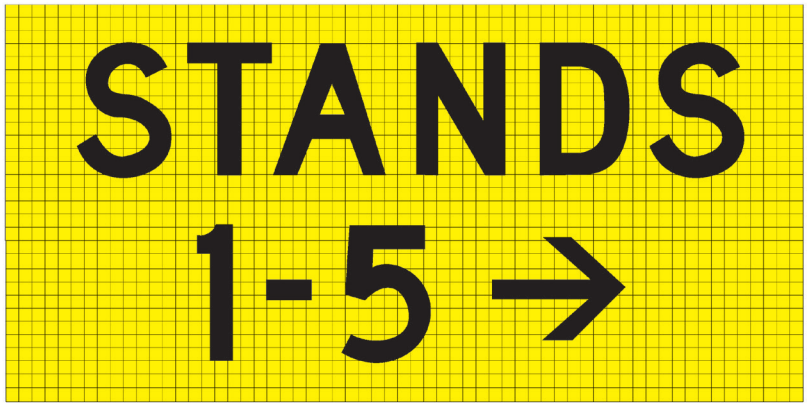
Notes:

1. The grid is shown only for the purpose of illustrating sign face and character proportions and should not show on a completed sign face.
2. For correct spacing between characters/symbols see table 7A.1.

Figure 7A.9 Sign face size proportions and layout continued



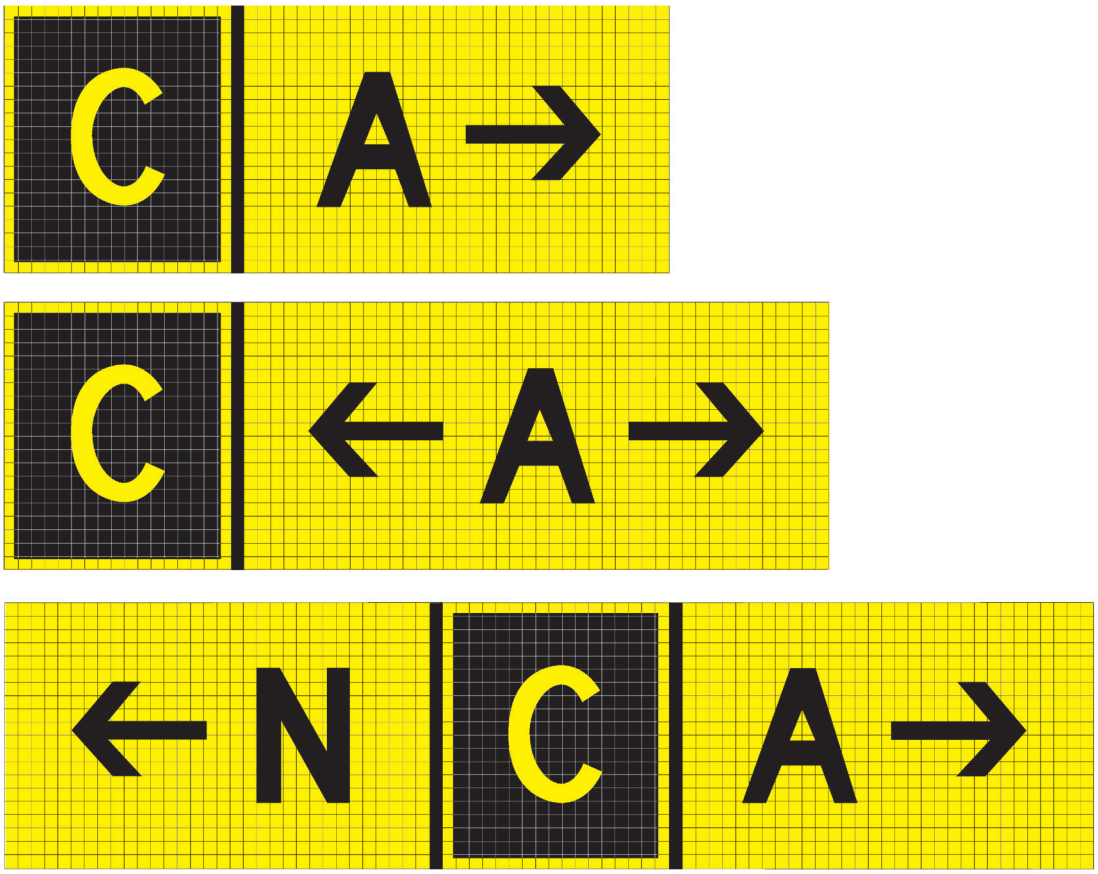
Where an information sign contains 10 or more characters, it may be constructed in the manner shown below, using 20cm letter height.



Notes:

1. The grid is shown only for the purpose of illustrating sign face and character proportions and should not show on a completed sign face.
2. For correct spacing between characters/symbols see table 7A.1.

Figure 7A.10 Sign face size proportions and layout



Notes:

1. The grid is shown only for the purpose of illustrating sign face and character proportions and should not show on a completed sign face.
2. For correct spacing between characters/symbols see table 7A.1.

APPENDIX 7B

Form and proportions of runway designator marking

1. This appendix details the form and proportions of the characters that should be used for runway designator marking drawn on a 5 mm grid in order to facilitate enlarging. The height of character to be employed is determined by the runway type and width and is listed at table 7.3. The spacing between characters is detailed at table 7B.1.

Table 7B.1 Runway designator marking – spacing between characters

Designator		Character height (m)		
1st character	2nd character	15	12	9
		Spacing (m)		
0	1	3.25	2.6	1.95
0	2–9	3.5	2.8	2.1
1	1	6.25	5	3.75
1	0,2–9	3.75	3	2.25
2	1	3.25	2.6	1.95
2	0,2–9	3.5	2.8	2.1
3	1	3.25	2.6	1.95
3	0,2–9	3.5	2.8	2.1

Figure 7B.1 Runway designator character dimensions – 15 m characters

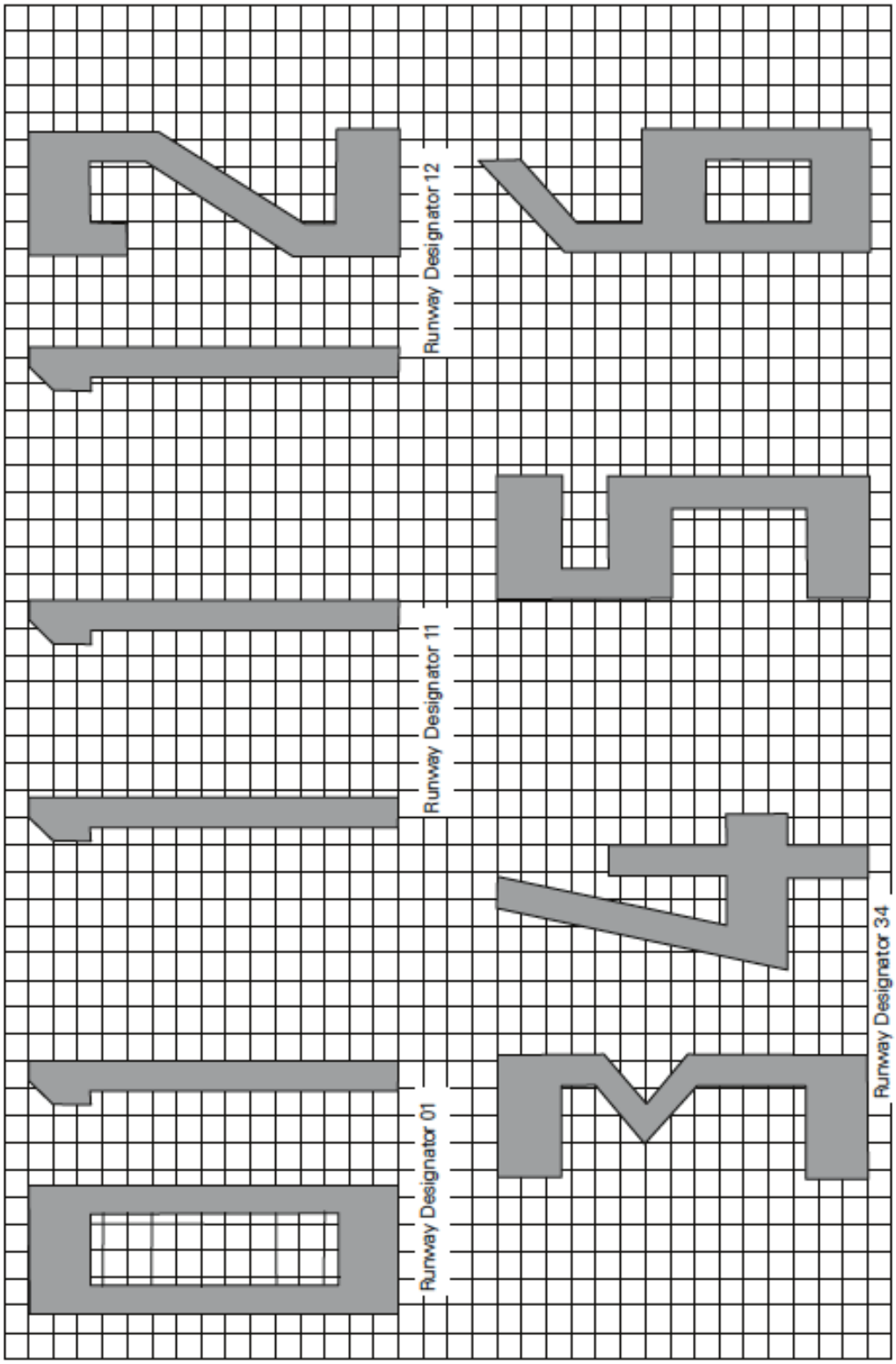
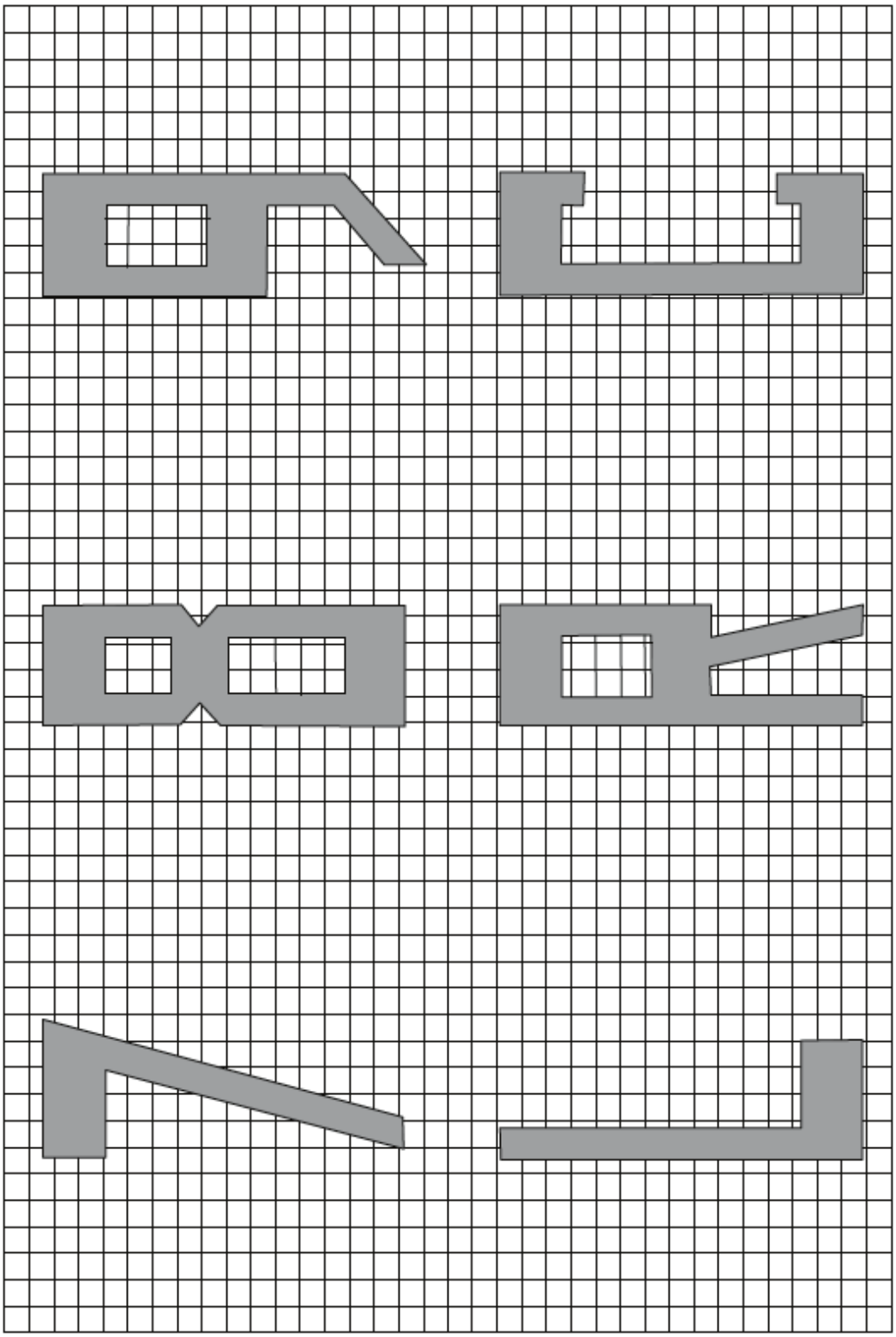


Figure 7B.2 Runway designator character dimensions – 15 m characters



APPENDIX 7C

Form and proportions of pavement

Information marking – taxiways and aprons

1. This appendix details the form and proportions of the letters and numbers that should be used for pavement information markings on taxiways and aprons, drawn on a 5 mm grid in order to facilitate enlarging. The characters and symbols may be enlarged to the desired size by any conventional process and will remain in proper proportion. To obtain characters of any height, divide the desired height in millimetres by 20 and use this value for size of the grid unit. For example, characters 2 m high will require a grid unit dimension of 100 mm. Similar means may be used to enlarge the symbols. Standard characters are twenty grid units high and five units wide. Horizontal strokes are three units deep. The space between characters should be two units, but optical spacing may be used. All characters having an arc at the top or bottom are extended slightly above or below the grid lines. An identical set of curves is used for 'B', 'D' and similar characters. Another identical set of curves is used for 'C', 'G', '2' etc.

2. The height of characters employed should be not less than 2 m and normally not more than 4 m.

3. Examples of surface painted signs are shown at figure 7C.6.

Figure 7C.1 Pavement markings

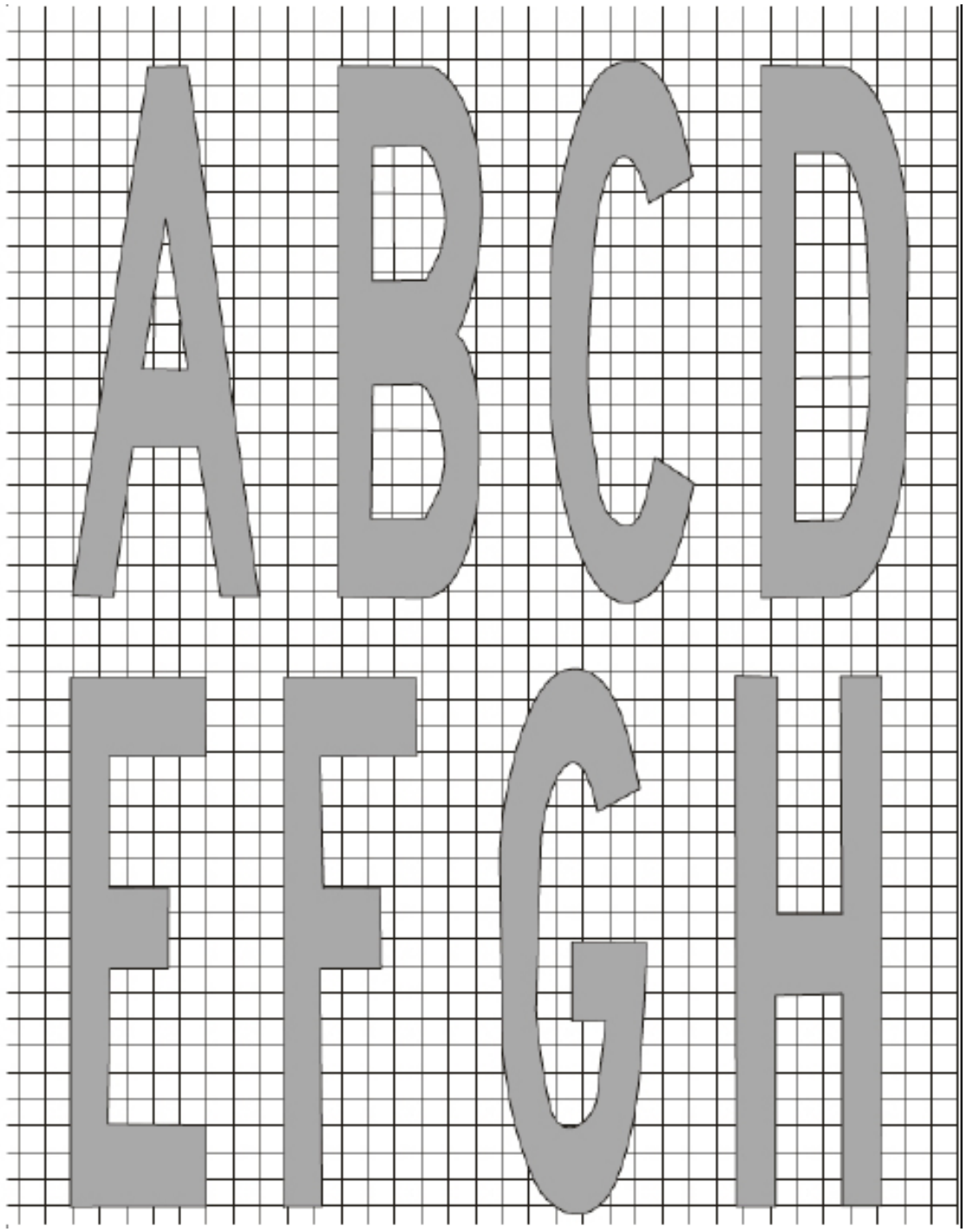


Figure 7C.2 Pavement markings

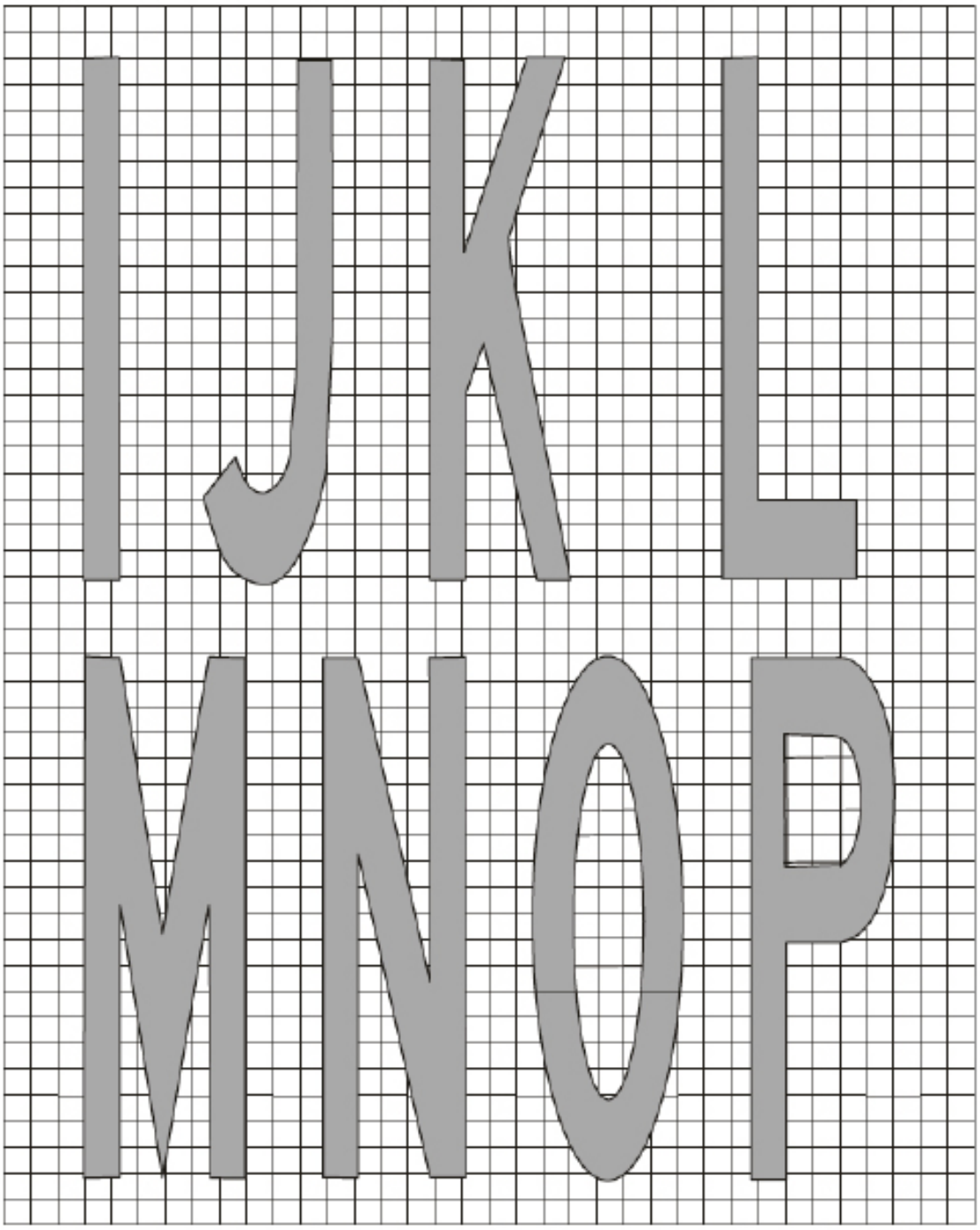


Figure 7C.3 Pavement markings

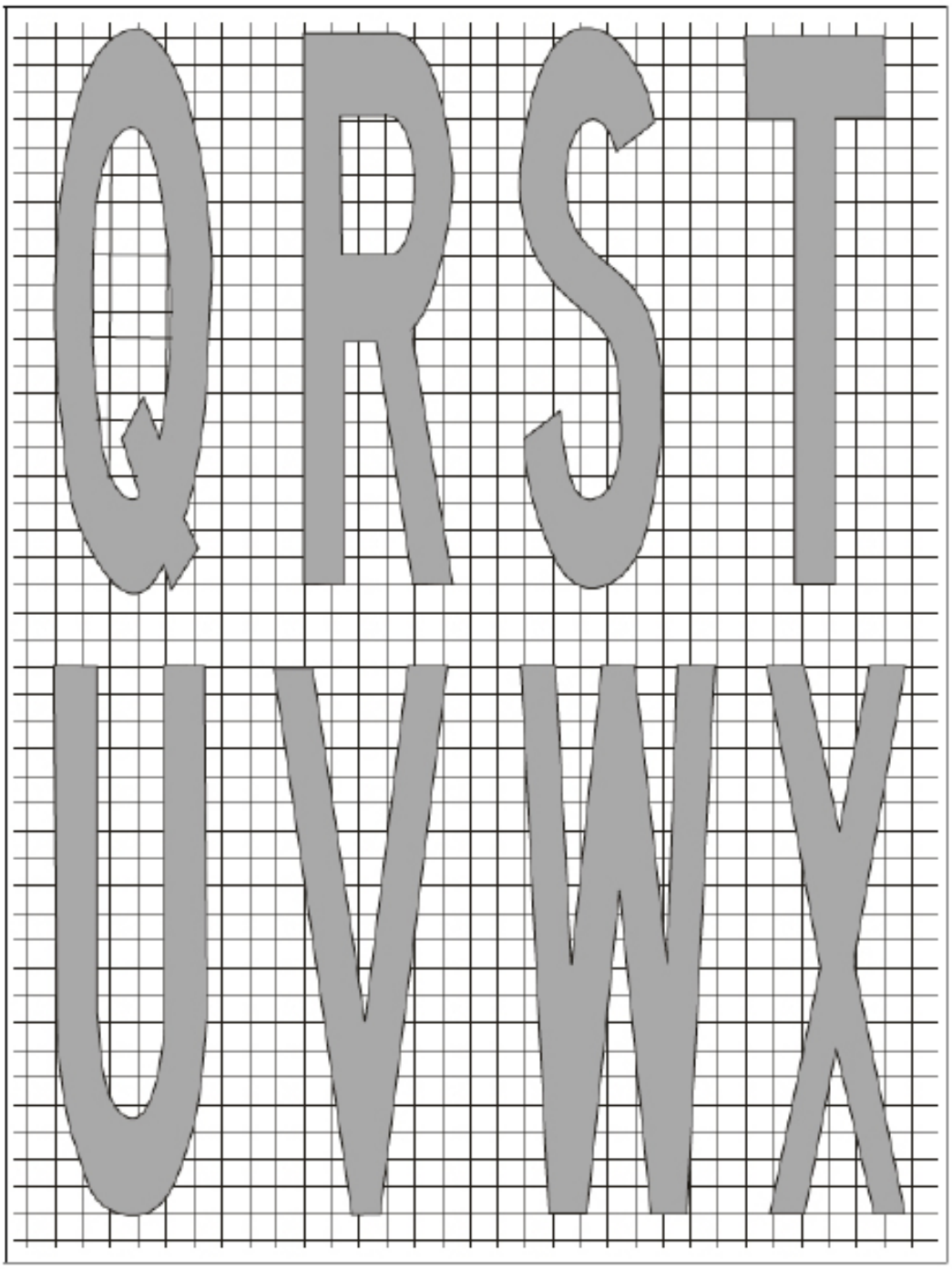


Figure 7C.4 Pavement markings

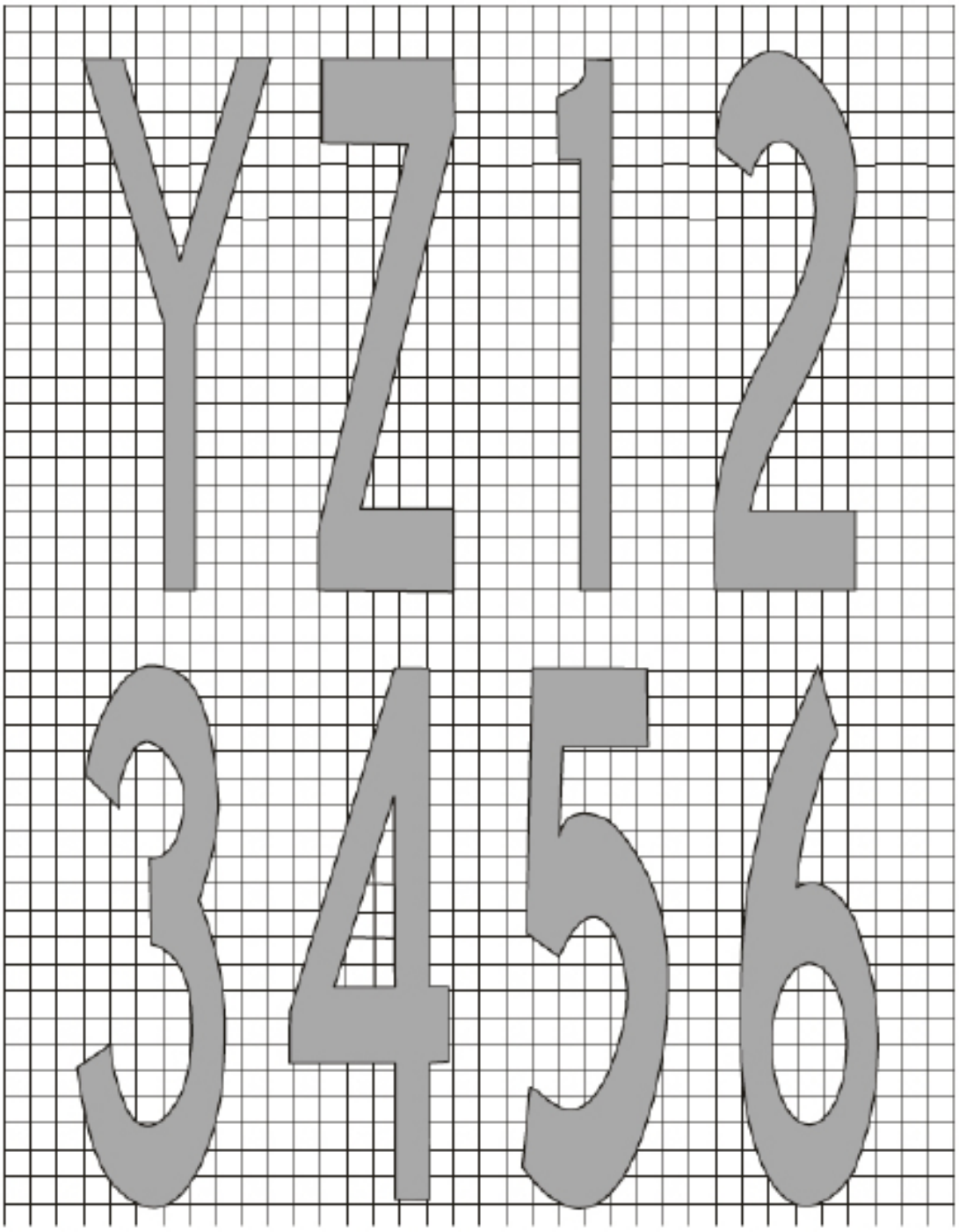


Figure 7C.5 Pavement markings

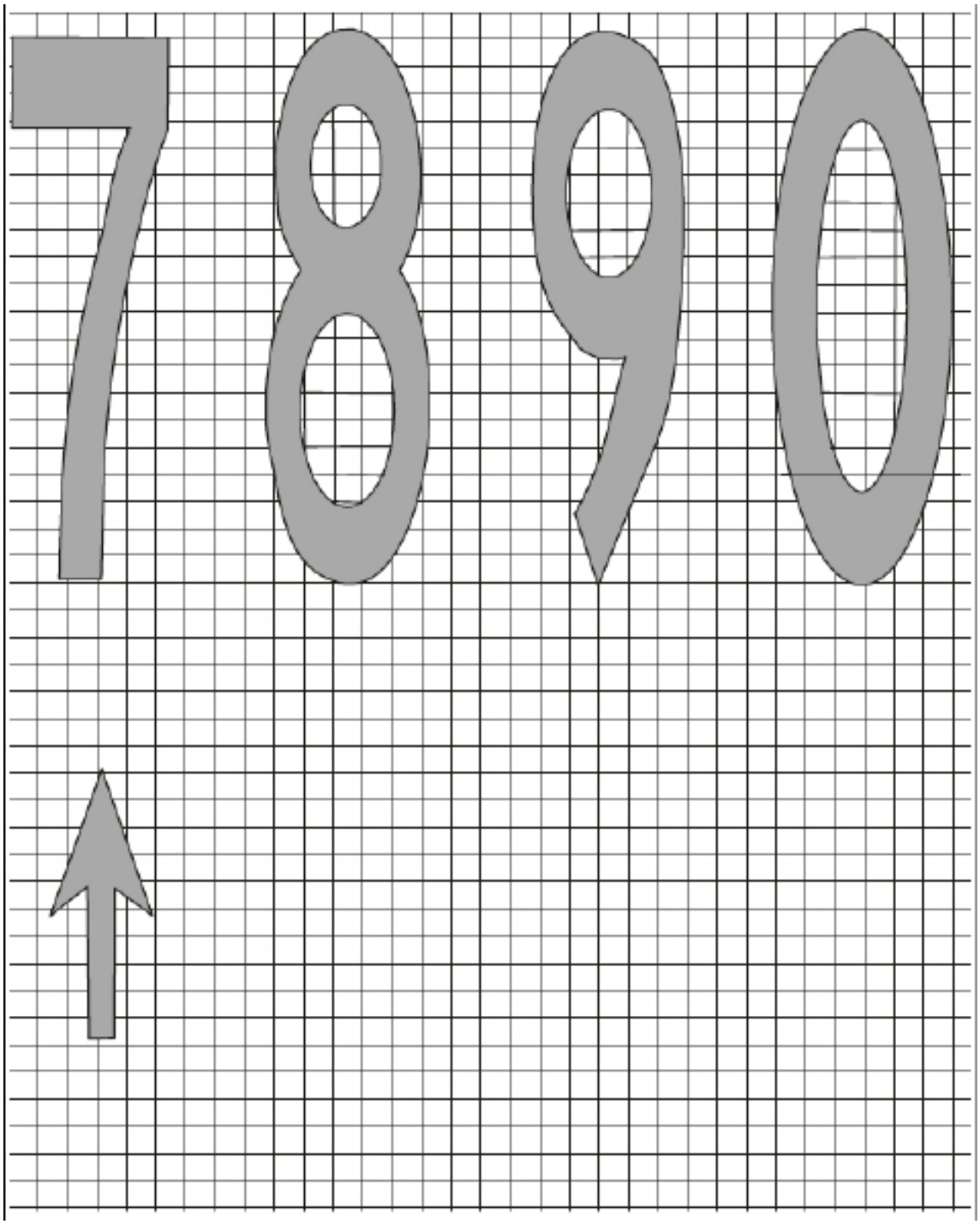
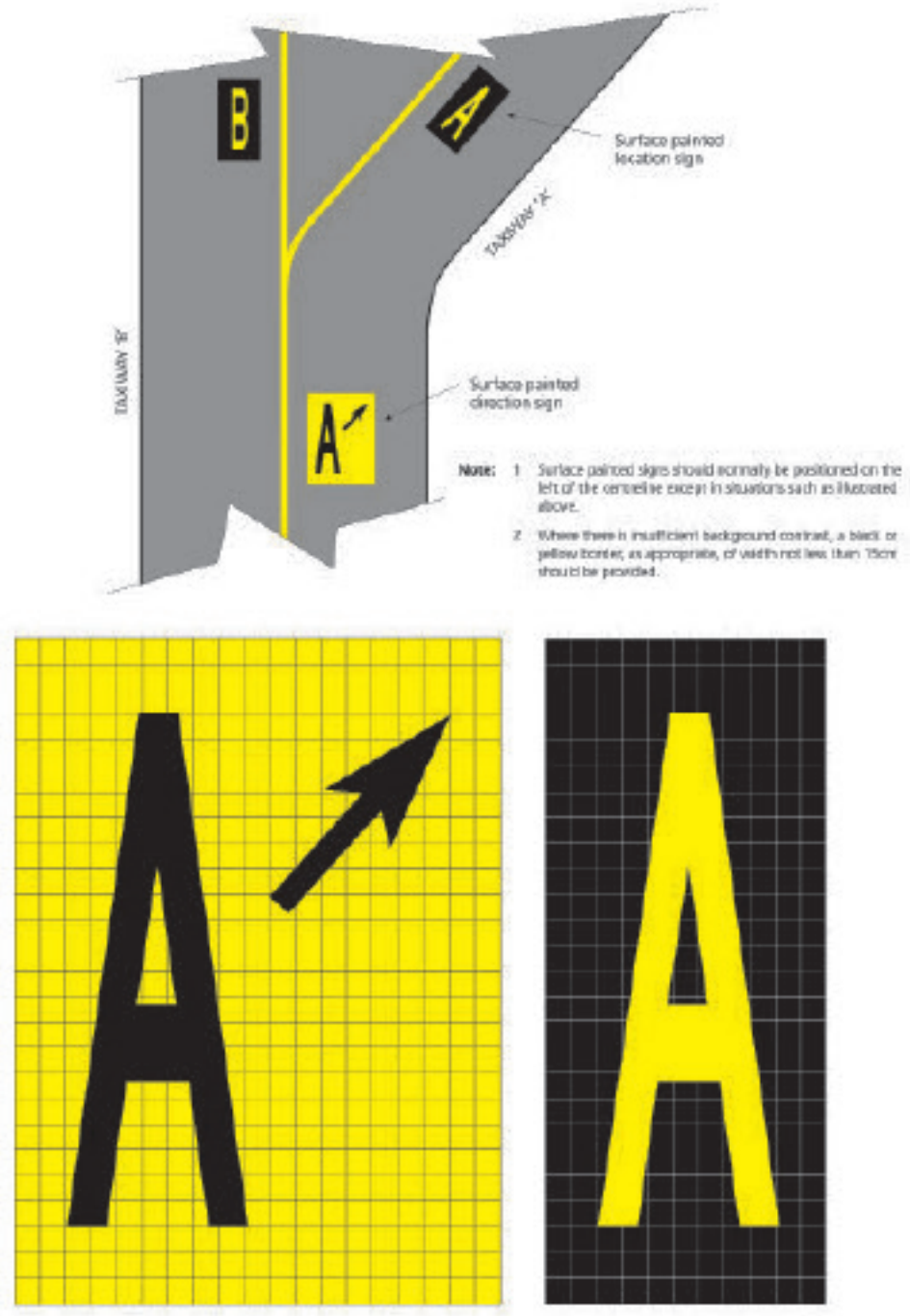


Figure 7c.6 Pavement markings for taxiways and aprons – examples of surface painted signs



Note: The grid is shown only for the purpose of illustrating sign size in relation to character proportions and should not show on the completed sign.

CHAPTER 8

Rescue and fire fighting service (RFFS)

Introduction

8.1 Condition 2 in the public use and ordinary aerodrome licences makes it mandatory for Aerodrome Operators to provide a Rescue and Fire Fighting Service (RFFS) appropriate to their aerodrome and as detailed in this chapter.

8.2 This chapter provides the minimum requirements relating to RFFS categories 3–10.

8.3 Requirements relating to helicopter categories H1-H3 are contained in appendix 8A. Requirements relating to RFFS category one and two are contained in appendix 8B. Requirements for RFFS category special and helicopter category special are contained in appendix 8C.

8.4 The objective of this chapter is to provide guidance to Aerodrome Operators on meeting CAA requirements relating to the establishment of a Rescue and Fire Fighting Service (RFFS) at a UK licensed aerodrome, and on ensuring the RFFS is capable of meeting ongoing regulatory requirements.

8.5 The scale and standards of RFFS including medical resources to be provided at licensed aerodromes in the United Kingdom accord with the International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs).

8.6 The Air Navigation Order (ANO) requires Aerodrome Operators to include in the aerodrome manual the scale of rescue, first aid and fire service facilities and the aerodrome emergency procedures. Guidance on the preparation and contents of the aerodrome manual is provided in chapter 2 of this CAP.

8.7 The effects on the environment of RFFS activities should be considered and mitigated wherever possible. The main areas of concern the RFFS should consider are water and media run-off, and air quality.

RFFS provision

8.8 Rescue and fire fighting equipment and services shall be provided at an aerodrome.

8.9 The level of protection normally available at an aerodrome should be expressed in terms of the category of the rescue and fire fighting services as described in table 8.1 and in accordance with the types and amounts of extinguishing agents normally available at the aerodrome.

8.10 The rescue and firefighting level of protection is appropriate to the aerodrome category determined using the principles in paragraphs 8.11 and 8.12 below except that where the number of movements (landing or take-off) of aeroplanes

performing passenger transportation in the highest category, normally using the aerodrome, is less than 700 in the busiest consecutive three months, the level of protection provided in accordance with paragraphs 8.11 and 8.12 below may be reduced by no more than one category below the determined one.

8.11 The aerodrome (RFFS) category shall be determined from table 8.1 and shall be based on the longest aeroplanes normally using the aerodrome and their fuselage width.

8.12 If, after selecting the category appropriate to the longest aeroplane's overall length, that aeroplane's fuselage width is greater than the maximum width in table 8.1 for that category, then the category for that aeroplane shall be one category higher.

Table 8.1 Aerodrome category for rescue and fire fighting

Aerodrome category (1)	Aeroplane overall length (2)	Maximum fuselage width (3)
3	12m up to but not including 18m	3m
4	18m up to but not including 24m	4m
5	24m up to but not including 28m	4m
6	28m up to but not including 39m	5m
7	39m up to but not including 49m	5m
8	49m up to but not including 61m	7m
9	61m up to but not including 76m	7m
10	76m up to but not including 90m	8m

8.13 The aerodrome operator, in order to assess whether the rescue and firefighting level of protection to be provided at the aerodrome is appropriate to the aerodrome rescue and firefighting category, should, at least annually, forecast the aeroplane traffic expected to operate at the aerodrome for the next twelve month period. Upon knowledge of planned changes to traffic volume and structure, additional assessments might be necessary. In doing so, the aerodrome operator may use all information available from aeroplane operators as well as statistics on aeroplane movements during the year preceding the day of the review.

8.14 During anticipated periods of reduced activity, the level of protection available shall be no less than that needed for the highest category of aeroplane planned to use the aerodrome during that time regardless of the number of movements.

8.15 Changes in the level of protection normally available at an aerodrome for rescue and fire fighting shall be notified to the appropriate air traffic services units and aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been

corrected, the above units shall be advised accordingly. Notification should be by radio and NOTAM.

8.16 A change should be expressed in terms of the new category of the rescue and fire fighting service available at the aerodrome.

8.17 Aerodrome Operators should develop contingency plans to limit the need for changes to the promulgated level of services. This may involve, for example, a preventative maintenance plan to ensure the mechanical efficiency of equipment and vehicles, and arrangements to cover unplanned leave and absence of the minimum level of RFF personnel including supervisory level.

8.18 The RFFS shall be provided throughout the hours a licensed aerodrome is available for use by aircraft engaged on flights required to use a licensed aerodrome and for 15 minutes after the departure of the last aircraft or until the aircraft has reached its destination, whichever is the shorter.

8.19 The level of protection required for all-cargo, mail, ferry, training, test, positioning and end-of-life aeroplane operations, including those carrying dangerous goods, irrespective of the number of movements, may be reduced in accordance with Table 8.1A as follows:

Table 81.A

Aerodrome category	RFF level of protection required
1	1
2	2
3	3
4	4
5	5
6	5
7	6
8	6
9	7
10	7

RFFS principal objective

8.20 The principal objective of a rescue and fire fighting service is to save lives. For this reason, the provision of means of dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome assumes primary importance because it is within this area that there are the greatest opportunities for saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an aircraft accident or incident, or at any time during rescue operations.

8.21 The most important factors bearing on effective rescue in a survivable aircraft accident are the training received, and the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.

8.22 Requirements to combat building fires and fuel farm fires, or to deal with foaming of runways are not taken into account.

Operational objective

8.23 The operational objective of the RFFS is to respond as quickly as possible to aircraft accidents and/or incidents in order to create maximum opportunity for saving life. Achievement of response times is dependent on the size of aerodrome, location of fire station(s) and disposition of vehicles and personnel at any given time.

8.24 The operational objective of the rescue and fire fighting service shall be to achieve a response time not exceeding three minutes to any point of each operational runway, in optimum visibility and surface conditions. The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding three minutes to any other part of the movement area in optimum visibility and surface conditions.

8.25 The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding two minutes to any point of each operational runway, in optimum visibility and surface conditions.

8.26 Response time is considered to be the time between the initial call to the rescue and fire fighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50% of the discharge rate specified in table 8.3.

Note: Optimum visibility and surface conditions are defined as daytime, good visibility, no precipitation with normal response route free of surface contamination e.g. water, ice or snow.

8.27 A response safe system of work includes a number of elements that must come together to deliver an effective and safe response. A comprehensive hazard and risk analysis should be conducted over the optimum response routes within the aerodrome boundary that RFFS vehicles are likely to use to achieve the operational objective. The analysis and system of work should consider:

- standard operating procedures
- call handling
- alerting system
- position of the fire station or standby area
- position of training area where a response may be made from

- suitable access roads and routes
- visibility and surface conditions
- a clear route
- vehicle performance
- vehicle maintenance
- effective equipment
- competent staff
- communications
- an effective safety culture
- effective leadership and incident command
- human factors
- monitoring and review including records

8.28 In assessing an effective response all of these areas will be scrutinised and reviewed. Aerodrome Operators should not focus on any one aspect in isolation in measuring effectiveness.

Continuous agent application

8.29 During flight operations, sufficient trained and competent personnel should be designated to be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. These trained personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration should also be given for personnel to use hand lines, ladders and other rescue and fire fighting equipment normally associated with aircraft rescue and fire fighting operations.

8.30 Any other vehicles required to deliver the amounts of extinguishing agents specified in table 8.3 should arrive no more than one minute after the first responding vehicle(s) so as to provide continuous agent applications.

Minimum levels of personnel

8.31 In determining the number of personnel required to provide for rescue and fire fighting , consideration should be given to the types of aircraft using the aerodrome.

8.32 In determining the minimum number of rescue and fire fighting personnel and supervisory levels required, a Task Resource Analysis (TRA) should be completed and the level of staffing and qualification promulgated in, or referenced to, the aerodrome manual. CAP 1150 should be referred to for additional guidance

8.33 The objective of providing an adequate level of competent personnel is to have available sufficient staff at all responsibility levels to ensure that:

- the RFFS is capable of achieving the Principal Objective;
- all vehicles and equipment can be operated effectively and safely;
- continuous agent application at the appropriate rate(s) can be fully maintained;
- sufficient supervisory grades can implement an Incident Command System;
- the RFFS elements of the aerodrome emergency plan can be effectively achieved.

8.34 The minimum staffing and supervisory levels resulting from the analysis should be detailed in the aerodrome manual.

8.35 The Aerodrome Operator shall develop and implement a training programme to ensure that RFFS personnel are competent in their task and role.

8.36 Aerodrome Operators are, or should designate a person who is, responsible for the overall control and management of the aerodrome RFFS, and this person should adopt the role of fire service manager. The RFFS management structure should provide for a competent person to take command of an emergency response throughout the promulgated hours of operation.

8.37 RFFS personnel should be identified by markings in accordance with the National Incident Command System. The officer in charge of the aerodrome RFFS should wear a conspicuous coloured tunic or tabard in order to become distinguishable from the local authority fire officer.

8.38 To produce foam or other extinguishing agent on the move there should be a driver and a monitor operator.

Extraneous duties

8.39 No extraneous duty should create conditions likely to compromise individual or crew performance or introduce additional hazards. RFFS personnel designated as part of the minimum level for response, and who are engaged on extraneous duties, shall be capable of meeting the response time objective while carrying out those duties. It is not considered reasonable to require personnel designated as part of the minimum riding strength to be engaged on duties involving the handling of fuel.

Medical standards

8.40 The objective of requiring medical assessments for aerodrome RFFS personnel is to ensure an acceptable standard for the fitness of personnel likely to be engaged in operational duties.

8.41 Aerodrome Operators are advised to determine an appropriate medical standard to be met by personnel employed as aerodrome fire fighters. Aerodrome

Operators should ensure that initial and ongoing medical assessment is conducted by a competent organisation.

RFFS training

8.42 All rescue and fire fighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the types of aircraft and the type of rescue and fire fighting equipment in use at the aerodrome, including pressure-fed fuel fires. Pressure-fed fuel fires can be either hydrocarbon or liquefied petroleum gas(LPG) and the training facilities should be commensurate with the risks.

8.43 Where LPG is used for live fire drills, provision should also be made for RFFS personnel to periodically practice the application of the types of extinguishing agent available at the aerodrome onto a hydrocarbon liquid fire.

8.44 The frequency of live fire drills, and the periodic application of firefighting agent to control and extinguish a hydrocarbon liquid fire, should be determined through a suitable training needs analysis.

8.45 RFFS personnel should receive appropriate initial and regular comprehensive recurrent training appropriate to their role and task to maintain the skills necessary to ensure that RFFS equipment can be put to use effectively. Guidance on developing and implementing an RFFS training programme can be found in CAP 699, Framework for the Competence of Rescue and Fire Fighting Service (RFFS) Personnel.

8.46 The rescue and fire fighting personnel training programme shall include training in human performance, including team co-ordination as set out in CAP 699.

Equipment

8.47 Rescue equipment commensurate with the level of aircraft operations should be provided on the rescue and fire fighting vehicle(s) and be based on the task and resource analysis.

8.48 All responding rescue and fire fighting personnel shall be provided with personal protective equipment to enable them to perform their duties in an effective manner.

8.49 Account should be taken of the Provision and Use of Work Equipment Regulations (PUWER) and the Personal Protective Equipment at Work Regulations which require that equipment is:

1. suitable for the intended use;
2. safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case;
3. used only by people who have received adequate information, instruction and training; and

4. accompanied by suitable safety measures, e.g. protective devices, markings, warnings.

8.50 Guidance on the rescue equipment to be provided at an aerodrome is given in the ICAO Airport Services Manual, Part 1.

8.51 Records of all tests and inspections shall be maintained by the Aerodrome Operator for a period of five years. The records should include details of consequential action where an inspection has revealed a defect or deficiency.

Appliances

8.52 The objective is to design and procure appliance(s) that are fit for the purpose for which they are required.

8.53 The minimum number of foam-producing vehicles shall not be less than that set out in table 8.2

8.54 Guidance on minimum characteristics of RFFS vehicles is given in the ICAO Airport Services Manual Part 1, which also gives guidance on procurement: procurement should be based on a formal specification process that provides a phased approach and considers the preliminary preparation of specification, and additional contractual considerations.

Table 8.2 Minimum number of RFFS appliances/vehicles

Aerodrome category	3	4	5	6	7	8	9	10
Minimum number of foam producing vehicles	1	1	1	2	2	3	3	3

8.55 A system of preventative maintenance of rescue and fire fighting vehicles should be employed to ensure effectiveness of the equipment and compliance with the specified response time throughout the life of the vehicle.

Minimum useable amounts of extinguishing agents								
	Foam meeting performance level A		Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Aerodrome category (1)	Water (L) (2)	Discharge rate foam solution (L/min) (3)	Water (L) (4)	Discharge rate foam solution (L/min) (5)	Water (L) (6)	Discharge rate foam solution (L/min) (7)	Dry chemical powders (kg) (8)	Discharge rate (kg/sec) (9)
3	1 800	1 300	1 200	900	820	630	135	2.25
4	3 600	2 600	2 400	1800	1 700	1 100	135	2.25
5	8 100	4 500	5 400	3 000	3 900	2 200	180	2.25
6	11 800	6 000	7 900	4 000	5 800	2 900	225	2.25
7	18 200	7 900	12 100	5 300	8 800	3 800	225	2.25
8	27 300	10 800	18 200	7 200	12 800	5 100	450	4.5
9	36 400	13 500	24 300	9 000	17 100	6 300	450	4.5
10	48 200	16 600	32 300	11 200	22 800	7 900	450	4.5

Notes:

the quantities of water shown in columns 2, 4 and 6 are based on the average overall length of aeroplanes in a given category

See paragraphs 8.64, 8.65, 8.72, 8.75, 8.76, 8.77, 8.78 and 8.79

8.56 At aerodromes where operation by aeroplanes larger than the average size in the given category are planned, the quantities of water should be recalculated and the amount of water for foam production and the discharge rates for foam solution should be increased accordingly. Additional guidance is available in chapter 2 of the ICAO Airport Services Manual, Part 1. In addition to the above the following should be taken into account:

1. Where the level of protection is reduced in accordance with 8.10 above, a recalculation of quantities of extinguishing agents should be carried out based on the largest aeroplane in the reduced category;
2. For all-cargo, mail, training, test, positioning and end-of-life aeroplane operations, including those carrying dangerous goods, the recalculation of extinguishing agents should be based on the largest aeroplane in the category specified in Table 8.1A above.

Extinguishing agents

8.57 The objective of an extinguishing agent is to extinguish/suppress a fire on which it is applied. Principal agents are provided for permanent control, i.e. for a period of several minutes or longer. Complementary agents may provide rapid fire suppression but generally only offer a transient control, which is available during application. The ICAO Critical Area Concept is not intended to ensure extinguishment of the entire fire, it seeks to control only the area of fire adjacent to the fuselage. The objective is to safeguard the integrity of the fuselage and maintain tolerable conditions for its occupants.

8.58 Both principal and complementary agents should normally be provided at an aerodrome.

Principal extinguishing agents

8.59 The principal extinguishing agent should be:

1. a foam meeting the minimum performance level A; or
2. a foam meeting the minimum performance level B; or
3. a foam meeting the minimum performance level C; or
4. a combination of these agents

except that the principal extinguishing agent for aerodromes in categories 1 to 3 shall meet the minimum performance level B or C.

8.60 The required quantities of extinguishing agents shall be in accordance with the aerodrome category, determined by tables 8.1, 8.2, and 8.3 and shall be available for immediate discharge from RFFS appliances.

8.61 For RFFS Categories 3-10, the discharge rates for foam shall be met using vehicle monitor(s).

8.62 Where different types of extinguishing agents are used on an aerodrome, care must be taken to ensure that incompatible types are kept apart, and stored in accordance with manufacturer's guidance.

8.63 Alternative principal extinguishing agents which are not defined in the ICAO Airport Services manual (ASM) Part 1, will require evidence that demonstrates the agent achieves an equivalent level of performance.

8.64 The quantity of foam concentrates separately provided on vehicles for foam production shall be in proportion to the quantity of water provided and the foam concentrate selected.

8.65 The amount of foam concentrate provided on a vehicle should be sufficient to produce at least two loads of foam solution.

8.66 When a combination of different performance level foams are provided at an aerodrome, the total amount of water to be provided for foam production should be calculated for each foam type and the distribution of these quantities should be documented for each vehicle and applied to the overall rescue and fire fighting requirement.

8.67 The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m2 for a foam meeting performance level A, 5.5 L/min/m2 for a foam meeting performance level B and 3.75L/min/m2 for a foam meeting performance Level C.

Worked example:

8.68 An RFFS Category 6 aerodrome, using performance level B foam, is required to have two appliances with a total of 7,900 litres of water and 948 litres of foam concentrate (two shots). It is also required to have 1,896 litres of foam concentrate in reserve (200% of 948). The total foam concentrate required on the aerodrome is 2,844 litres.

8.69 It actually has two appliances with 5,000 litres of water and 600 litres (2 x 300) of foam concentrate on each vehicle and 1,644 litres of foam concentrate in reserve, making its total 2,844 litres.

Note: By distributing its foam concentrate in this way it enables the vehicles to run with full tanks avoiding any free space which could upset the vehicle handling characteristics.

Complementary extinguishing agents

8.70 The complementary extinguishing agent should be a dry chemical powder suitable for extinguishing hydrocarbon fires, or any other alternative agent having equivalent firefighting capability.

8.71 The complementary agents should comply with the appropriate specifications of the International Organisation for Standardisation (ISO).

8.72 A quantity of gaseous agent or CO_2 shall be provided for use on small or hidden fires. A minimum extinguisher size is 5 kg for major and 2 kg for smaller vehicles.

8.73 Systems should be capable of delivering the agent through equipment which will ensure its effective application.

8.74 The discharge rate of complementary agents should be not less than the values shown in Table 8.3

8.75 If a 'high performance' dry powder is used it may be permissible to reduce the amount provided.

8.76 If an aerodrome operator wishes to reduce the quantity of dry powder provided (as outlined in 8.75 above) they must apply to CAA for such a concession. The application must be supported by an assessment that shows how the aerodrome operator is assured that the lower quantity of dry powder can provide an equivalent level of fire extinguishing performance for the types of fires where the agent is expected to be used.

Reserve supply of agents

8.77 A 200% reserve of foam concentrate and 100% of complementary agents and propellant gas shall be available at the aerodrome.

8.78 Extinguishing agent quantities designated as reserve should be held in any appropriate manner which easily allows vehicles to be replenished promptly (including on vehicles themselves).

8.79 Agent carried on appliances in excess of the minimum quantities can contribute to the reserve.

8.80 Where a major delay in the replenishment of the supplies is anticipated, the amount of reserve supply should be increased as determined by a risk assessment.

Storage of extinguishing agents

8.81 In addition to any statutory or legal requirements, consideration should be given to:

1. avoiding prolonged or extreme storage conditions;
2. regular inspection and testing;
3. keeping of log books and records;
4. manufacturers' recommended service and test intervals.

8.82 Where different generic types of extinguishing agents are used on the aerodrome, care must be taken to ensure that incompatible types are kept apart and care is exercised when these have to be used simultaneously against fires (e.g. powders and foams). In particular, the mixing of different types of foam concentrate may lead to serious sludging and possible malfunctioning of vehicle

foam production systems. If it is necessary to change the concentrate type carried on a vehicle, it is essential that the manufacturers of the concentrate and the vehicle are consulted for guidance to ensure that all parts of the foam system are thoroughly cleaned prior to the new concentrate being used. This is vital to prevent any damage to foam systems or detrimental foam performance caused by the inadvertent mixing of incompatible foam concentrate types.

8.83 For extinguishing agents that have a certificate of conformity and have remained sealed and stored according to manufacturer's guidance, a test to assess condition is not required within their shelf life unless the manufacturer's guidance recommends it.

8.84 Any stocks of fire extinguishing agents, such as foam concentrates held in bulk tanks, including appliance tanks, and drums where the seal has been broken, should be assessed for continued satisfactory performance by taking samples from each batch and having these analysed at regular intervals by a competent person. (By way of guidance, the measurement of those physical and chemical properties determined as being important during the selection phase using methods outlined in national standards will be appropriate).

8.85 Aerodrome Operators should ensure that suppliers of fire extinguishing media provide a certificate of assurance for each batch to the effect that the media supplied meets all requirements of para 8.101 and any supplementary conditions agreed with themselves prior to the occasion of the first purchase (e.g. suitability for use in premixed form). Material Safety Data Sheets should be used to determine the best practice with respect to hazards, use, storage and disposal of extinguishing agents.

Foam production performance testing

8.86 It is essential that the foam produced by an RFFS vehicle, or other such appliance, is of an acceptable quality and the delivery parameters such as monitor jet range and pattern meet and are maintained to the appropriate operational requirement.

8.87 In order to ensure that foam production by an RFFS vehicle is of an acceptable standard a Foam Production Performance Test (i.e. an 'Acceptance Test') should be carried out:

1. when a RFFS vehicle is first acquired by the Aerodrome Operator for operational use at an aerodrome. (Acquisition may mean the new or second-hand purchase, leasing or hire of a RFFS Vehicle);
2. when significant maintenance, refurbishment or component replacement has been undertaken on a RFFS vehicle that could effect a change in the foam quality or production performance of the foam-making system. This includes a change of foam-making branches, nozzles or monitors. Only those

parts of the system that could have been affected by the work undertaken or the component change need to be tested.

8.88 The Foam Production Performance Test should confirm the following:

1. the induction percentage for all foam-making devices. (If the foam production system is fitted with an Induction Monitoring System, the test results obtained from analysis of the foam sample should correspond with those provided with the monitoring system, i.e. check for correct calibration and accuracy of induction monitoring system). Induction can be checked using water instead of foam;
2. the expansion ratio of all foam-making devices;
3. the quarter drainage time of all foam-making devices;
4. the jet range of the main monitor;
5. the spray pattern of the main monitor.

8.89 The test should be carried out to confirm the performance against a specification based on ICAO Airport Services manual (Doc 9137), Part I - Rescue and Fire Fighting, chapter 8, and should be conducted to an appropriate standard.

8.90 For vehicles equipped with foam monitors capable of producing foam while on the move, the tests shall include an assessment of this capability. Where both a high and low discharge capability has been provided on larger monitors, this provision should be tested in line with manufacturer's guidance.

8.91 For systems designed to induce at 6%, induction should be in the range 5% to 7% at the optimum working conditions. For systems designed to induce at 3%, the range is 3% to 4% and for 1% systems, the range is 1% to 1.1%. Pre-mixed foam systems shall have foam concentrate introduced to within a tolerance of 1.0 to 1.1 times the manufacturer's desired induction rate. Care should be taken in the use of freeze point depressants where pre-mixed foam systems are exposed to low temperatures, since excessive amounts of additives may have adverse effects on fire extinguishing performance.

In-service test

8.92 The in-service test should be conducted:

1. to ensure the ongoing capability of the foam production system;
2. at least every 12 months.

8.93 Once the foam production system has been fully tested, and assuming no changes have been made, the in-service testing shall consist of periodic checks to ensure induction accuracy.

8.94 The most effective method of continually assuring the induction accuracy is for the vehicle to be fitted with a monitoring device which:

1. monitors the induction percentage;
2. records the dates and percentage inductions of foam concentrate;
3. has an alert if the induction rate goes outside set parameters.

8.95 The frequency of the in-service tests should be determined and conducted in conjunction with the vehicle maintenance provider. The foam specimen for checking the induction percentage can be collected during normal procedural 'spot' tests or training. The most common method of conducting such a test is by using a refractometer; however, other methods are available.

8.96 Pre-mixed foam units shall be maintained and hydraulically pressure tested in accordance with the intervals set by manufacturer's guidance. Only foam concentrates suitable for use in pre-mixed form shall be used in these kinds of pressure vessels.

Foam properties

8.97 Expansion ratio: the amount of air entrained into a foam stream governs its expansion, which in turn may affect the fluidity of the finished foam and therefore the rate of spread over the surface of burning fuels. The expansion of a representative sample of the foam blanket produced should be no less than 6:1, a value between 8:1 and 12:1 being preferred.

8.98 Drainage time: the rate at which foam solution drains from a foam blanket may be a partial consideration in that foam blanket's efficiency in progressively controlling and extinguishing fires and subsequent post-fire security. Some guidance regarding an appropriate level of post-fire security provided by a finished foam blanket may be derived from experience of carrying out the ICAO fire tests. The time taken for the drainage of 25% of the foam solution from a representative sample of the foam blanket produced should be at least three minutes, and preferably more than five minutes. Any use of non-aspirated foam may need to be quickly supplemented by using aspirating foam to achieve a foam blanket of satisfactory stability.

8.99 Certain combinations of types of foam concentrate and branchpipes may be found to perform differently from others. Care should be taken during the selection process to ensure that the optimum combination of foam and equipment is chosen.

Foam performance levels and specifications

8.100 Foam concentrates used to provide the extinguishing agents quantities listed at table 8.3 are required to meet either performance level A, B or C as designated by ICAO in the airport services manual (Doc 9137), Part I – Rescue and Fire Fighting, chapter 8. The performance level A, B or C is to be certificated by a recognised, accredited third party testing authority.

8.101 Training foams do not comply with any recognised national or international standards; however, they will be quality assured by the manufacturer. They may be formulated to mimic the operational foams for induction, drainage and expansion properties; however, their fire fighting properties may be reduced. Personnel must understand this feature of training foams before they are used. Care should be taken to prevent confusion between the storage and use of training foams with their operational counterparts. Where the manufacturer can demonstrate that the training foam produces identical test results to those expected to be obtained by the operational fire fighting foam, it may be used to conduct the foam production performance and in-service tests.

8.102 The management of training foam should be in line with operational foam as set out in this chapter.

Provision of additional water supplies at licensed aerodromes

8.103 Supplementary water supplies, for the expeditious replenishment of rescue and fire fighting vehicles at the scene of an aircraft accident, should be provided.

8.104 The objective of providing additional water supplies at adequate pressure and flow is to ensure rapid replenishment of aerodrome RFFS vehicles. This supports the principle of continuous application of extinguishing media to maintain survivable conditions at the scene of an aircraft accident for far longer than that provided for by the minimum amounts of water set out in table 8.3.

8.105 Additional water to replenish vehicles may be required in as little as five minutes after an accident; therefore, Aerodrome Operators should conduct an analysis to determine the extent to which it, and its associated storage and delivery facilities, should be provided.

8.106 The aerodrome should consult closely with the local authority fire and rescue service when conducting this analysis, and the following factors are among those items which should be considered (but not limited to):

- sizes and types of aircraft using the aerodrome
- the capacities and discharge rates of aerodrome fire vehicles
- the provision of strategically located hydrants
- the provision of strategically located static water supplies
- utilisation of existing natural water supplies
- vehicle response times
- historical data of water used during aircraft accidents
- the need and availability of supplementary pumping capacity
- the provision of additional vehicle-borne supplies
- the level of support provided by local authority emergency services

- the pre-determined response of local authority emergency services
- fixed pumps where these may provide a rapid and less resource-intensive method of replenishment
- additional water supplies adjacent to airport fire service training areas
- overhead static water supplies
- foam concentrate compatibility

Fire station(s)

8.107 All rescue and fire fighting vehicles should normally be housed in a fire station.

8.108 Satellite fire stations should be provided whenever the response time cannot be achieved from a single fire station.

8.109 The fire station should be located so that the access for rescue and fire fighting vehicles into the runway area is direct and clear, requiring a minimum number of turns.

8.110 Guidance on the design and construction of fire stations can be found in ICAO Airport Services manual, Part 1 - Rescue and Fire Fighting.

Communications and alerting systems

8.111 A discrete communication system should be provided linking a fire station with the control tower, any other fire station on the aerodrome and the rescue and fire fighting vehicles.

8.112 An alerting system for rescue and fire fighting personnel, capable of being operated from that station, should be provided at a fire station, any other fire station on the aerodrome and the aerodrome control tower.

8.113 Communications equipment provided should ensure effective two-way communication between parties with an effective range that ensures reception within all areas that the RFFS may be required to operate in.

8.114 Radio facilities to enable the RFFS to communicate with responding Local Authority Fire Services shall be provided.

8.115 A method of monitoring the movement area for the purpose of alerting and deploying the RFFS without delay shall be provided.

8.116 Equipment to provide effective communication between vehicle drivers and foam monitor operators shall be provided.

8.117 Radio equipment to enable fire officers to maintain communications when not in their vehicles shall be provided.

8.118 Radio telecommunications (RTF) equipment shall be provided to enable the airport fire officer(s) to communicate with the aircraft flight deck. An aeronautical radio frequency, 121.600 MHz, is to be used for this purpose. All RTF

communications on this frequency shall be recorded on suitable equipment that has the capability to identify the time the communication took place. Procedures shall be in place to store recordings on archival media for a minimum period of 30 days from the date of the last recorded message. The CAA and Air Accident Investigation Branch (AAIB) may require access to the recordings.

8.119 To use 121.600 MHz, the RFFS must obtain prior approval to install and operate radio equipment from the relevant licensing authority. The use of 121.600 MHz is limited to direct communications between the fire officer and pilot when the aircraft is on the ground and only within the period of a declared emergency.

Difficult environs, the 1000 m area and access roads

8.120 Where an aerodrome is located close to water/swampy areas, or difficult terrain, and where a significant portion of approach or departure operations takes place over these areas, specialist rescue services and fire fighting equipment appropriate to the hazard and risk shall be available.

8.121 Emergency access roads should be provided on an aerodrome where terrain conditions permit their construction, so as to facilitate achieving minimum response times. Particular attention should be given to the provision of ready access to approach areas up to 1000 m from the threshold, or at least within the aerodrome boundary. Where a fence is provided, the need for convenient access to outside areas should be taken into account.

8.122 An assessment of the approach and departure areas within 1000 m of the runway threshold should be carried out to determine the options available for intervention. In considering the need for any specialist rescue and access routes, the following should be considered:

- the environment of the risk area, in particular the topography and composition of the surface
- the physical hazards and associated risks that exist within the area
- the options for access and for rescue and fire fighting purposes
- changes to the response area, e.g. tidal, seasonal
- the hazards, risks and control measures of the options for rescue
- the use of external services
- an analysis of the advantages and disadvantages of the options
- policies and procedures to define and implement standards
- competence standards to match the above
- monitoring and review of the capability

8.123 Aerodrome Operators should ensure the development of special procedures and availability of equipment to deal with accidents that may occur in these areas.

These facilities need not be located on, or provided by, the aerodrome if they can be made available by off-aerodrome agencies as detailed in the aerodrome emergency plan.

8.124 Where RFFS vehicles respond to incidents using the public highway, an assessment of the implications of such a response should be carried out. The following should be considered:

1. the legal requirements for vehicles and drivers
2. that suitable policies and procedures are in place
3. competence and training requirements for drivers
4. pre-planning of routes for suitability
5. the monitoring and review of such responses

8.125 Emergency access roads should be capable of supporting the heaviest vehicles that will use them, and be usable in all weather conditions. Roads within 90 m of a runway should be surfaced to prevent surface erosion and the transfer of debris to the runway. Sufficient vertical clearance should be provided from overhead obstructions for the largest vehicles.

8.126 When the surface of the road is indistinguishable from the surrounding area, or in areas where snow may obscure the location of the roads, edge markers should be placed at intervals of about 10 m.

8.127 With regard to access, Aerodrome Operators should consider the following:

1. providing direct access to the operational runway(s);
2. designating access routes to the response area;
3. the maintenance of roads and access routes;
4. eliminating the possibility of any vehicle blocking the progress of responding emergency vehicles;
5. taking account of the gross weight and maximum dimensions of the RFFS vehicle(s) expected to use them;
6. that roads are capable of being traversed in all conditions;
7. exit gates or frangible sections in the security fence;
8. exit points will need to be clearly identified. Retro-reflective tape or markers will be of assistance where the aerodrome may need to be accessible during the hours of darkness or conditions of low visibility;
9. any delethalisation requirements;
10. providing sufficient vertical clearance from overhead obstructions for the largest vehicle.

Maintaining the response capability in low visibility conditions

8.128 To meet the operational objective as nearly as possible in less than optimum conditions of visibility, especially during low visibility operations, suitable guidance, equipment and/or procedures for rescue and fire fighting services should be provided.

8.129 RFFS vehicles should approach any aircraft accident by the quickest route commensurate with safety, although this might not necessarily be the shortest distance to the scene. Traversing through unimproved areas can take longer than travelling a greater distance on paved surfaces, therefore a thorough knowledge by RFFS personnel of the topography of the aerodrome and its immediate vicinity is fundamental. The use of grid maps and careful selection of routes is essential for success in meeting the response objective.

8.130 RFFS vehicles should be equipped with an airfield chart clearly showing all taxiways, runways, holding points and vehicle routes marked with their appropriate designation. The chart(s) should be accompanied by written instructions clearly detailing the action that the driver should take in the event that the vehicle should break down or that the driver should become unsure of the vehicle's position on the aerodrome.

8.131 Consideration should be given to the provision and use of technical equipment, e.g. surface movement radar, infrared vision systems, taxiway centreline lighting, vehicle positioning equipment and other navigation aids that could enhance RFFS response to the location of an accident site in low visibility conditions.

8.132 Once low visibility operations have been initiated it may be necessary to restrict the operation of vehicles and persons in the aircraft manoeuvring area. Procedures developed for ATC to assist the RFFS in case of an accident or incident should be initiated.

8.133 RFFS and associated external emergency response personnel should be made aware of the existence of any areas that may from time to time become impassable because of weather or other conditions, and of the location of obstacles both permanent and temporary.

8.134 Operational procedures should be developed through which ATC stop or divert all aircraft and non-essential traffic that conflicts with responding RFFS vehicles. RFFS personnel should continuously monitor the minimum visibility operating conditions in order to maintain response capability under such conditions.

8.135 Further guidance can be found in CAP 168, chapter 2 appendix 2B low visibility operations.

Work in Progress (WIP)

8.136 The extent to which WIP is likely to affect the response capability or operational performance of the RFFS and other emergency services should be considered

during the work planning process. Where it is considered the proposed works might have an impact, suitable mitigations should be developed and, if necessary, adjustments to the emergency plan should be made and promulgated, prior to the commencement of work.

Recording of incident data

8.137 Data from incidents attended by the RFFS can be useful in a number of ways. They can be used to inform task and resource analysis, procurement, response policies and procedures. Whilst it is at the discretion of Aerodrome Operators how and what data they record it is suggested that the following are key fields. A template spreadsheet containing these fields is available from CAA by emailing aerodromes@caa.co.uk and requesting an 'RFFS Incident Reporting Data Template'.

Example template

Date	Incident identifier
Type of incident	Time incident closed
Type of aircraft	No. of PAX on board
Location of incident	No. of PAX evacuated
Time of call	No. of PAX rescued
Called by	Slides deployed
Time in attendance	Slides used
Size of fire	By how many pax
Fire fighting agents used	Was PEMS used (passenger evacuation management system)
Amount of agents used; initial extinguishment and prolonged control	Hazardous materials involved What How much
Time of burn before agent applied	Source of ignition
Category reduced	Category restored
RFFS vehicles attending	Fire fighting equipment used
FRS vehicles attending	Rescue equipment used
No. Of RFFS personnel	Damage to aircraft
Actions by others, FFG. or rescue	Area of damage sq m
Fatalities	Time to evacuate
Casualties	Follow up actions date closed
RFFS vehicle accidents/incidents	

Inspections and audits of the RFFS by CAA aerodrome inspectors

8.138 The objective of audits and inspections by the CAA is to establish and ensure continued regulatory compliance and the ability of the RFFS to achieve the principal and operational objectives. The CAA will perform an initial inspection/audit of an aerodrome's RFFS unit prior to, and then subsequent to, the issue of an aerodrome licence. Once the licence has been issued, the CAA will undertake regular inspections/audits.

8.139 The CAA Inspectors will seek:

1. evidence that the Aerodrome Operator has made a full assessment of the operational requirements;
2. evidence that the necessary procedures and practices have been documented and are in place for an effective response to aircraft accidents or incidents,
3. documentary evidence relating to the training, and assessment of competence, of personnel employed in the RFFS,
4. records of training received and assessments made, including those for training exercises conducted with other emergency services,
5. records of inspections, test and maintenance of all vehicles and equipment.

8.140 The Aerodrome Operator may be required to demonstrate the effectiveness of any of the objectives contained within this chapter. This may include any element, or all elements, of the aerodrome emergency plan.

APPENDIX 8A

Surface level heliports

Introduction

1. This appendix specifies the minimum RFFS requirements, which are specifically applicable to heliports where the category is H1, H2, or H3. This appendix has been compiled in such a way as to assist a Heliport Operator in demonstrating compliance with the requirements at the levels stated.

2. A heliport is defined as 'an aerodrome or a defined area intended to be used wholly or in part for the arrival, departure and surface movement of helicopters'.

3. Throughout this appendix the term 'heliport' is used; however, it is intended that these specifications also apply to areas for the exclusive use of helicopters at an aerodrome primarily meant for the use of aeroplanes.

4. The principal objective of a rescue and fire fighting service is to save lives in the event of a helicopter accident or incident.

5. This must assume at all times the possibility of and need for extinguishing a fire which may:

    1. exist at the time a helicopter is touching down, lifting off, taxying, parked, etc;
    2. occur immediately following a helicopter accident or incident; or
    3. occur at any time during rescue operations.

6. For this reason, the provision of adequate means of dealing promptly with an accident or incident occurring at, or in the immediate vicinity of, a heliport assumes primary importance because it is within this area that there are the greatest opportunities to save lives.

7. The most important factors bearing on effective rescue in a survivable helicopter accident are the training received, the effectiveness of the fire fighting equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.

8. Guidance material on rescue and fire fighting services for heliports can be found in:

    1. ICAO Airport Services manual (Doc 9137), Part 1 – Rescue and Fire Fighting
    2. ICAO Heliport manual (Doc 9261)

9. The scale and standards of RFFS to be provided at licensed heliports in the United Kingdom accord with the ICAO Standards and Recommended Practices (SARPs). The provision of RFFS for helicopters at unlicensed onshore sites can be found in CAP 789, Requirements and Guidance Material for Operators.

Minimum scale of services to be provided

10. The Heliport Operator shall provide, and staff, an effective RFFS capability that can respond to a helicopter accident/incident pending the arrival of external emergency services.

11. The provisions shall be available whenever flights required to use a licensed heliport are taking place. They shall be maintained for at least 15 minutes after the time of departure of any aircraft requiring the use of a licensed heliport or until the aircraft has reached its destination, whichever is the shorter.

12. Changes in the level of protection normally available at a heliport for rescue and fire fighting shall be notified to the appropriate air traffic services units and aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly. Notification should be by radio and NOTAM.

Level of protection

13. The level of protection to be provided for rescue and fire fighting shall be based on the overall length of the longest helicopter normally using the heliport and in accordance with the heliport fire fighting category determined from table 8A.1.

14. The level of protection to be provided at a heliport (heliport RFFS category) shall be determined from table 8A.1 appropriate to the overall length of the longest helicopter using the heliport irrespective of its frequency of operations. However, during anticipated periods of operations by smaller helicopters, the heliport fire fighting category may be reduced to that of the highest category of helicopter planned to use the heliport at that time.

Table 8A.1 Heliport Fire Fighting Category

Category	Helicopter overall length		
H1		Up to but not including	15 m
H2	From 15 m	Up to but not including	24 m
H3	From 24 m	Up to but not including	35 m
Note: Helicopter length, including the tail boom and the rotors.			

15. To determine the appropriate heliport fire fighting category the higher category of fuselage length or fuselage width should be applied.

16. See appendix (Appendix 8C for guidance on HS (Special) category helicopters.

17. For a helicopter take-off and landing area located on an aerodrome licensed for use by fixed wing aircraft, the RFFS at the aerodrome will be acceptable for helicopter operations provided that the amounts are at least equal to those required for H1, H2

or H3 operations, as appropriate and as shown in tables 8A.2 and 8A.3, and that the response time can be achieved.

Extinguishing agents

18. Principal and complementary agents shall be provided at a heliport, as specified in tables 8A.2 and 8A.3. Principal agents provide a level of post-fire security i.e. for a period of several minutes or longer. Complementary agents have rapid-fire suppression capability but provide control only during application and for a short period thereafter.

19. Hose line(s) of sufficient length(s) appropriate to dealing with fires involving the sizes and types of aircraft normally using the heliport, and which include a hand controlled foam-making branch, shall be provided.

20. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

21. Complementary Fire Fighting Agents shall comply with the appropriate specifications of the International Organisation for Standardisation (ISO).

22. Dry chemical powder and gaseous agents are normally considered more efficient than carbon dioxide for aircraft rescue and fire fighting operations.

23. Where the main complementary agent is a dry chemical powder, a quantity of gaseous agent or CO2 shall be provided for use on small or hidden fires. A minimum extinguisher size is 5 kg for major and 2 kg for smaller vehicles.

24. Where the main complementary agent is gaseous agent or CO_2, there shall be a minimum 9 kg of dry powder provided to assist in dealing with a running fuel fire.

25. A 200% reserve of foam concentrate and 100% of complementary agents shall be available at the heliport.

26. At a surface level heliport up to 100% of the water may be substituted with complementary agent. For the purpose of substitution the following equivalents should be used

    1. 1 kg of gaseous agent or dry powder = 0.66 litres of water for the production of foam meeting performance level B.
    2. 2 kg of CO2 = 0.66 litres of water for the production of foam meeting performance level B.

NOTE: where a heliport has substituted up to 100% of the water with complementary agent, it is recommended that the reserve supply of complementary agent held is increased to 200%

27. If a 'high performance' dry powder is used it may be permissible to reduce the minimum amount provided. For details see Chapter 8 paragraph 8.76 above.

Table 8A.2 Minimum usable amounts of principal fire extinguishing agents required for surface level heliports

Heliport category (RFFS)	Foam meeting performance level B			Discharge rate foam solution (litres/ minute)
	Water (litres)	Foam concentrate (litres)		
		At 3%	At 6%	
H1	500	15	30	250
H2	1 000	30	60	500
H3	1 600	48	96	800
Heliport category (RFFS)	Foam meeting performance level C			Discharge rate foam solution (litres/ minute)
	Water (litres)	Foam concentrate (litres)		
		At 3%	At 6%	
H1	350	11	21	175
H2	700	21	42	350
H3	1,070	33	65	535

Table 8A.3 Minimum usable amounts of complementary fire extinguishing agents required for surface level heliports

Heliport category (RFFS)	Complementary agent		
	Dry chemical powder	or gaseous agent	or carbon dioxide CO_2
	or a combination (in proportion)		
H1	23	23	45
H2	45	45	90
H3	90	90	180

Response time

28. Response time is considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50% of the discharge rate specified in table 8A.2.

29. At a surface level heliport, the operational objective of the rescue and fire fighting service should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.

30. The response area is considered as Final Approach and Take-Off area(s) (FATO), designated aiming point(s) and Touchdown and Lift Off area(s) (TLOF), including all areas used for the manoeuvring, rejected take-off, taxiing, air taxiing and parking of helicopters.

31. To ensure an effective response as close to the operational objective in less than optimum conditions, the heliport fire service should provide and instigate suitable guidance and/or procedures.

32. It is recognised that the two-minute response time may not always be achievable to all areas of an aerodrome/heliport where helicopters may arrive or depart, especially training areas, which may be designated outside the aerodrome boundary. In these cases the RFFS should respond as safely as possible. In the case of training areas designated outside the aerodrome/heliport boundary, the operator of the helicopter has a duty of care to ensure that the appropriate RFFS requirements and response are provided.

Minimum number of staff designated as RFFS personnel

33. Trained personnel shall be designated to respond and operate the RFFS provision whenever flights required to use a licensed heliport are taking place. The minimum number of personnel and level of supervision are defined in table 8A.4.

34. Heliport Operators should assess the medical and fitness suitability of all personnel detailed to respond as part of the RFFS.

Table 8A.4

Heliport RFFS category	Minimum number of personnel	Minimum supervision level
H1	Two	To be determined locally.
H2	Three	A competent person to supervise an emergency response throughout the promulgated hours of operation.
H3	Four	A competent person to supervise an emergency response throughout the promulgated hours of operation.

Extraneous duties

35. No extraneous duty should create conditions likely to compromise individual or crew performance or introduce additional hazards. RFFS personnel designated as part of the minimum level for response, and who are engaged on extraneous duties, shall be capable of meeting the response time objective while carrying out those duties.

Vehicles and ancillary equipment

36. A vehicle fit for purpose shall be provided and be readily available for immediate use to carry personnel and RFFS equipment to the scene of the incident. Non-

self-propelled appliances (trailers) are permissible but they must be connected to a suitable towing vehicle during helicopter movements.

37. Where soft or other difficult terrain is immediately adjacent to, or comprises part of the response area, a suitable all-wheel drive vehicle will be required to ensure an effective response. In other situations the vehicle must be suitable for the terrain at the specific site.

38. For night operations, sufficient lighting equipment for adequate illumination of an incident must be provided. This equipment may be carried on the vehicle, or by any other suitable means.

39. A method of monitoring the helicopter movement area for the purpose of instantaneously alerting and deploying the facility shall be provided.

40. A reliable method of summoning assistance from off-aerodrome local emergency services shall be provided.

41. Communications equipment should be provided, which will have a transmitting range effective within the response areas.

42. Where a considerable proportion of helicopter movements take place over water areas, the provision of a rescue craft should be considered. The objective should be to recover the maximum anticipated number of occupants of the largest helicopter in use in the most expeditious manner.

43. Rescue equipment commensurate with the level of aircraft operations should be provided. (See table 8A.5.)

44. All responding rescue and fire fighting personnel shall be provided with personal protective equipment to enable them to perform their duties in an effective manner.

45. Account should be taken of the PUWER and the Personal Protective Equipment at Work Regulations which require equipment is:

    1. suitable for the intended use;
    2. safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case;
    3. used only by people who have received adequate information, instruction and training; and
    4. accompanied by suitable safety measures, e.g. protective devices, markings, warnings.

46. Records of all tests and inspections shall be maintained by the Heliport Operators for a period of five years. The records should include details of consequential action where an inspection has revealed a defect or deficiency.

Table 8A.5

Equipment resource RFFS categories H1, H2 & H3	
Axe, aircraft non-wedging	Bolt cropper
Saw, general purpose	Hacksaw (with spare blades)
Crowbar	Harness knife (with sheath)
Side cutting pliers	Tin snips
Set screwdrivers	Adjustable wrench
Fire-resistant blanket	Hook, grab or salving
Ladder/steps (appropriate to helicopter size)	Powered cutting tool (H3 only)
General purpose line	

Medical provisions

47. Minimum quantities of medical equipment resources appropriate to the sizes and types of aircraft should be provided. Advice can be found on the Health and Safety Executive (HSE) website.

Training

48. Heliport Operators shall ensure that participating personnel are trained and competent in the operation of the RFFS equipment provided at the heliport. The training should be competence-based.

49. The Heliport Operators shall nominate a competent person(s) to conduct training.

50. Personnel shall receive training prior to initial participation and periodically thereafter. The Heliport Operator or the nominated competent person will determine periodicity. Examples of areas where training should be provided are detailed in table 8A.6.

51. Assessment of the competency of the person(s) determining, evaluating and conducting training shall be the responsibility of the Heliport Operator.

Table 8A.6 Example training competence (initial and ongoing)

1	Heliport Operator's safety policies
2	Hazards arising from aircraft operation and safety-related procedures
3	Triangle of fire
4	Extinguishing agents - use and methods of application
5	Fire appliance operations, driving training for emergency response
6	Ancillary equipment, selection, storage and handling, use, inspection and testing, maintenance and record-keeping
7	Personal protective equipment
8	Helicopter construction
9	Helicopter familiarisation
10	Response area topography
11	Fire and rescue procedures
12	Fixed wing, and rotary aircraft (tactics and techniques) – appliance positioning, external/internal fires, access, forcible entry, assistance with evacuation
13	Initial emergency medical aid and casualty handling
14	Personal training record(s)
15	Emergency plans
16	Preservation of evidence

Emergency planning/emergency orders

52. Emergency orders, which form part of the heliport manual, shall include arrangements for alerting the facility, for the immediate notification of other key aerodrome personnel and for summoning externally based emergency services. These orders shall detail procedures for anticipated emergency situations, including accidents/incidents which occur in the approach and departure areas. The areas within which a response will be made shall be shown in the heliport manual.

53. Off-aerodrome emergency services should be given the opportunity to familiarise themselves with the emergency procedures as well as the topography of the aerodrome.

Inspections of the RFFS by CAA aerodrome inspectors

54. The RFFS should operate as an effective unit. The Heliport Operator shall be required by the CAA to demonstrate that effectiveness from time to time.

55. The CAA Inspectors may also require to see documentary evidence relating to the training of personnel employed in the RFFS e.g. certificates of competence, records of training and assessment including those for training exercises conducted with other emergency services.

56. Records of all tests and inspections of extinguishing media shall be maintained by the Heliport Operator for a period of five years. The records should include details of consequential action where an inspection has revealed a defect or deficiency.

APPENDIX 8B

Rescue and fire fighting service (RFFS) requirements at category I and II aerodromes

Introduction

1. This appendix specifies the minimum RFFS requirements, which are applicable to aerodromes where the category is I or II. This appendix has been compiled in such a way as to assist a Aerodrome Operator in demonstrating compliance with the requirements at the levels stated.

Minimum scale of services to be provided

2. The Aerodrome Operator shall provide and staff an effective RFFS capability that can respond to an aircraft accident/incident pending the arrival of external emergency services.

3. The RFFS should be available whenever flights required to use a licensed aerodrome are taking place. It should be maintained for at least 15 minutes after the time of departure of any aircraft requiring the use of a licensed aerodrome or until the aircraft has reached its destination, whichever is the shorter.

4. Changes in the level of protection normally available at an aerodrome for rescue and fire fighting shall be notified to the appropriate air traffic services units and aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly. Notification should be by radio and NOTAM.

5. A change should be expressed in terms of the new category of the rescue and fire fighting service available at the aerodrome.

   Note: Aerodrome Operator should develop contingency plans to limit the need for changes to the promulgated level of services. This may involve, for example, a preventative maintenance plan to ensure the mechanical efficiency of equipment and vehicles, and arrangements to cover unplanned leave and absence of the minimum level of RFF personnel including supervisory level.

Level of protection

6. The level of protection to be provided shall be based on the overall length of the longest aeroplane using the aerodrome.

7. The level of protection to be provided at an aerodrome shall be determined from table 8B.1 appropriate to the overall length of the longest aeroplane using the aerodrome irrespective of its frequency of operations. However, during

anticipated periods of operations by smaller aeroplanes, the category may be reduced to that of the highest category of aeroplane planned to use the aerodrome at that time.

Table 8B.1 RFF category

Aerodrome category (RFF)	Aircraft overall length		
I		Up to but not including	9 m
II	From 9 m	Up to but not including	12 m

Remission

8. Remission enables aerodromes to provide RFFS facilities to one category below that determined by the size of the largest aeroplane.

9. Where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months, the level of protection provided shall not be less than one category below the determined category.

10. Aerodromes currently promulgating RFFS Category 1 or 2 may apply remission on only one category higher than their promulgated category.

Extinguishing agents

11. Principal and complementary agents shall be provided as specified in tables 8B.2 and 8B.3. Principal agents provide a level of post-fire security i.e. for a period of several minutes or longer. Complementary agents have rapid fire suppression capability but provide control only during application and for a short period thereafter.

Table 8B.2 Min quantities of principal fire extinguishing agents required

Aerodrome category (RFFS)	Foam meeting performance level B			Discharge rate foam solution (litres/minute)
	Water (litres)	Foam concentrate (litres)		
		At 3%	At 6%	
I	230	7	14	230
II	670	20	40	550
Aerodrome category (RFFS)	Foam meeting performance level C			Discharge rate foam solution (litres/minute)
	Water (litres)	Foam concentrate (litres)		
		At 3%	At 6%	
I	155	5	10	155
II	450	14	27	370

12. Hose line(s) of sufficient length(s) appropriate to dealing with fires involving the sizes and types of aircraft normally using the aerodrome, and which include a hand controlled foam-making branch, shall be provided.

Table 8B.3 Min quantities of complementary fire extinguishing agents required

Aerodrome category (RFFS)	Complementary agent (Kg)		
	Dry chemical powder	or gaseous agent	or carbon dioxide CO_2
	Or a combination (in proportion)		
I	45	45	90
II	90	90	180

13. Complementary fire fighting agents shall comply with the appropriate specifications of the ISO.

14. Dry chemical powder and gaseous agents are normally considered more efficient than carbon dioxide for aircraft rescue and fire fighting operations.

15. Where the main complementary agent is a dry chemical powder, a quantity of gaseous agent or CO2 shall be provided for use on small or hidden fires. A minimum extinguisher size is 5 kg for major and 2 kg for smaller vehicles.

16. Where the main complementary agent is gaseous agent or CO_2, there shall be a minimum 9 kg of dry powder provided to assist in dealing with a running fuel fire.

17. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent.

18. A 200% reserve of foam concentrate and 100% of complementary agents shall be available at the aerodrome.

19. At aerodrome categories 1 and 2 up to 100% of the water may be substituted by complementary agent. For the purpose of substitution the following equivalents should be applied:

    1. 1 kg of gaseous agent or dry powder = 0.66 litres of water for the production of foam meeting performance level B.
    2. 2 kg of CO2 = 0.66 litres of water for the production of foam meeting performance level B.

NOTE: where an aerodrome has substituted up to 100% of the water with complementary agent, it is recommended that the reserve supply of complementary agent held is increased to 200%

20. If a 'high performance' dry powder is used it may be permissible to reduce the minimum amount provided. For details see Chapter 8 paragraph 8.76 above.

Response time

21. The operational objective of the RFFS should be to achieve a response time not exceeding three minutes to any part of the manoeuvring area in optimum visibility and surface conditions.

22. Response time is considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle(s) is (are) in position to effect fire fighting and rescue operations.

23. Any other vehicles required to deliver the amounts of extinguishing agents specified in table 8B.2 should arrive no more than one minute after the first responding vehicle(s) so as to provide continuous agent applications.

Minimum number of staff designated as RFFS personnel

24. Trained personnel shall be designated to respond and operate the RFFS provision whenever flights required to use a licensed aerodrome are taking place. The minimum number of personnel and level of supervision are defined in table 8B.4.

Table 8B.4

RFFS category	Minimum number of personnel	Minimum supervision level
I	Two	To be determined locally.
II	Three	A competent person to supervise an emergency response throughout the promulgated hours of operation.

25. Aerodrome Operators should assess the medical and fitness suitability of all personnel detailed to respond as part of the RFFS.

Extraneous duties

26. No extraneous duty should create conditions likely to compromise individual or crew performance or introduce additional hazards. RFFS personnel designated as part of the minimum level for response, and who are engaged on extraneous duties, shall be capable of meeting the response time objective while carrying out those duties.

Vehicles and ancillary equipment

27. A vehicle fit for purpose shall be provided and be readily available for immediate use to carry personnel and RFFS equipment to the scene of the incident. Non-self-propelled appliances (trailers) are permissible but they must be connected to a suitable towing vehicle during aircraft movements.

28. Where soft or other difficult terrain is immediately adjacent to, or comprises part of the response area, a suitable all-wheel drive vehicle will be required to ensure an effective response. In other situations the vehicle must be suitable for the terrain at the specific site.

29. For night operations, sufficient lighting equipment for adequate illumination of an incident must be provided. This equipment may be carried on the vehicle, or by any other suitable means.

30. A minimum quantity of ancillary equipment resource appropriate to the sizes and types of aircraft should be provided. table 8B.5 provides a generic list of equipment for Categories 1 and 2 aerodromes that has been identified as acceptable. However the Aerodrome Operator may carry out an assessment and provide alternative equipment, which can facilitate effective access to the types of aircraft operating or likely to operate at the aerodrome.

31. A method of monitoring the aircraft movement area for the purpose of instantaneously alerting and deploying the facility shall be provided.

32. A reliable method of summoning assistance from off-aerodrome local emergency services shall be provided.

33. Communications equipment should be provided, which will have a transmitting range effective within the response areas.

34. All responding rescue and fire fighting personnel shall be provided with personal protective equipment to enable them to perform their duties in an effective manner.

35. Account should be taken of the Provision and Use of Work Equipment Regulations (PUWER) and the Personal Protective Equipment at Work Regulations which require that equipment is:

    1. suitable for the intended use;
    2. safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case;
    3. used only by people who have received adequate information, instruction and training; and
    4. accompanied by suitable safety measures, e.g. protective devices, markings, warnings.

36. Records of all tests and inspections shall be maintained by the Aerdrome Operator for a period of five years. The records should include details of consequential action where an inspection has revealed a defect or deficiency.

Table 8B.5

Equipment resources – categories I and II	
Axe, aircraft non-wedging	Bolt cropper
Saw, general purpose	Hacksaw (with spare blades)
Crowbar	Harness knife (with sheath)
Side-cutting pliers	Tin snips
Set screwdrivers	Adjustable wrench
Fire-resistant blanket	Hook, grab or salving
Ladder/steps (appropriate to aircraft size)	Breathing masks (filter)
General purpose line	

Medical provisions

37. Minimum quantities of medical equipment resources appropriate to the sizes and types of aircraft should be provided. Advice can be found on the Health and Safety Executive (HSE) website.

Training

38. Aerodrome Operators shall ensure that participating personnel are trained and competent in the operation of the RFFS equipment provided at the aerodrome. The training should be competence-based.

39. The Aerodrome Operator shall nominate a competent person(s) to conduct training.

40. Personnel shall receive training prior to initial participation and periodically thereafter.

41. The Aerodrome Operator or the nominated competent person will determine periodicity. Examples of areas where training should be provided are detailed in table 8B.6.

42. Assessment of the competency of the person(s) determining, evaluating and conducting training shall be the responsibility of the Aerodrome Operator.

Table 8B.6 Example training competence (initial and ongoing)

1	Aerodrome Operator's safety policies
2	Hazards arising from aircraft operation, dangerous goods and safety-related procedures
3	Triangle of fire
4	Extinguishing agents - use and methods of application
5	Fire appliance operations, driving training for emergency response
6	Use of equipment, selection, storage and handling, inspection and testing, maintenance and record-keeping
7	RFFS personnel safety and personal protective equipment
8	Aircraft construction and evacuation assistance
9	Aircraft familiarisation
10	Aerodrome familiarisation and topography
11	Fire fighting and rescue operations
12	Fixed wing and rotary aircraft (tactics and techniques) – appliance positioning, external/internal fires, access, forcible entry, assistance with evacuation
13	Emergency first aid and casualty handling
14	Personal training record(s)
15	Emergency plans
16	Emergency communications systems
17	Preservation of evidence

Emergency planning/emergency orders

43. Emergency orders, which form part of the aerodrome manual, shall include arrangements for alerting the facility, for the immediate notification of other key aerodrome personnel and for summoning externally based emergency services. These orders shall detail procedures for anticipated emergencies including accidents/incidents which occur up to 1000 metres from the runway threshold. The areas within which a response will be made shall be shown in the aerodrome manual.

44. Off-aerodrome emergency services should be given the opportunity to familiarise themselves with the emergency procedures as well as the topography of the aerodrome.

Inspections of the RFFS by CAA aerodrome inspectors

45. The RFFS should operate as an effective unit. The Aerodrome Operator shall be required by the CAA to demonstrate that effectiveness from time to time.

46. The CAA inspectors may also require to see documentary evidence relating to the training of personnel employed in the RFFS e.g. certificates of competence, records of training and assessment including those for training exercises conducted with other emergency services.

47. Records of inspections, test and maintenance of vehicles and equipment provided for the use of the RFFS should be available for audit.

APPENDIX 8C

Initial emergency response (IER) requirements for RFFS category special aerodromes – aeroplanes and helicopters

Aerodrome emergency procedures

1. A responsible person should be designated to promulgate clear and concise emergency procedures.

2. Emergency orders, which form part of the aerodrome manual, shall include arrangements for alerting the IER facility, for the immediate notification of other key aerodrome personnel and for summoning externally-based emergency services. These orders shall detail procedures for anticipated emergency situations including accidents/incidents which occur up to the aerodrome boundary.

3. Off-aerodrome emergency services should be given the opportunity to familiarise themselves with the emergency procedures and the topography of the aerodrome.

4. The IER should operate as an effective unit. The Aerodrome Operator shall be required by the CAA to demonstrate that effectiveness.

IER personnel and training

5. A minimum number of competent IER personnel shall be detailed to operate the IER equipment, and should be available for immediate response during flying operations. A competent person should conduct an assessment of the hazards and associated risks following which IER personnel should be provided with sufficient training to carry out their role.

6. IER Personnel should be competent in at least the following:

   - the aerodrome emergency procedures;
   - the aerodrome topography;
   - achieving a response as expediently as possible;
   - application of the necessary procedures to deal with the types of emergencies appropriate to the operation, hazards and risks;
   - the selection, use, and maintenance of equipment;
   - the application of the extinguishing agents;
   - Initial Emergency Medical Aid (IEMA) and casualty handling.

7. Records of all training should be maintained.

IER vehicle and equipment

8. A vehicle that is mechanically reliable, fit for purpose, and which is capable of accommodating IER personnel should be provided. The vehicle, including any towed equipment, should be capable of traversing the terrain likely to be encountered in response to any incident; all-wheel drive may be necessary. Specified equipment should be carried either on the vehicle or on a suitable trailer connected to the vehicle.

9. Radio communications equipment should be provided and should have a range that will ensure effectiveness within the expected response area.

10. A minimum quantity of ancillary equipment appropriate to the sizes and types of aircraft should be provided.

11. Account should be taken of the PUWER and the Personal Protective Equipment at Work Regulations which require that equipment is:

    1. suitable for the intended use;
    2. safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case;
    3. used only by people who have received adequate information, instruction and training; and
    4. accompanied by suitable safety measures, e.g. protective devices, markings, warnings.

Fire fighting agents

12. The tables below identify the quantities of fire fighting agent that are recommended. The agent should be available for immediate discharge from the vehicle/pressure unit.

Table 8C.1

Minimum usable amounts of extinguishing agents				
Foam meeting performance level B			Complementary agent	
Water (litres)	Foam concentrate (litres/min)	Discharge rate of foam solution (litres/min)	Dry powder or gaseous agents (kg)	or CO_2 (kg)
90	6 @ 6% 3 @ 3%	60	18	36
Foam meeting performance level C			Complementary Agent	
Water (litres)	Foam concentrate (litres/min)	Discharge rate of foam solution (litres/min)	Dry powder or gaseous agents (kg)	or CO_2 (kg)
60	4 @ 6% 2 @ 3%	40	18	36

Table 8C.2

Minimum usable amounts of extinguishing agents compressed air foam system					
Foam meeting performance level B				Complementary agent	
Water (litres)	Foam concentrate		Discharge rate of foam solution (litres/min)	Dry powder or gaseous agents (kg)	or CO_2 (kg)
	Induction rate	Expansion ratio			
60	0.2–0.4%	8–9:1	60	18	36
Foam meeting performance level C				Complementary agent	
Water (litres)	Foam concentrate		Discharge rate of foam solution (litres/min)	Dry powder or gaseous agents (kg)	or CO_2 (kg)
	Induction rate	Expansion ratio			
40	0.2–0.4%	8–9:1	40	18	36

13. Dry powders and gaseous agents are normally considered more efficient than CO_2 for aircraft rescue and fire fighting operations. When selecting dry powder for use with foam, care must be exercised to ensure compatibility.

14. It is acceptable to replace all or part of the amount of water for foam production by complementary agents. For the purpose of agent substitution the following equivalents should be used: 1 kg of complementary agent = 0.66 L water for production of a foam meeting performance level B.

Inspections of the IER by the CAA's aerodrome inspectors

15. At aerodromes where the RFF category is special, the CAA will, prior to initial licensing, be required to be satisfied that initial emergency response arrangements are satisfactory and will audit the arrangements as part of the normal audit process.

CHAPTER 9

Emergency planning

Introduction

9.1 The guidance contained in this chapter is developed from UK best practice, the requirements of Civil Contingency legislation and ICAO Standards and Recommended Practices (SARPs). Further information is contained in the ICAO Airport Services manual, Part 7, Airport Emergency Planning (Doc 9137–AN/898).

9.2 Aircraft accidents have the potential to involve a large number of casualties and fatalities. However, although they may be considered as disasters for the purposes of emergency planning, it would be incorrect to suggest that all aircraft accidents have the capability to achieve disaster proportions. Many will be capable of being dealt with locally using the facilities provided by the aerodrome or with limited support from category I responders. Nevertheless, an incident involving even the smallest aircraft can be life-threatening, not only to the occupants but also to those in the vicinity of the incident. Whilst the scale of response to a disaster may be much greater than that required for the majority of aircraft accidents, the principles of prevention, preparedness, response and recovery do not change.

9.3 Even though the Aerodrome Operator will have demonstrated to the CAA inspectors the ability of the aerodrome to meet the fire, rescue, and medical requirements specified earlier in this publication, the mere provision of equipment, supplies or personnel to the required standard does not necessarily constitute an efficient operational unit. The Aerodrome Operator should also be able to demonstrate that the aerodrome's emergency arrangements are effective, and that appropriate use can be made of all available resources, in particular external emergency services, if an aircraft accident or other incident were to occur.

9.4 An aerodrome may generate hazards in addition to those that relate directly to the operation of aircraft, e.g. the handling of bulk fuel storage. Aerodrome Operators should make plans to deal with emergencies that arise from these activities. The quantities of equipment, extinguishing agents and personnel required to deal with such emergencies may exceed those provided by the aerodrome for the scale of RFFS required to protect the movements of aircraft only.

9.5 Where an aerodrome accepts flights involving the carriage of dangerous goods, the RFFS should develop appropriate policies and procedures to deal with types of dangerous goods likely to be encountered in an incident, and ensure that RFFS personnel are adequately trained and protected.

9.6 The terminology used in this chapter is drawn from ICAO SARPs and the different arrangements that exist within the devolved administrations within the UK. As such there may be local differences of the terms used. It is important that whatever terms are used locally they are set out in the plans and understood by all stakeholders.

Civil Contingencies Act 2004

9.7 The Civil Contingencies Act 2004 and supporting regulations and statutory guidance establish a clear set of roles and responsibilities for those involved in emergency preparation and response at the local level. The Act divides local Responders into two categories, imposing a different set of duties on each.

9.8 Category I organisations are at the core of the response to most emergencies (e.g. emergency services, local authorities, NHS bodies). Category I responders are subject to the full set of civil protection duties.

9.9 Category II organisations are less likely to be involved in the heart of planning work but will be heavily involved in incidents that affect their sector. Category II responders have a lesser set of duties – co-operating and sharing relevant information with other category I and II Responders.

9.10 Aerodrome operators responsible for aerodromes through which, according to the most recent data available, at least 50,000 passengers or 10,000 tonnes of freight per year were transported are included as category II Responders under Civil Contingencies regulations.

9.11 The mechanisms for multi-agency co-operation at the local level are generally based on local police areas (with the exception of London), and bring together all the organisations who have a duty to co-operate under the Civil Contingencies Act, along with others who would be involved in the response. In England these are Local Resilience Forums (LRF), in Scotland Strategic Co-ordinating Groups (SCG), in Wales the Wales Resilience Forum (WRF) and in Northern Ireland the Civil Contingencies Group (CCG). For this guidance these will be known by the term Local Emergency Management Arrangements (LEMA).

9.12 Regardless of whether a duty exists under the Civil Contingencies Act 2004 or not, Aerodrome Operator should liaise with their LEMA to ensure that there is appropriate and adequate consideration of the risks and response required to aircraft incidents.

9.13 The arrangements at an aerodrome may include setting up an Emergency Planning Committee. Either there should be a link from the emergency planning arrangements at an aerodrome to the LEMA by direct membership, or representation through a member of the LEMA who has the aerodrome emergency planning included in their terms of reference or responsibilities.

9.14 Detailed guidance regarding emergency planning and the Civil Contingencies legislation can be found on the www.gov.uk website.

Emergency planning objectives

9.15 The objective of aerodrome emergency planning is to anticipate the effects an emergency might have on life, property, and aerodrome operations, and to prepare a course, or courses, of action to minimise those effects, particularly in respect of saving lives.

Emergency planning arrangements

9.16 The list at table 9.1 is intended to assist an Aerodrome Operator in choosing those organisations that should be represented on the aerodrome's emergency planning committee. However, the list is not comprehensive and some aerodromes may need expertise from organisations not shown, while others may find some of the organisations shown to be inappropriate.

Table 9.1 On- and off-aerodrome services from which planning committee members could be selected:

Aerodrome RFFS	Local Ambulance Trust
Aerodrome Police	Coastguard and Offshore Rescue
Aerodrome Security	Doctors
Airline Operators	Local Authority Fire and Rescue Service
Customs and Excise	First Aid Organisations
Occupational Medical	Local Hospital Trust
Mechanical Transport	Police
Telecommunications	Press
Works Facilities	Religious Leaders
Environment Agency	

9.17 The tasks that the emergency planning arrangements may consider are:

1. terms of reference of the planning committee
2. development of an emergency plan and orders
3. tactics
4. liaison
5. co-operative training
6. exercise planning
7. post-accident/incident and post-exercise reviews
8. review and monitoring
9. recording

9.18 A senior member of the aerodrome management team with the direct support of the Accountable Manager should chair any meetings. Records of the meetings should be taken and retained and the person accountable for the emergency planning arrangements shall be identified within the aerodrome manual.

Aerodrome emergency plan

9.19 The aerodrome emergency plan should set out how an emergency situation or incident can be managed in order to minimise the effects it may have on life, property, and aerodrome operations, and how the best use of appropriate available resources should be applied to achieve that aim.

9.20 An aerodrome emergency plan shall be established at an aerodrome, commensurate with the aircraft operations and other activities conducted at the aerodrome.

9.21 The aerodrome emergency plan shall provide for the co-ordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

9.22 The plan shall co-ordinate the response or participation of all existing agencies which, in the opinion of the appropriate authority, could be of assistance in responding to an emergency.

9.23 The plan should provide for the co-operation and co-ordination with the rescue co-ordination centre, as necessary.

9.24 The aerodrome emergency plan document should include at least the following:

1. the types of emergencies planned for;
2. agencies involved in the plan;
3. responsibility and role of each agency, the emergency operations centre and the command post, for each type of emergency;
4. information on names and telephone numbers of the offices or people to be contacted in the case of a particular emergency; and
5. a grid of the aerodrome and its immediate vicinity.

9.25 The plan shall observe human factors principles to ensure optimum response by all existing agencies participating in emergency operations. The principles should include:

1. the effects of human performance on the plan, for example workload, capabilities, functions, decision aids, environmental constraints, team versus individual performance;
2. training effectiveness;
3. staffing including numbers, skills levels and organisational structure;
4. personnel selection;

5. safety and health aspects, for example hazardous materials, safety systems and protective equipment.

9.26 A fixed emergency operations centre and a mobile command post should be available for use during an emergency. The mobile command post may be provided as part of the supporting emergency services response.

9.27 The emergency operations centre should be a part of the aerodrome facilities and should be responsible for the overall co-ordination and general direction of the response to an emergency. However, local arrangements will dictate the exact location and nature of this facility.

9.28 The command post should be a facility capable of being moved rapidly to the site of an emergency, when required, and should undertake the local co-ordination of those agencies responding to the emergency.

9.29 A person should be assigned to assume control of the emergency operations centre and, when appropriate, another person the command post. These would normally be category I responders.

9.30 Adequate communication systems linking the command post and the emergency operations centre with each other and with the participating agencies should be provided in accordance with the plan and consistent with the particular requirements of the aerodrome.

9.31 The plan shall include the ready availability of and co-ordination with appropriate specialist rescue services to be able to respond to emergencies where an aerodrome is located close to water and/or swampy areas and where a significant portion of approach or departure operations takes place over these areas. Further guidance on search and rescue can be found in the document 'Search and Rescue Framework for the United Kingdom of Great Britain and Northern Ireland' available on the Maritime and Coastguard Agency website.

9.32 Emergency orders shall clearly translate the emergency plan into a course or courses of action to be followed for a given emergency or incident, that will ensure the achievement of the emergency planning objectives.

9.33 Emergency instructions should provide details to individuals, or to departments, of the actions required to initiate the emergency plan.

9.34 The aerodrome emergency plan and orders shall include procedures for leading passengers evacuated from aircraft to secure areas away from the scene of an incident.

Emergency orders

9.35 Emergency orders should be drawn up detailing the lines of communication that will ensure all the agencies (or services) appropriate to the emergency are notified and alerted. These orders should be confined exclusively to actions to deal with emergencies or incidents.

9.36 The Aerodrome Operator should liaise with local emergency responders and establish responsibilities for incident command, particularly for the scene immediately adjacent to the aircraft. Any agreements should be recorded in the aerodrome manual.

9.37 Emergency Instructions should be drawn up and displayed, detailing the actions to be taken by any particular person or service under each emergency situation, to ensure that the emergency orders are completed. They should contain separate sections for display and use by the various persons or services concerned, e.g. air traffic control, aerodrome rescue and fire fighting service, aerodrome telephone exchange, police, etc.

9.38 Each department, section or individual should have on display, or immediately to hand, the emergency instructions that apply to their role in each emergency procedure.

Medical equipment

9.39 The objective is to ensure that sufficient medical services are provided. This objective should have regard to the type and configuration of aircraft, and the facilities should be based on a formal assessment. The assessment should ensure that the available emergency medical services provided are adequate and take into account the largest aircraft using the aerodrome.

9.40 Aerodrome Operator shall assess the level of medical supplies to be held on the aerodrome for emergency purposes. The Aerodrome Operator should seek the advice and co-operation of the local NHS Trust and responding ambulance services. Consideration should also be given to whether additional supplies should be made available to cater for an accident involving more than one aircraft.

9.41 Additional guidance on the provision of medical equipment and services can be found in the ICAO Airport Services Manual Part 7 Airport Emergency Planning appendix 3 (Airport Medical Services).

9.42 Portable casualty shelters and blankets for use during inclement weather conditions should be considered, taking into account the numbers of casualties that could reasonably be expected.

9.43 Portable lighting should be provided for illuminating an accident scene, particularly triage and casualty handling areas.

9.44 Aerodrome Operator should ensure that records appertaining to the medical facilities, covering specification, tests and inspection, and maintenance, are retained and can be made available for CAA inspection if requested. The records should include details of consequential action where an inspection has revealed a defect or deficiency. The records shall be retained for a minimum period of five years.

9.45 Where the journey time for the first Local Authority ambulance could exceed 15 minutes the provision of an on-site ambulance should be considered or alternative arrangements agreed with the NHS.

Supporting services, operating companies or agents

9.46 Circumstances at any individual aerodrome may require particular services to be involved in the event of an accident or incident. Appropriate services should be identified within the pmergency plan.

9.47 Liaison with the LEMA should be established to identify appropriate supporting services.

9.48 The roles of supporting services are set out in the guidance to the Civil Contingencies Act 2004.

9.49 It is important that full details of the aircraft are available, i.e. number of persons aboard, details of any dangerous goods or unusual freight (radio-active materials, livestock, etc.) and in this respect the aircraft operating company or its agents should be responsible for providing any documents, passenger lists and manifests concerning the aircraft involved.

9.50 The post-accident arrangements for any survivors who are not injured, as well as for passengers' relatives and friends who may be at the aerodrome waiting for the aircraft to land and may be unaware that an accident has occurred, is a joint responsibility between the aerodrome, the airline and/or its agents, and category I responders and should be set out in the emergency plan.

9.51 Following an aircraft accident, specialist equipment e.g. additional lighting or heavy lifting gear may be required that may not normally be readily available. The emergency committee should consider the potential need for this equipment and arrange for it to be available should circumstances require it. Care should be taken to ensure that the type and use of this equipment does not introduce the risk of fire in areas which may have become contaminated by fuel spillage.

9.52 Incidents involving aircraft will attract the attention of the press and media. Aerodrome Operators may wish to appoint a member of staff to liaise with members of the local and national press.

Assembly of assisting services

9.53 An aerodrome emergency plan must consider that category I responders are not likely to be familiar with the aerodrome layout, or the incident may occur in weather conditions that could hamper the ability of emergency services to find the accident site. A system must be devised whereby emergency services familiar or unfamiliar with the aerodrome can be easily guided to the accident or incident. One such system is to distribute a plan of the aerodrome overlaid with a grid, such that each square has an individual identifier. Consideration should be given to escort arrangements.

9.54 Suitable assembly or rendezvous points should be established, to which incoming vehicles should report, and from which they can be escorted to the accident or incident site with the minimum of delay. In all cases a person should be posted at the aerodrome main gate and the rendezvous point, and a telephone should be made available at both locations.

9.55 The arrangements and facilities for assisting services should be matched against the emergency plan, be suitable and fit for purpose.

Definitions of emergencies and incidents

Aircraft accident/aircraft accident imminent

9.56 Aircraft accidents which have occurred or are inevitable on, or in the vicinity of, the aerodrome.

Aircraft ground incident

9.57 Where an aircraft on the ground is known to have an emergency situation other than an accident, requiring the attendance of emergency services.

Full emergency

9.58 When it is known that an aircraft in the air is, or is suspected to be, in such difficulties that there is a danger of an accident.

Local standby

9.59 When it is known that an aircraft has, or is suspected to have, developed some defect but the trouble would not normally involve any serious difficulty in effecting a safe landing.

Weather standby

9.60 When weather conditions are such as to render a landing difficult or difficult to observe.

Unlawful acts

9.61 Action to be taken in the case of any unlawful act will be contained in the aerodrome's contingency plan, which will be drawn up in conjunction with the local police using department for transport guidance.

Off-aerodrome accidents

9.62 Emergency orders should contain details of the action to be taken in the case of aircraft accidents occurring outside the aerodrome boundaries.

Other duties

9.63 The emergency arrangements are generally focused on an aircraft accident or incident. Equipment and techniques recommended are generally directed towards this goal. However, the plans may include other incidents that occur such as domestic fires, road traffic crashes and hazardous materials. Emergency orders should include the action to be taken by aerodrome-based responders and, where appropriate, external emergency services, in the event of such calls being received.

9.64 The classification 'domestic' is given to any incident:

1. on the aerodrome not included in paragraphs 9.56 To 9.61;
2. outside the aerodrome boundary (other than aircraft accidents) which is liable to constitute a danger to flying or aerodrome property;
3. which the aerodrome rescue and fire fighting service might attend where the response is according to an agreement with the local emergency services;
4. which is in response to calls from the public or police on humanitarian grounds.

Command and control

9.65 The importance of an agreed framework for command and co-ordination should not be underestimated. This enables each agency to tailor its own response and interface with the plans of other agencies without disrupting its own procedures.

9.66 There is further information on managing the local multiagency response to, and recovery from, emergencies on the www.Gov.Uk website. This section describes the three management tiers and briefly mentions the arrangements for managing an incident site.

9.67 Whether it should be fully implemented at an aircraft accident should be determined by the severity and numbers of casualties. At the start of any incident for which there has been no warning, the operational level should be activated first, with the other levels coming into being with the escalation of the incident, or a greater awareness of the situation.

9.68 An Aerodrome Operator should have a clear and coherent policy that sets out the approach for delivering effective aircraft incident command and liaison with external emergency services.

Bronze – the operational level

9.69 Bronze is the level at which the management of immediate 'hands-on' work is undertaken at the site(s) of the emergency. Personnel first on the scene will take immediate steps to assess the nature and extent of the problem. Bronze commanders will concentrate their effort on the specific tasks within their

areas of responsibility – for example, the police will concentrate on establishing cordons, maintaining security and managing traffic. In most instances, the police will co-ordinate the operational response at the scene to ensure a coherent and integrated multi-agency response.

9.70 A key function of a Bronze commander will be to consider whether circumstances warrant a Silver level of management. Where the Silver level of management is established, Bronze commanders become responsible for implementing the Silver commander's tactical plan within their geographical area or functional area of responsibility.

Silver – the tactical level

9.71 The purpose of the Silver level is to ensure that the actions taken by Bronze are co-ordinated and coherent in order to achieve maximum effectiveness and efficiency. Silver will usually comprise the most senior officers of each agency committed within the area of operations, and will assume tactical command of the situation, usually from an incident control point located nearby or directly adjacent to the scene. They will address issues such as the setting up of an outer cordon, and the location of key functions or facilities such as a survivor assembly point, casualty clearing station and media liaison point.

9.72 In those cases where it becomes clear that resources, expertise or coordination are required beyond the capacity of Silver (e.g. where there is more than one incident), it may be necessary to invoke the Gold level of management to take overall command and set the strategic direction.

Gold – the strategic level

9.73 If it becomes necessary to implement multi-agency management at the Gold level, a Strategic Co-ordinating Group (SCG) (commonly referred to as 'Gold Command' or simply 'Gold') would be formed, which brings together Gold commanders from relevant organisations to establish the policy and strategic framework within which Silver will work. Chairing the SCG will normally fall to the police. However, depending on the circumstances it may be more appropriate for another agency to take the lead (for instance, the local authority may take the lead in the recovery phase).

9.74 Depending on the nature, extent and severity of the emergency, either the regional tier or central government may become involved. The SCG will then become the primary interface with these other levels of response.

Control of the incident site

9.75 The UK government has issued guidance on how an incident site should be managed including the use of cordons. This guidance can be found under 'preparation and planning for emergencies' on the www.gov.uk website.

Testing and exercises

9.76 The plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

9.77 The plan shall be tested by conducting:

1. a full-scale aerodrome emergency exercise at intervals not exceeding two years; and partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; or
2. a series of modular tests commencing in the first year and concluding in a full-scale aerodrome emergency exercise at intervals not exceeding three years and reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

Note: The exercises should be set to rotate the time of the year and daylight or darkness.

9.78 Where an aircraft accident occurs to which the response has adequately tested all or part of the plan, a licence holder may use that experience as part of the above exercise process.

9.79 Guidance on exercises is available from the following sources:

- ICAO Airport Services manual Part 7, Airport Emergency Planning, chapter 13
- under 'preparation and planning for emergencies' on the www.gov.uk website

Rendezvous point signs and directional arrows

Signs used on the public highway

9.80 Signs placed on a public highway will need to conform to the dimensions and colour scheme as defined by the Department for Transport (DfT) 'Working drawings for traffic signs'; details are available on the www.legislation.gov.uk website. Examples of these signs are:

Figure 9.1

2708	2709	2710
Junction ahead leading to route for emergency vehicles to a temporary incident control point	Permanently mounted sign indicating a route for emergency vehicles to an emergency services incident point	Permanently mounted sign indicating a route for emergency vehicles to an emergency services incident point

Signs used on the aerodrome

9.81 Rendezvous point signs should be displayed at the point(s) designated by the aerodrome emergency orders. Signs should be clearly visible from any direction from which vehicles are likely to approach.

9.82 Signs located on the aerodrome should be large enough to be seen from a distance and comprise bright, white letters 'EMERGENCY SERVICES RENDEZVOUS POINT' on a contrasting green background with a contrasting yellow border.

Figure 9.2

9.83 Sufficient signs bearing RVP directional arrows should be placed in such a manner that 'off-aerodrome' responders are directed to the RVP.

Figure 9.3

9.84 Where appropriate, signs should be illuminated.

Assessment of the aerodrome emergency plan

9.85 CAA Inspectors will require to be assured of the suitability of the Aerodrome Operator's emergency plan. Consequently, inspectors will wish to see documentary evidence relating to the arrangements put in place by the Aerodrome Operator. Inspectors may attend an exercise pre-briefing, testing or debriefing, or may choose to attend emergency exercises conducted by the aerodrome. Notification of a proposed full-scale exercise must be given to the CAA inspector at least six months in advance.

CHAPTER 10

Aeronautical information

Information to be available

10.1 The Aeronautical Information Publication (AIP) is identified as the publication used for the provision of aeronautical information/data necessary for the regularity and efficiency of air navigation.

10.2 The licence holder should ensure that all information relating to the aerodrome and its facilities which is significant for the conduct of flights to and from the aerodrome, is available to users of the aerodrome.

10.3 The licence holder is responsible for notifying the Aeronautical Information Service (AIS) of any information for inclusion in the AIP, including errors or omissions in the aerodrome information, and any impending changes in the aerodrome or its facilities likely to affect this information. For reasons of data integrity, assurance and approval of changes, all notifications of permanent changes to the AIP must be submitted using the AIP change request form obtainable via the NATS AIS website at http://www.nats-uk.ead-it.com/public/index.php%3Foption=com_content&task=blogcategory&id=187&Itemid=307.html).

10.4 For the guidance of pilots and operators seeking a briefing from the aerodrome authority, details of the following should always be available:

1. construction or maintenance work on or immediately adjacent to the manoeuvring area;
2. unserviceable portions of any part of the manoeuvring area;
3. the presence and depth of snow, slush, ice or frost on runways and taxiways or an apron;
4. runway surface condition when affected by water – damp, wet, standing water as appropriate;
5. anti-icing or de-icing liquid chemicals or other contaminants on a runway, taxiway or apron;
6. snow drifted or piled on or adjacent to runways or taxiways;
7. parked aircraft or other objects on or immediately adjacent to taxiways;
8. the presence of other temporary hazards;
9. failure or irregular operation of any part of the aerodrome lighting system or of the aerodrome main and secondary power supplies;
10. failure, irregular operation and changes in the operational status of any electronic approach or navigation aid or aeronautical communications facility;

11. failures and changes in the RVR observer system;
12. along with any other information of operational significance.

Action required for occurrences of operational significance other than those involving electronic aids and communication facilities

10.5 Whenever any of the following conditions occur or can be anticipated and are of operational significance, the licence holder should take action to amend the UK AIP and/or to promulgate the change by NOTAM by contacting AIS:

1. changes in the availability of the manoeuvring area and changes in the runway declared distances; except that increases in declared distances may only be made with the agreement of the CAA;
2. changes in the permanent level of RFFS category; except that changes may only be made with the agreement of the CAA;
3. significant changes in aerodrome lighting and other visual aids;
4. presence or removal of temporary obstructions to aircraft operation in the manoeuvring area;
5. presence or removal of hazardous conditions due to snow, ice or slush on the movement area;

Note: Notification of such conditions may be by use of the SNOWTAM proforma (form CA 1271). Details on how to complete the SNOWTAM form are published in an AIC.

6. presence of airborne hazards to air navigation;
7. interruption, return to service, or major changes to rescue facilities and fire fighting services available, except that permanent changes to the promulgated RFF Category may only be made with the agreement of the CAA;
8. failure or return to operation of hazard beacons and obstruction lights on or in the vicinity of the aerodrome;
9. erection or removal of obstructions to air navigation, and erection or removal of significant obstacles in take-off, climb or approach areas;
10. air displays, air races, parachute jumping, or any unusual aviation activity along with any other information of operational significance.

10.6 When any of the above arises at short notice a request for NOTAM action should be made to AIS.

10.7 When the situation is premeditated a written request for AIP Amendment or Supplement action should be made to AIS with a copy sent to the airspace, ATM and aerodromes team. Licence holders should be aware that certain types of

information are required to be published in accordance with the AIRAC System, which requires significant advance notice to be given.

10.8 Any of these occurrences could affect the operation of the electronic aids or communication facilities. Advice in this respect should always be sought from the authority responsible for their operation who in turn will decide whether further NOTAM action is required.

Action required for occurrences affecting electronic aids and communications facilities

10.9 NOTAM action will be necessary in the following circumstances:

1. the establishment or withdrawal of electronic aids to air navigation;
2. changes in the regularity or reliability of operation of any electronic aid to air navigation or aeronautical communication facility.

10.10 The operating authority for these aids should:

1. request NOTAM action by AIS; or
2. request AIP amendment or supplement action through liaison with the appropriate ATS regional office or through appropriate channels for NATS facilities.

10.11 The operating authority will be consulted on any other occurrences detailed in paragraph 10.5.

Information centre

AIS for AIP Amendment, Supplement, AIC and NOTAM is:

Aeronautical Information Service
Heathrow House
Bath Road
Cranford
Middlesex
TW5 9AT

UK NOTAM Office (available H24):020 8750 3773/3774
UK AIS Publications (AIP etc.) (available Monday to Friday): 020 8750 3777
Facsimile: 020 8750 3771
AIS website: www.ais.org.uk

For general Notam enquiries: ais.supervisor@nats.co.uk

AFTN address:
Notam proposals: EUECYIYP

For general free text: EGGNYFYX

CHAPTER 11

Water aerodromes

Introduction

11.1 ICAO annex 14 does not differentiate between land and water as a surface from which aircraft can operate; nor, since Article 255 defines that an aerodrome can be an area of water, does the ANO.

11.2 Operations on water differ significantly from those conducted on land, and the licensing criteria for land aerodromes are inappropriate in some areas. Although based on the existing land aerodrome criteria, the different operational and safety risks when operating onto and from water, particularly in more challenging environments such as rivers and lochs, have been recognised and addressed. For example, seaplanes require more flexibility in choosing optimum areas of water for take-off and landing; hence, solutions have been developed to address the designation and identification of the water on which seaplane operations will take place.

11.3 The process of granting a licence by the CAA for a water aerodrome is no different from that of a land aerodrome, and each application would be assessed on the ability to meet the relevant requirements. The following licensing criteria focus on those licensing factors where water aerodromes differ from land aerodromes. These factors primarily include the physical characteristics of the operating environment, mooring procedures, and rescue and fire fighting services; however, one fundamental licensing criterion that requires the licence holder to establish and maintain an appropriate Safety Management System (SMS) remains the same. The criteria should therefore be considered in addition to criteria outlined elsewhere in this document that apply to land and water aerodromes equally.

11.4 The water aerodrome licensing criteria are designed to cater for day, Visual Flight Rules (VFR) operations only; they do not cater for night, Instrument Meteorological Conditions (IMC) or, currently, operations by seaplanes of performance groups A and B.

11.5 In addition to aviation legislation, a seaplane in contact with the water is subject to maritime legislation; including the International Regulations for the Prevention of Collision at Sea, harbour regulations and local byelaws that are not addressed in this document. Where appropriate, licence holders should consult with those bodies that have a regulatory or statutory interest in the use of, or in the operation of, an aerodrome within the licensed area. These include the Maritime Coastguard Agency; the Ports Authorities; the Health and Safety Executive; the Environmental Agency; local government and national parks authorities; and the Transport Security and Contingencies Directorate at the Department for Transport.

Note: All commercial flight activities (fixed wing and rotary) of 10 tonnes or more maximum authorised take-off weight or with more than 19 seats, and de facto the locations that they operate from, are subject to EU Regulation 2320/02 on aviation security and, therefore, the UK National Aviation Security Programme administered and enforced by Transport and Contingencies Directorate at the DfT.

Aerodrome manual and notification in the uk aeronautical information publication

11.6 ANO Article 211(7) requires the inclusion in the aerodrome manual of information and instructions relating to the matters listed under Schedule 12. Items (11), (12), (13) and (14) of Schedule 12 do not directly apply to water aerodromes.

11.7 The following items, in addition to those notified for a land aerodrome and applicable to a water aerodrome, should be published in the aerodrome manual and the AIP:

1. the aerodrome reference point (ARP) co-ordinates and the Aerodrome Reference Elevation (ARE);
2. the shape of the manoeuvring area(s); the lengths and bearings of the edges (in degrees magnetic); and the means of identification; and
3. specific procedures and measures by which the safety of seaplane operations is assured, and an indication of any areas where seaplane operations are restricted or prohibited.

Physical characteristics

Reference point and elevation

11.8 The aerodrome reference point (ARP) should be located at the planned geometric centre of the manoeuvring area, or at the main one if more than one is provided.

11.9 An Aerodrome Reference Elevation (ARE) should be determined at the ARP. This elevation should be determined from the Chart Height, or from the lowest recorded water level, converted to an elevation in metres above ordnance datum.

Movement area

11.10 Licence holders should determine the area of any land and water on which seaplane operations may take place. It is this area that shall be the movement area.

11.11 One or more manoeuvring area(s) should be established within the movement area from which all seaplane operations requiring the use of a licensed aerodrome should take place.

11.12 Operational procedures should be developed for safe seaplane taxying and mooring in the proximity of other seaplanes and obstacles that minimise the risk of damage to occupied or unoccupied seaplanes, particularly where this might result from variations in wind direction, water current, depth and ebb, and flow of tide. ICAO annex 2, Rules of the Air, specifies Standards applicable to water operations that, although similar to those applicable to land aerodrome operations, are not reproduced in CAP 393, Air Navigation: The Order and the Regulations.

11.13 As far as practicable, all reasonable effort should be made to provide a movement area that is free from debris likely to cause damage to a seaplane. In particular, procedures should be established for the regular inspection of the manoeuvring area(s) to remove FOD.

Manoeuvring area

11.14 In some cases, the available manoeuvring area will be large enough to provide a choice of take-off and landing direction, dependent upon prevailing water surface and weather conditions. For the purpose of this chapter, this type of manoeuvring area is termed 'omni-directional'. However, in other cases, such as on a river or narrow loch, it may be more appropriate to provide a manoeuvring area that caters for take-off and landing in one direction and its reciprocal only, in a direction parallel to the longer sides of the manoeuvring area. This type of manoeuvring area is termed 'bi-directional'. Unless specified otherwise, the licensing criteria apply to both types of manoeuvring area.

11.15 The manoeuvring area(s) should be square, rectangular or rhomboidal in shape, and should encompass all parts of the water surface intended for the taking off and landing of seaplanes.

11.16 For the purpose of providing the appropriate minimum strip width and obstacle limitation surfaces, manoeuvring areas are coded according to the maximum take-off mass, or performance group, of the largest seaplane likely to operate from the water aerodrome, as shown in table 11.1.

11.17 Code W1, W2 and W3 manoeuvring areas should have a minimum width, at any point, equal to the visual strip width for code numbers 1, 2 and 3 land runways respectively, as outlined in chapter 3.

Table 11 Water aerodrome manoeuvring area coding

Manoeuvring area code	W1	W2	W3
Seaplane maximum take-off mass	Less than 2730 kg	2730 kg to 5700 kg	5701 kg or more and seaplanes of performance groups A and B

Obstacle Limitation Surfaces (OLS)

Note: Licence holders should consult the CAA for code W3 criteria not specified below.

Take-off climb and approach surface

11.18 A take-off climb surface and an approach surface should be established in the direction of take-off or landing for each manoeuvring area, with the elevation of the inner edges of both surfaces equal to the ARE. The inner edges of the take-off climb surface and an approach surface originate at a distance of 30 m from the appropriate edges of a code W1 manoeuvring area, and 60 m from the appropriate edges of code W2 and W3 manoeuvring areas, and slope upwards and outwards until reaching their limiting distance.

11.19 The take-off climb surface and an approach surface for a code W1, W2 and W3 omni-directional manoeuvring area should form a continuous surface surrounding the manoeuvring area and be equal to the corresponding length and slope dimensions for land-based runway code numbers 1, 2 and 3 respectively.

11.20 The dimensions of the take-off climb surface and an approach surface relating to a code W1, W2 and W3 bi-directional manoeuvring area should correspond to the dimensions for land-based runway code numbers 1, 2 and 3 respectively; see chapter 4.

Transitional, inner horizontal and conical surface

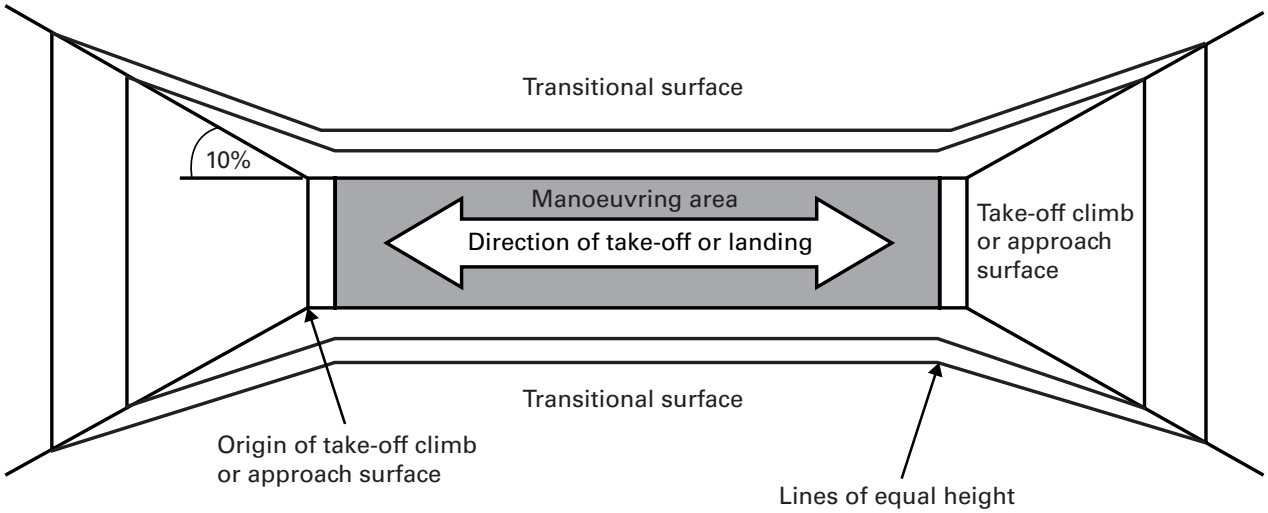
11.21 The inner edge of the transitional surface is coincidental with the edge of the manoeuvring area in both elevation and position. It slopes upwards and outwards with distance from the manoeuvring area until it intercepts the plane of the inner horizontal surface.

11.22 A transitional surface is not required for an omni-directional manoeuvring area.

11.23 An inner horizontal surface should be established at a height of 45 m above the ARE, and should be circular in shape radiating from the ARP to a distance of 2000 m and 2500 m for codes W1 and W2 manoeuvring areas respectively.

11.24 The conical surface relating to codes W1 and W2 manoeuvring areas slopes upwards and outwards from the periphery of the inner horizontal surface in accordance with the criteria shown in chapter 4 for the landbased runway code numbers 1 and 2 respectively.

Figure 11 Take-off climb, approach and transitional surfaces for a bi-directional manoeuvring area



Wildlife strike hazard

11.25 Licence holders should provide a wildlife hazard management plan that includes the identification of the risk and hazards that may exist, and suitable mitigation measures.

11.26 All reasonable measures should be taken to discourage wildlife from gathering in the movement area, and under anticipated departure and arrival flight paths.

Visual aids

11.27 The edges of each manoeuvring area should be easily identifiable by pilots departing from, or arriving at, the water aerodrome.

11.28 Floating visual aids should be conspicuous and conform to maritime regulations or, where such regulations and requirements do not exist or are not applicable, the intended use of shapes, colours and lights specified in chapters 4, 6 and 7 should be considered.

Signals

11.29 Aerodrome signals, to assist pilots in complying with the Rules of the Air Regulations 1991 (the Rules) and ICAO annex 2 relevant to the operation of the water aerodrome, should be provided as specified in chapter 7, unless the same guidance and information can be provided to pilots by an alternative means of compliance.

Rescue and Fire Fighting Services (RFFS)

11.30 Procedures for the enhancement of passenger and crew post-accident survival should be developed, and facilities in terms of staff and equipment, appropriate to the type of seaplane operations anticipated at the water aerodrome, should be provided. Within the provision of these procedures and facilities, account should be taken of the effect that variable environmental conditions might have on the ability of the RFFS to respond rapidly to accidents and incidents.

11.31 Where provided, a rescue vessel should be of a design and size that would allow survivors to be brought aboard, or it should be equipped with an adequate number of floatation devices of a design that would enable survivors to remove themselves from the water.

11.32 The RFFS should achieve a response time not exceeding 15 minutes to any point of the movement area in good visibility and water surface conditions.

11.33 At a water aerodrome where the hours of operation are notified, the RFFS should be available 15 minutes before and after the times published. Where the hours of operation are not notified, the RFFS should be available prior to the engine start of the first departing seaplane, or to the first arriving seaplane commencing its final approach; and until the last arrival is moored, or 15 minutes after take-off of the final seaplane.

11.34 RFFS personnel should receive initial and recurrent competence-based training relevant to their role and task, and should at all times be physically capable of performing the tasks expected of them.

Emergency planning

11.35 The objectives of emergency planning outlined in chapter 9 apply equally to a water aerodrome.

11.36 The emergency plan should consider the particular hazards associated with seaplane operations, including:

1. passenger evacuation into a further life-threatening environment, e.g. deep water;
2. the onset of hypothermia, and its associated effects, during and following prolonged immersion in cold water; and
3. the immediate toxicity and respiratory effects on survivors in the water following the ingestion of floating fuel and oils and their associated vapours, and fire suppressant foams, powders and gases.

11.37 Additional guidance on seaplane accidents in the water is outlined in appendix 6 to the ICAO Airport Services manual (Doc 9137) Part 7.

CHAPTER 12

Heliports

12.1 This chapter applies to land based heliports that wish to be licensed.

12.2 ANO Articles 207 to 209 indicate what helicopter operations are required to be conducted at, from or to a licensed facility.

12.3 The licensing process for a heliport is the same as that required for fixed-wing aerodromes, and is laid out in CAP 168, chapters 1 and 2.

12.4 The standards and best practice against which the application for a licence will be assessed are those laid out in ICAO annex 14 Volume 2, and where applicable also annex 14 Volume 1. ICAO document 9261 – AN/903, The Heliport Manual, provides expanded guidance on the requirements of annex 14 Volume 2.

12.5 When compiling the aerodrome manual, licence applicants should also be aware of any requirements that might apply to their operations from ICAO annex 6, Operation of Aircraft, Part III International Operations, Helicopters.

12.6 Certain aspects of the requirements of other ICAO Annexes may also apply and should be considered or discussed with their nominated aerodrome/heliport inspector when applying for an aerodrome licence.

12.7 Guidance on the standards and best practice for the operation of heliports that do not require a licence can be obtained from Flight Operations (Helicopters), SARG, Aviation House, Gatwick, and also from the British Helicopters Association (BHA), Fairoaks Airport, Chobham, Woking, Surrey, GU24 8HU, Telephone 01276 856100. Email:info@britishhelicopterassociation.org

Civil Aviation Authority

Wildlife hazard management at aerodromes

CAP 772

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Foreword

This document does not constitute a CAA 'requirement'. The content and status of the CAP is provided as information, specialist advice and supplementary guidance material in support of EC Regulation 139/2014 and associated (EASA) Acceptable Means of Compliance and Guidance Material. The guidance expands upon the related material provided by EASA and reflects good practice and accepted standards currently supported and implemented by stakeholders, reflecting PANS Aerodromes (Doc 9981), ICAO Airport Services Manuals (Doc 9137), International Birdstrike Committee (IBSC) Standards and the ACI's WHM Handbook.

Aerodromes subject to UK CAA national aerodrome licencing requirements may use this guidance material to demonstrate a means of compliance to support the applicable wildlife hazard management requirements stated in CAP 168.

The term 'in the vicinity' (or aerodrome surroundings) is interpreted to mean land or water within 13 km of the aerodrome reference point and to landfill and waste disposal sites as defined under relevant UK legislation. It is important to note that 13km (as a distance to safeguard for *wildlife hazard* purposes) is not a specific requirement in this context.

An 'appropriate authority' is deemed to be an authority that has the power to take action in a particular situation.

Acknowledgments

The CAA previously contracted the Food & Environment Research Agency (now known as 'Animal and Plant Health Agency') to assist and provide specialist subject matter expert advice during the formulation of this revised guidance. The CAA further recognises the subject matter expert advice input provided by the following stakeholders:

- The Airport Operators Association
- Birdstrike Management Ltd
- AWM Ltd
- Aerodrome Habitat Engineering
- Ecology & Habitat Management Ltd
- Mulholland Landscape Consultants
- STRI Aviation/Landsafe International
- Avian Safe
- DeTect

- Robin Radar
- Bird Control Group

Background

Although ICAO and EASA now refer to the subject matter as ‘wildlife’ (defined as animals/mammals and birds), for simplicity and consistency and in order to avoid confusion throughout the majority of this document the term ‘birdstrike’ is used. Where direct quotes from ICAO or EASA references are quoted, ‘wildlife’ may be used.

This document focuses primarily on risks posed to aircraft by birds as they are the greatest risk from wildlife according to historical UK CAA occurrence data.

Where issues regarding wildlife hazards other than birds are presented the stakeholders should seek specialist advice from the relevant authorities and agencies.

Certification Standards for airframes and aircraft engines provide modern commercial aircraft with a measure of resistance to birdstrike damage. This is, however, proportionate to the size and type of aircraft, with light or general aviation type aircraft and helicopters currently having no birdstrike certification standards for windshields or airframes.

Aviation safety agencies, regulators and associated stakeholders worldwide have produced guidance, standards, manuals and policy documents to help aerodrome and aircraft operators in managing and mitigating bird and wildlife strike risks, these may all be referenced and adopted as applicable.

Chapter 1

Standards, recommended practices and requirements

The UK, as a signatory to the Chicago Convention on International Civil Aviation, has adopted the standards and recommended practices (SARPs) specified in Annex 14 (Volume 1 Aerodrome Design and Operation), published by the International Civil Aviation Organization (ICAO).

The guidance in this document is also based on requirements and recommendations in the following documents:

- Article 10 of EC Regulation 139/2014[1]
- EASA (ADR.OPS.B.020 Wildlife strike hazard reduction)
- Chapter 5 of CAP 168 Licensing of Aerodromes

Wildlife and conservation laws

When addressing the hazard posed by both birds *and* wildlife, stakeholders must ensure their actions are lawful. Specific licences are required for some wildlife control activities in order to preserve air safety which would otherwise be illegal under the 1981 Wildlife and Countryside Act. The agencies responsible for them are:

- Natural England
- Scottish National Heritage
- Natural Resources Wales
- Northern Ireland Department of Agriculture, Environment and Rural Affairs

A those involved in any wildlife control activities lethal or otherwise must ensure they are familiar with any restrictions that may apply to aviation related wildlife control and management activities issued by the relevant licensing authorities, as noted above.

Generally, a species specific licence may be issued by the relevant agency when:

- There is a genuine problem to resolve or need to satisfy for which a licensing purpose is applicable;
- There are no other satisfactory alternative options;
- The licensed action will contribute to resolving the problem or meeting the need;

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2014:044:0001:0034:EN:PDF

- The action to be licensed is proportionate to the scale of the problem or need;

The aerodrome Accountable Manager must be satisfied that any aerodrome wildlife control personnel (‘in-house’ personnel or contracted third parties) act within the provisions of any relevant licence. Ultimately, it is the responsibility of individuals to ensure compliance with the law and to be aware that failure to comply with the relevant legislation could result in fines of up to £5,000 and/or a 6 month custodial sentence. In Scotland proceedings may be taken against the aerodrome in respect of an offence, whether or not proceedings are also taken against an individual.

Natural England and their equivalents may consider the impacts of ‘on-aerodrome bird control’ and related activities on adjacent areas that have been designated for protecting wildlife. Sites of Special Scientific Interest (SSSI) for example are protected by the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000. Aerodromes whose land contains an SSSI or whose actions could impact on a nearby SSSI should therefore consult with the relevant agency before carrying out wildlife control activities.

Bird control and dispersal activities undertaken by the aerodrome that are not included within the existing provisions of an SSSI and which may damage an SSSI’s natural features cannot be undertaken without consent from Natural England or equivalent. A significant number of SSSI’s are also included in European or internationally protected designations such as Special Areas of Conservation, Special Protection Areas and Ramsar sites under the Habitat Regulations 2010 (as amended). Many of these are classified as 'Natura 2000' sites under European legislation. Aerodromes operating adjacent to or in close proximity to designated nature conservation sites should discuss their bird/wildlife control management plans with the relevant conservation agencies to ensure that any planned wildlife hazard control activities meet the requirements of the relevant legislation.

Natural England provides useful guidance concerning 'Sites of Special Scientific Interest’ for land owners and occupiers.

Chapter 2

Wildlife hazard management plans

Principles and objectives

The reduction of birdstrike can be split into three areas:

- Identify hazards
- Evaluate management options
- Develop strategies to manage risk

Strategies should focus on deterring birds from flying in the same airspace as aircraft on and in the near vicinity of the aerodrome, and primary control options should include:

- Aerodrome habitat management
- Active control procedures
- Safeguarding

Each aerodrome location presents a unique habitat that influences the type and population of bird species present. It is therefore essential that the most appropriate and effective measures are identified and adapted to suit local conditions.

Wildlife hazard management plans

Wildlife hazard management plans (WHMP) should:

- Assess the wildlife hazard on, and in the vicinity of, the aerodrome;
- Establish a means and procedures to minimise the risk of collisions between wildlife and aircraft;
- Notify the appropriate authority if a wildlife assessment indicates conditions in the surroundings of the aerodrome are conducive to a wildlife hazard problem.[2]

As a minimum, a WHMP's should include details of:

- Persons who are accountable for developing and implementing the risk assessment programme, overseeing the control activities, analysing data and carrying out risk assessments;

[2] EASA (ADR-OPS B.020 Wildlife Strike Hazard Reduction)

- Risk assessment methodologies that are to be conducted and the risk mitigation measures that are in place;
- Policies and procedures for reducing wildlife strike risks on the aerodrome including:
    - Processes for effective on-aerodrome habitat management;
    - Flexible use of a range of deterrent, dispersal and control measures to prevent habituation from occurring;
- Details of any relevant permissions or licences for control measures;
- Recording of control activities;
- Reporting control issues to aerodrome management and airside or flight safety committees;
- Recording and analysis of strike reports;
- Logging species, observations, intelligence and subsequent data analysis;
- Policies for bird control during hours of darkness and low visibility operations.

The WHMP should be referenced or included in the aerodrome manual and made available to the CAA for audit and compliance monitoring purposes.

Measures detailed in the plan should relate to the threat posed by each identified risk, but should also include details on how measures may change due to changes in bird and wildlife activities; for example, dealing with seasonal change or following collection of wildlife data. The measures should include the wildlife control techniques described in this or other authoritative documents, at the aerodrome operator's discretion.[3]

Whichever technique or tools are used, priority should be given to reducing the presence of large and/or flocking birds and, where practicable, to managing other congregations of birds that present a threat to aircraft safety whether on or off-aerodrome.

Safeguarding systems

Safeguarding systems need to be put in place to guard against new or increased wildlife hazards caused by developments both on and in the vicinity of an aerodrome. They should

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Other useful references include:

- International Birdstrike Committee, Recommended Practices No.1 Standards for Aerodrome Bird/Wildlife Control, Issue 1, October 2006;
- Airports Council International (ACI) – Aerodrome Bird Hazard Prevention and Wildlife Management Handbook;
- ICAO Doc 9137 (Airport Services Manual);
- PANS Aerodromes (Doc 9981)

include details of activities employed by the aerodrome operator to control or influence areas beyond the boundary of the airfield, in the vicinity of the aerodrome (up to 13 km and in some instances beyond, or less than 13 km, as determined by risk and effectiveness of interventions) and where practicable, could include:

- Establishment of a process with the local planning authorities for consultation on proposed developments that have the potential to be wildlife attractant within 13 km of the aerodrome;
- Means to influence land use and development surrounding the aerodrome such that the strike risk does not increase and, where practicable, is reduced;
- Means to help encourage landowners to adopt wildlife control measures and support landowners' efforts to reduce wildlife strike risks, via land use agreements; and
- Procedures to conduct and record the results of off-aerodrome site monitoring visits.

Record keeping

It is essential to record all wildlife control activities undertaken both tactically and strategically as determined locally, routinely, hourly, daily or per shift basis, details of which should form part of the WHMP. This intelligence and data can also be used in order to:

- Evaluate the effectiveness, performance and success of risk management programmes;
- Identify areas requiring attention;
- Highlight key risk periods;
- Provide a record of activities that were being undertaken in the event of an incident and assist with any follow-up investigation.

There is no standard or agreed list of details that must be collected, but the following may be a useful guide:

- Name of the personnel on duty;
- Shift start and finish time;
- Time for each activity or record;
- Location of activities;
- Species details of the bird or other wildlife observed and/or dispersed;
- Numbers of each species seen, including nil returns;

- Dispersal action taken;
- Reaction of wildlife to dispersal;
- Direction of dispersal.

For airports with an aircraft movement every 15 minutes or more, the International Birdstrike Committee recommends recording bird control actions as they are undertaken, but also that a record is added to the log at least every 30 minutes, even when no active control took place or where no bird or wildlife observations were made.

Review and evaluation

Procedures to monitor and evaluate the performance and effectiveness of wildlife control strategies might include:

- Wildlife control performance monitoring, measurement and improvement systems;
- Personnel training, competence assessment and appraisal;
- Trend analysis.

An analysis of bird and wildlife strikes and observations should be undertaken periodically (at least annually) and after any significant strike event has occurred as part of the risk assessment process. Recording information is essential to provide evidence that active bird control is in place in the event that an incident occurs, and equally provides an opportunity to assess and evaluate fluctuations in wildlife occurrences in different areas of the airfield.

Chapter 3

Roles and responsibilities

The roles and responsibilities of all personnel are important elements of the aerodrome operator's safety management system and contribute to the effectiveness of the wildlife/birdstrike management plan.

Where aerodrome bird or wildlife control is provided by third party service delivery companies there should be auditable oversight mechanisms in place, such as a service level agreement and formal arrangements that ensure trained, assessed and competent personnel are employed and that the overall performance of the activity is both compliant and is able to demonstrate measureable safety performance indicators and improvements.

In accordance with EASA ADR.OR.D.010 the aerodrome operator shall ensure that when contracting or purchasing any part of its activity, the contracted service, equipment or systems conform to the applicable requirements. The aerodrome operator is therefore obligated to ensure that the Competent Authority (CAA) is given access to the contracted organisation in order to determine continued compliance with the applicable requirements.

Contracted organisations should have a thorough understanding of their roles and responsibilities as set out in the formal arrangements and wildlife hazard management plan and be able to work effectively with other organisations as required, both on and off aerodrome, such as air traffic control and local landowners etc.

The roles and responsibilities may be adjusted to suit an aerodrome's specific hazard and control circumstances. The following subject headings describe the type of roles and responsibilities that may be typically included in a wildlife hazard management plan.

Bird control manager/co-ordinator

The aerodrome operator has overall accountability for wildlife hazard management at the aerodrome, but responsibility for wildlife control and the delivery and implementation of the management plan at the aerodrome is typically delegated to a coordinator, airside service delivery or compliance manager. Their primary objectives should be to:

1. Ensure that personnel understand how to assess and determine wildlife hazard and strike risks; understand the hazard management plan and have adequate resources to implement the plan;
2. Manage implementation of the plan via internal audit and periodic review;
3. Review statistical analysis of strike records;
4. Ensure the results of strike analysis are communicated to management and stakeholders as appropriate;

5. Monitor habitat changes on and in the vicinity of the aerodrome, and develop and implement appropriate management and control activities;

6. Ensure adherence to habitat management, airfield grass policies and associated maintenance programmes;

7. Understand the implications of not managing wildlife strike hazards effectively and not following the plan and initiating any necessary changes;

8. Analyse and interpret records (shift logs) of control activities, strike reports and on and off-airfield observations and intelligence;

9. Understand the need for periodic surveys of bird and wildlife concentrations and movements in the local area (up to or beyond 13 km as determined by aerodrome management policies);

10. Work with, for example, local landowners, farmers, gamekeepers, local nature reserve managers and racing pigeon organisations in order to influence and raise awareness of bird hazard matters;

11. Consult and engage with aerodrome planning development and engineering departments regarding safeguarding proposals, and engage with planning applicants where a proposed development has potential to change risk (e.g. restoration of mineral extraction sites);

12. Monitor the effectiveness of any bird and habitat management measures via quality audit or similar process;

13. Identify potential wildlife strike risks through collation of local ornithological reports and survey data;

14. Seek advice and assistance from outside specialists on matter requiring expertise not available at the aerodrome;

15. Produce reports on specific bird hazard issues, safety briefs and issue warnings to pilots via NOTAM, ATIS or AIP as necessary;

16. Ensure wildlife control record-keeping (recording observation counts, strike recording and reporting, dispersal, culling and habitat management diaries, etc.) are correctly recorded in a manner that can be easily interrogated and audited;

17. Ensure that all necessary training, passes, permits and licences are current;

18. Ensure the supply and safe keeping of equipment, including firearms and lasers.

Aerodrome bird/wildlife control personnel

Control personnel (or Bird Control Units, BCU) are responsible for the direct delivery of control duties on the aerodrome and enacting the management plan to counter any wildlife

presence on the airfield that presents a potential risk to aircraft flight safety. As such, the wildlife control personnel's duties should include:

1. Maintaining surveillance of wildlife activity on the aerodrome and around the aerodrome boundary;
2. Implementing wildlife control measures in accordance with the plan to counter any detected wildlife strike risk;
3. Providing information to air traffic control with details of potential wildlife strike risks and management activities as they occur;
4. Recording and reporting all confirmed, unconfirmed, near-miss or suspected wildlife strikes;
5. Advising the aerodrome certificate/licence holder and/or the accountable manager of habitat control issues on the airfield and identifying improvements to the wildlife control process; and
6. Assisting with wildlife/bird surveys and gathering and recording intelligence.

Chapter 4

Risk identification

Assessment of wildlife strike risk

The aerodrome operator should develop and maintain a systematic method of obtaining information regarding hazardous wildlife species and their habitats to manage them effectively. This should include:

- Assessing the hazards in the context of aircraft operations;
- Analysis of strike records to identify how many of each species have been struck over specific periods of time;
- Identification of species more likely to cause damage to aircraft, such as flocking birds and larger, heavier species, such as waterfowl;
- Development of a risk assessment methodology to inform the control programme in accordance with policies set out in the management plan.

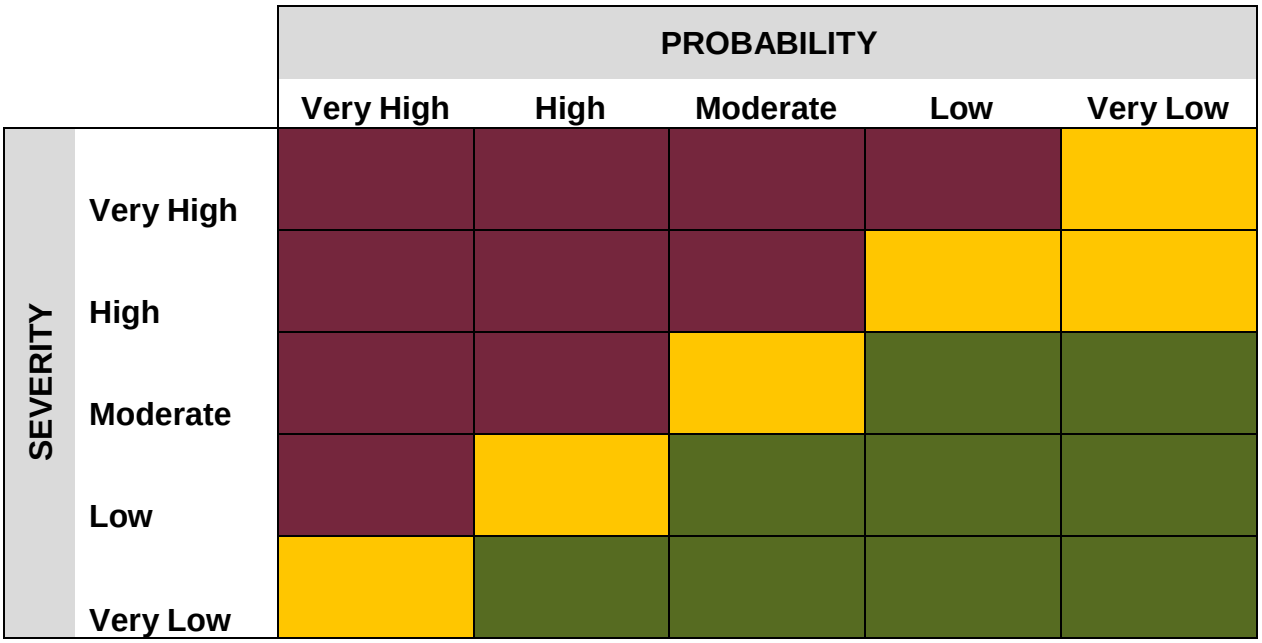
Details of existing wildlife locations and wildlife movements both on and off the aerodrome should be recorded to provide a baseline and allow resources to be targeted effectively, and a risk assessment should then be carried out. The record and risk assessment should include:

- Detailed information of wildlife, identifying species, size, numbers and habitats that influence wildlife population and behaviour, and likely aircraft damage in the event of a wildlife strike;
- Risk information that can be quantified in the short and long term, dependent upon wildlife population and seasonal changes, including an assessment of the frequency of serious multiple wildlife strikes;
- The potential and continuing risks, so they can be assessed on a comparable basis control actions focused in a structured manner;
- The determination of the acceptability of the level of risk by summing the probability and severity, based on a probability/severity matrix, such as that illustrated in Figure 1 based on published birdstrike risk assessment methodology;[4]
- The identification of management options for, in this example, yellow/amber and red risks;

[4] Allan, J (2006), A Heuristic Risk Assessment Technique for Birdstrike Management at Airports.

- The development, implementation and monitoring of an action plan to eliminate, reduce or mitigate risks.

Figure 1: Example wildlife strike risk assessment matrix



Red: high risk – additional management actions should be implemented for this species as soon as possible.

Yellow/amber: medium risk – current risk management strategies for this species should be reviewed and additional steps taken if appropriate.

Green: low risk – no additional action above that already being implemented for this species is currently necessary.

Probability of a strike

Probability of strike risk for different species can be calculated using, ideally, data recorded from the last 5 year period to provide an annual average number of strikes for inclusion in a matrix. Accurate up to date records are invaluable. Additional to observations by aerodrome personnel, liaison with local landowners and land users such as local bird watchers and ornithological societies, nature reserve wardens, water bailiffs, gamekeepers, farmers and pigeon racers, for example, may also be useful. Specialist wildlife and birdstrike organisations can also help apply wildlife strike knowledge in the context of the location of a potential bird attractant site and the type and numbers of species found there.

Using UK birdstrike data, the following ratings have been calculated:

Figure 2: Probability ratings

	Very High	High	Moderate	Low	Very Low
Number of strikes	>10	3.0 - 10	1.0 - 2.9	0.3 - 0.9	0 - 0.2

Severity

Using UK wildlife strike data submitted to the CAA, severity was calculated by species, based on the percentage of strikes that caused some form of damage to an aircraft. These proportions are provided in Figure 3. Examples of some severity percentages for different species are shown in Figure 4.

Figure 3: Severity (probability of damage to aircraft engines)

	Very High	High	Moderate	Low	Very Low
Number of strikes	>20%	10 - 20%	6.0 - 9.9	2.0 - 5.9	0 - 1.9

Figure 4: Example of species and their damage probability percentages

Species	Damage Percentage	Species	Damage Percentage
Mute swan	42.5%	**Feral pigeon**	6.5%
Canada goose	26.7%	**Black-headed gull**	4.6%
Herring gull	13.0%	**Kestrel**	2.6%
Buzzard	11.4%	**Starling**	2.6%
Lapwing	8.3%	**Swift**	1.2%
Woodpigeon	6.6%	**Skylark**	0.7%

Additional species severity ratings can be calculated using the mean weight of the species concerned. Strikes involving multiple birds have a far higher probability of causing damage to aircraft. Severity ratings should therefore be increased when strikes from multiple birds are being recorded. The severity rating should be upgraded to ‘very high’ when a ‘high’ severity species is recorded involving multiple birds, and ‘moderate’ or ‘low’ rated species should be upgraded after three or more strikes are recorded involving multiple birds, e.g. ‘low’ to ‘moderate’, ‘moderate’ to ‘high’ etc.

Figure 5: Example of calculation for four lesser black-backed gull strikes during the last five years, of which three were multiples

Strikes per year over last 5 years	0.8/year	Low
Probability of damage	11.9%	High

Low x High = Level 2 Risk. Three multiple strikes recorded in last five years raises 'High' to 'Very High' damage probability. Low x Very High = Level 3 Risk; Action plan necessary with annual review.

All species recorded within a risk assessment matrix should be updated following any strike occurrences to ensure validity. On establishing where each species lies within the matrix, the management plan can be used to target resources against the highest risk.

Off-aerodrome wildlife surveys (‘13 km bird circle’)

Off-aerodrome bird monitoring or control to 13 km is not stated in EASA Aerodrome regulation and so this particular guidance may be interpreted to support an aerodrome’s own policy with regard to assessment of the wildlife hazard on, and in the surroundings of the aerodrome.

In order to provide flexibility and proportionality, aerodrome operators may determine to monitor off-aerodrome bird or wildlife activities in different ways to achieve the desired objectives and benefits. Off-aerodrome monitoring practices may be dependent and determined by the size and complexity of the aerodrome itself, the type of operating aircraft; the human resource available, the bird/wildlife hazard presented in the vicinity and results of any risk assessment (as noted in the aerodrome’s wildlife hazard management plan).

However, it is important that the aerodrome wildlife hazard management plan reflects whatever process has been decided upon and that is demonstrably implemented and explains the rationale where an alternative approach or deviation from 13 km has been applied. Ultimately however, it is the aerodrome operator’s responsibility to determine and manage the effectiveness of its off-airfield wildlife hazard ‘safeguarding’ policies, practices and procedures.

Principally, but not exclusively, off-aerodrome bird/wildlife surveys or assessments are carried out in order to identify:

- Wildlife attractants;
- Concentrations and regular movement patterns of hazardous birds at different times of the year;

Such assessments should be carried out routinely, at least seasonally and may include the following factors:

- Location: the proximity to and direction from the aerodrome;
- Site attractiveness: whether it is used as a source of food, a roost site or a breeding site;
- Species and numbers of birds/wildlife present;
- Flight lines of birds to/from a site and whether flight lines are direct to the aerodrome, cross aircraft flight paths outside the aerodrome boundary, or are overhead the aerodrome are all important factors that should be considered;
- The relationship of a site to other sites that attract the same species e.g. the location of a landfill facility that attracts foraging gulls will need to be assessed in relation to local reservoirs or nesting sites that attract roosting or breeding gulls respectively;
- Daily/seasonal factors: whether the site is a continuous risk (each day and throughout the day), a regular daily risk (once/twice a day), a risk related to specific daily or seasonal activities, or an annual risk;
- Any control action undertaken by the site operator: actions may range from no action to housekeeping actions only, passive and active wildlife deterrence measures, such as proofing and culling; and
- Perhaps most importantly, the schedule of periodic and seasonal visits to sites should be documented so that an accurate assessment of the different risks associated with a site at different times of day or year can be evaluated.

Wildlife attractant habitats: on-aerodrome

Aerodrome environments provide a wide variety of attractants and these should be identified and assessed to determine the most appropriate prevention, controls, reduction and eradication actions. The following may also apply to sites in the vicinity of the aerodrome.

Food

Food resources will vary by species but could include:

- Earthworms, snails, slugs, spiders, millipedes, insects and larvae that are typically present in grassland, thatch and underlying soil;
- Plant species present in the grass such as clovers, Trifolium spp, dandelion Taraxacum officinale, chickweeds Stellaria media and Cerastium spp, vetches Vicia spp and Lathyrus spp, amongst others.
- Plant species that are present within water bodies;

- Small mammals, such as rabbits, voles, mice and rats along with reptiles and amphibians such as newts, toads, frogs, lizards, snakes and fish and invertebrates that inhabit water bodies;
- Wastes from in-flight and terminal catering areas, litterbins in car parks or on aircraft viewing terraces, etc.;
- Scrub, bushes, brambles, nut or berry bearing trees including, but not limited to; barberry, holly, cotoneaster, rowan, hawthorn, wild cherry, buddleia etc.

Different food sources may attract different species at different times of year and should be managed accordingly.

Open terrain

Flat, open terrain, including airfield grassland, runways, taxiways, aprons and paved surfaces, may all create secure areas for birds and some wildlife, as do buildings, lighting structures and other installations such as radar towers.

Evidence in the UK suggests that cutting the airfield grass to an appropriate optimum height can be one of the most effective measures of bird hazard control, often referred to as the Long Grass Policy or 'LGP'.

The presence of other, less prominent features such as open drainage ditches, ponds, scrub, bushes and trees, earth banks, and waste food also provide further resources for wildlife to exploit and should be managed and secured where possible.

Car parks may also provide refuges for wildlife if they are not busy, as well as providing discarded food sources for birds and wildlife opportunities during busy peak seasons.

Buildings and structures

Aircraft hangars, terminal buildings, airport rescue and fire stations, old aircraft, lighting and signage structures all provide roosting sites, perching opportunities or possible nest sites. Sheltered ledges, access holes and crevices within and underneath such structures can prove ideal nesting locations for feral pigeons, stock doves, pied wagtails and starlings.

Rooftops themselves, including green roofs designed as part of a SUDS, may be attractive to gulls or wading birds such as oystercatchers, for nesting, loafing and roosting.[5]

Rooks, carrion and hooded crows have been known to nest on aerodrome lighting gantries and they should be designed to prevent this or allow nests to be removed easily.

[5] Sustainable Urban Drainage Schemes

Landscaping

Landscaping developments include grass reinstatement, tree and shrub planting and may include the creation or enhancement of water features. Landscaping schemes have the potential to:

- Create dense vegetation that may become a roost;
- Provide an abundant autumn and winter food supply in the form of fruits, nuts and berries;
- Create standing water or watercourses that attract gulls and waterfowl; and
- Result in areas of short grass that provide feeding opportunities for a wide range of hazardous wildlife.

As they can increase the wildlife attraction, any landscaping scheme on the aerodrome should, be avoided and could also set a precedent for safeguarding policies concerning off-airfield developments.

Trees provide food in the form of fruits (acorns, beech-mast etc.) flowers and leaves, and are a place for birds to roost or nest. Where possible, there should not be any trees within airside areas or the airport boundary. If trees are necessary, those that offer minimal resources should be chosen and planted in such a way as to reduce their attraction to birds.

Dense vegetation, such as thorn thickets, game coverts and young un-thinned conifer screening belts, can provide nesting sites for woodpigeons, small passerines (perching birds) and corvids, as well as roosting sites for potentially large flocks of starlings.

Water

Open, standing water, such as balancing ponds, reed beds and watercourses, drainage ditches or river channels, may attract large flocking birds, including ducks, geese, swans, grebes, waders, herons, coot, moorhen and cormorant. The more open water sites there are on and around an aerodrome, the more complex and frequent the movements of waterfowl will be. There may also be more activity at night than during the day.

Wet weather can create water-logging that brings worms and other soil invertebrates to the surface, making them very accessible to foraging wildlife.

Wildlife attractant habitats: off-aerodrome

Both manmade and natural landscaping features off-aerodrome can attract wildlife onto and aerodrome. These can include:

- Landfill sites
- Sewage works

- Building developments
- Drainage schemes
- Reservoirs
- Gravel pits
- Coastal areas
- Rivers and estuaries
- Woodland and agricultural land

If feeding sites are numerous and spread out (e.g. ploughed fields in autumn) bird activity can be unpredictable, with the overnight roosts being the only constant feature. Their flight lines can cross over an aerodrome or low level aircraft arrival or departure routes.

Agricultural activities in fields close to an airport, like ploughing, harrowing and cropping, which disturb the soil, together with sludge spraying, manure spreading, seed drilling, ripe crops, harvesting, and hay and silage cutting, create ideal feeding opportunities for waterfowl, gulls, lapwings, corvids, starling and pigeons that may then cross the airfield. Such activities will increase the resources needed for on-aerodrome wildlife control.

Awareness and understanding of wildlife concentrations and movements can improve the efficiency of wildlife control on the aerodrome. For example, if the dusk return passage of gulls over the aerodrome to a roost is understood, aerodrome wildlife control personnel may be able to warn air traffic control at the appropriate time.

The coast

Sandy and muddy shores, especially around estuaries, have the potential to support large numbers of gulls, waders, wildfowl and fish-eating birds. Coastal aerodromes may therefore have larger numbers of bird species, whose activity patterns are complicated by tide state and affected more by the weather, which could have a significant impact on flight safety and require further specialist assessment.

Landfills for food wastes

Waste from household and commercial premises at open landfill sites can contain a high proportion of food waste which may support large numbers of gulls, corvids and starlings.

Similar waste at open transfer stations or composting facilities can attract similar species of birds.

Gulls congregating at landfills present the following risks:

- When not feeding, they spend most of the day on open sites within 6km of the landfill;
- They may soar up to 3000ft or more in clear weather; and

- Their flight lines between food source and roost may cross an aerodrome or its approach and departure routes.

Corvids and starlings present similar risks, but they generally travel less than gulls (max 16 km to or from a roost site). In some areas, Red Kites can also be abundant at landfill sites presenting a similar risk to large gulls.

Sewage treatment and disposal

Sewage treatment plants can attract large numbers of black-headed gulls, common gulls and starlings. Numbers vary depending on the type of installation and effluent release system.

Reservoirs, lakes and ponds

Water bodies ranging from small ponds to large manmade reservoirs can attract wildlife for food (weed, vertebrate and invertebrate species), roosting (space and security) and nesting sites (often islands or spits). Waterfowl, wading birds, fish eating birds (cormorants, herons, grebes and egrets) and gulls may congregate in large numbers.

Sand, gravel and clay pits

The large voids created by mineral workings sometimes result in ponding. This can create temporary habitats suitable for a range of waterfowl. Similarly, restoration by flooding to provide lakes or nature reserves may provide habitats around an aerodrome.

Agricultural attractants

Growing and harvesting crops inevitably attracts wildlife at some stage. However, the attraction usually arises suddenly and persists for only a few days or weeks and the risk is mainly confined to local farms.

Livestock can also attract birds. Cattle feed, either as spillage or in store, can attract large numbers of collared doves, feral pigeons, starlings and house sparrows. Free-range pig farming can attract large numbers of gulls, corvids and pigeons, and grazing cattle, sheep and horses keep grass short and maintain suitable feeding conditions for gulls, waders, corvids and starlings. Farm buildings may be suitable for nesting species such as feral pigeons.

Chapter 5

Habitat management

The purpose of this chapter is to describe broad guidance on what may be considered as established good practice regarding typical airfield habitat/grass management at UK aerodromes. The various options described and discussed recognise that a “one size fits all” approach is not appropriate given the broad range of environmental, climatic and operational factors that are presented at respective aerodromes across the UK.

Where deemed necessary by the aerodrome operator, appropriately trained, competent and professional habitat management specialist should be contracted to manage aerodrome grass and habitat maintenance programmes. The aerodrome operator should ensure that such specialists and organisations are resourced and competent to undertake the desired task. Ultimately, it is for the aerodrome operator to determine and require evidence of the desired competencies, skills and experience pre-requisites - with the sole objective of ensuing that the aerodrome grass and habitat programme delivers the most effective, performance based and efficient methods of achieving the critical goal of minimising the risk to aircraft flight safety posed by hazardous birds and wildlife.

General habitat management considerations

Effective, performance based, aerodrome wildlife habitat management is a critical and important activity that should yield a continuous reduction in the numbers and types of hazardous bird (and wildlife) on and in the vicinity of the aerodrome. Habitat management techniques should therefore be aimed at the removal or reduction of habitats that attract wildlife that give rise to the greatest risk.

The key objective of habitat management is to proactively and systematically prevent hazardous wildlife from being attracted to the airfield environment in the first place and thereby reduce the reliance on reactive or 'active' bird control methods in order to prevent wildlife strikes.

Aerodrome grassland has the potential to provide food, security and nesting habitats for a variety of birds. Studies and fact based research[6] over many years has determined that grass that is maintained at a height of 200-300 mm with minimal levels of weed infestation has been proven to reduce the presence of upright stems and the majority of hazardous bird species. This method of grass management is often referred to as a 'long grass policy' (or LGP) (Brough and Bridgeman 1980).[7] In the majority of cases throughout the UK, a LGP may prove to be the most effective programme to adopt, however other factors such

6 http://www.int-birdstrike.org/Amsterdam_Papers/IBSC25%20WPA1.pdf

7 T. Brough and C. J. Bridgman (1980) *An Evaluation of Long Grass as a Bird Deterrent on British Airfields*, Journal of Applied Ecology, Vol. 17, No. 2 (Aug., 1980), pp. 243-253

as grass sward type, ground conditions, climate and the nature and variety of local bird populations may ultimately influence the determination and applicability of an aerodrome's grassland policy, therefore additional or bespoke strategies may be required to effectively manage the risk.

Wild flower meadows and grassland managed for silage or hay crops can attract large numbers of birds at various times of year and should be avoided where practicable. Silage cutting often results in a higher percentage of weed seeds and increased deterioration of the grass sward and should be discouraged. Longer grass (typically above 300 mm) that falls over because it cannot support itself also has a greater potential to attract wildlife.

Where aerodrome operators choose to deviate from an established LGP as described in this document, they should do so only after having received advice from an appropriate, trained and competent habitat management specialists, or agronomists with relevant airfield habitat experience. Ultimately however, it is for the Aerodrome operator to determine the suitability and competency skill set of persons and organisations providing expert advice.

The LGP should be extended to include the grass areas or margins adjacent to runway and taxiway edges. As grass grows according to season, so does the presence and prevalence of certain wildlife species and therefore grass maintenance should be planned accordingly to deter and target species when necessary.

Where a LGP is employed, it's primary intention is to reduce the attraction to hazardous birds via a healthy, erect, dense grass sward, which is weed free. This acts to reduce the attractiveness to wildlife that wish to reside on the airfield, reduce security and the accessibility of food that wildlife may feed on. Grass on aerodromes should therefore be maintained at a height of approximately 220- 300 mm where possible and be capable of standing upright during winter months.

The efficacy and performance of the LGP is affected by the general management programme of the grassland sward – notably nutrition, thatch management, pest, weed and disease control. Holistic management of the sward should be determined and prescribed by an appropriate and experienced habitat management specialist.

In addition to the establishment and periodic review of a habitat management programme, the following parameters should be measured, recorded and be subject to periodic quality assurance and performance checks:

- Sward height
- Sward density
- Species composition
- Soil properties (type, texture, nitrogen, phosphorus, potassium and pH)
- Rooting depth

- Weed and moss presence (type and percentage cover)
- Insect presence (populations)
- Surface drainage issues

The frequency of review is ultimately at the discretion of the aerodrome operator however, it is recommended that reviews are undertaken at regular intervals (as a minimum, annually) in order to allow for adequate quality control monitoring.

Prior to the establishment of a LGP, soil nutrient analysis should be taken from key points across the habitat areas so as to gather the relevant intelligence and establish a baseline. Such analysis should be repeated annually as part of a structured review of the performance of the airfield grass and overall habitat in order to form the basis for nutrient input requirements. Any nutrient deficiency should be made good where deemed necessary.

Specialist strains of grasses, designed for airfields that may be more effective at maintaining both 220-300 mm heights and delivering the desirable wildlife deterrent qualities throughout the year may be considered.

Different strains of the same grass species may be necessary to achieve suitable wildlife deterrent qualities for respective aerodromes. Emphasis should be on providing a nutritional programme that aids the production of a sward that repels hazardous wildlife.

Airfield grasslands should be monitored to ensure that the ideal upright species are present in sufficient density to maintain the effectiveness of the sward. Where this is not the case consideration should be given to over-seeding using well established methods (ie killing and removing decaying matter before seeding) to increase the proportion of the desired grass species in the habitat. Consideration should also be given to using direct drill seeding equipment to ensure no seed or arisings remain on the surface.

Grass trimmings (or ‘arisings’) that settle between the stems after cutting may result in ‘thatch’. This can prevent applications such as fertiliser or herbicide from acting effectively and provide a suitable micro-habitat for insects and small mammals.

Thatch should not be allowed to measure more than 35-40 mm from the top of the soil profile. Greater depths than this means deterioration of the sward caused by the weakening of the desirable grass species. Thatch should be removed during on-going habitat maintenance operations to help create a healthy sward.

Rooting depth of the sward should also be measured to ensure that grass plants can achieve full growing potential in any given season. A failure of the root system may necessitate a more detailed review to determine the causes and the suggested remedies.

Long grass maintenance requires activity throughout the year. Several dates are given in the paragraphs and diagram below but aerodrome operators should take account of local climatic conditions for planning their own maintenance regimes.

Methodologies for specific maintenance options – bottoming out

Frequency

Bottoming out is removing the decaying grass down to between 30-40 mm from ground level depending on the contours of the soil surface. This important operation should be carried out with other maintenance operations ie ‘harrowing’ and soil ‘aerating’ to enable a five year cycle to be achieved. Advice from the habitat management specialist is recommended to ensure the grassland thatch build-up is closely monitored.

Timing

Bottoming out should take place in early spring when bird activity is at its lowest and as soon as ground conditions are sufficiently stable to allow the ingress of heavy machinery. The procedure (detailed below) should be completed in time for the sward to reach the optimum sward height.

Equipment

Forage harvesting is the recommended practice for grass collection. Equipment should be carefully set to penetrate the thatch layer of the sward, thereby removing thatch, moss, less persistent weeds and any decaying vegetation without damaging the crowns of grass plants or creating a bare or excessively open sward.

All arisings should be collected as part of the operation. Leaving grass clippings in situ may create a ‘foreign object debris’ (FOD) hazard to aircraft and may also smother the habitat causing die-back and creating feeding and loafing opportunities for birds. Additionally, grass arisings may provide undesired food and habitat for invertebrates and small mammals.

Immediately following bottoming out, if required, the ground should be scarified with spiked harrows or equivalent machinery. Arisings from this operation should be raked and collected to prevent sward damage and the attraction of birds or other wildlife, due to decaying organic matter. The purpose of scarifying is to further remove thatch, weeds and other decaying material and in creating a ‘clean’ sward going into the spring/summer.

Ongoing habitat maintenance

Once the operation is completed, rolling/aerating and/or an application of fertiliser may be undertaken, dependent upon the condition of the sward. The sward should be assessed for surface undulations and the decision to roll and/or apply fertiliser should be made by the habitat management specialist. Rolling can create compaction issues which may inhibit drainage capabilities in certain circumstances and therefore should be carefully considered before being implemented.

Quality assurance

Where necessary, the results of the bottoming out process should be assessed to ensure the following factors are met:

- That bottoming out was undertaken to sufficient depths in order to remove thatch (to a minimum of 30/40 mm from soil surface) in order to create a 'clean' sward;
- That all arisings from the operation are collected;
- That, if required, the sward recovery programme (e.g. fertilizer) was appropriately carried out;
- That ruts and soil compaction created during the operation is rectified as soon as practicable.

Where the ground is waterlogged or in an unstable or unsuitable condition, the aerodrome operator may consider delaying the bottoming-out operation due to vehicle use which could result in rutting of the surface and other potential soil structural damage. Typically, where climatic conditions create temperatures below 6°C, recovery of the vegetation following bottoming-out is very slow and has the potential to delay the effectiveness of the chosen grass policy. In these situations consideration should be given to delaying the bottoming out procedure until suitable conditions prevail. This will ensure the required vegetation height is retained throughout the summer period when juvenile birds are most likely to be present on and around the aerodrome. In exceptional circumstance bottoming-out may be taken in late summer before the final growth spurt of the grasses, which will ensure upright growth by late autumn.

Where damage occurs (to the grass sward such as) through use of equipment on uneven ground it is recommended that these grass areas should be reinstated as soon as the temperatures exceed 6°C.

Failure to remove decaying vegetation (through bottoming-out/habitat maintenance) when it reaches a depth of 35-40 mm may result in slower recovery of the sward and give rise to a potential increase in wildlife activity and increased weed infestations.

When necessary, e.g. due to poor grass swards, aerodrome managers may consider a phased replacement of the grass habitat during the bottoming-out process over a five year period with new upright species. This will ensure that grasses do not fall over during periods of inclement weather and provide a clear base area above the soil surface for arisings to decay and avoid the build-up of future thatch. The suitability of the site to accommodate such species should be given careful consideration prior to sowing.

Mowing – long grass policy

Airside grassland ideally should be maintained between 220-300 mm unless alternative proven strategies are advised by a habitat management specialist. At no point should the

height of cut fall below 200 mm, other than due to the exemptions listed below and during bottoming out.

Deviations from a long grass policy

Helicopter operations

Aerodromes and Heliports predominantly used for helicopter operations may typically adopt a shorter grass policy regime, maintaining swards at between 50 and 100 mm in take off, landing and low level operation areas of the airfield. Perimeter grasslands and areas away from flight situations should still follow standard long grass policy in order to address the bird hazard, as deemed necessary.

Light aircraft (GA) grass landing strips, taxiways and parking areas

The grasses in these areas typically require maintaining at 75 mm throughout the growing season.

It is recommended that regular inspections of these areas are undertaken by appropriately trained habitat management specialists to monitor surface drainage compaction, weeds and grass density issues created by aircraft movements.

ILS glidepath and critical areas

The height of the grass in certain areas on the aerodrome may affect the performance of aeronautical navigational and visual aids, especially the Instrument Landing System (ILS).

In damp or wet conditions, the radiated signal as received by an aircraft or the signal received by the ILS field monitors may become distorted, affecting both the integrity and continuity of service of the system. The effect of grass heights on the ILS signal depends on the:

1. Type of grass (broad or narrow leaf);
2. Height of the grass and density of growth;
3. Water content within, or water from dew or rain on the leaves; and
4. Heights and types of aerials (transmitting and monitor).

It is not possible to give exact grass heights that would cover all systems and environments. However the following have been shown to be acceptable custom and practice:

- ILS glidepath: grass height of up to 100 mm is considered to be acceptable from the glidepath aerial to approximately 5 m beyond the monitors. A grass height of up to 200 mm is considered to be acceptable beyond this point up to the limit of the glidepath critical area.

- ILS localiser: a grass height of up to 200 mm may be considered acceptable within the critical area. Other heights may also be suitable; however, the advice from the Air Navigation Service Provider (ANSP) should be sought before implementation of any deviation from these grass heights.
- Aerodrome visual aids: aerodrome visual aids should be maintained as short grass for the smallest radius around the object necessary to prevent sightlines being obscured. The use of a 'total kill' herbicide in these areas will create bare ground and bird feeding opportunities and therefore should be avoided. Shorter grass should be maintained at between 50 mm and 100 mm.

Sward specific issues

Unless specialist advice suggests otherwise (or subject to the deviations noted above) an LGP would typically be the adopted policy for most UK aerodromes. In certain circumstances however, the habitat management specialist may determine that the grassland sward present on an aerodrome would not have suitable rigidity to allow it to be successful at optimum LGP heights and therefore in such instances, it may be preferable to alter or deviate grass cutting height regimes in order to retain the most effective repellent properties to birds. Where this is the case, the aerodrome may wish to consider the benefits of a re-seeding programme with an upright stalk species in order to allow the establishment of an LGP.

Cutting operations – timing and frequency

Cutting should commence as soon as sward heights have recovered to within the LGP parameters during the spring growing period. Timing should take into account ground conditions with cutting not undertaken during periods where surface firmness is insufficient to take the weight of machinery. The frequency of cutting should reflect the need to maintain the minimum and where stated, a maximum height, as described in the aerodrome's LGP. This will inevitably vary between sites and be dependent upon growing conditions in any given year.

Cutting operations – equipment and vehicles

Typically, a rotary cutter will be required. Equipment should be maintained appropriately to ensure that quality the cut is not compromised. All equipment should be regularly serviced and mowing blades kept sharp. Equipment should be set up correctly, on the aerodrome, to ensure correct and even cutting heights of 220-300 mm are maintained and that 'turf tyres' are fitted to tractors in order to reduce ground compaction.

Equipment cutting heights should be checked during the cutting process to ensure that the original settings are maintained throughout the entire cut.

Mowing speeds should be appropriate for the condition of terrain. Where uneven ground is present, speeds should be reduced sufficiently to allow units time to adjust to terrain and prevent surface scalping.

Use of growth regulators

Where indicated by the habitat management specialist, growth regulators may be applied to short grass areas of the aerodrome. Growth regulators stunt the vertical growth of a sward yet promote lateral growth, thereby strengthening the base of the sward. The impact of growth regulators is therefore as follows:

- To reduce mowing frequency;
- To reduce the amount of clippings deposited into the sward;
- To strengthen the base of the sward, reducing opportunities for weed establishment.

The use of growth regulators is most appropriate on any short grass areas of the airfield as these are prone to becoming weak and open.

Nutrient application

Fertiliser should only be applied in sufficient quantities if required to maintain the habitat in a healthy and upright condition. Any decision to apply fertiliser to a site should be based on the soil sample results. Soil sampling should, where practicable, be undertaken at the start of each year by an independent soil testing laboratory. Any deficiencies notified, should be addressed during the spring growing period. Fertiliser should be applied using appropriate equipment and during appropriate weather conditions. The appropriate fertiliser specified by the habitat management specialist should be applied in conjunction with the soil testing information. Fertiliser regimes should be tailored to encourage desirable or discourage undesirable species in the sward, however this should not jeopardise the integrity of the sward.

Over-seeding

Where the existing grass species are unsuitable for upright growth at the designated height, aerodrome managers should consider a replacement seeding programme to upgrade the sward with more appropriate species.

In these cases consideration should be given to using specialist strains of grasses designed for airfield use (as recommended by the habitat management specialist) which may be more effective at maintaining 220 mm height for wildlife deterrent qualities throughout the year. Local climate, soil type and drainage properties are important considerations during this process, recognising that there may be local variations within the aerodrome boundary.

Different strains of the same grass species may be necessary to achieve suitable wildlife deterrent qualities for each airport, with habitat management specialist advice necessary to ensure satisfactory establishment. The emphasis is on providing a nutritional programme that aids the production of a stiff stemmed upright sward rather than on rapid

soft leaf growth, which is ultimately detrimental to the effectiveness of the grasses as a wildlife deterrent.

Weed control

The presence of weeds is a sign of a weak grassland sward. Weeds provide feeding opportunities and can create shorter lying areas where which birds can 'loaf'. All grassed areas should be maintained to at least 95% weed free where practicable. A programme of herbicide/manual control (cutting or removal) should be implemented as often as required to control weed infestations. Blanket applications may not always be necessary – multiple targeted treatments of key areas may reap more effective and more efficient control than single blanket sprays. Short grass areas are generally more vulnerable to weed invasion and may require additional attention.

Herbicide type

The type of herbicide used should be based on an assessment of the type of weeds present on the site, with an appropriate herbicide, or combination of herbicides used to specifically target the weeds present. Herbicide recommendations can be made directly by a BASIS qualified professional agronomist or in cooperation with an independent approved BASIS-registered professional.[8] A regular inspection of the airfield habitat should be undertaken in order to identify weed presence. If weeds are seen to be developing, then an herbicide application should be considered to cover the areas of concern.

Pest control

A programme of control measures should be developed and implemented as often as required to control pest infestations. It is important that the type of pest problem is correctly identified to ensure adequate control. Insect larvae within the soil structure can have an adverse impact on birds and wildlife deterrence. Whilst species should always be identified to ascertain management programmes first, the main pest species that require monitoring are crane fly larvae (commonly called leatherjackets) chafer beetle larvae and cut-worms. All of these have a direct effect on turf by eating the plant roots and act as a direct cause of wildlife/bird population increases by providing a high protein food source – particularly for corvids and starlings. The activities of the larvae and associated foraging by wildlife can severely disrupt the grass surface and in extreme cases they may strip an aerodrome of grass giving rise to a potential FOD risk and the necessity for costly re-seeding.

Monitoring of adult insects, alongside accurate determinations of insect larvae populations within the soil profile is vital to the accurate identification and treatment of pest problems.

Guidance should be sought from the trained habitat management specialist to determine the most appropriate programme of control, which will be based on the type of pest present. The control methods should be approved products/techniques. Given the

[8] http://www.basis-reg.co.uk/About/Who-We-Are

absence of available insecticides, if severe outbreaks occur then advice should be sought from the habitat management specialist on future maintenance and control of the pests.

Regular reviews of the airfield should be conducted to identify signs of pest presence. In addition, the aerodrome's 'bird control unit' (BCU) or equivalent, should also report any areas of heightened bird activity which should then be investigated for possible causes. If pests are found to be the cause of a particular bird hazard problem then additional control measures should be considered to cover the areas of concern.

Moss control

Moss is an attractant to bird life, harbouring invertebrates which birds will readily seek to obtain. Its presence is also a sign of a weak, poorly draining sward. Moss is a particularly common problem on areas of disused concrete around the airfield where it will readily establish and will require periodic control. A programme of moss control should include the use of approved control agents, hand scraping and removal (in the case of concrete areas) and, in the case of grassed areas, it will be necessary to identify the weakness of the habitat that is allowing moss to develop. Any control measures should be undertaken early enough in the year to ensure weather conditions are suitable to allow the sward to quickly recover. It is crucial that moss control is not undertaken late in the year as expanses of open ground may be left over the winter period resulting in increased bird presence. Scrub includes any vegetation that is not maintained under the long grass policy (or alternative grass policy) and may include rank grassland, gorse, bramble, nettle, wetland, scrub trees and bushes. Scrub is a significant issue on airfields. It provides cover for rabbits, foxes and deer and game birds and safe nesting habitat for small birds and also provides these birds (which are often only able to fly short distances between pockets of vegetation) with an opportunity to access airfield property that would not otherwise be available to them. All scrub present within airfield boundaries should be removed, and then areas reinstated to meet the aerodrome's grass policy requirements. Depending upon the type of scrub present and the type of terrain upon which it is found, a combination of flail collectors, strimmers, chain saws and hand cutting tools should be used to remove or control scrub on site. Initial scrub control (i.e. remove or to maintain within long grass policy parameters) should occur before the bird breeding season (i.e. works should be undertaken by the end of February) to prevent birds colonising. Once the initial works have been completed, repeat operations should be undertaken as regularly as necessary to maintain the scrub with long grass policy limits.

Trees

Trees inevitably pose a considerable bird attractant. Nesting birds can be found in significant numbers in just a small number of trees and the proximity of trees to runways and approach/take-off paths is a critical factor as this influences the amount of time a pilot or the aerodrome's BCU has to react to birds emerging from trees during take-off and landing aircraft operations. Ideally trees should not exist within the aerodrome boundary and any trees that are retained should be managed regularly in the form of pollarding and

coppicing to reduce their nesting potential. All retained trees, both within aerodrome boundary and those in the immediate surroundings, should be regularly monitored by the BCU for nesting birds and action taken to remove any hazardous species.

Balancing/pollution control ponds and ditches

Interceptors effectively create open water hazards, likely to be frequented by large birds (ducks, geese, swans, etc) and should, where practicable be 'bird proofed' ie covered or netted. This is of particular significance given their close proximity to runways and taxiways. The grassland around the interceptors (which generally sit within fenced perimeters) should be maintained to long grass policy standards.

Ditches within the aerodrome boundary can be a significant wildlife attractant when not maintained appropriately. Ditches should be regularly inspected and maintained to ensure throughput of water is not restricted at any time and to prevent bankside vegetation from providing a habitat attractant. Bankside vegetation may need to be cut to 50mm at least twice per year, with all arisings removed.

Ground works

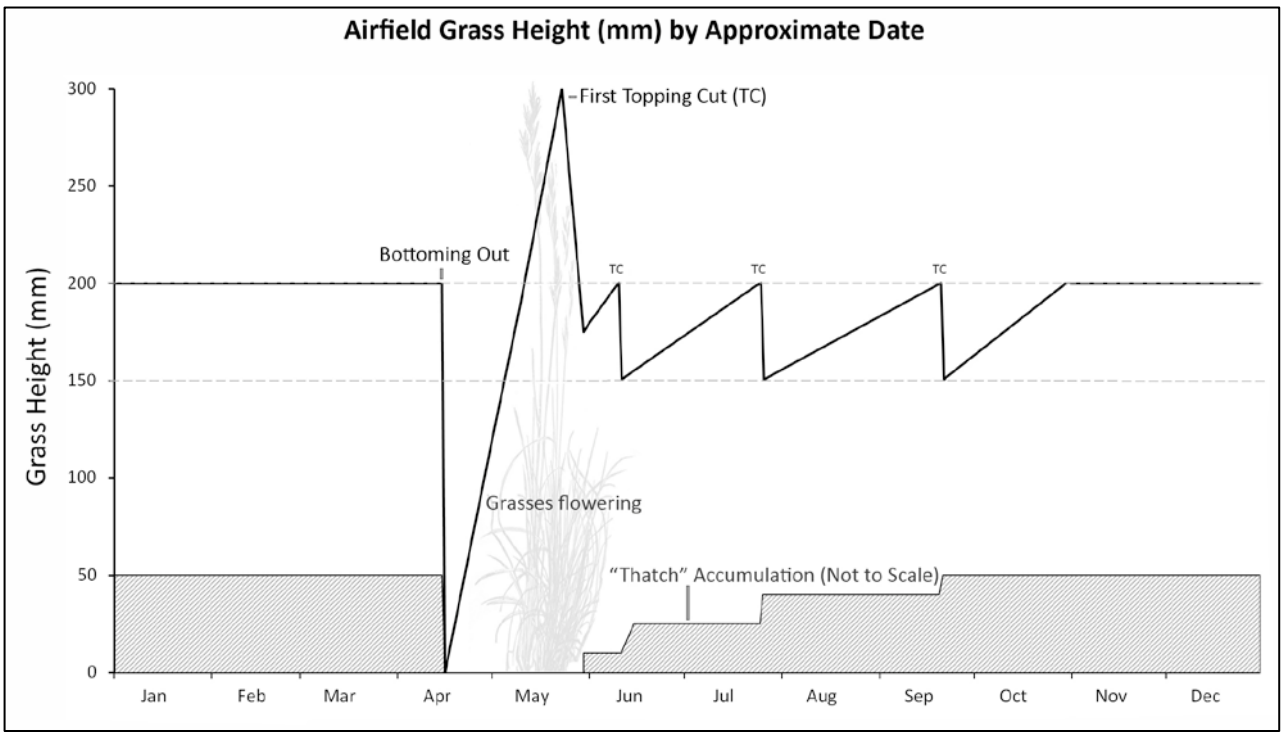
Ground works on and immediately adjacent to, the airfield can create temporary havens for birds and other wildlife. Any works requiring the removal of the grassed surface should be undertaken by competent personnel working to a reinstatement programme guided by the habitat management specialist. The airside works programme should ensure a successful and timely reinstatement. Timing of works should be carefully planned to ensure ground is reinstated with full grass cover well before the onset of the winter period.

Consideration should be given to the following when undertaking ground works:

- Proximity to air traffic
- Time of year
- Control of dust generation and creation of FOD
- Soil type
- Drainage
- Grass species

Completed ground works should be signed off by the appropriate person nominated by the aerodrome operators.

Figure 6: A traditional grass management regime



Alternative grass management options

Whilst a long grass policy or adaptations of, may be suitable and recommended by habitat management specialists, it is recognised and accepted that for a variety of reasons this may not always be practicable or achievable. In any case, a prescriptive grass/habitat management regime implemented by an aerodrome falls outside the scope of both EASA and CAA regulatory requirements. It is accepted that alternative methods to manage airfield habitats may be adopted at the sole discretion of the aerodrome operator and in some cases in coordination with the ANSP. It is important to emphasise that where alternative grass and habitat management are considered, that as part of the change management process, a risk assessment is completed to ensure that any deviations would not detrimentally increase hazardous bird/wildlife populations to the airfield and pose an increased flight safety risk to aircraft operations.

Other considerations

Food waste

Waste food is an attractant to gulls, corvids, pigeon species and starlings in particular and should not be tolerated on an aerodrome. Where food waste could occur, all bins and skips provided should be of designs that prevent animals (such as foxes and rodents) and birds getting in; for example, with drop-down or swinging lids. They should be emptied before they overflow.

Signage should be used to ensure contractors and other personnel are fully aware of the issues surrounding potential wildlife attractions.

Buildings

Where practicable dilapidated buildings should be removed, proofed or repaired to prevent roosting or nesting birds from getting access. Prevention systems, such as exclusion netting of the correct mesh size and installation type for the target species or ledge spikes, should be used to prevent any wildlife accessing these sites at any time and you should be able to demonstrate that this is being achieved.

Where wildlife is observed using lighting and signage structures, proofing should again be undertaken to prevent access where possible.

When new buildings are being designed they should:

- Prevent wildlife gaining access to the interior and roof spaces
- Use self-closing doors or plastic strip curtains or other mechanisms to prevent access by wildlife
- Be without roof attractions: consider the implications of green, flat and shallow pitched structures
- Have minimal roof overhangs and be without ledges beneath overhangs or external protrusions
- Allow easy access to rooftops in case it becomes necessary to take action against nesting gulls or waders that colonise large flat or shallow-pitched roofs. Gulls will also use steeply sloping roofs where the nests can be lodged behind vents, skylights, in gullies, etc.

Derelict aircraft should be removed or otherwise rendered inaccessible, as they have the potential to provide perching and nesting sites and may result in overgrown vegetation underneath.

Specialist birdstrike advice should be sought before taking action against starling roosts, rookeries, breeding gulls and any wildlife inhabiting buildings to ensure success.

Water

Wherever possible, watercourses on an aerodrome should be culverted. Where culverting is not possible, effective wildlife exclusion or control systems such as netting exclosures extending to the aerodrome perimeter should be used as necessary. Netting exclosures are the most efficient approach and other control measures or habitat modification will no longer be needed. Open channels should be free of bank side and emergent vegetation to minimise the attraction to wildlife and damage to nets.

If large permanent water areas cannot be eliminated, wildlife should be prevented from accessing sites. Where possible, water bodies should be proofed using exclusion methods such as netting or specialist floating balls. Wires suspended above the water surface could

be used over larger areas where netting structures may not hold up. These require careful spacing to ensure that target species are effectively excluded.

Wet and waterlogged grass areas that attract hazardous wildlife should be drained or the site re-graded to eliminate hollows that hold standing water. If drainage cannot be achieved, active control measures will be needed to ensure that the site does not result in increased risk.

The following habitat controls may also reduce the attractiveness of water bodies to wildlife that are part of the safeguarding process:

- The water should be as deep as possible (over 4m) to minimise bottom-growing vegetation
- In order to reduce nesting opportunities, there should be no development of islands. Attached promontories or spits can be used to reduce the open expanse of water bodies and prevent gull roosts forming.
- Banks should be as steep as possible (preferably vertical), with vegetation only deployed to prevent wildlife from walking in and out of the water.
- A vertical fence approximately 1 m high could be constructed around the water edge to prevent wildlife such as Canada geese getting access.
- On smaller lakes, wires suspended above the surface may deter wildlife that requires long take-off and landing runs (e.g. swans and geese). The wires should be made visible with tags (10 x 6 cm minimum), to increase the visibility to wildlife.
- Dense vegetation that provides nesting cover should be avoided. The water should be surrounded with long grass or a sterile substrate.
- Water should not be stocked with fish.

Landfills, sewage treatment and disposal sites

A netting exclosure is the most effective and reliable system to control birds at landfill and sewage treatment and disposal sites with open tanks. If this is necessary, an aeronautical assessment should be carried out to determine risk to the aerodrome and any agreed netting system should include an appropriate inspection and maintenance regime to ensure its reliability. Many examples of installed nets have poor maintenance regimes resulting in large rips or tears in the exclosures and a significant hazardous bird presence.

It is essential that companies who agree to implement active bird deterrence programmes at their sites meet targets agreed by the airport for bird presence and that there are auditable standards and penalties for failure.[9] Expert advice should be sought from the

[9] http://cdn.environment-agency.gov.uk/geho0409bput-e-e.pdf

CAA about the options for controlling risk from landfill and sewage treatment/disposal sites.

Active risk management

While aerodrome habitat management is critical for preventing a strike risk from arising in the first place, effective control measures should be deployed to manage the residual risks and be sufficiently dynamic and resourced to respond to immediate issues and prevent risks arising in the event that habitat management is not feasible.

Due to the difficulties of detecting and monitoring dispersal of hazardous birds at night and during low visibility periods, active bird control activity should be undertaken with caution during these periods; however, the overriding principle of ensuring birds and animals are not residing on operational surfaces prior to any aircraft movement should be adhered to in all conditions, where practicable.

Any system that scares birds and prevents the operator from controlling their departure from an airfield should be avoided ('scaring' vs 'control').

Deterrence

Birds respond to a variety of stimuli that can be used to disperse them from an airfield. The objective of deterrence is not to scare randomly around an airfield but to control bird movements and disperse them effectively. This can be achieved using a variety of methods, and different species respond in different ways. The ultimate objective is to 'educate' hazardous bird species that the risk of remaining in the aerodrome environment outweighs the potential rewards that the airside environment may offer. Habituation is an extremely simple form of learning, in which an animal, after a period of exposure to a stimulus, stops responding.[10] Any system used should therefore only target birds when it is necessary. Human operated (active) control is more effective than automated (static) scaring systems.[11]

Distress calls

Many birds react strongly to signals that indicate danger, distress or death. Some birds, typically social species that communicate with each other vocally (e.g. gulls, lapwings, corvids and starlings) emit piercing repeated distress calls when captured by a predator.

Different species react in different ways, but in general responsive flocks will react to a recorded distress call play-back in the field by showing alertness, lifting, taking flight and approaching the source of the call to investigate. The operator can control the behaviour of the birds by drawing them towards a vehicle, holding them overhead, then, when the broadcast is terminated, ensuring their dispersal.

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10 http://www.animalbehavioronline.com/habituation.html

11 Cleary, E.C. & Dolbeer, R.A. (1999) Wildlife hazard management at airports, a manual for airport personnel. US Federal Aviation Administration, Washington DC.

When using distress calls, the control vehicle should ideally be stationed approximately 100m upwind of the target flock, but this may require variation when considering the impact on aircraft movements. Birds will gain height and depart (gulls and lapwings), or resort to trees (corvids) or water (gulls) where they are safe. Birds should become airborne within 20 seconds and approach the speaker. Throwing a lure up (white for gulls and black for corvids), which resembles a struggling victim, can stimulate a flock to lift if necessary. Also noteworthy that foxes may approach the sound of a distress call as they investigate a possible food opportunity.

Volume settings should be low enough that they will not attract birds onto the aerodrome from distance. It is good practice to start the broadcast at a low volume and increase it until the target birds starts to respond if this is likely to be of concern.

The specific distress call of the target flock species should be used if possible.[12] If several species are present, play the distress call of whichever species there are more of first. Species that do not have distress calls will sometimes follow the lead of those that do.

Once airborne, you will need to keep the distress call playing to give the flock enough time to approach and investigate the source of the calls but no more than 90 seconds.

Lapwings will often take flight and fly around in wide circles at some distance (as they are seeking the safety of an open environment to avoid danger but will try to return to the airside environment) in which case it may be necessary to subsequently use pyrotechnics to ensure dispersal.

Starlings commonly fly directly away from distress calls and it may be necessary to follow them slowly to prevent them from re-alighting. Local birds, especially corvids, may start to depart immediately once the distress call has been used a few times and may eventually habituate, so it may be necessary to reinforce non-lethal control techniques with lethal control.

Dispersal by a pyrotechnic bird scaring cartridge (BSC)

Use of a BSC is a common means of dispersing bird at aerodromes. Also commonly known as a 'shell cracker', a BSC is typically a 12 bore shotgun cartridge case with the shot replaced by a projectile containing an explosive charge and delayed fuse/light trace, so that the projectile detonates at some distance from the gun. Birds will usually fly away from the detonation so it is possible to control their direction to some degree - detonations behind birds can hasten their departure, and to either side can keep them on track and to hold a flock together. A BSC fired high in the path of an approaching flock will cause it to pause and orbit. However, birds will often avoid a significant headwind and they will eventually turn back.

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[12] Baxter, A. T.; Bell, J. C.; Allan, J. R.; and Fairclough, J. (1999). The Interspecificity of Distress Calls. 1999 Bird Strike Committee-USA/ Canada, First Joint Annual Meeting, Vancouver, BC. Paper 8. http://digitalcommons.unl.edu/birdstrike1999/8

Several types of BSC are available. Generally, for use on an aerodrome the BSC should:

- Have a range greater than 80 m when fired at a 45° elevation (i.e. a flight time of four to five seconds before detonation) to allow firing from outside the runway strip and to provide a reasonably effective area
- Have a bright tracer component that is clearly visible in sunlight throughout its flight
- Detonate between maximum and ½ maximum height when fired at a 45° elevation
- Produce a sharp, loud 'crack', with a bright flash

The effect of a BSC is significantly improved by using a trace, especially when trying to control their direction. The trace should be visible in sunlight throughout its flight.

Several types of signal pistol with a 12 bore liner and a few purpose-made 12 bore pistols are in use at UK aerodromes. The pistol should be fit for purpose and be pressure tested for the type of BSC used. Pistols and BSCs should be transported in appropriate carrying cases and stored in a secure and safe location when not in use. Use of BSCs and rockets may present a FOD hazard to aircraft which should be managed accordingly. Operators should also be competent in their use, comply with relevant firearm and munitions legislation, and be provided with appropriate personal protection equipment (PPE).

In many circumstances, you may not be allowed to fire a BSC beyond the aerodrome perimeter, but by firing vertically its effect can be extended outwards over a considerable distance, including locations such as the approach path.

One large flock of birds is more likely to leave the aerodrome using this method than several smaller ones. However, firing directly into a flock will probably fragment it and the individuals may not re-group, so this should be avoided unless they have ignored previous dispersal attempts. A very close detonation may be useful to disperse birds that re-group quickly, such as flocks of starlings. A BSC should not be fired immediately before or during a distress call broadcast.

Aerodrome managers should consider whether the benefits of being able to respond to dynamic situations could be hindered by the need to contact Air Traffic Control on each occasion a BSC is fired.

Manual dispersal techniques

Many birds are afraid of humans, especially those that are commonly shot as pests (e.g. corvids and pigeons) and traditional quarry species (wildfowl and waders), so you can try other approaches including exiting a vehicle and slowly raising and lowering the outstretched arms.

Arm waving may not cause birds to move very far, but they will leave directly away from the person. This is effective against all common species, and can be used at short notice,

especially where noise or pyrotechnics are unacceptable because of proximity to people or livestock, or because of fire risk.

Lures

A lure is a leather pad with an attached wing on a string. Waving it can be effective, but throwing it high into the air so that it falls to the ground with wings ‘fluttering’ will cause target flocks to fly up and directly away. This can work at ranges of several hundred metres. Birds react as if the lure is an individual 'in trouble' and may even approach to investigate and it also enhances responses to distress call broadcasts. Traditional falconer's lures, dead bird effigies, and even a tennis ball fastened in the corner of a black or white bin bag can prove useful tools.

Other methods and techniques

A number of other measures have been used with varying degrees of success, including:

- Flags
- Plastic tape that vibrates and hums in the wind
- Weighted plastic balls on water
- Bird scaring rockets

Birds of prey (falconry)

Use of falcons can be suitable and effective for both civil and military aerodrome bird control and is used at some European and North American airports and airbases. Dogs such as Collies are also used at many US military bases and at some European airports.

The use of birds of prey is an additional technique that can be integrated into a bird control program at any aerodrome.

Birds of prey can undoubtedly cause changes in the behavioural patterns of some bird species that regularly frequent or habituate aerodromes and the vicinity, and when employed correctly may enhance other techniques.

Falconry in the true sense is defined as the art of hunting wild quarry with a trained bird of prey. This procedure can be complex and time consuming and can in some instances result in a falcon being under a reduced amount of control. Consideration of their use during periods without aircraft movements is therefore important.

As with dogs, falcons are a natural predator and therefore most species of bird will react quickly to their presence. Like other techniques, falcons that are persistently used and do not present a threat to target birds can result in habituation. Undoubtedly, birds of prey and dogs require dedicated, experienced, trained, competent and well motivated personnel to manage them, so all the techniques used with should only be carried out by persons with demonstrable sector significant experience.

Lasers

The use of lasers for bird dispersal on aerodromes has increased since early 2000. In the UK, use of lasers is subject to the requirements specified in ICAO Annex 14 Volume 1 and CAP 736 Guide for the Operation of Lasers, Searchlights and Fireworks in UK Airspace and EASA Rules concerning 'laser-free zones'. CAA approval or consent is not required to introduce and use lasers for bird control. However, aerodrome operators and or their third party contractors should conduct a thorough safety assessment prior to introduction. Risk assessments should include information on the class of laser and the type and degree of harm they pose to both public and flight safety, and develop a safety procedures and an outline of the scope of work for which use of the laser is intended to be used. Details of such assessment and subsequent use should be shared with other airport users, ANSP and local emergency services and consider use promulgating bird control lasers in via NOTAMs or in the AIP.

The following specific values should be included in any risk assessment:

- Eye hazard distance: Nominal Ocular Hazard Distance (NOHD)
- Flash blindness distance: Sensitive Flight Zone Exposure Distance (SFZED)
- Glare distance: Critical Flight Zone Exposure Distance (CFZED)
- Distraction distance: Laser Free Flight Zone Exposure Distance (LFFZED)

Trials have shown that green lasers (with wavelength around 532 nanometre) may be a useful bird dispersal tool in bird control operations as part of a bird hazard management program where trials indicated that effective bird dispersal may be achieved in low light conditions, whereas lasers with a higher output power (up to 500mW) maintained their effectiveness in brighter light conditions.

The range of portable systems developed specifically for bird control extends beyond 1.5 km. This requires the use of additional safety features allowing the user to safely operate bird control laser products. A scope or sight can be attached to ensure that the user is always aware of his projection area. A horizontal safety system which shuts off the laser when tilted above a preset angle should be considered when procuring devices as this helps limit any likelihood of unintended exposure of the laser beam to aircraft, airport personnel and the general public.

All operators of lasers should be aware of the EU safety recommendations according to International Standard IEC60825 and Accessible Emission Limit (AEL) safety recommendations for Class 3B laser products. The British Standard user guide for laser safety (PD IEC TR 60825-14:2004) recommends a laser safety officer is appointed where class 3B lasers are used and the operators followed a laser worker course. The main manufacturers of laser equipment offer laser worker and laser safety officer training courses. All laser class 3B products should have at least the following safety requirements:

- Key control

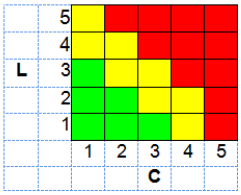
- Visible or audible output indicator
- Remote interlock switch

Figure 7: Laser risk assessment

Subject: Airside Bird Control Laser Usage	**Work Activity and Location: Bird control on the airfield**
Reference number:	**Dept / Section: Airside Operations**
Date completed:	
RA team members:	**Responsible Manager:**
	Review date:

Hazards Identified, Harmful Consequences, Persons at Risk	Existing Control Measures	Residual Risk			Actions Required	Target Date	Person Responsible	Predicted Residual Risk			Completion Date & Initials
		L 1-5	C 1-5	R RAG				L 1-5	C 1-5	R RAG	

lote: Residual risk:
= Likelihood ranking: 1=Improbable; 2=Unlikely; 3=Possible; 4=Likely; 5=Probable
= Consequence severity: 1=Minor injury; 2=Moderate injury; 3=Significant injury; 4=Single fatality; 5= Multiple fatalities
= Risk level: (R = red, A = amber G =green - see matrix opposite)



Repellents and passive deterrents

Repellents that are used elsewhere in the world include sticky gels and filaments, used against roosting and nesting species on ledges and beams on buildings. Otherwise, lines strung over restricted sites, such as marshy areas and bird spikes can be effective on aerodrome signs, lights, building edges and ledges. All injurious and lethal substances are illegal for use in the UK for aviation purposes.

Lethal control

When habitat management and active wildlife deterrence fail to reduce risk, the implementation of lethal control can reinforce the effect of non-lethal control techniques. It can also be used to reduce numbers and sick or injured birds, or to deal with an immediate problem.

It is possible for species to habituate to the use of lethal control particularly the deployment of shotguns. These have a limited range (circa 40m) beyond which some species will behave as if they are safe.

All activities involving the use of firearms should be independently certificated by the local police/licensing agency. Applications for firearms permits should be made and certified before use. Safe use, storage of guns and ammunition and record-keeping require

separate and specific training by competent and qualified persons, security procedures and skills sets and are covered under separate firearms legislation.

Special legal provisions exist that licence the shooting of certain birds/wildlife on aerodromes, and are subject to specified conditions. They require an operator to be able to demonstrate that acceptable non-lethal measures have been attempted first. Stupefying or poison baiting is not licensed for use on aerodromes in the UK.

Population control

The implementation of lethal control to reduce or eliminate the presence of hazardous wildlife on or around an airport requires a full understanding of the behaviour of the species being targeted and you should seek expert advice. Gulls in winter, for example, may have migrated to the UK from anywhere between Northern Scandinavia and Eastern Europe and move long distances between sites, so attempting to cull them is unlikely to result in a satisfactory risk reduction. Conversely, the removal of a population of feral pigeons that reside in airport buildings on the airfield may be essential before proofing and preventing further infestations in that area.

During the breeding season, the effectiveness of egg control will vary with species. Feral pigeons, if the conditions are suitable, can breed all year round and require permanent monitoring and action to have any effect. Gulls and many wading bird species will re-lay if eggs or nests are destroyed (removed, oiled or pricked) just once in a season. Successive visits are therefore necessary between April and August to ensure breeding does not occur. Alternatively, species such as Canada geese can be controlled by a single action to prevent hatching after which the adults need to moult and do not have sufficient time to breed again.

Trapping and removing wildlife from an airfield requires specialist skills and experience and the law may limit some actions, and you should consider whether it will influence on-airfield wildlife activity; for example, providing baited traps on an airfield can attract other wildlife.

In some locations, small mammals may be a particular problem. Large populations of rabbits can make it impossible to grow effective long grass and the rabbit population may need to be controlled accordingly. Lethal control may therefore be an essential requirement for the removal of species that can both influence habitat and create an attraction in their own rights. Any lethal control should ensure that all carcasses are removed from the airfield and disposed of appropriately to avoid becoming a carrion attraction themselves.

Safeguarding

Virtually all land types and land uses (including natural habitats) attract wildlife in some way. Safeguarding should therefore address developments that could become wildlife attractants with the potential to increase the wildlife strike risk at a nearby aerodrome.

ICAO recommends that the appropriate authority shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any other source which may attract wildlife to the aerodrome, or its vicinity, unless an appropriate wildlife assessment indicates that they are unlikely to create conditions conducive to a wildlife hazard problem. Where the elimination of existing sites is not possible, the appropriate authority shall ensure that any risk to aircraft posed by these sites is assessed and reduced to as low as reasonably practicable.

Where an assessment shows that the wildlife strike risk may increase or could increase under certain conditions in the future, and the aerodrome certificate/licence holder and developer are unable to agree a solution, the aerodrome operator may object to the planning application on aviation/air safety grounds. Local knowledge of wildlife populations and activities or an appropriate similar safeguarding case to support any objection can be used and objections withdrawn when measures implemented to manage risks are deemed acceptable (to the airport operator). It may be possible to modify a development (e.g. exclusion of food wastes from a new landfill) or impose planning conditions. Where a safeguarding case is resolved through the imposition of planning conditions, it may be appropriate for the conditions (and 'wildlife control/reduction management plan') to be subject to a legal agreement between the planning authority and the developer or property owner, or its successors.

After planning permission has been granted, the aerodrome operator should regularly monitor the development for compliance with any planning conditions relevant to them that are imposed and report any alleged breach or non-compliance to the local planning authority.

Although the notification, designation, classification and listing of national, European and internationally protected sites, such as Sites of Special Scientific Interest (SSSIs), European Sites (SACs and SPAs) and Ramsar Sites, do not require planning permission, the creation of new conservation sites is usually associated with other developments that require planning permission and, as applicable, safeguarding consultation. Many nature reserves are created to protect particular flora or invertebrate communities, which do not represent an increase in wildlife strike risk; however, others, such as estuarine reserves, may be major wildlife sites. It is essential that the aerodrome operator establishes contact with agencies responsible for the management of sites, such as the RSPB, as a simple change in design may help prevent hazardous species using the new area.

Informal safeguarding agreements may exist to prevent the large-scale release of racing pigeons for the purposes of racing near aerodromes, without notifications. Releases of over 40,000 birds at a time can occur and as such represent a specific and major hazard. Releases are therefore prohibited within 13 km of 28 major aerodromes in the UK 16.[13] In agreement with the Royal Pigeon Racing Association (RPRA), any proposed release of racing pigeons associated with a sanctioned race, within 13 km of a licensed aerodrome

[13] http://www.rpra.org/racing-handbook/rulebook

should be notified to the aerodrome authority or air traffic control provider at least 14 days before. Aerodrome operators should contact the RPRA to confirm contact details to ensure this information is transmitted. In addition, the ANSP (ATC unit) should be notified by telephone at least 30 minutes before a given release time, in order to confirm the number of birds, intended destination and direction of flight. Aerodromes can then pass on information via ATIS or NOTAM, as necessary. If required, the ATC manager may request a delay in the release by up to 30 minutes (or longer in exceptional circumstances). Racing pigeons can travel at speeds of up to 60 mph (depending on the head or tail wind), hence an aerodrome should be able to ascertain the approximate position of flocks of birds once the release location and destination details are known. CAA recognises that for training flight pigeon releases, the issue concerning prior notification is problematic; however, the CAA continues to engage with the RPRA and other to ensure that necessity communication of releases is brought to the attention of its members and associate Homing Unions.

Chapter 6

Reporting of occurrences

Changes to regulation

Implementation of EC Regulation (EU) 376/2014[14] concerning the reporting, analysis and follow-up of occurrences in civil aviation has been implemented within the UK. The Regulation updates legislation for the UK Mandatory Occurrence Reporting (MOR) and the UK Air Navigation Order (ANO) accordingly. The EU regulation places additional requirements on organisations, as well as 'competent authorities' and EASA, beyond what is currently contained within existing legislation for both external occurrence reporting and internal occurrence reporting systems.

Specific items within the new regulation include:

- A widening of scope to include ground handling organisations for mandatory reporting;
- Organisations being required to ensure that their internal safety reporting systems are compatible with the European Co-ordination Centre for Accident and Incident Reporting Systems (known as 'ECCAIRS') software and the Accident/Incident Data Reporting (ADREP) taxonomy.
- Organisations being required to ensure that preliminary results of any analysis of a MOR are submitted to the competent authority (CAA) within 30 days and the report of the final result of analysis, within three months.

Consequently, there have been significant changes concerning birdstrike reporting when compared to previous processes and procedures. Such changes include: what is reportable; who is obligated to report; what constitutes a reportable occurrence and details concerning voluntary reports. Further information is available on the CAA website.

Reporting

All bird and wildlife strikes occurrences should be reported to the CAA, this includes confirmed, unconfirmed, near miss or significant event; such reports should be annotated as such in the relevant narrative headings or content.

The table below provides additional guidance further details of which can be found here within the MOR code.

[14] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0376&from=EN

EU 376/2014 or IR2015/1018 Reference	Question	Interpretation, guidance and key attributes
Wildlife strike including bird strike	Does this now mean all birdstrikes?	Yes, this includes all wildlife and birdstrikes **with or without** damage. Suspected Birdstrikes or encounters with flocks should also be reported. Key additional attributes required: **Species** (of bird/wildlife if identified and **location of damage** (on the aircraft).

Data management and information sharing

Historical birdstrike data is provided on the CAA website.

Requests for the release of any bird/wildlife strike data, or other occurrence data requests must be submitted to CAA via form SRG 1605.

Species identification

To enable effective and detailed risk assessment and trend analysis, it is essential that accurate bird species information is provided when a report is submitted to the CAA. Aerodrome Wildlife Hazard Management Plans should clearly set out procedures for obtaining species identification for this purpose. Where species identification cannot be achieved locally by trained personnel, the management plan should detail what other means and methods might be used (i.e. employing the services of third party specialist organisation for wildlife remains identification). Remains can be identified via digital photographs of whole birds, major bird parts or feathers. Details of the aircraft type, phase of flight, location, time, date and aircraft altitude may all add valuable information that may help to confirm an accurate identification.

Bird identifications can be achieved when even the smallest amounts of remains are left, but care needs to be taken during collection. Appropriate protective gloves should always be worn when collecting any sample and handling dead wildlife remains. These should then be double bagged and sent to the appropriate selected organisation together with full details.

Chapter 7

Aerodrome ornithology

Wildlife identification

Each wildlife species has unique features, behaviour patterns and actions. Published field guides usually include practical information on how to observe and record the various characteristics of birds that enable them to be identified.

Good field guides cover the different groups of birds in a generally accepted taxonomic sequence. Field guides that illustrate birds with photographs or paintings of birds in varied poses should be avoided, but coloured paintings with birds in similar poses, and with plumage variations for each species described or illustrated, are more useful for identification.

Important differences between species should be made clear, and the text should provide information on at least the following:

- Size
- Characteristic behaviour
- Comparison with similar species, habitats (winter and breeding)
- Movements, populations (including seasonal changes)
- Food
- Voice
- Nesting behaviour

Wildlife ecology

Behaviour varies with season, time of day, weather and other factors. Its way of life is based on mobility: some species migrate to exploit seasonal food abundance and to avoid harsh winters; some species commute daily between safe roosts and feeding grounds; and some take flight to avoid predators. These factors all help with identification.

Birds have sharp eyesight, communicate vocally and have good hearing over a similar range of frequencies as humans. They are unable to hear ultrasonic sound devices and most birds found on UK aerodromes have little or no sense of smell.

Birds observed in the field are almost always engaged in some activity that provides information about them. Song and call notes are often characteristic and, with experience, enable identification and even detection of unseen birds.

The following species represent the most commonly encountered birds on UK aerodromes. Their numbers will vary depending on season, time of day and location of the aerodrome and good field identification guides should provide further details.

Specific bird behaviour

Gulls

Common UK gulls fall into two broad groups: small (black-headed and common) and large (herring, lesser and great black-backed). Gulls feed predominantly on soil invertebrates, especially on disturbed ground, but can be found scavenging waste or hunting insects in the air.

Most often they are encountered crossing an airfield when moving between their breeding or roosting sites, and feeding sites. These can include farmland, playing fields with short grass, sewage works, and landfill sites where food wastes are tipped. They will also forage along coastlines, estuaries, river banks and in parkland where they will readily adapt to take food from people. When not feeding, flocks may spend long periods on open undisturbed sites and commonly use aerodromes for security. During the breeding season, gulls of all species may be found nesting on rooftops of buildings both on and off the aerodrome.

Gull numbers in the UK increase each winter because of migration. Numbers generally rise from July through to November and fall in March. Previously, lesser black-backed gulls would largely leave the UK in winter, returning to breed each spring. However, evidence suggests that many now remain in the UK, in large numbers, and therefore may be a birdstrike risk at any time[15]. Ploughing fields nearby may cause short-term influxes of these species during the autumn months.

Lapwing and golden plover

Lapwings prefer open habitats with low or sparse vegetation, especially grassland. In lowland Britain, numbers are usually at a minimum during the breeding season. Flocks begin to build in June or July as local birds disperse from breeding sites and others migrate to the UK. Some aerodromes provide attractive habitats to small numbers of lapwing during the breeding season, but can attract substantial flocks of non-breeding birds towards the end of the summer. At this time, they may appear lethargic and reluctant to disperse because of moulting.

Once harvesting and ploughing are underway from August, lapwing numbers on aerodromes decline as they move to exploit these seasonal feeding opportunities. They remain relatively scarce on aerodromes until October or November when large flocks reappear. Unless hard weather settles in, numbers can remain high in winter until spring migration in February and March. However, prolonged frozen ground or snow cover

[15]CAA birdstrike data indicates that gulls are struck most frequently in July, August and September

prevents lapwings from feeding and they are forced to move to seek better conditions further south or at the coast. The most effective tool for preventing lapwings residing on airfields is an effective LGP.

Golden plover are slightly smaller than the lapwing and much more difficult to detect on aerodromes because of their cryptic coloration. They are less common than lapwing but wintering flocks can be very large and dense. Golden plover frequent similar habitats to lapwings during the winter and use aerodromes in much the same way, often forming mixed flocks. Feeding birds run, pause and up-end like lapwings. Golden plover may also attempt to feed and roost on aerodromes at night. CAA data show both species have been struck far less frequently in recent years.

Other waders

The oystercatcher is primarily a coastal species but moves inland to moors to breed and to lowland water bodies in winter to feed. On aerodromes, particularly those near the coast, they will nest on gravel islands surrounding lights and marker boards, broken up paved surfaces, fresh drains and disturbed ground, such as rabbit holes. They will may also use shingle flat roofs that provide an ideal substitute for coastal shoreline areas.

The curlew is often found on mudflats and grassland, often in large flocks in winter, mostly around the coast but inland in smaller numbers throughout lowland Britain and Ireland. The curlew nests on moors (up to 600 m above sea level) and farmland. Nesting curlews defend a large territory against other curlews and, therefore, aerodromes rarely have high densities of breeding birds. They are very obvious and present a potential wildlife strike risk when displaying or defending nests against crows and potential predators but at other times are remarkably inconspicuous. They rarely alight on paved surfaces when nesting, but wintering flocks often do.

Other waders may appear on coastal aerodromes, especially when on migration in spring and autumn or on any aerodromes where damp ground or sedge is present. An effective grass policy and active control are the best methods for preventing waders using aerodromes.

Corvids

Rooks are gregarious and feed on soil invertebrates, grain and seeds, and roots on farmland and aerodromes. They find much of their food by vigorously probing the soil. They nest colonially, forming rookeries in tall trees, where they return for security. Dawn and dusk flight lines and pre-roost assemblies may increase the risk of a wildlife strike occurring. Their foraging range is restricted to a few kilometres from the rookery when nesting. Consequently, the presence or absence of rooks on aerodromes in the breeding season depends on the size and proximity of the local rookeries. British and Irish rooks are largely sedentary but continental birds boost the UK winter population, especially in the east.

Carrion crows and hooded crows are involved in relatively few wildlife strikes despite a ubiquitous presence on aerodromes. Their presence, however, signals to other wildlife that the area is safe and may result in greater risks than initially appears. Their diet includes carrion, small mammals and birds, eggs, animals, soil invertebrates, grain and fruit and waste food. On aerodromes, carrion or dead insects around runway lights may attract them to runways. They will drop hard-shelled prey on runways and taxiways to break it open.

Although common, jackdaws are involved in very few wildlife strikes, they commonly associate with other corvids and significant numbers may nest and/or roost in hangars. Jackdaws are very gregarious, often in mixed flocks on farmland and aerodromes. Their diet is similar to that of rooks, but on grassland jackdaws feed on surface-dwelling invertebrates, rather than digging for prey. They also take small mammals, eggs, waste and chicks. They roost communally, again, often with rooks in woodland. They nest in cavities in hollow trees, buildings (including hangars), aircraft hulks, chimneys, quarries and cliffs. The jackdaw is an abundant resident, with numbers being swelled by continental birds during winter.

The most effective way of controlling corvids on aerodromes is a good LGP along with suitable habitat controls to prevent nesting opportunities, after which active control as per other species should be carried out.

Waterfowl

Waterfowl include the wildfowl (ducks, geese and swans) and also herons and cormorants etc. Some, such as geese and swans, are large birds and present a significant risk to aircraft operations. However, provided that any water habitats on aerodromes are effectively managed to exclude waterfowl, their presence is restricted to flight lines across the aerodrome, which in itself can be hazardous if not checked and understood.

The numbers of some species of geese have increased rapidly since the 1950s and flocks may occur on or near aerodromes. Canada geese are gregarious, roosting on lakes and ponds, and travelling several kilometres daily to feed on farmland, parkland and short grass. Pairs are widely dispersed on islands in lakes, rivers and gravel pits in the breeding season. Canada geese tend to be site-faithful, with females tending to return to their natal areas to nest each year. Flocks of feral, non-migratory Greylag geese have also established in parts of the UK, especially southern and eastern England.

‘Wild’ geese commonly winter in Britain, notably in northern and eastern areas. These migratory Greylag and Pink-footed geese feed on farmland in large flocks, returning year on year to well-defined areas centred around roosts on lakes or estuaries. They often fly to roosts after dark and may stay airborne for extended periods if disturbed. They rarely venture onto airfields and are best dispersed using active deterrence measures if located.

Mute swans mainly frequent rivers, lakes and small ponds, although they move onto farmland to feed, especially during winter. Flights are mainly confined to movements

between roosting and feeding areas. Swans may mistake runways for water bodies and can occasionally be found in damp conditions walking around an airfield after crash landing on the runways. Birds should be dispersed by manual control efforts when aircraft movements permit, or captured (they may often be reluctant to fly off) and released some distance from the airfield.

A variety of species of duck spend the winter in the UK - many are relatively large, heavy birds that tend to fly in close formation, with the potential to cause damage to aircraft when struck. By far the most numerous duck species is the mallard, frequenting rivers, lakes and small ponds, often feeding in fields (in ponds, water courses or when flooded) around aerodromes and often at night.

The grey heron can sometimes be found hunting mice and voles on aerodromes.

The cormorant nests at both coastal and inland colonies, with numbers supplemented during the winter months by continental birds. Inland, it feeds on ponds, lakes and rivers where fish are plentiful, and roosts communally on lakes, in trees and on power cables.

The most appropriate tool for preventing water birds from accessing aerodromes is to proof all water bodies.

Pigeons

In recent years, woodpigeons have been involved in an increasing number of birdstrikes, as the national population has undergone a significant increase. Woodpigeons are most numerous on well-wooded farmland, feeding on cereals, clover, rape, peas and other crops, weeds, acorns and beech-mast. They are found at aerodromes mainly in summer, when weeds in long grass are flowering and seeding, and in late winter in search of clover leaves after acorn crops are exhausted and stubble fields gleaned bare or ploughed under. Outside the breeding season there are communal roosts in larger woods but flight lines are not well defined and temporary, reflecting changes in feeding area. They fly between the roost and feeding fields (up to around 10 km, but further in areas with less arable land) throughout the day. Feeding flocks are larger in the mornings. Later in the day, some birds return to the roost or perch in trees near the feeding fields, especially in the longer autumn and spring days.

Stock doves are often misidentified as woodpigeons or feral pigeons. Birdstrikes involving stock doves tend to be in the early summer when they are attracted by weeds. Stock doves can occur as pairs or in small flocks, often with woodpigeons. Their food includes weed seeds, and stock doves are particularly attracted to very long grass with many wild flowers, especially vetches.

Feral pigeons are known to live on aerodromes, often roosting and nesting in disused buildings and hangars. In such sheltered environments they can breed year-round.

Racing pigeons may be present a birdstrike risk during the racing season, generally between April and September.

The collared dove has become widespread and numerous in Britain since its arrival from the continent in the 1950s. It is common in towns, suburbs, parks, farms and granaries but less so on or around aerodromes.

Management and control of pigeon species may be best achieved through an effective LGP and thorough ‘bird-proofing’ of buildings and general good housekeeping within the aerodrome environment that reduces the availability of food sources to hazardous species.

Starlings

Although the starling is involved in a relatively small percentage of birdstrikes in the UK, they can form large and dense flocks during feeding bouts or prior to joining a roost around dusk. Breeding numbers have declined significantly since 1970, due probably to changes in agricultural practice. Most strikes occur during and after the breeding season when flocks of juveniles are difficult to disperse from aerodromes. Starlings are omnivorous opportunists, taking a wide range of food including worms, insects, seeds, fruit, cereals, household scraps and other waste. However, grassland is the most important feeding habitat and flocks busily probe the ground with partly open bills. They progress over the ground with a characteristic 'rolling' motion in which birds from the rear periodically take flight and move to the leading edge of the flock. Thus, they appear to be able to overcome at least in part the problem of detecting predators when foraging in aerodrome long grass. Starlings sometimes 'shadow' livestock to prey on disturbed invertebrates and flies, and also 'hawk' for flying insects when they are abundant (e.g. crane fly, ants).

Starling roosts can contain thousands of birds. Typically they roost in dense vegetation (not necessarily tall but usually difficult to penetrate) such as thorn thickets, game coverts, young un-thinned conifer plantations, reed beds etc. Starlings may travel long distances between roost and feeding areas. They nest between April and July in holes in trees, buildings and occasionally aircraft.

The most appropriate forms of bird management practices vary from an effective grass policy through to proofing of nesting areas and removal of roosting habitat. Starling roosts can be dispersed by scaring action at dusk on several consecutive nights. Considerable effort and resources (and specialist advice) may be necessary to evict starlings from roosts using pyrotechnics, distress calls and/or lasers.

Birds of prey

There is a common but false belief that wild birds of prey keep other species away from aerodromes and that their presence on an aerodrome may be beneficial. Birds of prey are dependent on abundant prey, and will therefore be attracted to aerodromes with abundant small mammal, bird or wildlife populations.

The kestrel is a small falcon, which hunts small mammals and large insects on farmland, aerodromes and in a variety of open habitats. Its preferred prey is especially abundant in permanent grassland and the kestrel is, therefore, common on aerodromes and alongside motorways. It habitually hovers motionless on rapidly beating wings.

The sparrowhawk is a small short-winged hawk that hunts low over the ground, often using hedgerows or other linear obstacles as cover, to flush out small birds and is less commonly seen over an open airfield.

The buzzard is a much larger bird of open country, but may also be seen hovering over the open grassland on aerodromes.

It has seen a national population increase and is present throughout the UK and increasingly involved in birdstrikes. It soars on long broad wings and takes carrion, rabbits and other small ground-dwelling animals as well as feeding on grassland insects and invertebrates, which may be indicative of detrimental or poor grass and habitat management at the aerodrome.

The red kite is similar in size to the buzzard and has undergone a highly successful conservation release programme throughout the UK. As such it is now present in many areas around aerodromes and has featured in the CAA's national birdstrike records in recent years. This is a scavenging species where good housekeeping will be essential to prevent them attempting to use aerodromes. Active dispersal of these species is difficult to achieve yet they will often attempt to feed on an airfield when grass cutting or 'bottoming out' procedures are being implemented.

The peregrine falcon is a large falcon that hunts birds such as feral pigeons in the air. Peregrines may indicate that hazard management action is needed to remove their food sources.

Effective aerodrome habitat management is critical for the control of birds of prey. Active control of rabbits may help to reduce buzzard presence although they are equally adapted to feed on voles and soil invertebrates such as worms and beetles. Proofing of perching areas will reduce opportunities for birds to reside on airfields. Active and rigorous deterrence is necessary and removal under appropriate licence conditions may be necessary to prevent wildlife strike risks occurring.

Game Birds

Numbers of pheasants vary locally with the intensity of rearing and release by neighbouring estates. The pheasant roosts overnight in woods and thickets ('coverts') and generally walks onto fields and aerodromes to feed. It can sustain flight for only a few seconds, usually to escape danger.

Grey and red-legged partridges are both squat, ground-living birds, often found on arable land in small flocks ('coveys'). They roost on the ground and are also active at night. They are very difficult to detect and flush from aerodrome long grass. They prefer very long grass or ruts and divots on an aerodrome. Management is difficult however advice from Natural England or other statutory bodies should be sought.[16]

[16] E.g. Natural England Technical Note 105; Game birds: managing the bird-strike risk at airports and airfields

Swifts, swallows and martins

Swifts, swallows and martins (house and sand) are summer visitors, which feed on flying insects. Flocks congregate where prey is concentrated by the wind, or where they arise: aphids over bean and cereal fields, midges over water, froghoppers and crane fly over grass. Large numbers of swallows and martins can sometimes sit on runways in autumn in between feeding on aerial prey over airport grass.

Swallows nest on ledges and beams in buildings. Flocks alight on runways and taxiways mainly in autumn. Flocks of swallows and martins feeding in flight usually resist attempts to disperse them but can sometimes be moved on when resting on the ground. The key to managing these species is a good long grass policy that includes suitable insecticide activity to prevent the presence of aerial insect emergences in the first place.

The swift nests in holes in buildings and only alights at the nest. Swifts do not respond to dispersal actions.

Mammals

Based on UK strike data over the past 20 years, due to the very low probability of strikes to aircraft by mammals, this guidance document does not discuss detailed information on control measures involving animals. Where aerodrome operators are presented with issues concerning the control of wildlife other than birds, specialist advice should always be sought.

Red fox, deer species, sheep, hare, cat, rabbit, badger, hedgehog and bat have all been involved in wildlife strikes at aerodromes in the UK. Some species have been involved in occurrences which have resulted in aircraft damage (deer and fox). Very small herbivorous mammals – rodents, such as mice and voles – represent no direct strike hazard to aircraft but, as discussed elsewhere in this document, may attract predatory birds (and omnivorous species such as corvids) to the airfield, particularly when grassland populations of voles are high.

The rabbit constitutes a negligible strike risk to aircraft due to its small size and its behaviour. Their control is, however, recommended to prevent habitat damage or attraction to birds of prey.

A long grass policy may attract hares, with strikes peaking in late winter and early spring. This species typically weighs 3-4 kg but although there have been reported strikes there have been few reports of damage to aircraft in the UK.

To date, only a small number of collisions between deer and aircraft have been reported in the UK. From the reported incidents on record, the risk is higher during the hours of darkness. In the event of deer on the aerodrome it is advised that the entry route onto the airfield is identified and closed off and any scrub or tree plantations that provide cover for deer should be removed or substantially thinned out. Shooting deer must be approached

with extreme caution because of the firearm and safety requirements; hence deer management experts should always be consulted when such issues arise.

Chapter 8

Personnel training

As part of the EASA Aerodrome Operator Management System requirements, an obligation is placed on the aerodrome operator to establish and implement a training programme for personnel involved in the operation, maintenance and management of the aerodrome and for persons working unescorted on the movement area, or other areas.

In accordance with EASA Aerodrome Means of Compliance (AMC) it is necessary for aerodrome operators to ensure that personnel have demonstrated their capabilities in the performance of their assigned duties through competency or proficiency checks at adequate intervals, in order to ensure a continued competence. Attendance on a refresher training course does not necessarily mean competence. Training programmes should therefore be bespoked to incorporate some level of assessment and test as part of the syllabus, ideally not open-book, with a set target pass grade of at least 70%, for example.

Aerodrome Operators should ensure that only adequately qualified and experienced instructors and assessors are used for implementation of birdstrike training programmes and that they maintain appropriate qualification records to demonstrate compliance with the requirements, during audit.

Service level agreements between the aerodrome operator and any external, or third party training providers should be established that require the competency of training providers to be demonstrated and that the contents of all training programmes and syllabus are established to meet the requirements both of the aerodrome and to also satisfy any regulatory requirements.

The CAA has supported industry stakeholders developing a standardised training syllabus for airport operations personnel covering a wide range of airside operations subjects, including Wildlife Hazard Management. Further details can be found via the National Certificate in Airside Operations, via People1st.

Alternatively, the following topics may be considered to form part of locally agreed training syllabus as part of a WHM training programme, which supports EASA's Guidance Material at GM3 ADR.OPS.B.020:

Background to wildlife strike hazards

Nature and definition of wildlife strikes, nature and extent of the aviation wildlife management problem; characteristics of the aerodrome, including coastal aerodromes, inland aerodromes, grass aerodromes or tarmac aerodromes.

Roles and Responsibilities

How a wildlife control unit should be structured and who has responsibility for what roles and who the relevant people are, for example, air traffic control, air crews and external agencies.

Assessment of Risk

Understanding methods for evaluating wildlife strike risk and how this can be applied to the aerodrome environment.

Wildlife Identification

Correctly identifying aerodrome wildlife and understanding what to look out for when identifying species.

Aerodrome Ecology

Evaluating and understanding the features and factors on and around an aerodrome that attract hazardous species.

Habitat Management

An understanding of how to maintain an environment which is unattractive to birds and other wildlife.

Wildlife Ecology

An understanding of how wildlife could respond to different control methods: lively and immediate dispersal; temporary and unsettled dispersal; leaving aerodrome; removal to alternative area of aerodrome; following favoured routes of departure etc.

Passive and Active Scaring Techniques

An understanding of how to disperse birds and other wildlife and the benefits and advantages of using different active and passive management techniques on and in the vicinity of an airfield and the applicability of techniques to different situations including health and safety aspects relating to all equipment and methods used.

Wildlife and the Law

An understanding of the law of the devolved UK, what can and cannot be done to resolve wildlife strike issues within the law including local bye-laws affecting the way operating bird scaring equipment might be utilised.

Wildlife Strike Reporting

An understanding of the requirements of reporting and what constitutes a wildlife strike. Collection, preservation and identification of strike remains.

Wildlife Recording

How to maintain a wildlife control log and what to record. Systems and procedures for reporting and analysing data.

Safeguarding

Understanding the importance of managing the off-airfield environment and monitoring the impacts of wildlife hazards in the vicinity of an aerodrome.

Training and Certification

To ensure that wildlife/bird control personnel maintain competence, Annual refresher or another system of monitoring should be implemented by the aerodrome operator.

A written certification should be provided to those who successfully pass the test(s). If a published training procedure is not provided by the trainer the certificate should attest to the fields the trainee has successfully completed.

APPENDIX A

Avian radar

The use of avian radar is increasingly being deployed and considered by a number of major commercial air transport airports around the world.

The information provided in this appendix discusses the background, tactical use and capabilities. Aerodrome operators and other stakeholders should contact organisations with experience in avian radar in order to learn more about the capabilities and limitations in order to suit local issues, both tactical and strategic.

Background

Avian radar systems are increasingly being used around the world to monitor hazardous bird movements in relation to aircraft safety. From the 1950s through to the mid-1990s radar developers have tried to relate their findings to birdstrikes, often for the military, which led to the rise in Europe of the 'BIRDTAM' system, a Notice to Airmen message, advising of the general location of increased bird activity measured by long-range radars as a secondary function to their use for air traffic control.

In the late 1990s work by the United States Air Force led to the development of small dedicated avian radars using equipment sourced from the marine radar industry. Initially these were used to develop historical models of where and when birds hazardous to aircraft were active at bombing ranges and on airfields. These projects demonstrated that the technology was rapidly maturing whereby biological targets could be tracked and activity records stored in databases for developing historical models as well as to be used in real-time for birdstrike risk reduction. In 1997 the USAF Avian Hazard Advisory System (AHAS) was developed to use data from more than 140 long range weather radars, isolate returns from biological targets and use that information to identify areas of increased birdstrike risk, as a means to reduce the potential for loss of aircraft training on low-level routes, bombing ranges and other military training areas including the area around airfields.

More recently, dedicated avian radars have emerged which do not rely on the use of sub-optimal marine radars, but which are purpose-built for bird detection. This ensures that each part of the radar data processing chain is optimized for finding bird targets. Many of the new generation radars have tracking capabilities for individual birds.

Moreover they have added classification between small, medium and large sized birds and flocks.

Operational use

The first dedicated avian radar system for an airfield was deployed in the UK, at RAF Kinloss in Scotland and was integrated into air traffic control and approach radar rooms using displays that were similar to those commonly used in Precision Approach Radars (PAR). These PAR-like displays showed the position of birds on one image of the display in range and elevation (side view) and on the other image in azimuth and range (top down). The two images were located one above the other so that the position of targets could easily be determined from one to the other in the exact same way that controllers were used to in managing aircraft arrivals and departures. The concept of operations was then modified to execute procedures to wave off an aircraft on arrival or delay departures if flocks were located on or near the flight corridors.

Today, commercially produced avian radars from various manufacturers in the US, Canada and Europe are in operational use by the US Air Force, NASA (for space shuttle launches from 2006 to 2011), by the US Navy and at several commercial airports in the US, Europe and Africa. The US Federal Aviation Administration (FAA) is also currently evaluating systems from various manufacturers and has published an Advisory Circular 150/5220-25.

The effectiveness of avian radar for detecting different bird species at various distances is highly dependent on the quality of the hardware and software (algorithms). To know the capabilities, and the limitations of the avian radar, it is highly recommended to perform an extensive system comparison and a thorough validation in the field. The insight in what the system can detect at which distance is fundamental to inform decision-making about birdstrike prevention based on avian radar.

Avian Radar Concept of Operations

It is important to make a distinction between the tactical operational use in real-time of bird radar compared to strategic use, non real-time, giving long-term and trend data analysis:

Tactical use of Avian Radar

- Real-time informing the bird control on the airfield with early warning detection of potential birdstrike risk to aircraft;
- Automatic activation of bird deterrent means by avian radar.

Strategic Use of Avian Radar

- Providing an insight into spatial and temporal distribution and in trends of bird migration patterns crossing in the near vicinity of the airport;
- Support of habitat management by providing insight into roosting and feeding areas and on hot spots of high bird concentration areas;
- Measurement of near-misses as precursor indicators of birdstrike;

- Providing specific and precise information of birdstrike risk to pilots as used by ATIS and NOTAM;
- Measurement of the effectiveness and durability of bird control actions providing insight in habituation of existing bird deterrents;
- Providing information supporting the optimal planning of bird control personnel.

The concept of operations for avian radar systems is crucial to their effective utilisation on an aerodrome. Information on the activity of large birds or large flocks of birds hazardous to flight operations can be acted upon in real time if the concept of operations is modified to use procedures similar to those utilized for missed approaches, runway incursions by vehicles or personnel or severe weather, windshear and even volcanic ash clouds.

In the years since 2002 significant advances have been made to create concepts of operation that include using radar data to show where and when bird control personnel need to be deployed to scare away birds based on recent trends in activity or in real-time. Real-time indicators are particularly important at night when personnel cannot easily see the birds they need to remove from runways, taxiways and flight corridors.

Following the initial year of deployment, most avian radar systems installed at a new location may detect at least one bird activity pattern that was previously unknown. Birdstrikes are relatively infrequent occurrences and strike statistics often don't readily identify larger night-time activity patterns that are readily apparent to radar. Radar allows mass tracking of bird hazards to be assessed.

A clear concept of operations needs to be established to know where and when conditions are occurring that are likely to result in actual risk and the procedures that will be implemented by air traffic control to deal with them. Options for using data to support bird control operations and identify bird activity patterns to improve the response times and the resulting effectiveness of bird control operations, especially at night, are also available.

The establishment of long-term trends and spatial distribution of bird activity around airfields allows identification, documentation and management of birdstrike hazards that evolve and change over time as a result of the changing nature of bird populations, migratory patterns, agriculture, land use and climatic conditions. It is impossible to manage this critical risk without data on the timing and level of the risk which radar can provide. Radar systems are the only surveillance technology currently available that provide consistent 24/7 risk assessment of the airspace in the majority of weather conditions.

Modern bird detection radars are now being deployed at airports around the world that provide a unique opportunities to help monitor, detect and evaluate (birdstrike) risk at aerodromes. Expert guidance should be sought from independent specialists on how bird detection radar technology could be used to help manage (birdstrike) risk at UK aerodromes.

APPENDIX B

Wildlife strike hazard at small non-commercial or General Aviation aerodromes

Operators of General Aviation (GA) aerodromes are recommended to take practicable steps, proportionate to the identified hazard and assessed risk, to remove and or disperse birds both from:

- The aerodrome itself
- In the near vicinity beyond the airfield boundary fence where local 'safeguarding' arrangements exist and where deemed necessary

The best practice standards outlined in this document apply predominantly to aerodromes operating commercial air traffic, irrespective of aircraft movement frequency or type of aircraft involved. However it is reasonable at aerodromes not conducting commercial air traffic, such as non-public transport, VFR flights and at those aerodromes operating as flying training establishments, to be aware of the risks to flight safety posed by birds and other wildlife and as such the measures outlined may be used proportionately as applicable.

In order to meet this objective the CAA recommends an aerodrome should have in place:

- A named individual responsible for wildlife hazard management;
- A list or map of habitat types on and bordering the airfield that have the potential to attract birds;
- A record of the species and approximate numbers of birds recorded within these habitats;

To assess the risk of a bird or wildlife strike, the aerodrome should confirm hazardous birds on or in the vicinity of the runway and detail the desired options for managing and reducing any risk that is presented.

Risk Control

The aerodrome's policy and records should document and demonstrate when or whether any habitat management is undertaken to reduce the presence of birds that are considered to cause risk.

Such procedures could include cutting grass in accordance with a LGP (as described in Chapter 5, Risk Management), requesting farmers to plough fields with spilt grain in or asking gamekeepers not to rear pheasants adjacent to the airfield fence, for example.

The aerodrome's record keeping should document whether and when any active dispersal of birds is undertaken on the aerodrome. For example, this could include warning pilots of bird issues, driving a vehicle at any birds seen on the aerodrome prior to aircraft movements or deployment of any of the more formal or typical bird dispersal methods.

Training

GA aerodromes are unlikely to have the resources to train staff in formal bird hazard control and may not perceive a need, based on records of strike incidents. However, any deterrence activities should result in a reduced risk. Familiarisation and awareness of the aerodrome and its surrounding habitat is therefore considered an essential element.

Where deemed necessary, support from a professional bird/wildlife strike prevention specialist should be sought and documentary evidence of this process, its implementation and outcomes should be recorded.

MAG

INTERIM REPORT & ACCOUNTS FOR THE SIX MONTHS ENDED 30 SEPTEMBER 2018

MAG is a leading UK airport group which owns and operates three major UK airports and a successful airport property business.

- Manchester
- London Stansted
- East Midlands
- MAG Property

280+
destinations by 70 airlines

745k
tonnes of cargo shipped per annum

35.7m
passengers
(six months ended 30 Sept 2018)

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Financial highlights (Six months ended 30 September 2018)

Revenue
£508.5m

2018	508.5
2017	469.4
2016	430.8

+£39.1m
+8.3%

Adjusted EBITDA*
£244.5m

2018	244.5
2017	235.7
2016	215.9

+£8.8m
+3.7%

Adjusted operating profit*
£167.8m

2018	167.8
2017	164.4
2016	148.4

+£3.4m
+2.1%

Passenger numbers
35.7m

2018	35.7
2017	34.4
2016	31.6

+1.3m
+3.8%

Cash generated from operations
£246.3m

2018	246.3
2017	188.0
2016	180.5

+£58.3m
+31.0%

Profit from operations
£164.9m

2018	164.9
2017	159.7
2016	145.5

+£5.2m
+3.2%

Operating highlights

- Summer season demonstrates strength of demand for flights from MAG airports
- Jet2.com establishes major new base at London Stansted, its first in the South East
- Investment in passenger facilities: transformation programmes with a combined value of more than £1.5bn now underway
- Manchester Airport Transformation Programme ('MAN-TP'), the largest ever private investment in the North West, now under construction
- London Stansted secures permission to grow up to 43 million passengers per annum
- Major new employment programme, MAG Connect, now established in response to expected growth in the coming years

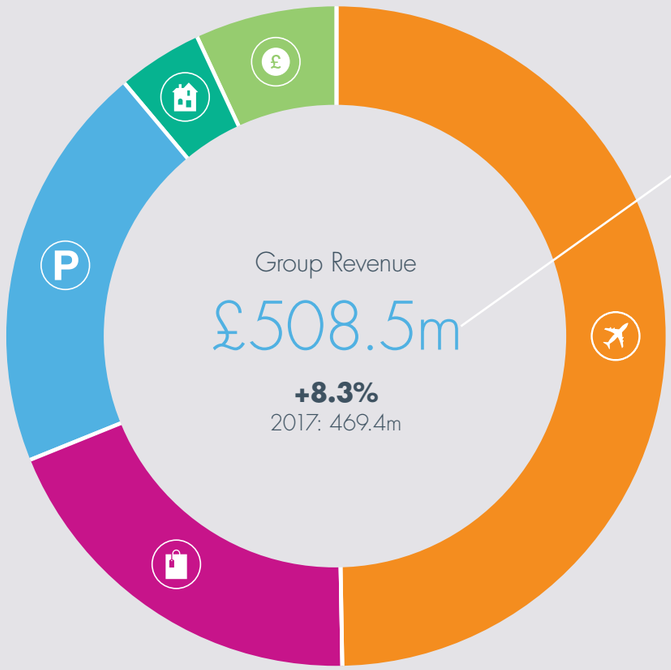
Our vision

To be the premier airport management and services company.

Notes
[1] All numbers relate to continuing operations unless stated, and 2017 & 2016 numbers have been restated as explained on page 15.
* Before Significant Items as explained in the financial review on page 15

At a glance

The Group serves 60m passengers annually flying through its airports, which together employ over 5,000 MAG personnel and support over 40,000 jobs on-site.



8.3%

GROWTH IN REVENUE

MAG's overall strategic intent is to increase long-term shareholder value by generating profitable growth, developing its assets and deploying efficient and customer-focused operating processes throughout the business.

Aviation	£203.1m
Retail	£111.9m
Car parking	£129.4m
Property	£24.4m
Other	£39.7m

Our strategic values

INVESTING

- Deliver great service at every touch point
- Provide modern and customer focused infrastructure

CONNECTING

- Enhance the reputation and profile of MAG
- Achieve profitable growth in all our businesses

TRANSFORMING

- Focus on operational excellence
- Energise and unlock the potential of our people

Aviation

MAG has a diverse carrier mix from across the globe, with an excellent track record of supporting and delivering passenger growth.

By forging strong commercial partnerships with airlines, our airports have been able to increase choice and convenience for our passengers and make a stronger contribution to economic growth in their regions.

MAG owns and operates three of the top four cargo airports in the UK, which handle over £27.5bn and 745,000 tonnes of air cargo to and from the UK every year.

Aviation revenue
£203.1m
2017: £193.7m

280+
More than 70 airlines serving 280+ destinations

Retail

Across our airports, retail space at MAG extends to in excess of 400,000 sq ft with over 50 operators and we work with a diverse range of brands, both new and established, to help them operate successfully in an airport environment.

Partnering with MAG gives retailers access to potentially more than 60m customers each year.

Retail revenue
£111.9m
2017: £104.0m

200+
shops, bars and restaurants across our airports

Car Parking

We use a combination of market leading analytical, ecommerce, marketing and trading expertise to deliver a tried and tested formula for our highly successful airport car parking businesses. Our car parks cater for all tastes and budgets ranging from our competitively priced JetParks brand through to Meet & Greet and Valet services.

Car Parking revenue
£129.4m
2017: £110.8m

75,000+
parking spaces across all our sites

Property

MAG Property manages almost 6m sq ft of high-quality space in offices, terminals, hangars, warehouses and hotels across our airport portfolio at Manchester, London Stansted and East Midlands.

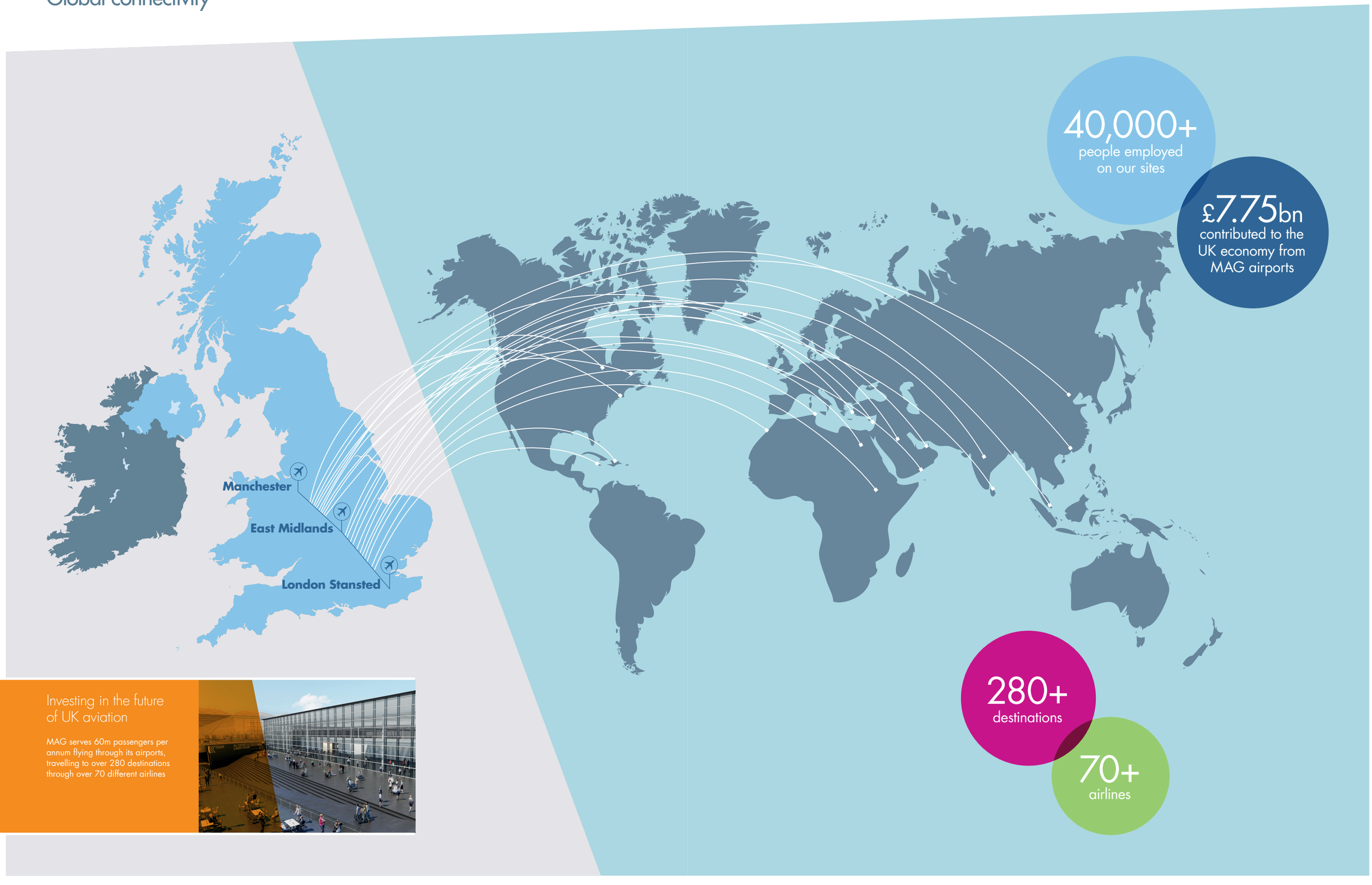
We do much more than simply let the space: we understand the complexities of the infrastructure and services that make airports work, so we know how to help businesses based there take full advantage of them.

Property revenue
£24.4m
2017: £23.1m

£522m
of investment property assets across all airports

* Numbers relate to continuing operations unless stated, and 2018 and 2017 numbers have been restated as explained on page 15.

Global connectivity



Investing in the future of UK aviation

MAG serves 60m passengers per annum flying through its airports, travelling to over 280 destinations through over 70 different airlines

Chief Executive's operating review

Investing in the future of UK aviation.

Revenue
£508.5m

2018	**508.5**
2017	469.4
2016	430.8

+£39.1m
+8.3%

Adjusted EBITDA*
£244.5m

2018	**244.5**
2017	235.7
2016	215.9

+£8.8m
+3.7%

Notes
1 All numbers relate to continuing operations unless stated, and 2017 and 2016 numbers have been restated as explained on page 15
* As explained in the financial review on page 15.

> "Following a successful start to the year, the next 6 months will see the first phase of our infrastructure investment move towards completion, facilitating further growth for summer '19 and beyond."

CHARLIE CORNISH,
GROUP CHIEF EXECUTIVE, MAG

Our dynamic and innovative approach to operating airports has once again delivered a strong performance, with MAG ending the six months to September 2018 on a real high, passing the milestone of handling 60 million passengers per annum across our three airports.

In the first half of the year, MAG welcomed 35.7m passengers, growth of 1.3m. This 3.8% year on year growth in passenger numbers across the Group in the six months to September demonstrates the strong demand for flights and the recognition by airlines of the huge opportunities to grow their networks at our airports.

Overall, the strength of demand for aviation, coupled with an expanding and popular retail, food and beverage operation, led MAG's EBITDA to grow £8.8m to £244.5m, underpinning the Group's ongoing £1.5bn investment programme.

Manchester Airport had a resilient summer, with passenger numbers holding up flat year on year, despite the loss of Monarch, the airport's seventh largest airline in October 2017. The airport has continued to develop its long haul route network, and I was delighted to be able to announce new direct links to Mumbai and Addis Ababa, the first ever links from the North to India and Sub-Saharan Africa respectively.

This, coupled with strong short haul growth that backfilled Monarch's capacity and a resurgence in summer traffic to Turkey, means we forecast a return to significant growth for Manchester for the remainder of the year, and for next summer.

This growth will be supported by the opening of the first phases of our £1bn transformation programme, on time in Spring 2019, offering a first class passenger experience and more terminal capacity. When complete, the transformation programme will allow Manchester to capitalise on its two existing runways, the only major airport in the country outside of London to offer such runway capacity and long term potential for growth.

60m+
passengers per annum passing through our three airports

Chief Executive's operating review continued

Integrating Manchester Airport into a high speed rail network across the North will further enable the airport to maximise the use of its two runways. An interchange between HS2 and Northern Powerhouse Rail at the airport will deliver huge benefits for the region, bringing cities such as Liverpool, Sheffield, Leeds, Hull and Newcastle much closer to the airport by public transport, facilitating trade and inward investment across the North, as well as the immediate area of South Manchester and Cheshire. We would like to see government commitment to this scheme as soon as possible.

At **London Stansted Airport** we achieved a new record high of 15.9 million passengers per annum in the first half of the year – a growth of 8.9%.

We are proud of the growth in routes and choice since we acquired London Stansted in 2013; the airport is now welcoming more than 40% more passengers than it was at that time. The first half of this year offered a window into the next phase of Stansted's development, with the much-anticipated launch of Emirates' daily Boeing *777* service to Dubai, offering three classes of service to businesses and leisure travellers. It is great to have Emirates with us at Stansted. The inaugural flight in June was a magnificent moment for the airport, and testament to the hard work of the team there.

8.3%
revenue growth

The Dubai route opens up an unprecedented array of onward global destinations for passengers travelling east from Stansted, and has already proved extremely popular with the hi-tech businesses in the London-Cambridge corridor. We are optimistic that this route will grow further in the coming years and that other new airlines will follow in providing long haul connections from Stansted.

Elsewhere, Stansted's core European markets have also grown, with Ryanair and Jet2.com both continuing to expand operations at the airport and new links introduced by the likes of WOW Air, Air Corsica and Pobeda.

The airport is also optimistic about quickly replacing routes to New York and other North Atlantic destinations which had been served by Primera Air. Although the airline went into administration in October 2018, it had achieved excellent ticket sales on its Stansted transatlantic routes, demonstrating the strength of demand for these destinations from Stansted's catchment area in London and the East of England.

To ensure Stansted is able to continue to grow, we recently applied to raise the 'planning cap' on the number of passengers the airport is able to serve each year. Raising this limit from 35 to 43 million Stansted will provide vital new capacity for the next decade. We were delighted that, in November, Uttlesford District Council approved our planning application.

The decision will enable Stansted to make best use of its capacity, while also importantly providing the local community with the assurance that our future growth will be delivered in a measured and sustainable way, within the existing flight limits and noise footprint.

It will also boost economic growth and deliver 5,000 additional jobs at Stansted, while offering our airline partners the long-term clarity they need to plan new routes.

East Midlands Airport is playing an ever more critical role, not just in powering the 'Midlands Engine' but also the whole of the UK's economy. By day, East Midlands is a popular passenger airport with ambitions to grow (HY performance: 3.2m passengers (-0.3%)). At night the airport transforms into the most important airport for cargo aircraft in the UK, making it one of the most important ecommerce hubs in the country. DHL's operation at the airport continues to expand, and UPS are building a new facility which will boost further the airport's express freight credentials. A 6 million sq ft new logistics park and rail freight terminal at SEGRO, next door to the airport, will contribute to the ongoing success of this element of the airport's operation.

MAG as a group is investing in our airports now because we believe that they will play an increasingly important role in meeting aviation demand in the UK over the coming years. Manchester and London Stansted are both in a position to provide more of the connectivity this country needs, using their spare capacity to support significant growth.

In the forthcoming Aviation Strategy, we expect Government to set out an ambitious programme that will enable the UK's major airports to maximise their economic contribution to the UK. Investing in those UK airports with capacity to grow over the next decade will drive economic growth into their regions and across the country. In our view, there is a strong case to be made for prioritising investment in better transport links to airports, and reducing the burden of a punitive Air Passenger Duty regime to encourage airlines to establish new routes from airports in the UK, rather than elsewhere in Europe.

The hugely positive effect that new long haul connectivity, especially to airports outside of London, can have on the national economy is clear. Our China Dividend report, published in September, analysed the effect of the new routes from Manchester to Beijing and Hong Kong that we have introduced in the past few years.

Growth will be further enabled by the opening of the first phases of our £1bn Transformation Programme

The findings of the report are clear. As a result of this direct connectivity to China, levels of growth in trade, tourism and knowledge exchange between the North and the Far East are outstripping national averages. Chinese companies are increasing their investments in the North of England with hundreds of millions of pounds recently committed to big infrastructure schemes across the North, including projects in Greater Manchester, Sheffield, Liverpool and Lancashire. This investment and economic stimulus is good for UK Plc. There needs to be a much stronger focus on the new direct routes that can be established to dynamic overseas economies, something which will become even more important once Britain leaves the EU.

Earlier in the year I was delighted to travel to Bulgaria to announce MAG's intention to bid to operate Sofia Airport, the country's largest, for the next 35 years. We are targeting this opportunity because we have a clear vision of the airport's potential growth and how we can use our expertise to deliver a passenger experience and global route network for Sofia Airport that is comparable to other top tier airports around the world.

Our international ambitions, together with a significant UK growth programme means this is an exciting time for MAG as an airport group.

I write this at a time of significant political uncertainty, with a draft Brexit deal recently agreed and due to be put before the UK Parliament in the coming weeks. We have been clear that the best result for the aviation industry would be a Brexit deal which preserves the liberal flying freedoms and competitive approach to the aviation market that have driven so much important connectivity and economic growth across the continent over the last couple of decades. We are hopeful and optimistic that such a deal is within reach.

However, it is important that there are contingency plans in place for aviation were such a deal not to be signed. To this end, we welcomed the publication of technical notices from both the UK and the EU which set out a clear and positive commitment to allow airlines access to fly between the UK and the EU, even in a no deal scenario.

Our latest set of financial results demonstrates that MAG is a business which continues to grow, resilient to challenges and external impacts. The business is well balanced across UK market and geographies, and we have ambitions to expand further into new markets, which will grow both scale and resilience for the business, with strong growth prospects over the coming years. As we leave the EU, UK Plc will need to connect and do business with an increasing range of global markets. MAG airports can deliver the connectivity that the whole of the UK needs to these markets, and we stand ready for the demand for air travel to and from the UK to continue growing.

Passenger numbers
35.7m

2018	**35.7**
2017	34.4
2016	31.6

+1.3m
+3.8%

Profit from operations
£164.9m

2018	**164.9**
2017	159.7
2016	145.5

+£5.2m
+3.2%

Business model

Our business model is based on long-term relationships with our owners and partners, and well invested assets, creating value for all of our stakeholders.

WHAT WE DO

Aviation
MAG has a diverse carrier mix from across the globe, with an excellent track record of supporting and delivering passenger growth. We also own and operate three of the top four UK cargo airports.

39.9% of Revenue

Retail
We work with a diverse range of brands, both new and established, to help them operate successfully in an airport environment.

22.0% of Revenue

Car parking
We use a combination of market leading analytical, ecommerce, marketing and trading expertise to deliver a tried and tested formula for our highly successful airport car parking businesses.

25.5% of Revenue

Property
We do much more than simply let the space on our airport sites: we understand the complexities of the infrastructure and services that make airports work, so we know how to help businesses based there take full advantage of them.

4.8% of Revenue

HOW WE CREATE VALUE THROUGH OUR COMPETITIVE ADVANTAGES

Broad catchment
More than 70% of the UK's population live within two hours of a MAG airport.

Talented people
Our skilled employees bring commercial expertise and an innovative approach to product development and excellent customer service.

Well-invested assets
Manchester and London Stansted have significant spare runway capacity, and MAG's capital plan is for continued investment in our asset base.

Long-standing partnerships
We have long-term incentivised commercial agreements with our diverse carrier mix and retail partners.

Strong capital position
MAG is committed to retaining its strong investment grade credit ratings, supporting access to long-term capital markets.

Long-term, supportive shareholders
Our unique ownership structure comprises an effective blend of public and private shareholders, including Manchester City Council (35.5%), IFM Investors (35.5%) and the nine other Greater Manchester local authorities. (29%).

HOW WE DELIVER VALUE

Financial review

MAG has built on last year's strong results with delivery of sustained growth in the first half of this financial year.

The solid half year results are driven by continued implementation of MAG's growth strategy, with increased passenger volumes, strong commercial performance and cash generation, together with continued focus on the management of our operating cost base.

We have also continued to invest significantly across all our airports to set the foundations for customer focused infrastructure in support of our continuing long-term growth strategy.

With the continued growth we've achieved this year, together with the strong long-term prospects for the Group, we are pleased to continue to declare sustainable and growing dividends to our shareholders.

Revenue
£508.5m

2018	508.5
2017	469.4
2016	430.8

+£39.1m
+8.3%

Profit from operations
£164.9m

2018	164.9
2017	159.7
2016	145.5

+£5.2m
+3.2%

Adjusted EBITDA*
£244.5m

2018	244.5
2017	235.7
2016	215.9

+£8.8m
+3.7%

Cash generated from operations
£246.3m

2018	246.3
2017	188.0
2016	180.5

+£58.3m
+31.0%

Adjusted cash generated from operations*
£249.2m

2018	249.2
2017	192.7
2016	183.4

+£56.5m
+29.3%

Notes
1 All numbers relate to continuing operations unless stated, and 2017 and 2016 numbers have been restated as explained on page 15.
* As explained in the financial review on page 15.

Summary of the period's results (£m)

	Six months ended 30 September 2018	Six months ended 30 September 2017[4]	2018/2017 Change £m	2018/17 Change %
Passenger numbers	**35.7**	34.4	1.3	3.8%
Revenue	**508.5**	469.4	39.1	8.3%
Adjusted EBITDA[1]	**244.5**	235.7	8.8	3.7%
Adjusted operating profit[2]	**167.8**	164.4	3.4	2.1%
Profit from operations	**164.9**	159.7	5.2	3.2%
Profit before taxation	**130.5**	132.1	(1.6)	(1.2%)
Adjusted cash generated from operations[3]	**249.2**	192.7	56.5	29.3%
Cash generated from operations	**246.3**	188.0	58.3	31.0%
Capital Investment	**277.5**	128.1	149.4	116.6%
Dividends paid in the period	**110.7**	93.9	16.8	17.9%
Net debt	**(1,559.4)**	(1,222.3)	(337.1)	(27.6%)
Equity shareholders' funds	**1,547.9**	1,568.6	(20.7)	(1.3%)

Notes
1 Adjusted EBITDA is earnings before interest, tax, depreciation and amortisation, and before significant items
2 Adjusted operating profit is operating profit before significant items
3 Adjusted cash generated from operations is cash generated from operations before significant items
4 Comparative figures relate to continuing activities (excluding Bournmouth disposal) and restated to account for IFRS 15 adoption

Reconciliation of adjusted EBITDA to adjusted operating profit and profit from operations (£m)

	Six months ended 30 September 2018			Six months ended 30 September 2017		
	Before significant items	**Significant items**	**After significant items**	Before significant items	Significant items	After significant items
Adjusted EBITDA	**244.5**	**(2.9)**	**241.6**	235.7	(4.7)	231.0
Depreciation and amortisation	**(76.7)**	**–**	**(76.7)**	(71.3)	–	(71.3)
Adjusted operating profit / profit from operations	**167.8**	**(2.9)**	**164.9**	164.4	(4.7)	159.7

Measures used to assess performance

The Group uses a number of measures to assess financial performance that are not defined within IFRS and are widely referred to as 'Alternative Performance Measures' (APMs). The directors use these measures to review the performance of the Group, as evidenced by performance targets being significantly based on Adjusted EBITDA. As such, these measures are important and should be considered alongside the IFRS performance measures. The adjustments from IFRS measures are separately disclosed and are items that are significant in size or non-recurring in nature, and where, in the directors' view, their separate disclosure gives a more accurate indication of the Group's underlying financial performance. For example, costs incurred on Groupwide restructuring programs, certain costs associated with significant new systems implementations or costs associated with the new terminal, and M&A activity, are considered one-off and are presented within significant items as adjustments to the IFRS measures of financial performance. Alternative performance measures used within these statements are accompanied by a reference to the relevant IFRS measure and the adjustments made.

Summary trading performance

The Group has delivered further growth in the first half of the financial year, with all our Airport divisions exceeding the prior period performance at both a revenue and adjusted EBITDA level. This has been driven predominantly by an increase in passenger numbers of 3.8% to 35.7m and improved commercial yields. During the first 6 months of the year the effect of the Monarch Airlines collapse together with air traffic and pilot strikes across Europe has impacted on earnings growth right across UK airports, and has driven a circa 3% drag on MAG's year-on-year growth, and a 5% drag at Manchester. However MAG PAX growth is outperforming the UK market and adjusted EBITDA performance is above our plan, up £8.8m (3.7%) at £244.5m.

The largest increase in passengers is at London Stansted (growth of 8.9% on prior period), where an increased number of airlines has led to a 5% increase in the routes served. This has been driven by increased capacity from Ryanair and Jet2.com and new routes such as the Emirates service to Dubai.

New long-haul routes with new and existing airlines have also been added, to increase the breadth of destinations across our airports, including the new Emirates service to Dubai from Stansted. The new routes have more than compensated for the loss of Monarch Airlines passengers following the airline's collapse in October 2017.

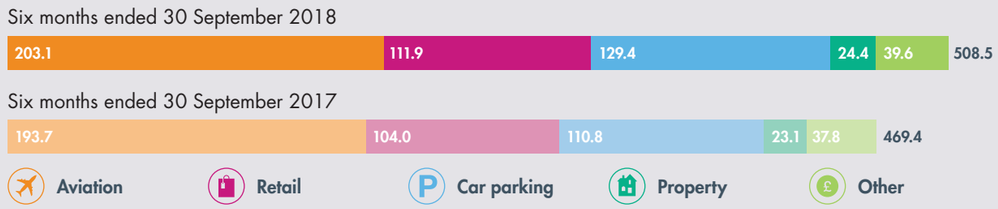
Financial review continued

East Midlands Airport has seen continued growth in express freight traffic predominantly driven by DHL.

Bournemouth Airport, which was sold in the previous financial year contributed 0.5m passengers to the prior period. However, the increased passenger numbers experienced at Stansted have more than compensated for this in the current period.

The Group's passenger growth has led to an 8.3% increase in total revenues to £508.5m, with the Group's commercial strategy, and the impact of targeted investments across retail and car parking, driving improvements in the overall income per passenger.

Income analysis



Passenger traffic

	Six months ended 30 September 2018 (m)	Six months ended 30 September 2017 (m)	Change (m)	Change %
Manchester Airport	**16.6**	16.6	0.0	–
London Stansted Airport	**15.9**	14.6	1.3	8.9%
East Midlands Airport	**3.2**	3.2	0.0	(0.3%)
Continuing Business	**35.7**	34.4	1.3	3.8%
Bournemouth Airport	**–**	0.5	(0.5)	(100.0%)
Total Business	**35.7**	34.9	0.8	2.4%

Aviation income of £203.1m represents growth of 4.9% on the equivalent period in the prior year, reflecting the additional passenger growth from London Stansted. Cargo income, which represents 4.2% of aviation income, has seen growth of 4.4% to £12.5m driven by a greater volume of express freight traffic in East Midlands.

Retail income of £111.9m for the first six months of the year has grown by 7.5%, driven by increased passenger volumes, and improved yields. This has been supported by the continuing food and beverage performance within food led bars and casual dining including the piloting of the "Proof 65" own branded bar at East Midlands Airport.

Car parking has seen increased revenue growth over the first six months of the year, with revenues 16.8% higher than prior period. MAG acquired the Looking4Parking business which provides a service for the public to book parking online and which added £0.9m of revenue. Additionally, the revenue increases were driven by additional capacity to serve the increased passenger volumes, and effective management of the customer trend of moving to pre-book channels.

Property income across the Group has increased by £1.3m (5.7%) to £24.4m. This is due to additional letting activity across each site, including the newly refurbished top 3 floors in 4M at Manchester, a new cargo facility at East Midlands, together with new lettings at Stansted. Occupancy levels across the group's investment portfolio have grown to 94.7%. Other income, which includes utilities recharges and fees for airline services and aviation fuel sales, has grown by £1.9m (5.0%) on prior period.

Operating costs before depreciation have increased by £30.3m, largely driven by additional costs to support higher volumes, higher income in car parking and investment in customer service. Together with inflationary cost increases.

Depreciation and amortisation costs of £76.7m are £5.4m higher than the prior period, reflecting the accelerated investment in infrastructure across the Group.

During the first half year the Group undertook a restructuring of our property portfolio (£0.6m) and worked on potential international growth opportunities (£1.6m). These are the main projects in the £2.9m being recognised as a significant item within the consolidated income statement.

After deducting the above depreciation, amortisation and significant items from adjusted EBITDA, the profit from operations for the period is £164.9m, an increase of £5.2m (3.2%) on the prior period.

Property

The MAG Property division manages the investment property portfolio comprising offices, hotels and cargo properties on an overall investment property portfolio of £522m. MAG also holds a 50% interest in the Airport City development at Manchester Airport.

The property team continue to create opportunities to maximise value across its property portfolio as part of MAG's commitment to investing in and developing the property and land at our airports.

Adjusted EBITDA* by division (£m)

	Six months ended 30 September 2018 (m)	Six months ended 30 September 2017 (m)	Change (m)	Change %
Manchester Airport	**121.1**	118.1	3.0	2.6%
London Stansted Airport	**103.5**	92.1	11.4	12.4%
East Midlands Airport	**18.0**	17.7	0.3	1.5%
MAG Property	**9.1**	10.9	(1.8)	(16.3%)
Group, consolidation and other	**(7.2)**	(3.1)	(4.1)	133.0%
Continuing Business	**244.5**	235.7	8.8	3.7%
Bournemouth Airport	**–**	0.9	(0.9)	(100.0%)
Total Business	**244.5**	236.6	7.9	3.3%

Profit from operations by division (£m)

	Six months ended 30 September 2018 (m)	Six months ended 30 September 2017 (m)	Change (m)	Change %
Manchester Airport	**82.0**	80.7	1.3	1.6%
London Stansted Airport	**71.6**	61.9	9.7	15.7%
East Midlands Airport	**12.5**	11.9	0.6	4.8%
MAG Property	**9.1**	10.5	(1.4)	(13.1%)
Other businesses and consolidation	**(10.3)**	(5.3)	(5.0)	95.8%
Continuing Business	**164.9**	159.7	5.2	3.2%
Bournemouth Airport	**–**	0.2	(0.2)	(100.0%)
Total Business	**164.9**	159.9	5.0	3.1%

Cash flow

Adjusted cash generated from operations during the first six months of the year has increased on the prior year by £56.5m (29.3%) reflecting good translation of profits into cash and working capital management. Strong cashflow is a key part of supporting our long-term financing position and allows the Group to continue to invest in infrastructure and development opportunities.

Financing and interest

Group net interest payable for the period, at £33.5m, has increased in line with borrowings. The underlying finance charge was higher at £44.6m, partially offset by £11.2m of interest costs capitalised.

Net debt has increased from 31 March 2018 to £1,559.4m. During the period, the Group received £175m from our shareholders in the form of shareholder loans. A second tranche of £175m will be received in the second half of the year. This will support the funding of our transformation projects whilst maintaining a healthy and balanced funding position.

The Group continues to retain two strong investment grade credit ratings which support ongoing access to long-term capital markets to facilitate growth.

Capital investment

The Group increased its rate of investment in its infrastructure across all its airports, with expenditure totalling £277.5m during the first half of the year.

The Manchester Transformation Programme continues to be the largest individual project in the period with spend of £161.5m taking our cumulative spend to £376.6m. We also saw significant transformation activity at London Stansted.

The significant investments at both airports will both improve the experience for passengers and airlines using the airports, and provide the foundations to unlock their significant future growth potential.

Financial review continued

Pensions

The accounting deficit for all Group schemes is calculated by independent scheme actuaries PricewaterhouseCoopers, who incorporate data taken from a number of markets in calculating the closing deficit position at the Balance Sheet date.

During the six-month period the IAS19 accounting deficit of the aggregate of the Group's defined benefit schemes reduced from £87.3m to £34.4m. The reduction in the deficit reflects the strong positive asset returns over the period, coupled with an improvement on corporate bond yields over the same period.

Tax

The tax charge for the six months ended 30 September is £36.0m (2017: £37.0m). The effective tax rate for the period is higher than the actual corporation tax rate of 20%, predominantly due to the level of disallowable depreciation in excess of capital allowances, as has been the case since the abolition of industrial buildings allowances.

Equity shareholders' funds and dividends

Equity shareholders' funds are £1,547.9m (31 March 2018: £1,520.6m). The movement comprises £94.5m profit after tax, remeasurement gains on pension liabilities (net of tax) of £43.5m recorded in reserves, and the payment of a dividend of £110.7m during the first half of the year, reflecting the final dividend for the year ended 31 March 2018.

In line with our dividend policy, in light of the growth achieved during the first six months of the financial year, and consistent with the strong long-term growth prospects, the directors have declared an interim dividend of £64.0m, which will be paid to the shareholders upon the signing of these financial statements.

Post Balance Sheet events

Primera Air filed for insolvency on 2nd October 2018. The business does not anticipate any financial exposure to its net asset position as at the balance sheet date resulting from the insolvency.

On 26th October 2018 the high court handed down a judgement in a case involving Lloyds Banking Group's defined benefit pension scheme regarding equalisation of Guaranteed Minimum Pension (GMP) for men and women. We are currently working with the trustees and our advisors to identify and quantify any additional pension liability which we expect to be recognised in the second half of the 2018/19 year.

Responsibility statement of the directors in respect of the half-yearly financial report

We confirm that to the best of our knowledge:

- the condensed set of financial statements has been prepared in accordance with IAS 34 'Interim Financial Reporting' as adopted by the EU; and
- the interim management report includes a fair review of the information required by:

  (a) DTR 4.2.7R of the Disclosure Guidance and Transparency Rules, being an indication of important events that have occurred during the first six months of the financial year and their impact on the condensed set of financial statements, and a description of the principal risks and uncertainties for the remaining six months of the year; and

  (b) DTR 4.2.8R of the Disclosure Guidance and Transparency Rules, being related party transactions that have taken place in the first six months of the current financial year and that have materially affected the financial position or performance of the entity during that period, and any changes in the related party transactions described in the last Annual Report that could do so.

[redacted]

GROUP CHIEF EXECUTIVE, MAG

[redacted]

CHIEF FINANCIAL OFFICER, MAG
6 DECEMBER 2018

Accounting Policies

Basis of accounting

This condensed consolidated interim financial information for the six months ended 30 September 2018 has been prepared on a going concern basis, and in accordance with the Disclosure Guidance and Transparency Rules of the Financial Conduct Authority and IAS 34 'Interim Financial Reporting' as adopted by the European Union. The condensed consolidated interim financial information should be read in conjunction with the Annual Report and Accounts for the year ended 31 March 2018, which has been prepared in accordance with IFRS as adopted by the European Union. The historical cost convention is applicable to these financial statements with the exception of investment properties, financial instruments and employee benefit scheme assets and obligations, which are fair valued at each reporting date.

The condensed set of interim financial statements has been prepared by the Group applying the same accounting policies and significant judgements as were applied by the Group in its published consolidated financial statements as at 31 March 2018, except for the following standards and interpretations, which are effective for the Group from 1 April 2018:

Effective for the year ending 31 March 2019 (EU endorsed)

- IFRS 9 'Financial Instruments' – Finalised version, incorporating requirements for classification and measurement, impairment, general hedge accounting and derecognition.

  The revised standard has replaced IAS 39 'Financial Instruments: Recognition and Measurement', and introduces new guidance for classification and measurement, impairment of financial instruments, and hedge accounting. The impact of the revised standard has not had a material impact upon the Group's financial statements.

Effective for the year ending 31 March 2020 (not yet EU endorsed)

- IFRS 16 'Leases'

The new standard fundamentally changes the accounting for leases by lessees. It eliminates the current IAS 17 dual accounting model, which distinguishes between on-balance sheet finance leases and off-balance sheet operating leases, and instead introduces a single, on-balance sheet accounting model that is similar to current finance lease accounting.

In preparation for the adoption of IFRS 16 in the financial statements for the year ending 31 March 2020, the directors are in the process of assessing the potential impact, which is expected to be material.

The results for the six months to 30 September 2018 have not been audited, but at the Group's request have been reviewed by the auditors, KPMG LLP, and a private review opinion has been issued to the Group.

The financial information for the full year ended 31 March 2018 is an abbreviated version of the Group's Annual Report and Accounts for that year, which has been delivered to the Registrar of Companies. The report of the auditor was:

(i) unqualified;

(ii) did not include a reference to any matters to which the auditors drew attention by way of emphasis without qualifying their report; and

(iii) did not contain a statement under section 498(2) or (3) of the Companies Act 2006.

The preparation of these financial statements in accordance with prevailing accounting practice requires the use of estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses. The assumptions and estimates are based on management's best knowledge of the event or actions in question; however, actual results may ultimately differ from these estimates.

The accounting policies that the Group has adopted to determine the amounts included in respect of material items shown in the statement of financial position, and also to determine the profit or loss, are listed in full in the Group's Annual Report and Accounts for the year ended 31 March 2018. Unless stated otherwise, these have been applied on a consistent basis.

Going concern

The current economic conditions create uncertainty, particularly over passenger numbers, which has a direct impact on income. The Group has demonstrated its ability to grow operating margins together with the ability to manage its investment programme according to affordability and business performance. At the interim period ended 30 September 2018, the Group had £2,021.9m (31 March 2018: £1,846.9m) of committed facilities and a net debt position of £1,559.4m (31 March 2018: £1,326.8m).

The Group had financial headroom in excess of £457.7m at 30 September 2018 (31 March 2018: £515.0m), and based on the Board approved five-year business plan, MAG is forecast to have available spare facilities throughout the next 12 months that are more than adequate for the Group's financing requirements.

The Group's forecasts and projections, taking account of reasonably possible changes in trading performance, including Brexit scenarios, show that the Group should be able to operate within the level of its current facilities.

The Group is subject to two historical financial covenants: net debt/EBITDA and EBITDA less tax paid/net finance charges. The covenants are tested half yearly on 31 March and 30 September. As at 30 September 2018 the Group had complied with both of the covenants, and as a result of the Group's prudent financial policy, there is significant covenant headroom. The directors believe that the Group is well placed to manage its business risks successfully despite the current uncertain economic outlook. After making enquiries, the directors have a reasonable expectation that the Group has adequate resources to continue in operational existence for the foreseeable future. Accordingly, they continue to adopt the going concern basis in preparing the Interim Report and Accounts.

Risks and uncertainties

The principal strategic level risks and uncertainties affecting the Group, together with the approach to their mitigation, remain as set out on pages 40 to 43 in the 2018 Annual Report and Accounts, which is available on the Group's website (www.magairports.com). In summary the Group's principal risks and uncertainties are:

- Security breach
- Material sustained disruption to operations
- Major Health and Safety incident affecting our customers or colleagues
- Cyber security
- Brexit
- Regulatory risk
- Delivering major programmes
- Recruitment, development and retention of talented people.

Forward-looking statements

This condensed consolidated interim financial information contains forward-looking statements. Although the Group believes that the expectations reflected in these forward-looking statements are reasonable, it can give no assurance that these expectations will prove to be correct. Due to the inherent uncertainties, including both economic and business risk factors underlying such forward-looking information, actual results may differ materially from those expressed or implied by these forward looking statements.

The Group undertakes no obligation to update any forward looking statements, whether as a result of new information, future events or otherwise.

Condensed consolidated income statement
for the six months ended 30 September 2018

	Note	Six months ended 30 September 2018 £m Total before significant items	Six months ended 30 September 2018 £m Significant items	Six months ended 30 September 2018 £m Total after significant items	Restated Six months ended 30 September 2017 £m Total before significant items	Restated Six months ended 30 September 2017 £m Significant items	Restated Six months ended 30 September 2017 £m Total after significant items	Year ended 31 March 2018 £m Total after significant items
Continuing operations								
Revenue	1	**508.5**	**–**	**508.5**	469.4	–	469.4	818.1
Profit from operations before significant items	4	**167.8**	**–**	**167.8**	164.4	–	164.4	215.4
Significant items								
Exceptional costs	3	**–**	**(2.9)**	**(2.9)**	–	(4.7)	(4.7)	(8.6)
Profit from operations		**167.8**	**(2.9)**	**164.9**	164.4	(4.7)	159.7	206.8
Share of (loss)/profit of associate	10	**(0.1)**	**–**	**(0.1)**	4.3	–	4.3	4.2
Gains and losses on sales and valuation of investment properties	9	**(0.8)**	**–**	**(0.8)**	0.8	–	0.8	14.5
Finance costs		**(33.5)**	**–**	**(33.5)**	(32.7)	–	(32.7)	(67.6)
Profit before taxation		**133.4**	**(2.9)**	**130.5**	136.8	(4.7)	132.1	157.9
Taxation	5	**(36.6)**	**0.6**	**(36.0)**	(37.9)	0.9	(37.0)	(35.4)
Profit from continuing operations		**96.8**	**(2.3)**	**94.5**	98.9	(3.8)	95.1	122.5
Discontinued operations								
Profit/(loss) from discontinued operation (net of tax)	6	**–**	**–**	**–**	0.2	–	0.2	(12.8)
Profit for the period		**96.8**	**(2.3)**	**94.5**	99.1	(3.8)	95.3	109.7
Earnings per share expressed in pence per share								
Continuing operations				**29.8**			30.1	38.7
Discontinued operations				**–**			0.1	(4.0)

The accompanying notes form an integral part of the condensed consolidated financial statements.

Condensed consolidated statement of comprehensive income
for the six months ended 30 September 2018

	Note	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Profit for the period		**94.5**	95.3	109.7
Other comprehensive income/(expense)				
Items that will not be reclassified to profit or loss:				
Remeasurement of retirement benefit liabilities	14	**52.5**	30.2	21.8
Deferred tax on remeasurement of retirement benefit liabilities	5	**(9.0)**	(5.0)	(3.7)
Other comprehensive income/(expense) for the period		**43.5**	25.2	18.1
Total comprehensive income for the period		**138.0**	120.5	127.8

Condensed consolidated statement of changes in equity
for the six months ended 30 September 2018

	Note	Attributable to equity holders of the Company: Share capital £m	Share premium £m	Reserves £m	Total £m
Balance at 1 April 2018		**316.7**	**687.2**	**516.7**	**1,520.6**
Total comprehensive income for the year					
Profit for the year		–	**–**	**94.5**	**94.5**
Remeasurement of retirement benefit liabilities, net of tax	5, 14	–	**–**	**43.5**	**43.5**
		–	**–**	**138.0**	**138.0**
Transactions with owners recorded directly in equity					
Dividends paid to equity holders	7	–	**–**	**(110.7)**	**(110.7)**
Balance at 30 September 2018		**316.7**	**687.2**	**544.0**	**1,547.9**

The accompanying notes form an integral part of the condensed consolidated financial statements.

Condensed consolidated statement of changes in equity
for the six months ended 30 September 2017

	Note	Attributable to equity holders of the Company: Share capital £m	Share premium £m	Reserves £m	Total £m
Balance at 1 April 2017		316.7	687.2	538.1	1,542.0
Total comprehensive income for the year					
Profit for the year		–	–	95.3	95.3
Remeasurement of retirement benefit liabilities, net of tax	5, 14	–	–	25.2	25.2
		–	–	120.5	120.5
Transactions with owners recorded directly in equity					
Dividends paid to equity holders		–	–	(93.9)	(93.9)
Balance at 30 September 2017		**316.7**	**687.2**	**564.7**	**1,568.6**

Condensed consolidated statement of changes in equity
for the year ended 31 March 2018

	Note	Attributable to equity holders of the Company: Share capital £m	Share premium £m	Reserves £m	Total £m
Balance at 1 April 2017		316.7	687.2	538.1	1,542.0
Total comprehensive income for the year					
Profit for the year		–	–	109.7	109.7
Remeasurement of retirement benefit liabilities, net of tax	5, 14	–	–	18.1	18.1
		–	–	127.8	127.8
Transactions with owners recorded directly in equity					
Dividends paid to equity holders		–	–	(149.2)	(149.2)
Balance at 31 March 2018		**316.7**	**687.2**	**516.7**	**1,520.6**

The accompanying notes form an integral part of the condensed consolidated financial statements.

Condensed consolidated statement of financial position
as at 30 September 2018

	Note	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
ASSETS				
Non–current assets				
Goodwill		**169.3**	166.3	166.3
Property, plant and equipment	8	**2,736.6**	2,405.6	2,535.2
Investment properties	9	**521.6**	602.7	526.1
Intangible assets		**44.1**	43.1	42.0
Investment in associate	10	**17.0**	11.4	15.7
Deferred tax assets	15	**5.8**	14.0	14.8
		3,494.4	3,243.1	3,300.1
CURRENT ASSETS				
Inventories		**2.7**	2.5	2.5
Trade and other receivables		**206.5**	177.3	149.2
Cash and cash equivalents		**22.7**	36.4	20.0
		231.9	216.2	171.7
LIABILITIES				
Current liabilities				
Borrowings	11, 12	**(57.0)**	(203.9)	–
Trade and other payables		**(250.0)**	(240.2)	(222.3)
Deferred income		**(38.3)**	(29.3)	(24.8)
Current tax liabilities		**(41.5)**	(39.7)	(37.4)
		(386.8)	(513.1)	(284.5)
NET CURRENT LIABILITIES		**(154.9)**	(296.9)	(112.8)
Non–current liabilities				
Borrowings	11–13	**(1,525.1)**	(1,054.8)	(1,346.8)
Retirement benefit liabilities	14	**(34.4)**	(77.2)	(87.3)
Deferred tax liabilities	15	**(220.0)**	(233.2)	(220.2)
Other non–current liabilities		**(12.1)**	(12.4)	(12.4)
		(1,791.6)	(1,377.6)	(1,666.7)
NET ASSETS		**1,547.9**	1,568.6	1,520.6
Shareholders' equity				
Share capital		**316.7**	316.7	316.7
Share premium		**687.2**	687.2	687.2
Retained earnings		**544.0**	564.7	516.7
TOTAL EQUITY		**1,547.9**	1,568.6	1,520.6

The accompanying notes form an integral part of the condensed consolidated financial statements.

The financial statements on pages 20 to 41 were approved by the Board of Directors on 6 December 2018 and signed on its behalf by:

[redacted]

CHARLIE CORNISH
GROUP CHIEF EXECUTIVE, MAG

Condensed consolidated statement of cash flows

for the six months ended 30 September 2018

	Note	Six months ended 30 September 2018 £m Before significant items	Six months ended 30 September 2018 £m Significant items	Six months ended 30 September 2018 £m After significant items	Six months ended 30 September 2017 £m After significant items	Year ended 31 March 2018 £m After significant items
Cash flows from operating activities						
Profit for the year		**133.4**	**(2.9)**	**130.5**	132.3	157.9
Gains and losses on sales and valuations of investment properties		**–**	**–**	**–**	(0.8)	(14.5)
Share of loss/(profit) of associate		**0.1**	**–**	**0.1**	(4.3)	(4.2)
Net finance income and expense		**44.6**	**–**	**44.6**	32.7	67.6
Depreciation and amortisation		**76.7**	**–**	**76.7**	72.0	143.4
Profit on sale of property, plant and equipment		**0.4**	**–**	**0.4**	(1.3)	(1.3)
Increase in trade and other receivables and inventories		**(54.9)**	**–**	**(54.9)**	(81.3)	(26.4)
Increase in trade and other payables		**49.5**	**–**	**49.5**	35.6	1.4
(Decrease)/ Increase of grants		**(0.2)**	**–**	**(0.2)**	0.3	0.4
(Decrease)/ Increase in retirement benefits provision		**(0.4)**	**–**	**(0.4)**	2.8	4.5
Cash generated from continuing operations		**249.2**	**(2.9)**	**246.3**	188.0	328.8
Profit before taxation – discontinued operation				**–**	**–**	1.9
Depreciation and amortisation – discontinued operation				**–**	**–**	1.0
Movement in working capital from discontinued operation				**2.4**	**–**	(0.2)
Interest paid				**(44.7)**	(31.9)	(76.5)
Tax paid				**(27.2)**	(19.9)	(38.2)
Net cash from operating activities				**176.8**	136.2	216.8
Cash flows from investing activities						
Purchase of property, plant and equipment				**(303.9)**	(115.2)	(319.1)
(Investment in)/ Distributions from associate				**(1.4)**	8.0	3.5
Proceeds (net of selling costs) from sale of property, plant, equipment and investment properties				**6.6**	14.8	48.3
Proceeds from sale of discontinued operation				**–**	**–**	44.9
Cash outflow from discontinued operation				**–**	**–**	(0.1)
Net cash used in investing activities				**(298.7)**	(92.4)	(222.5)
Cash flows from financing activities						
Increase/ (Decrease) in bank loan borrowings, net of debt issue costs				**60.3**	69.8	(136.9)
Issue of shareholder loans				**175.0**	**–**	**–**
Bond issued in the year, net of issue costs				**–**	**–**	295.1
Dividends paid to shareholders				**(110.7)**	(93.9)	(149.2)
Net cash from/(used in) financing activities				**124.6**	(24.1)	9.0
Net increase in cash and cash equivalents	17			**2.7**	19.7	3.3
Cash and cash equivalents at beginning of the period				**20.0**	16.7	16.7
Cash and cash equivalents at end of the period				**22.7**	36.4	20.0

The accompanying notes form an integral part of the condensed consolidated financial statements.

Notes to the financial statements

for the six months ended 30 September 2018

1. Revenue

An analysis of the Group's revenue is as follows:

	Six months ended 30 September 2018 Continuing operations £m	Six months ended 30 September 2018 Discontinued operation £m	Restated[1] Six months ended 30 September 2017 Continuing operations £m	Restated[1] Six months ended 30 September 2017 Discontinued operation £m	Year ended 31 March 2018 Continuing operations £m	Year ended 31 March 2018 Discontinued operation £m
Aviation income	**203.1**	**–**	193.7	1.8	332.7	2.3
Commercial income						
Retail concessions	**111.9**	**–**	104.0	0.6	181.6	0.7
Car parking	**129.4**	**–**	110.8	1.6	187.2	2.0
Property and property related income	**24.4**	**–**	23.1	0.5	44.4	3.0
Other	**39.7**	**–**	37.8	1.0	72.2	2.3
Total commercial income	**305.4**	**–**	275.7	3.7	485.4	8.0
Total income	**508.5**	**–**	469.4	5.5	818.1	10.3

Note:
[1]2017 restatement is due to the adoption of IFRS 15 'Revenue from Contracts with Customers' during 2018 (see 2018 Annual Report and Financial Statements).

Other income includes utility cost recharges, fees for airline services and aviation fuel sales.

Aviation income includes passenger charges, aircraft arrival and departure charges and aircraft parking charges, all of which are recognised at point of departure.

Revenue from the remaining income streams is recognised over time on a straight line basis.

As at 30 September 2018 there were no performance obligations that were unsatisfied.

Notes to the financial statements continued
for the six months ended 30 September 2018

2. Business and geographical segments

For management purposes, the Group is organised into four main operating divisions: Manchester Airport, London Stansted Airport, East Midlands Airport and MAG Property.

The reportable segments are consistent with how information is presented to the Group Chief Executive (Chief Operating Decision Maker) to report its primary information for the purpose of assessment of performance and allocation of resources.

The primary business of all of these Operating Divisions is the operation and development of airport facilities in the UK, and accordingly, no separate secondary segmental information is provided.

Six months ended 30 September 2018

	Manchester Airport £m	London Stansted Airport £m	East Midlands Airport £m	MAG Property £m	Group, consolidation and other[3] £m	**Consolidated – continuing operations £m**
Revenue						
External sales	243.4	203.5	42.0	13.7	5.8	**508.5**
Inter–segment sales[4]	(1.8)	–	–	1.8	–	**–**
Total revenue	241.6	203.5	42.0	15.5	5.8	**508.5**
Result						
Segment operating profit/(loss) before significant items	82.3	71.6	12.5	9.1	(7.7)	**167.8**
Significant items	(0.3)	–	–	–	(2.6)	**(2.9)**
Segment operating profit/(loss) after significant items	82.0	71.6	12.5	9.1	(10.3)	**164.9**
Share of loss of associate						**(0.1)**
Gains and losses on sales and valuation of investment properties						**(0.8)**
Finance costs						**(33.5)**
Profit before taxation						**130.5**
Other information						
Segment assets	1,882.5	883.1	249.1	(Note 1)	711.4	**3,726.1**
Segment liabilities	(212.4)	(153.1)	(65.4)	(Note 1)	(1,747.5)	**(2,178.4)**
Capital expenditure	198.7	67.0	7.1	(Note 1)	4.7	**277.5**
Depreciation	37.0	31.9	5.5	(Note 1)	0.4	**74.8**
Amortisation	1.9	–	–	(Note 1)	–	**1.9**
Taxation	18.0	14.5	2.4	(Note 1)	1.1	**36.0**
Result – geographical location[2]						
Segment operating profit/(loss) before significant items	91.4	71.6	12.5	(Note 2)	(7.7)	**167.8**

See next page for footnotes.

Notes to the financial statements
for the six months ended 30 September 2018

2. Business and geographical segments continued

Six months ended 30 September 2017

	Manchester Airport £m	London Stansted Airport £m	East Midlands Airport £m	MAG Property £m	Bournemouth Airport (Discontinued) £m	Group, consolidation and other[3] £m	**Restated consolidated operations £m**
Revenue							
External sales	230.6	183.2	39.6	15.3	5.4	0.8	**474.8**
Inter–segment sales[4]	(1.0)	–	–	(0.7)	–	1.7	**–**
Total revenue	229.6	183.2	39.6	14.6	5.4	2.5	**474.8**
Result							
Segment operating profit/(loss) before significant items	83.0	61.9	11.9	10.9	0.2	(3.3)	**164.6**
Significant items	(2.3)	–	–	(0.4)	–	(2.0)	**(4.7)**
Segment operating profit/(loss) after significant items	80.7	61.9	11.9	10.5	0.2	(5.3)	**159.9**
Share of profit of associate							**4.3**
Gains and losses on sales and valuation of investment properties							**0.8**
Finance costs							**(32.7)**
Profit before taxation							**132.3**
Other information							
Segment assets	1,497.1	982.9	247.5	Note 1	19.0	712.8	**3,459.3**
Segment liabilities	(180.4)	(168.1)	(64.6)	Note 1	(6.3)	(1,471.3)	**(1,890.7)**
Capital expenditure	99.6	24.6	3.8	Note 1	–	0.1	**128.1**
Depreciation	33.8	30.2	5.8	Note 1	0.7	0.2	**70.7**
Amortisation	1.3	–	–	Note 1	–	–	**1.3**
Taxation	26.4	18.4	2.7	Note 1	0.1	(10.6)	**37.0**
Result – geographical location[2]							
Segment operating profit/(loss) before significant items	93.9	61.9	11.9	Note 2	0.2	(3.3)	**164.6**

Notes:
1. The Group's reporting structure is such that the assets and liabilities of MAG Property are included in the Manchester Airport statement of financial position.
2. For management accounting purposes MAG reports property income and profit on sale of property assets (excluding London Stansted) within the MAG Property division. For statutory purposes property income and profit on disposal of property assets is reported in the subsidiary companies depending on the geographical location of the investment properties and property, plant and equipment. The table shows how profit from operations would appear with property reported by geographical location.
3. Group consolidation and other includes, Group, Head Office, MAG USA, and other subsidiary companies and balances arising on consolidation, which are not specific to the other main operating divisions. Assets include goodwill and fair value adjustments arising on consolidation. Liabilities include borrowings, further details of which can be found in Note 20 Borrowings.
4. Sales between segments are at arm's length.

Notes to the financial statements continued
for the six months ended 30 September 2018

3. Significant items

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Recorded in profit from operations			
Significant Items[1]	**2.9**	4.7	8.6
Total significant items recorded in profit from continuing operations	**2.9**	4.7	8.6
Recorded in profit/(loss) from discontinued operations			
Loss on sale of discontinued operation[2]	**–**	–	14.1
Total significant items recorded in profit/(loss) from discontinued operations	**–**	–	14.1
Total significant items	**2.9**	4.7	22.7

Notes:
1 **Significant Items**
Significant Items of £2.9m (2017: £4.7m) include costs of property restructuring programmes, M&A activity, and costs incurred as a result of the ongoing Manchester Transformation Programme works.
2 **Loss on disposal**
On 4 December 2017, the Group disposed of Bournemouth International Airport Limited and its subsidiaries: Bournemouth Airport Property Investments (Offices) Limited, Bournemouth Airport Property Investments (Industrial) Limited and Bournemouth Airport Core Property Investments Limited.

4. Profit from continuing operations before significant items

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Turnover	**508.5**	469.4 [2]	818.1
Wages and salaries	**(105.6)**	(89.6)	(183.3)
Social security costs	**(10.0)**	(8.5)	(17.6)
Pension costs	**(9.6)**	(8.6)	(17.5)
Employee benefit costs	**(125.2)**	(106.7)	(218.4)
Depreciation and amortisation	**(76.7)**	(71.3)	(143.4)
Profit on disposal of property, plant and equipment	**(0.4)**	1.3	1.3
Other operating charges[1]	**(138.4)**	(128.3)	(242.2)
Profit from continuing operations before significant items	**167.8**	164.4	215.4

Notes:
1 Other operating charges includes maintenance, rent, rates, utility costs and other operating expenses.
2 Restated see note 1

Notes to the financial statements
for the six months ended 30 September 2018

5. Taxation

Analysis of charge in the year

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Current taxation			
UK corporation tax on profits for the period	**36.2**	40.0	44.2
Adjustment in respect of prior period	**–**	–	2.2
Total current taxation	**36.2**	40.0	46.4
Deferred taxation			
Temporary differences arising in the period	**(0.2)**	(2.7)	(10.4)
Adjustment in respect of prior period	**–**	(0.3)	(0.6)
Total ordinary deferred taxation	**(0.2)**	(3.0)	(11.0)
Total taxation charge/(credit)	**36.0**	37.0	35.4

Taxation on items charged/(credited) to equity:

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Deferred taxation on remeasurement of retirement benefit liabilities	**9.0**	5.0	3.7
Total taxation charge/(credit)	**9.0**	5.0	3.7

The current taxation charge for the period has been calculated based on the forecast underlying effective tax rate for the full year of 25.2% (2017: 27.5%).

The March 2016 Budget included a reduction in the rate of Corporation tax from 1 April 2020 of 2% to 17%. This change was substantively enacted on 5 September 2016. Deferred tax balances at 30 September 2018 have therefore been calculated at 17%, unless they are expected to unwind earlier than 1 April 2020, in which case the deferred tax balances have been calculated at the prevailing rate at the time the unwind is expected.

Notes to the financial statements continued
for the six months ended 30 September 2018

6. Discontinued operations

On 4 December 2017, the Group entered into a sale agreement to dispose of its entire shareholding of Bournemouth International Airport Limited and its subsidiaries: Bournemouth Airport Property Investments (Offices) Limited, Bournemouth Airport Property Investments (Industrial) Limited and Bournemouth Airport Core Property Investments Limited, which carried out all of the Group's Bournemouth Airport operations. The disposal was effected in order to generate cash flow for the expansion of the Group's other businesses.

The results of the discontinued operation, which have been included in the consolidated income statement, were as follows:

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m	Year ended 31 March 2018 £m
Revenue	–	5.5	10.3
Operating costs	–	(5.3)	(8.4)
Operating profit	–	0.2	1.9
Significant items	–	–	(14.1)
Gains and losses on sales and valuation of investment properties	–	–	–
Attributable tax expense	–	–	(0.6)
Profit/ (Loss) of discontinued operation	–	0.2	(12.8)
Net profit/ (loss) attributable to discontinued operation (attributable to owners of the Company)	–	0.2	(12.8)

A loss of £14.1m arose on the disposal of Bournemouth International Airport Limited and its subsidiaries, being the difference between the proceeds of disposal and the carrying amount of the subsidiary's net assets and attributable goodwill.

7. Dividends

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m
Amounts recognised as distributions to equity holders in the period		
Dividend paid in relation to the year ended 31 March 2018 of 34.95 pence (2017: 29.65 pence) per share	**110.7**	93.9
Proposed interim dividend for the year ended 31 March 2019 of 20.21 pence (2017: 17.46 pence) per share	**64.0**	55.3

Notes to the financial statements
for the six months ended 30 September 2018

8. Property, plant and equipment

	Freehold land and property £m	Long leasehold property £m	Airport infrastructure £m	Plant, fixtures and equipment £m	Assets in the course of construction £m	Total £m
Cost						
At 1 April 2018	203.2	451.7	2,105.3	659.4	369.0	3,788.6
Additions	–	–	11.7	15.4	250.4	277.5
Reclassification from Assets in the course of construction	0.2	16.4	41.0	34.9	(92.5)	–
Reclassification to investment properties (note 9)	–	–	–	0.9	(1.7)	(0.8)
Disposals	(0.5)	–	(2.6)	–	–	(3.1)
At 30 September 2018	**202.9**	**468.1**	**2,155.4**	**710.6**	**525.2**	**4,062.2**
Depreciation						
At 1 April 2018	64.5	187.1	513.3	488.5	–	1,253.4
Charge for the period	0.2	6.0	38.1	30.5	–	74.8
Depreciation on disposals	–	–	(2.6)	–	–	(2.6)
At 30 September 2018	**64.7**	**193.1**	**548.8**	**519.0**	**–**	**1,325.6**
Carrying amount						
At 30 September 2018	**138.2**	**275.0**	**1,606.6**	**191.6**	**525.2**	**2,736.6**
Carrying amount						
At 31 March 2018	138.7	264.6	1,592.0	170.9	369.0	2,535.2

The carrying amount of land not depreciated as at 30 September 2018 is £57.4m (31 March 2018: £57.4m).

Capitalised borrowing costs

During the period ended 30 September 2018, borrowing costs of £11.2m were capitalised (30 September 2017: £4.4m). Capitalised borrowing costs were calculated by applying an average interest rate of 5.88% in the current period to cumulative expenditure incurred on qualifying assets, pro rated to give the charge for the period ended 30 September 2018.

Notes to the financial statements continued
for the six months ended 30 September 2018

9. Investment properties

	Investment properties £m
Valuation	
At 1 April 2018	526.1
Reclassification from assets in the course of construction (note 8)	0.8
Disposals	(5.3)
Revaluation	–
At 30 September 2018	**521.6**
Carrying amount	
At 30 September 2017	**602.7**
At 31 March 2018	526.1

Investment properties

The fair value of the Group's commercial investment property at 31 March 2018 has been arrived at on the basis of a valuation carried out at that date by Deloitte LLP. Strutt & Parker carried out the valuation of the London Stansted residential property portfolio, and Meller Braggins carried out the Manchester residential property portfolio at 31 March 2018. The valuers are independent and have appropriate, recognised professional qualifications, and recent experience in the locations and categories of the locations being valued. The valuations, which conform to International Valuation Standards, were arrived at by reference to market evidence of transaction prices for similar properties, land valuations and discounted cash flow methods.

The fair value of the Group's commercial property at 30 September 2018 was updated by Deloitte Chartered Surveyors as at the statement of financial position date. No fair value gains or losses have been recognised at 30 September 2018 as the difference between the fair value and the carrying value of the commercial investment property at that date was immaterial.

Gains and losses on sales and valuation of investment properties reported in the consolidated income statement of (£0.8m) in the period (30 September 2017: £0.8m) comprise a loss on sale of (£0.8m) (30 September 2017: £0.8m).

Notes to the financial statements
for the six months ended 30 September 2018

10. Investment in associate

	£m
Cost and carrying value	
At 1 April 2018	15.7
Investment in associate	1.4
Group's share of associate's loss	(0.1)
At 30 September 2018	**17.0**

The investment in associate relates to the Group's investment in Airport City.

Included within the investment in associate balance is an amount of £2.5m (31 March 2018: £2.5m) relating to MAG's own costs incurred in the setting up of its share in Airport City. This will be released to the consolidated income statement on a proportional basis on the sale of plots within the Airport City development.

Airport City, a partnership with three other partners to develop part of the land around Manchester Airport for hotels, offices and logistics and advanced manufacturing, was formally constituted on 8 October 2014. The directors have applied IFRS 10 'Consolidated Financial Statements' and IAS 28 Revised 'Investment in Associates' in classifying the Group's 50% share in Airport City as an Associate, determining that MAG has significant influence over Airport City by virtue of its shareholding, but not control given that all key matters require a super–majority of more than 79.9%, such that MAG plus all but one other party must be in agreement to exercise control.

Airport City's year end date is coterminous with the Group's year end, and the financial information detailed below is consistent with the Airport City financial statements prepared to the same date. Summarised financial information of the Group's investment in Airport City is as follows.

	Six months ended 30 September 2018 £m	Six months ended 30 September 2017 £m
Current assets	**31.4**	31.7
Current liabilities	**(3.8)**	(13.9)
Net assets	**27.6**	17.8
Group's share of associate's net assets	**14.5**	8.9
Revenue	**–**	28.4
(Loss)/profit for the period	**(0.3)**	10.5
Group's share of associate's (loss)/profit for the period	**(0.1)**	5.2

As part of its investment in Airport City, the Group has agreed to make an equity contribution up to a maximum of £30m if required.

Airport City has no significant contingent liabilities to which the Group is exposed, and there are no restrictions that would prevent the transfer of funds to the Group (2017: none).

Notes to the financial statements continued
for the six months ended 30 September 2018

11. Borrowings

	Note	30 September 2018 £m	30 September 2017 £m	31 March 2018 £m
Bank loans	12	**57.0**	203.9	(2.8)
Bonds	13	**1,098.6**	803.3	1,098.1
Shareholder Loans		**426.5**	251.5	251.5
		1,582.1	1,258.7	1,346.8
Borrowings are repayable as follows:				
In one year or less, or on demand				
Bank loans	12	**57.0**	203.9	–
		57.0	203.9	–
In more than one year, but no more than two years				
Bank loans		**–**	–	–
		–	–	–
In more than two years, but no more than five years				
Bank loans	12	**–**	–	(2.8)
In more than five years – due other than by instalments				
Bonds	13	**1,098.6**	803.3	1,098.1
Shareholder Loans		**426.5**	251.5	251.5
		1,525.1	1,054.8	1,349.6
Non–current borrowings		**1,525.1**	1,054.8	1,346.8
Total borrowings		**1,582.1**	1,258.7	1,346.8

The Group is party to a Common Terms Agreement (CTA) where bank and bond creditors benefit from the same suite of representations, warranties and covenants. The CTA was signed on 14 February 2014.

The CTA, together with a Master Definitions Agreement, covers inter alia, The Amended and Restated Initial Authorised Credit Facility Agreement (ACF), The Amended and Restated Liquidity Facility Agreement (LF), and the Group's issue of publicly listed fixed rate secured bonds in February 2014 and April 2014 respectively.

The Group issued a £450.0m publicly listed fixed rate secured bond on 14 February 2014 with a scheduled and legal maturity of 31 March 2034.

The Group issued a £360.0m publicly listed fixed rate secured bond on 16 April 2014 with a scheduled and legal maturity of 2024. All proceeds from the issue of the bonds (net of certain issuance fees) were used to repay a large portion of the Secured Senior Term Facility.

The Group issued a £300.0m publicly listed fixed rate secured bond on 15 November 2017 with a scheduled and legal maturity of 31 March 2039. All proceeds from the issue of the bonds (net of certain issuance fees) were used to repay the Revolving Credit Facility.

The Amended and Restated LF Agreement has total facilities of £60.0m and is sized to cover 12 months interest on secured debt. The LF Agreement is a 364–day revolving facility with a five year term on each annual renewal.

The Group's borrowings are all secured by a fixed and floating charge over substantially all of the assets of the Group.

Shareholder Loans increased to £426.5m as at 30 September 2018 following the issue of £175m of loans during the period.

Notes to the financial statements
for the six months ended 30 September 2018

12. Bank loans

	30 September 2018 £m	30 September 2017 £m	31 March 2018 £m
Secured Revolving Credit Facility	**60.0**	207.0	–
Less: unamortised debt issue costs[1]	**(3.0)**	(3.1)	(2.8)
	57.0	203.9	(2.8)

Note:
[1] Issue costs arising in relation to obtaining finance are amortised over the duration of the financing as part of the effective interest rate.

At 30 September 2018 the Group had £425.0m (31 March 2018: £485.0m) undrawn committed borrowing facilities in respect of which all conditions precedent had been met at that date. The undrawn committed borrowing facilities consist of a £500.0m Secured Revolving Credit Facility (£60.0m drawn at 30 September 2018), less certain carve–outs in respect of ancillary facilities of £15.0m. The Group also had access to £10.0m of overdraft facilities.

Interest on the Secured Revolving Credit Facility is linked to LIBOR plus a margin.

See Note 11 for further information on financial liabilities, including maturity analysis.

13. Bonds

	30 September 2018 £m	30 September 2017 £m	31 March 2018 £m
Repayable other than by instalments			
MAG bond 4.125% £360.0m due 2024	**360.0**	360.0	360.0
MAG bond 4.75% £450.0m due 2034	**450.0**	450.0	450.0
MAG bond 2.875% £300.0m due 2039	**300.0**	–	300.0
Less: discount on issue	**(6.2)**	(1.9)	(5.4)
Less: unamortised debt issue costs	**(5.2)**	(4.8)	(6.5)
	1,098.6	803.3	1,098.1

See Note 11 for further information on financial liabilities, including maturity analysis.

14. Retirement benefits

	30 September 2018 £m	30 September 2017 £m	31 March 2018 £m
Balance in scheme at start of the period	**(87.3)**	(104.6)	(104.6)
Movement in period			
Current service cost recognised in income statement	**(6.1)**	(6.2)	(12.4)
Contributions	**7.6**	4.8	10.7
Net interest expense recognised in income statement	**(1.1)**	(1.4)	(2.8)
Total remeasurements in statement of comprehensive income	**52.5**	30.2	21.8
Balance in scheme at end of the period	**(34.4)**	(77.2)	(87.3)

Related deferred tax assets on any pension deficits are reported separately under the requirements of IAS 12 'Income taxes'.

Notes to the financial statements continued
for the six months ended 30 September 2018

15. Deferred taxation

	Deferred taxation asset £m	Deferred taxation liability £m	Total £m
At 1 April 2018	14.8	(220.2)	(205.4)
Credit to income	–	0.2	0.2
(Charge) to equity	(9.0)	–	(9.0)
At 30 September 2018	**5.8**	**(220.0)**	**(214.2)**

16. Related party transactions

The ultimate parent entity is Manchester Airports Holdings Limited, a company registered in England and Wales. The ultimate controlling entity is Manchester Airports Holdings Limited.

Transactions involving The Council of the City of Manchester and the other council shareholders

The Council of the City of Manchester ('MCC') is a related party to Manchester Airports Holdings Limited as MCC owns 35.5% of the share capital of the Company.

As at 30 September 2018 the amount of loans outstanding owed to MCC by the Group was £145.3m (30 September 2017: £83.2m). Manchester Airport Finance Holdings Limited made loan repayments of £nil (30 September 2017: £nil) to MCC during the year and paid interest of £6.5m (30 September 2017: £5.0m).

As at 30 September 2018 the amount of loans outstanding owed to the other nine councils (each of which is a related party to Manchester Airports Holdings Limited by virtue of its shareholding) by the Group was £130.1m (30 September 2017: £79.4m). Manchester Airport Finance Holdings Limited made loan repayments of £nil (2017: £nil) to the other nine councils during the year and paid interest of £6.0m (30 September 2017: £4.8m).

Included in external charges are charges for rent and rates amounting to £12.8m (30 September 2017: £14.0m) and other sundry charges of £0.4m (30 September 2017: £0.4m). The majority of these amounts are due to MCC. The remainder are collected by MCC and distributed to other local authorities.

Transactions involving IFM

Industry Funds Management (IFM), through its subsidiary, is a related party to Manchester Airports Holdings Limited as IFM owns 35.5% of the share capital of the Company. During the year, the Group was party to the following transactions with IFM.

As at 30 September 2018 the amount of loans outstanding owed to IFM by the Group was £151.5m (30 September 2017: £89.4m). Manchester Airport Finance Holdings Limited made loan repayments of £nil (30 September 2017: £nil) to IFM during the year and paid interest of £6.9m (30 September 2017: £5.4m).

Transactions involving associate

As at 30 September 2018 the amounts owing to the Group were £nil (30 September 2017: £0.1m) and amounts owed by the Group were £nil (30 September 2017: £nil). Net assets of £nil (30 September 2017: £4.7m), comprising freehold land, were sold to the associate by the Group during the period.

Notes to the financial statements
for the six months ended 30 September 2018

17. Reconciliation of net cash flow to movement in net debt

	At 1 April 2018 £m	Cash flow £m	Other non–cash movements £m	**At 30 September 2018 £m**
Cash at bank and in hand	20.0	2.7	–	**22.7**
Cash on short term deposit	–	–	–	**–**
Cash and cash equivalents disclosed on the statement of financial position	20.0	2.7	–	**22.7**
Overdrafts	–	–	–	**–**
Total cash and cash equivalents (including overdrafts)	20.0	2.7	–	**22.7**
Current debt	–	(57.0)	–	**(57.0)**
Non–current debt	(1,346.8)	(178.3)	–	**(1,525.1)**
Net debt	(1,326.8)	(232.6)	–	**(1,559.4)**

18. Capital commitments and contingent liabilities

	30 September 2018 £m	30 September 2017 £m	31 March 2018 £m
Capital expenditure that has been contracted for but has not been provided for in the financial statements	**212.9**	–	225.8

In addition the Group has performance bonds and other items arising in the normal course of business amounting to £1.3m at 30 September 2018 (30 September 2017: £1.4m). As part of its investment in Airport City the Group has agreed to pay an equity contribution up to a maximum of £30m if required.

Notes to the financial statements continued
for the six months ended 30 September 2018

19. Acquisitions and disposals

Current Period Acquisitions

Looking4Parking

On 21 June 2018, the Group acquired 100% of the issued share capital of Agency of the North Limited ('AOTN') for cash consideration of £3.8 million with an additional payment of up to £5.0 million payable if certain criteria are met. As at the half year the Group are regarding consideration as amounting to the £3.8m up front payment as current estimates are that the criteria for additional payments will not be met.

AOTN currently trades through its wholly owned subsidiary Looking4Parking Limited.

The Board believes that the excess of cash consideration paid over net identifiable assets on acquisition of £3.3m is best considered as goodwill on acquisition. The provisional goodwill calculation is summarised below:

	Book Value £m	Measurement Adjustments £m	**Provisional fair value at 30 September 2018 £m**
Acquiree's net assets at acquisition date:			
Goodwill	2.3	–	**2.3**
Property, plant and equipment	0.1	–	**0.1**
Intangible Assets	1.3	3.2	**4.5**
Cash	2.0	–	**2.0**
Trade and other receivables	0.7	–	**0.7**
Trade and other payables	(6.1)	–	**(6.1)**
Deferred Tax Liability	–	(0.2)	**(0.2)**
Net identifiable assets	0.3	3.0	**3.3**
Goodwill on acquisition			**0.5**
Total consideration			**3.8**

Included in the six month period ended 30 September 2018 is revenue of £917,000 and a profit before tax of £100,000 in respect of AOTN.

Half Year Impact of Acquisitions

Had the acquisition of AOTN been effected at 31 March 2018, the revenue and profit before tax of the Group for the 26 week period to 30 September 2018 would have been £1.6m and £0.2m respectively.

Acquisition Costs

Acquisition related costs amounting to £235,000 have been excluded from the consideration transferred and have been recognised as an expense in the year, within administrative expenses in the Consolidated Income Statement.

Notes to the financial statements
for the six months ended 30 September 2018

20. Post balance sheet events

Primera Air filed for insolvency on 2 October 2018. The business does not anticipate any financial exposure to its net asset position as at the balance sheet date resulting from the insolvency.

On 26 October 2018 the high court ruled against Lloyds Banking Group in its case regarding equalisation of Guaranteed Minimum Pension (GMP) for men and women. The impact of this ruling upon individual pension schemes will need to be fully assessed. Business expectation would be that the impact on the company schemes would be at the lower end of impacted schemes. The accounting for this increase in liabilities will be reflected in the annual report.

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East Midlands Airport and MAG

East Midlands Airport and our Group

Every year, East Midlands Airport connects over 4 million passengers with the world, to serve more than 80 leisure and business **destinations**.

As the winner of many prestigious awards; including Best Regional UK Airport for Customer Service in 2013, our airport is a vibrant economic hub, supporting over 6,000 jobs and generating around £300 million for the region.

As the UK's number one provider of pure freight airport we manage approximately 300,000 tonnes a year. We are dedicated to helping keep your communications moving and are home to leading air freight operators, such as DHL, TNT and UPS, as well as being a major air-hub for the Royal Mail.

Located in the heart of England, East Midlands Airport is in prime position to a variety of transport links and is easily accessible by train, car, bus and coach from the M1, A42/M42 and A50. This makes us the premier choice for travellers from across the East Midlands, Warwickshire, Staffordshire, South Yorkshire and beyond.

The Air Traffic Control Tower at East Midlands Airport stands at just over 52 metres high, with a construction made up of 750 tonnes of concrete and at a building cost of 3.5 million pounds.

We can also boast the sixth longest civilian runway in the UK, at a length of 2,893 metres. Our on-site airport fire engines are around three times the size of standard fire engines, with the largest appliance capable of producing 350 gallons of foam and 3,000 gallons of water.

MAG

MAG now serves nearly 42 million passengers through its ownership and operation of Manchester, London Stansted and East Midlands airports. Its property and facilities management arm, MAG Property, is responsible for the Group's estate and also the development of Manchester's Airport City.

MAG's overall strategic intent is to increase long term shareholder value by generating profitable growth, developing its assets and deploying efficient and customer focused operating processes throughout the business.

More than just a regional success story, the Group's airports and property business already contribute more than £3bn to the UK economy and support thousands of jobs.

For further information visit MAGairports.com

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News › Jobs › East Midlands Airport

East Midlands Airport recruitment fair has hundreds of jobs on offer

Businesses based at the Castle Donington airport site are hiring - so don't miss out

By **Dan Robinson**
12:45, 8 JAN 2018 | **UPDATED** 13:16, 10 JAN 2018

NEWS

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East Midlands Airport's recruitment fair held this month will have hundreds of jobs on offer.

The event - on Saturday, January 27 - will be staged in the check-in hall from 10am to 2pm.

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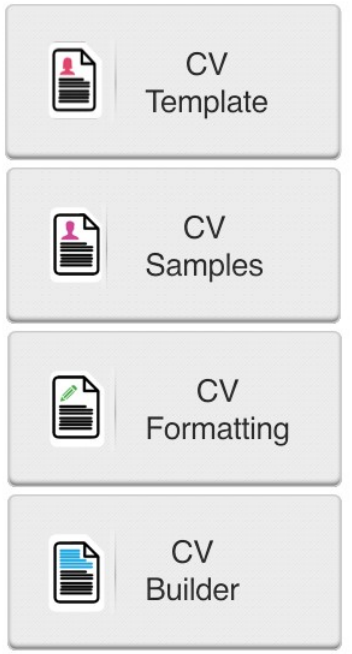


RECOMMENDED

Hundreds of jobs up for grabs at East Midlands Airport

Some of the 80 businesses based at the Castle Donington airport site – including airlines, check-in agents and hotels – will be advertising roles, reports the Nottingham Post.

Airline operator Jet2.com is among those recruiting check-in agents, while ground and cargo handling services expert Swissport is looking for check-in and baggage handling staff.

Two of the airport's largest international cargo firms, UPS and DHL, has various roles available for its expanding operations.

East Midlands Airport

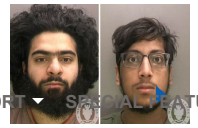
Parcel delivery firm DHL opened a £90m extension to its huge depot on the site in 2016, while UPS submitted plans in November to build a new £114m air freight terminal that could bring another 1,400 jobs.

Meanwhile, the airport itself is recruiting for seasonal staff to work in customer-facing roles such as security, car parking, catering and supporting passengers with mobility issues.

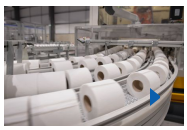
5 big Leicestershire employers that are recruiting in 2018

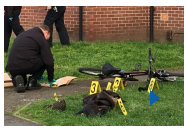
Colleen Hempson, East Midlands Airport's (EMA) corporate social responsibility manager, said: "Airports are exciting places.

"With thousands of passengers passing through our doors every day flying off to destinations all over the world, it's a fast-paced and dynamic environment in which to work.


Schoolboy friends from Leicester plotted to join Isis

Passengers 'put at risk' by airport security staff


Loo roll company's multi-million pound expansion plans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Jobs available based at East Midlands Airport

Busy scenes at East Midlands Airport

"There are jobs to suit many people from customer-facing roles to behind the scenes operational work.

"Partner organisations based nearby also offer a range of jobs that will appeal to people of all ages and experience."

Over 100 jobs up for grabs at huge Tesco warehouse in Leicestershire

Jobseekers will have the opportunity to meet with representatives from employers to discuss the available vacancies at the fair.

The airport's academy team, which provide training to unemployed people who want to improve their skills before applying for jobs , will also be on hand.

If you're looking for work or thinking about a career change, visit our dedicated jobs site Fish4.co.uk.

With almost five million passengers flying to and from EMA each year, it has established itself as a hub for low cost airlines such as Jet2.com and Ryanair, as well as tour operators like TUI Airways.

Together, they serve more than 80 domestic and European short-haul destinations, as well as Cancun, in Mexico, and Orlando, in the United States.

Jobs boost as Co-op announces major supermarket expansion

Its cargo operation is the UK's second largest after Heathrow.

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Here's a chance to work at East Midlands Airport

NCP reveals how it is slashing crime at car parks

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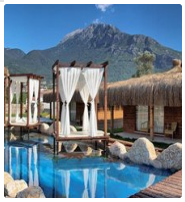
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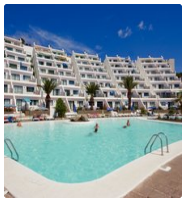
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Knife attack happened minutes before stabbing, police say

Claude Puel must play his cards right this Christmas

Second arrest after suspected attempted murder in Leicester

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The recruitment fair is free to attend. Car parking is also free in the Long Stay 1 and 2 car parks, from which courtesy buses will take attendees to and from the terminal.

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For more information about the airport's own roles, visit magairports.com/careers/areas-of-opportunity.

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OLIVER WYMAN

GLOBAL FLEET & MRO MARKET FORECAST COMMENTARY

2019–2029

AUTHORS
Tom Cooper, Vice President
Ian Reagan, Manager
Chad Porter, Technical Specialist
Chris Precourt, Technical Analyst

MARSH & McLENNAN COMPANIES

FOREWORD

Oliver Wyman's *Global Fleet & MRO Market Forecast Commentary 2019–2029* marks our firm's 19th assessment of the 10-year outlook for the commercial airline transport fleet and the associated maintenance, repair, and overhaul (MRO) market. We're proud to say that the annually produced research, along with our *Airline Economic Analysis* (AEA), has become a staple resource of aviation executives—whether in companies that build aircraft, fly them, or service them, as well as for those with financial interests in the sector through private equity firms and investment banks.

This research focuses on airline fleet growth and related trends affecting aftermarket demand, maintenance costs, technology, and labor supply. The outlook reveals significant changes that are important to understand when making business decisions and developing long-term plans.

As you will see from the report, the next decade holds great opportunities and challenges for the industry as both technological innovation and the move away from traditional energy sources redefine business as usual across industries and the globe. This will be an era of disruptive growth, driving companies to ask tough, fundamental questions about what it will take to stay relevant and expand.

In conjunction with the *Global Fleet & MRO Market Forecast 2019–2029*, we conduct an annual survey on hot topics, critical issues, and new opportunities in MRO. To participate in the 2019 survey, please contact the research team at MROsurvey@oliverwyman.com.

Oliver Wyman's Aviation Competitive & Market Intelligence team, partners, and vice presidents are available to assist with any questions about this forecast, as well as the AEA. We hope you find the data and insights valuable as you refine your business models and develop strategies for moving forward.

Best regards and wishes for a wonderful 2019,

Tom Cooper
Vice President and Study Leader

January 14, 2019

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1 EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The aviation industry and the businesses that support it are experiencing another year of unparalleled growth, thanks to an expansion in the global population able to afford air travel. Rising incomes and consumer spending are pushing passenger travel to record levels and fueling the largest year-over-year increase of the in-service fleet since 2008.

Looking ahead a decade, air travel demand is anticipated to be equally robust, with an additional 200 million people expected to enter the middle class across the planet. Growth in revenue passenger kilometers (RPK) will regularly exceed the annual expansion of gross domestic product (GDP) in most economies—particularly in high-growth areas like China and India. Even amid global trade tensions, the projections for commercial air travel remain optimistic across all regions of the world.

Consequently, the persistent demand is spawning record growth in the global fleet. For the beginning of 2029, our forecast projects a total fleet of 39,175 aircraft, up more than 11,600 from the 2019 total of 27,492. Between 2019 and the beginning of 2024, we anticipate the in-service fleet will grow annually at 3.9 percent—a pace that will slow to 3.3 percent for the next five years.

The order book and the corresponding delivery schedule associated with this expansion are translating into significant business for the world's leading airframe manufacturers, Boeing and Airbus. The bulk of the fleet expansion will be narrowbody jets, such as Boeing's 737 MAX and Airbus' A320neo. By 2029, nearly 13,800 737 MAX and A320neo aircraft will have been delivered, at which time narrowbodies will represent over two-thirds of the entire global fleet.

To satisfy airline needs, Boeing and Airbus plan to ramp up already historically high monthly production. Airbus has publicly committed to producing 63 A320s per month in 2019 and eventually increasing that to 75 per month sometime in the 2020s. Boeing also has announced its intention to boost production of its 737 MAX by nearly 10 percent to 57 per month in 2019 and has said it is studying ways to increase the monthly rate to between 63 and 70 in 2020.

Perhaps not surprisingly, the ramp-up has proved disruptive, particularly to the supply chain of the two original equipment manufacturers (OEMs). Late deliveries of fuselage components and engines have caused OEM production delays and, in turn, late deliveries to airlines. The unfulfilled orders have prompted carriers to defer formal retirements and even pull aircraft out of storage to keep up with the demand for air travel.

RISING COSTS AND EMISSIONS

However, there are complications from delaying the replacement of older aircraft with the new, more fuel-efficient series becoming available. By retaining older aircraft to meet capacity needs, airlines have been unable to reduce jet fuel consumption at an important time. Driven by crude oil production cuts by the Organization of Petroleum Exporting Countries (OPEC) and economic turmoil in Venezuela, jet fuel prices have been climbing since 2016. They hit a three-year high in October 2018 before falling over 25 percent during the fourth quarter. Despite this end-of-year dip, jet fuel prices have begun to make a dent in airline profitability, adding more than $31 billion in operating costs during the year and shrinking margins by almost a full percentage point.

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Decisions to keep older planes in service have also slowed airline efforts to cut greenhouse gas emissions. All airlines with international service started monitoring carbon emissions on January 1, 2019, in compliance with a landmark climate change agreement brokered by the International Civil Aviation Organization that requires reductions in airline emissions beginning in 2021. By 2029, new aircraft are expected to make up 42 percent of the fleet which, on average, will produce between 15 and 20 percent fewer emissions than their predecessors. That said, high travel demand will complicate the ability of the aviation industry to meet emission targets.

Labor costs also have been on the rise as contracts are negotiated in an environment of strong profitability and a tight labor market. Upward pressure on wages is expected to escalate as the gap grows between the number of pilots and trained aviation maintenance technicians available and the number needed. Labor and fuel are the industry's two largest operating expenses, representing almost half of total operating costs.

Boeing projects that the aviation industry will need 635,000 new commercial pilots by 2037 to satisfy growing demand within the sector. Currently, there are roughly 550,000 full-time commercial pilots, but because of the heavy contingent of baby boomers (born between 1946 and 1964) among them, a significant percentage are expected to retire within the next 10 years.

A similar situation affects aviation maintenance technicians (AMTs) who, like pilots, are on average older than workers in other industries, such as technology, retail, and healthcare. The challenge of being a mechanic in today's environment also is more difficult, requiring the ability to service older aircraft built before 2000 as well as newer planes with more sophisticated technology.

Combined, these increased operating expenses are already putting pressure on what has been an unprecedented period of airline profitability. Since 2011, US airline profits have increased with each successive year. That turns out not to be the case in 2018, when cumulative net profits for North American carriers are expected to slip to $14.7 billion versus the $18.7 billion earned in 2017—a drop of more than 20 percent.

Additionally, the International Monetary Fund (IMF) indicated in its October 2018 outlook that growth in the largest global economies may have peaked, even as the world GDP growth rate is expected to remain at 3.7 percent for 2019. The agency described the global economy as "fragile," with increased risk and declining odds for upside surprises. The United States and the European Union will both expand at below three percent this year and at less than two percent in 2020, according to the IMF. China, while still growing at more than six percent, will also see economic growth slow over the next two years.

Weakening Western European economies and the rising prospect of no Brexit deal by the March 29, 2019, deadline may cause problems for the region's aviation industry. While the United Kingdom has pledged to recognize certificates, approvals, and licenses issued by the European Aviation Safety Agency (EASA) for at least two years whether a deal is in place or not, the EU has publicly stated it would not recognize UK certificates, approvals and licenses in the same way. This could cause a substantial disruption in air travel in and out of the UK.

Meanwhile, European airlines are likely to consolidate, with several smaller European carriers going out of business this year and several more teetering. While disruptive, the closures and the consolidation that will inevitably follow should be positive for carriers, as it was for the US industry a decade ago.

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MORE CARGO AND MRO

Like passenger air travel, cargo volume also has been growing, driven primarily by the double-digit expansion of e-commerce sales in recent years. Air cargo demand as measured by freight tonne kilometers (FTK) saw an estimated 3.8 percent increase in 2018, while cargo capacity, measured by available freight tonne kilometers, saw an estimated 4.4 percent increase, after a slight contraction in 2017. (FTK measures metric tonnes of cargo per kilometer.)

Yet, for incumbents, there is potential disruption ahead with the entry into the delivery space of e-commerce giant Amazon. The internet retailer is building a $1.5 billion international air cargo hub in Cincinnati, Ohio. The 1,100-acre complex is anticipated to eventually support a fleet of more than 100 Amazon Air Cargo aircraft; the company has already acquired 40.

Besides air delivery by jets, Amazon is also testing a drone delivery service. Much of the drone testing by Amazon and other tech companies has occurred outside the US because of strict federal and state aviation rules that limit drone use. Google, for instance, recently started a pilot drone delivery service in Finland. Within the decade, we expect to see commercial drone delivery develop, although it may not be initially in the US.

With the expansion of business in the commercial aviation industry, the maintenance, repair, and overhaul (MRO) market that supports it is also expected to grow. Total MRO spend is expected to rise to $116 billion by 2029, up from $81.9 billion in 2019. Aside from the growth in the fleet, the increase will be driven by more expensive maintenance visits and technology enhancements.

The annual average growth rate for the MRO market will be 3.5 percent over the decade. More of this growth will take place between 2024 and 2029, when MRO spend will grow $19 billion versus $15 billion between 2019 and the start of 2024. The slower initial five years will be driven by the escalating number of newer-generation aircraft that enter the fleet. These aircraft have longer maintenance intervals and replacement thresholds for such things as life-limited parts than older jets.

Growth in aviation will be more concentrated in Asia and the developing world, particularly China and India. By 2035, the Civil Aviation Administration of China projects, the number of airports in the nation will almost double, reflecting this spike in demand and the government’s big push to fund the necessary infrastructure. By the end of the decade, China will become the biggest global market for air travel and Asia will be the new center of global aviation activity.

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FLEET AND MRO FORECAST SUMMARY

REGION	AFRICA	MIDDLE EAST	ASIA PACIFIC	CHINA	INDIA	LATIN AMERICA	NORTH AMERICA	EASTERN EUROPE	WESTERN EUROPE	WORLD
2019 FLEET										
NARROWBODY	460	564	2,152	2,819	460	1,085	4,208	896	3,294	15,938
WIDEBODY	179	781	1,383	414	67	177	1,277	153	1,057	5,488
REGIONAL JET	159	66	220	143	4	273	1,905	241	466	3,477
TURBOPROP	327	29	655	-	73	236	643	124	502	2,589
TOTAL	**1,125**	**1,440**	**4,410**	**3,376**	**604**	**1,771**	**8,033**	**1,414**	**5,319**	**27,492**
2029 FLEET										
NARROWBODY	749	906	3,803	6,146	1,177	1,582	5,493	1,169	4,752	25,777
WIDEBODY	340	1,278	1,817	780	149	364	1,694	240	1,383	8,045
REGIONAL JET	73	47	415	261	13	277	1,624	252	365	3,327
TURBOPROP	163	46	594	22	208	164	436	82	311	2,026
TOTAL	**1,325**	**2,277**	**6,629**	**7,209**	**1,547**	**2,387**	**9,247**	**1,743**	**6,811**	**39,175**
FLEET GROWTH RATES										
2019–2024	1.5%	5.0%	4.9%	9.6%	12.1%	2.7%	1.3%	2.6%	2.7%	3.9%
2024–2029	1.8%	4.4%	3.4%	6.2%	7.7%	3.4%	1.6%	1.7%	2.3%	3.3%
2019–2029	**1.6%**	**4.7%**	**4.2%**	**7.9%**	**9.9%**	**3.0%**	**1.4%**	**2.1%**	**2.5%**	**3.6%**
2019 MRO (US$ BILLIONS)										
AIRFRAME	$0.9	$1.5	$3.7	$2.2	$0.7	$1.1	$5.2	$1.3	$4.6	$21.1
ENGINE	$0.9	$5.6	$7.1	$2.2	$0.7	$1.5	$7.8	$1.6	$6.0	$33.4
COMPONENT	$0.4	$0.9	$2.2	$1.3	$0.3	$0.8	$4.1	$0.7	$2.9	$13.8
LINE	$0.3	$1.0	$2.3	$1.5	$0.3	$0.7	$3.4	$0.7	$3.4	$13.7
TOTAL	**$2.6**	**$9.0**	**$15.3**	**$7.2**	**$2.0**	**$4.1**	**$20.5**	**$4.3**	**$16.9**	**$81.9**
2029 MRO (US$ BILLIONS)										
AIRFRAME	$0.8	$2.1	$4.7	$4.2	$0.9	$1.2	$5.2	$1.2	$4.7	$25.0
ENGINE	$1.3	$8.0	$8.5	$7.3	$1.6	$2.3	$10.3	$2.0	$8.7	$50.0
COMPONENT	$0.7	$1.5	$3.6	$3.6	$0.9	$1.2	$4.7	$1.1	$3.7	$21.0
LINE	$0.5	$1.5	$3.4	$3.3	$0.7	$1.0	$4.2	$0.9	$4.4	$20.0
TOTAL	**$3.4**	**$13.1**	**$20.3**	**$18.3**	**$4.0**	**$5.6**	**$24.5**	**$5.2**	**$21.5**	**$116.0**
MRO GROWTH RATES										
2019–2024	1.4%	3.8%	3.6%	11.0%	6.0%	3.1%	1.1%	2.1%	2.4%	3.4%
2024–2029	4.1%	3.9%	2.1%	8.5%	8.2%	3.3%	2.5%	1.9%	2.5%	3.7%
2019–2029	**2.7%**	**3.9%**	**2.9%**	**9.7%**	**7.1%**	**3.2%**	**1.8%**	**2.0%**	**2.5%**	**3.5%**

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2

STATE OF THE INDUSTRY

STATE OF THE INDUSTRY

Economic performance has been impressive in most regions of the world over the last five years, largely the result of greater consumer buying power, moderate fuel prices, low interest rates, rising equity markets, and industry consolidation. Despite the Brexit vote, North Korean nuclear threats, and the rise of nationalist rhetoric and protectionism, global markets have remained relatively stable.

Over the long term, however, aviation industry growth has been—and will continue to be—driven by the ever-expanding global middle class. According to the International Air Transport Association (IATA), current trends suggest that the number of global airline passengers could double by 2037. In addition to rising standards of living around the globe, air travel is becoming more accessible because of lower transportation costs, additional routes, and globalization.

The burgeoning demand aside, there are some clouds on the horizon. First, there is the recent erratic stock market behavior: In 2018, US equities suffered their worst December since 1931 with the S&P 500 down nine percent and the Dow Jones Industrial Average off 8.7 percent. While there are no signs of a significant downturn, there are indications that the industry may experience a slowdown—particularly in the world's largest economies. It shouldn't come as a surprise, given the duration of the current economic boom, which is slated to reach the 10-year mark in the US in June. We are starting to see the positive trends become less so, with both interest rates and tensions among global trading partners on the rise. There is also intensifying concern over the rate at which climate change is advancing, which may mean increased regulation and forced cutbacks.

Bottom line? Despite the steady expansion of demand for air travel, the global aviation industry may see fewer profits over the next 10 years as economic growth slows worldwide and operating costs increase.

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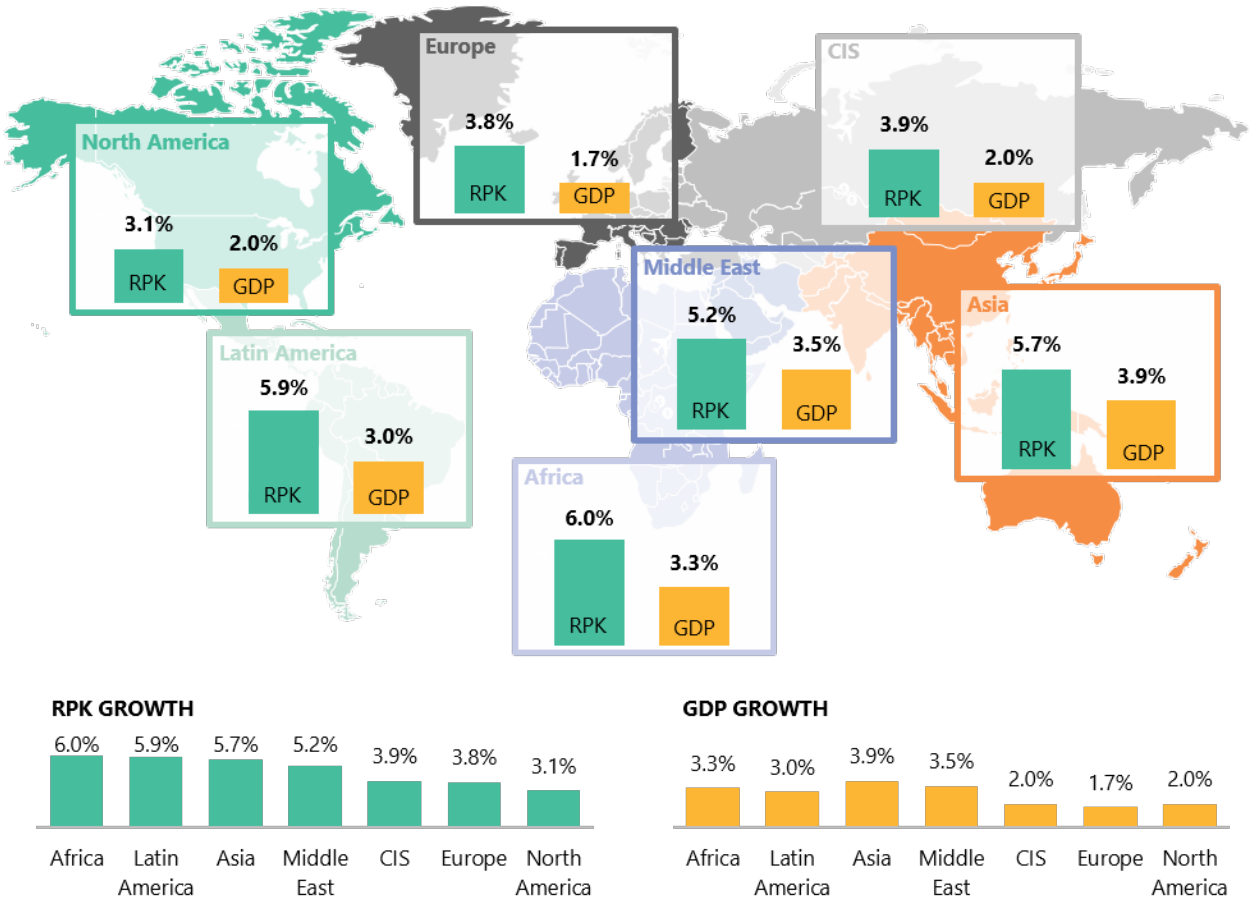
ECONOMIC DRIVERS

Although demand for air travel has traditionally been closely tied to GDP growth, passenger traffic has, in fact, outpaced it globally for over a decade. IATA has estimated that at the end of 2018, the world will have spent $854 billion on air transportation, representing one percent of global GDP; that spending pattern should be expected to continue as a burgeoning middle class opts to use its new disposable income on travel.

Aside from improved living standards, factors driving increased demand include deregulation of global travel through open-skies agreements, better service quality, and the expanded number of routes. While the mature regions of North America and Europe have experienced these effects over the last 10 years, the developing regions of Africa, Asia, the Middle East, and Latin America are just beginning to feel their impact. This is where the largest gains will occur over the next decade as the number of people in these regions with money to travel expands.

EXHIBIT 1: 20-YEAR RPK AND GDP ANNUAL GROWTH RATE PROJECTIONS



Note: The 20-year period ends in 2037
Source: Boeing

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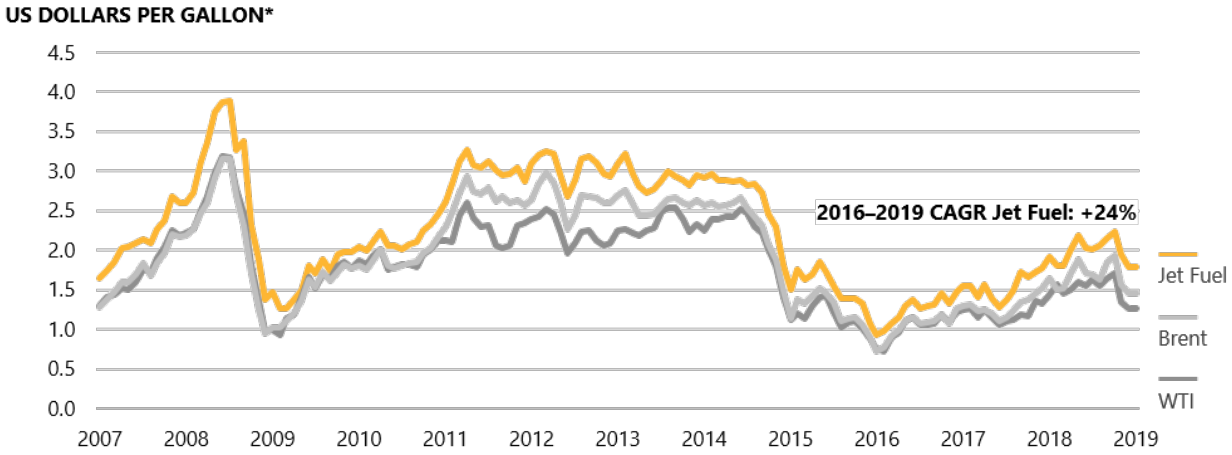
FUEL AND LABOR

Representing between 20 and 25 percent of operating expenses, the price of jet fuel has always played a pivotal role in determining the profitability of airlines. This coming decade will be no exception.

Over the past two years, fuel prices have steadily increased from the lows of 2016 until hitting a three-year high in September 2018. Despite hedging by some airlines, the escalating cost began to eat away at airline profitability. In October and November of 2018, the price per gallon dipped 25 percent as supply increased, thanks to US shale production. Yet, even with that big drop, fuel was expected to increase global airline operating costs in 2018 by more than $30 billion over the previous year.

EXHIBIT 2: SPOT PRICES OF CRUDE OIL AND JET FUEL PER GALLON



*Crude prices are calculated by dividing the price by the number of gallons in a barrel
Note: CAGR stands for compound annual growth rate
Source: US Energy Information Administration

Strong air travel demand and delivery delays of next-generation jets also compelled carriers to defer the retirement of many older, less fuel-efficient aircraft and, in certain cases, to pull aircraft out of storage. That made it harder for carriers to cut fuel consumption to offset the rising price throughout the year.

This constraint is expected to be short-lived as aircraft manufacturers catch up on delivery commitments and accelerate production. Airlines are likely to reduce fuel usage and curb operating expenses by retiring additional older aircraft and replacing them with more fuel-efficient models. Over the next 10 years, newer aircraft with the latest engine technology hold the potential to cut over 40 billion gallons of fuel consumption.

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Besides cutting costs and consumption, the newer, more fuel-efficient jets will help limit the amount of carbon dioxide (CO_2) and other greenhouse gas emissions produced by the industry. Over the next decade, these new aircraft could cut more than 400 million cubic tons of CO_2 emissions that would have otherwise been produced from the operation of older jets. The complication for the industry lies in the fact that while new aircraft are more fuel-efficient and environmentally friendlier than older jets, the acceleration in air travel demand means more miles and more emissions. Currently, air transport accounts for two percent of global man-made CO_2 emissions.

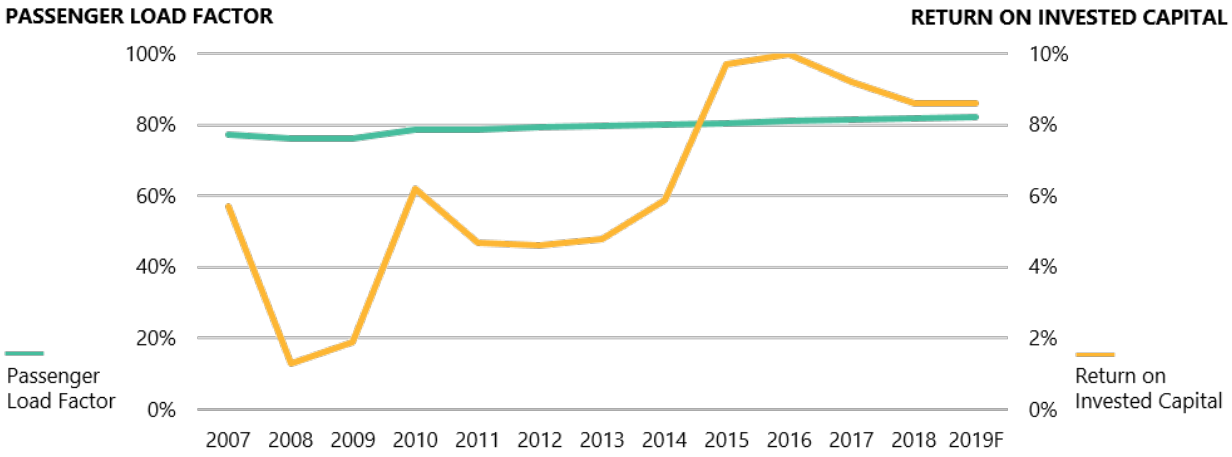
The other critical operating expense for airlines is labor, which, like fuel, makes up about a quarter of their operating costs. Restrained labor and fuel costs have long helped airlines, particularly in the US, report attractive profits. That began to change in 2018.

To accommodate rising demand for air travel, airlines have hired additional employees: In 2018, industry employment grew by 3.1 percent, pushing total airline employment above 2.8 million workers. Although airlines also continued to post improvements in productivity, the recent hiring and labor contracts signed in 2017 increased year-over-year unit labor costs by 2.2 percent in 2018 after many years of stable costs. Moving forward, the projected shortage of certain skilled aviation workers, including pilots and mechanics, could exacerbate this trend.

Carriers that have been marginally profitable may find themselves in negative territory in 2018 and again this year, with some never to return to the black. This scenario began to play out in Europe, where several operators, including Skywork, Cobalt Air, Small Planet Airlines, VLM, and Primera Air, announced they would cease operations.

These new economic pressures are likely to drive additional consolidation among European carriers, which should end up being a positive development for the region's industry. Compared with the strong balance sheets of North American airlines, the European aviation sector has struggled with more fragmentation and less profitability. Industry consolidation should help solve the problems of insufficient scale and poor yields that have plagued some European carriers.

EXHIBIT 3: GLOBAL PASSENGER LOAD FACTOR VERSUS RETURN ON INVESTED CAPITAL



Note: Passenger Load Factor is a measure of capacity utilization that is calculated as the percentage of available seats filled
Source: IATA

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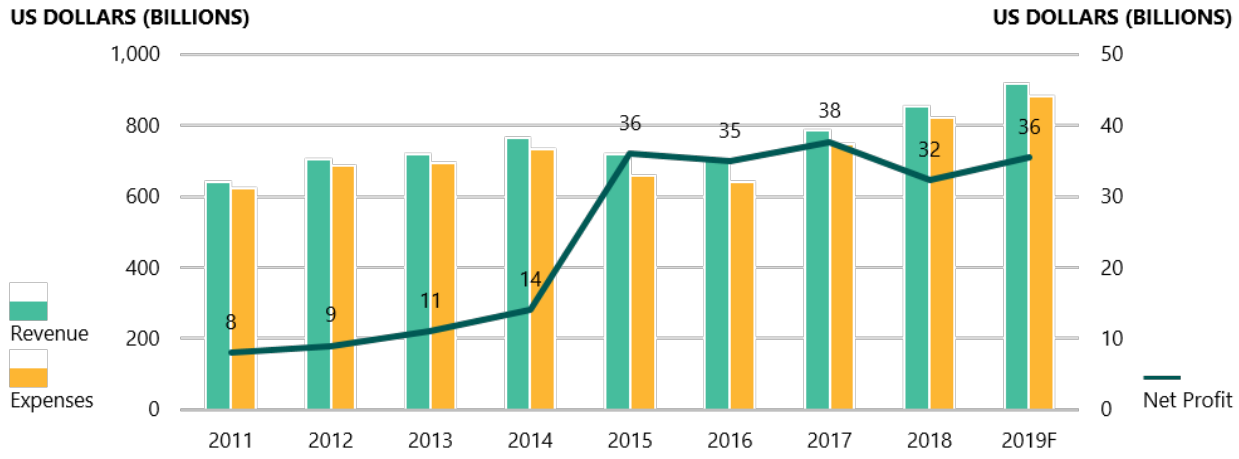
DECLINING PROFITABILITY

Given rising costs, the industry's net profits for 2018 are estimated to be $32.3 billion, down 14.3 percent from the $37.7 billion reported in 2017. While industry consolidation and strong load factors have helped limit margin degradation, the 5.7 percent net margin in North America in 2018 is nevertheless more than two percentage points below the 7.9 percent achieved in 2017. The region still has the strongest financial performance, but its share of global profits has dropped modestly from 50 percent in 2016 to an estimated 45 percent in 2018.

EXHIBIT 4: GLOBAL AIRLINE INDUSTRY FINANCIAL PERFORMANCE



Note: The net profit totals have been rounded to the nearest whole number
Source: IATA

Until 2017, airlines posted strong enough improvements in productivity to maintain flat unit labor costs. In 2018, costs rose an estimated 2.2 percent. Compounding the challenge, airlines are experiencing a shortage of pilots and maintenance technicians. In Asia, where the bulk of the growth in the aircraft fleet is expected to take place, the potential shortfall may begin to affect business sooner.

With large contingents of baby boomers in both job categories, shortages are expected to develop as more and more approach retirement age, which could force wages to rise. In five years, the US demand for mechanics will start outpacing supply—a situation where the jobs will be available, but the people to fill them will not. That gap will persist and widen at least through 2027, when it is expected to reach nine percent. To date, millennials have not shown enough interest in becoming either a pilot or an aviation maintenance technician to offset the anticipated surge in retirements.

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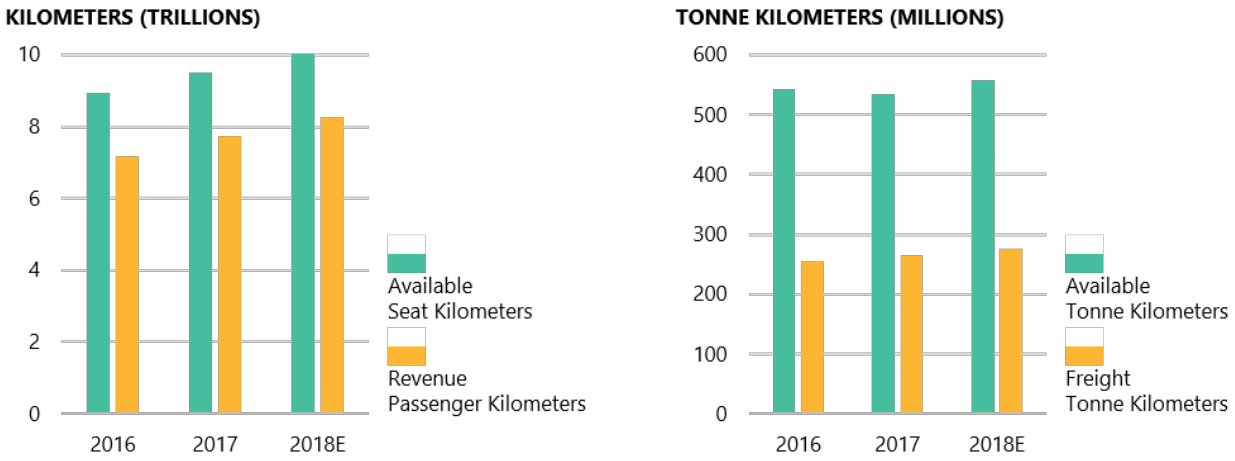
TRAFFIC AND INFRASTRUCTURE

In addition to economic growth, other factors have played important roles in the increased demand for air travel throughout the world. Market liberalization, service quality improvements, route additions, increased competition, and lower fares are all factors that have benefited both mature and developing regions across the globe. As government deregulation allowed new players to enter markets, low-cost and ultra-low-cost carrier business models have picked up market share, particularly in emerging markets. Besides suppressing fares, they offer more choices for passengers.

EXHIBIT 5: PASSENGER AND CARGO TRAFFIC, 2016–2018E



Note: 2018 year-end data are estimated
Source: IATA

The last three years have seen strong global expansions in passenger and freight traffic. Compound annual growth for revenue passenger kilometers (RPKs) was 7.3 percent, and compound annual growth for freight tonne kilometers (FTKs) was 4.1 percent. Passenger capacity and traffic have grown in tandem for the past two years. In contrast, freight capacity saw a slight contraction in 2017 before rebounding in 2018.

From a regional standpoint, Asia Pacific has recorded the fastest annual growth in both RPKs and available seat kilometers (ASKs), with 8.5 percent and 7.6 percent respectively in 2018. That's followed by Europe, which grew RPKs at 6.4 percent and ASK at 5.7 percent.

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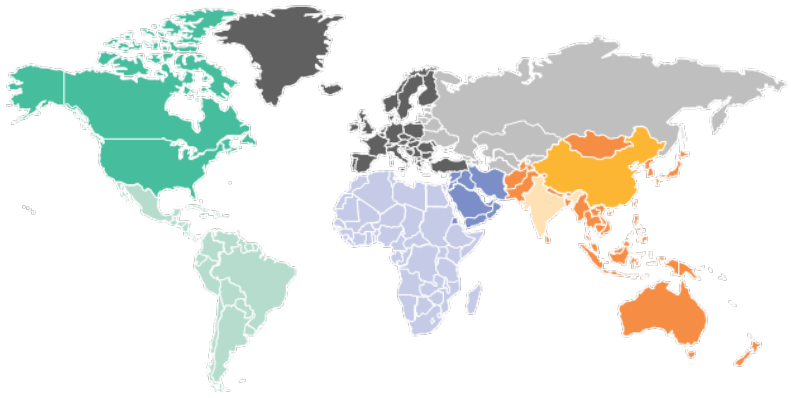
EXHIBIT 6: THE 10 FASTEST-GROWING AIRPORTS IN 2017

PASSENGERS HANDLED

Rank	Name	Region	Growth
1	Antalya, TR (AYT)	Western Europe	38.2%
2	Lisbon, PT (LIS)	Western Europe	18.8%
3	Moscow, RU (SVO)	Eastern Europe	17.8%
4	Nanjing, CN (NKG)	China	15.5%
5	Milan, IT (MXP)	Western Europe	14.2%
6	New Delhi, IN (DEL)	India	14.1%
7	Brussels, BE (BRU)	Western Europe	13.6%
8	Xi'an, CN (XIY)	China	13.2%
9	Bangalore, IN (BLR)	India	12.9%
10	Hangzhou, CN (HGH)	China	12.6%

CARGO HANDLED

Rank	Name	Region	Growth
1	Johannesburg, ZA (JNB)	Africa	39.3%
2	Cincinnati OH, US (CVG)	North America	27.3%
3	Moscow, RU (SVO)	Eastern Europe	25.8%
4	Muscat, OM (MCT)	Middle East	23.8%
5	Kuwait, KW (KWI)	Middle East	23.3%
6	Hangzhou, CN (HGH)	China	20.8%
7	Campinas, BR (VCP)	Latin America	20.7%
8	Mumbai, IN (BOM)	India	18.1%
9	Nairobi, KE (NBO)	Africa	18.0%
10	Madras, IN (MAA)	India	17.2%



Source: IATA

Both Airbus and Boeing predict nearly five percent average annual expansion in RPK globally over the next 20 years. The Middle East and Asia are expected to lead this trend. In fact, Asia is already home to 13 of the 30 busiest passenger airports and is expected to claim more spots on that list. Meanwhile, China's growth will mean it replaces the US as the largest domestic travel market in the world by 2022.

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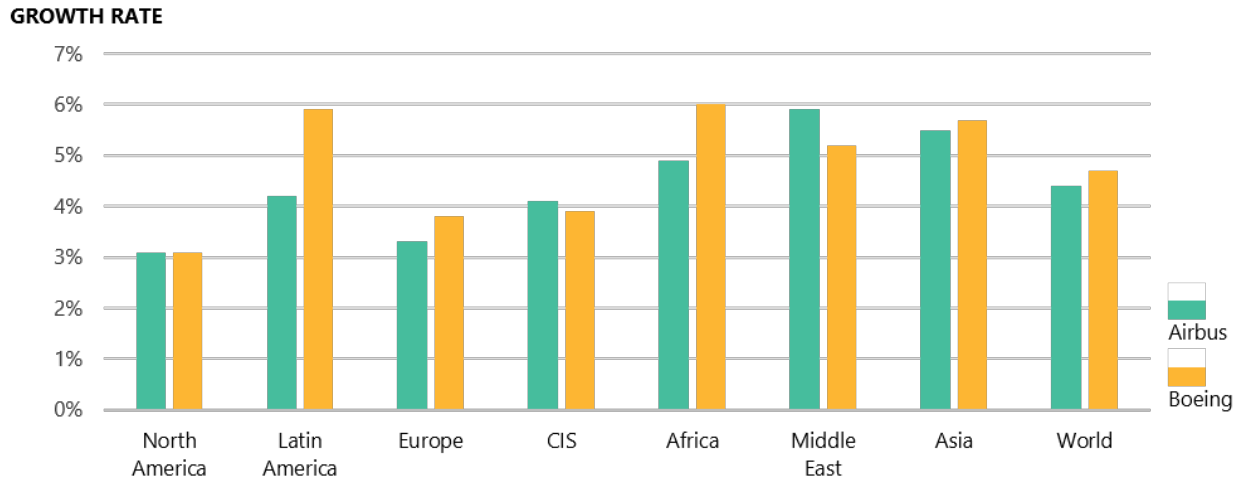
EXHIBIT 7: AIRBUS AND BOEING 20-YEAR PASSENGER TRAFFIC GROWTH FORECAST



Note: The 20-year period ends in 2037
Source: Airbus, Boeing

EXHIBIT 8: 2018 PASSENGER TRAFFIC GROWTH IN DEVELOPING ECONOMIES*

Note: 2018 year-end data are estimated
Source: IATA

Continued infrastructure investments will be required in Asia to accommodate anticipated growth. Many hubs are already operating beyond capacity, which has resulted in a high volume of delays over the past several years. Most major airports in the region are planning to build or are already adding runways and passenger terminals. The Civil Aviation Administration of China released a report at the end of December that estimated China would have 450 airports by 2035, nearly twice what it has now. In fact, Asia will account for almost 35 percent of planned airport investment scheduled to take place primarily over the next decade, according to Business Monitor International, with a large chunk going into greenfield airports.

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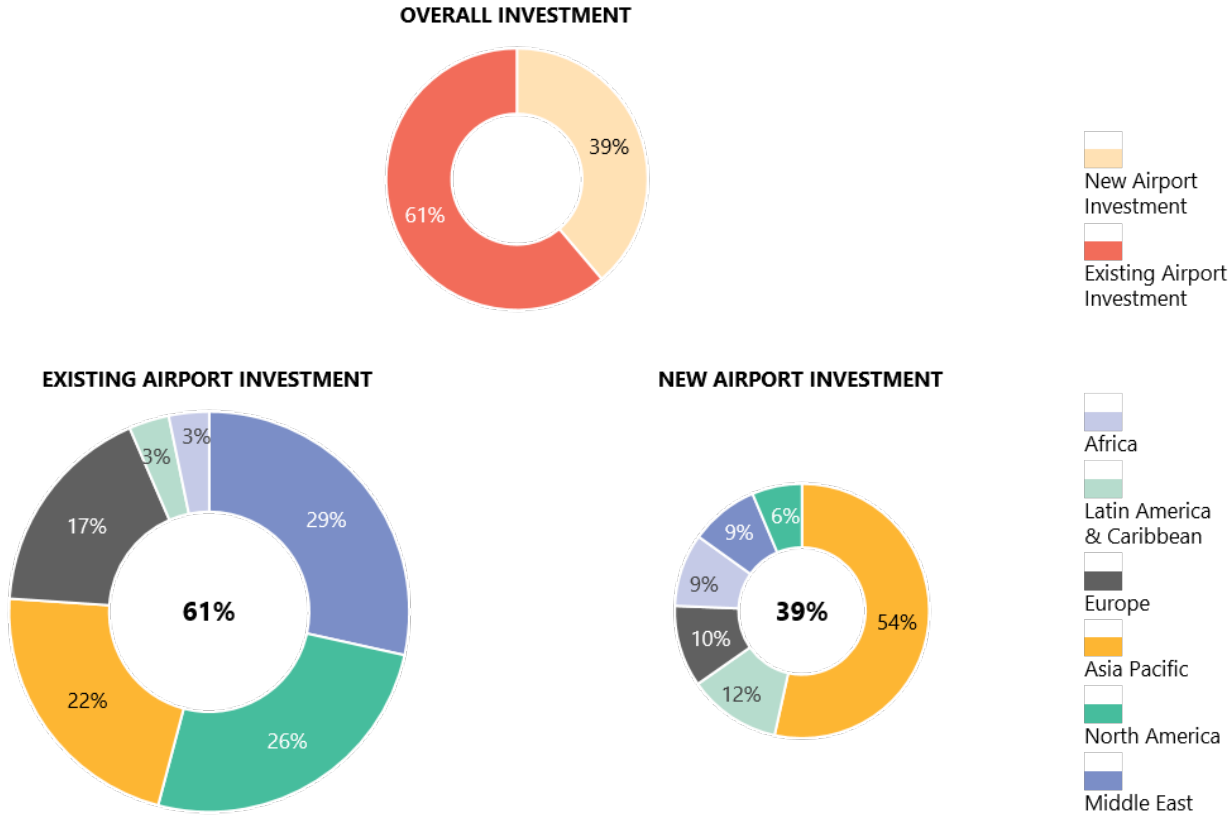
Despite the investment planned in Asia, the spend will not be evenly distributed across countries. For instance, despite growing demand, India is far behind in infrastructure investment, yet is expected to spend less than one-fifth of what China has planned. As demand in the region continues to accelerate, it will be important to have the proper infrastructure to accommodate these passengers.

EXHIBIT 9: PLANNED AIRPORT INVESTMENT FOR EXISTING AIRPORTS VERSUS NEW AIRPORTS



Source: Business Monitor International

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3

FLEET FORECAST

IN-SERVICE FLEET FORECAST

The active global commercial fleet stood at 27,492 aircraft as of August 1, 2018. Driven by high demand for air travel, the fleet will grow 3.6 percent annually on average over the next 10 years, supporting RPK growth of nearly 4.7 percent over the same period. During the first five years of the decade, the compound annual growth rate (CAGR) for the fleet is expected to be 3.9 percent. As the rate of deliveries stabilizes, the fleet CAGR will slow to 3.3 percent over the second five years.

EXHIBIT 10: 2019–2029 GLOBAL FLEET CHARACTERISTICS

	2019	2024	2029
FLEET SIZE	27,492	33,295	39,175
5-YEAR CAGR	N/A	3.9%	3.3%
AVERAGE AGE	11.3	10.9	10.7

Note: CAGR stands for compound annual growth rate
Source: Oliver Wyman

As new deliveries replace older aircraft, the average age of the fleet will drop five percent from 11.3 years old today to 10.7 in 2029. In total, the reduction in age trims 22,000 total years of service from what the global fleet would have otherwise accumulated by 2029. That amounts to more than $3.3 billion of spending on MRO. Of the more than 21,000 aircraft deliveries anticipated in the decade, 45 percent will replace in-service aircraft; the rest represent additions to the fleet. The result is a more efficient fleet that is larger in average seating capacity and has lower maintenance costs, particularly over the short to medium hauls.

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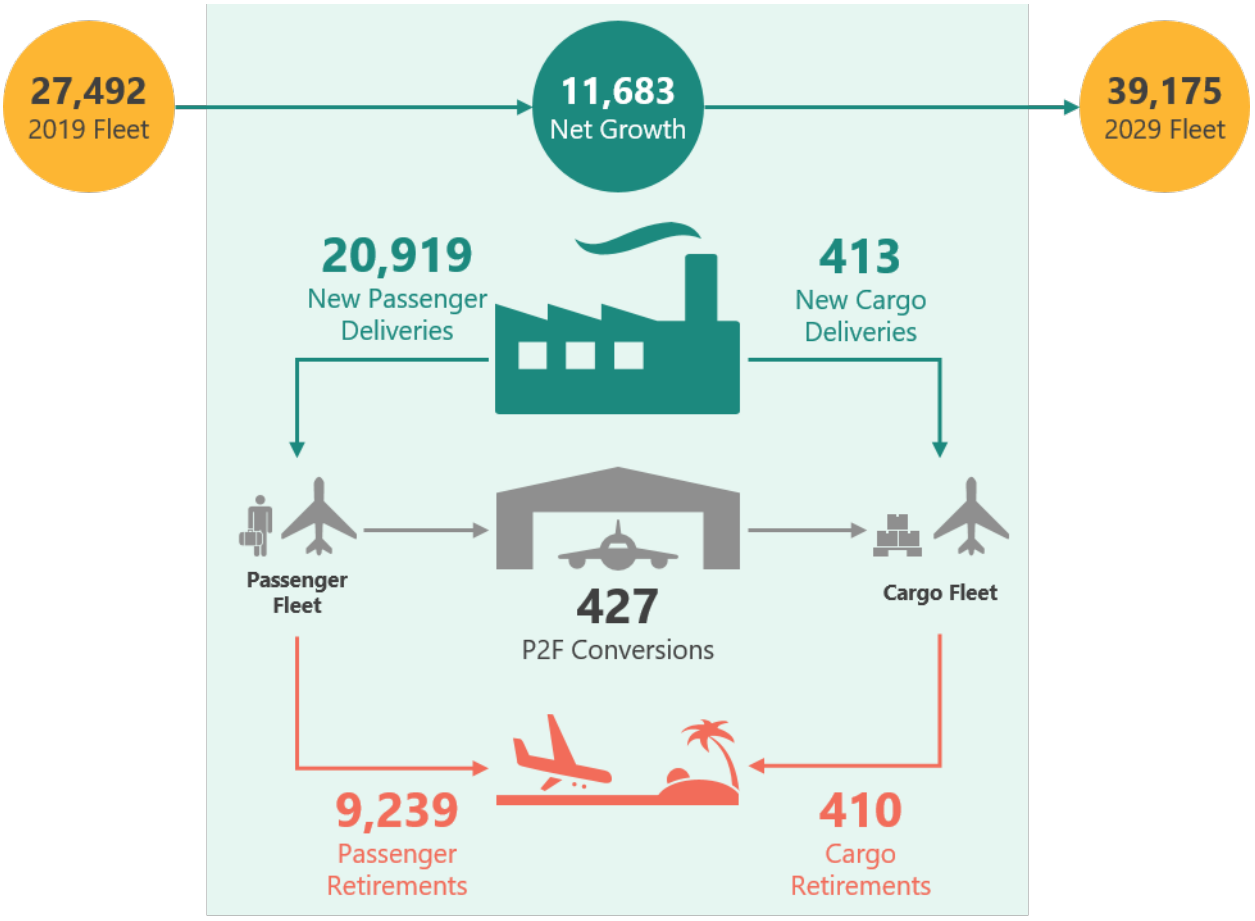
EXHIBIT 11: GLOBAL AIRCRAFT DEMAND, 2019–2029



Source: Oliver Wyman

The passenger fleet is projected to grow by nearly 11,300 aircraft by 2029, while the cargo fleet is forecast to grow by 430. Most of these additional cargo aircraft will be passenger-to-freighter (P2F) conversions.

IN-SERVICE FLEET FORECAST BY AIRCRAFT CLASS

Overall fleet growth is not spread evenly among aircraft classes. Narrowbody aircraft have been enjoying the greatest gains in recent years, a trend expected to continue as performance improvements and greater operational and revenue flexibility drive capacity increases at the expense of regional jets and turboprops.

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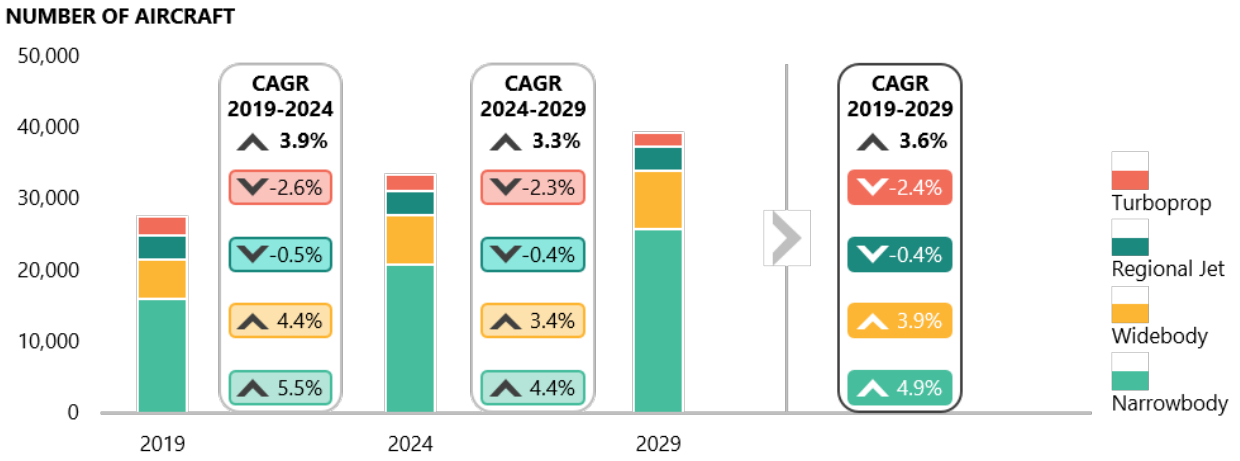
EXHIBIT 12: GLOBAL FLEET FORECAST BY AIRCRAFT CLASS, 2019–2029



Source: Oliver Wyman

Growing at an average annual rate of 4.9 percent, the number of narrowbody aircraft in the fleet will top 25,700 by 2029, up from around 15,900 at the beginning of 2019. Widebody aircraft are the second-fastest growing class, with a projected 3.9 percent average annual growth rate. Their representation will increase to around 8,000 by 2029, up from 5,500 in 2019. By contrast, the numbers of regional jets and turboprops are forecast to decrease over the next decade, falling annually on average 0.4 percent and 2.4 percent, respectively. The two classes will have a combined total of 5,353 aircraft by 2029 versus 6,066 in 2019.

NARROWBODIES

The share of narrowbodies will increase from 58 percent to 66 percent by 2029. Most are new additions to the fleet or are replacing regional jets and turboprops as a more economically attractive alternative. Narrowbodies fit the business model of most low-cost carriers because of their extended ranges, fuel efficiency, and higher maximum takeoff weight. For instance, the newest high-quality narrowbodies will include 180-minute extended operations approval, permitting trans-Atlantic routes. Narrowbodies accommodate these benefits while still using standard-size gates at airports.

EXHIBIT 13: NARROWBODY FLEET, 2019–2029

	2019	2024	2029
FLEET SIZE	15,938	20,816	25,777
5-YEAR CAGR	N/A	5.5%	4.4%
MARKET SHARE	58%	63%	66%
AVERAGE AGE	10.5	10.2	10.2

Source: Oliver Wyman

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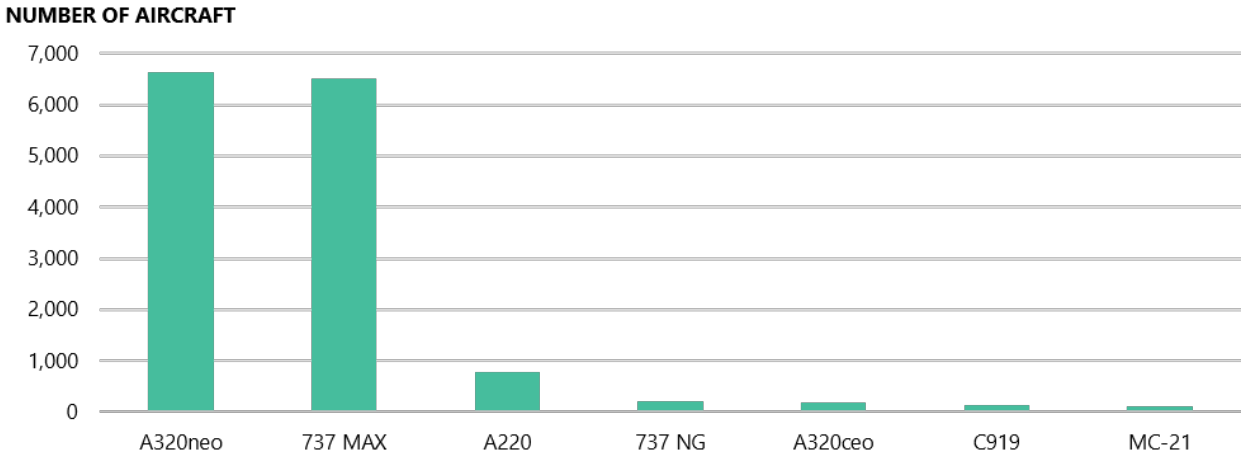
After Airbus' acquisition of the C Series program (renamed the A220) from Bombardier, competition in the narrowbody space beyond Airbus and Boeing is effectively non-existent. Together, Airbus and Boeing are forecast to represent 98 percent of all narrowbody deliveries through 2029. After production delays in the summer of 2018, Boeing and Airbus appear to be back on track with their manufacturing schedules for the 737 MAX and A320neo. Both manufacturers expect to increase output in 2019.

EXHIBIT 14: NARROWBODY DELIVERIES BY AIRCRAFT PLATFORM, 2019–2028



Source: Oliver Wyman

EXHIBIT 15: NARROWBODY AIRCRAFT SIZE CATEGORIES

	SMALL	INTERMEDIATE	LARGE
SEAT COUNT	<140	140–190	>190
AIRCRAFT TYPE VARIANT	737-700 A319 A220 SERIES	737-7 MAX, 737-800, 737-8 MAX, 737-900 A319neo, A320, A320neo Irkut MC-21 COMAC C919	737-9 MAX, 737-10 MAX, 737 MAX 200 A321, A321neo

Source: Oliver Wyman

Small narrowbodies with a seat count below 140 currently make up 18 percent of the narrowbody fleet and will account for just nine percent of the class by 2029. Because of strong operator preference for larger narrowbody aircraft and their improved operating efficiency, intermediate narrowbody aircraft with 140 to 190 seats, such as the 737-8 MAX and A320neo, are expected to represent 71 percent of the narrowbody fleet by 2029. Narrowbodies with over 190 seats are forecast to grow in share, with projections that they will reach 20 percent by the end of the decade.

This preference toward larger narrowbody aircraft bolsters the argument that a middle-of-the-market aircraft will be successful moving forward. This aircraft would need the potential to carry more than 230 passengers while having intercontinental range—a spiritual successor to the range and capacity that the 757 filled in the previous generation of aircraft. That is not a consensus,

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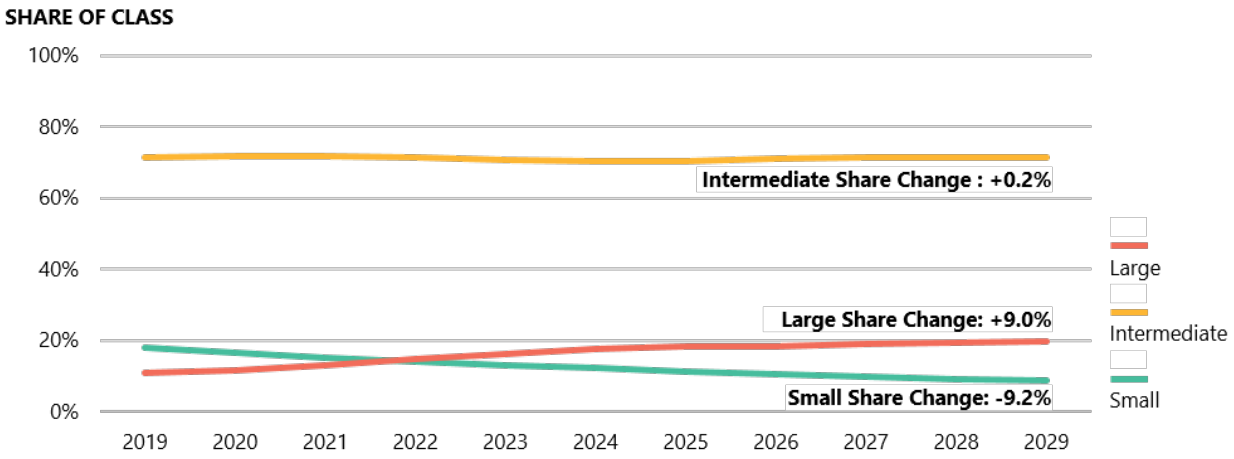
however. Airbus believes its A321neoLR has the range and capacity to fill this segment. Boeing has contended that several thousand aircraft in this capacity range would find demand while still maintaining narrowbody economics. A firm decision from Boeing on the launch of a new aircraft will likely come in the near future.

EXHIBIT 16: PASSENGER NARROWBODY FLEET COMPOSITION BY CATEGORY, 2019–2029



Source: Oliver Wyman

The remaining 737 Classics, 757s, and MD-80s will leave the fleet or be converted into freighters. Operators are also forecast to increase the rates of conversion and removal for 737NGs and A320ceos as they aggressively change out aging fleets.

WIDEBODIES

The global widebody fleet is forecast to grow from 5,488 aircraft to 8,045 by 2029. Market share for the class is expected to remain about 20 percent over the forecast period, with a 3.9 percent CAGR. The average age of the widebody fleet is expected to remain at about 11 years over the forecast period.

EXHIBIT 17: WIDEBODY FLEET, 2019–2029

	2019	2024	2029
FLEET SIZE	5,488	6,811	8,045
5-YEAR CAGR	N/A	4.4%	3.4%
MARKET SHARE	20%	20%	21%
AVERAGE AGE	11.0	10.8	11.0

Source: Oliver Wyman

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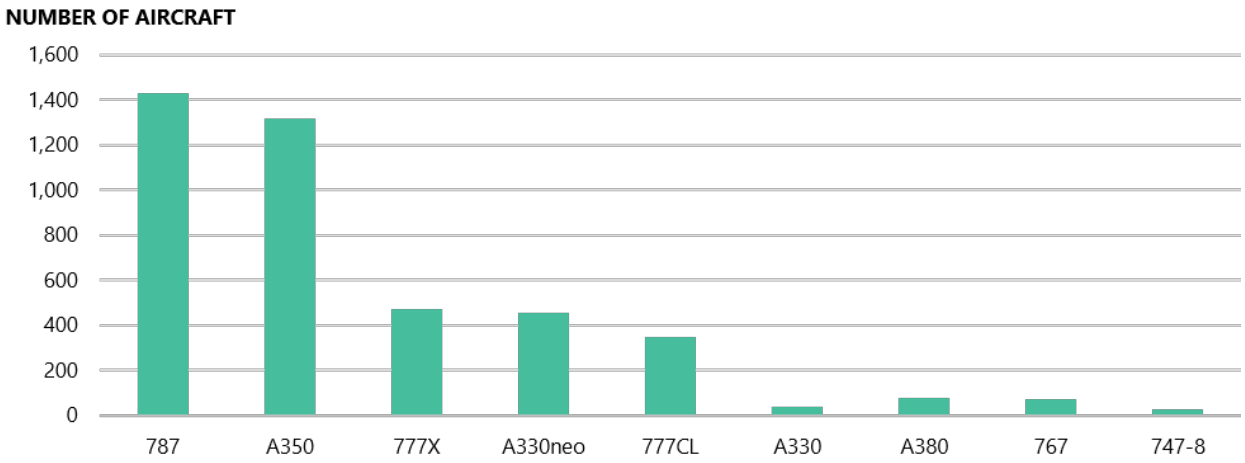
Boeing's 787 series and Airbus' A350 are clear favorites of airlines in the widebody class and will dominate deliveries over the forecast period. The 787 series alone will comprise about a quarter of the widebody fleet by 2029. That represents a change from the current widebody breakdown in which Airbus' A330/A340 family and the Boeing 777 series each make up 26 percent of the fleet. The changeover, among other things, will create a significantly more fuel-efficient, high-tech fleet. Even though Airbus is introducing the A330neo widebody with a lower sticker price, improvements in operational costs and efficiencies offered by the 787, A350 and 777X are expected to ultimately outweigh the A330neo's acquisition cost. Order books already indicate that preference. There is speculation within the market that Airbus may produce a freighter version of the A330neo.

EXHIBIT 18: WIDEBODY DELIVERIES BY AIRCRAFT PLATFORM, 2019–2028



Source: Oliver Wyman

Over the forecast period, the aircraft platforms most quickly retiring will be the 767, 777-200, and A330/A340, along with most of the remaining 747-400s. The 767 will account for the majority of all widebody freighter conversions.

EXHIBIT 19: WIDEBODY AIRCRAFT SIZE CATEGORIES

	SMALL	INTERMEDIATE	LARGE
SEAT COUNT	<275	275–350	>350
AIRCRAFT TYPE VARIANT	787-8 A330-200, A330-800neo A350-800	777 787-9, 787-10 A330-300, A330-900neo A350-900	747 777X, 777-300ER A350-1000 A380

Source: Oliver Wyman

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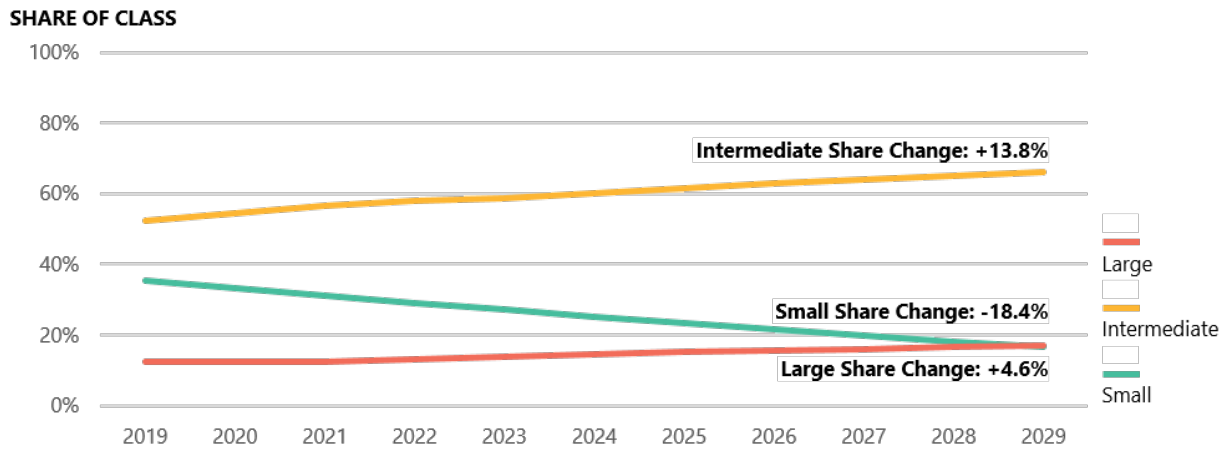
The widebody fleet is experiencing a similar phenomenon to the upsizing trend in the narrowbody fleet previously discussed. Operators are expected to move quickly toward intermediate widebodies and away from the smaller variants. The market share of these small widebodies will shrink considerably as new-generation narrowbodies with increased range can cover most of the routes that these smaller widebodies traditionally fly.

Currently comprising 53 percent of the widebody fleet, intermediate twin-aisle aircraft are forecast to boost their share to 66 percent by 2029. This additional share is taken almost entirely from small widebodies, which are expected to drop to 17 percent from the current 35 percent of the widebody fleet. The share of large widebodies will increase marginally from 12 percent to 17 percent by 2029.

EXHIBIT 20: PASSENGER WIDEBODY FLEET COMPOSITION BY CATEGORY, 2019–2029



Source: Oliver Wyman

REGIONAL JETS

Regional jets will play a less important role in the future fleet, despite the fact that multiple new platforms will enter service over the next several years. In North America, where over half of all regional jets are domiciled, the role these aircraft will play hinges on whether large network carriers and their pilot unions can agree on loosening weight and seat count restrictions on regional carriers.

EXHIBIT 21: REGIONAL JET FLEET, 2019–2029

	2019	2024	2029
FLEET SIZE	3,477	3,393	3,327
5-YEAR CAGR	N/A	-0.5%	-0.4%
MARKET SHARE	13%	10%	8%
AVERAGE AGE	11.2	11.7	10.9

Source: Oliver Wyman

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The regional jet fleet is forecast to decrease by 150 aircraft over the next 10 years, an average annual decline of 0.4 percent. Overall market share of the class is expected to fall from 13 percent to eight percent.

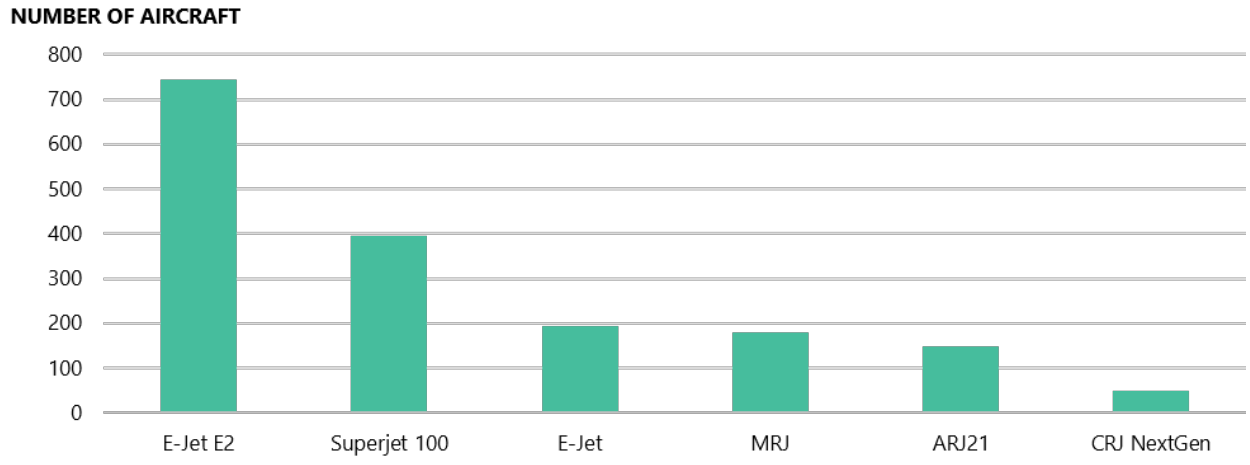
EXHIBIT 22: REGIONAL JET FLEET CATEGORIES

	MEETS SCOPE	EXCEEDS SCOPE	REGULATORY LIMITS
SEAT COUNT	<100	>100	N/A
	AND	OR	
MTOW LIMIT	<86,000 LB	>86,000 LB	
AIRCRAFT TYPE VARIANT	CRJ	E-JET E2	SUPERJET 100
	ERJ	MRJ	ARJ
	E-JET		

Source: Oliver Wyman

The Embraer E-Jet and E-Jet E2 families are forecast to dominate the regional jet delivery schedule over the next decade. The new, more advanced E-Jet E2s will provide greater flexibility with their increased range. In fact, global regional jet competition could narrow to a one-platform race, with the Bombardier CRJ order book falling dramatically and the Mitsubishi MRJ struggling to get certified. The Chinese-made ARJ21 has entered service but is unlikely to draw orders from outside China because of stricter certification requirements in other regions of the world. The aircraft also hasn't shown signs of ramping up production rates to an export-size level. The Superjet 100 could become more than a niche player after building a customer base in Western Europe and Latin America and raising production capabilities to around 30 aircraft per year.

EXHIBIT 23: REGIONAL JET DELIVERIES BY AIRCRAFT PLATFORM, 2019–2028



Source: Oliver Wyman

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Many of the smaller regional jets are expected to be removed from the fleet over the next decade. CRJ retirements will accelerate quickly during the first half of the forecast period, representing nearly 40 percent of all regional jet removals for the entire forecast period. There will be very few Embraer ERJ left in the fleet by 2029, as there will be no new deliveries and many of the current aircraft will be retired over the 10 years.

The end of CRJ manufacturing and the potential for Bombardier to divest the program altogether (as the company did with the Q400) could have significant aftermarket support implications if Bombardier retreats from the commercial market entirely.

TURBOPROPS

Turboprop aircraft are no longer expected to have much of a presence in the global fleet. The class is forecast to decline 2.4 percent annually over the next 10 years. That leaves the fleet size at just over 2,000 jets, or about five percent, of the global fleet by 2029, serving special purpose and highly specialized routes.

EXHIBIT 24: TURBOPROP FLEET, 2019–2029

	2019	2024	2029
FLEET SIZE	2,589	2,275	2,026
5-YEAR CAGR	N/A	-2.6%	-2.3%
MARKET SHARE	9%	7%	5%
AVERAGE AGE	16.6	16.2	15.2

Source: Oliver Wyman

Many of the older-generation turboprops, such as Saab 340s and Fokker 50/70s, will disappear from the global fleet over the forecast period. The Q400 program, largely uncompetitive in recent years because of higher operating costs, was sold in late 2018 by Bombardier to Canadian airframe manufacturer Viking Air. As the one remaining relevant player, the ATR fleet will make up most deliveries and is projected to grow at an average annual rate of 2.8 percent over the next 10 years.

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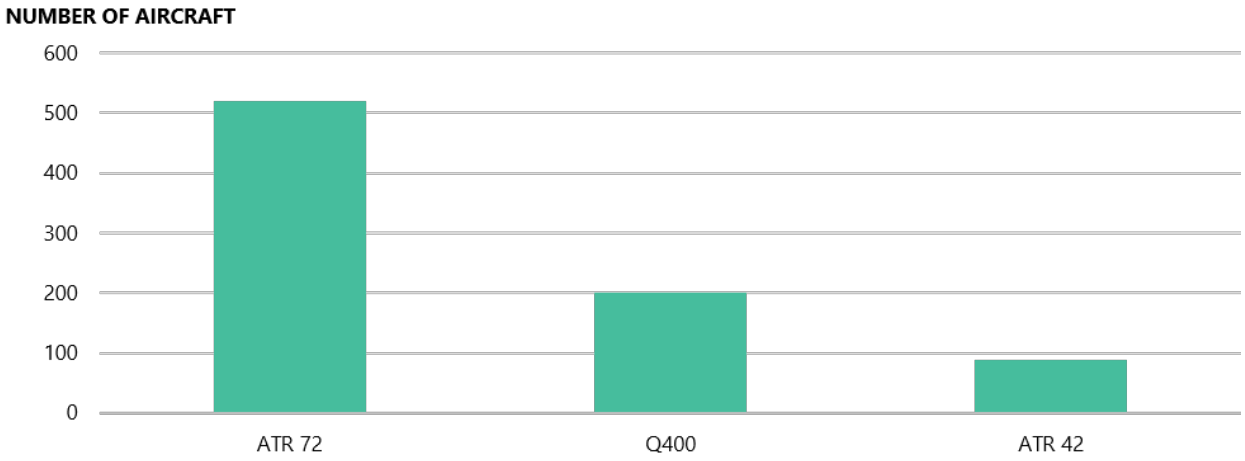
EXHIBIT 25: TURBOPROP DELIVERIES BY AIRCRAFT PLATFORM, 2019–2028

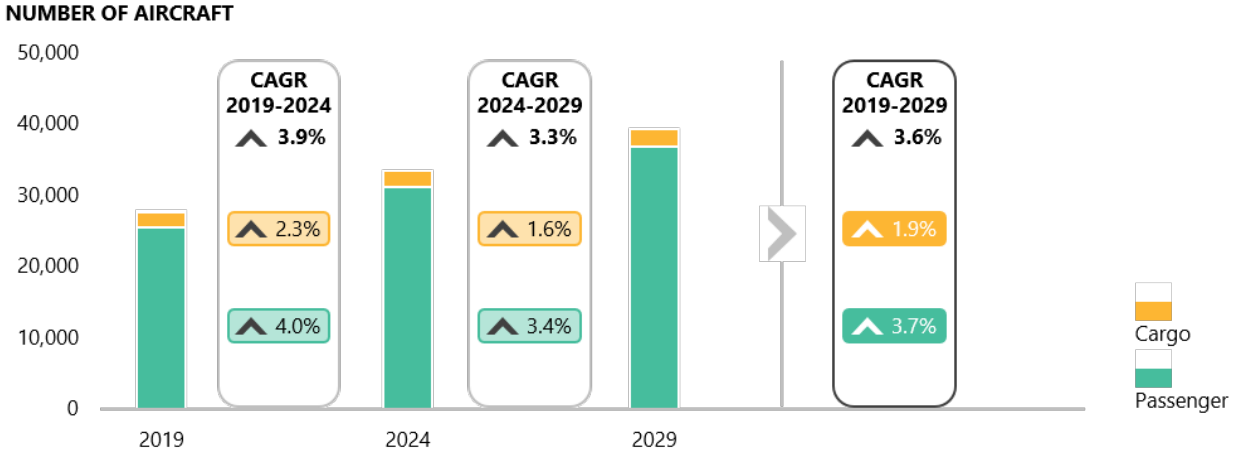


Source: Oliver Wyman

IN-SERVICE FLEET FORECAST BY AIRCRAFT USAGE

The global cargo fleet, currently about seven percent of the global fleet, is expected to grow at a modest rate of 1.9 percent over the next decade, reaching over 2,400 aircraft by 2029. The passenger fleet is forecast to grow at a healthier 3.7 percent annually, increasing its share to 94 percent of the global fleet.

EXHIBIT 26: GLOBAL FLEET FORECAST BY AIRCRAFT USAGE, 2019–2029



Source: Oliver Wyman

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Through 2024, the cargo fleet will grow 2.3 percent, reflecting deliveries of 767 aircraft on order from FedEx. However, the growth is expected to slow to just 1.6 percent annually between 2024 and 2029. One challenge facing cargo operators is the continued increase of cargo space in the undercarriage of new-generation passenger aircraft. Over the last five years, freight carried in passenger aircraft has increased 24 percent. Trucking growth is also a strong competitor in domestic markets.

EXHIBIT 27: GLOBAL FLEET AVERAGE AGE BY AIRCRAFT USAGE, 2019–2029

	2019	2024	2029
PASSENGER	10.4	9.9	9.8
CARGO	22.2	23.3	24.2
OVERALL	11.3	10.9	10.7

Source: Oliver Wyman

The average age of passenger aircraft is forecast to decrease slightly from 10.4 years to 9.8 over the next 10 years, as thousands of newly delivered aircraft hit the market and older aircraft are removed from the fleet. However, the average age of cargo aircraft is forecast to increase from 22.2 years to 24.2 by 2029. Cargo aircraft are remaining in service longer than ever, driven by the success of passenger-to-freight conversions that keep older passenger aircraft flying.

REGIONAL IN-SERVICE FLEET CHARACTERISTICS

No doubt, China is one of the principal growth engines behind the rising size of the fleet. Between 2019 and 2029, China is forecast to receive 3,981 more deliveries than retirements, an increase in fleet size of 114 percent. Asia Pacific is expected to see a 50 percent net increase in aircraft over the same decade. While North America will accept the most aircraft deliveries in absolute terms over the next 10 years, the region's fleet will grow only 15 percent, as most deliveries will replace jets being retired.

India will accept the third fewest deliveries of the major world regions, yet its national fleet will soar in size by 156 percent between 2019 and 2029. All the new jets will be additions to its current numbers because almost no aircraft will be retired. By 2029, the Asia Pacific fleet, including China and India, will account for nearly 40 percent of the global fleet.

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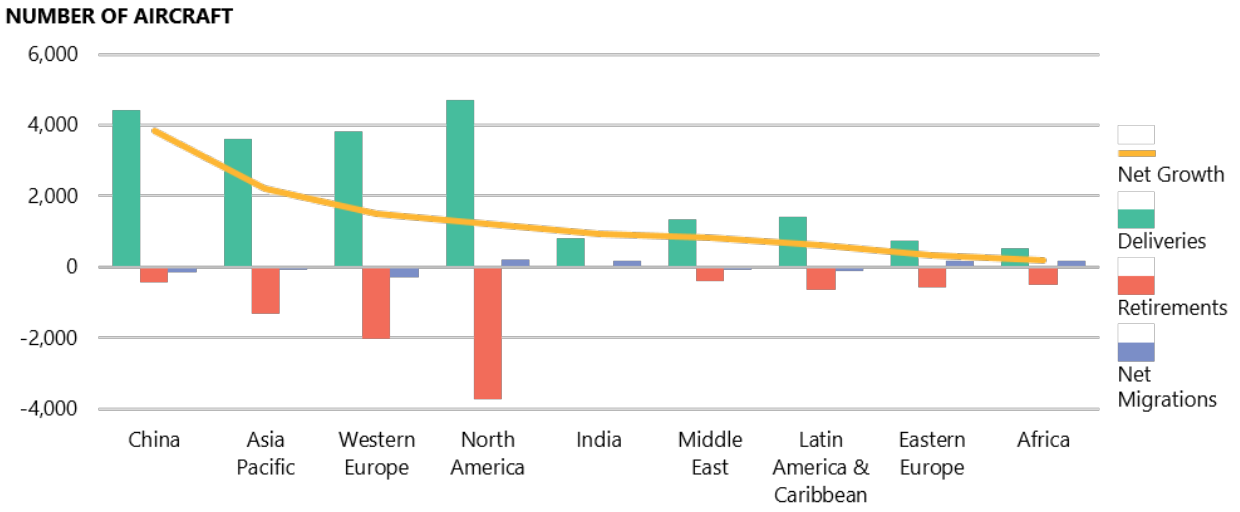
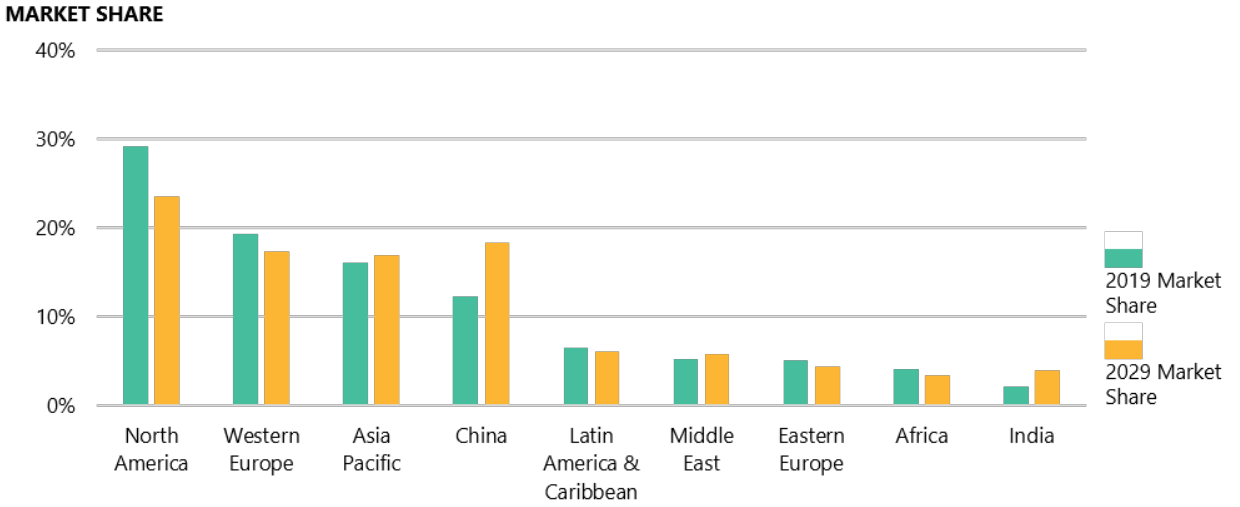
EXHIBIT 28: FLEET GROWTH BY REGION, 2019–2029



Source: Oliver Wyman

The delivery and retirement patterns will result in a change in overall global distribution of aircraft that favors Asia. China will increase fleet share by more than six percent by 2029, which reflects the nation's efforts to satisfy the desires of its burgeoning middle class to travel. Asia's gain will result in a decline in share primarily in North America and Western Europe.

EXHIBIT 29: FLEET SHARE CHANGE BY REGION, 2019–2029



Source: Oliver Wyman

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EXHIBIT 30: THE FLEET'S AVERAGE ANNUAL GROWTH RATES BY REGION, 2019–2029

	2019–2024	2024–2029	2019–2029
AFRICA	1.5%	1.8%	1.6%
ASIA PACIFIC	4.9%	3.4%	4.2%
CHINA	9.6%	6.2%	7.9%
EASTERN EUROPE	2.6%	1.7%	2.1%
INDIA	12.1%	7.7%	9.9%
LATIN AMERICA	2.7%	3.4%	3.0%
MIDDLE EAST	5.0%	4.4%	4.7%
NORTH AMERICA	1.3%	1.6%	1.4%
WESTERN EUROPE	2.7%	2.3%	2.5%

Source: Oliver Wyman

The mature regions of North America and Western Europe are forecast to experience relatively modest growth over the next 10 years, growing at just 1.4 and 2.5 percent annually. Asia represents the highest levels of growth, with the regions of China, India, the Middle East and Asia Pacific growing at annual rates of 7.9 percent, 9.9 percent, 4.7 percent, and 4.2 percent over the next 10 years. After a short-term rebound in fleet size, Eastern Europe is forecast to return to lower growth levels of just over two percent per year, while Africa is expected to continue to struggle to modernize and grow the infrastructure needed to increase the regional fleet.

EXHIBIT 31: AVERAGE AGE OF FLEET BY REGION, 2019–2029

	2019	2024	2029
AFRICA	15.5	14.7	13.4
ASIA PACIFIC	9.7	9.8	10.3
CHINA	6.4	7.6	9.0
EASTERN EUROPE	11.6	12.0	12.6
INDIA	7.1	8.8	10.7
LATIN AMERICA	11.4	10.7	9.9
MIDDLE EAST	9.3	9.1	9.6
NORTH AMERICA	14.1	13.3	12.1
WESTERN EUROPE	11.4	11.1	10.6

Source: Oliver Wyman

As fleets grow, the average aircraft age will vary among regions. North America, Western Europe, Latin America, and Africa will see the age decrease as older fleets are replaced with new deliveries. In contrast, the fleets in China, India, Eastern Europe and Asia Pacific will age as aircraft stay in service to meet increased demand, leading to greater emphasis and importance for aircraft maintenance programs.

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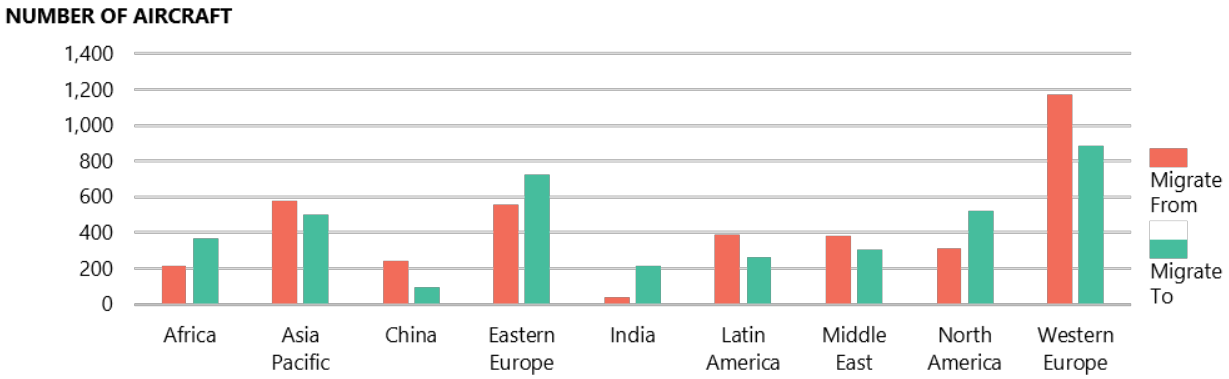
EXHIBIT 32: NET AIRCRAFT MIGRATIONS BY REGION, 2019–2029



← Migrate From \ Migrate To →	Africa	Asia Pacific	China	Eastern Europe	India	Latin America	Middle East	North America	Western Europe
Africa		30	0	30	0	10	51	30	63
Asia Pacific	47		53	136	58	41	50	81	110
China	20	63		40	10	10	0	50	48
Eastern Europe	39	42	0		20	39	73	62	280
India	0	20	0	10		0	0	0	10
Latin America	20	39	10	39	20		20	80	158
Middle East	73	38	0	93	30	10		30	111
North America	41	30	0	59	10	46	20		105
Western Europe	131	242	30	317	64	107	90	189	

Fewer migrations → More migrations

Source: Oliver Wyman

Outside of deliveries, aircraft are also sold between regions, and this migration of jets is another way that regional fleet size changes. That said, Africa is the only region where a significant percentage of fleet growth—about 75 percent—is the result of migrations. Most regional fleet growth is not substantially affected by migrations. Over the next 10 years, there are expected to be 1,440 net migrations.

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MRO MARKET FORECAST

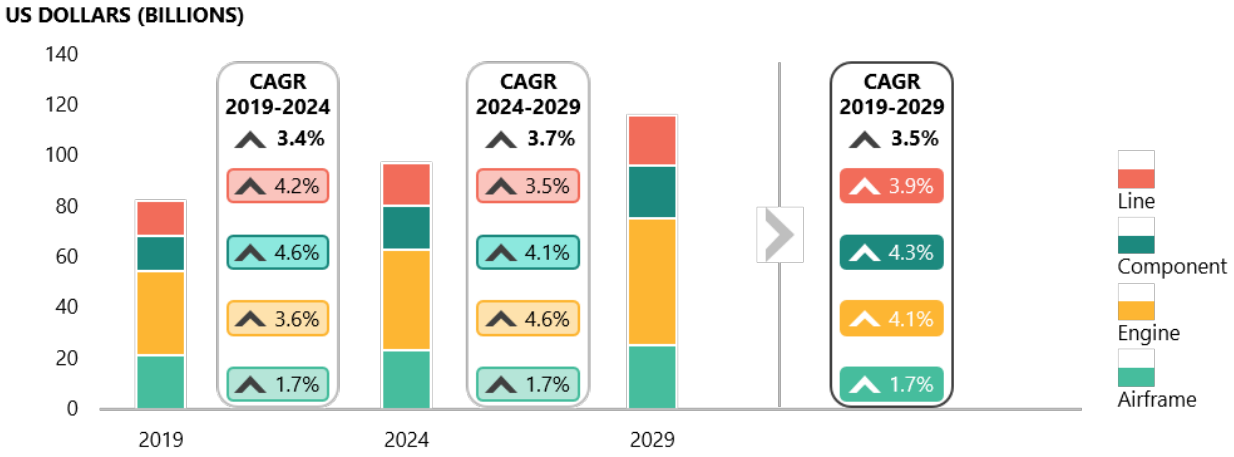
MRO MARKET FORECAST

The commercial air transport MRO market, valued around $82 billion in 2019, will be driven by the growth and changing composition of the global fleet. New-generation aircraft, equipped with more fuel-efficient engines and sophisticated technology, will begin to represent a larger share of in-service aircraft.

Most of these aircraft will be larger narrowbodies, as airlines move toward aircraft with improved operational flexibility. The goal is to accommodate more passengers with airplanes that are cheaper to operate than the larger, less flexible widebody aircraft that tend to dominate long-haul flights. This transition also reflects a greater willingness by passengers to accept smaller cabins on long-haul flights than what was the norm just 10 years ago. This move to replace older-generation aircraft will slow MRO spend in the first half of the next 10 years, as the number of expensive late-life maintenance events declines with the retirement of aging aircraft and as the intervals between scheduled maintenance lengthen for the newest jets.

Between 2019 and 2024, the MRO market will grow at a CAGR of 3.4 percent, increasing MRO spend to $96.9 billion. The market in the next five years will accelerate slightly—3.7 percent annually on average—as the new-generation aircraft reach the stage when life-limited parts need replacement and the number of other scheduled maintenance events rises. By the beginning of 2029, MRO spend is expected to total $116 billion. Over the full 10-year forecast period, the global air transport MRO market will average 3.5 percent growth annually.

EXHIBIT 33: GROWTH OF MRO SPEND, 2019–2029



Source: Oliver Wyman

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The growth of airframe maintenance costs will slow because of the increased use of proven design materials such as composites, titanium, and advanced aluminum alloys that reduce the need for fatigue-related inspections and corrosion-related maintenance checks. These new, more advanced technologies and materials can reduce overall fatigue and corrosion maintenance tasks by 60 percent for certain aircraft. Over the course of the forecast period, airframe will be the slowest-growing MRO segment, with an average annual growth rate of 1.7 percent.

The pace of growth for engine MRO will vary over the decade. In the first five years, new engines are expected to lengthen the interval between shop visits with less need to replace life-limited parts and to conduct other scheduled maintenance. Over those years, the CAGR for engine MRO is expected to be 3.6 percent. That will rise to 4.6 percent in the second five years of the decade.

The latest-generation engines, while much more fuel-efficient, also use increasingly exotic and expensive materials and more complex technologies—particularly related to life-limited parts. While their resilience tends to make them last longer and be less problematic in general, they can be quite expensive to replace or repair when the time comes.

The landscape and strategy of the component MRO market are changing because OEMs are becoming more prominent within the sector. For instance, manufacturers of complex components are offering long-term service packages to aircraft purchasers in order to increase their participation in the aftermarket. Additionally, larger parts manufacturer approvals (PMA) providers are working to gain control over the design, development, and manufacturing of their parts. PMA is an emerging segment that has undergone a lot of merger and acquisition activity, which has ended up helping the bigger players.

Line maintenance remains an attractive market, considering the number of new-generation aircraft in the global fleet that require less heavy-maintenance hangar work. STS Aviation Group's line maintenance business has set up multiple new stations in the past two years, coinciding with it acquiring many of the 17 locations offloaded by HAECO Americas in October 2016. The company now has more than 30 stations operating across the US and the Bahamas. Europe has experienced healthy line maintenance growth the last few years, with Monarch Aircraft Engineering adding stations to its network. FL Technics established four new line stations, and Magnetic MRO opened more locations in 2018.

Despite all this, there is little change expected in the relative share of component and line MRO spend over the forecast period. The labor and material costs associated with routine maintenance and ATA chapter spend is also consistent across the next 10 years.

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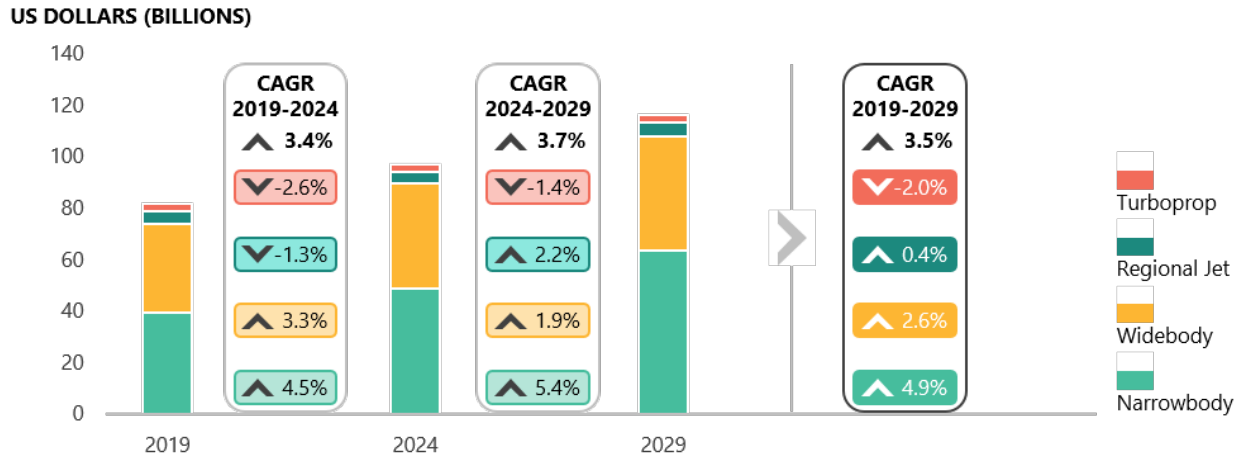
EXHIBIT 34: MRO MARKET FORECAST BY AIRCRAFT CLASS, 2019–2029



Source: Oliver Wyman

Globally, MRO spend related to narrowbody and widebody aircraft is expected to account for $73.6 billion of the $81.9 billion MRO market total; regional jets and turboprops compose the rest at $8.3 billion. In 2019, narrowbodies are expected to make up 58 percent of the global fleet and 48 percent of MRO market share, an increase of one percent and three percent over last year. Widebodies are expected to make up 20 percent of the global fleet at the beginning of 2019 and represent more than 42 percent of MRO spend because of their complex and maintenance-intensive nature. That represents a slight decline from the start of 2018, when they accounted for 44 percent of the MRO spend and 20 percent of the fleet.

Oliver Wyman forecasts a significant shift in MRO spend away from regional jets and turboprops and toward narrowbody aircraft over the next 10 years. Over the forecast period, narrowbody MRO spend will climb $24.2 billion, from $39.1 billion to $63.3 billion by 2029. Overall, the MRO market share for narrowbodies is expected reach nearly 55 percent by the end of the forecast period, largely driven by their increased representation across the fleet. By 2029, widebody MRO market share will drop to 39 percent, totaling $44.8 billion, and regional jets and turboprops will combine for seven percent of MRO spend, totaling $7.9 billion.

Within the categories of narrowbodies and widebodies, MRO spend will be concentrated on a handful of aircraft platforms. In 2019, the top 10 aircraft platforms will make up 87 percent of the total MRO market; by 2029, the top 10 will represent more than 93 percent.

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EXHIBIT 35: TOP AIRCRAFT PLATFORMS BY TOTAL MRO SPEND

Source: Oliver Wyman

The fleet composition by vintage is expected to undergo the most dramatic shift in priorities related to MRO expenditures. Driven by the upgrade and expansion of the fleet, new-generation aircraft will grow from 13 percent of total MRO spend in 2019 to 52 percent by 2029. There is no doubt that this changeover will pose many challenges for MRO providers as they handle new materials and technologies in sophisticated next-generation airframes and engines used on aircraft like the 737 MAX and A320neo series. To service the new generation of aircraft adequately, airlines and MRO providers would benefit from making investments in training, digital capabilities, and the infrastructure their top priorities.

Many MROs have stated plans to implement technologies such as paperless shops and hangars, predictive maintenance, virtual maintenance training, and drone-supported maintenance within the next three years. This will allow more thorough and efficient aircraft monitoring, improve technician efficiency and productivity, and pay off in greater reliability performance in later years.

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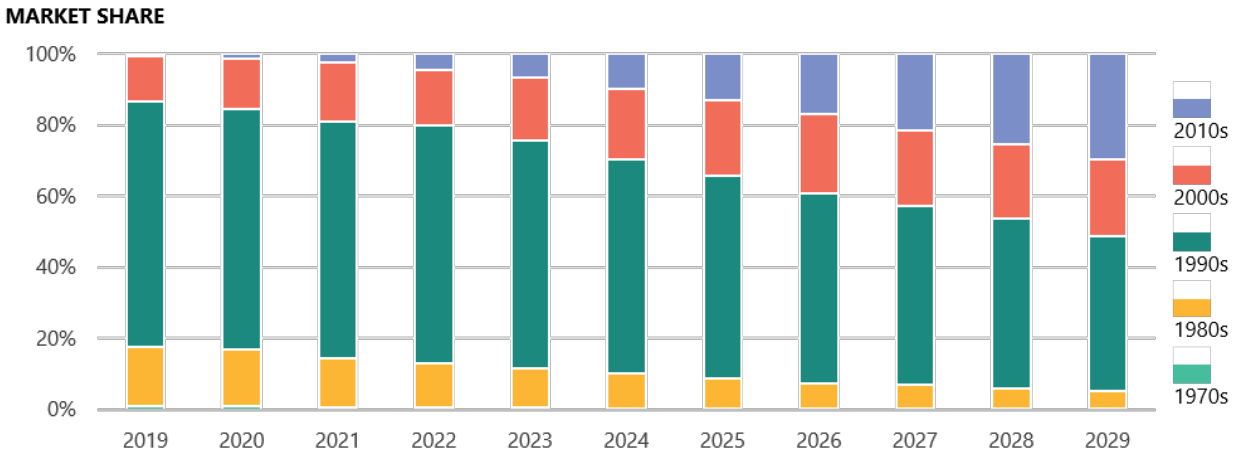
EXHIBIT 36: TOTAL MRO SPEND BY AIRCRAFT VINTAGE, 2019–2029



Source: Oliver Wyman

From an MRO perspective, a diverse global fleet requires airlines to form MRO strategies that complement varying business model needs. From low-cost carriers—and the recently introduced long-haul low-cost carriers—to airlines with an established global presence, operators can focus on maintenance intervals that fit well with their fleet mix and flight schedules.

In addition to the heightened competition for qualified technicians, there is the potential for increased competition in the engine aftermarket following the agreement between CFM International and IATA. After years of OEMs controlling the engine parts and services aftermarket, this agreement has the potential to loosen their hold on supply chains. The pact aims to clarify ambiguity in contracts and warranties that affect PMA and designated engineering representative (DER) repairs. While prospects for PMAs may improve modestly with this agreement, it is too early to know for sure how much growth will be realized. Airlines and MROs, however, will be able to explore all options to best leverage a broadened supply chain to reduce material costs.

Challenges extend to component and line maintenance MRO providers as well. Component MROs need the capital to acquire testing equipment and licenses to access OEM manuals, software/firmware, and data for these new parts. Line maintenance providers will need to improve training and expand the use of the newest aircraft health-monitoring and fault isolation systems, as well as software configuration protocols.

As fleet growth shifts to Asia and other developing economies, so will MRO spend, especially given those regions' labor rate and supply chain advantages. By 2029, the combined MRO demand in Asia Pacific, China, and India will be almost double that for North America.

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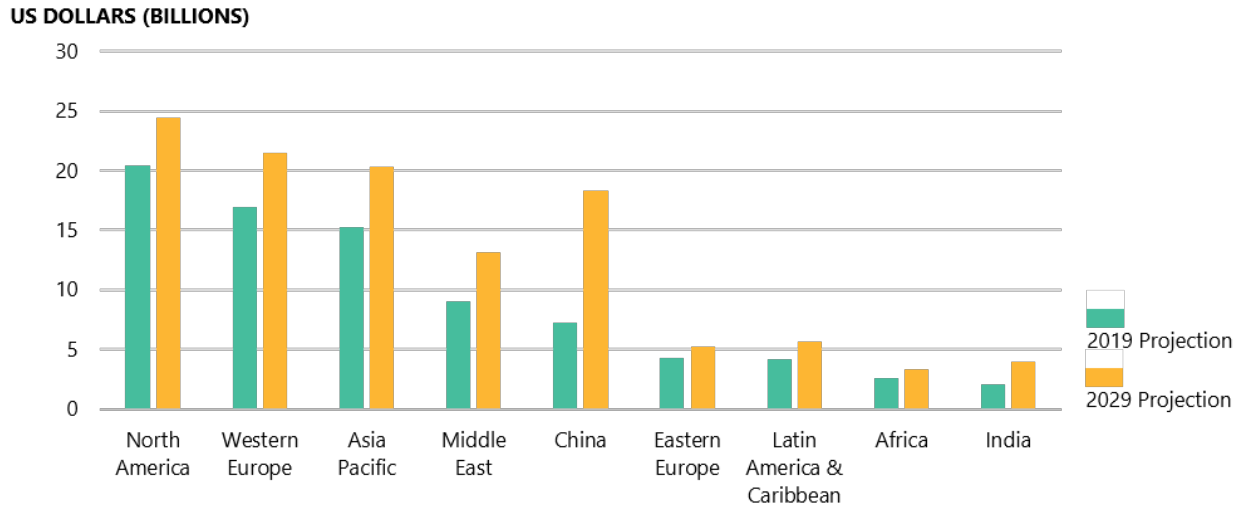
EXHIBIT 37: TOTAL MRO SPEND BY REGION, 2019 VERSUS 2029



Source: Oliver Wyman

Our forecast shows slow growth in North American MRO spend, rising from $20.5 billion in 2019 to $21.6 billion in 2024, before accelerating slightly in the next five years. It is expected to reach $24.5 billion by 2029. Growth over the entire 10-year forecast period will average 1.8 percent annually.

European MRO spend will experience the same slow growth. Despite a surprising increase in the Eastern European fleet this year, the long-term trend of low single-digit fleet growth is expected to continue, depressing growth for MRO spend. In Western Europe, the MRO market will grow 2.5 percent annually on average, but will end the decade by shrinking more than two percentage points in global market share.

Despite rising demand in the region, African fleet growth is expected to be constrained over the next decade by geopolitical tensions, unreliable safety records, high airport fees and taxes on jet fuel. Still, the MRO market in the region will grow from $2.6 billion to $2.8 billion over the next five years, a CAGR of 1.4 percent. As the existing fleet ages during the second half of the forecast period, annual MRO spend will increase to $3.4 billion for an average growth rate of 2.7 percent over the entire forecast period.

Latin America MRO is expected to slightly exceed the market average, with 3.2 percent growth annually. The region is forecast to increase MRO spend by $1.5 billion, reaching $5.6 billion by 2029 and representing almost five percent of the global MRO market, a small increase in share from today.

The Middle East, currently the fourth-largest MRO demand market in the world, will be surpassed by China and fall to fifth by 2024. The drop will be from rapid growth in China rather than a deceleration in the Middle East, where the MRO spend will still achieve a CAGR of 3.9 percent over the next decade. That growth is faster than the market average for the forecast period. By 2029, the Middle East will add $4.1 billion in MRO spend and represent more than 11 percent of the global market.

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Asia, as has been the case for years, remains the driver of MRO growth. China, the largest and fastest-growing nation in the region, will more than double its annual MRO spend by 2029, with an $11.1 billion increase to $18.3 billion. At that point, it will represent 16 percent of the total global MRO market.

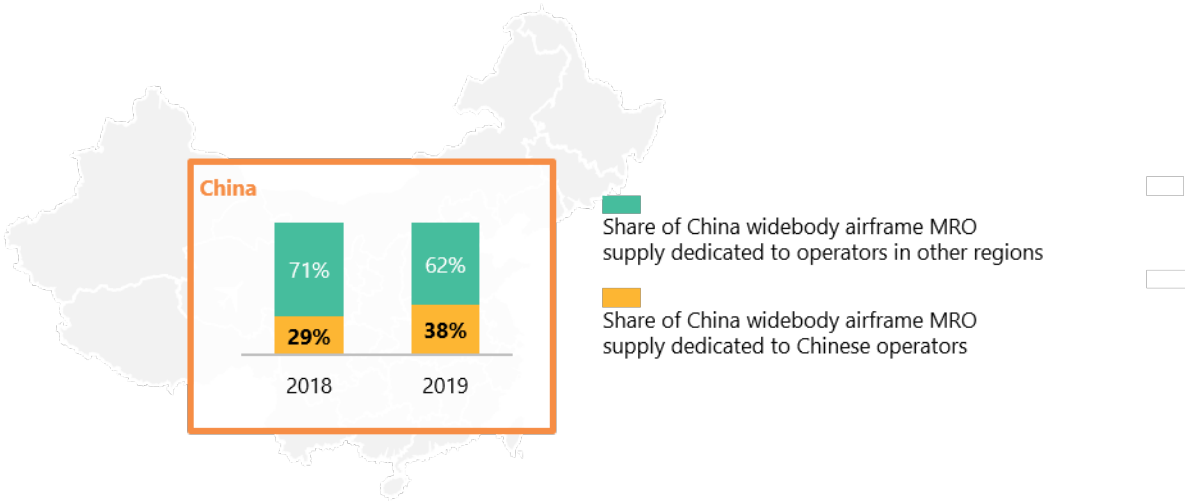
India, growing at 7.1 percent annually, also is expected to exceed the market average and end the decade representing more than three percent of the market. While the small percentage shows the relative size of India's absolute MRO spend, it also suggests the potential for continued growth, given the size of its burgeoning middle class.

Although growth in the Asia Pacific region—which includes Japan, Australia, Indonesia and South Korea, among others—will average only 2.9 percent annually, the MRO market will almost equal that of Western Europe by 2029. The market will grow almost $5 billion to $20.3 billion.

While China will be the key driver of MRO spend growth in Asia, rising labor costs, coupled with temporary infrastructure and capacity constraints, have shifted the global trade of MRO services.

In 2018, operators around the world sent nearly 24 percent of widebody heavy airframe maintenance to Asia Pacific and China. Given the infrastructure and capacity constraints, the industry is approaching an inflection point where capacity within Asia cannot accommodate both the growing MRO demand within the region and the work being sent there by other regions, particularly from North America and Western Europe.

EXHIBIT 38: CHINA WIDEBODY HEAVY AIRFRAME MRO, DOMESTIC OPERATORS VERSUS FOREIGN



Source: Oliver Wyman

We have observed a shift in how the supply of China widebody MRO is allocated on a global level. There is an increased share of maintenance work being completed for operators in-country and less MRO work being performed for operators outside the region, particularly those in the mature North America and Western Europe regions.

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5 ECONOMIC SENSITIVITY ANALYSIS

ECONOMIC SENSITIVITY ANALYSIS

Forecasting, particularly over the long term, is complex and subject to many external variables. This baseline analysis reflects Oliver Wyman's view of the most likely scenarios facing the industry, but slight changes in assumptions relating to the political and economic landscape can lead to considerable differences in the size and complexion of the global fleet and MRO market when the effects are amplified over time. It takes only one significant global event to alter the course of the air transport industry.

When looking at external variables such as GDP, passenger traffic growth, jet fuel cost, and long-term interest rates, the understanding should be that these are not independent of each other. They are more representative of the overall economic and industry environment. How these environments influence the decisions of airlines on fleet size is ultimately what drives future MRO spend. Given the degree of uncertainty surrounding economic and political variables over time, numerous scenarios are possible, each resulting in disparate fleet and MRO market predictions based on key factors.

EXHIBIT 39: FACTORS AFFECTING FORECASTING

Source: Oliver Wyman

In our analysis and in general, economic health, passenger traffic growth, jet fuel prices, and long-term interest rates are the four primary factors affecting growth in the global fleet and MRO market. These elements influence demand and therefore can alter airline fleet planning, ultimately affecting the delivery rate of new aircraft and the retirement rate of in-service aircraft. A strong global economy and the factors that drive increased traffic growth—such as consumer confidence and increased wages—would lead to greater demand for additional aircraft. If the opposite occurs—a slowdown in large economies, for instance—operators would likely alter fleet plan growth, potentially scaling back to more closely align with demand. Alternatively, a significant, long-term jump in jet fuel prices would encourage airlines to increase retirements of old, less fuel-efficient aircraft and, where possible, meet demand with new, more efficient aircraft. Like cheap fuel, low interest rates benefit operators and lessors, as the cost of financing new aircraft falls. As interest rates rise and this cost increases, operators might stick with their current fleets and retire aircraft at a slower rate.

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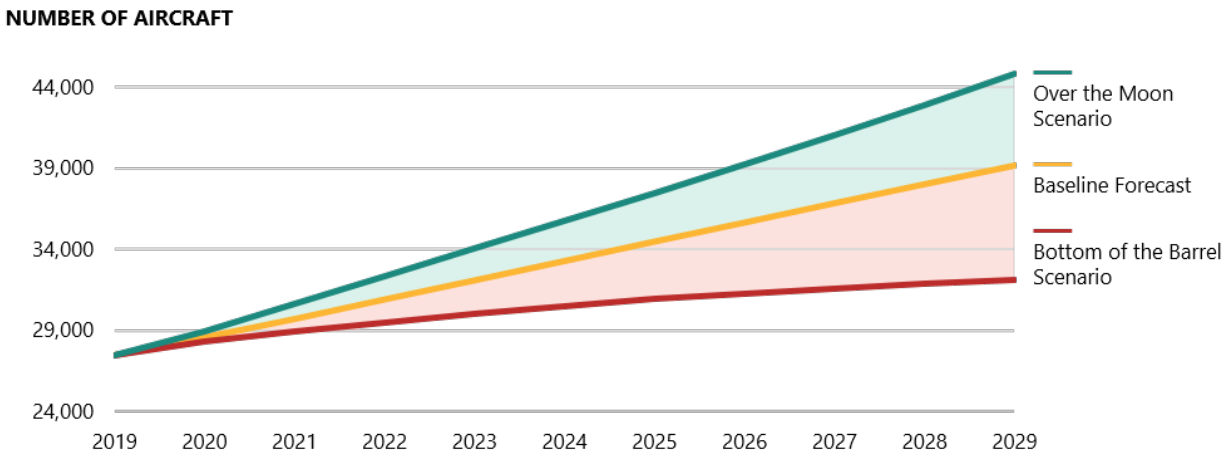
These four factors impact the global fleet and MRO market, but to different degrees and in different ways. Over the forecast period, the world's economic health and its impact on traffic volume are ultimately most pivotal in determining fleet expansion or contraction. If passenger and cargo traffic growth is soaring, operators are going to supply the world with the appropriate number of seat and tonne miles to handle demand, regardless of fuel prices and interest rates. If the economy is strong, airlines could raise ticket prices to offset the higher fuel cost while still meeting the increased demand.

The factors in the scenarios below represent the best case and worst case for the market in relation to the values used in our baseline forecast. For example, if the economy grows faster than our baseline, the metrics would fall closer to our best-case scenario.

EXHIBIT 40: FLEET FORECAST WITH ALTERNATIVE SCENARIOS, 2019–2029



Source: Oliver Wyman

Two alternative scenarios to the baseline forecast will be reviewed in the following sections:

- **Over the Moon:** This is the scenario that depicts the global economy as a well-oiled machine, running in perfect harmony year after year. This is the extreme best-case scenario.
- **Bottom of the Barrel:** This is an extreme negative scenario illustrating the effects of an event or series of events that have devastated the world economy.

OVER THE MOON

This scenario represents an extreme coalescing of positive forces and therefore is unlikely. For this best-case turn of events to come about, economic health would need to soar across all supporting metrics. In this environment, operators would be quite profitable and have a low cost for borrowing, enabling them to meet the demand for additional seat miles through new aircraft orders. Because fuel prices would be low, older, less fuel-efficient aircraft would likely remain in the fleet to meet demand as there is no longer a high variable-cost disadvantage to operate them.

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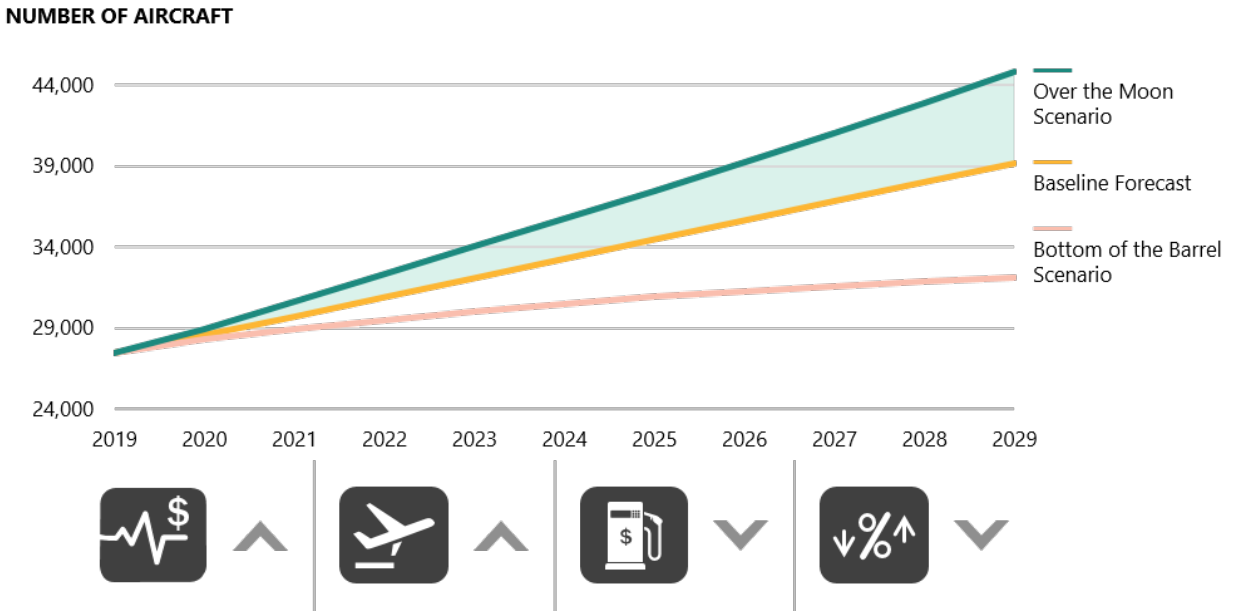
EXHIBIT 41: OVER THE MOON FLEET FORECAST, 2019–2029



Source: Oliver Wyman

In this scenario, the commercial fleet would grow to 44,803 by 2029, a more than 5,600-aircraft increase from our baseline forecast, due to over 3,000 additional deliveries and almost 2,500 fewer retirements. This fleet growth would fuel an expansion of the MRO market to $131.7 billion in 10 years' time, nearly $16 billion more than our current baseline forecast. In this high demand environment, additional carriers would have entry points into the market to serve various passenger groups around the world. Manufacturers would accelerate production rates even further, and MROs would see an explosion in maintenance work required for older aircraft remaining in service.

BOTTOM OF THE BARREL

This is the worst-case scenario. This outcome would involve a devastating event that severely impacts the world economy in general and the airline industry in particular. The Great Recession of 2007–2009, because of its unanticipated severity, is a prime example of such an event. In a scenario like this, world GDP growth would be much slower than anticipated, traffic growth would be exceptionally low, fuel prices would increase over the short term because of economic uncertainty or supply problems, and interest rates would increase. In this environment, operators would likely increase aircraft retirements because of high fuel prices and low passenger traffic growth. New aircraft orders would be deferred or cancelled altogether.

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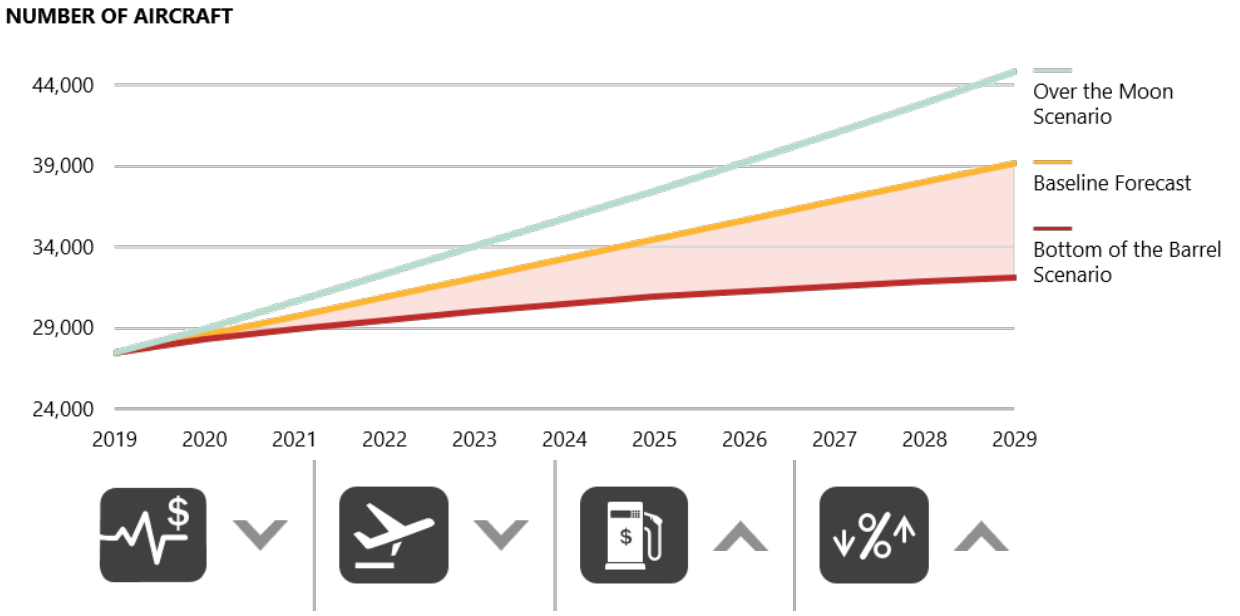
EXHIBIT 42: BOTTOM OF THE BARREL FLEET FORECAST, 2019–2029



Source: Oliver Wyman

In a Bottom of the Barrel environment, the fleet would grow to only 32,361 by 2029, nearly 7,000 aircraft fewer than the base forecast, driven by 3,540 fewer deliveries and almost 3,300 more retirements. The lack of new aircraft and the removal of older, more MRO-intensive aircraft would limit the MRO market to $99.5 billion by 2029. Such an environment, with a slow-growing world fleet hobbled by a lack of demand, would create financial hardships and could bankrupt carriers with low yields and insufficient scale. Consolidation for certain mainline carriers could occur, and independent MROs would be affected as operators may only perform crucial maintenance tasks.

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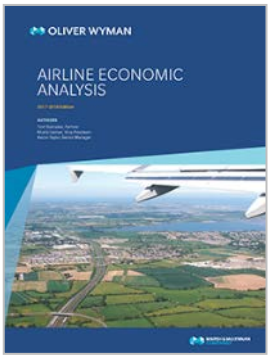

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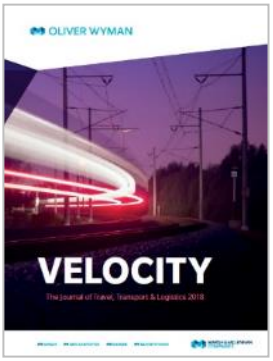

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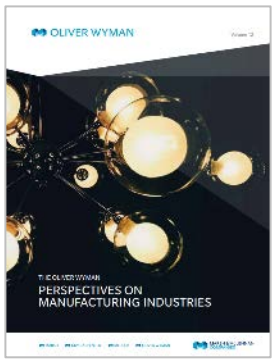

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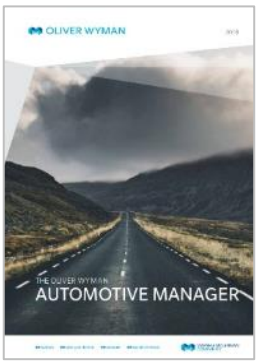

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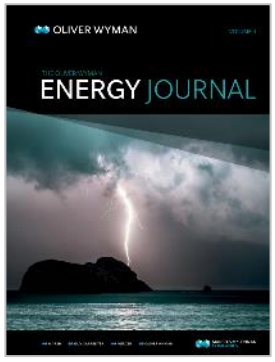

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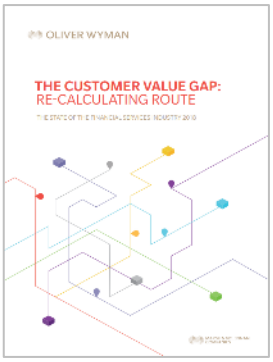

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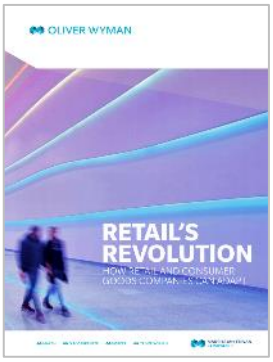

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TRANSPORT FOR THE NORTH

Enhanced Freight and Logistics Analysis Report

STRATEGIC TRANSPORT PLAN EVIDENCE BASE

JANUARY 2018

This report has been commissioned by Transport for the North to inform development of its Strategic Transport Plan. Proposals and recommendations in the report are those of Arup. Publication of the report does not imply TfN endorsement of any material in the report.

Document Verification

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Document ref					
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		Signature			
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Aims and Objectives

The Northern Powerhouse Independent Economic Review (NPIER) was published in June 2016 and set out that by 2050, a transformed economy in the North would feature the following:

- Gross Value Added (GVA) projected to be 15% (£100 billion) higher than business as usual projections;
- Productivity would be 4% higher; and
- 850,000 additional jobs would be created.

Transport for the North, seeking to become the Government's statutory body tasked with improving transport in the North of England, are therefore integral to achieving the outcomes of NPIER.

Freight and Logistics as a key enabling capability to achieving transformational economic growth is a prime focus and therefore there is an important requirement to set out how investment should be made in the transport network to ensure it meets the demands that will be placed upon it by passengers and freight.

Strategic Transport Plan (STP)

TfN are developing a Strategic Transport Plan (STP) alongside a long term investment programme to support the people and businesses across the North and to create a stronger, more diverse and resilient place for people to live, commute and conduct business.

TfN has published a variety of other reports which make up the evidence base for the STP. For each of these reports, an element of this enhanced freight and logistics analysis has been used although since these reports were published, the freight analysis has been further developed and enhanced, the outcome of this work is contained within this report.

In addition to the freight and logistics reports (this report and the initial freight study), the STP evidence base is also made up of:

- Major Roads Report;
- Integrated Rail Report;
- Independent International Connectivity Report; and
- Economic Appraisal.

This evidence base will be used within the Strategic Development Corridor studies which will be undertaken by TfN to produce a prioritised programme of investment.

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However, by using the tonne kms metric, the mode share is as follows:

- Road 87.2% (2016), 88.0% (2050)
- Rail 12.1% (2016), 11.6% (2050)
- Waterway 0.6% (2016), 0.4% (2050)

As freight is generally moved over longer distances by rail it is more accurately reflected using the tonne km metric. Rail mode share is shown to decrease slightly between 2016 and 2050 which reflects longer haulage distances by road, generally driven by the growth in e-commerce and increased consumer spending which require more and larger National Distribution Centres (NDCs) and Regional Distribution Centres (RDCs), often only connected by road. This trunking of goods between NDCs and RDCs drives up the distances that road freight vehicles travel.

The growth of the various modes for the movement of freight is also reflected in the GBFM outputs and suggests that based on tonnes lifted, there will be a 33.1% increase in goods moved between 2016 and 2050. This is broken down as follows:

- Road 33.1%
- Rail 39.0%
- Waterway 11.6%

Using tonne km as a metric, the growth is more substantial reflecting freight moving over longer distances. GBFM predicts the growth in tonne km as 60.4% overall, broken down as follows:

- Road 61.8%
- Rail 52.9%
- Waterway 11.6%

Key Flows

Taking into account the growth in the economy forecast between 2016 and 2050, it is clear that as consumer spending increases, so will the demands for goods. This has an enormous effect on the logistics and freight sector with more demands for the movement of goods both into and out of the North of England.

The majority of commodity groups show strong growth across the horizon to 2050 with the exception of bulk traffic, which is affected by the reduction in demand for coal as the UK moves away from coal fuelled power stations towards other sources such as nuclear and renewable energy from wind for example.

The outputs from GBFM forecast the growth in a number of commodity groups between 2016 and 2050. These are:

- Intermodal 41.8%
- Construction and Metals 34.6%

- Petrol and Petroleum Products 49.2%
- Other Bulks -1.8%

Clearly through the growth predicted, the demands placed upon the North's transport network will be greater and the challenges faced now and predicted in the future will be exacerbated.

Challenges

Road

Some of the challenges facing the road freight sector are highlighted below and include:

- Vehicle emissions;
- Congestion;
- Workforce / skills shortage;
- Lack of safe and secure overnight parking for freight vehicles; and
- Regional and city distribution.

Rail

Lack of capacity on the rail network in the North is a key challenge and can generally be expressed in a number of ways in addition to availability of freight paths covered above:

- Train Average Speeds;
- Train Length Limits;
- Train Weights;
- Gauge Clearance;
- Headways and Network Access; and
- Utilisation of Freight Paths.

Waterborne

As with the other transport modes, water-based transport and, in particular for this report, the Northern Ports face a number of challenges which include:

- Consolidation of shipping lines and focus on southern ports;
- Port location and access and infrastructure;
- Land availability and planning restrictions; and

- Unbalanced flows.

Air

Much of the air freight which arrives or departs the North of England is currently moved by road. The scope of either influencing modal shift or redirecting this freight to Northern airports is limited until a greater number of long haul passenger or dedicated cargo services are introduced.

Drivers for Change

The analysis set out in this report highlights the forecast significant increase in freight movements into, out of and throughout the North in the future and the impact this has on existing infrastructure. This change will have a significant impact on three key areas listed below and these form the key Drivers for Change upon which the rationale for investment should be based:

- The increase in forecast freight movement is going to have a significant impact on **congestion**, the **environment** and **quality of life** in the North;
- The **shortage of skilled drivers and labour** is going to place considerable pressure on the logistics and freight industry to service businesses and consumers in the North; and
- As a result of the above there will also be an impact on the **cost of logistics** and the **service levels** the sector can deliver to businesses and consumers in the North.

The North's Freight Vision

In order to achieve the desired economic growth, action needs to be taken to address the challenges outlined in the previous section which can generally be achieved through two overarching methods:

- Reduce the Demand for infrastructure; and / or
- Increase the Capacity of the transport infrastructure.

Under both of these methods there are two main areas that TfN can affect in order to drive change and which are covered within the subsequent sections of this report. These are through:

- Policy based solutions, which can influence how the private sector operates and invests; and
- Physical solutions, such as new infrastructure.

This report focuses on how the freight and logistics sector in the North could be enhanced and supported by TfN building on the key drivers identified above. This will be achieved through key focus points:

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Other proposals include working with the public sector to ensure alternative modes of transport are included in public sector procurement and to ease planning conditions on freight infrastructure. Finally there could be a merit in creating more road space for freight vehicles by reducing other users of the road network.

On the infrastructure front, the report identifies four main principles as rational for investing in and enhancing infrastructure. These principles are to improve:

- East-west connectivity;
- North-south connectivity;
- General capacity enhancements; and
- Intermodal connectivity.

Providing skills and utilising data to plan for the future

In order to ensure that the North has the skills required to meet the future needs of the freight and logistics sector, TfN should work towards a number of key strategic aims to promote the industry and make it more attractive as a career. This works across all modes where increase the skills base and the pool of resources is imperative to meet future demand. Working with the industry to improve the standards for HGV drivers in particular will help to address the driver shortage currently being felt in the UK.

The evidence base used in the development of this report is a mixture of model outputs from the GBFM and information gleaned through engagement with a number of freight and logistics operators and industry experts.

There remains however an important requirement to increase the robustness of the evidence base through the collection of more information and ensuring TfN have a long term strategy for gathering the required data to assess KPI's and how the North's freight industry operates. This could be through embracing the move to the use of Big Data and developing systems that will aid the enhancement of the freight and logistics story within TfN.

Freight and Logistics Action Plan

The report contains a Freight and Logistics Action Plan which sets aside areas where TfN can provide influence in order to deliver on the Freight Vision. These areas encompass maximising the use of the North's existing assets, delivering effective investment through the correct modal mix and providing the skills and utilising data to plan for the future.

The Action Plan forms a basis for future Freight and Logistics work should TfN choose to take it forward.

1 Introduction

In September 2016, Transport for the North (TfN) published its *Northern Freight and Logistics Report* which set out how a combination of public and private sector investment in new transport infrastructure could achieve £34.7 billion of user and non-user benefits to the UK economy and £13-£20 billion of wider economic benefits (GVA benefits).

The report also contained some initial modelling of the North's freight network using the Great Britain Freight Model (GBFM) developed and maintained by MDS Transmodal (MDST).

In June 2016, the Northern Powerhouse Independent Economic Review (NPIER) was published, which set out the transformational economic growth opportunity for the region. The review clearly set out the markets that offered the greatest potential growth and highlighted that the logistics and freight industry was a key enabling capability in supporting this growth. Whilst the 2016 Freight and Logistics report focused on what interventions should be prioritised in a freight and logistics strategy to optimise logistics flows and grow the sector, it did not set out the justification for these investments within the context of the NPIER.

Subsequently, Arup were commissioned by TfN to advance the strategic thinking around Freight and Logistics on a regional, national and global level, visualise "The Freight Story" and examine why investment in the transport network in the North is required (from a freight and logistics perspective) to achieve Transformational economic growth.

In addition, utilising the evidence that indicates why investments should be made, the final part of the commission looks at what interventions are required and how these can be achieved.

This report will be used as part of the evidence base within the Strategic Development Corridor studies that will be undertaken by TfN.

1.1 Structure of the Report

This report is structured in such a way so that a rational argument for the investment in freight transport infrastructure can be presented. This includes breaking down the argument into the following categories:

- **Why**: the current and future forecast for freight movements in the North of England and why investment will be required to achieve transformational economic growth.
- **What**: the overarching objectives of what needs to be achieved to deliver the transformational economic growth. This will include examining a number of scenarios under which strategies can be tested.
- **How**: the means by which the objectives will be meet and how the freight and logistics strategy for the North of England will be implemented.

2 Context

2.1 Aims and Objectives

The North of England plays a major part in the success of the UK in the global marketplace. Despite this, the economy of the North of England lags behind that of other areas of the UK. The premise of the Northern Powerhouse was therefore introduced by the 2010-15 UK Coalition Government and has been maintained by subsequent governments.

The aims and objectives of the Northern Powerhouse is to boost economic growth in the North of England and is based around the North's four distinctive prime capabilities, encompassing:

- Digital technology: including software and content;
- Advanced manufacturing: especially materials and processes;
- Energy: including nuclear and offshore wind; and
- Health innovation: including life sciences, medical technology and service delivery.

In order to support these prime capabilities and drive job numbers there are three key enabling capabilities of which logistics is one. The other two are financial and professional services and higher education.

The Northern Powerhouse Independent Economic Review (NPIER) was published in June 2016 and set out that by 2050, a transformed economy in the North would feature the following:

- Gross Value Added (GVA) projected to be 15% (£100 billion) higher than business as usual projections;
- Productivity would be 4% higher; and
- 850,000 additional jobs would be created.

Transport for the North, seeking to become the Government's statutory body tasked with improving transport in the North of England, are therefore integral to achieving the outcomes of NPIER.

Freight and Logistics as a key enabling capability to achieving transformational economic growth is a prime focus and therefore there is an important requirement to set out how investment should be made in the transport network to ensure it meets the demands that will be placed upon it by passengers and freight.

2.2 Strategic Transport Plan (STP)

One of the key issues identified by the NPIER in the North's ability to deliver transformational economic growth by improving connectivity. Transport services across the North do not encourage economies of agglomeration and

transformational changes to the services provided would ensure that the North of England becomes a more attractive and buoyant marketplace. TfN, with a focus on Pan-Northern connectivity and presenting a single voice for the North, has a responsibility to deliver the case for strategic transport investment across the North of England. To this end, TfN are developing a Strategic Transport Plan (STP) alongside a long term investment programme to support the people and businesses across the North and to create a stronger, more diverse and resilient place for people to live, commute and conduct business.

TfN's vision is of a:

"*thriving North of England, where modern transport connections drive economic growth and support an excellent quality of life."*

The vision will be the guiding principle for the STP which will cover all aspects of TfN's activities. Freight and Logistics will be a key theme running through the STP and as such has been fed into some of the parallel work streams.

In essence the STP will:

- Be a long term, multi-modal plan;
- Identify a sequenced investment and delivery programme;
- Ensure that value is added to the Northern economy;
- Pursue transformational economic growth;
- Be a public facing, publicly supported plan; and
- Be a living, evolving document.

TfN are delivering a number of evidence streams to support the development of the STP as shown in Figure 1.

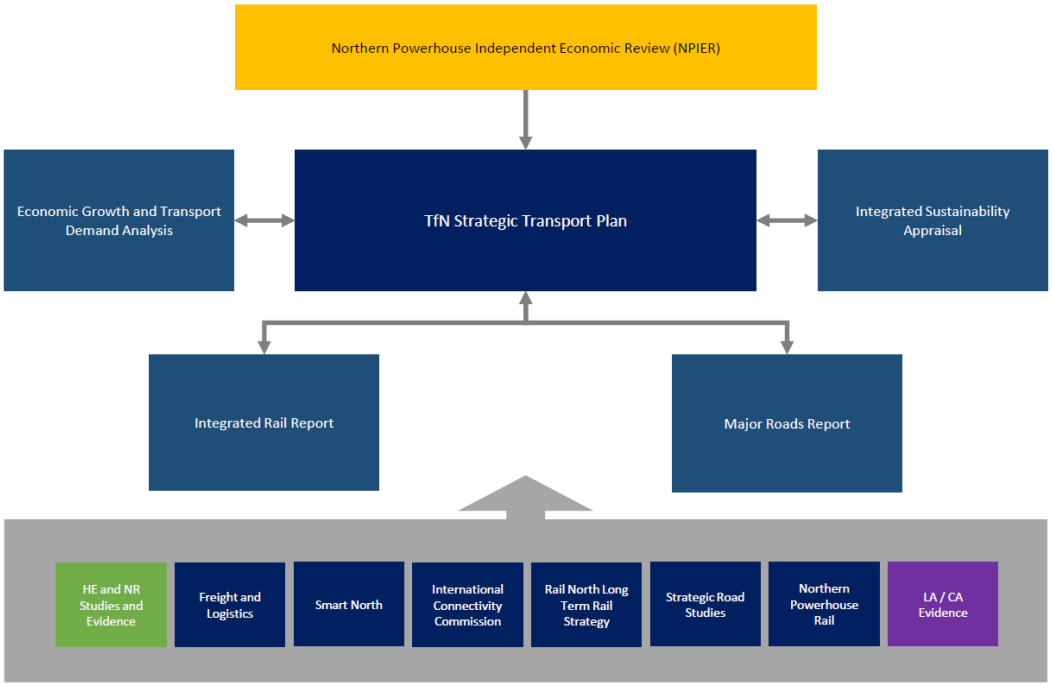

Figure 1 TfN STP Evidence Base and Parallel Work streams

Freight and Logistics is one of the parallel work streams and has fed into the Integrated Rail Report (IRR) and the Major Roads Report (MRR) as well as directly into the STP.

2.3 Previous Freight Report

TfN published a Freight and Logistics Report in September 2016 following a piece of work which examined the opportunities to reduce the cost of freight transport to both users and non-users, create new facilities, expand market share in the logistics sector and attract inward private sector investment to the Northern Powerhouse.

As part of the work, consultation sessions were held with a wide range of stakeholders. The outcomes of these consultations fed into the work.

The report concentrated on developing a preferred strategy alongside a list of interventions to feed into TfN's strategic investment plan. This strategy and suggested interventions have fed into the proposals set out in this report.

2.4 STP Evidence Base

TfN has published a variety of other reports which make up the evidence base for the STP. For each of these reports, an element of this enhanced freight and logistics analysis has been used although since these reports were published, the freight analysis has been further developed and enhanced, the outcome of this work is contained within this report.

In addition to the freight and logistics reports (this report and the initial freight study), the STP evidence base is also made up of:

- Major Roads Report;
- Integrated Rail Report;
- Independent International Connectivity Report; and
- Economic Appraisal.

This evidence base will be used within the Strategic Development Corridor studies which will be undertaken by TfN to produce a prioritised programme of investment.

2.5 Scope of Work

The second phase of the Freight and Logistics work stream (which this report covers) was commissioned in December 2016. It builds upon the first report by developing a clear case for investment through expansion of the "Why" case.

2.6 The North's Transport Network

The North of England's transport network is extensive and encompasses rail, road, see and air infrastructure in addition to a significant volume of warehousing, particularly around Liverpool, Manchester and Leeds.

The transport infrastructure supports a Northern population in the region of 16 million people, 7.9 million jobs and over 14,400 square miles of land. It also ensures that the North of England contributes over £290 billion GVA towards the UK economy.

Freight accounts for 9% of the country's GDP and supports every industry with access to goods and services. In the UK, a total of 1.65 billion tonnes of freight are lifted by all modes per annum. A little over a third of freight activity takes place in the North of England.

The North boasts a wealth of freight assets that grant the North a strong multimodal freight capability. These include:

- Eleven major ports in addition to other smaller ports located on the Tyne, Tees, Humber and Mersey as well as in Lancashire, Cumbria and Northumberland;
- Seven international airports including Liverpool John Lennon, Leeds-Bradford, Doncaster-Sheffield, Humberside, Durham Tees Valley and Newcastle in addition to the major international airport at Manchester;
- Three Strategic Rail Freight Interchanges (SRFIs – distribution centres with intermodal terminals) at Ditton, Wakefield and Selby with more emerging;

- Five further Intermodal Terminals at Trafford Park, Leeds, Garston, Doncaster and Widnes;
- A Strategic Road Network focused on the M62/M60/M56 and A66/69 East-West corridors and the M6 and M1/A1 North-South corridors;
- A strategic rail network principally comprising of the West Coast Main Line, East Coast Main Line and Midland Main Lines that connect the North of England to the South and the Transpennine routes; and
- A significant amount of distribution centre capacity.

Despite these assets being available, many are not being fully utilised due to a number of reasons such as lack of joined up infrastructure or attractive alternative logistics solutions. Gaps in connectivity prevail that urgently require investment; 80% of road freight in the North is domestic traffic, most of which is short haul (making it difficult to justify the use of rail on commercial or efficiency grounds), which places a heavy burden on the strategic road network.

Figure 2 shows the key transport infrastructure within the North of England.

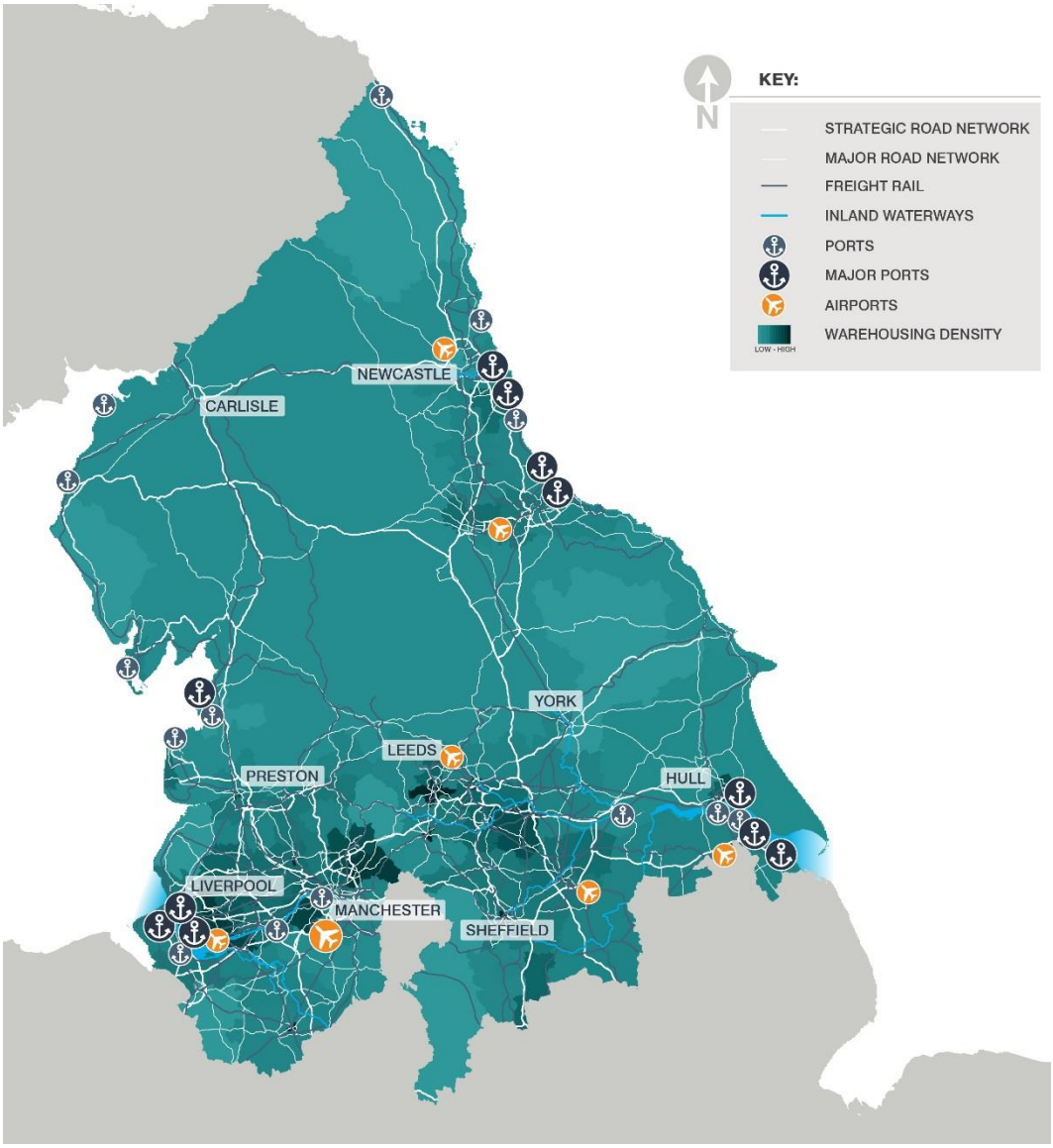

Figure 2 Key Transport Infrastructure - North of England

2.6.1 Road Network

The Strategic Road Network (SRN) in the North of England cover many of the regions large economic centres. North-South routes are provided through the M6 between Carlisle and Rugby, providing a vital link through the west of the region, and the A1 (M) between Newcastle close to Doncaster through the east of the region. The M1 links Leeds to London and provides a key route into and out of the North.

East-West routes are provided primarily through the M62 as the central corridor between Liverpool in the west and close to Hull in the east. Additional routes include:

- M56 between Manchester and the Welsh Border near Chester
- M58 between the M6 at Wigan to the north of Liverpool close to the Port;

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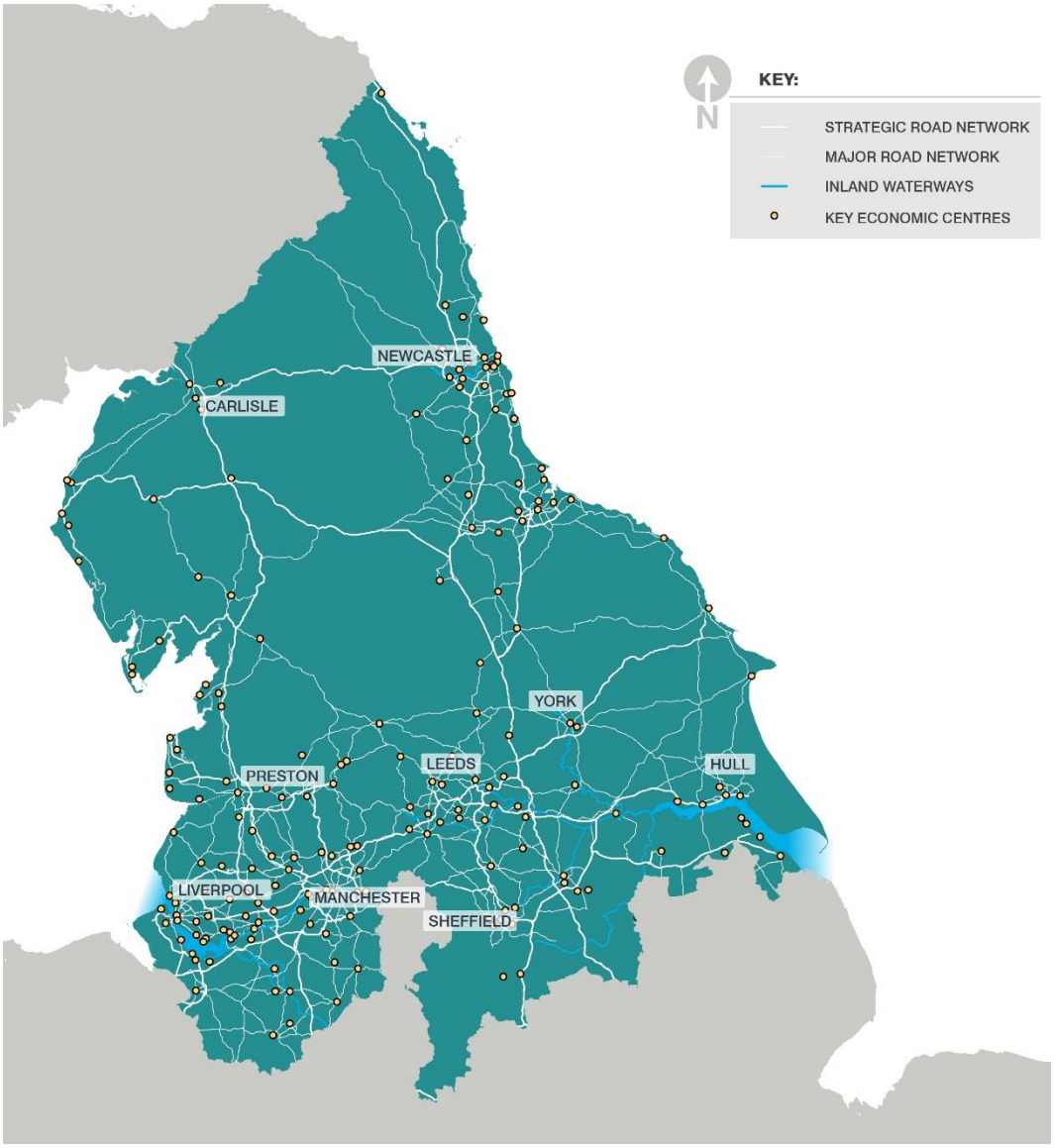

Figure 3 TfN Major Road Network

2.6.2 Rail Network

The North of England has an extensive rail network ranging from faster main lines to rural branch lines and freight-only lines into and out of ports for example.

The main north-south rail routes include:

- West Coast Main Line (WCML) from Scotland / Liverpool and Manchester to London Euston through the North of England via Crewe;
- East Coast Main Line (ECML) from Scotland / Newcastle / Leeds / Middlesbrough / Hull / York / Darlington to London Kings Cross through the North of England via Doncaster; and
- Midland Main Line (MML) from Sheffield to London St Pancras.

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such that the transportation of goods is undertaken efficiently in terms of lower unit rates and reduced transit times both within the region and across its boundary connections

Beyond the linkage to the above conditional outputs, the vision for rail freight is that it will act as a complementary mode of transport to road. Rail freight will have aims in this regard to reduce the environmental impact of the movement of freight, and also play a significant role in relieving road congestion. Such vision will by necessity need to be tempered with an appreciation of the commercial impact of such a modal shift taking due account of rail's advantages (bulk movements along defined corridors) and limitations (not suitable for low volumes to diverse destinations).

A large proportion of the Northern rail freight has historically been related to movements of coal between ports and inland power stations. It was also linked with heavy industry such as the making of steel. These volumes are now falling as the UK switches to a lower carbon economy and with the loss of significant portions of the country's heavy industry. However this provides an opportunity to utilise the released capacity to the benefit of other commodities where it is in the right place to do so.

The North's rail network is shown in Figure 4.

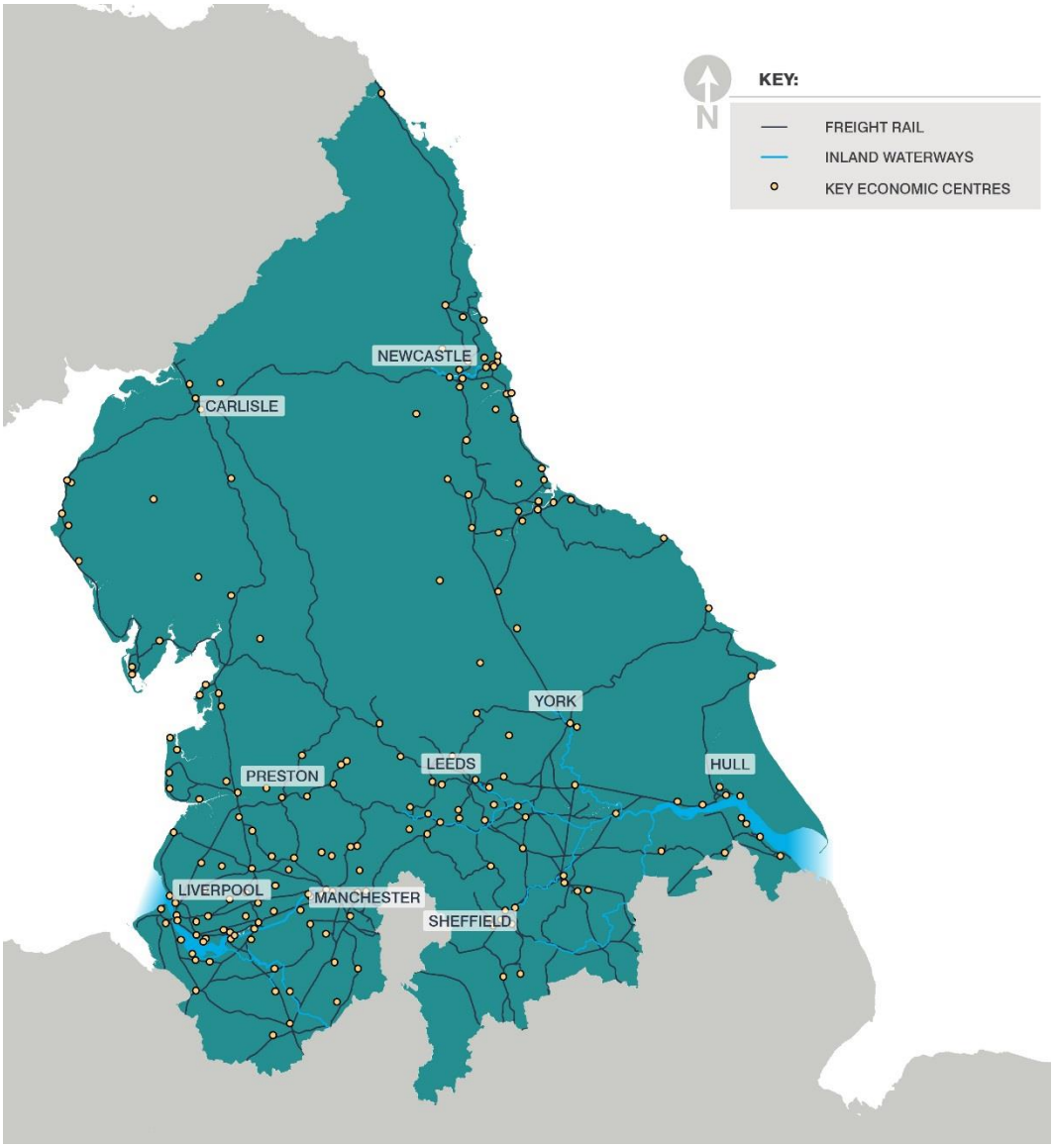

Figure 4 North of England Rail Network

2.7 Key Freight Operators

The North of England is home to a number of freight and logistics organisations of varying sizes and complexities. Generally these can be split into four areas:

- Distribution – Logistics companies that use a wide range of solutions to transport goods throughout the North of England. This could include road, rail, water or air transport;
- Ports – Organisations that own and operate the North's various ports;
- Rail Freight Operating Companies (FOCS) – Organisations that operate rail freight trains on the UK rail network; and
- Shipping Lines – Organisations that provide short or deep sea shipping services into or out of ports in the North of England.

Examples of these organisations are included in Figure 5.

Distribution and Haulage	Rail Freight Operating Companies (FOCs)	Shipping Lines and Freight Forwarders	Ports and Terminal Operators
• Royal Mail • DHL • Wincanton • DPD Group • UPS • Kuehne + Nagel • Whistl UK • Yodel Distribution • Eddie Stobart Logistics • Gist • Clipper Logistics Group • Turners (Soham) • FedEx UK • WH Malcolm • CM Downton • JG Russell • Harry Yearsley • Canute Haulage • Prestons of Potto • Reed Boardall • Bowker Haulage	• DB Cargo • Freightliner • GB Railfreight • Direct Rail Services (DRS) • Colas Rail • Devon & Cornwall Railways (DCR)	• DFDS Seaways • Stena Line • P&O Ferries • Isle of Man Steam Packet • Maersk • Grimaldi Lines • Bibby Line Group • Seatruck • Mediterranean Shipping Company (MSC) • Atlantic Container Line UK Ltd (ACL) • Independent Container Line (ICL) • BG Freight Line • Express Cargo UK • UK Freight Forwarding • Tuscor Lloyds • Interspan	• Peel Ports • Associated British Ports (ABP) • PD Ports • Port of Tyne • Cumbria County Council • Swissport • Kerry Logistics • Evergreen Shipping • Stobart Group

Figure 5 Key Freight Operators

In addition, freight is also carried by air, however in the North of England this is more likely to be moved by long-haul passenger aircraft operating into and out of Manchester Airport such as Emirates Airlines, Qatar Airways, Etihad Airways, Cathay Pacific Airways and Singapore Airlines. Other Northern airports are looking to grow their air freight activity and are lobbying hard to ensure that the last mile of route of the major road network doesn't impede the speed and efficiency of delivery of airfreight to the airports.

3 Methodology

3.1 Introduction

The data used to inform the current and future freight forecasts analysis within this report is based upon model outputs from the Great Britain Freight Model (GBFM) which is developed and maintained by MDS Transmodal .

This section highlights how the model has been used to provide the data for the scenarios examined within this report.

3.2 The Great Britain Freight Model (GBFM)

GBFM is a four stage freight transport model. Over the last ten years GBFM has been used by a wide variety of ports and warehouse developers, as well as public sector bodies at a regional and national level, including for road freight forecasts as part of the DfT's National Transport Model (NTM).

3.3 Methodology

GBFM uses the available official freight transport statistics to develop a multi-modal base year matrix for 2016 for this study. It then explains the observed freight transport movements in terms of generalised costs, reflecting how the freight transport industry determines the choice of mode and allowing future market and policy-based scenarios to be developed for any future year where these scenarios affect generalised cost of freight transport.

GBFM was used in the initial freight and logistics report published by TfN and included a demand forecasting module allowing demand to be forecast up to 2043 including origins and destinations for both domestic and short sea international movements so that both domestic and international movements by ferry can be modelled.

For this subsequent enhanced analysis, the economic output from the Northern Powerhouse Independent Economic Review (NPIER) was included in the future year scenario whereby the future year was 2050.

To produce the outputs for the future year scenario which is referred to in the report as the 2050 Do Nothing with NPIER Growth scenario the following process was followed:

- MDS Transmodal built on the previous major work undertaken for the TfN Freight & Logistics Strategy (September 2016) for which there were 2033 and 2043 "Do minimum" outputs (without NPIER growth) (see below)
- To generate 2050 outputs a continued trend through 2033 & 2043 to extrapolate to 2050 (without NPIER growth) was assumed;
- For each TfN zone the 2050 Business-As-Usual (BAU) forecast of GVA & population was used. These were compared to the equivalent (higher) 2050 forecasts in the NPIER transformational scenario.

- For each zone, two scale-up factors for 2050 were calculated:
    - GVA in the NPIER transformational scenario) / (GVA in BAU); and
    - Population in the NPIER transformational scenario) / (Population in BAU).
- An average of the above two figures was taken to give a scale-up factor for freight tonnes to/from each TfN zone; and
- For any freight journey this scale-up factor was calculated for the origin and the destination zone and the traffic was scaled up by the average for the origin and destination to give results for the 2050 NPIER transformational scenario.

The full assumptions for the modelling work carried out by MDST are contained within the documents prepared as part of the initial Freight and Logistics Study whereby the Phase 1 Baseline Report sets out the assumptions and methodology for calculating the baseline freight volumes.

The TfN Freight and Logistics Study Technical Appendices document sets out how the future year forecasts were created in more detail aside from the process outlined above.

3.4 Representation of the Data

The GBFM model outputs have been analysed using ArcMap GIS software, to handle geographic data and create visual representations of current and future forecast freight flows to, from and within the north of England. For each mode of transport, these outputs take the form of a route based network with two-directional freight flows, as modelled for different scenarios, connected to each section of route.

GBFM model outputs distinguish by mode of transport, and this is reflected in the representation of the data:

1. **Road Freight**: two data types – annual volume in cargo tonnes and number of HGVs;

2. **Rail Freight**: two data types – annual volume in cargo tonnes and number of rail paths used; and

3. **Waterborne freight**: one data type – annual volume in cargo tonnes.

Volume in cargo tonnes has been used as the main basis for representation of the data, as this data type is available for each mode thereby making direct comparison possible.

Two primary visualisation methods have been used to represent the data:

1. Flow volumes indicated through **line thickness.**
   The data has been grouped in bandwidths, created as appropriate based on

the range and distribution pattern for flow values within each individual data set, with line thicknesses scaled to the mid-point of each bandwidth.

Where possible, line thickness representation scales have been created to match within each group of figures, so that they are instantly visually comparable.

A minimum significance threshold has been created for each data set in order to visually represent it, with the base transport network shown where freight flows remain below this threshold.

2. Flow volumes indicated through a **heat map colour scale**.

   This is used only in the Key Corridors figures, with methodology is applied as above.

3.4.1 Road and Rail Freight data

The road and rail freight data for each scenario has been used to calculate and 'difference' figures, comparing between:

- 2050 Do Nothing (without NPIER) to 2050 Do Nothing (with NPIER); and
- 2016 Base to 2050 Do Nothing (with NPIER).

The differences in freight flows are represented graphically through line colour, with yellow lines used to represent growth and dark blue lines used to represent decline.

The GBFM model outputs for road and rail freight also distinguish between movement types as follows:

- Domestic: freight movement to/from/within TfN and South England/Wales/Scotland
- Through: domestic freight movement through TfN (i.e. between South England/ Wales and Scotland)
- UK Import freight movement
- UK Export freight movement

In addition, the road and rail freight model outputs have been analysed by commodity group, although there are no 2050 forecasts for road split by commodity group due to the limitations of inputs available for this type of modelling.

3.4.2 Waterborne Freight data

The GBFM outputs for waterborne freight were in the form of an OD matrix, which was analysed using spreadsheet software to calculate annual cargo tonnes values for representation. Analysis focuses on six 'Port Groups' within TfN, as follows: Humber Ports, Tees Ports, Tyne & Wear Ports, Mersey Ports, Lancashire

Ports, and Cumbrian Ports. The import and export freight movements which travel through these are represented on separate figures.

The origin/destination regions in the UK (3 within TfN) were grouped into six areas as follows: North East, North West, Yorkshire & Humber, Other England, Wales and Scotland.

Outside the UK, the origin/destination country groups have been analysed and represented in eight areas as follows, broadly in relation to their location relative to the UK: Irish Republic, Northern Europe, Central Europe, Southern Europe, Far East & the Gulf, Africa, North America and Latin America.

3.4.3 Key Corridors

The GBFM outputs used in the key corridors analysis were in the form of an OD matrix, which was analysed using spreadsheet software to calculate annual cargo tonnes values for representation. This combines the road and rail modes, so represents all land surface based freight movement. The flows are represented on the basis of the 2050 Do Nothing (with NPIER) growth scenario. Flow volumes are indicated through a heat map colour scale, with darker shades for larger freight volumes.

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increase in freight by inland waterway. In addition, the heaviest growth occurs on the rail network.

Table 2 North of England Growth (Tonnes Lifted)

Mode	Growth from: 2016 Base > 2050 Do Nothing (without NPIER)		Growth from: 2016 Base > 2050 Do Nothing (with NPIER)		Growth from: 2050 Do Nothing (without NPIER) > 2050 Do Nothing (with NPIER)	
	Tonnes Lifted	**Growth**	**Tonnes Lifted**	**Growth**	**Tonnes Lifted**	**Growth**
Road	129,273,060	22.5%	189,868,998	33.1%	60,595,938	8.6%
Rail	12,727,125	28.9%	17,554,885	39.8%	4,827,760	8.5%
Waterway	-	0.0%	1,486,217	11.6%	1,486,217	11.6%
Total	**142,000,185**	**22.5%**	**208,910,100**	**33.1%**	**66,909,916**	**8.7%**

A more accurate metric for measuring mode share is through analysing tonnes kilometres. As freight is generally moved over longer distances by rail it is more accurately reflected using this metric where the total freight is multiplied by the distance it travels.

Table 3 outlines the mode share based on tonne kilometres and shows that the rail mode share has increased. Using this metric however does show the rail mode share decreasing throughout the three scenarios reflecting longer haulage distances by road which is generally driven by the growth in e-commerce and increased consumer spending which require more and larger National Distribution Centres (NDCs) and Regional Distribution Centres (RDCs), often only connected by road. This trunking of goods between NDCs and RDCs is driving the increasing distances that road freight vehicles travel.

Table 3 North of England Mode Share (Tonne Km)

Mode	2016 Base		2050 Do Nothing (without NPIER)		2050 Do Nothing (with NPIER)	
	Tonnes Km	**Mode Share**	**Tonnes Km**	**Mode Share**	**Tonnes Km**	**Mode Share**
Road	71,841,903,276	87.2%	107,035,877,428	88.0%	116,257,849,963	88.0%
Rail	9,994,744,474	12.1%	14,087,404,401	11.6%	15,284,660,792	11.6%
Waterway	526,873,283	0.6%	526,873,283	0.4%	587,949,522	0.4%
Total	**82,363,521,033**	100.0%	**121,650,155,112**	100.0%	**132,130,460,277**	100.0%

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quantities of construction materials will be required to be moved. An example of such developments are those which occur along the Energy Coast in West Cumbria between 2020 and 2030. It is understood that the freight demand to support the new and existing developments on the Cumbrian Coast Line could include the following services, many of which are additional to the existing demands placed on the line:

- Nugen/Moorside – 4 Trains per day
- National Grid – 3 trains per day
- Low Level Waste Repository – 3 trains per day;
- West Cumbria Mining – 6 trains per day;
- Sellafield – 2 trains per day;
- Port of Workington – 1 train per day; and
- Port of Barrow – 2 trains per day.

The Cumbrian Coast Line needs to support these major developments and the capacity of line is significant constraint.

Whilst the mapping of future freight flows does not reflect the demands created by developments such as those listed above (the construction period will have been completed by 2050), they should be considered within each of the respective Strategic Corridor Studies where any required interventions should be identified.

4.2 Road Freight

4.2.1 Operation

The road haulage sector is the UK's fifth largest employer. It is a highly competitive, low-margin business and is service-driven responding to customer demand which fluctuates depending on a number of factors including seasonality and the economic outlook.

Most operators within the road haulage sector work within a licensing system that is highly regulated. There are exceptions for smaller vehicles under 3.5 tonnes.

4.2.2 Commodities

A wide variety of commodities are moved around to, from, within and through the North of England by road. The modelling exercise has grouped these into six main categories, namely:

- Temperature Controlled Foodstuffs;
- Other Foodstuffs;
- Construction and Metals;

- Crude Materials and Manufactured Items;
- Petrol and Petroleum Products; and
- Other Bulks.

Examples of types of freight under each category are shown in Table 5.

The road commodities are only provided for the 2016 year scenario due to limitations with the model however later in the report, total freight flows by commodity irrespective of mode have been analysed and assumptions have been made to calculate the likely forecast volumes for road.

Of the six commodity categories for road, no indication has been made on which are categorised as intermodal (unlike the rail commodity groups). For the purposes of the analysis in this report, it is assumed that Temperature Controlled Foodstuffs, Other Foodstuffs and Crude Materials and Manufactured Items could all be transported in intermodal containers.

Table 5 GBFM Road Freight Commodity Groups

1. Temperature Controlled Foodstuffs	2. Other Foodstuffs	3. Construction and Metals
• Fresh / Fruit and Veg • Perishable Foodstuffs	• Cereal • Potatoes • Sugar Beet • Live Animals • Sugars • Beverages exc. Tea & coffee • Stimulants and spices • Other non-perishable foodstuffs • Animal Fodder & Foodstuff & Waste • Oil, seeds & oleaginous fruit & fat	• Wood and cork • Pig iron, ferro-alloys • Semi-finished rolled steel product • Iron & steel bars, rods, rail & tramways • Steel sheets, plates, hoop & strip • Tubes, pipes, iron & steel castings • Non-ferrous metals • Sand, gravel, clay & slag • Sal, iron pyrites, sulphur • Other stone earths & minerals • Cement and lime • Plasters • Other manufactured building materials • Manufacturers of metal • Glass, glassware and ceramic products

4. Crude Materials and Manufactured Items	5. Petrol and Petroleum Products	6. Other Bulks
• Textiles • Raw animal & veg material • Paper pulp & waste paper • Transport equipment • Tractors, agricultural machinery • Other machinery apparatus / appliance • Leather, textiles and clothing • Automotive • Miscellaneous manufactures • Misc. articles	• Crude petroleum • Fuel derivatives • Gaseous hydrocarbons, liquid • Non fuel derivatives • Coal chemicals	• Coal • Lignite and peat • Coke • Iron ore • Non-ferrous ores and waste • Iron and steel waste and blast furnace dust • Natural fertilisers • Chemical fertilisers • Basic chemicals • Aluminium oxide and hydroxide • Other chemical products

Appendix A1 presents the mapped commodity flows by road across the North of England for 2016.

All of these commodities can be moved by road, rail and water with infrastructure and capacity often a key limiting factor (in addition to cost). Containerised freight is an example whereby utilising rail and water for longer distance movements may be more attractive. Bulk goods is also another commodity group which is particularly suited to high volume, longer distance movements by modes other that road and rail and water are often a more attractive proposition for bulks.

4.2.3 Total Cargo Movements

4.2.3.1 2016 Base

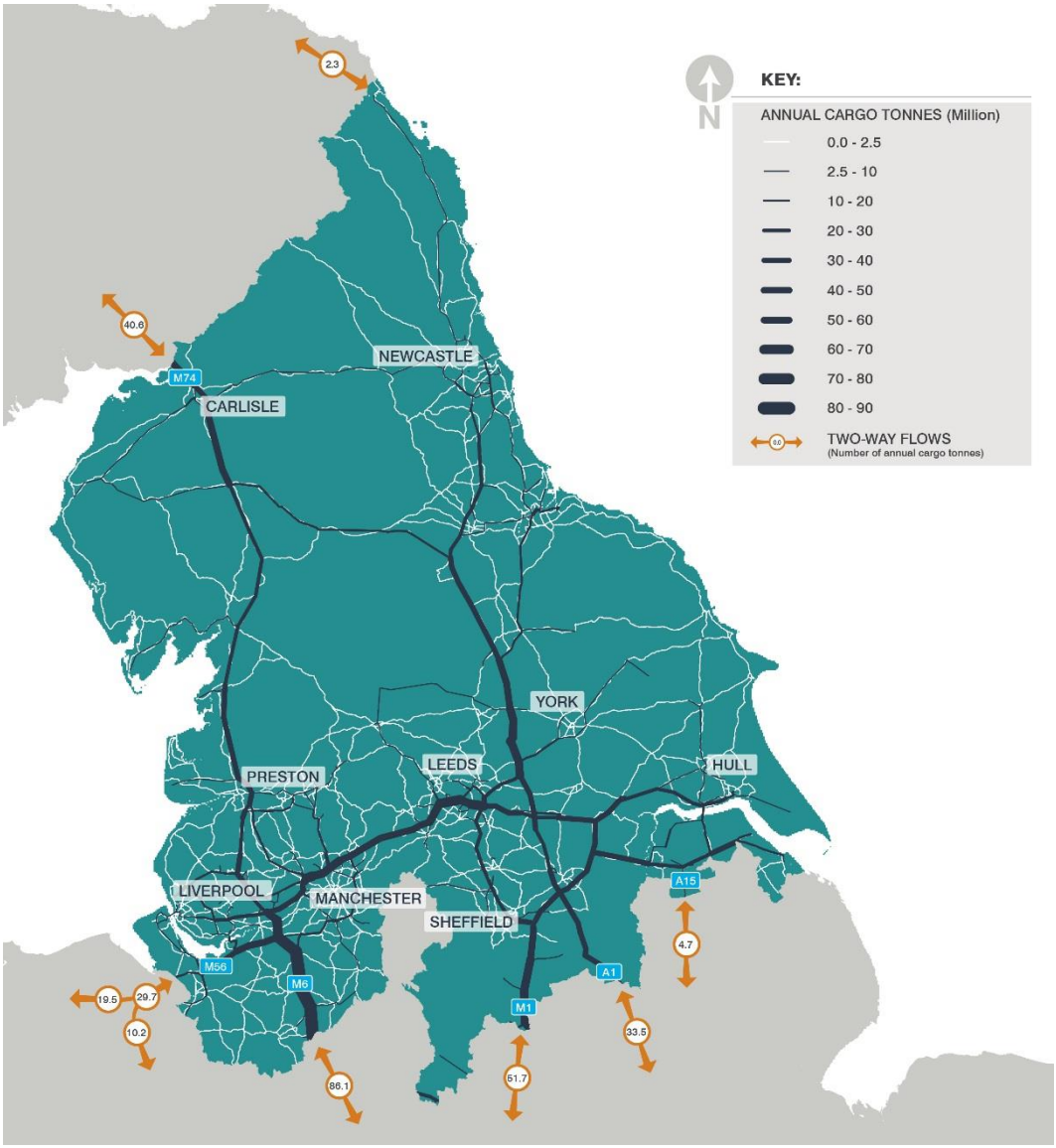

Figure 6 shows the 2016 Base freight flows in cargo tonnes that travels via the Major Road Network (MRN)

The figure shows that in 2016, the heaviest freight flows in the North of England occur on the M6 south of Warrington and on the M62 between Manchester and Leeds. Heavy flows are also shown on the M56 towards North Wales, the A1(M) in North Yorkshire as well as on the M1 to the south of Sheffield. The section of the M6 between Penrith and the Scottish Border to the north of Carlisle also shows significant movements of freight.

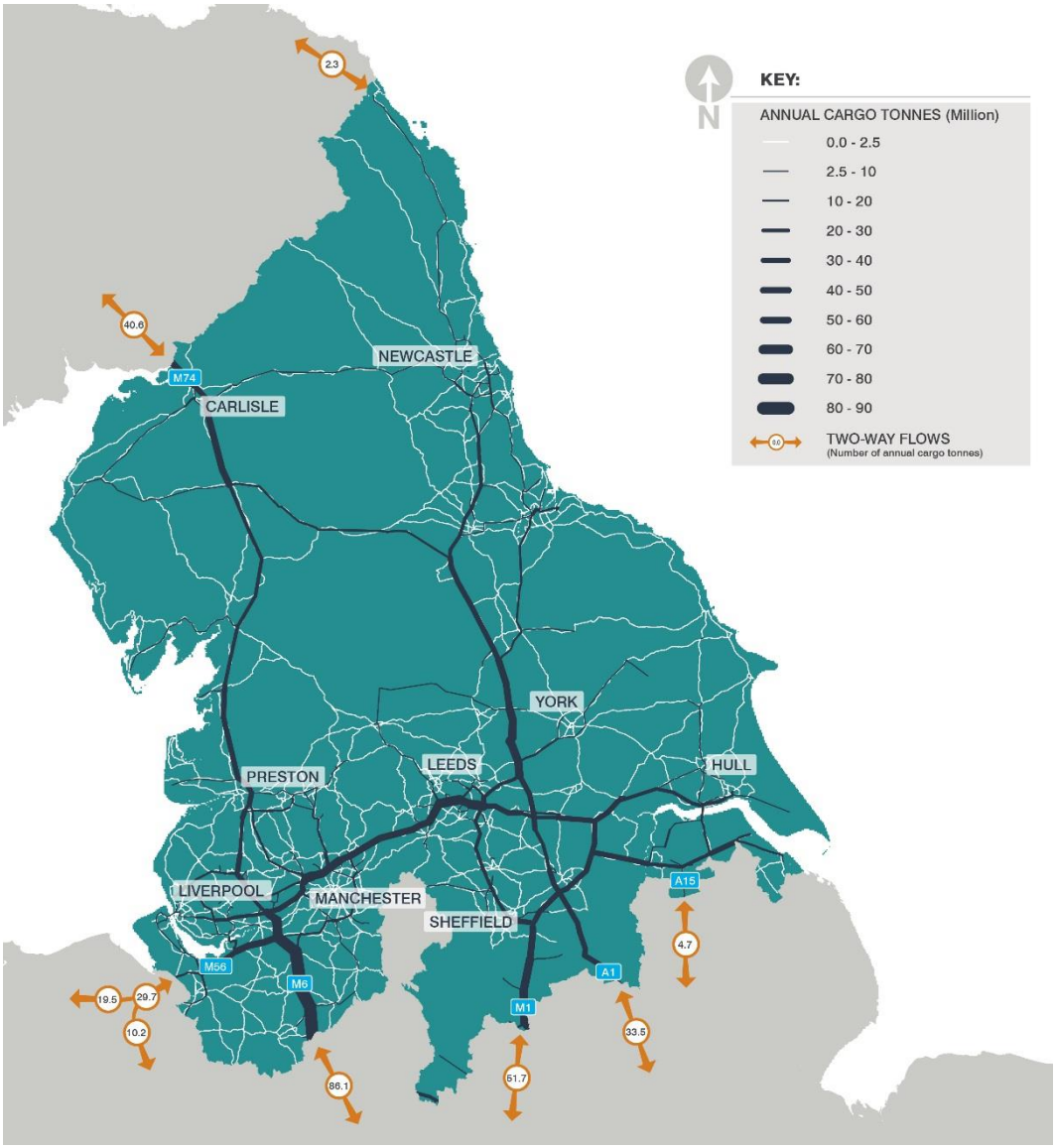

Figure 6 Road Freight (cargo tonnes) - 2016 Base

4.2.3.2 2050 Do Nothing (without NPIER)

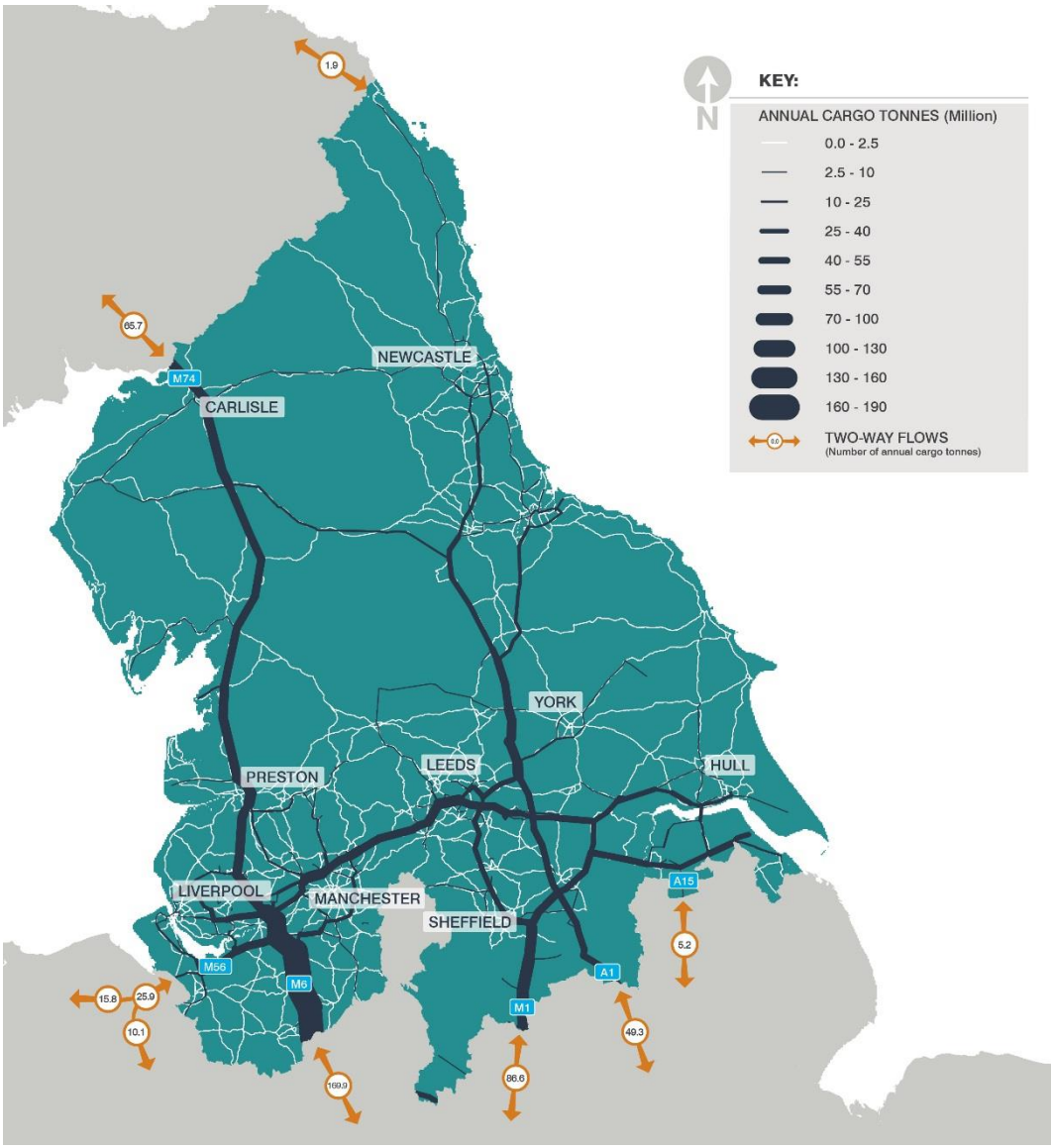

Figure 7 illustrates the forecast freight moved on the MRN in 2050 under the No NPIER growth scenario. Significant flows are forecast particularly on the M6 over its full length but specifically south of the M62 corridor.

The volume of freight moved via the M6 south of the M62 is 160 Million tonnes annually compared with 86 Million tonnes in the 2016 Base scenario.

Significant flows are also shown on the major freight routes including the M62, A1(M), M1 and M180.

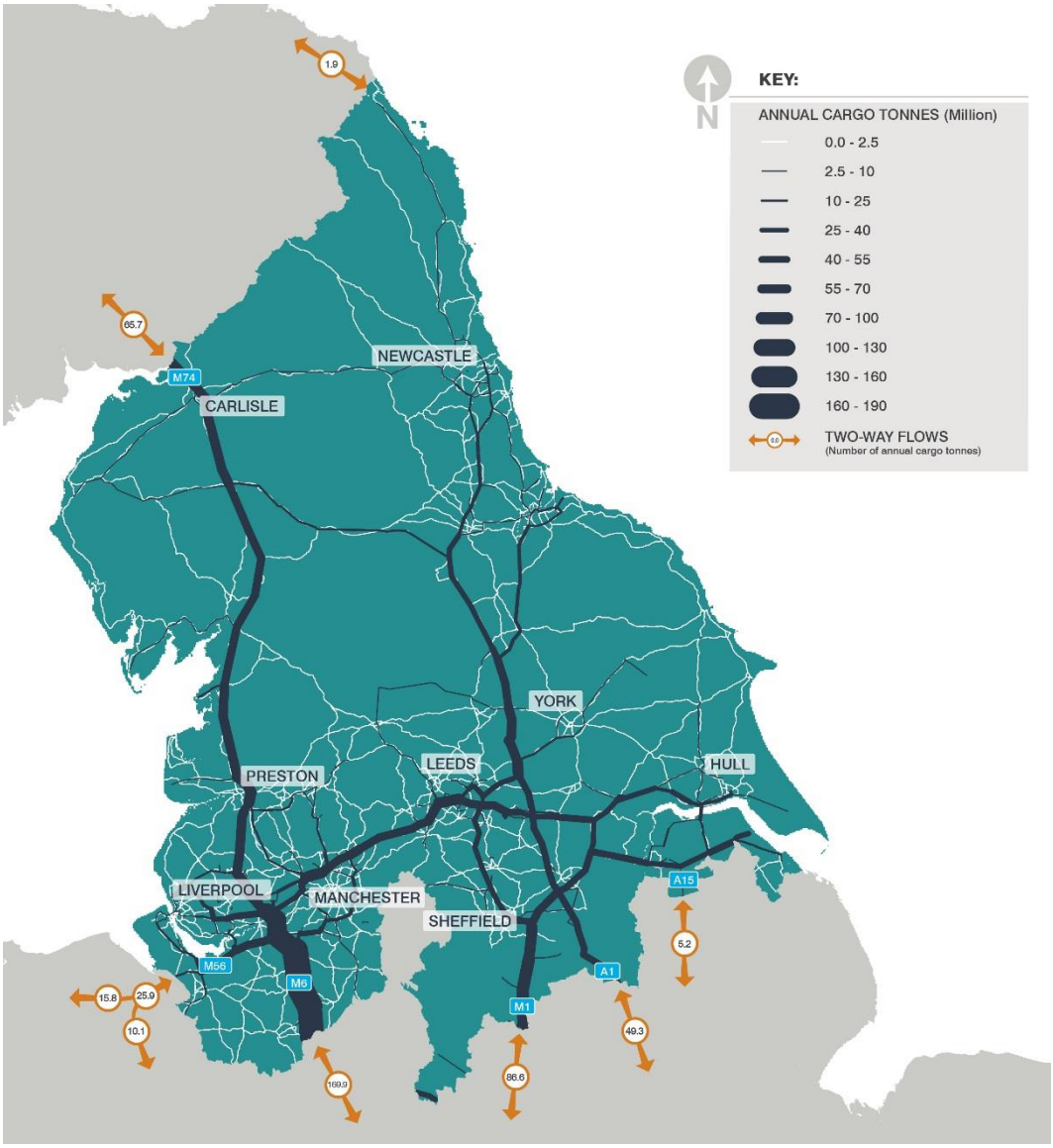

Figure 7 Road Freight (cargo tonnes) - 2050 Do Nothing (without NPIER)

4.2.3.3 2050 Do Nothing (with NPIER)

Figure 8 shows the cargo volumes on the MRN in 2050 under the Do Nothing with NPIER growth scenario whereas Figure 9 shows the difference between the 2016 Base and the 2050 Do Nothing (with NPIER) scenarios.

The figures show that on the existing road network the heaviest road freight flows occur on the M6, particularly south of Warrington and on the east –west axis between Liverpool / North Wales, Manchester, Leeds and the Humber. The A1(M) in North Yorkshire and M1 South of Sheffield also experiencing significant growth in volumes of freight traffic.

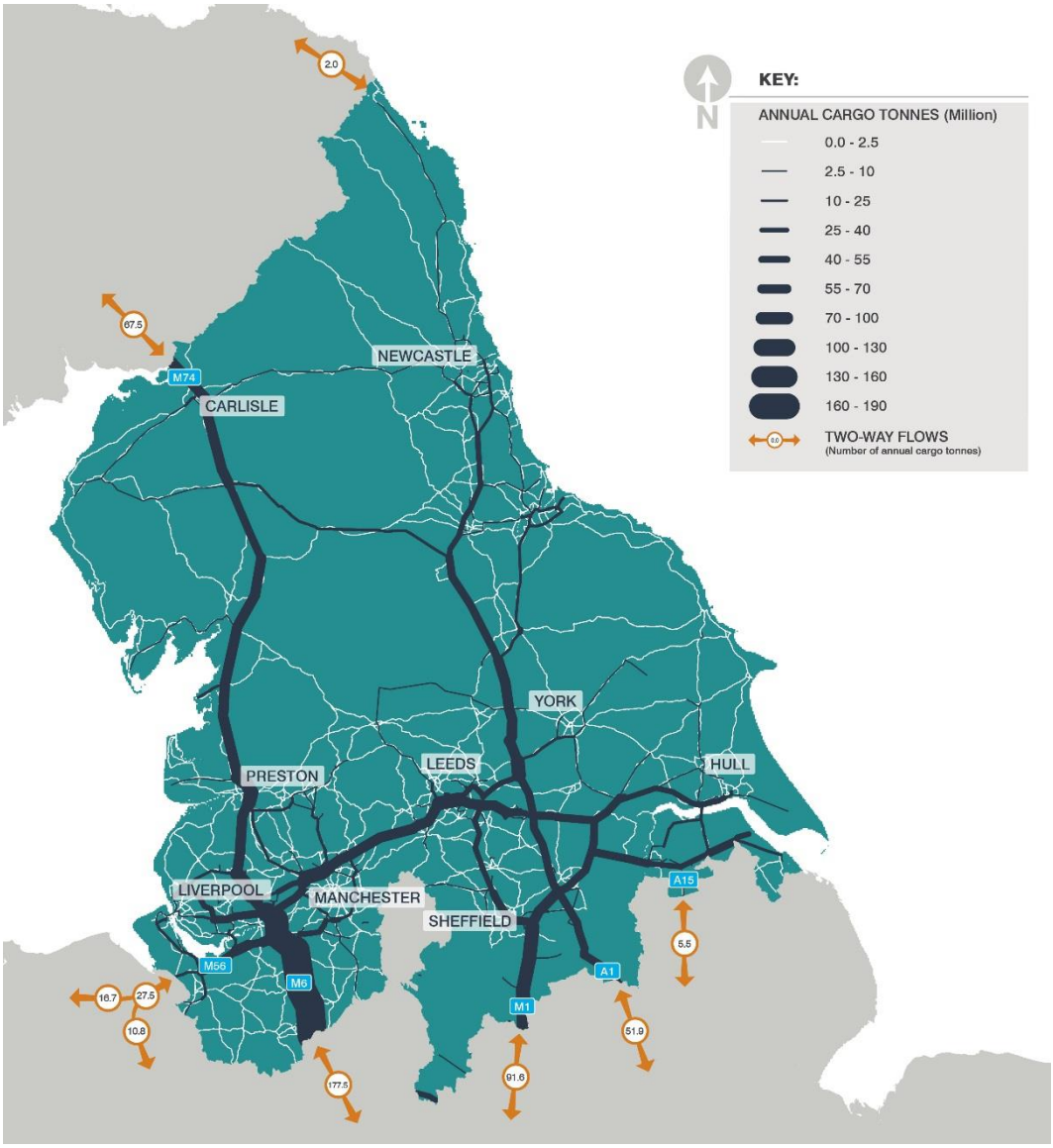

Figure 8 Road Freight (cargo tonnes) - 2050 Do Nothing (with NPIER)

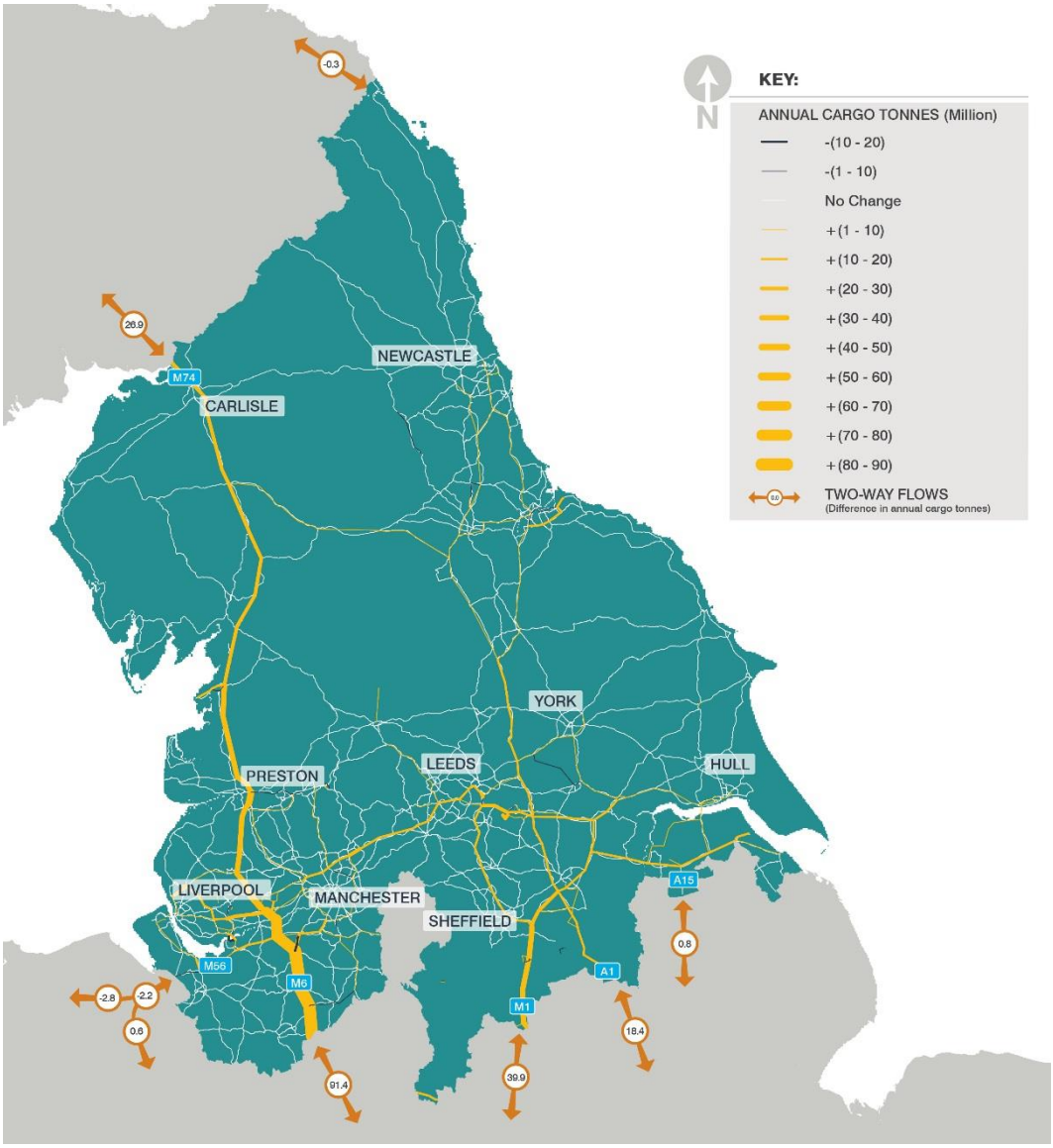

Figure 9 Road Freight (cargo tonnes) - Difference between 2016 Base and 2050 Do Nothing (with NPIER) scenarios

4.2.4 Movement Types

GBFM has been interrogated to analyse the types of road freight moves in the North of England. Movement types are grouped as shown in Table 6.

Table 6 Movement Types

Movement Type	Description
Domestic: To, from and within the North	Domestic freight movements where goods are loaded or unloaded in the North of England at one end of the journey at least.
Domestic: Through the North	Domestic freight movements that are not loaded or unloaded in the North of England but travel through the North to on journeys between other regions e.g. Scotland to Midlands.

International: Imports	Any international freight movements that are imported to UK and that travel within the North of England – this could be via Ports or Airports but within and out with the North of England.
International: Exports	Any international freight movements that are exported from the UK and travel within the North of England – this could be via Ports or Airports but within and out with the North of England.

Each of these has been analysed in the following sections.

4.2.4.1 Domestic: To, from and within the North

The domestic flows are the dominant movement type across the North with the major flows in 2016 shown on Figure 10 and the forecast flows in 2050 (Do Nothing with NPIER scenario) shown on Figure 11.

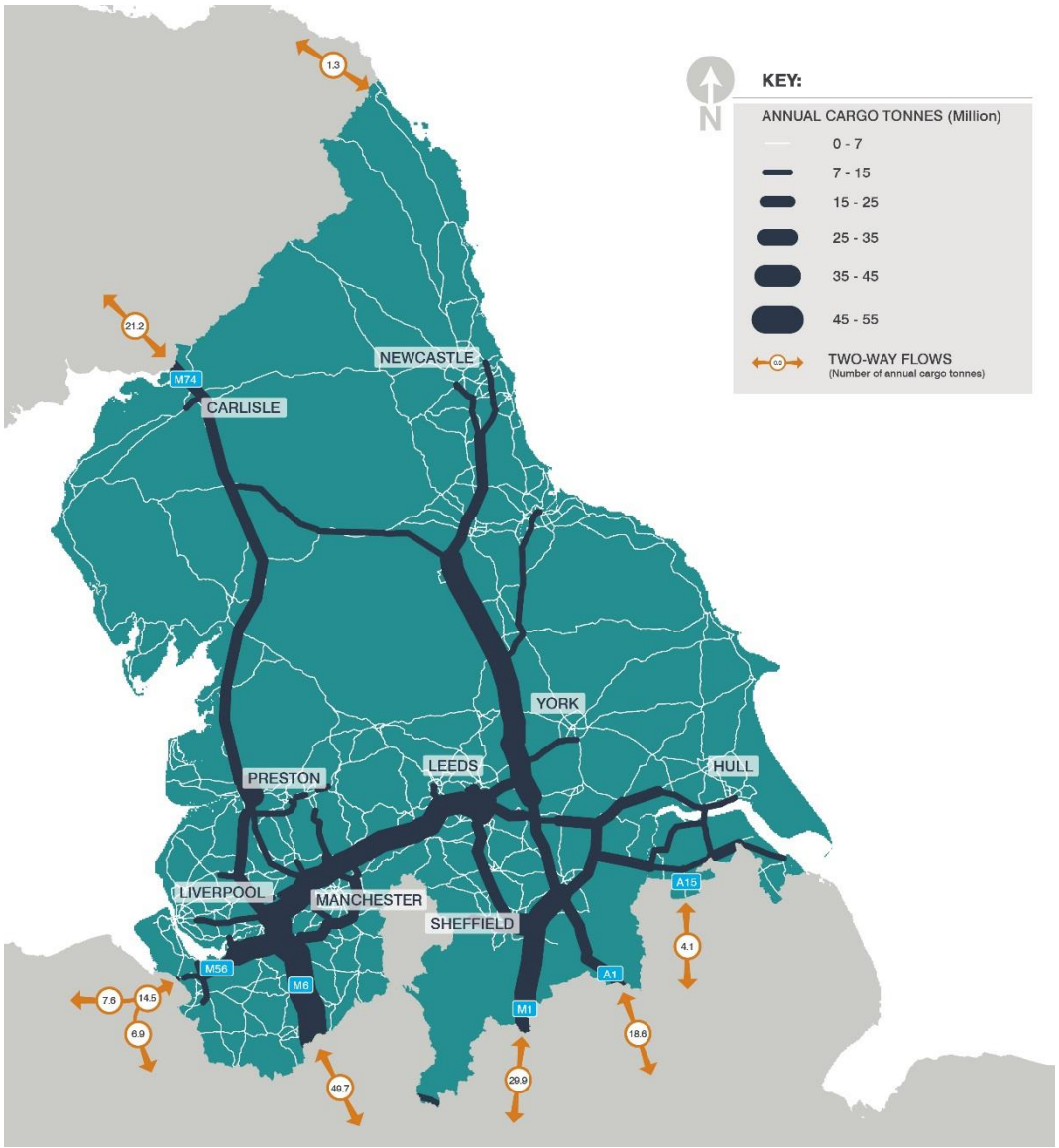

Figure 10 Road Freight Movement Types: 2016 Domestic: To, from and within the North

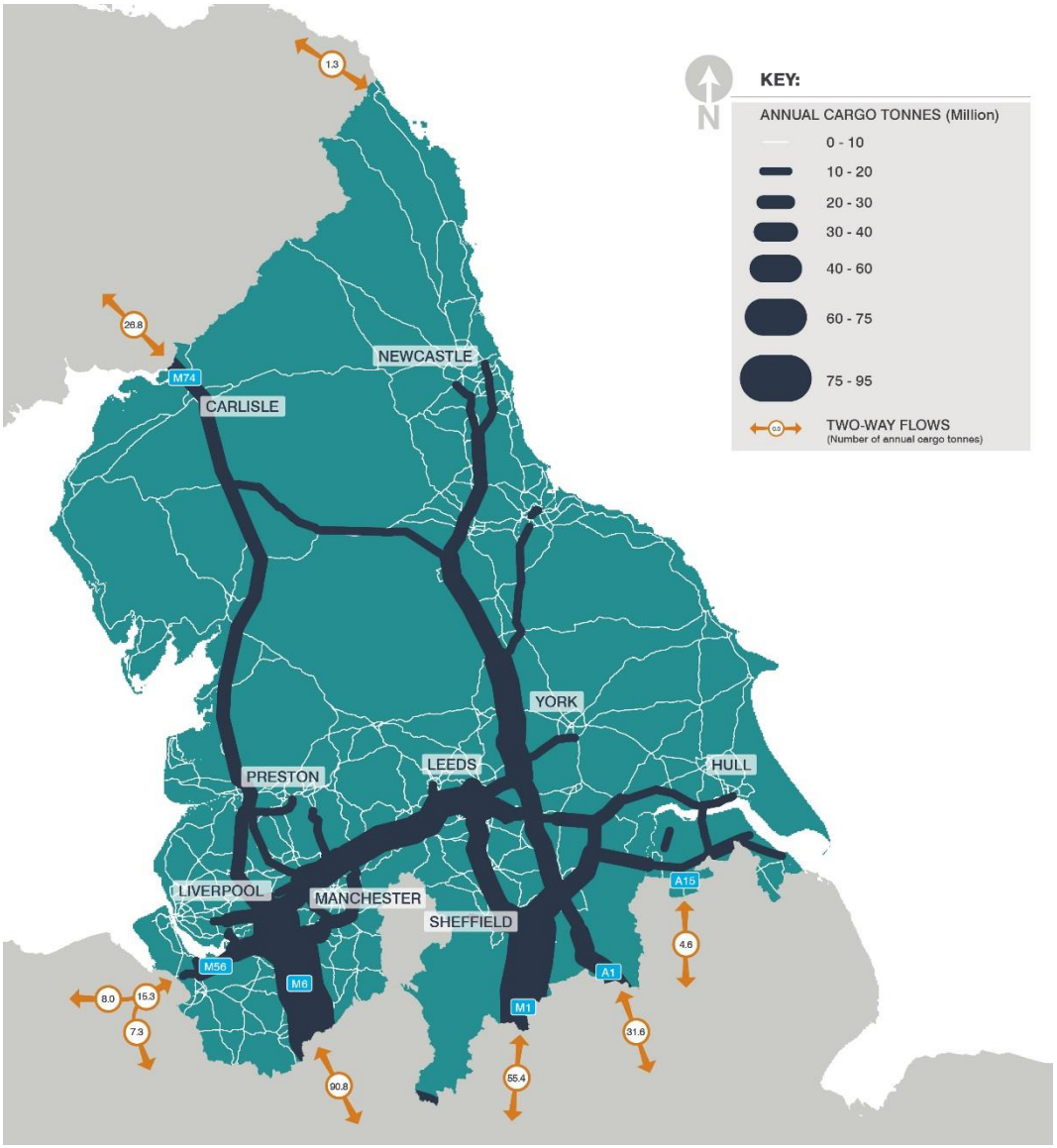

Figure 11 Road Freight Movement Types: 2050 (Do Nothing with NPIER) Domestic: To, from and within the North

A large proportion of domestic freight flows are made up of National Distribution Centre (NDC) to Regional Distribution Centre (RDC) movements on the key trunk routes. These flows increase in line with the growth in consumer spending and as the popularity of online "e-tailers" grows for example.

The growth in cargo tonnes on a selection of the North's strategic routes between 2016 and 2050 is shown in

Table 7. The most significant growth occurs on the M1 and M6 providing links to the Midlands and southern England.

Table 7 Road Freight - Key Strategic Routes Flows - Domestic: To, from and within the North

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	22.1	28.8	30%
M6 - near Lancaster	18.7	23.2	24%
M6 - southern TfN border	53.7	96.0	79%
M62 - between Leeds & Bradford	44.2	54.5	23%
M1 - southern TfN border	40.1	72.7	82%
A1 - southern TfN border	18.6	31.6	70%
M180 - near Scunthorpe	11.3	18.3	61%
M62/A63 - near Hull	14.6	17.1	17%
A1(M) - near Thirsk	33.4	47.1	41%
A66 - between Darlington & Penrith	8.6	11.9	39%

4.2.4.2 Domestic: Through Traffic

The remainder of the domestic flows are made up of movements between regions out with the North of England. These movements include road vehicles transporting goods from the likes of Scotland to the Midlands for example.

The significant domestic through movements in 2016 are shown on Figure 12 with the corresponding forecast for 2050 (Do Nothing with NPIER) shown on Figure 13.

Table 8 illustrates the growth on some of the North's key routes and illustrates that the traffic on the M6 along its length will grow considerably. This growth is attributed to the trend to a model with more NDC and RDC model caused by the move towards next-day-delivery of a wide variety of goods. This move is likely to lead to distribution chains with a very large NDC able to hold a wide variety of goods, which are then trunked overnight to local depots for local delivery. In 2050, more NDCs are forecast within Central England, which are predicted to supply RDCs in both the North of England and in Scotland.

Through the introduction of more and larger NDCs and RDCs to support the growth in consumer spending and the changing ways in which people purchase goods, the average length of haul by road freight increases. For the sorts of cargoes that typically go through warehouses (e.g. Fast Moving Consumer Goods (FMCGs)), the domestic average length of haul increases from 93km in 2016 to 130km in the 2050 Do Minimum scenarios (approximately 1 km per year). This reflects the longer route that road vehicles are travelling.

The figures illustrate however, that the main route for through movements is via the M6 between southern England and Scotland with a smaller proportion of

traffic utilising the A1(M) and A66 before joining the M6 (or vice versa) on journeys to and from Scotland. This route is significantly more popular than the A68 or A1 north of Newcastle as it provides a quicker route to Central Scotland, the majority of which is motorway standard rather than single lane A-roads via other routes.

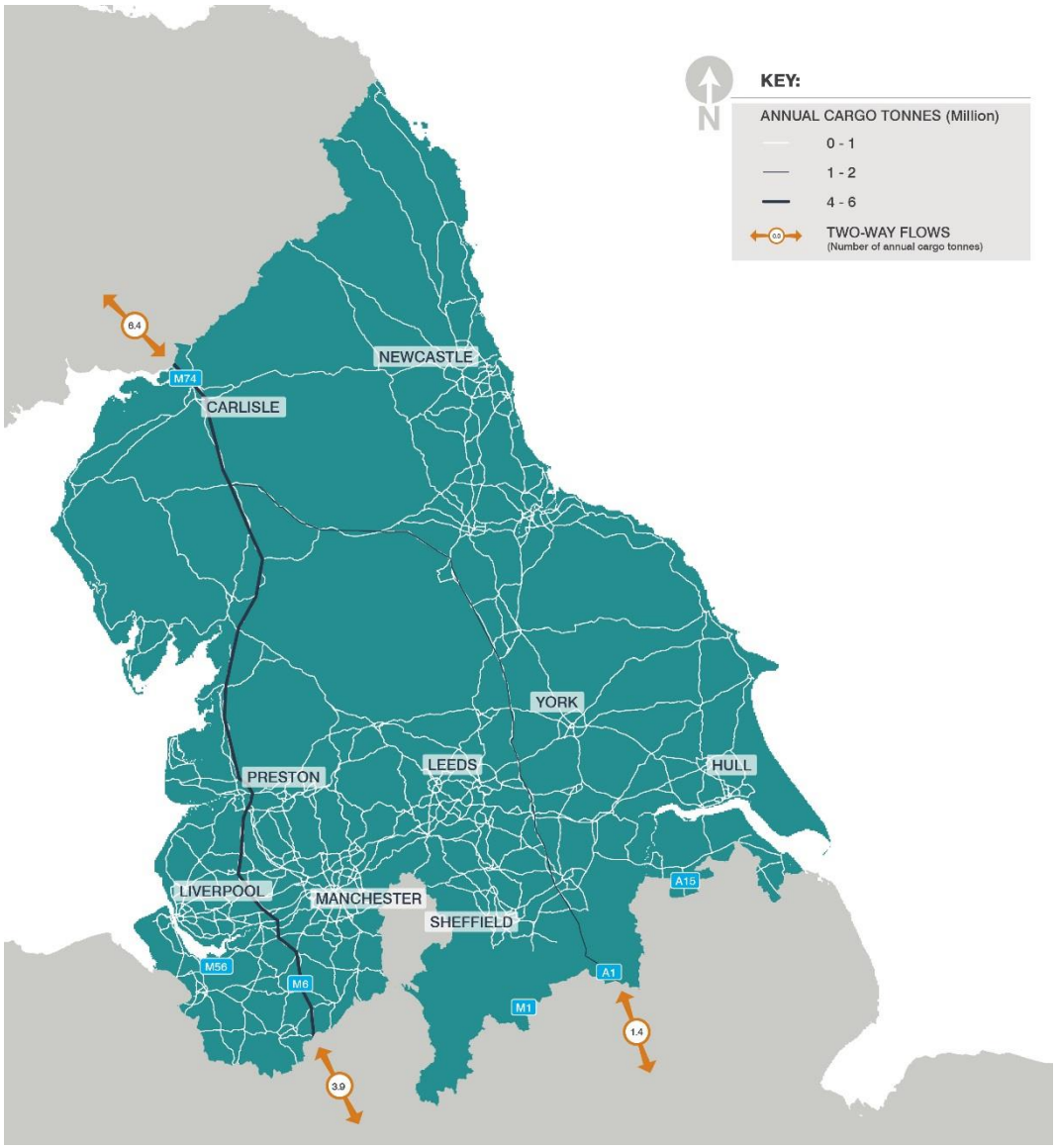

Figure 12 Road Freight Movement Types: 2016 Domestic: Through traffic

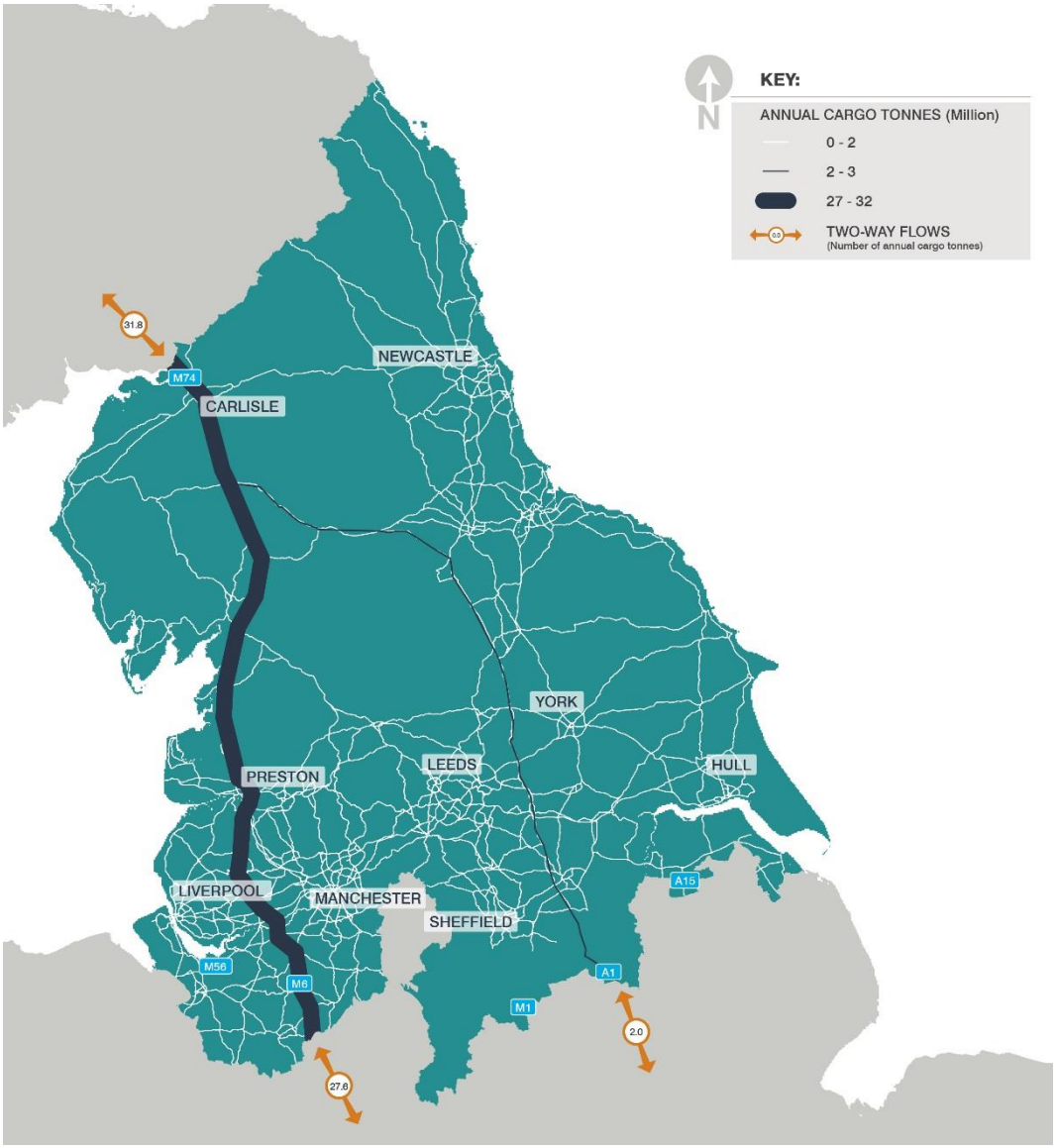

Figure 13 Road Freight Movement Types: 2050 (Do Nothing with NPIER) Domestic: Through traffic

Table 8 Road Freight - Key Strategic Routes Flows - Domestic: Through Traffic

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	6.4	31.9	396%
M6 - near Lancaster	4.8	28.9	507%
M6 - southern TfN border	4.2	28.3	576%
M62 - between Leeds & Bradford	-	-	n/a
M1 - southern TfN border	0.3	0.9	242%
A1 - southern TfN border	1.4	2.0	45%
M180 - near Scunthorpe	0.02	0.02	22%
M62/A63 - near Hull	-	-	n/a

A1(M) - near Thirsk	1.7	3.0	78%
A66 - between Darlington & Penrith	1.7	2.9	77%

4.2.4.3 International: Imports

Of the international freight moved within the North, imports are most dominant. All freight that has been imported to the North of England in 2016 is shown on Figure 14 with the forecast 2050 (Do Nothing with NPIER) flows shown on Figure 15.

The imported freight moved by road is focussed on the Ports, particularly on the Mersey, Humber and Tees as well as existing freight terminals such as Trafford Park in Manchester.

Table 9 illustrates the growth in imported freight on some of the North's key routes. The figures show a decrease in imports between Scotland and the North with negative growth on both the M6 (north of Penrith and the A66 between Penrith and Darlington. Significant increases in import traffic is experienced on the M1 and M180 as well as on the M6 south of the M62 corridor.

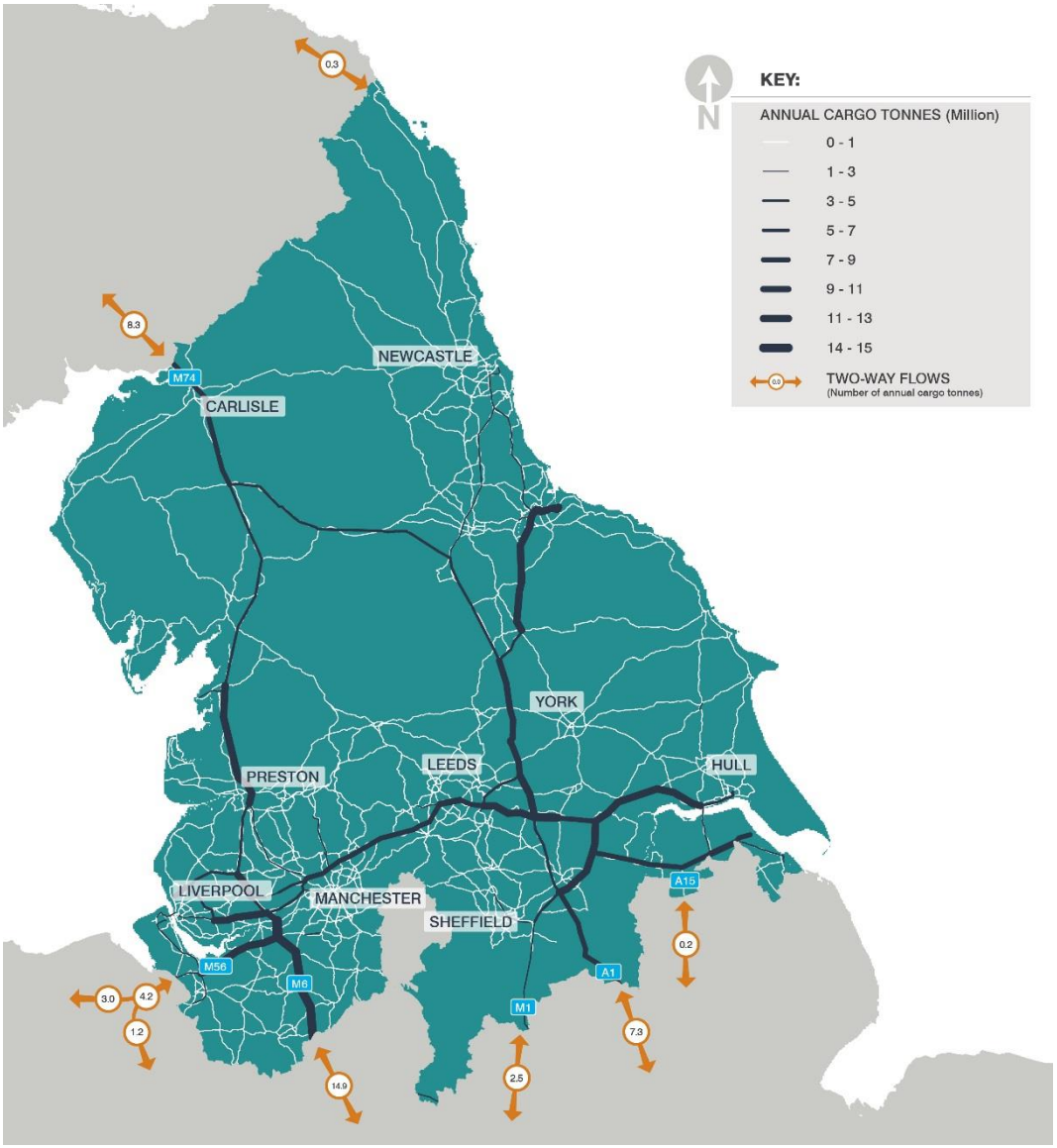

Figure 14 Road Freight Movement Types: 2016 International – Imports

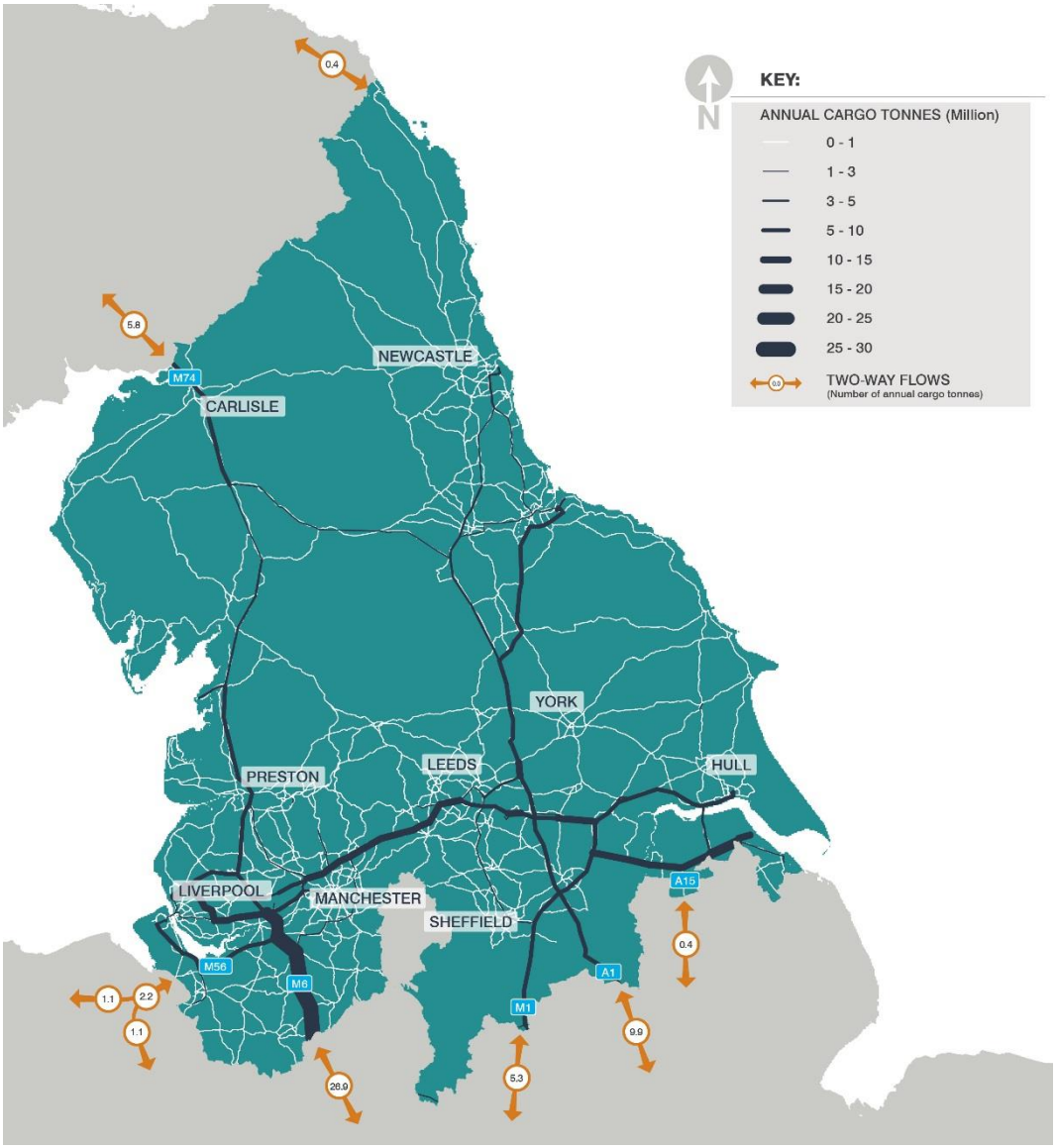

Figure 15 Road Freight Movement Types: 2050 Do Nothing (with NPIER): International – Imports

Table 9 Road Freight - Key Strategic Routes Flows - International: Imports

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	7.8	5.2	-33%
M6 - near Lancaster	5.2	7.2	38%
M6 - southern TfN border	15.0	27.3	82%
M62 - between Leeds & Bradford	9.0	11.9	31%
M1 - southern TfN border	2.9	6.1	114%
A1 - southern TfN border	7.3	9.9	35%
M180 - near Scunthorpe	7.4	12.9	76%
M62/A63 - near Hull	5.4	7.5	41%

A1(M) - near Thirsk	9.3	9.9	7%
A66 - between Darlington & Penrith	4.7	2.9	-38%

4.2.4.4 International: Exports

Exports account for less of the international freight moved by road in the North of England due to the nature of the UK's manufacturing capabilities. Figure 16 illustrates the export freight moved by road in 2016 with the forecast 2050 (Do Nothing with NPIER) flows shown on Figure 17.

The figures show that in 2016 the main exports routes are to and from the Ports, particularly on the Humber and the Mersey. There are also significant export flows from the east coast ports towards Scotland utilising the A66.

In 2050, the flows change to become more focused on the Mersey and Humber ports however, a significant flow is also shown as using the Port of Heysham in Lancashire. There is a reduction in export traffic to and from Scotland, however the flows increase heading to Southern England on the M6 and A1(M) in particular.

The major growth in exports is focused on the east-west corridor between Liverpool and Hull as well as the north-south corridors to the south of the M62. In addition, there is a decline of export traffic into and out of Scotland on the northern section of the M6 and across on the A66 as shown in Table 10.

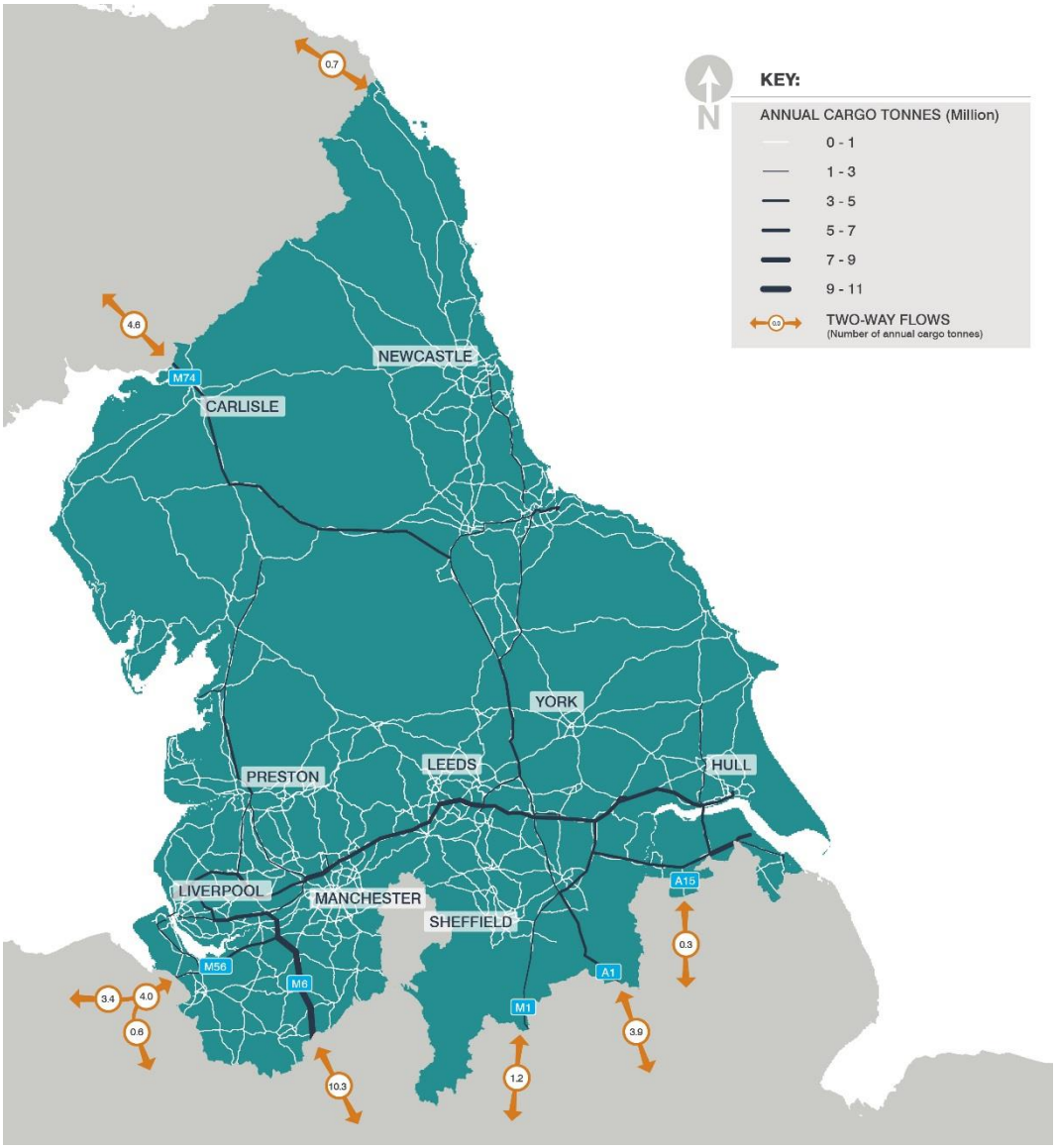

Figure 16 Road Freight Movement Types: 2016 International – Exports

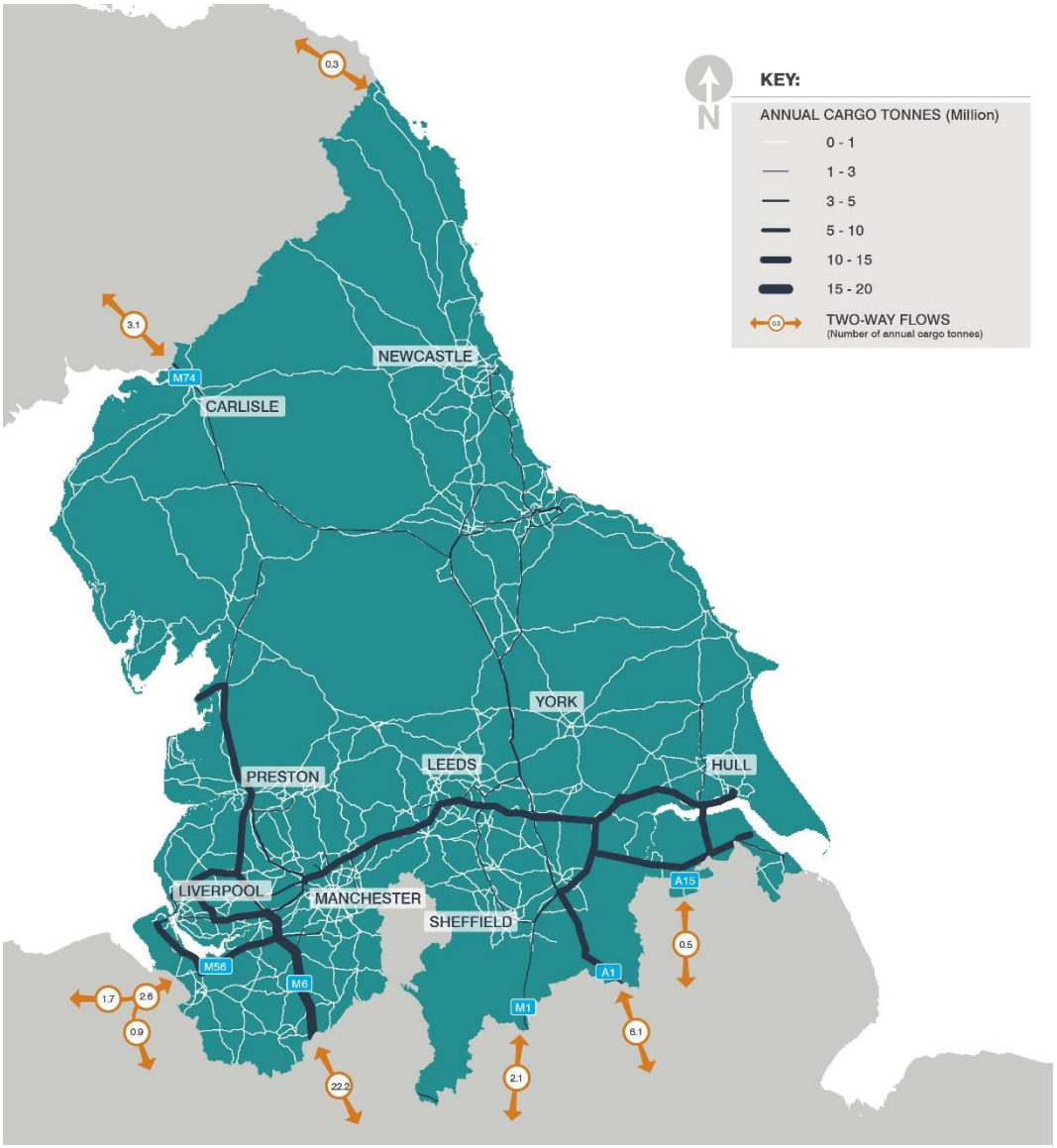

Figure 17 Road Freight Movement Types: 2050 Do Nothing (with NPIER): International – Exports

Table 10 Road Freight - Key Strategic Routes Flows - International: Exports

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	4.3	2.5	-41%
M6 - near Lancaster	3.0	9.8	227%
M6 - southern TfN border	10.3	22.3	116%
M62 - between Leeds & Bradford	7.2	11.9	65%
M1 - southern TfN border	1.5	2.6	74%
A1 - southern TfN border	3.9	6.0	56%
M180 - near Scunthorpe	3.9	6.8	73%
M62/A63 - near Hull	5.4	8.1	49%

A1(M) - near Thirsk	4.1	3.3	-20%
A66 - between Darlington & Penrith	3.7	2.8	-24%

4.2.5 Network Pinch Points

TfN's Major Roads Report highlights the major pinch points on the Major Road Network (MRN). It is helpful to conceptualise the MRN as a ladder that only provides the requisite strength for transformational growth with a series of strong north-south routes and multiple rungs for east-west connectivity.

4.2.5.1 North-South Connectivity

Throughout the evidence base for TfN's Major Roads Report, north-south movement is generally seen as better than east-west connectivity at present with the core components of the SRN, such as the M6, M1, M18, A1 and A168/A19 providing vital links between the North, Scotland and the Midlands. These have helped to define the economic geography in terms of journey to work, industry clusters and supply chain patterns of the North. Specific examples include:

- The links via the A19 between Nissan and the Port of Tyne which is the second largest exporter of cars in the UK;
- The continued strength of the logistics and food industry in the A1(M) corridor through North Yorkshire;
- The contribution and ongoing importance of the M1 (including its links to the M62) in terms of supporting the diversity of the polycentric and multiple NPIER sector West Yorkshire, Leeds City Region and Sheffield City Region economies alongside a wider pan-Northern and national connectivity role between London, the East Midlands, North East and Scotland; and
- Major distribution centres for growing retailers as part of a major transformation of the Dearne Valley area including ASOS and Aldi benefitting from links to the M1 and A1(M).

This over-reliance on the SRN for these north-south movements results in congestion and sections of the network prone to incident related resilience issues however, with particular problems including:

- The M1 around Sheffield and the A1(M) around Doncaster;
- The A1(M) including the A1 Newcastle - Gateshead Western Bypass, which links the whole area to Newcastle Airport, is one of the most congested roads in England;
- The A19 in the Tees Valley and North East, with the approaches to and the interchange with the A66 link to the A1 and Teesport being a key constraint for the area's network;
- The M6 in Cheshire and Warrington, albeit now benefiting from RIS1 smart motorway enhancements.

Estuary / river crossings and urban areas also provide north-south connectivity issues at a LEP level, with the following constraints to growth noted amongst others:

- River Tyne crossing points and their approaches are often subject to congestion. Further issues in the short to medium term are expected with planned major maintenance schemes on some of the Tyne Crossings providing fewer options and resilience for these journeys;
- A19 Tees Crossing - a pinch point at the Tees flyover, where delays regularly occur because there are too few high quality roads crossing the Tees;
- The Ribble Crossing proposal to unlock new development in Preston, South Ribble and Fylde; and
- Radial links to and through many of the Independent Economic Centres (IECs); and
- The Manchester Ship Canal, through Greater Manchester, Warrington and Cheshire West, where limited and often low capacity bridging points create resilience and capacity issues.

4.2.5.2 East-West Connectivity

TfN's Major Roads Report states that consistently across its evidence base the number, capacity, reliability and resilience of east-west road connections are seen as a constraint on the Northern economy. This is pertinent to links across the Pennines as well as the connections to and from key north-south axes described above.

The M62 and the A63 to the port of Hull are the only continuous east-west dual-carriageway roads linking the M6/M74 and A1/M1 north of the A50 corridor in the Midlands and south of the M8-A8 in Central Scotland. It carries half of all trans-Pennine road traffic, and two thirds of all freight, while performing a vital function in respect of the diversity and growth of the Liverpool City Region, Greater Manchester, West Yorkshire / Leeds City Region and Humber economies. Yet this role also leads to certain stretches experiencing a 70%-80% likelihood of serious congestion during peak periods.

It is also a key issue for network resilience, being the North's highest altitude motorway and more susceptible to snow and adverse weather. Various Partner documents reference the need for a long term strategy for improving resilience and reliability on this section of the M62 and A63, the neighbouring M60 and other trans-Pennine highway links.

Other east-west routes exist that also play an important role for east-west traffic and the resilience and reliability of these routes must be maintained. These routes include the A69 linking Tyne and Wear, Northumberland and Cumbria, the A66 which links Teesside and North Yorkshire to Cumbria, the A59 which links Merseyside and Lancashire to North Yorkshire and the A57 which links Merseyside and Cheshire to South Yorkshire. The majority of these routes are

single carriageway highways and therefore are impacted heavily by incidents or adverse weather across the Pennines.

4.2.6 Challenges

Some of the challenges facing the road freight sector are highlighted below and include:

- Vehicle emissions;
- Congestion;
- Workforce / skills shortage;
- Lack of safe and secure overnight parking for freight vehicles; and
- Regional and city distribution.

It should be noted however that more detailed analysis on the some of these challenges are contained at the end of this section in Section 4.7.

4.2.6.1 Vehicle Emissions

As traffic begins to increase on the already busy road network, congestion is an inevitable consequence that will impact all road and rail users; not just freight movements. With this increase in traffic and the assumption that fossil fuels will still be in use by most of freight industry vehicles, this will likely lead to the increases in vehicle emissions being concentrated around the cities and ports, where most of the congestion is likely to occur. Significant inroads are already being made in built up areas to reducing the impact of freight through consolidation.

Congestion, particularly stop/start traffic where acceleration and deceleration occurs, can significantly increase emissions from vehicles including Heavy Goods Vehicles (HGV) compared to free flowing traffic. Corridors such as the M62, M6 and A1(M) which are already constrained, or showing signs of congestion currently will produce greater emissions of GHG unless some interventions are undertaken.

It is likely that interventions to increase the capacity as well as increase vehicle efficiency will be required to help mitigate the effects of the increase in freight within TfN. Whilst it is acknowledged that providing improvements will result in the creation of GHG in the form of building infrastructure etc., it should be noted that this will be a short to medium term effect that will be mitigated against in the long term by providing for alternative fuelled vehicles and electric trains.

This issue needs to be considered separately as two potential impacts:

1. The release of emissions to atmosphere that will contribute to climate change which could present a risk to the environment/human health through extreme weather events; and

2. The release of emissions at a local level which will affect pollutant concentrations contributing to the damage of human and ecological health when exposed over certain time periods.

The issue of regional air quality related to emissions is explored in more detail in Section 4.7.2 where the impact of the increase in vehicles on the road network is examined.

4.2.6.2 Congestion

As the demand for freight increases in line with increased consumer spending and the growth in e-commerce, more and more vehicles are predicted to use the road network in the North of England.

The pinch points on the network have been set out in Section 4.2.5 and as such any increase in the volume of traffic will only result in increased congestion which has an impact on logistics operator's operational costs. Additionally, increased congestion leads to an increase in vehicle emissions as more and more traffic is stationary in queues or travelling at slower speeds.

Section 4.7.1 outlines the impacts of congestion on time and how this affects costs to the logistics sector in more detail.

4.2.6.3 Workforce / Skills Shortages

A major challenge currently being felt in the haulage industry is related to the shortage of HGV drivers. There are a number of reasons for this which are outlined in more detail in Section 4.7.3 as this forms a key driver for change.

As demand for freight increases and in particular in the road haulage sector, the current driver shortage will be exacerbated to the extent to where the demand for road transport far exceeds supply. There are a number of methods for addressing this which include moving freight to other modes as well as improving the attractiveness of a career in freight distribution.

4.2.6.4 Lack of safe and secure overnight parking for freight vehicles

Road freight in particular faces specific issues including a lack of overnight parking facilities for HGVs adjacent to the MRN. A study conducted for the DfT in 2011[1] examined the usage and supply of overnight parking spaces for goods vehicles across the UK including the North. The DfT recently commissioned a new survey into the HGV parking shortage, building on the 2011 study. The DfT expects to publish the findings of this research later in 2017.

A summary of Northern regions is shown in Table 11.

[1] Lorry Parking Study Demand Analysis, Department for Transport 2011

Table 11 HGV Parking Statistics

Region	Official Secure Parking			Unofficial unsecure parking		Total number of road freight crimes (2010)
	Total Truck stop capacity (spaces)	Average Truck Stop occupancy (spaces)	Truck Stop Utilisation	Industrial Estates (spaces)	Lay-bys (spaces)	
North East	310	156	50%	127	119	38
North West	2,213	1,228	55%	480	276	278
Yorkshire and the Humber	1,628	728	45%	145	374	520
Total North	4,151	2,112	51%	752	769	836

Reference 1 - Table 3.8 National Overview (DfT Lorry Parking Study 2011)

Feedback from the industry shows that even though official truck stop occupancy appears to show them as underutilised, the official parking is often not in the correct place and the facilities on offer to drivers are overpriced deterring them from being used. As a result, drivers are opting to park in unsecured locations in laybys or industrial estates. The table shows that in 2010 (the last time the data was collected) the number of crimes associated with road freight was almost 850 per year.

There is a requirement to provide further parking sites for HGVs to ensure that more vehicles park in secure areas away from laybys and industrial estates to reduce road freight related crimes to a minimum. This would also minimise the movement of vehicles around built up areas when searching for a suitable overnight parking space.

4.2.6.5 Regional and City Distribution

As more and more cities face up to their responsibilities around regional air quality and bringing it under control, many are focusing on methods on reducing traffic in urban centres. One method for reducing traffic (and in particular freight vehicles) within urban centres is through consolidation of goods.

There are different types of consolidation techniques, such as:

- Process solutions:
    - Procurement-led;
    - Upstream supply chain; and
    - Click and collect.
- Physical solutions:

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it otherwise might have been available. It is often the case that freight trains do not run as per the working train timetable.

The planning and operation of freight services is fundamentally different to the processes applied for passenger services although the two regimes must mesh when it comes to the overall network timetable. Whereas passenger trains run independent of demand, freight services will generally run only if the traffic demands it. The exception to this are intermodal services which will generally be timetabled and planned to run even with low levels of loading. Freight services are also at the mercy of economic change and the closure of production sites or changes to the point of entry of imports to the UK, meaning that the requirements for a freight path can change midway through timetable periods. Equally the presence of extra tonnage may require the running of additional services at relatively short notice. In this regard freight planning tends to be far more volatile than passenger, which is more geared to long-term planned changes in service pattern.

The result of this volatility is that freight paths may be held in the Working Timetable for freight services which never run. Such paths are treated by FOCs as assets which they can capitalise on either through trading with other FOCs or have in store for future traffic. Network Rail has recently undertaken an exercise to try to remove redundant paths from the timetable in order to provide a clearer understanding of the capacity that is available for new traffic. Nevertheless the recent substantial reduction in coal movements has thrown up a further legacy of redundant freight paths.

With passengers demanding improved journey times and the TOCs responding to this through the introduction of new rolling stock the differential between the point-to-point journey times for passenger and freight is likely to grow. This potentially puts freight at a disadvantage in that those services will have to give way at junctions to passenger services or will be put into loops to allow passenger services to pass. One constant criticism raised by FOCs is the length of time, or average speed of their services which is poor compared to passenger trains and equivalent road movements. Table 12 provides some examples of transit times.

Table 12 Rail Freight Journey Time Examples

Origin	**Destination**	**Journey Time***	**Average Speed**
Liverpool	Drax Power Station	7.50 hours	16mph
Immingham	Drax Power	2.75 hours	19mph
Crewe	Trafford Park	1.25 hours	36mph
London Gateway	Trafford Park	7.50 hours	31mph
Immingham	Eggborough Power Station	3.50 hours	17mph
Tunstead	Eggborough Power Station	3.25 hours	53mph
Cardiff	Doncaster	8.75 hours	25mph
Wellingborough	Doncaster	3.50 hours	40mph

* Decimal fraction of hours used

Source: Network Rail Working Timetables

4.3.2 Commodities

The GBFM analyses rail freight commodities in a slightly different way to the road commodities. The following outlines the rail freight commodity categories where intermodal is treated as its own commodity group:

- Intermodal;
- Biomass;
- Iron Ore;
- Petroleum;
- Network Rail Engineering;
- Construction and Metals;
- Coal; and
- Other:
    - Industrial Minerals;
    - Chemicals;
    - Domestic Waste;
    - Automotive;
    - General Merchandise; and
    - Other.

Appendix A2 outlines the commodity flows transported by rail in 2016 and those forecast for 2050.

Intermodal freight is shown as growing between 2016 and 2050 whereas bulk traffic such as coal shows a decrease. This is similar across all modes of transport, not simply rail.

In some cases, rail is the only viable option for the transportation of certain commodities. The transport of nuclear flasks to and from Sellafield in Cumbria is an example where rail access must be maintained to ensure safe and secure transport of this hazardous material as shown in Figure 18.

Figure 18: Specialist commodities such as Nuclear Waste as shown in the image are included in the "Other" commodity category (Source: DRS)

4.3.3 Total Cargo Movements

4.3.3.1 2016 Base

The total cargo movements for rail are expressed in Cargo Tonnes across the rail network in the North of England.

Figure 19 shows the volume of freight moved annually by rail in 2016. The largest volumes of freight are moved by rail between the Humber Ports at Grimsby and Immingham and the East Coast Main Line (ECML). The majority of this freight is made up of bulk materials. Additionally, large volumes of freight are moved on the West Coast Main Line (WCML) particularly south of Warrington (also includes east-west flows due to network capacity issues on more direct routes) and on the ECML north of Doncaster towards Middlesbrough and Newcastle.

Other major flows are shown towards Manchester and particularly Trafford Park which includes intermodal freight from the southern ports.

The major east-west freight movements occur on the Hope Valley Line with minimal flows on other east-west routes between Manchester and Leeds.

There is a perception that the significant reduction in coal movements in the UK (down 64% year on year) has had a major impact on freight movements. In fact freight by rail has only dropped around 4% over the last year as the volumes have been made up by significant increases in intermodal traffic, which now account for 40% of UK freight movements, and construction, which is 26%.

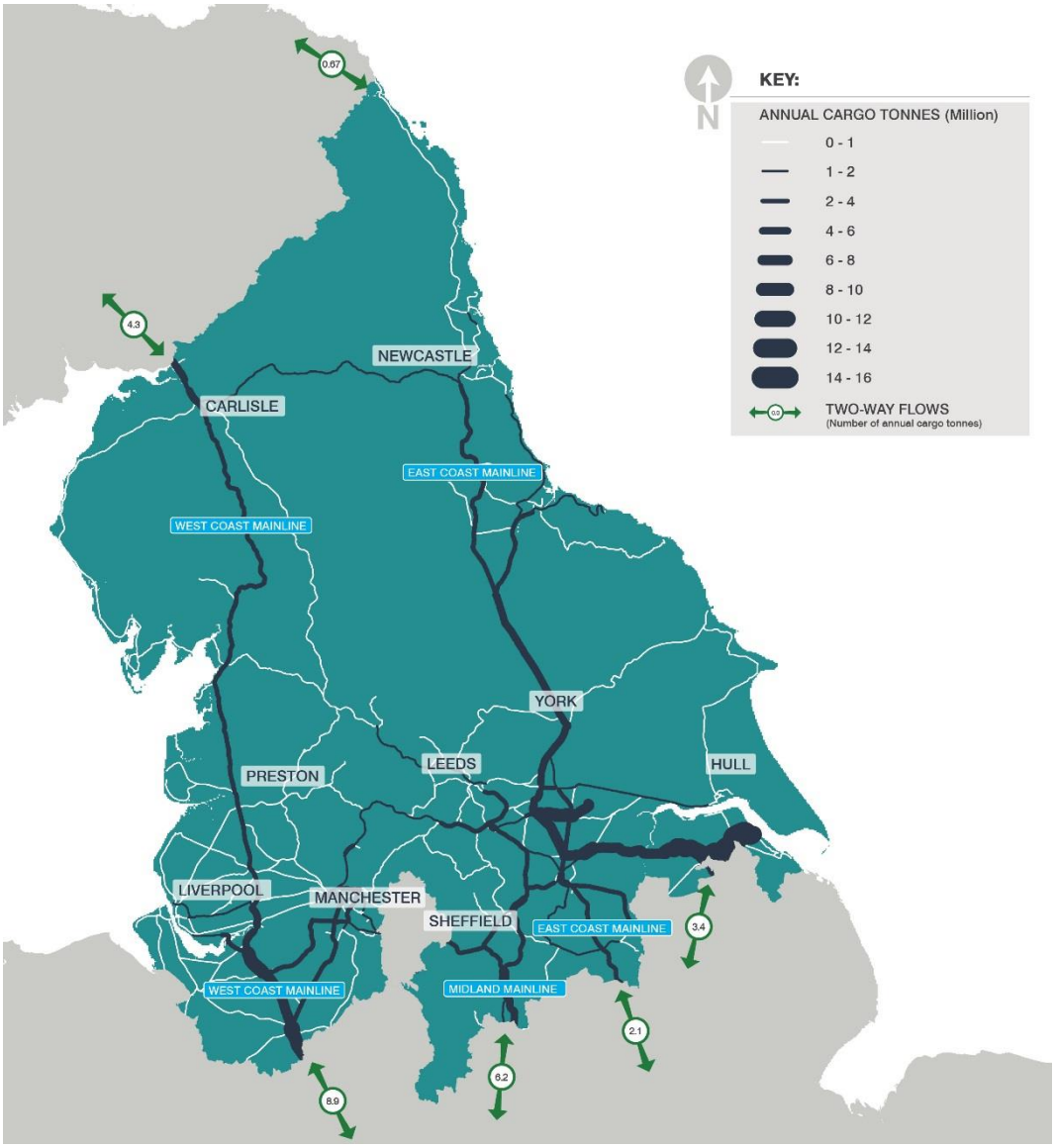

Figure 19 Rail Freight - 2016 Annual Total Cargo Movements (Cargo Tonnes)

4.3.3.2 2050 Do Nothing (without NPIER)

Figure 20 illustrates the cargo tonnes moved by rail throughout the North of England in the 2050 Do Nothing (without NPIER) scenario.

The Figure shows that the heaviest flows are located on the WCML south of Warrington. In addition, significant flows are shown on routes into Liverpool (to Garston and Widnes / Ditton) and the Port of Liverpool from the WCML, as well as towards Manchester and Trafford Park. Significant freight flows are also shown around the Humber Ports and towards the ECML as well as on the ECML towards the Port of Tees.

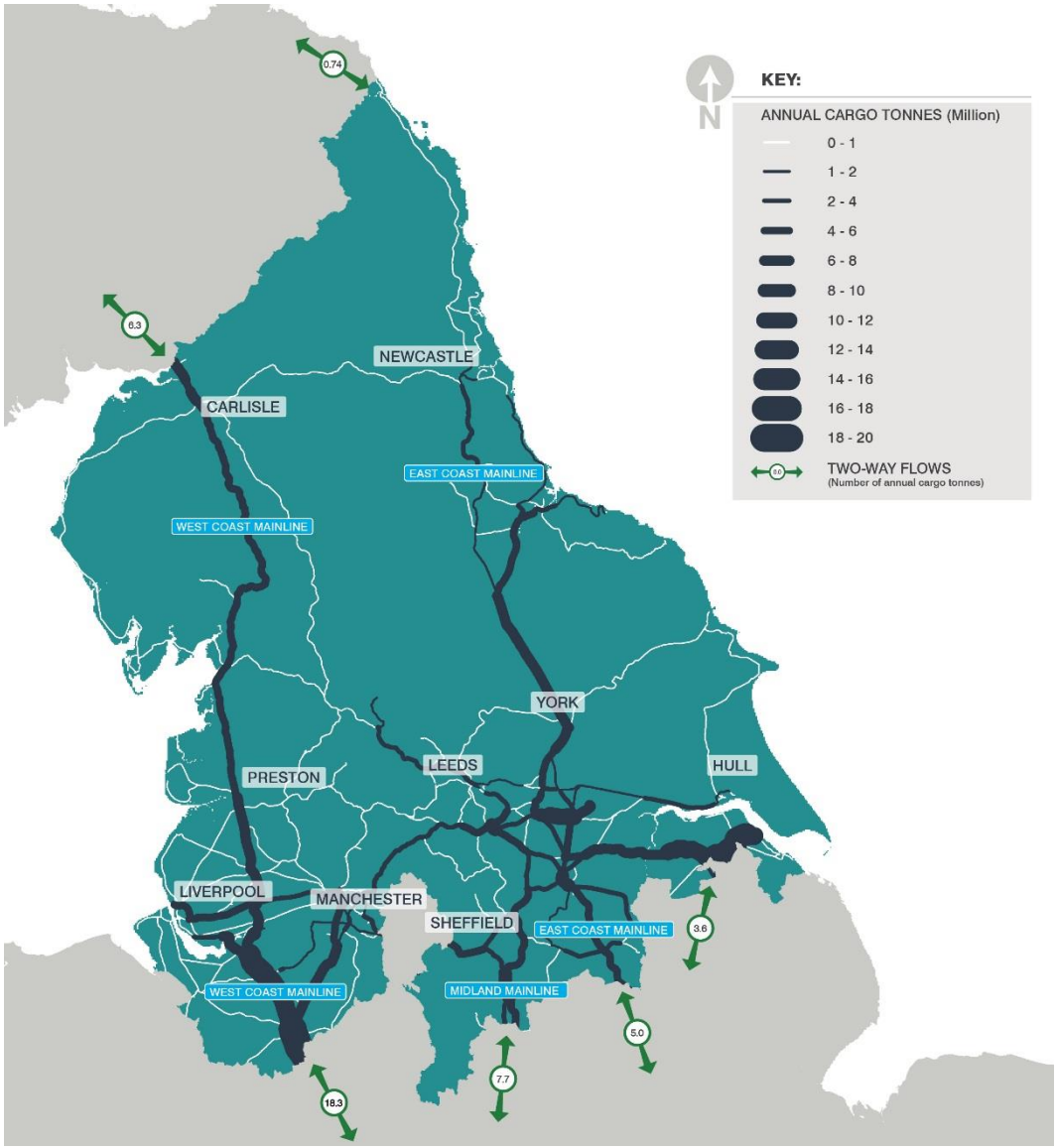

Figure 20 Rail Freight - 2050 Do Nothing (without NPIER) Annual Total Cargo Movements (Cargo Tonnes)

4.3.3.3 2050 Do Nothing (with NPIER)

Figure 21 and Figure 22 illustrate how the cargo movements by rail change between 2016 and 2050 under the NPIER growth scenario. Figure 22 in particular shows that strong growth occurs on the WCML along its length but particularly south of Warrington. There is also growth on the ECML south of Doncaster and on sections of the line leading to Leeds.

The Chat Moss route between Liverpool and Manchester shows a growth in freight movements as well as the line from Wavertree to the Port of Liverpool and from the WCML to Garston and Widnes / Ditton. Increased freight movements are also shown on the Manchester to Leeds route via Diggle against a reduction in traffic on the Calder Valley route.

The primary drivers for growth on the rail network is increased intermodal freight volumes with reductions particularly driven by less bulk materials (aside from construction bulks) requiring transport.

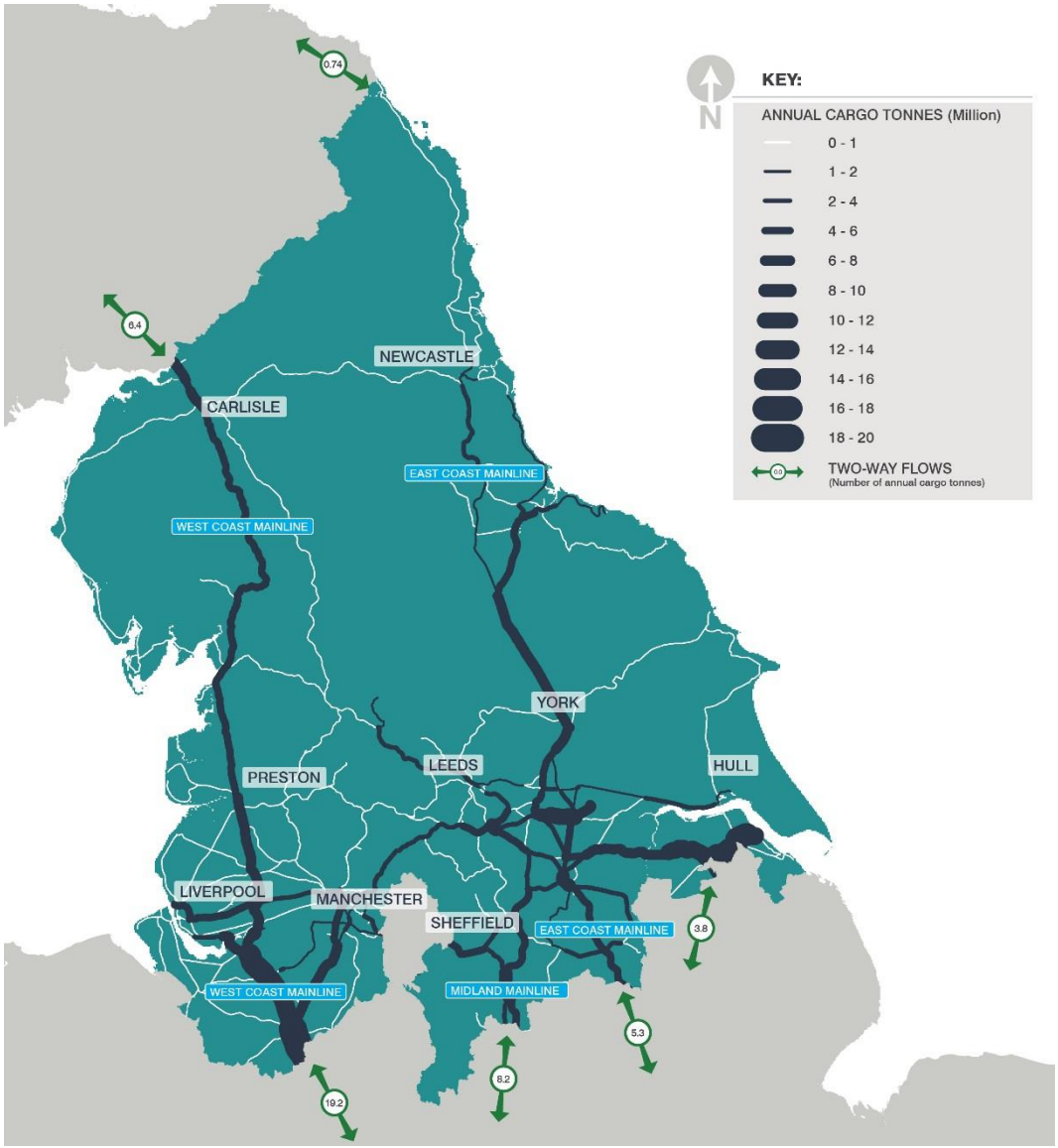

Figure 21 Rail Freight - 2050 Do Nothing (with NPIER) Annual Total Cargo Movements (Cargo Tonnes)

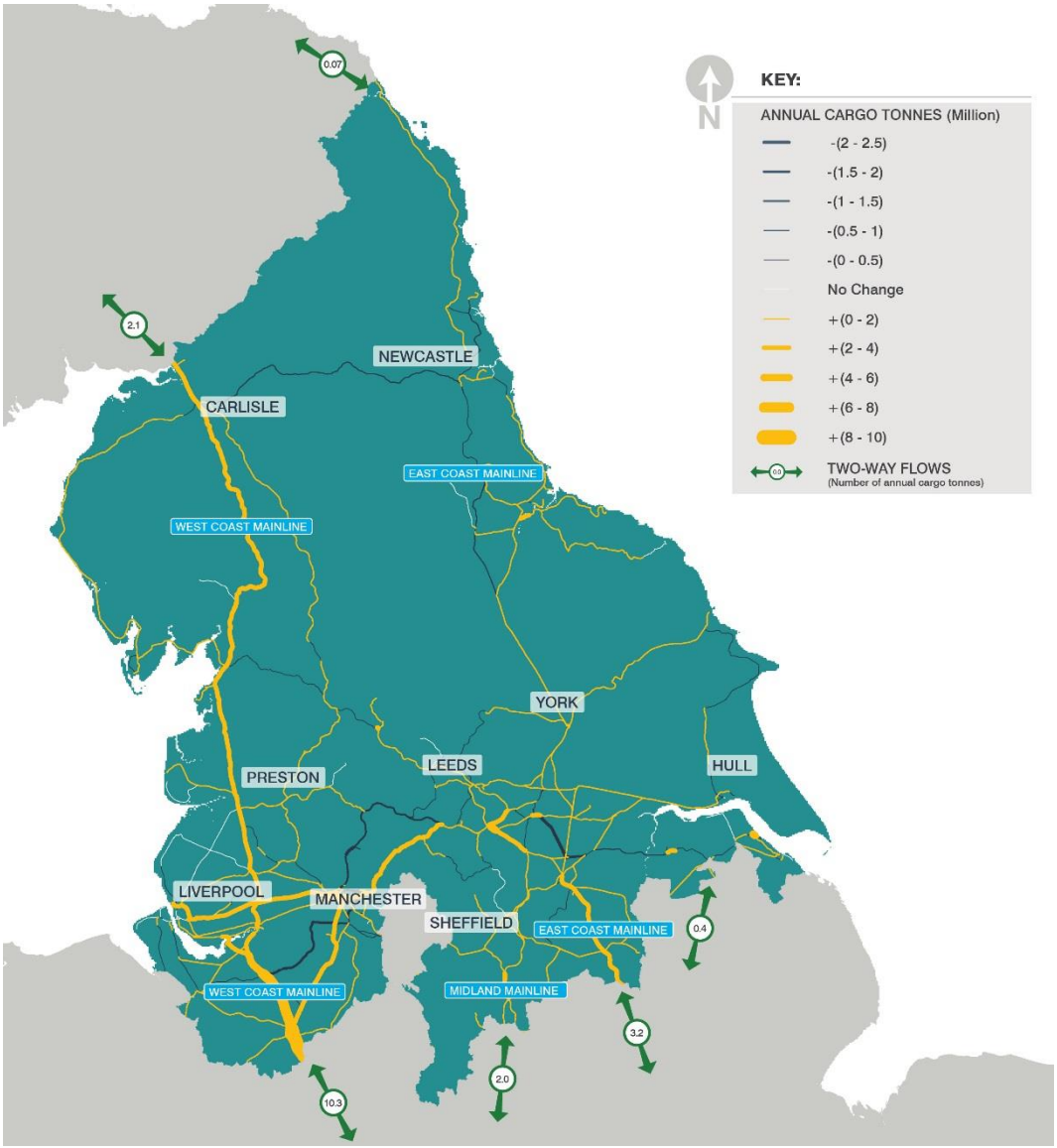

Figure 22 Rail Freight - Difference between 2016 and 2050 Do Nothing (with NPIER) Annual Cargo Tonnes Movements

This figure assumes an unconstrained rail network and in reality the east-west movements could use any east-west route taking into account infrastructure limitations such as gauge, speed, trailing weight and traction in addition to the ensuring a commercially viable solution for the FOC.

4.3.4 Movement Types

Utilising the same process for road outlined in Section 4.2.4, the movement types on the rail network have been analysed. These movement types are split into:

- Domestic flows – to, from and within the North;
- Domestic flows – through the North;
- International flows – imports; and

- International flows – exports.

4.3.4.1 Domestic: To, from and within the North

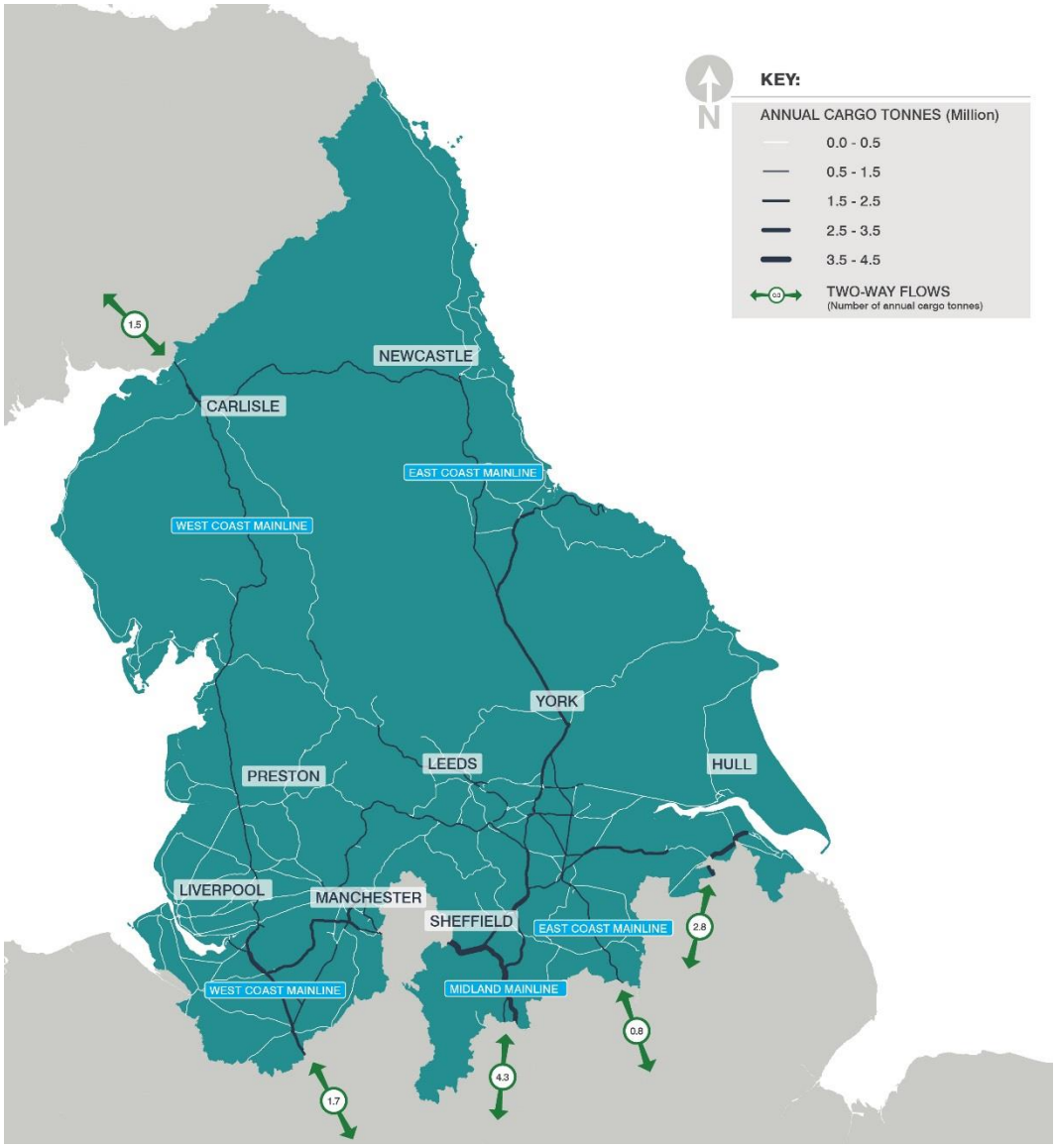

Figure 23 Rail Freight Movement Types: 2016 Domestic: To, from and within the North

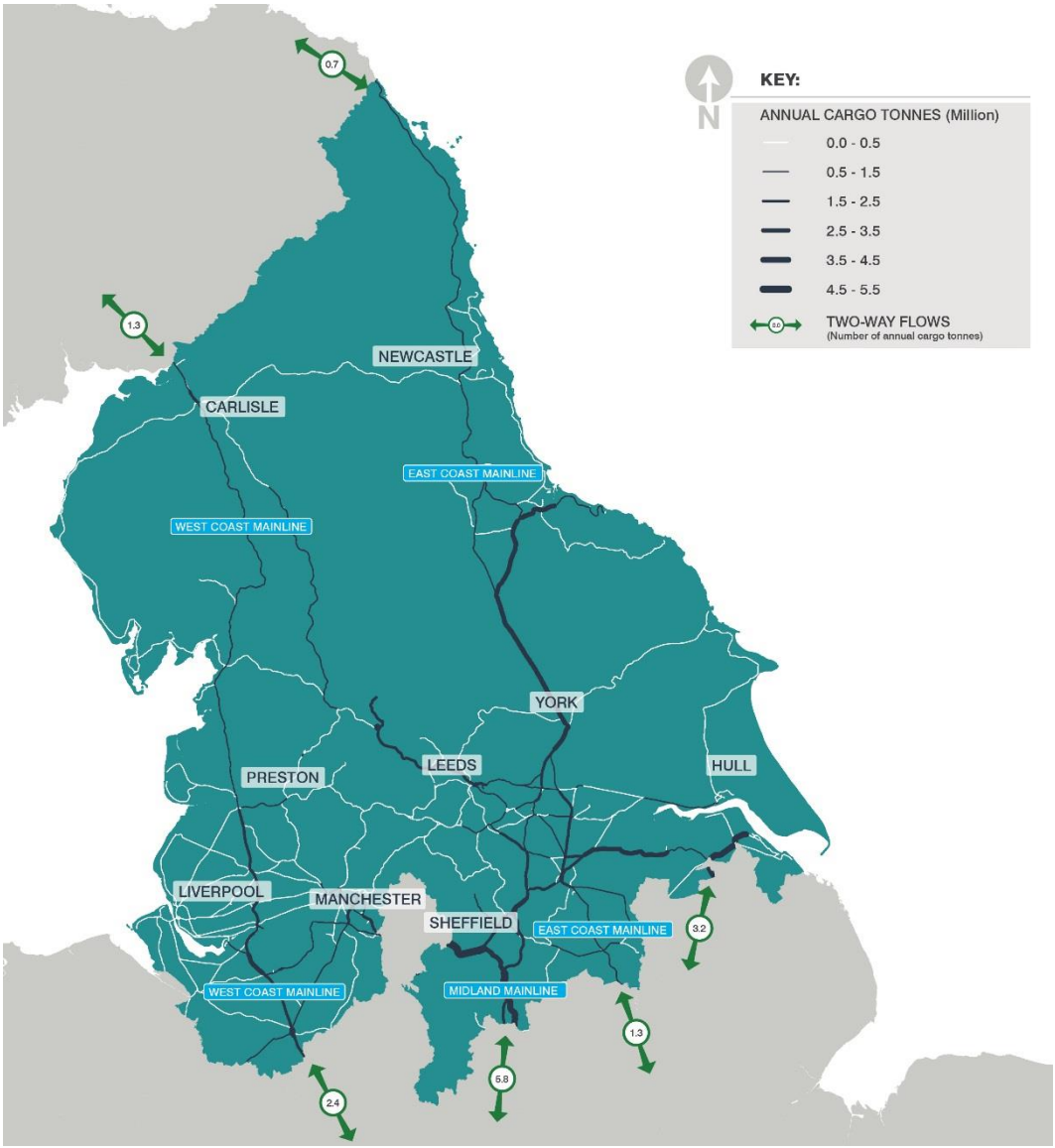

Figure 24 Rail Freight Movement Types: 2050 Domestic: To, from and within the North

4.3.4.2 Domestic: Through traffic

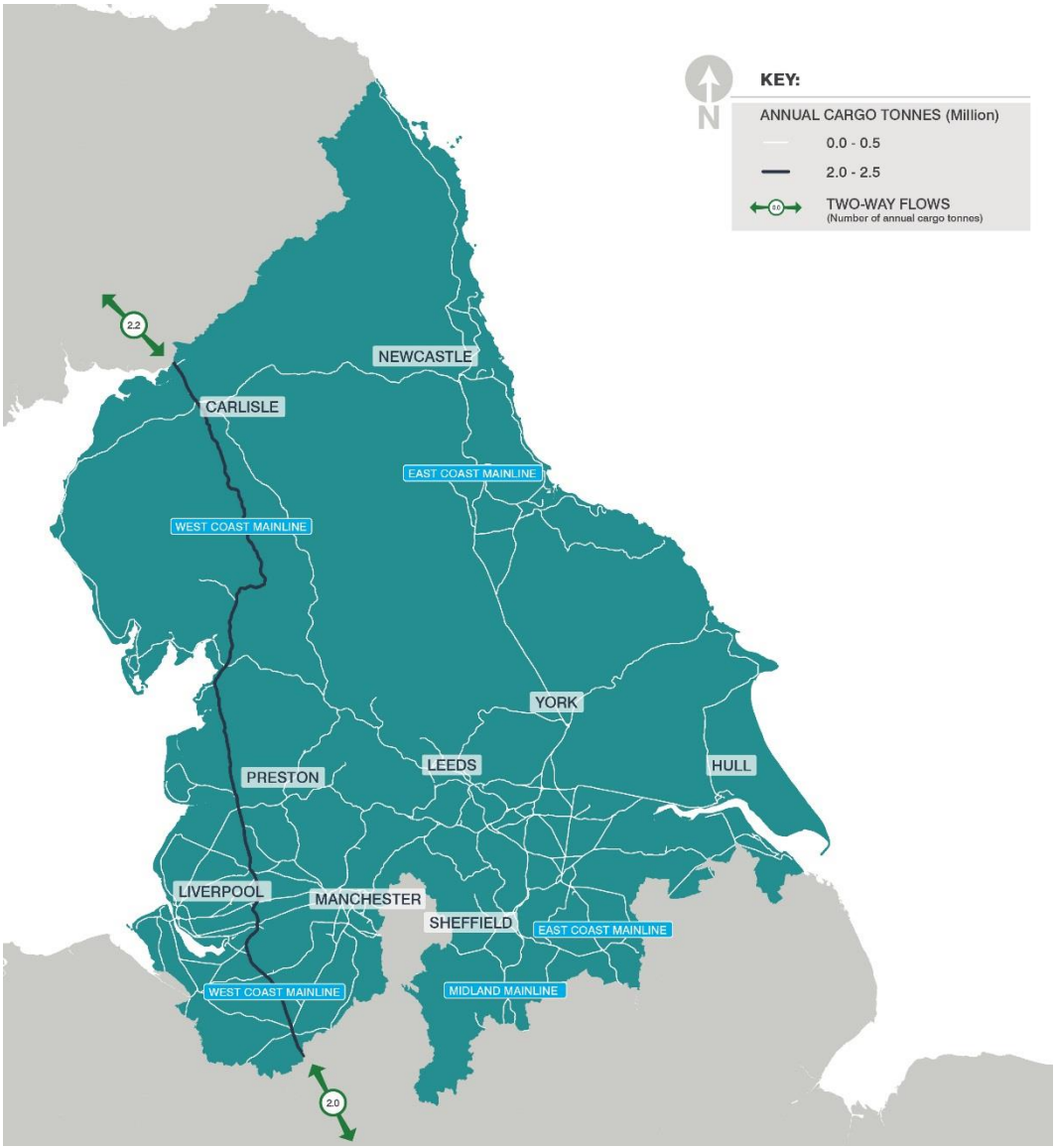

Figure 25 Rail Freight Movement Types: 2016 Domestic: Through traffic

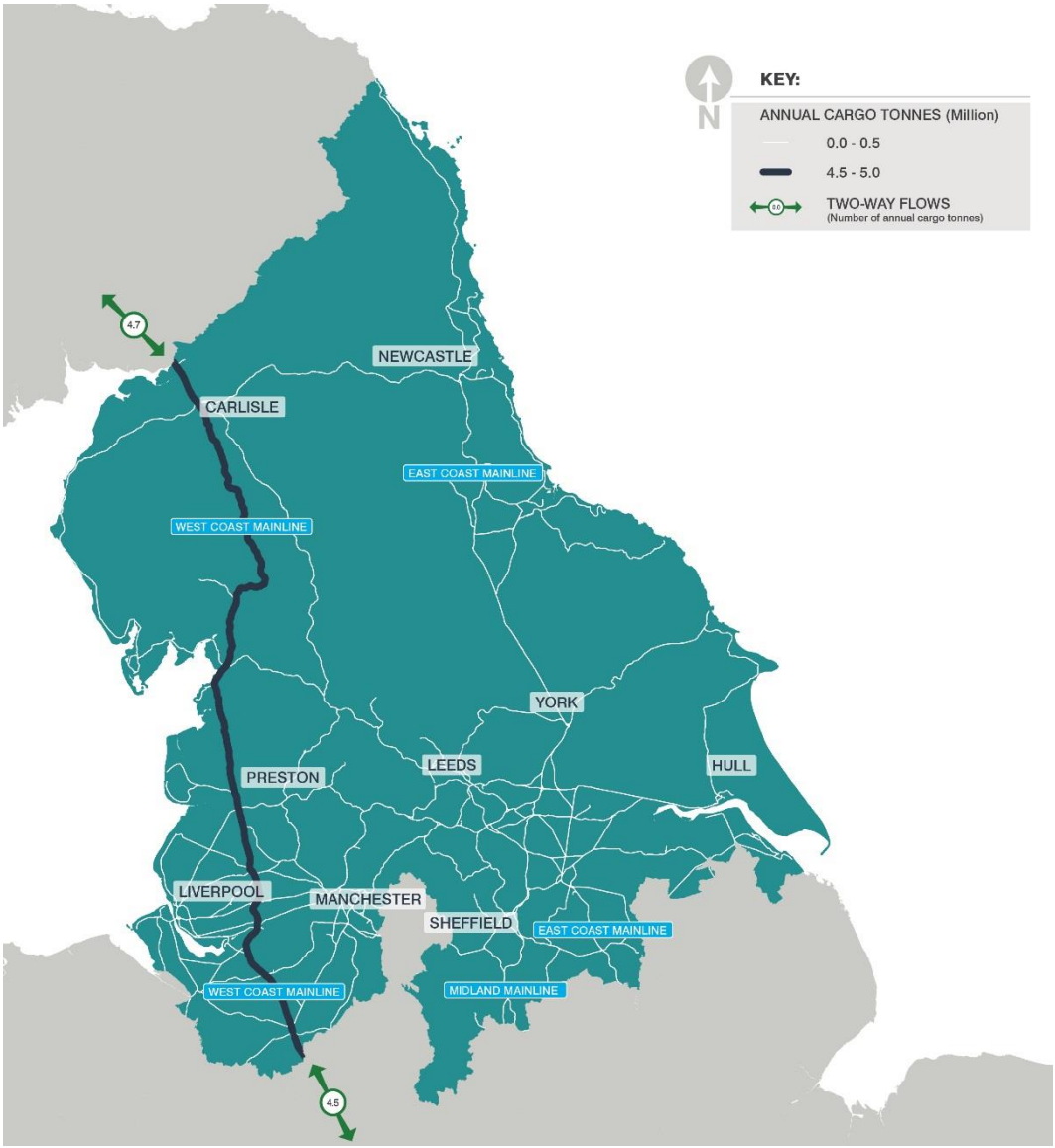

Figure 26 Rail Freight Movement Types: 2050 Domestic: Through traffic

4.3.4.3 International: Imports

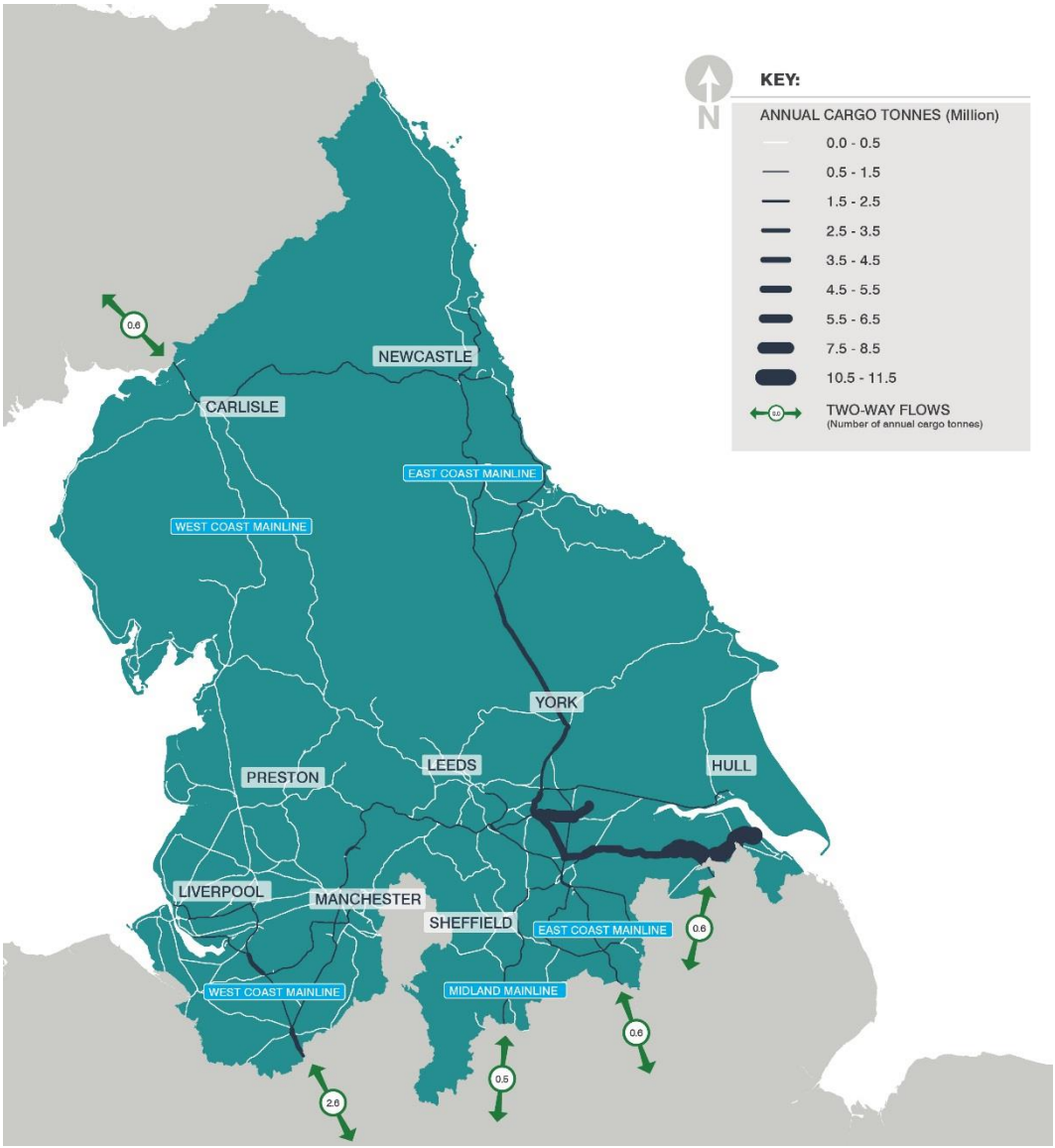

Figure 27 Rail Freight Movement Types: 2016 International: Imports

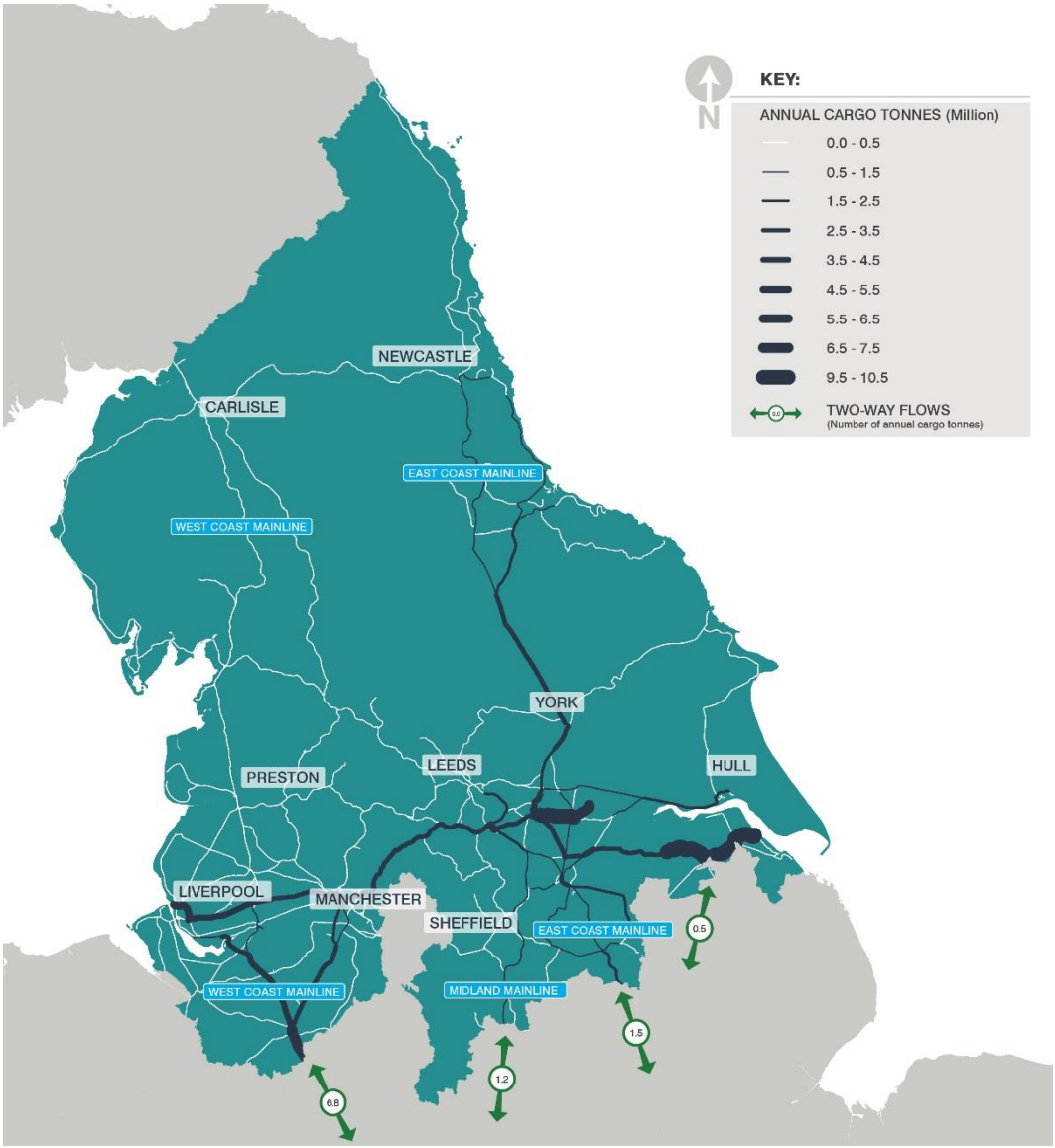

Figure 28 Rail Freight Movement Types: 2050 International: Imports

4.3.4.4 International: Exports

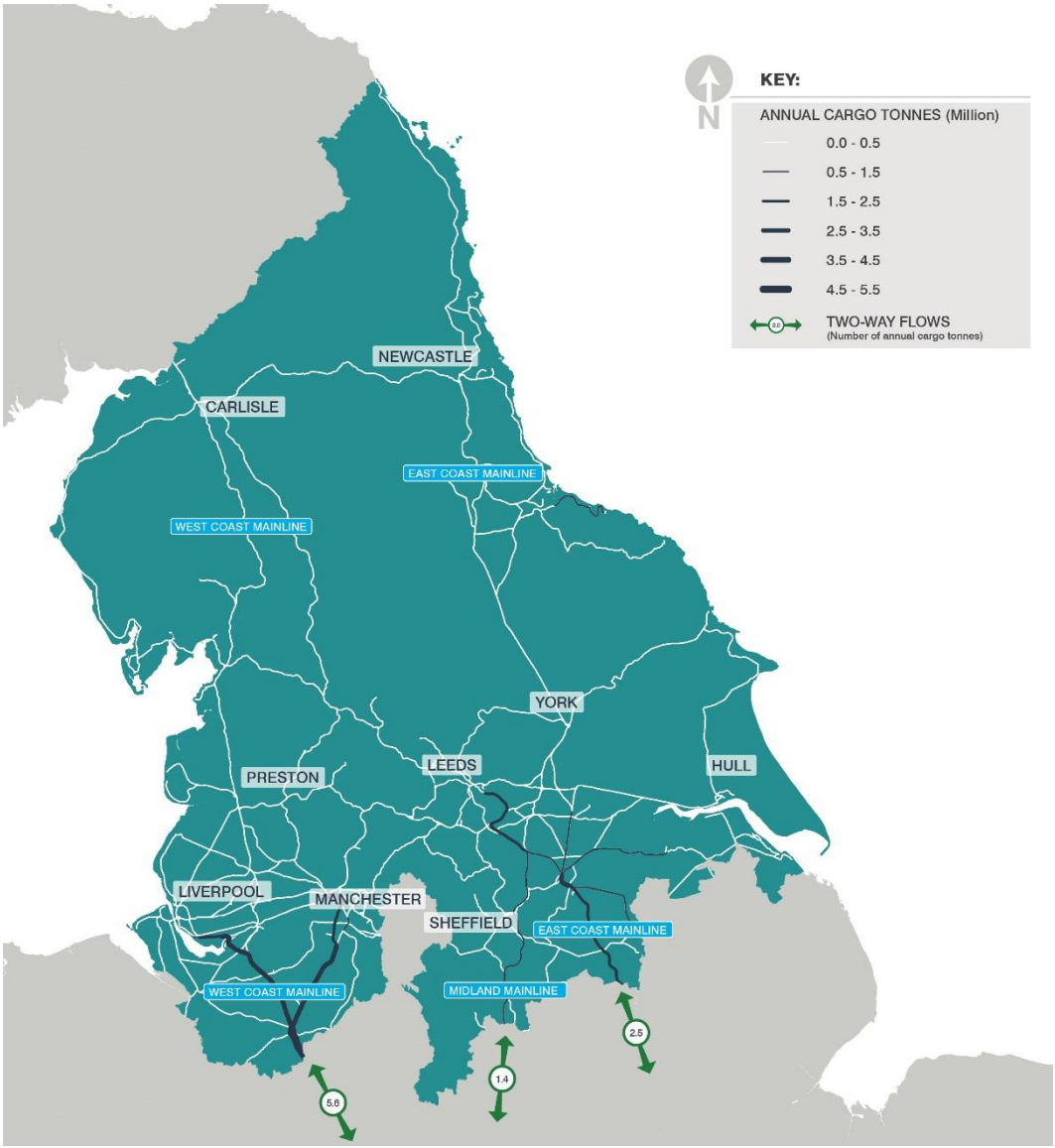

Figure 29 Rail Freight Movement Types: 2016 International: Exports

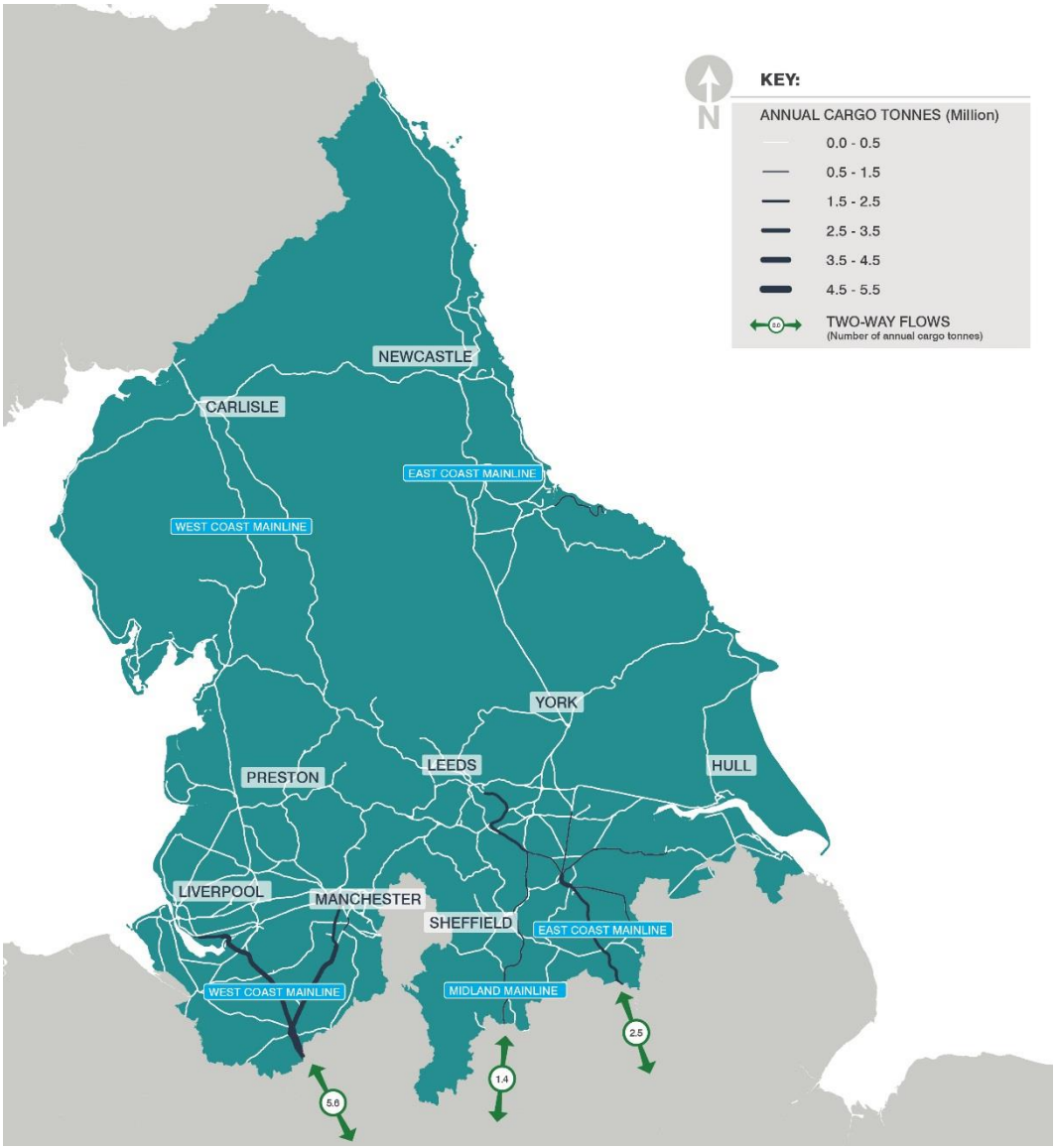

Figure 30 Rail Freight Movement Types: 2050 International: Exports

4.3.5 Network Pinch Points

4.3.5.1 Rail Freight Paths

An exercise was undertaken, examining the network pinch points in respect of the freight path requirements generated by running the GBFM. It should be noted that this exercise provides a quantitative assessment of the impact of variations in rail freight demand between 2016 and 2050.

For the purposes of this exercise, it is assumed that no infrastructure enhancements have taken place during this period.[2]

[2] Whilst there are infrastructure enhancements currently under way which may improve the performance of rail freight, including gauge clearance schemes such as South Humberside, the

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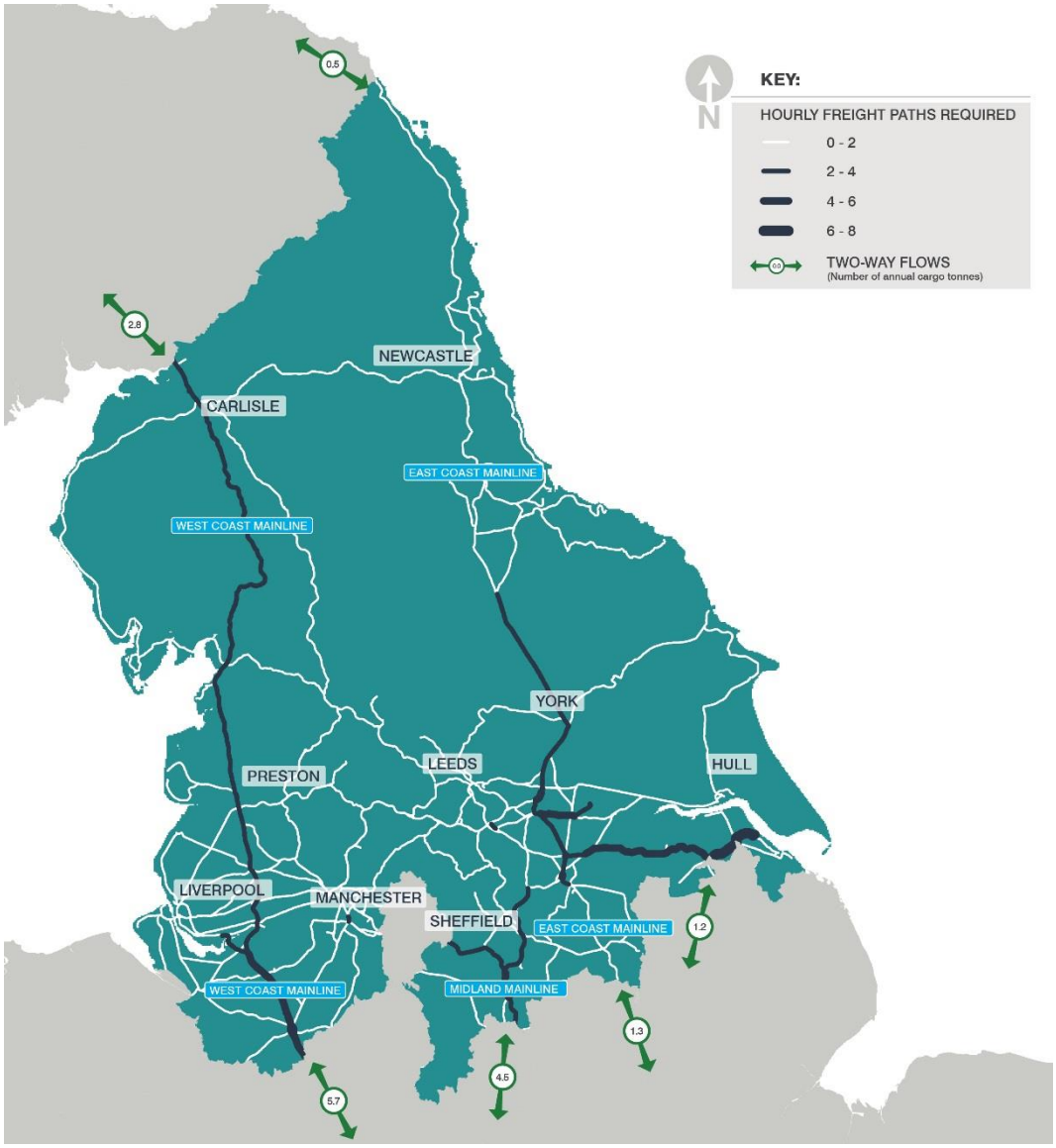

Figure 31 Rail Freight - 2016 Hourly Freight Paths Required

Figure 31 shows the strongest demand for freight (expressed in hourly paths required) on the South Humberside Main Line, and North-South flows from Scotland, particularly on the West Coast Main Line (WCML). The impact of the investment at Liverpool2[3] is not shown, as the terminal opened in early 2017. There is also significant freight demand on the Hope Valley line, and the East Coast Main Line (ECML), with modest demand to Teesport (not shown, as it represents the equivalent of less than 2 paths per hour in 2016) branching from that route.

Figure 32 shows the demand for rail freight paths in 2050 without the application of an NPIER growth scenario. This shows modest growth (compared to 2016) within the Liverpool City Region, Teesport, and Humberside. This reflects the fact that these areas have the largest ports in the North.

[3] 'Liverpool2' is a new, £400m deep water container terminal, capable of handling 13,500 TEU post-panamax vessels.

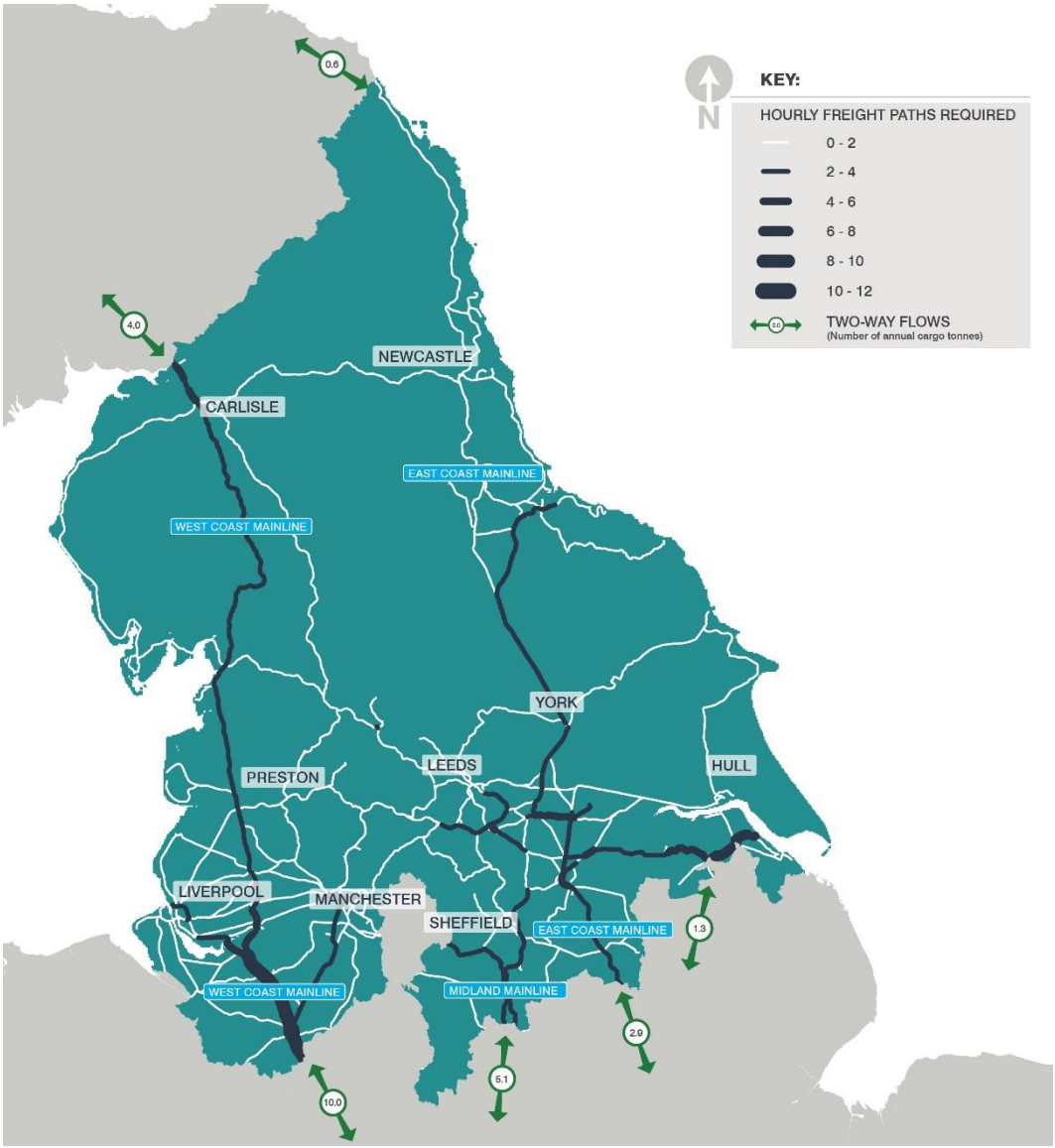

Figure 32 Rail Freight - 2050 Do Nothing (without NPIER) Hourly Freight Paths Required

Figure 33 shows, with the application of 'NPIER growth', demand for paths with a similar distribution to Figure 31. The largest demand is on the South Humberside Main Line, and the WCML south of Warrington. In this scenario, the full trans-Pennine route between Leeds and Manchester sees freight demand in excess of 2 paths per hour, which is not the case in Figure 33. The impact of investment in Liverpool can also be observed with the intermodal terminal at Widnes/Ditton driving demand. With additional pathing requirements to meet the growth in demand for flows from Scotland, the WCML is likely to form a pinch point.

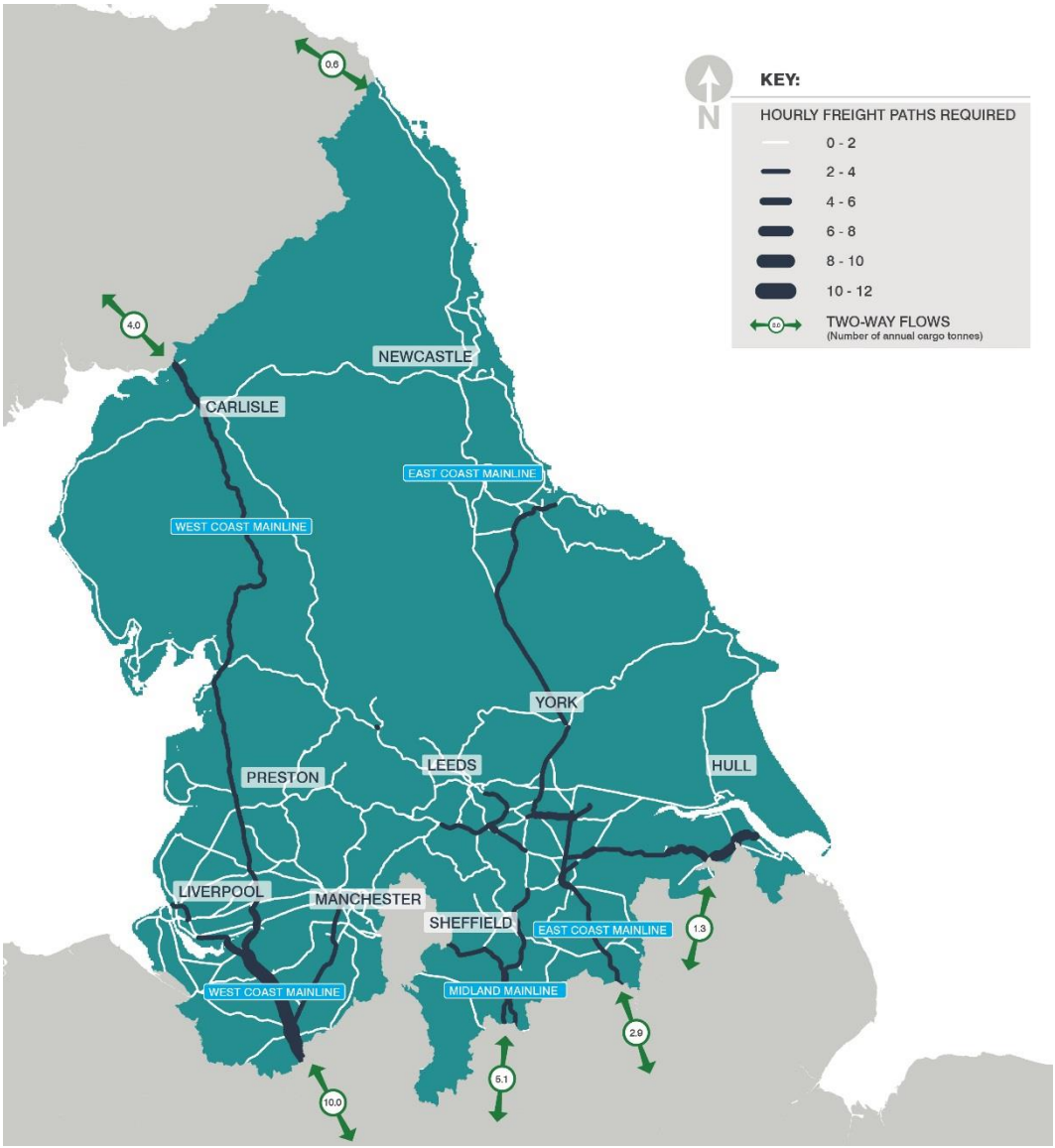

Figure 33 Rail Freight - 2050 Do Nothing (with NPIER) Hourly Freight Paths Required

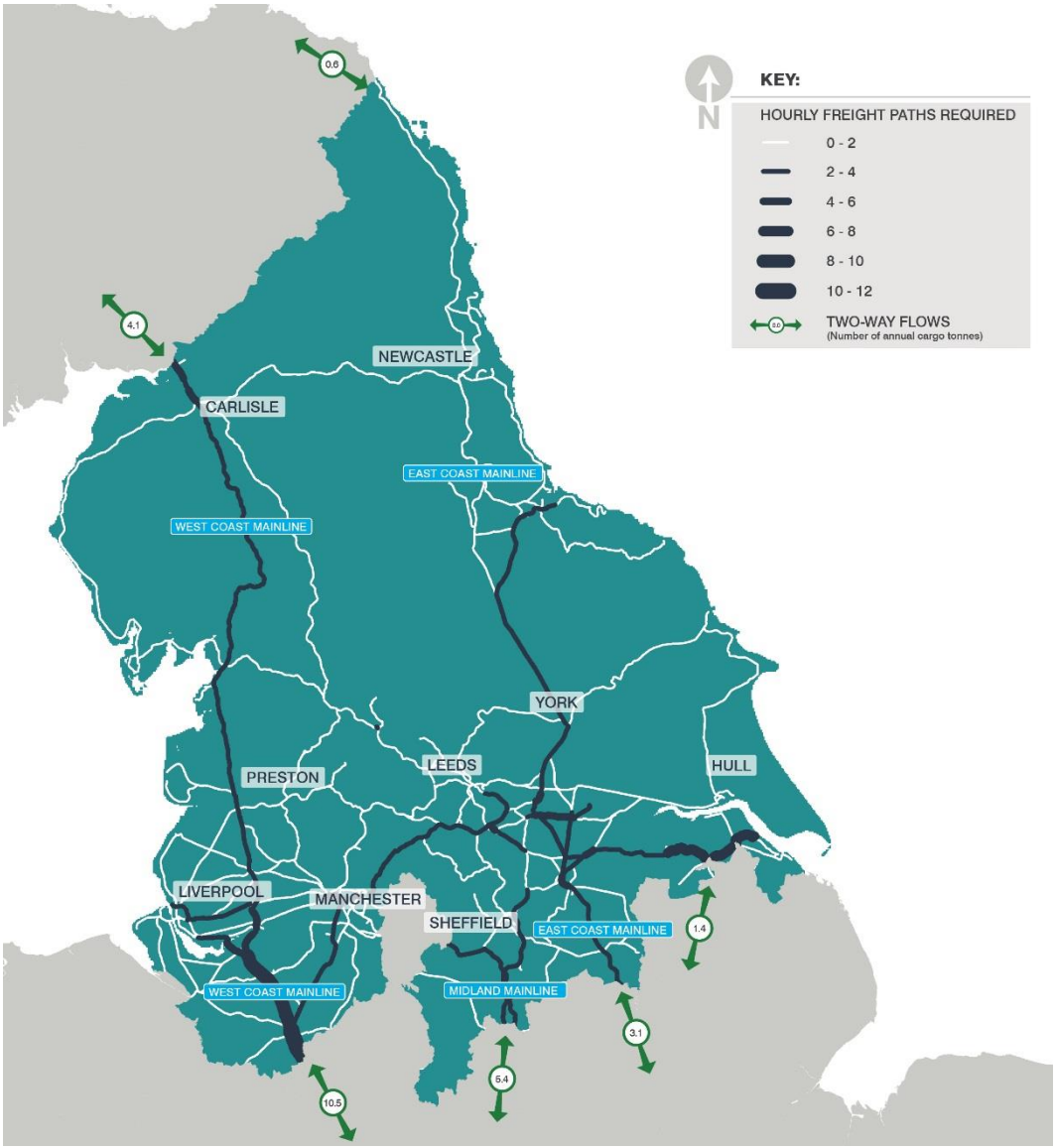

Figure 34 Rail Freight - Difference between 2016 and 2050 Do Nothing (with NPIER) freight paths required

4.3.5.2 Qualitative Analysis of Potential Pinch Points

A qualitative analysis has been undertaken, based on a comparison between 2016 and 2050 demand for freight paths on individual route sections. This initial exercise to identify pinch points has aggregated track sections in order to allow for commentary at a level appropriate for this analysis.

The analysis is based on current network capacity and the nature of the traffic (e.g. freight only / mixed use / high speed long distance passenger) on the various route sections. The impact of changes in demand for paths is then considered in this context.

The outcome of the qualitative analysis is categorised by a RAG assessment as shown in Table 13.

Table 13 RAG assessment for Freight Path Requirement Assessment

Not considered to be an issue	
May be an issue – will require more analysis	
Based on current knowledge considered to be a pinch point	

In each case, freight traffic is considered in isolation. Passenger traffic is assumed to remain constant (i.e. the current passenger timetable), with the exception to the potential impact of HS2 Phase 2 (north of Birmingham) on WCML passenger service movements.

The values in Table 14 are the total path forecasts per hour for both directions – it is assumed that there is a balanced flow with half the traffic in each direction. The table highlights the impact of the growth of freight services in relation to the routes. A threshold of two trains per hour has been set as the point where it is likely that capacity constraints may occur. The assumption being that below this level the risk of exacerbating or creating a capacity constraint will be low.

It is also worth noting that assumptions made in relation to the focus of intermodal growth in Manchester being at Trafford Park are different to that of the network Rail Freight Market Study which assumed a distribution of growth across other facilities including Parkside and Port Salford. This has led to variations in the assumed growth on routes in this area.

Table 14 Rail Freight - Pathing Assessment

	Tracks	Freight Paths Required			Comment / Status
		2016	2050	Delta	
West Coast Main Line - Crewe to Carlisle					
Southern Border to Crewe	4	5.7	10.4	4.7	This is a four tracked section but is likely to benefit from the transfer of passenger services to HS2.
Crewe to Winsford South Jn.	4	4.9	8.5	3.6	
Winsford South Jn. to Hartford	2	4.9	8.5	3.6	This two tracked section is a pinch point both now and in the future with HS2
Hartford to Weaver Jn.	2	5.9	9.2	3.3	This is a significant increase on a double tracked mixed traffic section and so could be problematic.
Weaver Jn. to Warrington	2	3.5	4.8	1.3	This is an increase of less than one freight path per hour which could be an issue.
Warrington to Winwick Jn.	4	2.9	4.6	1.7	
Winwick Jn. to Wigan	2	2.5	4.0	1.5	
Wigan to Preston	2	2.5	4.0	1.5	
Preston to Carlisle	2	2.4	3.8	1.4	
Newton le Willows to Seaforth					
Newton le Willows to Edge Hill	2	<2	2.2	1.2	This is not considered to be an issue given the current passenger train services.

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Knottingley to Drax	2	4.4	5.5	1.1	Given the historical level of services into Drax this is not considered to be problematic
Applehurst Junction to Immingham					
Applehurst Jn. to Stainforth Jn.	2	3.3	2.6	-0.7	The dominance of freight services on this route and the relatively slow speed and limited frequency passenger services means that there are not issues anticipated with these variations
Stainforth Jn. to Thorne Jn.	2	4.6	4.6	0.0	
Thorne Jn. to Scunthorpe	2	4.2	4.0	-0.2	
Scunthorpe to Wrawby Jn.	2	5.9	6.1	0.2	
Wrawby Jn. to Brocklesby Jn.	2	7.2	7.7	0.5	
Brocklesby Jn. to Immingham	2	6.9	7.5	0.6	
Swinton to Peak Forest					
Swinton to Aldwarke	2	2.6	2.8	0.2	The variations in path numbers are all relatively modest meaning that there should be little difficulty in accommodating them. In general these are not high speed passenger routes.
Aldwarke to Masborough	2	3.1	3.4	0.3	
Masborough to Tapton Jn.	2	2.4	2.7	0.3	
Tapton Jn. to Dore	2	2.2	2.7	0.5	
Dore to Earles	2	3.0	3.7	0.7	
Earles to Peak Forest	2	2.2	2.5	0.3	
Tapton Junction to Alfreton					
Tapton Jn. to Claycross South Jn.	2	4.5	5.4	0.9	The increase of freight traffic on these routes are likely to require intervention.
Claycross South Jn. to Alfreton	2	2.9	3.1	0.2	This is a minor upgrade and not considered significant
Ardwick to Leeds					
Ardwick to Guide Bridge	2	<2	2.4	1.4	This is a congested stretch of track and likely to be a pinch-point
Guide Bridge to Mirfield	2	<2	2.0	1.0	
Mirfield to Healey Mills	2	<2	2.3	1.3	These are largely freight only sections with the increase in pathing demand likely to be within the route capability
Healey Mills to Wakefield	2	<2	2.5	1.5	
Wakefield to Altofts Jn	2	<2	2.9	1.9	This is a likely to be a congested stretch of track and likely to be a pinch-point
Altofts Jtn to Leeds	2	<2	2.6	1.6	
Wakefield to Moorthorpe					
Wakefield to Moorthorpe	2	2.5	3.2	0.7	This is mixed traffic route with LDHS passenger services although the forecast increase in freight traffic is small it could be an issue
Skipton to Rylstone					

Skipton to Rylstone	1	<2	2.7	1.7	This is a freight-only branch capable of handling this level of traffic

In addition to the above, there is a potential / existing conflict between freight and passenger trains on the Hope Valley line which is constraining capacity and journey time improvements on this main passenger line between Sheffield and Manchester. There is a Transport and Works Act Order (TWAO) awaiting ministerial approval for a scheme to address this.

Determination of the capability of individual track sections to handle the forecast volumes of freight and passenger traffic is a function of the signalling capability of the line, the mix of traffic (types and speed), and the number of tracks / loops.

Whilst this initial analysis provides an indication of potential pinch points based on the available information, more detailed analysis, on a corridor by corridor basis, will need to be undertaken alongside analysis of passenger service demand. This will allow for the development of interventions to alleviate constraints. It is also important to note that any significant increase in passenger trains will have a considerable impact on these findings.

There is a need to make more use of under-utilised routes such as Settle and Carlisle and routes to and from the Humber Ports.

Nevertheless, as a result of this initial analysis it has been possible to identify the most likely areas of conflict between demand for freight paths and passenger paths, which are:

- Hartford to Weaver Junction;
- Crewe to Trafford Park;
- Doncaster to Newark; and,
- Ardwick to Mirfield.

4.3.6 Challenges

Lack of capacity on the rail network in the North is a key challenge and can generally be expressed in a number of ways in addition to availability of freight paths covered above:

- Train Average Speeds;
- Train Length Limits;
- Train Weights;
- Gauge Clearance;
- Headways and Network Access; and
- Utilisation of Freight Paths.

4.3.6.1 Train Average Speeds

In order to ensure rail is an attractive mode of transport for the movement of freight, it needs to be able to compete effectively with road transport with suitable end-to-end journey times. Presently, across the UK rail network and focussing particularly on the North, the average speeds of freight trains and resulting journey times is not conducive to encouraging a greater shift of freight to rail.

Table 15 shows some typical freight train average speeds and resulting journey times on a number of services throughout the North taken from Network Rail's Working Timetables. Average speeds range from 16mph – 53mph.

Table 15 Typical Rail Freight Journey Times

Origin	Destination	Journey Time*	Average Speed
Liverpool	Drax Power Station	7.50 hours	16mph
Immingham	Drax Power Station	2.75 hours	19mph
Crewe	Trafford Park	1.25 hours	36mph
London Gateway	Trafford Park	7.50 hours	31mph
Immingham	Eggborough Power Station	3.50 hours	17mph
Tunstead	Eggborough Power Station	3.25 hours	53mph
Cardiff	Doncaster	8.75 hours	25mph
Wellingborough	Doncaster	3.50 hours	40mph

Source: Network Rail Working Timetables

Source: GBRf

Case Study: Drax Power

Drax Power import Biomass wood pellets from a number of Northern Ports including Liverpool, Immingham and Hull. These are moved by rail from the Port to the power station near Selby.

The import of wood pellets through Liverpool has experienced considerable difficulty in getting efficient rail paths, taking over 3 years to establish before contracts to build the terminal were placed. The average time for a loaded train on what is essentially a 100 mile journey has been over 7 hours, an average speed of just 16 miles per hour.

4.3.6.2 Train Length Limits

Rail's ability to carry significantly higher volumes of freight per journey in many cases allows it to compete effectively with road transport. The length of trains permitted on the rail network is pertinent especially when transporting non-heavy items such as intermodal freight as opposed to bulk goods.

Intermodal freight is a commodity experiencing considerable growth and due to its relatively light nature could be transported in longer trains will relatively little impact on the locomotive traction. Currently, 775m trains (including the locomotive) are considered to be the maximum length permitted for intermodal trains. It remains an aspiration in the UK to allow the running of trains of a greater length.

Longer trains have an impact in various areas but primarily in track signalling and resulting pathing requirements in addition to the availability of suitable loading and unloading facilities at freight terminals. There may also be a consideration in regard to length of existing loops across the rail network that allow faster trains to overtake.

Currently, 775m trains are permitted on the WCML from the South-east up to Crewe. The line north of Crewe (as of the end of Network Rail's Control Period 5 (CP5) is not cleared for 775m trains – this is the section of the route passing through the North of England.

4.3.6.3 Train Weights

Train weights are defined by the maximum axle weight of services that can travel over a given rail route and is known as the Route Availability (RA). The core rail network is generally able to meet the demands put on it by freight services however there may be specific areas where heavier trains result in re-routing of services and restricted operating speeds. This is generally associated with the transport of bulk cargo.

4.3.6.4 Gauge Clearance

In order to transport ISO containers on the rail network, sections of track are required to have the appropriate gauge clearance. ISO containers (9ft 6in in height) are commonly used for moving freight by sea shipping routes into and out of the North of England. To permit FOCs to transport this type of container on a standard wagon W10 gauge clearance is required.

A significant proportion of the rail network in the North of England does not have W10 clearance as shown in Figure 35, therefore limiting the scope for transporting intermodal containers by rail. Of the three Transpennine rail routes, W10 clearance is not in place at all. There are examples of routes where W10 does exist but only by way of complex manoeuvres such as between the ECML and Teesport where a deviation through Darlington and a reversing manoeuvre is required. The direct route has capacity issues such as the clearance of the Yarm Tunnel.

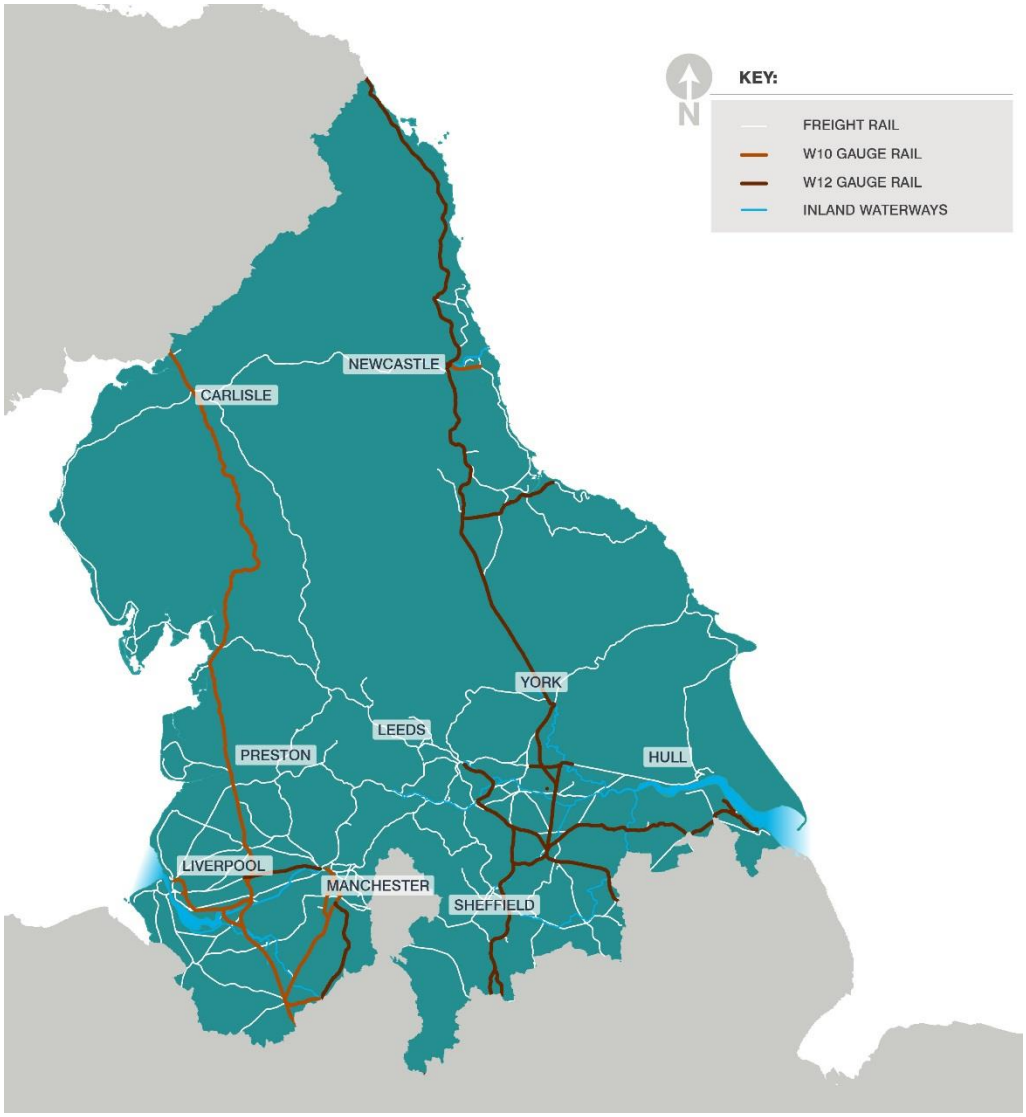

Figure 35 Rail Gauge Clearance

In addition, W12 clearance maintains the height of W10 clearance but features an increased width of 2600mm which accommodates the wider intermodal unit sizes and in particular those units used to transport refrigerated goods. As W12 clearance requires greater width, it is often significantly more expensive to implement as it can involve structure rebuilds and alterations to line side equipment.

Within the North of England, W12 gauge clearance is in place on the entire ECML as well as lines from it to Leeds and Sheffield. The MML is also W12, as is the line from Manchester to the WCML just south of Wigan. The route from Manchester to the WCML via Stoke-on-Trent is also W12 cleared. The majority of the WCML itself is only cleared for W10 gauge.

4.3.6.5 Headways and Network Access

The available headways on existing rail infrastructure are a significant problem often borne out by older signalling systems which can cause issues around

network access and days of operation. There are cases such as the Cumbrian Coast Line where the older signalling system inhibits expansion. On parts of the Cumbrian Coast Line, signal boxes are staffed only on Mondays – Saturdays with no operation on a Sunday. This will change soon when the boxes will be staffed seven days a week however the older signalling system and single line sections will remain.

4.3.6.6 Rail Freight Path Utilisation

It is well known in the Rail industry that freight paths are historically underutilised. Rail paths are often secured with good intentions but the loads never materialise. This has resulted in a reduction in the available paths on the rail network.

In order to assess the scale of unused paths, a high level utilisation exercise was undertaken to understand where freight paths are underutilised and where there is scope for improving the rail usage on certain routes.

A number of locations were identified in the TfN area: Colton Junction, Crewe Junction, Castlefield Junction and Knottingley. These four locations sit on different main routes and provide a picture of the current use of the rail freight industry in the area.

Utilising the Working Timetable (WTT) and information from Network Rail data feeds, we looked at the number of scheduled and actual train movements in weekdays from 08/03/2017 and 14/03/2017. The information from Network Rail also shows the variations to the WTT, Cancellations and Short Term Planned Routes. The results of the analysis are outlined in Table 16.

Table 16 - Rail Freight Utilisation Analysis

Type of Service	Castlefield Jn	Crewe Jn	Colton Jn	Knottingley
Working Timetable	210	693	182	81
Cancelled	63	152	345	278
Short Term Planned Routes	11	80	91	71
Variations to WTT	84	155	70	19
Total	368	1080	688	450
Utilisation (WTT Only)	82%	85%	42%	26%
Utilisation (Overall)	83%	86%	50%	38%

Two values of Utilisation have been analysed; number of trains running in comparison to the WTT and number of trains running in terms of number of scheduled trains (i.e. including Short Term Planned Routes). This is because although the Short Term Planned routes are not on the WTT, they still utilise the network and therefore it gives a more accurate reflection of the usage on rail freight.

Table 16 shows that the Castlefield Junction and Crewe Junctions are the most utilised in terms of keeping to the WTT and accommodating new movements.

Colton Junction and Knottingley have high proportions of cancellations, resulting in a much lower utilisation. On further inspection, many of these cancelled movements appear to be a result of the reduction in coal traffic with more than half of the cancelled routes in the top 10 cancelled routes being related to coal, as shown in Table 17.

Table 17 - Top 10 Cancelled Freight Paths

Loc.	Origin - Destination	Cancelled	Total	% run
Colton Jn	Drax Aes (Gbrf) - Tyne Coal Terminal Gbrf	32	55	42%
	Tyne Coal Terminal Gbrf - Drax Aes (Gbrf)	20	35	43%
	Doncaster Down Decoy Gbrf - Tyne Coal Terminal Gbrf	17	24	29%
	Doncaster Down Decoy Flhh - Redcar Bulk Terminal (Flhh)	17	20	15%
	Redcar Bulk Terminal (Flhh) - Doncaster Down Decoy Flhh	14	14	0%
	Drax Aes (Gbrf) - Hunterston (Gbrf)	10	10	0%
	Doncaster Up Decoy - York Engineers Yard	10	10	0%
	York Engineers Yard - Doncaster Up Decoy	10	10	0%
	Doncaster Down Decoy Gbrf - Hunterston (Gbrf)	10	10	0%
Knottingley	Drax Aes (Gbrf) - Tyne Coal Terminal Gbrf	31	49	37%
	Drax Aes (Gbrf) - Liverpool Biomass Tml Gbf	26	38	32%
	Drax Aes (Gbrf) - Tuebrook Sdgs Gbrf	23	26	12%
	Tuebrook Sdgs Gbrf - Drax Aes (Gbrf)	22	25	12%
	Tyne Coal Terminal Gbrf - Drax Aes (Gbrf)	20	35	43%
	Drax Aes (Gbrf) - Hunterston (Gbrf)	20	20	0%
	Hunterston (Gbrf) - Drax Aes (Gbrf)	12	12	0%
	Drax Power Station - Milford West Sidings	11	26	58%
	Hull Biomass Lp (Dbc) - Drax Power Station	10	11	9%
	Sudforth Lane Up Rs (Flhh) - Hunterston High Level Fhh	10	10	0%

4.3.7 Recent Rail Success Stories

Despite the challenges listed above, there have been some notable recent success stories for rail freight in the North of England. A selection of these are summarised below.

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These trains travel from Neuss, Germany, to 3MG Viking Park Ditton Foundry Lane transporting aluminium coils weighing up to ten metric tons each. The aluminium coils are then distributed onwards by road to customers.

On the reverse journey back to Germany, the trains carry aluminium bars weighing up to 27 metric tons each from Novelis' Warrington recycling plants, back to Neuss. The aluminium bars are transported by road from Warrington recycling plants to 3MG Ditton Foundry Lane rail terminal where they are loaded on to the trains. DB Cargo UK makes three round trips with trains 22 wagons long every week. Each one-way journey takes 25 hours.

4.4 Waterborne Freight

4.4.1 Ports

The UK, as an island nation, relies heavily on water-based freight to deliver imports and ship exports to and from a wide range of global destinations. In order to achieve this a number of major ports are located throughout the North of England alongside a greater number of smaller ports serving local areas as shown on Figure 36. The Major Ports are indicated in Table 18.

Table 18 Major Ports

Port Group	Major Ports
Mersey	Liverpool, Birkenhead, Garston, Manchester Ship Canal
Humber	Hull, Immingham, Grimsby
Tees	Tees, Hartlepool
Tyne and Wear	Tyne, Sunderland
Lancashire	Heysham
Cumbria	-

In addition to the Northern ports, freight flows to and from the North of England also travel via a number of other ports, particularly the southern ports such as Felixstowe and Southampton. Through the modelling of freight flows using GBFM the port throughput across the UK has been assessed.

Appendix B contains a graphical representation of the import and export volumes via each port group for 2016 and the forecast for 2050. It also provides the global origin and destination data for freight moving through these ports as well where in the UK the goods will be moved from and/or to. The total import and export volumes via these port groups are summarised in Table 19.

Table 19 Port Throughput

Port Group	Annual Cargo Volumes (million tonnes)					
	Imports			Exports		
	2016	2050	Growth	2016	2050	Growth
Tyne and Wear	3.4	4.6	35.3%	1.6	2.2	37.5%
Tees	21.1	26.1	23.7%	8.5	11.3	32.9%
Humber	50.4	65.8	30.6%	26.2	35.0	33.6%
Mersey	23.3	29.6	27.0%	7.9	17.3	119.0%
Lancashire	0.8	1.7	112.5%	1.2	2.5	108.3%
Cumbria	0.1	0.1	0.0%	0	0	0.0%

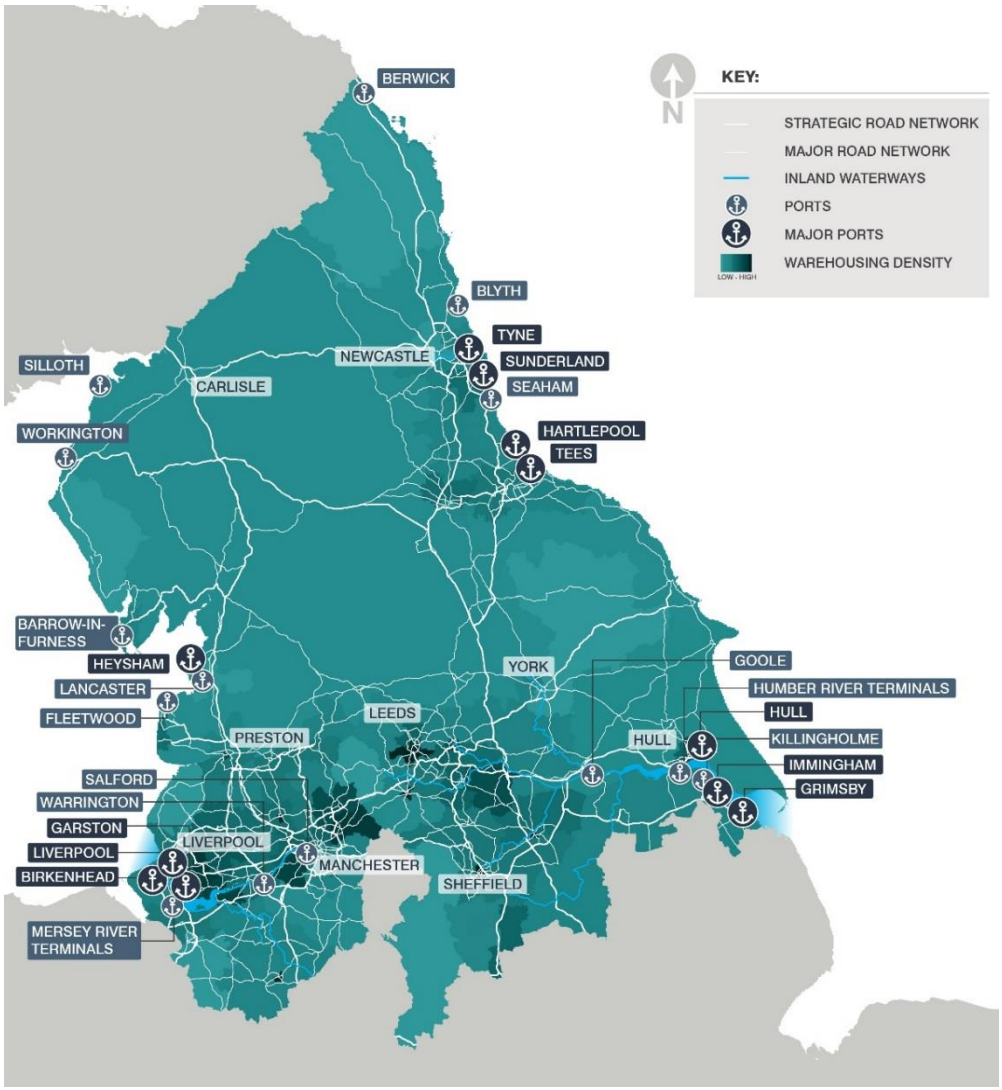


Figure 36 North of England - Port Infrastructure

Figure 37 and Figure 38 illustrate that Northern port's share of cargo throughput decreases between 2016 and 2050, although there is overall growth in total volumes as illustrated in Figure 39, which shows cargo imports and exports through the UK ports in 2016 and 2050. Whilst the throughput of the Northern ports is predicted to increase, the growth at the UK's major southern ports is expected to be higher mainly driven by intermodal freight units.

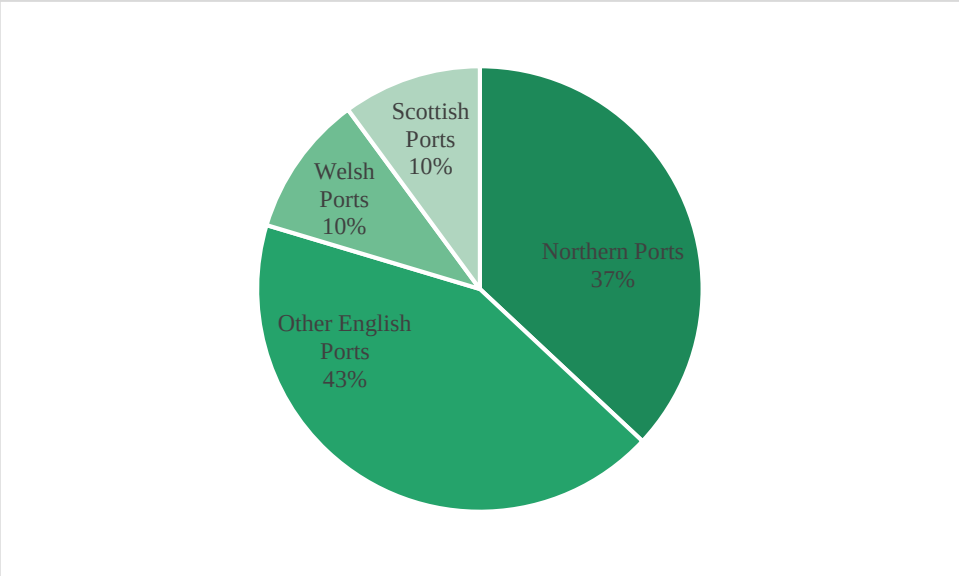


Figure 37 UK Ports Total Cargo Throughput – 2016

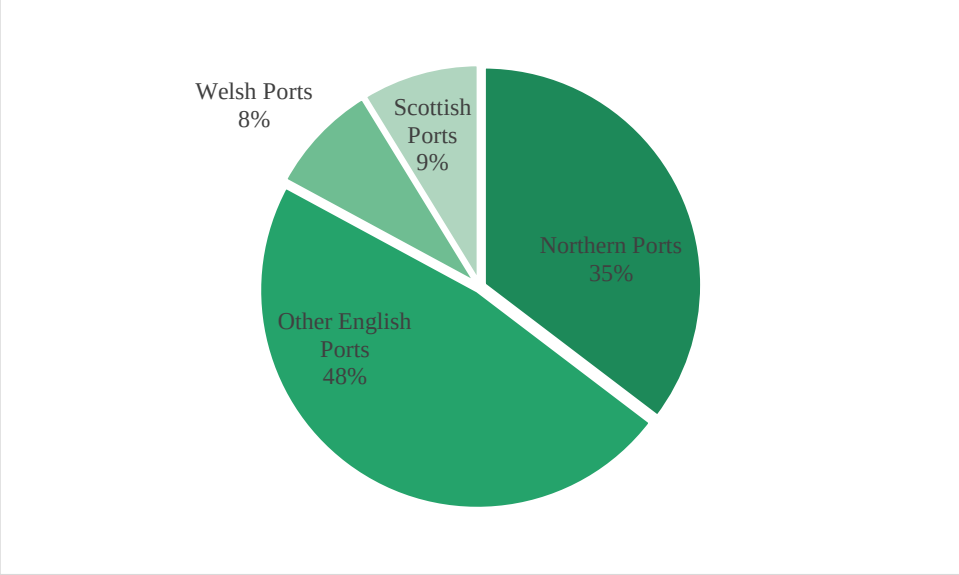
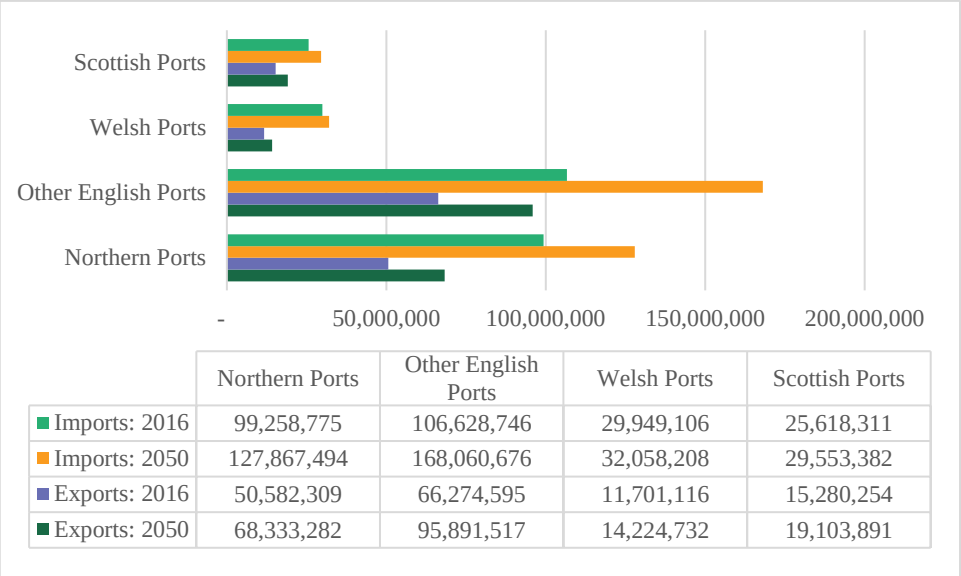


Figure 38 UK Ports Total Cargo Throughput – 2050



	Northern Ports	Other English Ports	Welsh Ports	Scottish Ports
Imports: 2016	99,258,775	106,628,746	29,949,106	25,618,311
Imports: 2050	127,867,494	168,060,676	32,058,208	29,553,382
Exports: 2016	50,582,309	66,274,595	11,701,116	15,280,254
Exports: 2050	68,333,282	95,891,517	14,224,732	19,103,891

Figure 39 UK Ports Imports and Exports by Port Groups (Annual Cargo Tonnes)

Ports play an intrinsic role in actively contributing to the success of the key areas of energy, advanced manufacturing, health sciences and digital and other sectors that are growth points in the Northern economy e.g. food and agriculture. Ports can be more than supply chain gateways for these sectors but can be the location for such activities e.g. Siemens in the Port Hull and BAE Systems in the Port of Barrow.

4.4.2 Shipping Types

Shipping movements are generally split into:

- Short Sea Shipping; and
- Deep Sea Shipping.

Short Sea Shipping (SSS) is the maritime transport of goods over relatively short distances on routes, such as Liverpool to Dublin and Immingham to Rotterdam, whereas Deep Sea Shipping (DSS) refers to the maritime transport of goods on intercontinental routes, crossing oceans.

The primary driver for growth in terms of shipping is intermodal container freight on both SSS and DSS routes. This is reflected in the 2050 forecast although the more predominant intermodal flows are focused on the southern ports, such as London Gateway, Southampton and Felixstowe, where extensive facilities for handling large container vessels have been created.

The Port of Liverpool has however invested over £400 million in the creation of a new deep-water container terminal that will enable two 13,500 TEU vessels to call at one time and hopes to attract regular container ship calls to boost the port's intermodal throughput.

Figure 40 illustrates the mixture of SSS and DSS routes into and out of the various Northern port groups in 2016 and the forecast for 2050. SSS transports the larger volume of cargo into the Northern ports with imports exceeding

exports. DSS tend to be focused on large vessels making one call in the UK on global loop routes. Currently some of intermodal freight brought into Europe by DSS services is fed into ports such as Rotterdam with smaller feeder vessels and SSS services transporting it as both accompanied and un-accompanied freight to the Northern ports. The intermodal freight that is transported via the southern UK ports generally travels to and from the North of England by rail into and out of intermodal terminals such as Trafford Park in Manchester for onward "last mile" distribution by road.

The Humber ports dominate the shipping volumes mainly because there are three significant ports (Hull, Immingham and Grimsby) located on the Humber Estuary. The majority of the freight handled by the Humber ports arrives via SSS routes. There is however also significant DSS services into and out of the Humber.

The Mersey ports are evenly balanced between SSS and DSS with aspirations of future growth in DSS services via the new container berth known as "Liverpool 2". Liverpool has developed a strong network of short sea shipping routes and is a major short sea shipping hub for the Irish Sea area with ro-ro ferry services to the Isle of Man, Dublin and Belfast (key operators including Stena Line, Seatruck Ferries, P&O Ferries and Isle of Man Steam Packet) and lo-lo container feeder services to Dublin, Belfast, Cork and Glasgow and from English Channel Ports (including Southampton, Rotterdam, Antwerp and Le Havre) for example. These feeder services to the English Channel Ports connect Liverpool to deep sea container services to the Far East, India, Africa and South America. Peel Ports also operate the innovative container ship service from the Port of Liverpool along the Manchester Ship Canal.

The Tees ports handle mainly SSS services and primarily import freight with Tyne & Wear ports handling smaller mixed volumes. Lancashire ports handle only SSS services and the ports in Cumbria handle a small amount of SSS services.

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In terms of volumes along each route, the DfT Ports Statistics and Barge Survey data gives annual volumes along each route. This is presented in Table 20.

Table 20 Inland Waterways Annual Cargo Volumes

Route	Traffic Type	Annual Cargo moved (million tonnes)										
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Manchester Ship Canal / River Mersey	Internal	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.5	0.8	0.6	0.4
	Seagoing	6.1	6.6	6.4	5.8	4.8	5.3	5.1	4.9	5.5	4.9	4.9
	Total	**6.4**	**6.9**	**6.7**	**6.1**	**5.0**	**5.6**	**5.4**	**5.4**	**6.2**	**5.5**	**5.3**
River Humber	Internal	0.6	0.4	0.3	0.3	0.3	0.2	0.5	0.3	0.5	0.6	0.3
	Seagoing	5.8	5.3	5.7	5.5	3.9	4.5	4.1	3.7	3.7	3.7	3.4
	Total	**6.4**	**5.8**	**6.0**	**5.8**	**4.2**	**4.8**	**4.6**	**4.0**	**4.2**	**4.3**	**3.7**
River Ouse	Internal	0.5	0.4	0.3	0.3	0.2	0.2	0.3	0.2	0.3	~	~
	Seagoing	2.8	2.4	2.6	2.4	1.8	2.2	2.0	1.4	1.5	1.5	1.5
	Total	**3.4**	**2.9**	**2.9**	**2.7**	**2.0**	**2.4**	**2.4**	**1.6**	**1.8**	**1.5**	**1.5**
Aire and Calder	Internal	0.4	0.4	0.3	0.3	0.2	0.4	0.3	0.2	0.1	0.0	~
	Seagoing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	**0.4**	**0.4**	**0.3**	**0.3**	**0.2**	**0.4**	**0.3**	**0.2**	**0.1**	**0.0**	**~**

The table shows that in terms of freight being moved by Inland Waterway, there has actually been on overall decline since 2005 however current investment in infrastructure is likely to arrest this decline.

4.4.4 Challenges

As with the other transport modes, water-based transport and, in particular for this report, the Northern Ports face a number of challenges which include:

- Consolidation of shipping lines and focus on southern ports;
- Port location and access and infrastructure;
- Land availability and planning restrictions; and
- Unbalanced flows.

4.4.4.1 Consolidation of shipping lines and focus on southern ports

As shipping lines seek greater efficiencies to reduce costs, the formation of shipping alliances to achieve consolidation is occurring across the industry. This can achieve a number of advantages, including:

- Cost savings, through delivering synergies and a longer term strategic advantage;
- Generates higher yields where the geographical footprint of the shipping lines is complementary; and

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Port of Liverpool – Cargo 200

The Port of Liverpool has developed the Cargo 200 initiative with an aim of removing 200 million miles off of the UK's road and rail infrastructure by the end of 2020.

The Port has signed up 200 advocates for the campaign to encourage shipping lines to introduce direct deep-sea services to Liverpool2.

The advocates signed up include organisations such as Warburtons, Bentley and Matalan.

There are however significant existing feeder services from the major hub ports in Continental Europe and the major southern UK ports into the Northern ports including Tyne, Hull, Immingham, Teesport and Liverpool. The ports on the east coast also feature a significant throughput of accompanied freight via short sea services from Europe whereas the ports based on the Mersey handle significant volumes to and from the Republic of Ireland and Northern Ireland.

It should be noted however that the trend towards larger ships is not limited to the container trade and is also pertinent in the movement of bulk commodities for example. This will influence how cargoes are directed in the future.

As the UK focuses on its withdrawal from the EU, the type of Brexit deal agreed by the UK Government may have a significant effect on Port traffic. It is difficult to predict the exact effects, however should significant additional pressure be put upon the Port of Dover through increased customs checks for example, the Northern Ports may be relied upon to relieve some of this pressure.

4.4.4.2 Port location and access and infrastructure

The landside facilities for the distribution of goods to and from the Northern Ports is imperative to increasing their attractiveness and ensuring freight is moved efficiently across the network.

Many of the Northern Ports are located in urban areas such as Liverpool within the city itself and therefore any increase in vehicle flows in particular on the local road network will have a negative impact on air quality with resulting congestion impacting on the operational cost of transport.

Many of the ports feature both road and rail access, however often routes to join the major transport networks are slow and unreliable. Again this reduces the competitiveness of the Northern ports.

Providing infrastructure to allow freight to be transported to and from the ports effectively is imperative. A good example of where the North falls short in this regard currently is the Biomass traffic that is brought into the UK through the Port of Liverpool for onward transport by rail to the Drax site at Selby. The route that trains take between the two points is not direct and often takes a considerable amount of time at low speeds due to capacity concerns (related to train weight and

pathing constraints) on the east-west routes between Liverpool and Yorkshire (see section 4.3.6.4).

The Port of Hull's rail connection as recently been upgraded to W10 gauge clearance to enable the movement of containers by rail to and from the port. Immingham, Teesport and Liverpool (restricted train lengths) also have the ability to handle containers by rail.

4.4.4.3 Land availability / planning restrictions

Ports are facing a number of challenges around finding suitable land for the expansion of their infrastructure and in turn are generally being frustrated in their attempts to expand by planning restrictions forced upon them.

Typically these planning restrictions are related to port access and road and rail connections.

4.4.4.4 Unbalanced flows

Another challenge is the unbalanced flows through the Northern ports where greater volumes of freight are being imported compared to the volumes of freight being exported. This often results in wagons, trailers or containers being transported around empty and a number of operators have commented that they often transport more waste from the UK than manufactured goods. Returning empty containers back into the system is also a key issue as it is a cost that creates very little benefit, however this is necessary to ensure container terminals in the North do not end up being a storage facility for empty containers.

4.5 Air Freight

4.5.1 Airports

The airport infrastructure in the North of England is illustrated in Figure 42. There are 7 airports across the North offering passenger and/or freight services. Most of the freight travelling by air into and out of the North does so in the belly hold of passenger aircraft, particularly long haul wide body aircraft. As a result of this the major freight flows by air into and out of the North are focused on Manchester Airport where there are a greater variety of air services as shown in Table 21. There are however some long haul wide-body air services into Newcastle International Airport which offer significant cargo space.

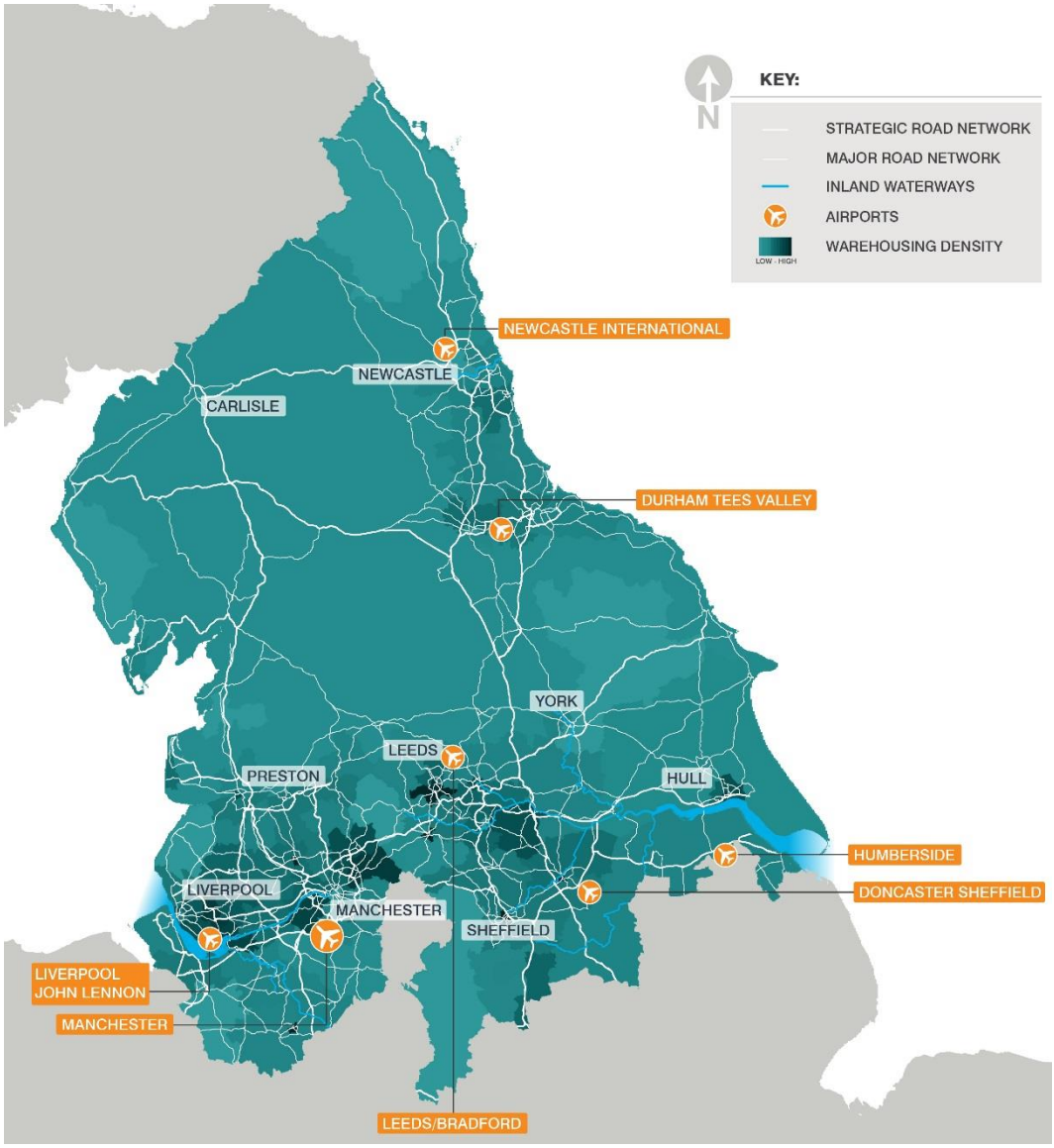

Figure 42 North of England - Airport Infrastructure

In addition to the major airports shown in Figure 42, Chester Hawarden Airport is the location of Airbus Broughton and plays a significant air freight role in the Airbus supply chain transporting finished wings made at Airbus Broughton on specially adapted Beluga aircraft to the final assembly plants in Toulouse and Hamburg. After assembly at Broughton, the aircraft wings are transported by A300-600ST (Super Transporter) Beluga freight aircraft to Toulouse in France.

Carlisle Lake District Airport will also open for scheduled air services from 2018 where there is a potential role for the transportation of freight such as mail.

4.5.2 Total Cargo Movements

At Manchester Airport, long haul airlines operate to an increasing number of destinations using wide-body aircraft such as Singapore, New York, Los Angeles, Hong Kong, Dubai and Abu Dhabi. As these long haul destinations grow, the cargo capacity at the airport also increases.

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Table 22 North of England Forecast Commodity Group Trends 2016-2050 (all modes - annual tonnes lifted)

Commodity Group	2016 Total	2050 Total	Difference	Growth
Intermodal	429,047,339	608,223,570	179,176,231	41.8%
Construction and Metals	145,432,706	195,780,275	50,347,569	34.6%
Petrol and Petroleum Products	23,582,068	35,173,303	11,591,235	49.2%
Other Bulks	58,040,217	56,995,074	-1,045,143	-1.8%
Automotive	218,109	262,330	44,221	20.3%

NPIER focuses on four key growth capabilities, namely digital technology, advanced manufacturing, energy and health innovation. Logistics as an enabling capability and as such there are several areas that offer potential growth. Construction logistics is an area experiencing growth and as further infrastructure schemes are developed, the need to transport construction materials will increase. This will be particularly pertinent with HS2 and the developments on the Energy Coast in Cumbria for example.

Another focus is around waste to energy schemes as demonstrated by Drax where there is a need to move bulk fuel (e.g. biomass pellets) from ports or source locations to the power plant. Rail is an attractive method of moving these bulk volumes and therefore there is scope for further movements in the future.

The results for (rail based only) automotive freight movements (another growth area) are presented here alongside the major commodity groups as it has been identified as a major growth sector.

Automobiles moved by road are included in the Intermodal commodity group. This is an unfortunate limitation of GBFM. Automotive rail terminals are located in the North such as in Speke (Ford) and Halewood (Jaguar Land Rover). Automotive Trains operate from Halewood to the Port of Southampton and from Dagenham and the Port of Southampton to Speke for example. Recently, General Motors (Vauxhall) at Ellesmere Port have also commenced automotive rail services to the London EuroHub at Barking.

Automobiles are also imported through a number of Ports within the North of England such as the Port of Grimsby which is the largest car import port in the UK following an investment of £26m by ABP into berths for larger automotive carrier ships.

The decline in coal traffic within the “Other Bulks” sector has been partially offset by an increase in demand for other types of bulk and therefore the reduction in real times is less stark.

The intermodal commodity group represents those freight flows which are currently intermodal or could be deemed as viable for intermodal transport. The vast increase between 2016 and 2050 reflects the growth of online retailers such as Amazon and increased consumer spending leading to increased freight movements.

4.6.2 Key Flows

The key movements within each of the commodity groups listed in Table 22 have been analysed in more detail to provide some key route pairs between defined high level zones which includes the North of England. The zones have been defined to represent similar sized areas and allow the key freight corridors to be defined and fed into the STP for further consideration within the Strategic Corridor Studies.

The zones are broken down as shown in Table 23 and on Figure 43.

Table 23 Key Flows High Level Zone List

Zone	Details
TfN: Central	Leeds, Sheffield, Doncaster, Intermodal Freight Terminals at Leeds Stourton, Wakefield and Doncaster and Drax Power etc
TfN: East	Scunthorpe, Hull, Grimsby, Humber Ports (Port of Hull, Immingham, Grimsby, Killingholme etc) and Tata Steel at Scunthorpe etc
TfN: North East	Newcastle, Sunderland, Middlesbrough and Ports on the Tees (Hartlepool, Port of Tees) and Tyne and Wear Ports (Port of Tyne, Port of Sunderland).
TfN: West	Manchester, Liverpool, Warrington, Mersey Ports (Port of Liverpool etc) and Intermodal Freight Terminals at Trafford Park, Garston and Widnes / Ditton etc
TfN: North West	Preston, Blackpool, Carlisle and Lancashire and Cumbria Ports (Port of Heysham, Port of Barrow, Port of Workington etc), Cumbrian Energy Coast etc.
Other England: East Anglia	Ipswich, Colchester, Norwich and major ports (Port of Felixstowe, London Gateway etc)
Other England: East Midlands	Leicester, Nottingham etc
Other England: London	London
Other England: South East	Major Channel Ports such as Port of Dover, Portsmouth, Port of Southampton and the Eurotunnel terminal at Folkestone.
Other England: South West	Bristol, Swindon, Exeter and south coast ports such as Plymouth.
Other England: West Midlands	Birmingham, Coventry, Stoke-on-Trent, Daventry International Distribution Centre
Scotland	Edinburgh, Glasgow, Scottish Ports such as Grangemouth, Leith, Greenock etc and Intermodal Rail Terminals at Mossend and Coatbridge
Wales	Cardiff, Swansea and Ports such as Holyhead and Fishguard.

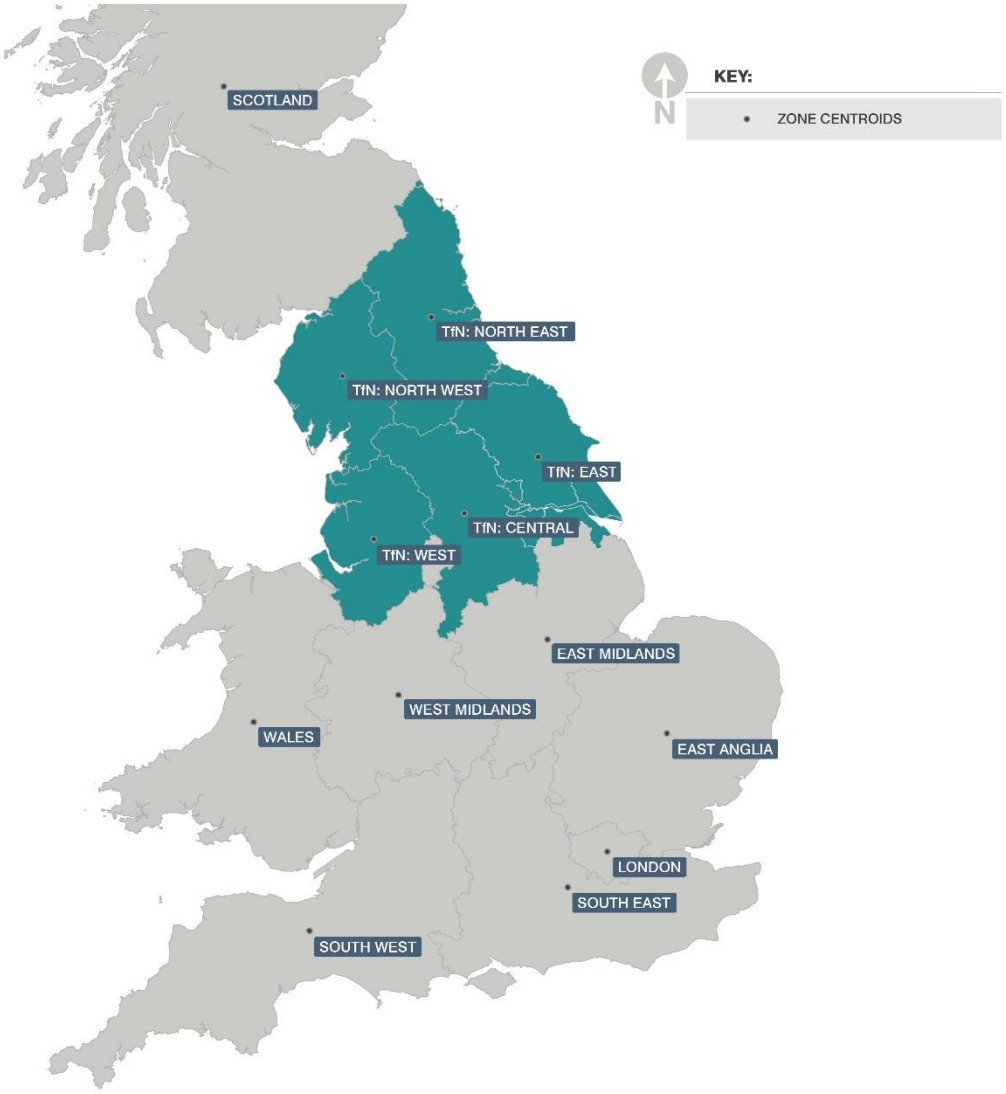

Figure 43 Key Flows Analysis Zone Configuration

The top 10 overall flows in to/from or through the North of England are listed in Table 24. The table shows that the major flows occur between the East Midlands and TfN Central zone with around 42.5 million tonnes of cargo moved in 2050.

There are also some substantial movements within the TfN zones; particularly between TfN Central and TfN East (with 40.7 million tonnes moved in 2050) and between TfN Central and TfN West (with 35.6 million tonnes moved in 2050).

Table 24 Top 10 Freight Flows in the North (all commodities) in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	East Midlands	TfN Central	30.9	42.5	11.6
2	TfN Central	TfN East	34.4	40.7	6.3
3	West Midlands	TfN West	29.9	38.7	8.8
4	TfN Central	TfN West	28.7	35.6	7.0
5	East Midlands	TfN West	14.2	33.8	19.5
6	East Anglia	TfN West	11.8	30.9	19.1

7	South East	TfN West	12.7	28.5	15.7
8	East Anglia	TfN Central	9.9	21.6	11.7
9	TfN East	TfN West	15.3	20.0	4.7
10	East Midlands	TfN East	13.9	19.1	5.2

The top flows weighted by cargo tonnes lifted for all cargo commodities are shown on Figure 44. The movements are shown between zone centroids and not to/from exact locations based on the data supplied from GBFM.

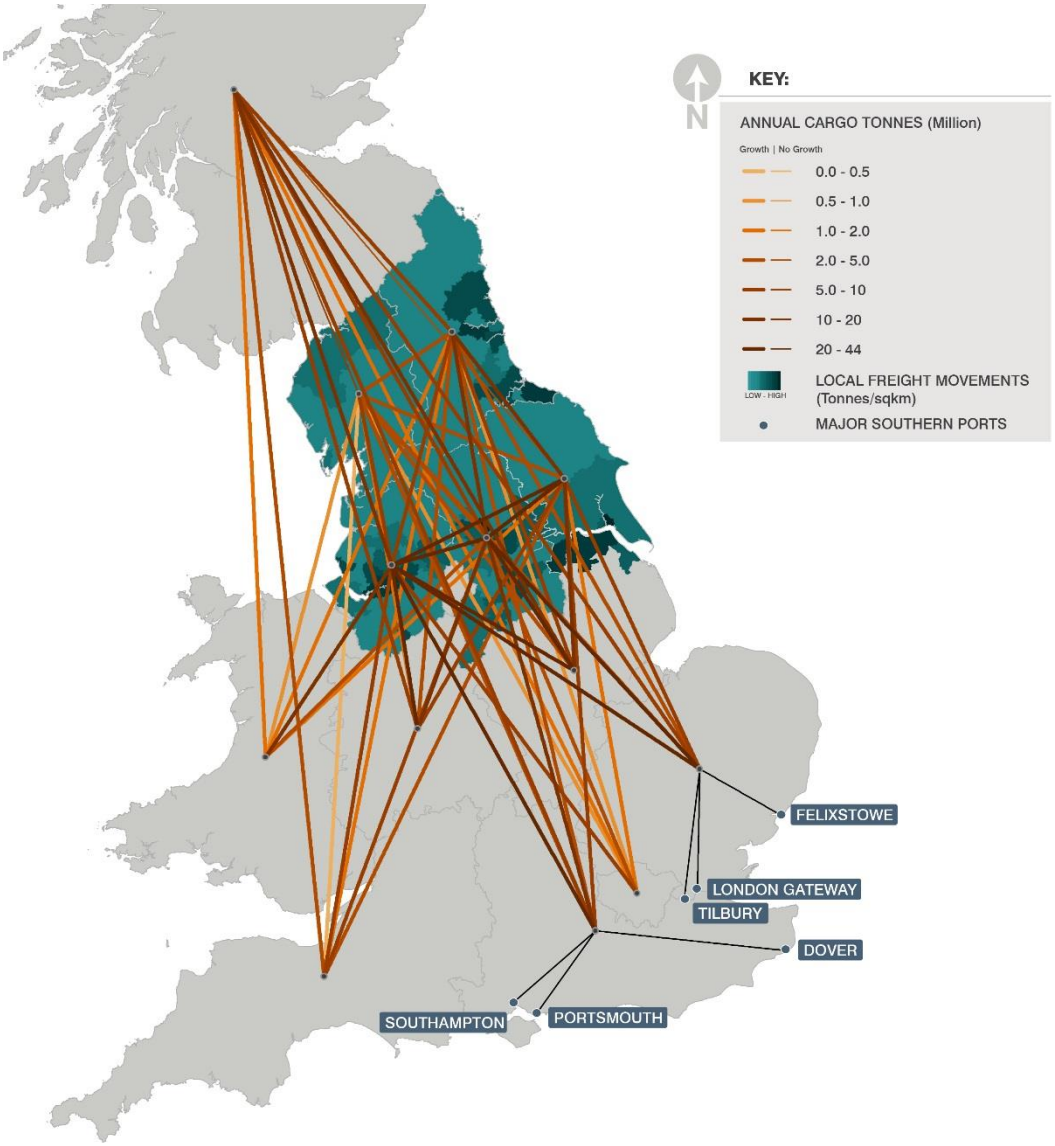

Figure 44 Top Freight Flows in the North (all freight flows) in 2050

4.6.2.1 Intermodal

Intermodal freight is a major growth area not only within the North of England but also nationally and globally. As consumer spending increases due to the popularity of online retailers for example, the demand for goods also increases. Many of these manufactured items or foodstuffs are transported in standard ISO

intermodal containers which can be moved relatively easily between varieties of transport modes.

Ports

In the UK, the vast majority of intermodal containers are imported and exported through the major ports in the south of England, namely the established ports at Felixstowe and Southampton. A new container port has been constructed and has commenced operations on the Thames and is known as London Gateway. Containers are however also imported and exported via the Northern Ports albeit in smaller numbers. Ports such as Liverpool, Hull, Immingham, Tyne and Teesport have regular intermodal services, which are generally made up of feeder vessels from the larger hub ports within Central Europe.

The Port of Liverpool has recently invested in its container handling facilities by building a new deep sea container berth capable of handling two 13,500 TEU vessels simultaneously with the aim of securing regular calls by larger liner vessels utilising Liverpool as a hub port therefore decreasing the proportion of containers moved by road and rail from the southern ports.

Challenges remain for all ports around multimodal access (road and rail) and through the limitations in the current supporting infrastructure in the North of England.

Multimodal Terminals

In addition to the North of England's ports, Multimodal freight terminals have been set up by some of the major freight operators in order to minimise the movement of containers by road and increase the proportion of those moved by rail on the trunk routes to and from the southern ports.

Figure 45 Intermodal Train (Source: DRS)

Rail services are currently operated between the three major container ports at Felixstowe, Southampton and London Gateway to the Multimodal terminals shown in

Table 25. Road haulage provides the means for transporting containers from across the North to the Multimodal terminals.

Table 25 Rail Served Multimodal Distribution Terminals - North of England

Name	Operator	Rail Services to / from (> daily)		
		Felixstowe	Southampton	London Gateway
Doncaster	Freightliner	✓	×	×
Leeds Stourton	Freightliner	✓	✓	✓
Liverpool Garston	Freightliner	✓	✓	✓
Trafford Park	Freightliner / DB Schenker	✓	✓	✓
Rotherham	DB Schenker	✓	✓	×
Wakefield	DB Schenker	✓	✓	✓
Ditton / Widnes	Stobart Ports	✓	✓	×
Teesport	PD Ports	✓	✓	×

In addition to the Multimodal Terminals in the North of England, there are additional sites in Scotland (Grangemouth, Coatbridge and Mossend) that are also connected to the southern ports by way of daily rail services (and too Teesport). Domestic intermodal rail services also run between Daventry and Scotland carrying high street goods and products. These services pass through the North of England (typically on the WCML) and therefore also have an impact on its infrastructure.

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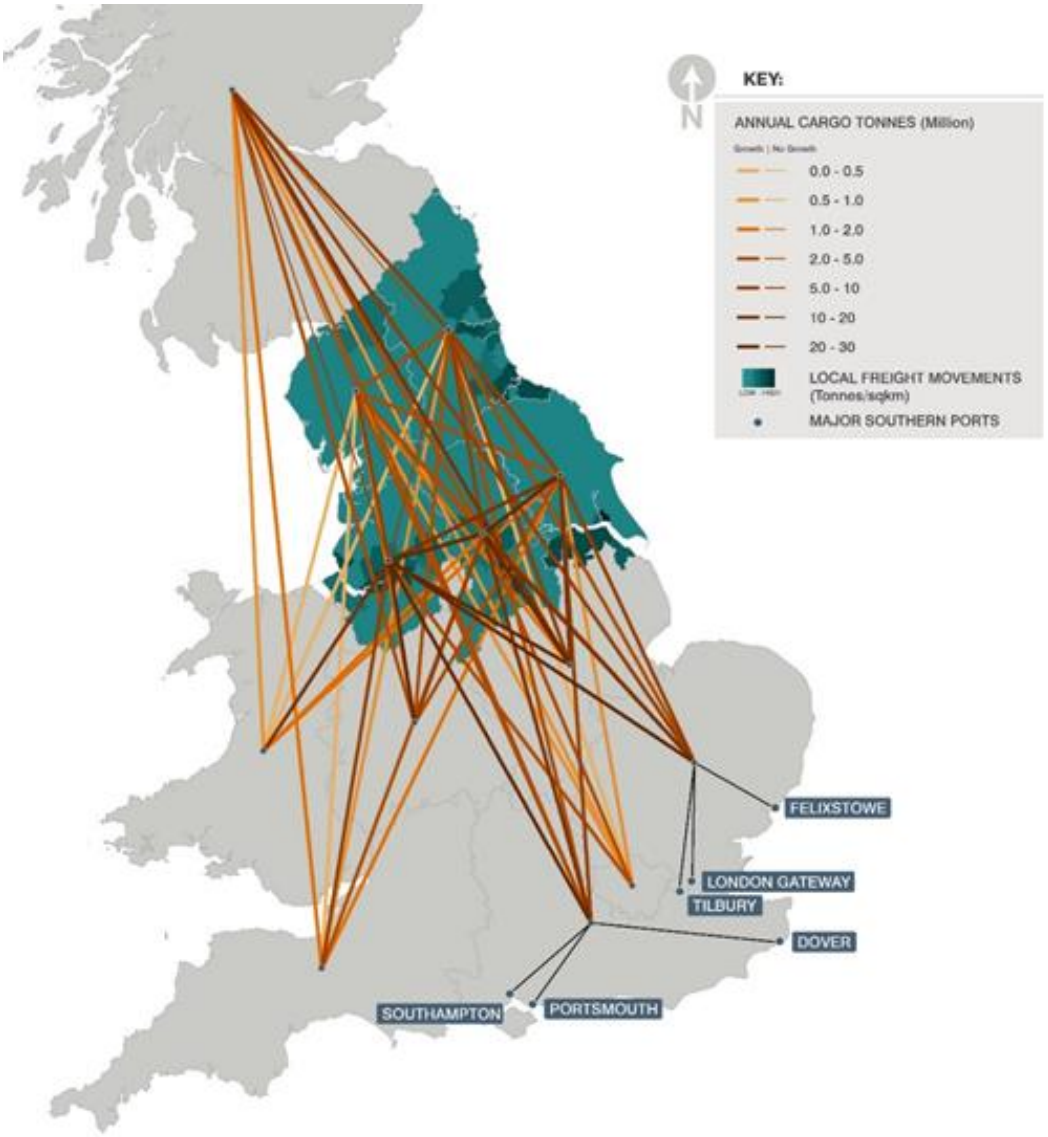

Figure 46 Top Intermodal Freight Flows in the North (all freight flows)

4.6.2.2 Construction and Metals

Materials relating to construction and metals are often imported into the North via the region's ports. There are however manufacturing plants such as British Steel in Scunthorpe (included in the TfN East zone) which generate a significant volume of cargo tonnes which are moved within and out of the North.

The top 10 O-D pairs for the movement of construction and metals materials, into, out of and within the North are shown in Table 27.

The table clearly shows that the top movements occur between the East Midlands and TfN Central and is related to construction materials such as crushed stone and cements from quarries being transported south. There is also a heavy movements between the West Midlands and TfN West and is related to (amongst other things), the movement of scrap metal to the Port of Liverpool for example.

Table 27 Top 10 Construction and Metals Freight Flows in the North in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	East Midlands	TfN Central	10.9	11.7	0.8
2	West Midlands	TfN West	5.7	10.2	4.5
3	TfN Central	TfN East	7.4	8.1	0.7
4	TfN Central	TfN West	6.5	7.8	1.3
5	East Midlands	TfN West	1.4	7.4	6.0
6	West Midlands	TfN Central	4.9	6.1	1.2
7	TfN Central	TfN North East	3.1	4.2	1.1
8	East Midlands	TfN East	2.8	4.1	1.3
9	East Anglia	TfN West	0.6	3.9	3.3
10	East Anglia	TfN Central	1.1	3.9	2.8

Figure 47 shows the top flows of construction and metals materials weighted by annual volume moved between the high level zones set out.

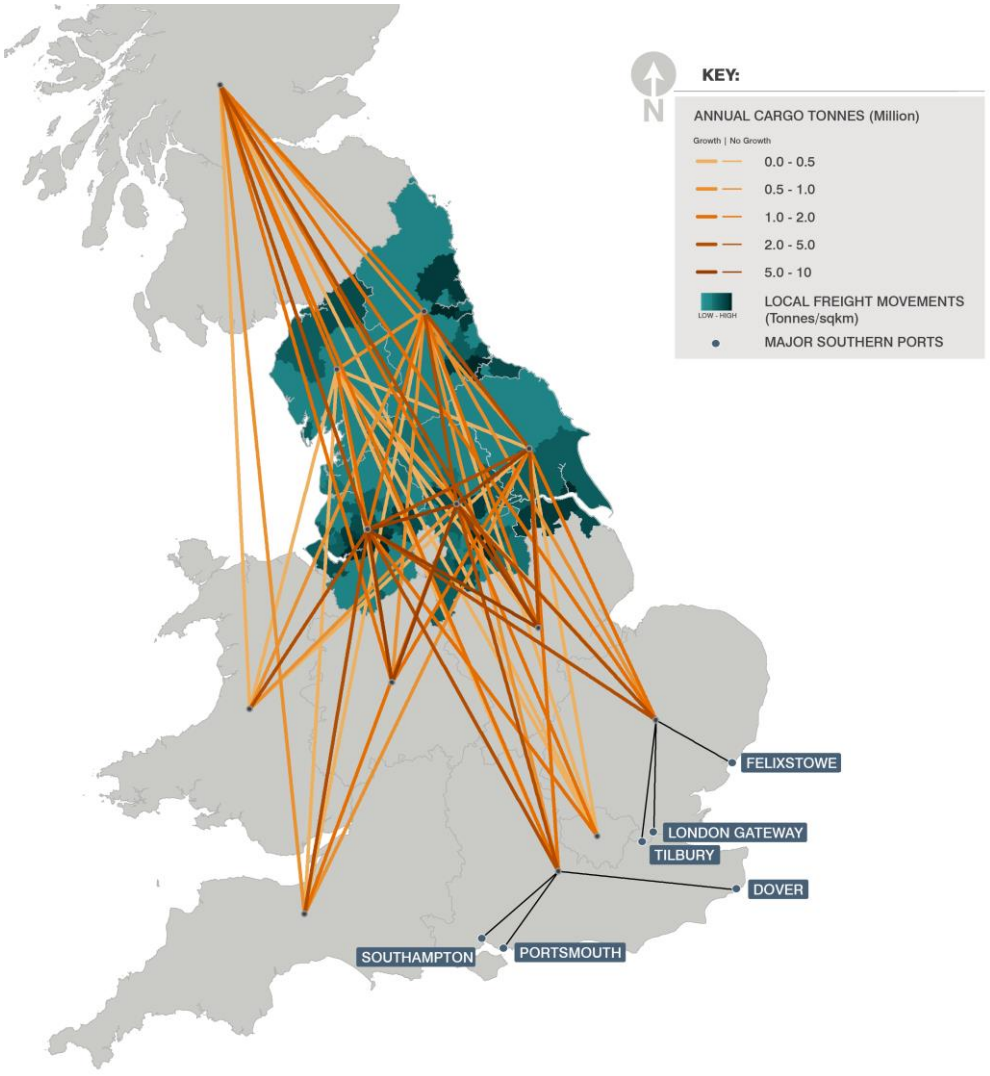

Figure 47 Top Construction and Metals Freight Flows in the North (all freight flows)

Figure 48 Bulk Material related to construction is moved in significant quantities by rail (Source: DRS)

4.6.2.3 Petrol and Petroleum Products

In comparison to the other commodities, the volumes of petrol and petroleum products moved is relatively low, however three large oil refineries are located within the North of England; one at Stanlow on the Mersey (within the TfN West zone) and the other two on the Humber (Total and Philips 66) (within the TfN East zone). There is also a large oil terminal and storage facility on the River Tees including a rail-connected terminal operated by Navigator as well as on the Tyne at Jarrow (also rail-connected).

Petrochemical plants are located on Teesside as well as on the Humber and Mersey.

In addition to the movement of these products by road and rail, substantial pipelines also exist with some stretching over long distances between the fuel terminals in the North and major airports in the south such as Heathrow and Gatwick.

Table 28 shows the top 10 O-D zone pairs for the movement of petrol and petroleum products into, out of and within the North of England.

Table 28 Top 10 Petrol and Petroleum Freight Flows in the North in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	West Midlands	TfN East	2.6	2.6	0.0
2	East Midlands	TfN Central	0.3	1.9	1.6
3	West Midlands	TfN West	0.7	1.4	0.7

4	TfN Central	TfN East	1.7	1.4	-0.3
5	TfN Central	TfN West	0.9	1.3	0.4
6	East Midlands	TfN West	0.2	1.3	1.1
7	East Midlands	TfN East	1.3	1.1	-0.2
8	West Midlands	TfN Central	0.4	0.7	0.4
9	South West	TfN East	0.1	0.7	0.6
10	TfN West	Wales	0.7	0.6	0.0

The top O-D movements of Petrol and Petroleum products are shown, weighted by volume on Figure 49.

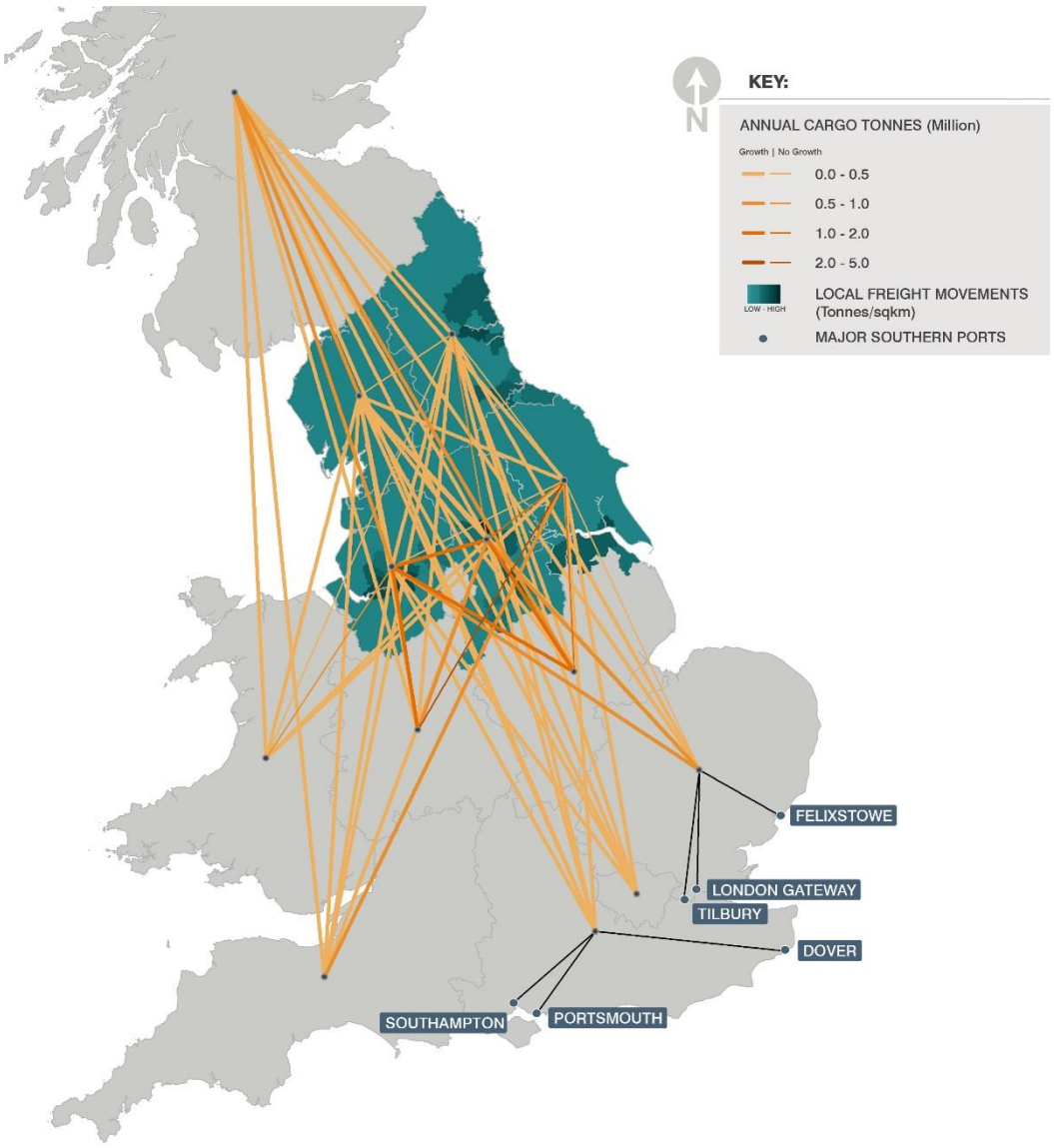

Figure 49 Top Petrol and Petroleum Movements in the North

4.6.2.4 Other Bulks

The Other Bulks commodity category shows a decline between 2016 and 2050 and is mainly related to the decrease in demand for coal. There are however other bulk materials moved in significant quantities within the North of England. One of these is the movement of Biomass pellets to the Drax Power Station near Selby

in the TfN Central zone. This is reflected in the top three OD movements shown in Table 29 as the biomass pellets are imported through ports on the Mersey, Tyne, Tees and Humber.

Table 29 Top 10 Other Bulks Freight Flows in the North in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	TfN Central	TfN East	8.2	6.3	-1.9
2	TfN Central	TfN West	3.5	4.7	1.1
3	TfN Central	TfN North East	2.9	3.0	0.1
4	East Midlands	TfN Central	1.9	2.3	0.4
5	West Midlands	TfN West	1.9	2.0	0.2
6	East Midlands	TfN West	0.9	1.4	0.5
7	East Midlands	TfN East	1.3	1.0	-0.2
8	Scotland	TfN West	0.6	0.8	0.2
9	West Midlands	TfN Central	0.6	0.8	0.2
10	TfN West	Wales	0.8	0.7	-0.1

The top movements of Other Bulks materials within the North of England are shown weighted by volume moved in 2050 on Figure 50.

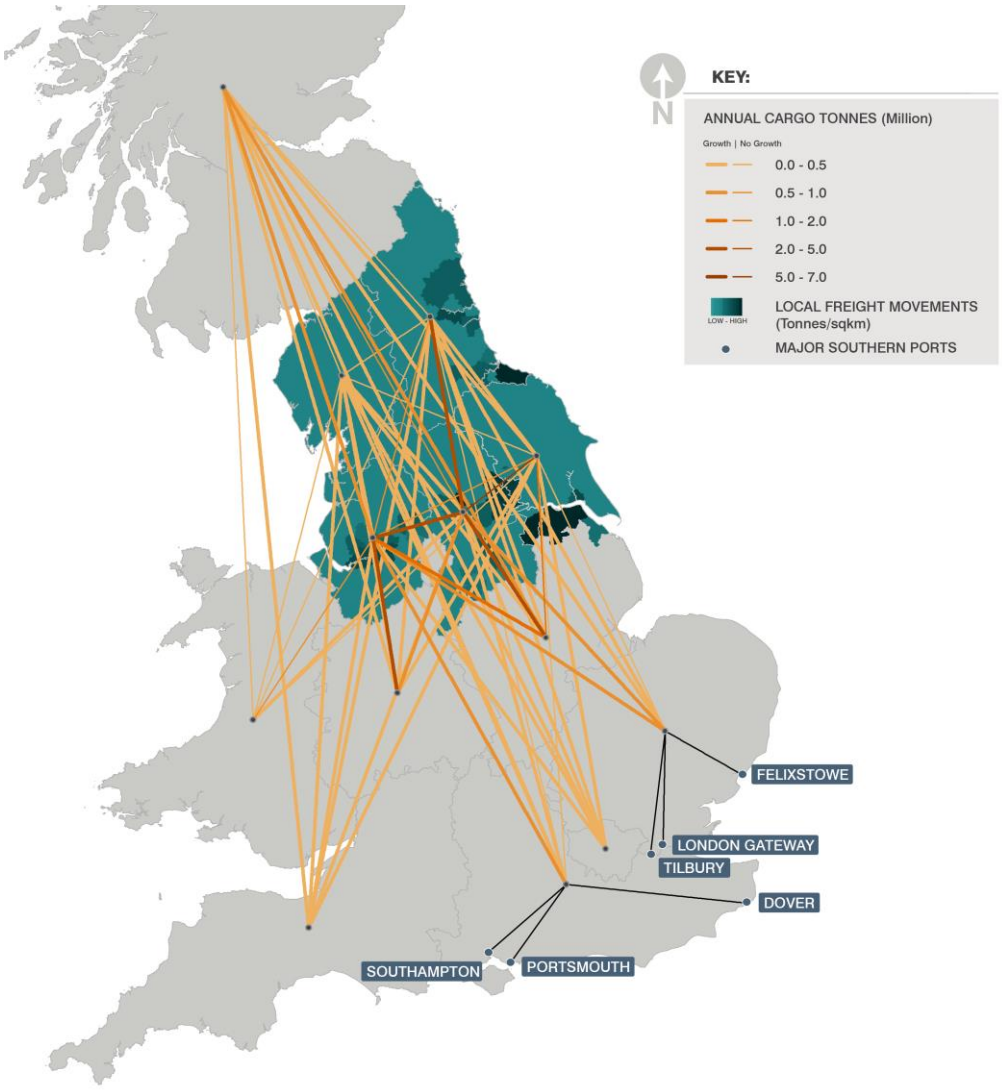

Figure 50 Top Other Bulks Movements in the North

Coal

The decline in the demand for coal has been significant for the rail freight sector and as such, capacity has been released on the rail network where coal movements no longer take place.

Table 30 shows the top 5 coal movements that show a decline between 2016 and 2050 whereas Table 31 shows the top 5 movements that have been discontinued completely. Many of these movements are related to the closing down of coal power stations such as at Drax near Selby for example.

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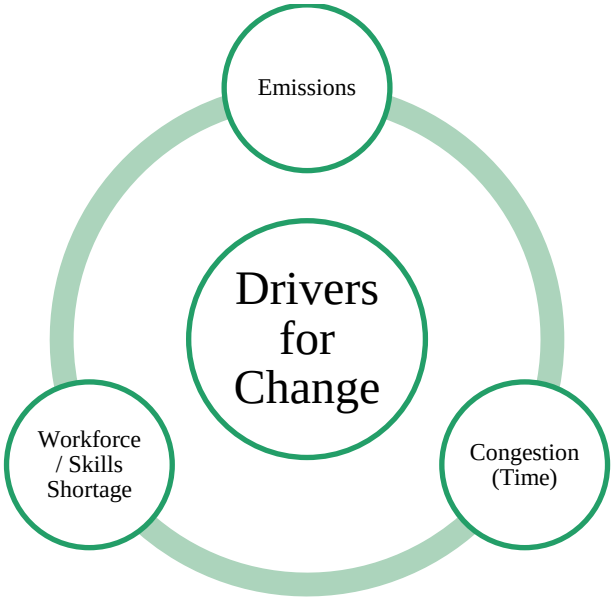

Figure 51 Drivers for Change

4.7.1 Congestion (Time)

As the demand for the transport of freight increases, alongside the general demand for transport as the economy grows, congestion is inevitable. Many of the key routes within the North already reach their design capacity at some point during the working day and this issue will be exacerbated in the future.

The Road Haulage Association (RHA) provides costs for different vehicle types in 2014 (see Table 32). These costs consider everything from drivers' wages to the depreciation of the vehicle. The cost data allows conclusions to be drawn on the monetary effect of time lost to congestion over a year to business.

Table 32 - RHA Goods Transport Costs (per average day)[4]

Vehicle Type	2014 Cost (£ per day)	2014 Cost (£ per 15 mins)
Rigid		
3.5 tonne	161	1.68
7.5 tonne	183	1.91
13 tonne	206	2.15
18 tonne	225	2.34
26 tonne	265	2.76
32 tonne	285	2.97
Articulated		
32/33 tonne	273	2.84

[4] http://www.andersonstransport.com/documents/terms/Cost-Tables-2014-EDITION.pdf

38 tonne	303	3.16
44 tonne	325	3.39

The modelling from GBFM forecasts the freight moved in cargo tonnes annually on the road network in the North. Utilising the assumptions in Table 33, an approximate number of annual HGV movements across the North can be calculated. It should be noted that this is a simple test that assumes one vehicle type and a theoretical overall equipment effectiveness (OEE) value. The OEE assumes that 80% of vehicles are fully loaded and that those vehicles operate at 80% efficiency (i.e. 80% of their maximum load capacity).

The assumption has been made that road movements consist of 60% HGV and 40% LGV movements. This therefore leaves the total capacities for the two modes at 19.2T and 4.8T, respectively.

Table 33 HGV Movements Assumptions

Assumptions	
Vehicle size (tonnes)	44
Max Load Capacity (tonnes)	30
Load Factor	80%
OEE	80%
OEE + Load Factor	64%
Average Vehicle Load (tonnes)	19.2
2050 Cargo Tonnes Moved by Road (tonnes)	763,909,612
2050 HGV Movements	39,786,958

The data presented in Table 33 shows that in 2050, based on the assumptions set out, there is forecast to be circa 40 million HGV movements on the Major Road Network within the North of England.

Table 34 illustrates the costs to the haulage industry of effects of congestion on the annual HGV movements within the North of England. Varying levels of congestion on similarly varying proportions of the total annual HGV movements generate different costs. If 50% of the HGV movements were caught in 15 minutes congestion every day during the working year, this would equate to an extra cost to the industry (purely time driven as a result of congestion) of £67,347,715. Similarly if 100% of HGV movements experienced 45 minutes congestion every day, the extra cost as a result of that congestion to the industry would be £404,086,292.

Table 34 - Cost of Congestion at varying levels

Time in Congested Conditions (mins)	**Cost of varying proportions of HGV Flows in Congestion (£ million)**			
	25%	**50%**	**75%**	**100%**
15	33.6	67.3	101.0	134.7
30	67.3	134.7	202.0	269.4
45	101.0	202.0	303.1	404.1
60	134.7	269.4	404.1	538.8

This creates a number of issues however in the context of time and cost that could have repercussions on the cost of goods to the consumer. Manufactures will

simply absorb these costs in the price of the goods to the detriment of the consumer.

Alleviating congestion will not only have a significant impact on the costs of the road haulage industry in the North, it may also attract additional investment from hauliers, which in turn will drive economic growth.

4.7.2 Emissions

With the proposed rise in freight traffic from 2016 to the forecast year of 2050 with NPIER Growth, there are significant concerns without taking any action around the regional air quality and contribution of emissions to the atmosphere in the North. This needs to be evaluated to understand the effects of this increase in freight traffic in terms of emissions and air quality.

CO^2e, or carbon dioxide equivalent, is a standard unit for measuring carbon footprints. It encompasses other greenhouse gases such as methane, nitrous oxide and ozone and allows them to be expressed in terms of CO^2e based on their relative global warming potential. This will be used as a measure to highlight the impacts of greenhouse gases (GHG) as a result of increasing freight volumes.

Outlined in Table 35 are the CO^2 (equivalent) volumes for each of the different freight modes. Air freight has been omitted from this analysis as the volumes and projected growth are minimal.

Table 35 - CO^2e values at 2016 and 2050[5]

	Road	**Rail**	**Waterway**	**Total**
2016	5.9 billion	294.8 million	8.5 million	6.2 billion
2050 without NPIER	8.7 billion	415.6 million	8.5 million	9.1 billion
2050 with NPIER	9.5 billion	450.9 million	9.4 million	9.9 billion
2016 to 2050 with NPIER difference	+3.6 billion	+156.1 million	+1.0 million	+3.8 billion
2016 to 2050 with NPIER difference (Percentage)	38.20%	34.61%	10.39%	38.02%

From the information provided in the Table, it can be seen that the two modes that will have the greatest impact on emissions in the TfN region are Road and Rail with increases projected upwards of 50%. This is a significant increase, which will occur mainly on the strategic road network where pollution hotspots are known to exist and on a number of already polluted cities and towns in the North of England.

Ships accessing the Northern ports also contribute to air quality issues. MARPOL SECA regulations restricting ship emissions to 0.10% m/m (mass/mass) have been operating on English Channel, the Baltic and North Seas. A global sulphur cap of 0.50% m/m will be implemented by 2020. A switch to cold-ironing and the

[5] It should be noted that this table does not include for any improvement in emissions associated with cleaner vehicles entering the UK fleet or the development of alternative fuel technologies.

use of lower sulphur fuels such as LNG may help but will require shore side infrastructure investment. Alternatively, some ships are being fitted with "scrubbers" which "clean" the emissions or rotor sails to harness wind energy.

Figure 52 shows the CO^2 emissions associated solely with Road Transport. As is expected, emissions are worse around the Strategic Road networks, most notably around the city centres. As the current levels appear to be severe in some of these areas, it can only be assumed that without any intervention and increased growth, these concentrations of CO^2 are likely to increase in the future. If these increases are realised and the introduction of cleaner vehicles/ rolling stock is not implemented successfully, it could have devastating effects on the general health of the population, have a detrimental effect on local wildlife and the environment as well as a number of other factors that could have detrimental impact to the wider global environment.

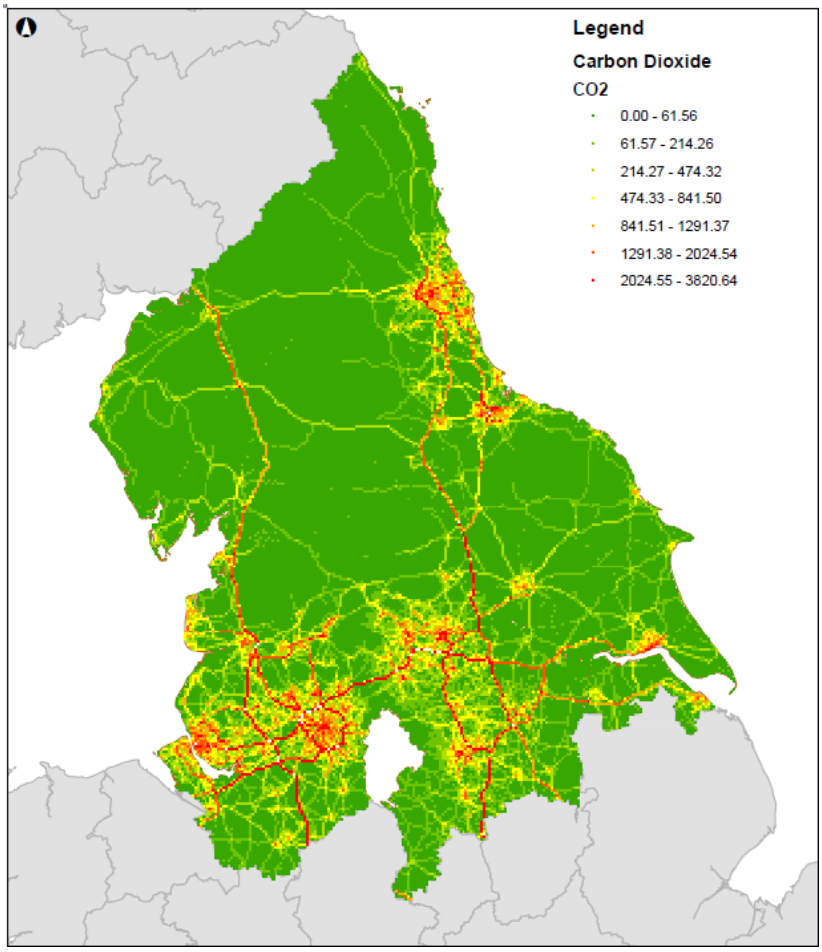

Figure 52 CO^2 emissions within TfN Boundary from Road Transport

4.7.2.1 Human health

Air quality limit values and objectives for certain pollutants, which are considered to be harmful to human health, are set out in legislation by the European Union (EU) and UK Government. The main pollutants of concern with regard to the

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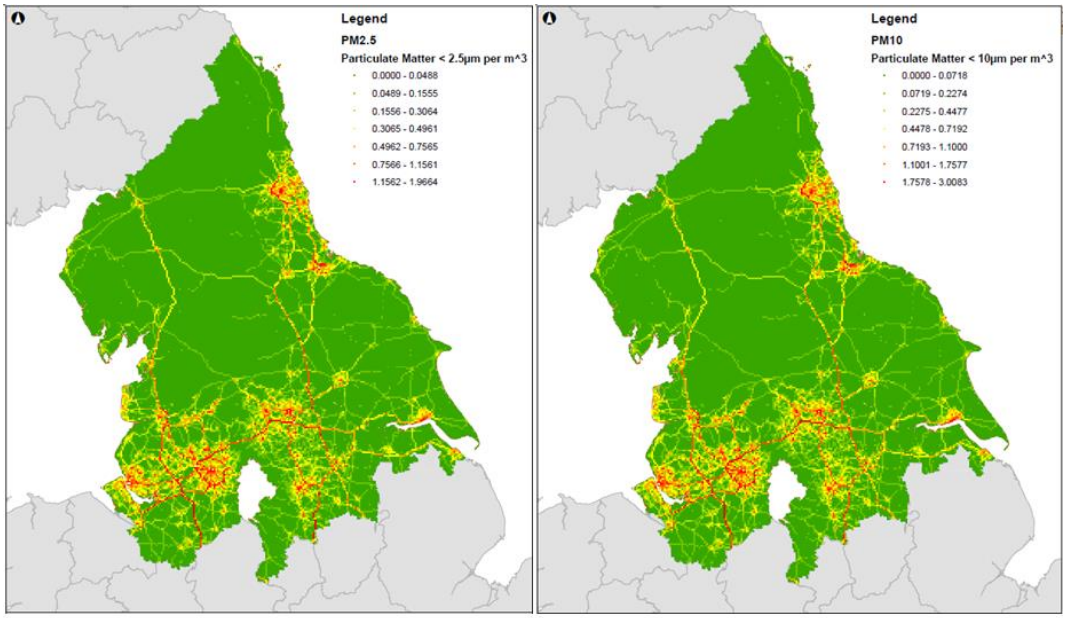

Figure 53 Particulate Matter in TfN Boundary from Road Transport (µg per m3)

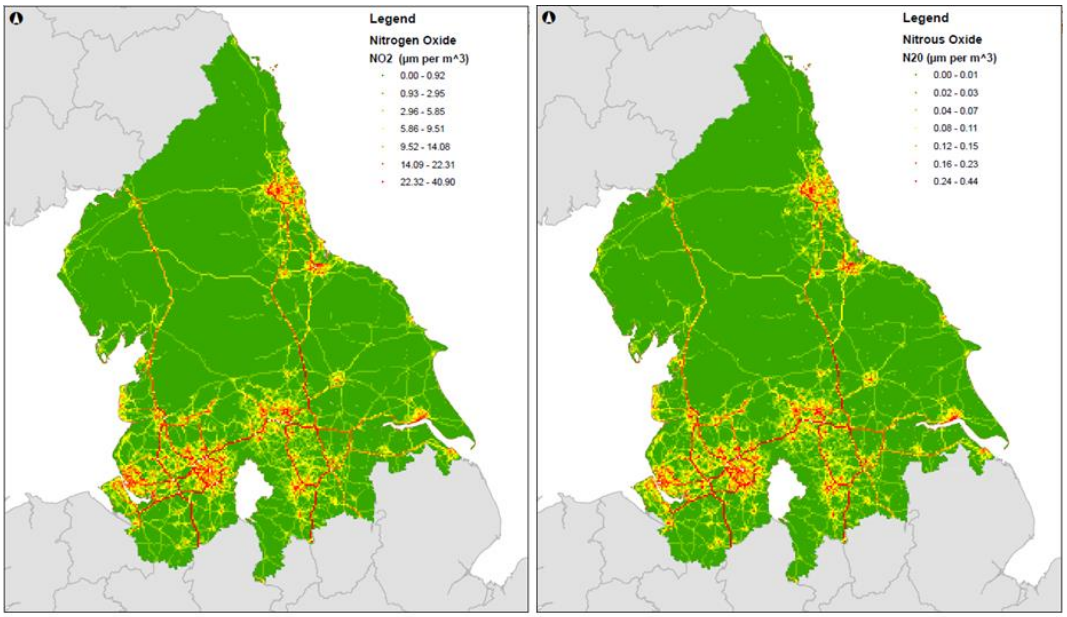

Figure 54 Nitrous Level in TfN Boundary from Road Transport (µg per m3)

4.7.2.3 Evaluation

The “INTERIM ADVICE NOTE 174/13” from Highways England, which focusses on the strategic road network outlines a series of questions that should be answered when assessing the significance of a scheme on local air quality, which can be viewed in

Table 36. These have been answered in a very high level manner to highlight the implications associated with the “Do Nothing” scenario.

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Despite the shortage, there are many qualified HGV drivers who are not driving HGVs suggesting retention is also an issue. Some of the major factors causing the driver shortage in the UK are:

- An aging workforce – in the UK the average driver age is 47.9 years old, 64% of HGV drivers are 45 years or older with only 2% under 25 (compared to 10% of the total employed population being under 25);
- Economic growth – demand to move goods has increased;
- EU Directives – extra training requirements as cited by the EU have been put in place although how Brexit affects this remains to be seen;
- Perception of the industry – perception of haulage and logistics amongst those looking for a career can be poor;
- Driver Safety – particularly for those drivers working abroad i.e. through Europe. Negative press coverage of incidents involving HGV drivers outside of the UK such as Calais for example;
- Financial costs of becoming an HGV Driver – often drivers have to self-fund driving tests, medical tests, initial Drivers CPC and a digital tacograph card;
- Lack of apprenticeship schemes – limited funding available for HGV driver apprenticeship schemes;
- Lack of acceptable facilities – concerns exist over the conditions that drivers are expected to work in. This includes lack of secure HGV parking with clean usable amenities such as toilets. Road side service stations charge premium prices for trucks to park, which often have to be funded by the driver in the first instance;
- Salaries – Salaries remain low despite the demand for HGV drivers with cheaper labour resourced from other parts of Europe (currently 89% of HGV drivers in the UK are from the UK with 10% from the EU - majority come from Eastern Europe and in particular Poland, Romania and Hungary, and 1% from elsewhere);
- Insurance – generally haulage companies require drivers to be over the age of 25 as the insurance premiums are too high for anyone younger. This prevents young people from becoming HGV drivers; and
- Work / Life Balance – long hours and time away from home can have an impact on the attractiveness of the job.

While there is a shortage in HGV drivers, the need for skills in other areas of the logistics sector is also important. In order to accommodate mode shift there needs to be sufficient staff working within the FOCs and in shipping to cope with the increased demand.

4.8 Summary

This section of the report has outlined trends in the freight and logistics sector in the North of England and the challenges that will be faced in the future based on an assumption that NPIER growth is applied to forecast unconstrained 2050 freight volumes. The major findings which make up the case for investment are summarised below:

4.8.1 Overall Freight Growth and Demands

- Based on tonnes lifted, the current mode share of freight moved in the North is broken down into:
    - 91% road;
    - 7% rail; and
    - 2% waterway.
- Based on tonne km the current mode share of freight moved in the North is broken down into:
    - 87% road;
    - 12% rail; and
    - 1% waterway.

  This reflects the increased distances that rail freight typically covers hence the higher mode share;
- Overall growth of freight moved in the North of England (including through movements) between 2016 and 2050 is predicted to be 33% based on tonnes lifted or 60% based on tonne km driven by growth in consumer spending and ecommerce. More goods will be required to be moved quickly and efficiently;
- Road freight in the North is expected to grow by 33% based on tonnes lifted between 2016 and 2050. Utilising the tonne km metric, the growth is forecast to be 62%;
- Freight moved by rail in the North is expected to grow by 40% between 2016 and 2050 based on tonnes lifted. In terms of tonne km, the growth is predicted to be 61.8% representing more trains travelling longer distances. It should be noted however that this is based upon an unconstrained forecast and to achieve this sufficient extra capacity will need to be provided on the rail network;
- The growth in freight moved by inland waterway is expected to be in the region of 12% irrespective of the metric used. Again this is an unconstrained forecast and capacity enhancements may be required.
- There are significant developments which will drive the need for freight movements such as construction materials that will occur in the

intermediate period between 2016 and 2050 that will need to be taken account of within individual strategic corridor studies;

- In commodity terms, based on unconstrained forecasts, growth is generally expected between 2016 and 2050 with the exception of bulk traffic:
    - Intermodal freight moved will increase by 41.8%;
    - Construction and metals freight moved will increase by 34.6%;
    - Petrol and Petroleum products moved will increase by 49.2%;
    - Other bulks moved will decrease by 1.8%;
    - Automotive freight moved (by rail only) will increase by 20.3%.

4.8.2 Road Freight

- Significant growth in freight volumes on the road network is predicted on the M6 and M1 between the Midlands and the North as well as on the A1(M) in North Yorkshire. On an east-west basis, the significant growth is predicted on the Liverpool / North Wales – Manchester – Leeds – Humber (north and south) corridor;
- The largest proportion of freight movements on the North's road network is made up of domestic traffic with major growth being driven by increased trunk movements between NDCs and RDCs mostly all by road;
- Freight vehicles travelling through the North by road are concentrated mainly on the M6 which provides the quickest north-south route, however there are also significant flows on the A1(M), crossing over the A66 to get to and from the M6. Significant growth is predicted on through movements on the M6 as more trunk movements take place between NDCs in the Midlands and other parts of England and RDCs in Scotland;
- Traffic related to imports and exports is focused on the North's largest ports on the Tees, Humber and Mersey but also on the major north-south routes such as the M6 and M1 linking to the UK's major ports in the South of England such as Felixstowe, London Gateway, Dover, Portsmouth and Southampton;
- A significant number of sites have been identified within the Greater Manchester Spatial Framework for warehousing and distribution which will increase the pressure on the highway network around Greater Manchester;
- Generally, the north-south road infrastructure in the North is more substantial and offers more alternatives than the east-west road infrastructure however there are significant capacity issues at the following locations:
    - M1 around Sheffield;
    - A1(M) around Doncaster and Newcastle;

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- WCML south of Warrington;
- WCML between Weaver Junction and Liverpool (particularly towards the Port of Liverpool and the intermodal freight terminals at Garston and Widnes/Ditton;
- WCML between Crewe and Manchester (particularly towards Trafford Park and through the congested Platforms 13 and 14 at Manchester Piccadilly);
- The ECML between Doncaster and Newark;
- The ECML south of Leeds and through Wakefield;
- The ECML around Northallerton;
- The MML south of Sheffield and through Chesterfield;
- The Cumbrian Coast Line between Carlisle and Sellafield in the interim period to 2050 in particular; and
- The Transpennine Rail Routes particularly between Manchester and Huddersfield however alternative east-west routes may be more appropriate.

- The key challenges facing the rail industry in the North are:
  - The current low average speeds of freight trains;
  - Train length limits – not enough loops capable of handling 775m trains;
  - Train weight limits;
  - Lack of appropriate gauge clearance for freight and in particular the larger intermodal units; and
  - Low utilisation of allocated freight paths in many cases limiting the available capacity of the network.

  The corridor studies should consider how these can be tackled through the proposed interventions.

4.8.4 Waterborne Freight

- The throughput of the Northern Ports is set to increase between now and 2050 driven largely by container based freight (91% of the UK container flows are currently through the UK's Southern ports). Despite the throughput of Northern Ports increasing, their share of the UK freight market is set to drop as the UK's southern ports are forecast to grow at a faster rate;
- Access by all modes of transport to the Northern ports remains a key issue where many are in built up areas and the existing road and rail networks have capacity issues;

- The region's two main inland waterways (Manchester Ship Canal and the Aire and Calder Canal) are utilised for freight however there are infrastructure constraints in the form of conflicts with existing infrastructure, such as low bridges on the Aire and Calder and swing bridges on the Manchester Ship Canal, which cause traffic congestion every time a ship passes through;
- Other challenges facing the water-based freight sector are:
    - Land availability and planning restrictions;
    - Consolidation of major shipping lines; and
    - Unbalanced flows of goods into and out of the UK – there is generally more import traffic than export traffic therefore there is the need to move empty containers back to hub locations.

4.8.5 Air Freight

- The North's major freight handling airport is at Manchester with the other airports in the region handling little or no air freight. Freight volumes at Manchester Airport are driven by increased long haul passenger air services where belly hold capacity is available. As more long haul connections are established, the air freight moved will increase;
- In comparison with the UK's major air freight hubs at London Heathrow and close by at East Midlands Airport, Manchester's flows are relatively low.

4.8.6 Drivers for Change

The Drivers for change deduced from the enhanced freight analysis undertaken in this section of the report can effectively be summarised into three key points:

- The increase in forecast freight movement is going to have a significant impact on **congestion**, the **environment** and **quality of life** in the North;
- The **shortage of skilled drivers and labour** is going to place considerable pressure on the logistics and freight industry to service businesses and consumers in the North; and
- As a result of the above there will also be an impact on the **cost of logistics** and the **service levels** the sector can deliver to businesses and consumers in the North.

5 The North's Freight and Logistics Vision

5.1 Introduction

With prime capabilities in advanced manufacturing, energy and health innovation (as identified in the NPIER), the North is one of the UK's regions that is most dependent on a reliable and efficient logistics industry and infrastructure, and the government's national industrial strategy plans may make this more so.

As a crucial enabling capability in supporting growth and development, there is significant potential to deliver a more resilient and efficient logistics network. However, despite the significant benefits that freight transport infrastructure can bring, there is always a difficult balance between investing for the movement of people and movement of freight.

In order to achieve the desired economic growth, action needs to be taken to address the challenges outlined in the previous section which can generally be achieved through two overarching methods:

- Reduce the Demand for infrastructure; and / or
- Increase the Capacity of the transport infrastructure.

Under both of these methods there are two main areas that TfN can affect in order to drive change and which are covered within the subsequent sections of this report. These are through:

- Policy based solutions, which can influence how the private sector operates and invests; and
- Physical solutions, such as new infrastructure.

A number of the recommendations in this section of the report are already being undertaken to a degree by organisations within the transport and logistics sector in the UK. TfN can add value by prioritising investment to be made across the various Strategic Development Corridors in the North of England whilst being mindful and taking cognisance of the work being undertaken by others.

5.2 The Vision

TfN's Pan-Northern transport vision is to:

> "Improve the frequency, capacity, reliability, speed and resilience of the North's transport system to make it easier for people and goods to move throughout the North. In doing so, we want to create a globally competitive environment that can sustain economic growth for decades to come."

The freight and logistics sector will play an important role in achieving the vision and as such its ability to operate efficiently, reliably and resiliently must be enhanced. This report focuses on how the freight and logistics sector in the North

could be enhanced and supported by TfN building on the key drivers identified in the previous section. This will be achieved through three key focus points as outlined in Figure 55.

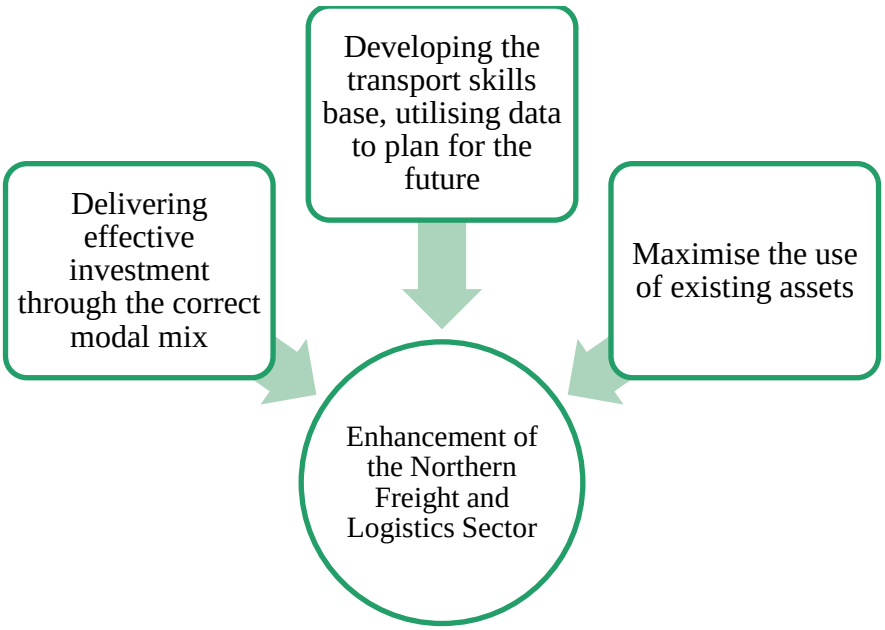

Figure 55 Enhancing the Northern Freight and Logistics Sector - Key Focus Points

The three key focus points are covered in the following sections of this report and consist of:

- The need to maximise the use of existing assets and prioritise their use for the greatest value they bring to the North;
- The need to ensure that the North has a modal mix that delivers the most effective investment in infrastructure, technology and policy, whilst supporting economic growth in the North through an efficient logistics industry; and
- The need to ensure that the North has the skills and can utilise available data to plan for the future.

5.3 The Future of Freight

The freight industry is vital in ensuring that the economy continues to grow and remain sustainable for the future. In the past 30 years, the freight industry has changed dramatically. A number of technological advances have resulted in more efficient processes, shifts to more sustainable modes and practises, managing emissions and providing faster and more efficient services. Inventions such as mobile phones, satellite navigation and the internet have revolutionised the way that people and companies make decisions and how they procure products and services.

In the past, it would have been unimaginable that the world, including freight, would advance in such a way and at such a speed. This therefore makes it difficult to understand how the freight industry will progress into the future. Research

undertaken by the CILT looked at the future vision by 2035 and outlined the main forces that would influence the transport and logistic operations within the UK (see Table 37).

Table 37 - CILT Vision 2035 Forces Summary[7]

Forces	Effect	Future Logistic Issues
Demographic	Rising Population; Aging Population	People are living longer and there are more of them. This in turn has increased the demand for goods which generally have to be delivered quickly.
Transport	Increase in demand	Larger volumes of freight are being moved more efficiently leading to stabilisation of HGVs, however there is a notable increase in the number of LGVs being used. Rail freight has also risen in the last decade.
	Varying prospects for domestic and international air transport	Declined due to the rise in rail freight and rising costs making it uncompetitive. With rise in low cost airlines etc. there is a likelihood that blocs like Russia and China will start to utilise these channels more frequently.
Economic	Environmental costs not reflected in cost of goods and service	Current market price of commodities does not reflect true cost to environment. Likely to be a factor in the future and therefore will drive up prices.
	More demand for 24-hour services	Forecast increase in people active between 9pm and 6am is estimated to be around 13 million by 2020. This can be for shopping, cinema etc. and will increase demand. Currently only forecasts could be found for London study, but the general findings are likely to apply to northern cities.
	Cost of energy	Due to increased activity throughout the day, and higher consumption, energy prices are likely to rise by 20%-30%. This could affect fuel prices and therefore impact the freight industry.
	Road congestion costs are high and will increase	Currently costs the UK £7-8 billion/year. If left unchecked, this could rise to around £22 billion/year by 2025.
Environmental	High probability of climate change	Likely increase in global temperature of 2°C by 2035, which could result in more frequent extreme weather events causing disruption to the logistics industry.
	Transport emissions will come under scrutiny	Domestic transport accounts for 22% of all GHGs in the UK. The reduction of this should be highly prioritised.
	Emission reduction targets under pressure	The UK Government is predicted to miss its 2018-22 target by a wide margin. This figure is for the whole economy, but transport will obviously have an effect.
	Ambitious aim for car fleet replacement	Reducing emissions by replacing the existing car and van fleet with electric and hybrid is the government's central policy to achieve reductions. In order to reduce emissions by 80% compared to 1990 levels, 31-37% of vehicles will need to be utilising alternative fuels by 2035. It is likely that fleet replacement will need to be accelerated in order to achieve this target.
Political	Changing role of government could	With the success of the devolved London administration, it is likely that other regional administrations will be created to deal with regional

[7] https://www.ciltuk.org.uk/Portals/0/Documents/About%20Us/Vision2035.pdf

Forces	Effect	Future Logistic Issues
	lead to new regional bodies	and local transport issues being addressed at a lower level.
	Balance of power is changing	Private sector now has more power in influencing policy due to lack of public funding.
	'User pays' becoming enshrined in government thinking	Shift away from public sector burden to charging the user at the point of consumption. This can drive up costs but offset them elsewhere meaning that logistics could potentially become more profitable with reduced taxes etc. whilst passing the cost on to the consumer.
	International context	Potential impacts of developing countries as consumption and increased freight markets emerge, impacting on global emissions. It is forecast that by 2050, 70% of people will live in an urban environment, changing the way that we currently operate as a society.
Technology	Price and range of electric cars	Limitation in distance and charging restrict the attractiveness of changing to electric vehicles. It is also considerably more difficult for HGV's as the batteries required would have to be substantial in size, based on current technology. This could change in the future, but it is unclear.
	Viable case for alternative fuels not proven	The move to LPG would be expensive and gas reserves are mainly owned by one country (Russia), which would allow them to dictate what the consumer pays. Still a lot of obstacles for other biofuels and hydrogen that will need to be addressed before becoming a viable replacement to electric, diesel and petrol vehicles.
	Communicating with vehicles	"Smart Infrastructure" is increasing and could be used to reduce congestion in the future by using cloud based services to analyse the entire transport network at once, basing decisions on real-time information.

Some of these forces have already been realised as highlighted above. There are now plans to devolve transport related matters to different regional administrations, electric vehicles are becoming more and more efficient and alternative fuels are still being heavily researched and look more viable than they did when this report was originally published.

With these forces likely to sculpt the future of the transport industry, the report then outlines the implications that this could have on the freight industry:

- **Industry Organisation**;
    - Likely to focus on minimising the impact of road congestion on supply chain, reduce costs, minimise CO_2 emissions and improve customer services. Automated warehouses are an example of changes to the industry that is making these aims a reality.
- **Making use of new technology to supply consumers**;
    - Social networking platforms are driving more efficient and effective supply chains. Online orders could allow for greater product price and product suitability with end-to-end carbon footprint being accounted for when making purchases.

Consignment track and trace likely to be more open to the public to allow them to track their orders, more than is currently available.

- **Partnership with Government**
    - All parties need to act in order to form a more productive relationship between the public and private sectors. Change is needed in the freight industry and this has been acknowledged by the Government. Clarification on competition laws and revisiting restrictive planning conditions will need to be addressed to aid the freight industry in remaining competitive and economically successful. Potential need for PFI type models in future freight developments.

As mentioned previously, forecasting the future can be difficult as the exact technological advances and behavioural changes the industry will go through are impossible to accurately predict. DHL have undertaken research using different scenarios to highlight the potential implications for freight operations in the future. Although some of these scenarios are extreme conditions and seem rather bleak in their outcomes, the progression to these scenarios is interesting and could be partially correct – after all, mobile phones were thought to be advanced in the 1980s and now they are just as powerful as a high end laptop.

Table 38 - DHL Future Scenarios Summary[8]

Scenario	Description	Freight Issues
Untamed Economy – Impending Collapse	Unchecked Materialism and consumption coupled with rejection of sustainable development creates flourishing global trade with no trade barriers. Untamed economy exacerbated by unsustainable lifestyles incur massive climate change, frequent natural disaster and constantly disrupted supply chains.	Massive increase in demand for transport and logistical services. Whilst climate change opens up new trade routes through the artic resulting in shorter trips etc. extreme weather events interrupt trade routes frequently and raises capital costs for logistic companies.

8 http://www.dhl.com/content/dam/Local_Images/g0/aboutus/SpecialInterest/Logistics2050/szenario_study_logistics_2050.pdf

Scenario	Description	Freight Issues
Mega-Efficiency in Megacities	Megacities are the main driver towards green growth. Overcoming challenges such as congestion and emissions results in megacities becoming collaborative champions. Open trade and Global governance models are partnered with supranational institutions with rural regions being left behind. Robotics revolutionise the production and services industry; Ownership is traded for "rent and use"; highly efficient transport concepts have been realised; zero-emission automated plants have cut carbon emissions; global "super-grid" with mega transporters including trucks, ships and aircraft as well as space transporters.	Logistics companies are trusted to run cities rather than provide one solution; airports, hospitals, shopping malls and construction sites. Logistics will also manage the complex planning and operating for advanced manufacturing plants. As a result of "dematerialisation", logistic companies now offer a range of renting and sharing services.
Customized Lifestyles	Individualism and personalised consumption becomes prevalent. Consumers are empowered to build/create/design/innovate their own products. This changes the function in which goods are moved, with raw materials being transport in bulk and products created regionally with the use of 3d printers and automation being accelerated in their usage. Extensive production of customised "things" results in increased energy use and raw material consumption leading to increase global temperatures.	Logistics will notice a vastly reduced need for long distance haulage of semi-finished and finished goods. Conversely, logistics also organise and provide the physical value of the supply chain via the handling of raw materials. Logistic services will also hand the encrypted data streams for construction and design blueprints for 3D computers. Decentralisation moves emphasis onto high-quality "last mile" services being the main focus of the logistics sector.
Paralysing Protectionism	Triggered by economic hardship, excessive nationalism and protectionist barriers, globalisation has been reversed with resources becoming scarce technological advances stalling and economies declining. High energy prices lead to international conflicts over resource deposits.	Decline in world trade leads to regionalisation of supply chain. Logistics becomes the strategic industry – as strained relations between blocs become apparent, bloc free countries act as intermediaries in international trade brokerage.

Scenario	Description	Freight Issues
Global Resilience – Local Adaptation	High consumption due to cheap, automated production results in accelerated climate change which frequently disrupts the supply chain and leads to supply failures for all kinds of goods. This forces a move away from redundant systems of production and moves towards regionalised supplies allowing the global economy to better weather troubling times.	Logistics is entrusted with the security of commodities and back-up infrastructure to guarantee reliable transport. To ensure backup systems are readily available contradicts the aim of reducing carbon. To balance this, high capacity utilisation is established using sophisticated logistical planning. Complex "Just in time" delivery processes will be located close to manufacturer's sites and will be seen as indispensable buffers.

In reality the future for freight and logistics could be summarised, thus:

a. The most likely outcome is a combination of these, but the logistics industry will go through change;

b. There is a role for the public sector to channel this change to ensure it delivers the economic and environmental objectives of the region. Policy is a key aspect in being able to achieve this; and

c. Technology, skills and the private and public sector working together are key aspects in delivering a successful strategy.

5.4 Maximise the use of existing assets

The first priority should be for TfN to contribute towards maximising the use of the current suite of transport assets within the North of England. Essentially this includes the road and rail networks but also the Ports and Airports.

5.4.1 Ports

The major ports within the North of England are privately owned and therefore rely on private sector investment to be able to grow and ensure supply meets demand. This has certainly been the case in the North where there is evidence that the port operators are willing to invest.

Ports will generally be responsible for maximising the value of their assets within the port boundaries and are actively engaged in examining where future technologies such as automation and infrastructure for ships utilising alternative fuels such as LPG can be implemented.

Any interventions that can improve the infrastructure connecting ports with their markets i.e. the road and rail networks is therefore vitally important.

There is a role for regional ports within the North to play in terms of supporting the wider Northern economy and helping to alleviate capacity issues at southern ports, particularly in light of Brexit. TfN should look to support the North's regional ports in this regard.

5.4.2 Rail

5.4.2.1 The Digital Railway

The railway signalling system in the UK is currently undergoing a major upgrade over the next 30 years to standardise the system to be in line with the European Rail Traffic Management System (ERTMS)

European Train Control System (ETCS) is the core signalling and train control component of ERTMS. ETCS continuously calculates a safe maximum speed for each train, with cab signalling for the driver and on-board systems that take control if the permissible speed is exceeded.[9] This has clear benefits to the freight industry that include:

- Increases capacity on existing lines due to reduced headways and constant interaction with other trains on the network;
- Higher speeds and reliability; and
- Reduced maintenance costs.

The premise of this system is desirable to the freight industry, however, on sections of line where traffic is mixed i.e. with passenger and freight services travelling at different speeds with different stopping patterns, the benefits will be diluted and not as effective.

Another system that could be installed that will assist with rail movements by both passenger and freight is the 'Connected' Driver Advisory System (C-DAS). Driver Advisory Systems are already in use by some operators, however, these are stored on timetables which are pre-loaded at the start of each journey. The C-DAS system connects in real time to the railway around it, providing information on what is actually happening on the network. This system has been introduced to South West Trains who say that:

"The system collects real-time data from a huge range of sources to calculate the ideal speed of the train to help ensure it arrives exactly on time. It also has the potential to reduce the impact on the environment by lowering energy consumption as well as allowing more frequent trains to be run on the network."[10]

This system is clearly desirable for the freight industry as it would make journeys more reliable, provide greater visibility of journey reliability and help to achieve a number of targets, both within the sector and within the environmental impacts.

5.4.2.2 Pop-up rail terminals

Rail freight terminals typically are expensive to set up, operate and maintain which can restrict the freight commodities moved by rail and supress certain

[9] https://www.thalesgroup.com/en/european-train-control-system-etcs
[10] http://www.railtechnologymagazine.com/Rail-News/south-west-first-operator-to-introduce-new-connected-driver-advisory-system

demands. One solution that has been piloted by DB Cargo has been the use of "Pop-up" terminals for the construction industry in the North West.

The idea of a "pop up" terminal is that a temporary site is utilised line side to move freight off of the rail network. The construction of such a terminal can take weeks rather than months and it can be easily removed when it is no longer needed.

In the context of the North-West, the "pop up" terminal was used to move aggregates from Dove Holes Quarry in Derbyshire to Warrington, resulting in 125,000 tonnes being moved from road to rail. Each of the trains carried around 1,540 tonnes which is the equivalent of 150 HGVs and produced around 76% less CO^2 per journey[11].

5.4.2.3 Timetabling

The surge in passenger rail in the past decade has placed considerable restrictions on freight whereby it is now more difficult to find paths on certain rail routes. This is unlikely to change without investment in the network to accommodate more freight traffic.

There is also an issue associated with procuring new paths faster. The current process for gaining these new paths is drawn out and therefore is usually a barrier to flexibility within the industry. Linked to this is the difficulty of identifying and removing unused paths from the timetable. This is principally driven by the Track Access Regime, which currently does not penalise unused paths.

Nevertheless the holding of such paths can be used as a tool to block other operators due to the competitive nature of freight and logistics. The pathing of freight trains is often such that there are long periods of freight trains standing waiting in order to progress in a timetabled path. This can be a result of being over-run by faster passenger services causing the freight train to be looped. It also means there are more freight trains waiting at junctions for late running passenger services which will get priority.

In conversation with FOCs as part of the Transport Scotland Freight Study, it was stated that they estimate 20% of a train's running time was spent standing waiting to progress. This clearly leads to inefficiency in the use of resources and lengthy delays in sidings also pose security risks associated with valuable cargos.

Enhancements and greater emphasis on the Freight Timetabling could result in more efficient freight services being provided and give them a similar prominence to passenger rail services.

DfT's Rail freight strategy also identified that ensuring sufficient capacity on the network does not only mean identifying future infrastructure investment, but also always making best use of the existing network. This could include making more flexible and innovative use of existing infrastructure, more efficient timetabling,

[11] http://uk.dbcargo.com/rail-uk-en/News_Media/news/11547848/UK_and_CEMEX_introduce_pop-up_rail_depot.html

and improving capability (for example, through reviewing and lifting speed and weight restrictions).

As part of the Rail Freight Strategy, DfT has commissioned work from Transport Systems Catapult to explore the implication and potential benefits of reducing freight dwell times.

5.4.3 Roads

5.4.3.1 Smart Motorways

Smart-motorways refers to a technology-driven approach to managing the use of key strategic roads. The technology used allows an increase in capacity and reduces congestion while maintaining safety. This results in journeys on these roads becoming more reliable.

Highways England[12] estimates that congestion on the motorway and major road network in England costs an estimated £2billion every year with 25% of this the result of incidents on the network. Section 4.7.1 examines the effects of increasing congestion on the Major Road Network in the North of England and shows why cutting congestion creates economic benefits for the region.

Smart motorways allow hard shoulders to be used for traffic either permanently or during peak times to help aid the flow of traffic and reduce congestion by creating an additional lane. The motorway is monitored for incidents and the hard shoulder closed immediately should any occur.

Technology is used to monitor congestion levels and change the speed limit on a particular stretch of road when required to smooth the flow of traffic and reduce stop-start movements which creates additional emissions and reduces journey reliability. The technology also allows warning signs to display information about journey times, incidents or heavy traffic ahead whilst also allowing for quick closure of lanes to let emergency vehicles through.

The major benefit to providing smart motorways is the ability to create more capacity from the existing asset at a lower cost than traditional widening schemes.

The first Smart Motorway scheme in the UK opened on the M42 motorway in 2006 and has provided the following statistics:

- Journey reliability improved by 22%;
- Personal injury accidents reduced by more than 50%; and
- Where accidents did occur, severity was much lower overall with zero fatalities and fewer seriously injured.

TfN should examine the case of Smart Motorways where major congestion is occurring on the MRN and where appropriate provide the required infrastructure to reduce costs of road widening that may not be required.

[12] http://www.highways.gov.uk/smart-motorways-programme/

Specifically for freight and logistics, an assessment of whether HGV only lanes on specific motorways could be introduced would be a worthwhile exercise within the strategic corridor studies.

5.4.3.2 Autonomous Trucks

Self-driving Trucks

As with the conventional motor vehicles, there is also significant research evaluating the use of self-driving trucks. Uber purchased a self-driving truck start up called "Otto" in August 2016 for $680 million, which reflects the significance of this potential industry revolution.

Autonomous technology has been developed to reduce accidents, increase efficiency and potentially ease congestion on road networks. This technology is still currently being developed, however it has been tested in Colorado to transport beer 120 miles across the state[13]. Similar tests have also been undertaken by Daimler in Germany although these are more advanced, with the Ministry of Transport and Infrastructure in Stuttgart looking to introduce these trucks into real traffic before 2025[14].

Current research is primarily focussed on highway/motorway driving to remove the monotonous driving and increase safety and efficiencies. TfN could play a coordinating role in supporting tests in the North.

Truck Platooning

Another feature of automation is "Truck Platooning". This forces trucks to travel close together on motorways rather than wastefully passing each other, and taking up valuable road capacity. Autonomous trucks like the Highway Pilot-enabled "Inspiration" can use vehicle-to-vehicle communication technology to virtually lock-onto the truck ahead, reducing the gap between them. This close formation allows for better aerodynamics and can increase operational efficiencies by 5-6% over trucks travelling in singular form. The use of GPS can also enable fuel savings by monitoring traffic situations and adjusting speeds within the cab.

In 2016, Iveco ran a cross border test of two trucks between Rotterdam and Belgium to demonstrate the viability of automated freight transport. This test was only semi-automated with the rear truck taking the lead from the truck in front[15]. These pilots however demonstrate that it will be possible to send multiple vehicles at once between origin and destination, resulting in faster deliveries with fewer drivers needed, which may partially mitigate the HGV driver shortage in the UK.

Truck platooning is not as advanced in the UK compared to mainland Europe and America, however the technology is available and is being enhanced indicating

[13] http://www.techrepublic.com/article/otto-self-driving-truck-company-the-smart-persons-guide/
[14] http://www.zdnet.com/article/daimlers-self-driving-18-wheelers-ready-to-take-to-the-autobahn/
[15] https://eandt.theiet.org/content/articles/2016/04/first-driverless-truck-platoon-heading-to-rotterdam-from-belgium/

that this is a viable alternative to normal operations and could be utilised in the future to support the growth of freight movement in the TfN region.

5.4.3.3 Electric Vehicles

With the focus on emissions now at the forefront of UK government policy, there has been a marked rise in the number of electric and hybrid vehicles on the road network, primarily within bus and private car fleets. As such, many vehicle manufacturers are working on producing the next generation of motor vehicles that will have lower emissions and be more efficient than traditional diesel and petrol ones.

Recent research and development by Damiler and Tesla has been looking into the construction and implementation of full electric LGV/HGVs. These are expected to be in full production within the next decade and look to reduce the penalty associated with the vehicle weight and the distance travelled[16]. This will deliver significant reductions in CO_2 emissions associated with HGV movements, but will not necessarily reduce the number of vehicles on the network. It will however mean that the Particulate Matter from braking and tyre-wear will still need to be tackled to ensure that public health is not being compromised.

Although mass production of electric HGVs is still under development, BMW has already deployed a fully electric 40T HGV. It is initially being used to transport automotive parts between its facilities in Munich and has a range of 100km on a full battery. The truck runs with no direct CO^2 generation and is quieter than conventional diesel trucks[17]. This results in a saving of around 11.8 tonnes of CO2 per year.

Although these vehicles are being produced to fulfil EU directives, there is a large upfront capital cost associated with these vehicles and it may take some time for these vehicles to be implemented into mainstream freight usage. For now, the industry is concentrating on implementing vehicles that meet Euro 6 engine standards.

5.4.3.4 Alternative Fuels

Aside from Electric and Hybrid Electric vehicles, there are a number of alternative fuels that are also being researched and could potentially be implemented within the Road Freight sector. Two of those are the use of hydrogen fuel cells and BioLPG.

Toyota are currently undertaking a feasibility study into the usage of fuel cell technology that could be used in HGVs. The hydrogen-fuelled vehicle will travel between ports in Los Angeles and Long beach from summer 2017 resulting in reduced emissions and noise pollution around and between the port areas[18]. This will result in the vehicle emitting water vapour instead of harmful pollutants. The

[16] http://www.commercialmotor.com/news/damiler-and-tesla-bring-fully-electric-hgvs-step-closer
[17] http://www.wired.co.uk/article/bmw-40-tonne-electric-truck
[18] http://freightinthecity.com/2017/04/toyota-put-hydrogen-fuel-cell-hgv-action-californian-port/

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specifications for pallets), Nestle (Bespoke Deck Beam Trailer) and Asda (Semi Deck Trailer Configuration).

Large operators with significant volume tend to be run efficiently, the issue often comes from smaller operators or routes that have less volume and therefore lower vehicle utilisation. TfN should be prepared to work with the industry to develop new and enhance existing solutions for vehicle efficiencies to maximise the use of the road network within the North of England. TfN's role could be as a facilitator of collaboration and set up regular workshops where innovative solutions could be discussed between organisations who may not ordinarily communicate with each other but where in doing so, mutual benefits could be realised.

5.5 Delivering effective investment through the correct modal mix

The Drivers for Change outlined in Section 4.7 which include congestion, emissions and workforce and skills are primarily based on a logistics and freight network dominated by road transport. In order to maximise the efficiency of the network and address the three drivers listed above, it is essential that the correct modal mix is achieved where flows (which could travel by rail or water) are transferred from an already congested road network.

This can be achieved through TfN having an influence over policy (such as through the administration of a specialist Northern grant scheme) and where that is not solely effective, through investment in the North's transport infrastructure.

5.5.1 Policy

Whilst it is inevitable that new infrastructure will be required, it may be possible to temper this against increased initiatives through the implementation of new policies designed to produce a modal shift or cause a reduction in the number of vehicles on the region's congested road network or the development and use of new technology.

Some new policy ideas are included in this section, such as:

- Establishing a franchised rail freight operator for routes that are considered not commercially viable at the present time and to encourage movement of freight by rail;
- Funding of more rail freight services through the use of grants such as MSRS and Waterborne Freight Grant (WFG) schemes;
- A drive to improve the perception of alternative modes of transport for freight led by TfN and the encouragement of collaboration between transport operators and shippers;
- Increased use of alternative modes of transport for freight in public sector procurement; and

- More road network capacity made available for freight through initiatives to reduce the number of private cars on the region's congested road network.

5.5.1.1 Encouraging modal shift through funding support

Freight Support Grants

The costs of starting up new freight routes can be high with no guarantee of a return on investment. For example, on the rail network the procurement of additional stock, track access charges and various other operational and terminal charges can make rail freight undesirable for some hauliers. With the introduction of additional rail freight grants, this could alleviate the pressure felt by FOCs and share the burden with the Government. It is in the interest of all parties to ensure that this is a success and as a result, the DfT, Transport Scotland and the Welsh Government have set up a "Mode Shift Revenue Support" Grant[23] to support the transfer for road freight to rail. This is done by demonstrating the amount of freight that can be transferred and awarded on the basis of removing large quantities of lorries from UK roads.

This appears to be the only current Grant option available to rail freight and is rather restrictive in terms of how it can be accessed as entails retrospective funding i.e. grants are paid after the freight has been moved.

As part of DfT's Rail Freight Strategy, the DfT commissioned a report from Arup, to look at innovative models of delivery. These new models could include parcels carried directly between and into city centres using the spare capacity on off-peak passenger services, or old rolling stock fully converted to carry freight into cities.

Franchised Rail Operator

The financial aspect of rail freight acts as a barrier to growth as there are alternative modes that appear much more affordable to some users. One issue that rail has when compared to road are the discrepancies with the licensing regime. HGVs are effectively subsidised by other road users, even though they put more strain on the road. Rail freight has however been effectively subsidised through the marginal costs for their use. This arrangement masks the levels of subsidy whereas direct subsidy for specific flows would be more transparent. Nevertheless the charges are levied based on tonnage and mileage, which is not replicated in the road freight model. This additional cost is effectively passed onto the user which is why rail is often priced out of the market when compared with road.

Another aspect of the financial issues associated with the rail freight sector is the lack of funding to allow trials of different commodities to be undertaken. Funding has been secured in the past to allow experimental movements to be undertaken, but this is not easily available and the process is complex. This would need to be simplified and embraced by both Network Rail and Government.

With this in mind, the idea of Freight Franchising could be considered as a progressive change within the North of England as well as the rest of the UK. The

[23] https://www.gov.uk/government/collections/freight-grants

premise of this option is simple; Freight Operating Companies (FOC) would bid to run services on specified routes which have been determined as not commercially viable to a timetable for a set period of time, similar to Passenger Rail Franchises. TfN would be able to support these services financially which would effectively reduce the risk for shippers given that the service would run to a regular timetable. The shippers would pay for a slot on a particular service. The benefits of using this structure include:

- Ensuring that freight services are always being run and therefore increases availability and reliability;
- Reduces costs by making rail a more attractive option (Economies of Scale) and allows better competition with road;
- More accountability and greater prominence in terms of ranking on the rail network i.e. it is no longer second class to passenger transport; and
- Provide upfront funds to Network Rail to deliver freight enhancements

If this could be realised in the TfN region, it would set a good precedent to other routes out with the region.

As this has never been done before, there are issues with deliverability and setup costs as well as commercial aspects with existing freight services. A more detailed analysis of this option should be undertaken in the future to highlight the viability of such a scheme and outline the different opportunities and risks such a structure might contain.

Coastal Shipping

TfN could support the Mode Split Revenue Support (MSRS) Scheme and the Waterborne Freight Grant (WFG) initiative through either managing the fund regionally or / and providing more funding to move freight onto Coastal shipping routes particularly from the southern ports directly into Northern Ports.

MSRS freight grants provide revenue support to encourage mode shift from road to rail or inland waterway, where the costs are higher than road, and where there are environmental benefits to be gained. MSRS assists companies with the operating costs associated with running rail and waterborne freight transport instead of road (where rail/water are more expensive than road).

WFG can assist a company with operating costs associated with running waterborne freight transport instead of road, where transport by water is more expensive. The grant applies to coastal and short sea shipping and can assist a company for up to 3 years. (Coastal shipping services take place entirely within the waters of the UK; Short-Sea shipping involves the transport of goods between the UK and destinations in Mainland Europe).

Any grant offered will be limited to the lower of (i) the value of environmental benefits (ii) the financial need for grant (iii) 30% of the total operating costs of the water movement or (iv) € 2 million.

The combined budget for MSRS and the Waterbourne Freight Grant (WFG) was £18.6 million in 2013-2014 and a similar amount was envisaged for 2014-2015.

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This could include significant improvements to public transport encouraging general road users to switch from their private cars. This would create more space on the road network for larger freight vehicles and reduce the significant emissions generated by non-freight road transport.

A multi-modal approach to improving conditions on the road network should be taken within the strategic corridor studies and TfN should seek to aim to improve conditions for road freight through the promotion of improved public transport schemes. This is not to say that freight infrastructure should be ignored, as it along with relevant policy is key to achieving economic growth through ensuring that logistics maintains is status as an enabling capability.

5.5.1.5 Work with local authorities to ease planning conditions

A review of planning applications involving freight interchanges which have been determined in the past 5 years has been undertaken. The time between the submission of an application and a decision being issued averaged around 2 years. Most decisions were delayed due to a failure to provide sufficient information or plans to the relevant bodies, regarding the impacts of the development on the surrounding infrastructure. These include, but are not limited to; National Grid overhead lines, ecology, water regulation and drainage systems, and implications on traffic flows in the area.

Of the ten applications reviewed, half were granted permission while half were refused. Different types of application process were used. Three applications were submitted via the Development Consent Order process to the Secretary of State given the development were classed as Nationally Significant Infrastructure Projects. Seven applications were submitted to local authorities as outline planning applications. One of the DCOs has yet to be determined whilst the other two were permitted. Two of the outline planning applications were permitted whilst five of them were refused. Of these five, two of the developers appealed the local authority's decisions to refuse the applications and both appeals were dismissed by the Planning Inspector.

For those applications that were refused, the Green Belt was consistently a contentious issue. Local authorities were concerned that such a significant development was a major intrusion, the benefits of which failed to outweigh harm done to the Green Belt however one previously refused application was overturned on appeal on the basis that the need for strategic rail freight interchanges serving London and the South East was capable of representing a very special circumstance which outweighed harm to the Green Belt. Other contentious issues resulting in refusal includes the increase in traffic to the local area, and reduced air quality and noise impacts to local residents. Public opinion was consistently unfavourable towards the developments.

Successful applicants had consulted the relevant bodies to assess potential impacts, including the Environmental Agency and Highway Agency. Developments located in industrial areas that already had adequate transport links and experienced a high level of background noise were also more likely to be permitted.

As statutory transport body, TfN could assist in helping developers through the planning process via a number of methods:

- Bottom up approach – Preparing a Planning Advisory Note to local authorities explaining the powers that TfN have and that fact that there may be some revenue earning opportunities (ties in with the 2020 loss of local government funding)
- Top-down approach – Following on from the National Policy Statement for National Networks (DfT, 2014) which highlights a 'compelling need for an expanded network of SRFIs', TfN could prepare its own version of this as a National Policy Statement- light version covering the region.

5.5.2 Infrastructure

It is very likely that the implementation of new policies will require support to be successful through the provision of enhanced infrastructure to ensure that supply can meet the demand generated by a growing economy.

The exact nature of the infrastructure required to support the growth of the transport network will be derived through the individual Strategic Corridor Studies being commissioned by TfN. This report seeks to identify where new infrastructure is required on a high level basis.

The premise behind the requirement for new infrastructure is based around four key themes outlined in Figure 56.

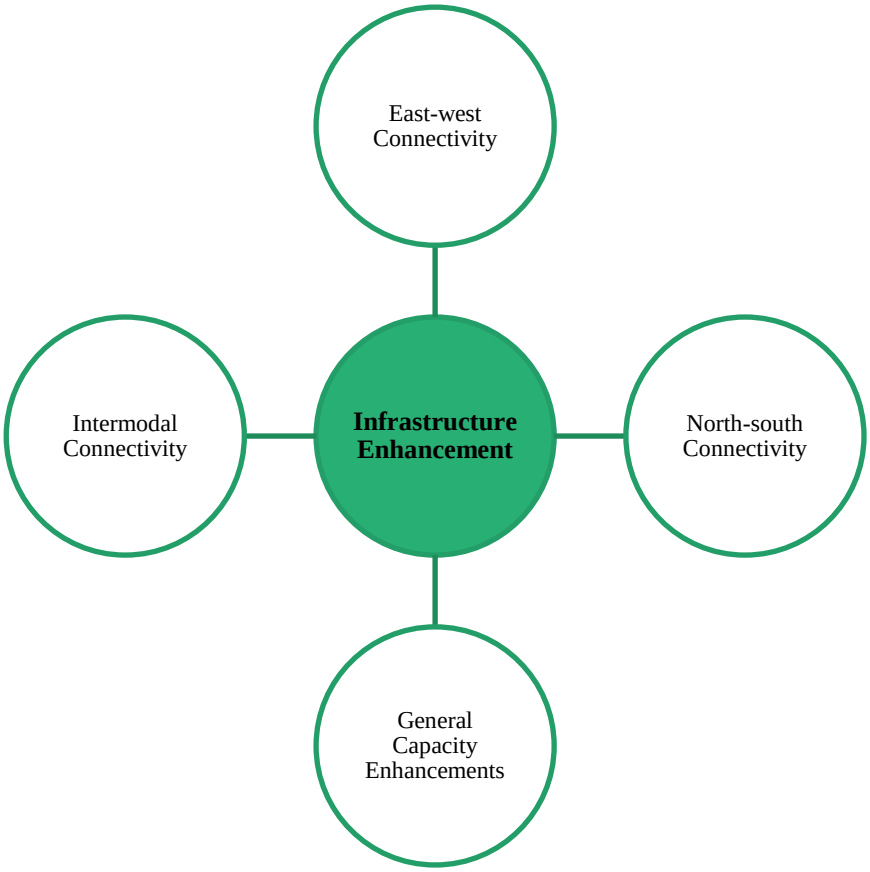


Figure 56 Infrastructure Enhancement Themes

5.5.2.1 Road freight

In terms of improvements to infrastructure to increase the efficiency of road freight transport, the following are some examples of where enhancements could be made. These should be considered in each of the relevant strategic corridor studies.

East-west connectivity:

- Northern Transpennine Improvements (A66/A69)
- TfN Manchester North West Quadrant Improvements (M60)
- Additional south Transpennine routes (Transpennine Tunnel)
- Road widening and key junction enhancements on east-west SRN routes (M62, M60, M56)
- Existing A Road capacity upgrades, interchange improvement schemes and link / relief road schemes

North-south connectivity:

- Road widening and key junction enhancements on north-south SRN routes (M6, M1, A1(M))

General capacity enhancements:

- Removal of road toll to improve flows across congested river crossings
- Dedicated lanes for HGVs on motorways

- Permissions sought for road trains
- Enhancement of secure HGV parking sites across the North

Intermodal connectivity:

- Enhanced port connectivity i.e. A5036 Liverpool, A63 Hull and A19 to the Port of Tees

5.5.2.2 Rail freight

In order to increase the volumes of freight moved by rail and to improve the attractiveness of rail as a mode for moving freight, the following are some examples of where enhancements to infrastructure could be made. These should be considered in each of the relevant strategic corridor studies.

East-west connectivity:

- Establishment of a key east-west freight route allowing access from west coast ports such as Liverpool and east coast ports on the Humber, Tees and Tyne. The route would need to be appropriately gauge cleared (W12 is desirable) and able to accommodate 750m long trains that would encourage retailers like Wilkos and Argos to transfer deliveries to rail
    - Up to 3 paths an hour (bi-directional) will be required on the Transpennine route (could be any route) assuming the unconstrained scenario developed in GBFM;
    - Between the WCML at Newton-le-Willows and Liverpool, 2 paths an hour will be required for freight;
    - On the line between Doncaster and Scunthorpe, up to 4 freight paths an hour will be required;
    - Between Scunthorpe and Immingham/Grimsby up to 8 paths an hour for freight will be required.
    - Safeguarding of freight paths on east-west routes when and if Northern Powerhouse Rail (NPR) is constructed and in operation.

North-south connectivity:

- Additional capacity will be required on both the ECML, MML and WCML in order to accommodate future demand under a Do-Nothing scenario.
    - On the WCML south of Crewe, up to 10 paths an hour will be required with 3 paths an hour allocated on the Crewe to Manchester line and 4 paths an hour on the Weaver Junction to Liverpool Line. North of Preston, 4 paths an hour will be required for freight.
    - On the ECML, up to 5 paths an hour will be required south of Doncaster, with up to 4 per hour north of York.
    - On the MML 5 paths per hour will be required south of Sheffield.
    - Safeguarding of freight paths on WCML once HS2 is constructed and in operation.

General capacity enhancements:

- Additional capacity will need to be explored on lines where demand in the interim period up to 2050 may be high. This includes for example, the Cumbrian Coast Line and the demand created by the construction of various large scale developments in the near future along its length in the period between now and 2030;
- Increased use of in-cab signalling to increase capacity for freight trains;
- Capacity enhancement for longer (750m) and heavier freight trains with enhanced gauge clearance for the largest intermodal units (W10/W12).

Intermodal connectivity:

- Methods for improving the establishment of increased intermodal terminals across the North and their connection to the rail network. This may be through working in partnership with local authorities.
- Enhanced rail connections and available capacity for freight trains to the UK's ports, specifically those located in the North.

5.5.2.3 Water-based freight

Improving the case for water-based freight transport where appropriate will require enhancements to infrastructure within the North. Some examples of the type of enhancements required are provided below.

East-west connectivity:

- n/a

North-south connectivity:

- Coastal feeder services from southern UK and central European ports is increasing. Ensuring Northern ports are able to handle the increase in throughput and in some cases offer additional capacity.

General capacity enhancements:

- Ensure ports are capable of handling future demand and are able to accommodate larger ships using alternative fuels such as LNG for example.
- Improved capacity on Manchester Ship Canal and Aire and Calder Canal through removing constraints such as low bridges where possible.

Intermodal connectivity:

- Enhanced port access by all modes and greater ability to offer quick and efficient intermodal transfer.
- Examine innovative solutions such as automated inland freight terminals to take pressures away from the port and surrounding area.

5.5.3 TfN High Level Intermodal Freight Tool (HiLIFT)

5.5.3.1 Purpose of the Model

HiLIFT was created as a way of evaluating the effects of different interventions on the major road and rail networks in Northern England in 2050 if the NPIER Growth scenario is realised. The tool provides high level details of the areas that are likely to be affected on the Road and Rail Network independently using Base information provided from MDST's GBFM Output for the TfN region.

Intermodal freight flows are then separated from Non-intermodal flows to allow various scenarios to be applied and to view the effects these scenarios have. The tool illustrates all freight tonnage movements on each road and rail network but only allows adjustments to be made to the Intermodal Flows.

It is a certainty that there is strong encouragement towards the decarbonisation of freight transport and move towards low / zero emissions. This will open up many opportunities around modal shift and how it can be achieved. The model examines the impacts of modal shift and of reduced emissions.

5.5.3.2 Modal Mix Scenarios

HiLIFT tests a range of scenarios developed from some key themes and includes:

- 2016 Scenario Year:
    - Current Conditions
- 2050 with NPIER Growth Scenario Year:
    - Future Base Conditions
    - Coastal Shipping
    - Inland Freight Terminals – Increased Rail
    - Automation and Alternative Fuels
    - User Specific

Under each of the scenario themes, three levels of testing have been carried out which reflect low, medium and high impacts; the current conditions, future base conditions and user specific scenarios are the exception to this where one level of testing has been conducted.

The key testing scenarios have been set out as described in Table 39

Table 39 HiLIFT Scenario Theme Details

Scenario	Testing Level	Description
Coastal Shipping	Low	Assumes 5% shift from road moves between Southern Ports and Northern England to Coastal Shipping

	Medium	Assumes 10% shift from road moves between Southern Ports and Northern England to Coastal Shipping
	High	Assumes 15% shift from road moves between Southern Ports and Northern England to Coastal Shipping
Inland Freight Terminals – Increased Rail	Low	Assumes a 5% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
	Medium	Assumes a 10% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
	High	Assumes a 15% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
Automation and Alternative Fuels	Low	Assumes that operational efficiency of intermodal vehicles goes from 80% to 90% and 10% of intermodal road vehicles use alternative fuels
	Medium	Assumes that operational efficiency of vehicles goes from 80% to 95% and 20% of road vehicles use alternative fuels
	High	Assumes that operational efficiency of vehicles goes from 80% to 100% and 50% of road vehicles use alternative fuels

All details regarding the assumptions, variables and parameters as well as model limitations can be found in Appendix X.

5.5.3.3 Scenario Testing

The following section examines the results of the scenario testing on the four modal shift themes.

In order to represent the findings of each scenario, an evaluation tool has been used as illustrated in Figure 57.

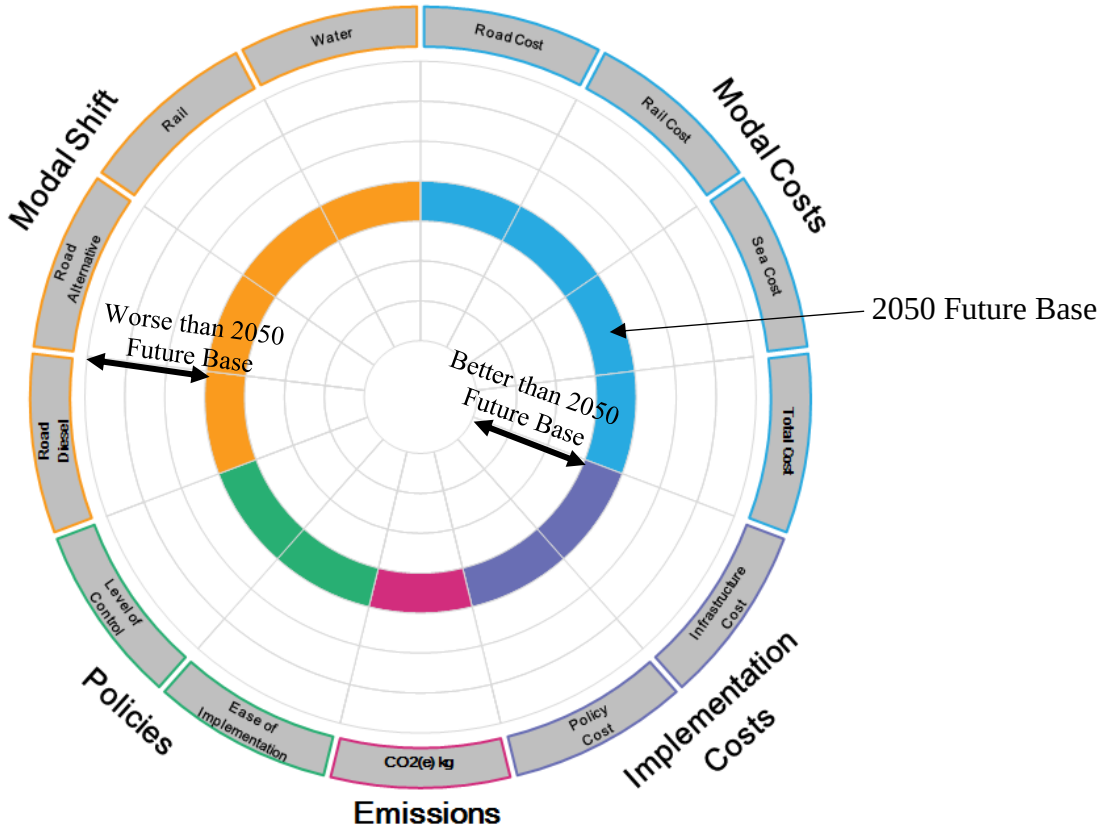


Figure 57 HiLIFT Scenario Evaluation Wheel

The wheel evaluates each of the scenarios based on a number of categories. These categories are outlined in Table 40.

Table 40 HiLIFT Evaluation Wheel KPIs

Category	KPIs	Details
Modal Costs	Road Cost	Total costs based on road vehicle operating costs
	Rail Cost	Total costs based on freight train operating costs
	Sea Cost	Total costs based on coastal shipping container vessel operating costs
	Total Cost	Overall intermodal costs of all modes
Implementation Costs	Policy Cost	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents costs of implementing required policies to support the initiative.
	Infrastructure Cost	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents costs of providing the appropriate infrastructure to support the initiative.

Emissions	CO2(e) kg	Measured in overall CO2 equivalent in kg of all freight vehicles based on distances travelled within the North.
Policies	Ease of Implementation	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents how easy the policies required to support the initiative will be to implement.
	Level of Control	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents how easy the policies required to support the initiative will be to control.
Modal Shift	Road Diesel	Indicates the increase or decrease in traditional diesel vehicles over the 2050 Future Base Do Nothing scenario. An increase is seen as a negative with decreases seen as a positive.
	Road Alternative	Indicates the increase or decrease in vehicles running on alternative fuels over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive.
	Rail	Indicates the increase or decrease in freight trains over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive with decreases seen as a negative.
	Water	Indicates the increase or decrease in coastal shipping vessels over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive with decreases seen as a negative.

The following sections outline the results from the scenario testing in HiLIFT for the scenarios outlined in Table 39.

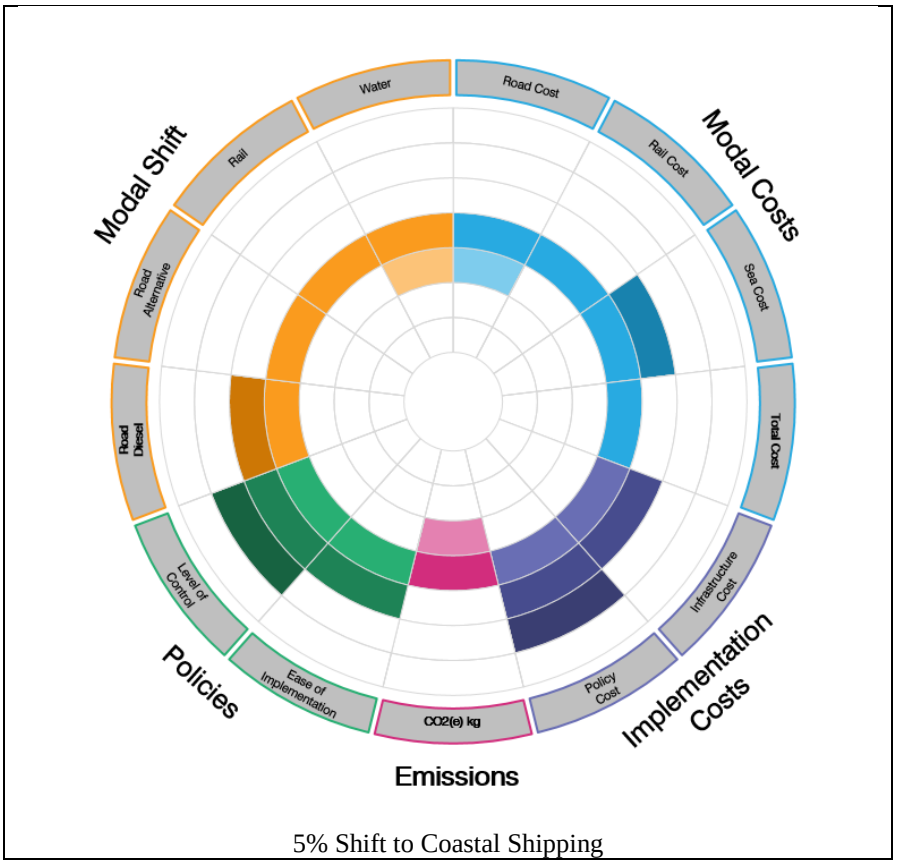
Coastal Shipping Scenario

The Coastal Shipping scenario outlines the effects of displacing some of the road movements to feeder vessels, taking HGV and LGVs off trunk routes between the southern ports and the North where road would be used for the final movement of the cargo from the North's ports to / from the origin / destination location.

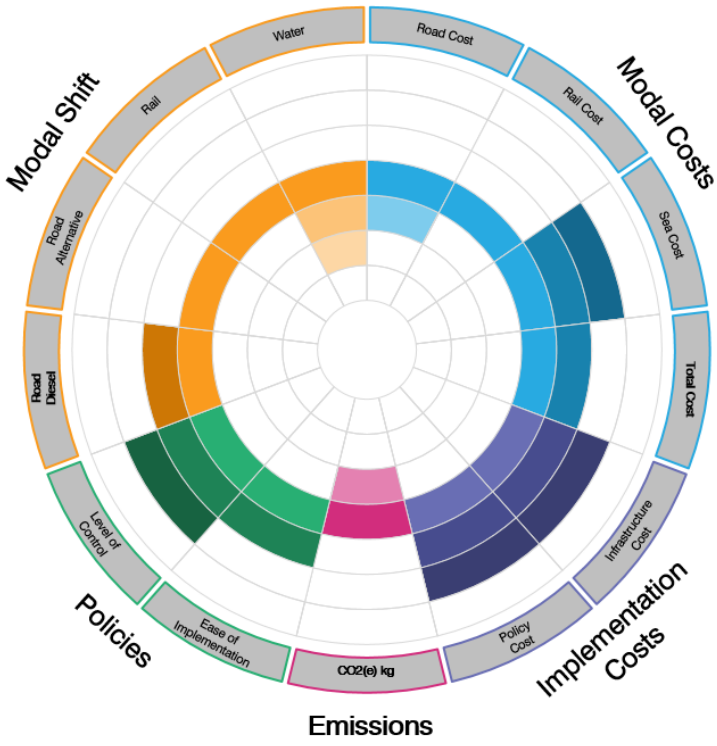
As this scenario considers new additional coastal shipping services over base line, there are costs involved with developing this scenario but these costs can be offset by the saving in CO2e.

This scenario indicates that there would be an increase in the number of vehicles on the road and this may be correct, however, what the model is not showing (due to the high level nature) is that these movements are being taken off the most congested sections i.e. M6 and applied to less congested areas on the network i.e. from the ports. So this is shown as a negative based on the figures, but in reality, this would be a benefit in terms of congestion reduction.

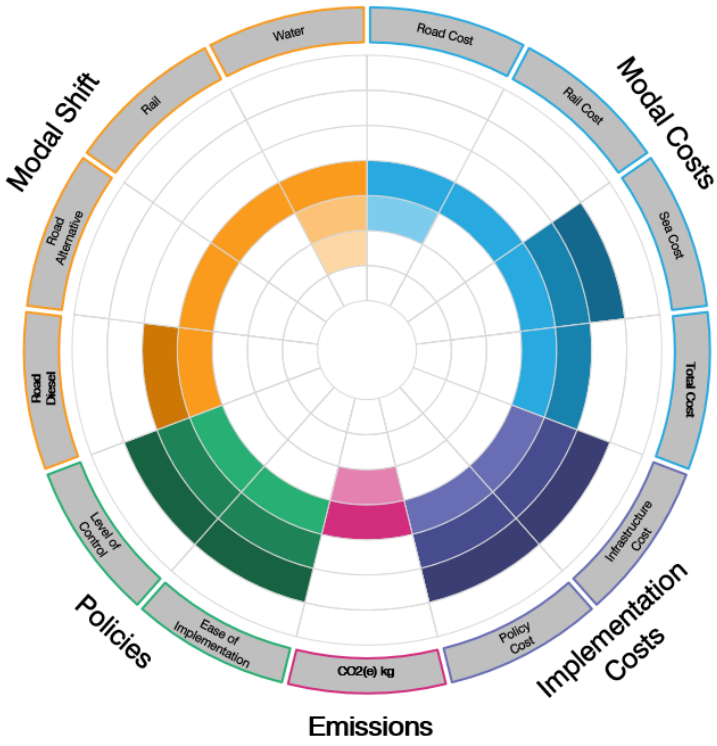
The Coastal Shipping option could be considered viable in promoting freight in the North, building the economic powerhouse and increasing the health benefits in the North however, there are a number of hurdles that need to be addressed such as build or enhance coastal shipping terminals to make them more competitive as well as implementing controls to ensure that this scenario will be a success in practise.



5% Shift to Coastal Shipping



10% Shift to Coastal Shipping



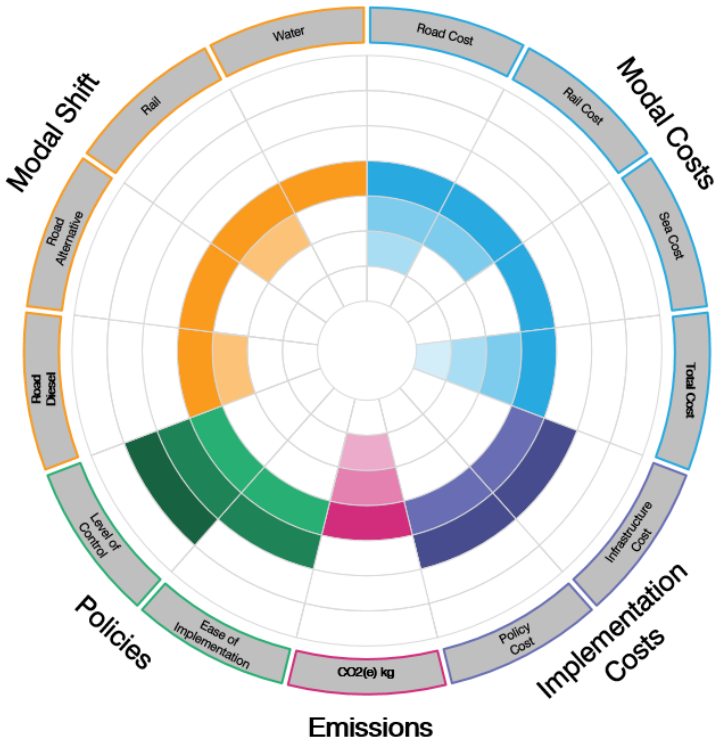
15% Shift to Coastal Shipping

Inland Freight Terminals Scenario

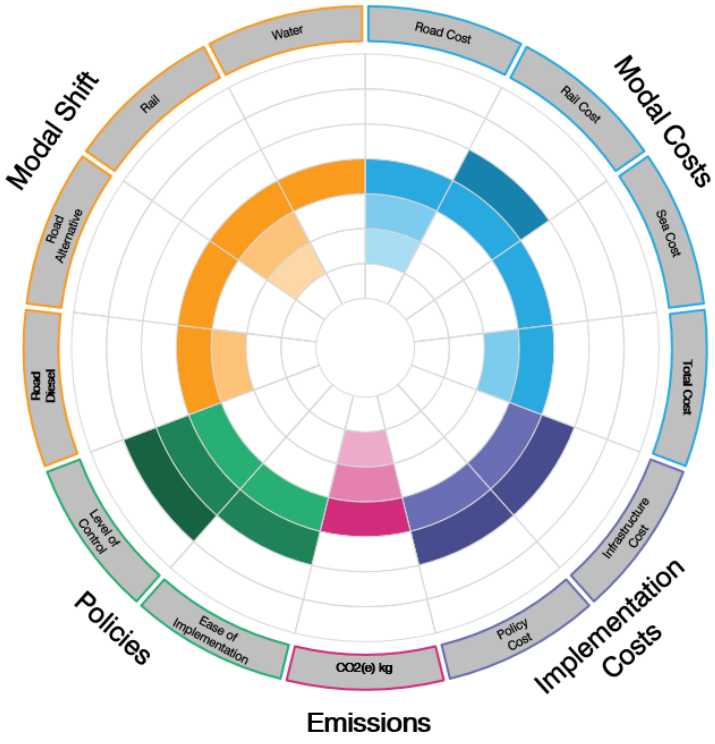
The Inland Freight Terminal scenario outlines the effects of displacing some of the road movements to the rail network, taking HGV and LGVs off the congested sections of the road network in the south and redistribute trips in the North.

It can be seen that the greater the share, the greater the cost however, it should be noted that there are significant decreases in CO2e, road movements and road costs.

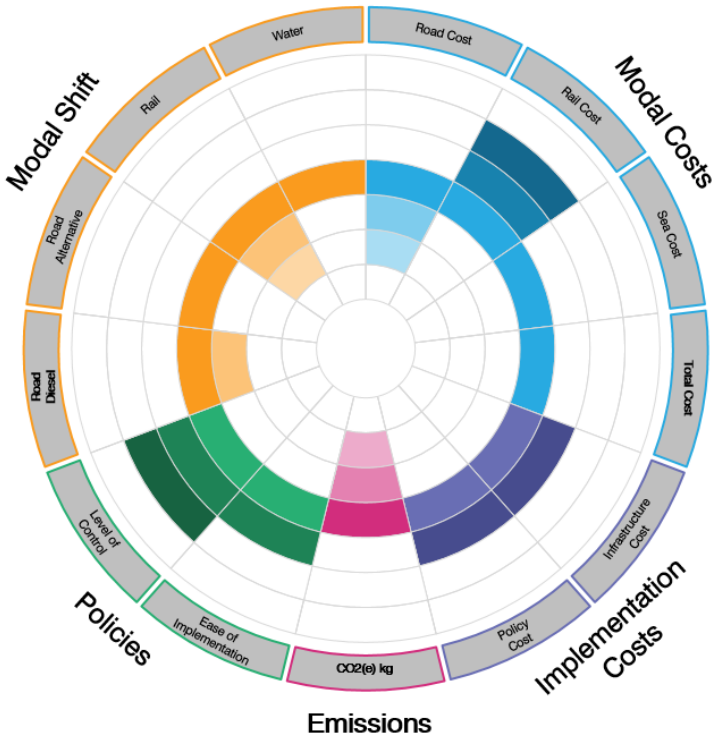
Due the high level nature of the model, it does not highlight that although there would be increases in rail infrastructure, potential difficult policy implementation and low levels of control, it is highly likely that once these routes/services/terminals are developed, costs, reliability and attractiveness of the inland terminals will be realised and be successful in releasing freight capacity in the North.



5% Shift to Inland Freight Terminals



10% Shift to Inland Freight Terminals



15% Shift to Inland Freight Terminals

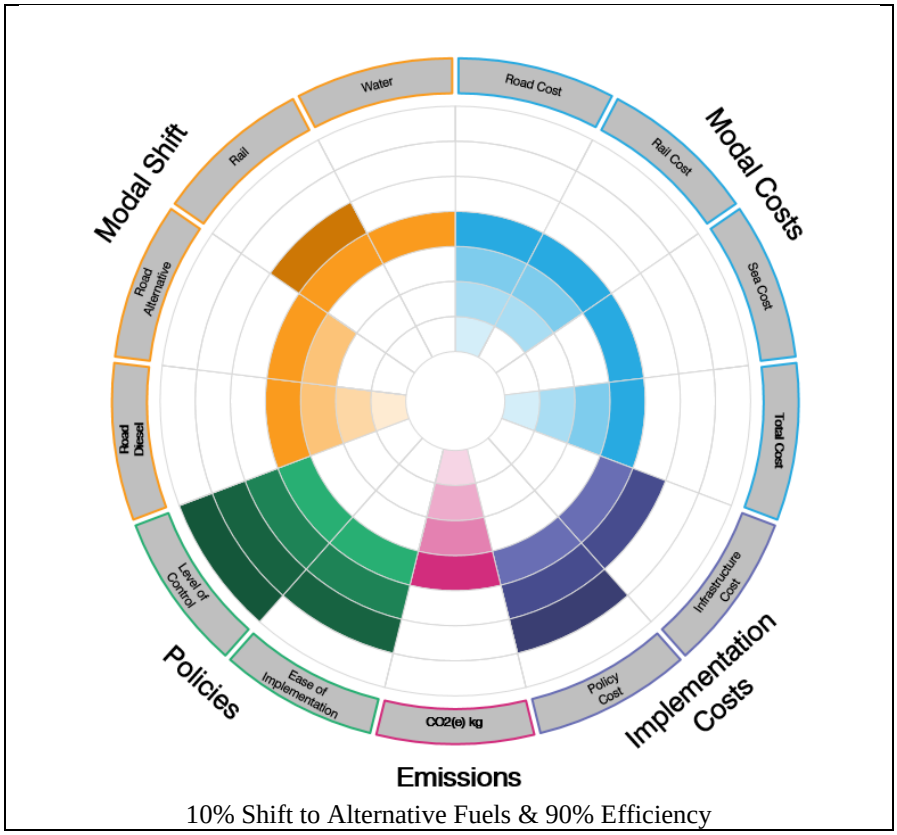
Automation and Alternative Fuels Scenario

The Automation and Alternative Fuels scenario outlines the effects of increasing freight efficiencies as well as improving emissions through the use of alternative fuels. These combined measures can better manage congestion whilst reducing the number of vehicles needed and reduce the emissions that are produced from non-alternative fuelled vehicles.

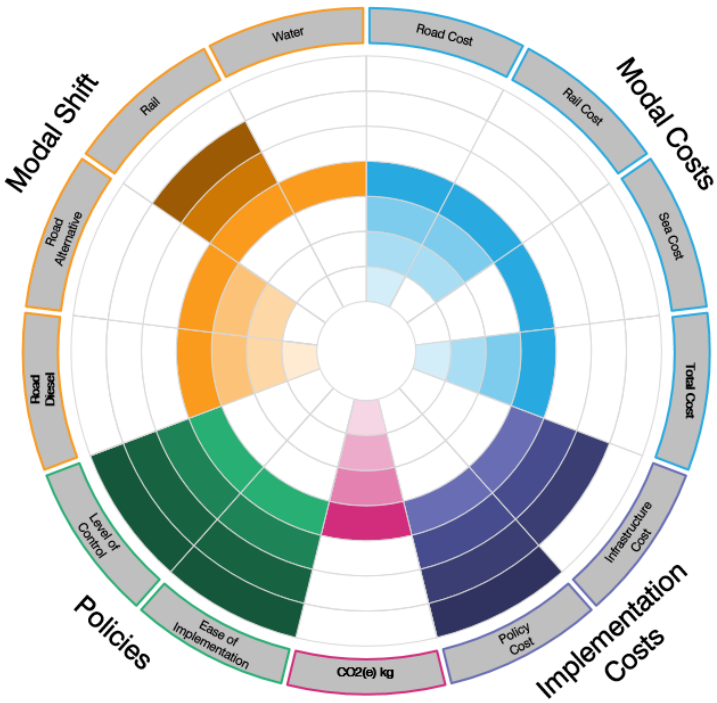
It can be seen from the diagrams that by increasing efficiencies and encouraging alternative fuels, there are cost savings as well as health benefits.

The difficulty in ensuring this scenarios success is the policy measures and the level of control and implementation due to the privatised nature of the freight industry.

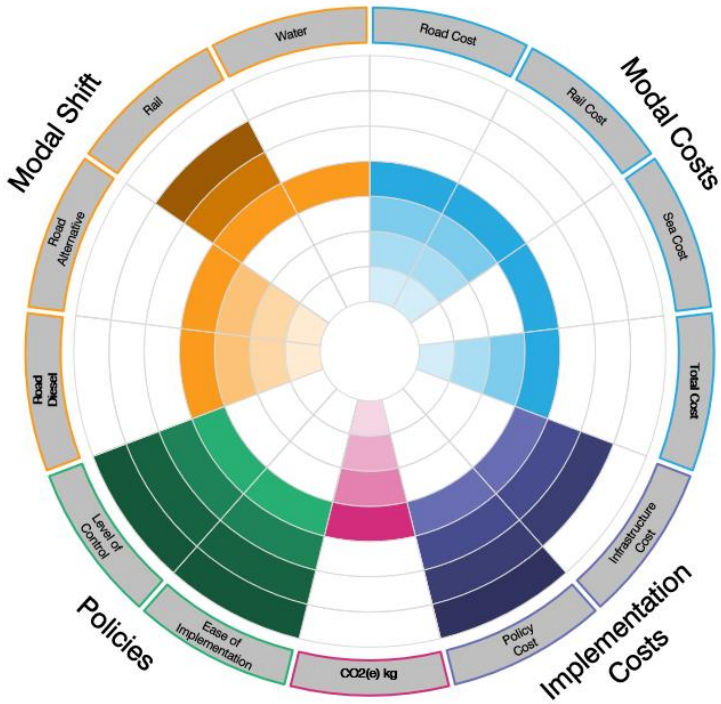
Although, it should be noted that alternative fuels i.e. renewables, are becoming a focus of research in the freight industry. There are also numerous examples of increasing efficiencies to ensure that there are less wasted trips. With this in mind, the future base scenario might actually be vaguely similar to these outputs, but this is unlikely to be realised in the near future.



10% Shift to Alternative Fuels & 90% Efficiency



20% Shift to Alternative Fuels & 95% Efficiency



50% Shift to Alternative Fuels & 100% Efficiency

5.6 Providing Skills, and utilising data to plan for the future

5.6.1 Workforce and skills

In order to ensure that the North has the skills required to meet the future needs of the freight and logistics sector, TfN should work towards a number of key strategic aims. The FTA conducted its annual Transport Manager Survey in June 2016 where respondents were asked a number of questions, one of which focused around what measures are required to address driver recruitment and deployment.

The strategic aims to tackle the workforce and skills shortage are:

- Increase the availability and funding for apprenticeships at the same time reducing qualification costs;
- Guidance on skills, funding and support;
- Staff development;
- Improve industry image;
- Access to student type loans;
- Incentives to recruit long-term unemployed;
- Improve driver roadside facilities;
- Improve driver pay, hours and conditions; and
- Reduce driver regulatory burden.

TfN should aim to work with the haulage industry to achieve the above aims where a role of ensuring the industry promoted adequately is essential.

It is also essential that TfN work with the industry to create a safe environment for staff to work in. This includes physical safety of staff as well as protection of their information. It should also include cognisance to the safety of the freight being transported within the North and how this can be enhanced.

5.6.2 Technology / Data

The importance of data in maintaining an efficient and resilient transport network cannot be overstated. Companies in every sector are making significant efforts to increase their data-driven decision making processes, replacing what the requirement to make decisions based on gut-feelings.

For the freight and logistics industry, online e-tailers are a good example of organisations using big data to anticipate sales volumes, customer product preferences and future requirements.

For TfN, the power of big data will be key to understanding the forecast demands that will be placed on the transport network both in terms of numbers of vehicles

on the road, operation of rail services in booked paths and when ships are likely to deliver or pickup goods for the UK's ports.

Real time data will also be key to managing incidents and linking across all modes to ensure the resilience of the transport networks is maintained.

The availability of data will increase dramatically in the coming years as developments such as the 'Internet of Things' grow, providing huge and varied quantities of data in real time. Much of this data will be related to transport and mobility.

Whilst collecting data is valuable, TfN will have a role to play in terms of ensuring this data is safe and secure. Cyber security consists of technologies, processes and measures that are designed to protect systems, networks and data from cyber-crimes. TfN have a duty to ensure that effective measures are in place to reduce cyber risks, identifying threats, vulnerabilities and risks that could be faced.

6 Recommended Next Steps

6.1 Introduction

This section of the report sets out the next steps for TfN and some of the areas where further action is required in order to respond to and plan for the increasing demands that will be placed upon the North's transport network in the coming years.

It is clear that due to rapidly evolving changes in consumer behaviour, the demands for goods will increase requiring a transport network that can respond to these demands efficiently and resiliently.

This report has recommended three key themes for ensuring that the transport network is sufficiently equipped for the future, namely:

- Maximise the use of existing assets;
- Deliver effective investment through the correct modal mix; and
- Providing the skills and utilising data to plan for the future.

The subsequent sections will form a suggested Freight and Logistics Action Plan for TfN to aid the above themes and take forward into the Strategic Development Corridor studies.

6.2 Freight and Logistics Action Plan

6.2.1 Maximise the use of existing assets

6.2.1.1 Use of Digital Technology

TfN should support the rail industry as it explores how digital technology such as ETCS (in-cab signalling) on the rail network (The Digital Railway) and smart motorways on the road network could be deployed to gain more capacity from existing infrastructure and where these may be a more cost-effective solution rather than completely new infrastructure.

6.2.1.2 Automation

Innovative methods for increasing capacity include automation. Automation does not only refer to automated vehicles although these are currently in advanced stages of development and may offer a solution to congestion and emissions issues in urban areas in the near future.

For TfN, however some aspects of automation should be explored where benefits to regional pan-northern movements could be offered. This includes HGV convoys on the motorway network (platooning) and automated systems for moving freight particularly into and out of ports for example. Trials of this nature

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suitable for rail. These opportunities should be explored in the Strategic Development Corridor studies.

6.2.2.2 Funding

Rail

The report recommends a number of actions for encouraging a modal shift to rail. These actions include promotion of rail freight though increased collaboration between transport operators and shippers. TfN should look to set up sessions where industry organisations can collaborate and share ideas. This should be targeted and developed through consultation with private sector stakeholders.

TfN should also explore:

1. How the market can be encouraged to operate more freight paths by reducing the financial risk by restructuring funding streams through to setting up a franchised rail freight operator for particular routes that would otherwise be unviable
2. How freight can be better integrated into the passenger timetable by assessing how they are operated technologies used, etc.

The premise of this action should be developed in consultation with DfT.

Coastal Shipping

TfN should look to develop a case for increasing the movement of intermodal containers on coastal shipping routes between the UK's southern ports and the North of England (and Scotland). This could also include increased services to central European hub ports such as Rotterdam and Antwerp.

Coastal shipping is an increasingly attractive method for the movement of empty containers out of the North due to the heavy import flows. Empty containers do not have the same time pressures as loaded containers and therefore they do not need to travel by road.

TfN should work with port operators, retailers and shipping lines to develop the case for increased coastal shipping services and undertake a review of funding opportunities and risk reduction.

6.2.2.3 Alternative Fuels

As the pressure to reduce emissions from transport continues, there is a stronger case for the development of infrastructure to support alternative fuels.

Future investment should include where appropriate the provision of infrastructure that supports and encourages an increase in the use of alternative fuels. This could include strategically placed refuelling points across the north for alternative fuels such as hydrogen and LPG.

Working with the region's ports to improve infrastructure to support ships using alternative fuels such as LNG will also be imperative, particularly if coastal shipping is to be encouraged.

6.2.2.4 Policy Incentives

TfN should look to work with rail freight operators and local authorities to seek to break down the planning obstacles that are often put in place that hinder the development of freight terminals such as onerous planning conditions. TfN should use the forecast traffic volumes in 2050 to highlight why a modal shift is beneficial to each local authority and the benefits that it could bring.

6.2.3 Providing skills and utilising data to plan for the future

6.2.3.1 Skills Strategy

TfN should build upon the work being done to create its own skills strategy and work with freight groups and bodies such as the Road Haulage Association (RHA), Freight Transport Associated (FTA) and CILT (Chartered Institute of Logistics and Transport (CILT) to ensure that the industry is developing the skills required in the freight and logistics sector to meet future demands.

Priorities for this stream of work should seek to improve the perception of the freight and logistics sector (particularly the haulage industry) and ensure that the industry gets exposure to a younger audience to ensure the longevity and resilience of the workforce.

6.2.3.2 Robust Data

The evidence base used in the development of this report is a mixture of model outputs from the GBFM and information gleaned through engagement with a number of freight and logistics operators and industry experts.

There remains however an important requirement to increase the robustness of the evidence base through the collection of more information and ensuring TfN have a long term strategy for gathering the required data to assess KPI's and how the North's freight industry operates. This could be through embracing the move to the use of Big Data and developing systems that will aid the enhancement of the freight and logistics story within TfN.

TfN should work with partners, many of whom have already started this process to examine whether a Pan Northern approach to data collection and interrogation can be established. This may utilise data collected from a number of sources including GPS systems such as Traffic Master, Tom-Tom, INRIX or mobile phone data.

6.2.3.3 Work with city regions

TfN should work with city regions around the development of strategies affecting freight and logistics in urban areas and the sharing of data. Supply chains are

international but Northern Cities are evaluating policy interventions to mitigate and control their environmental impact locally, such as low emission zones. These new schemes will fundamentally change the way road freight is moved throughout the North and the coordination of such interventions and cross learning could be of benefit to the North.

6.2.4 TfN's role in Brexit

Britain's exit from the European Union (EU) has the potential to have a significant impact of the freight and logistics sector. These impacts could be in the form of opportunities and/ or threats.

TfN should work with the sector as the Brexit process is undertaken to understand the significance of any impacts that might arise and how the industry should respond. TfN could act as a voice for the freight and logistics sector in the North of England to ensure that any concerns or views are represented to Government during the process.

6.2.4.1 Free Port Zones

An opportunity presented by Brexit are the establishment of Free Port Zones. Free Ports are areas that, although inside the UK boundary geographically, would be considered outside of the country for customs purposes. This would result in goods entering and exiting the port without incurring typical import procedures or tariffs and incentivising domestic manufacturing.

Currently no free port zones exist in the UK as EU laws prevent them from being established but successful examples can be found in the USA where jobs have been created, manufacturing output stimulated and trade boosted.

Post Brexit, TfN could support the creation of Free Port Zones at major ports and airports in the North to aid the development of economic clusters in maritime, logistics, aviation, aerospace and space sectors along with the continued development of Enterprise Zones in other areas. This could include international rail freight terminals through links to the Channel Tunnel.

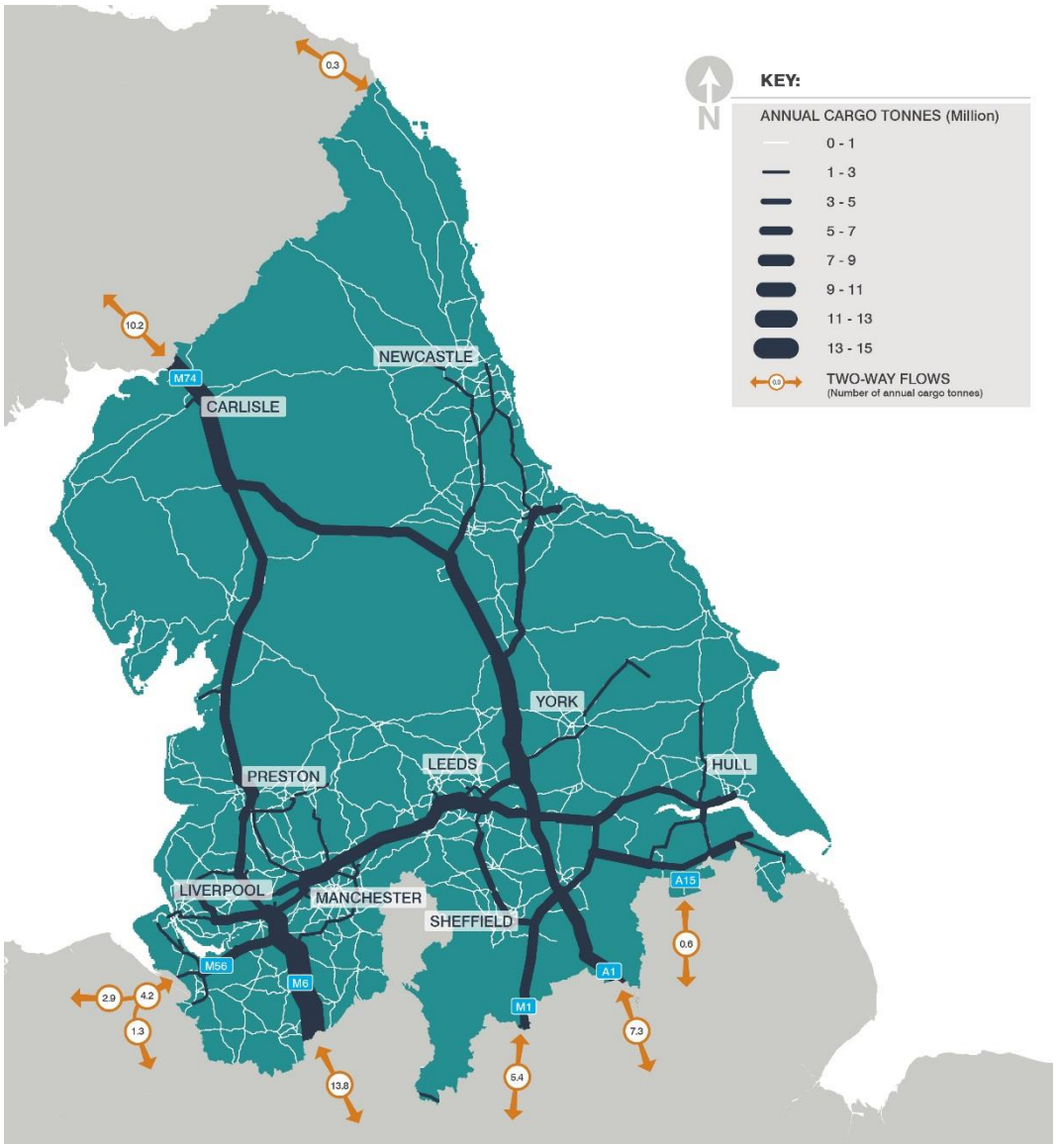
6.2.4.2 Impact of Brexit on Southern Ports

On the flip side to the opportunities offered by Free Port Zones, Brexit could have an enormous detrimental impact on ports, particularly in Southern England such as Dover where new border checks procedures could have a significant impact on the surrounding road network which is already strained by the existing throughput of vehicles on the UK's busiest cross-channel ferry routes.

This could offer an opportunity for Northern Ports to increase throughput as the pressure is lifted from constrained ports in the south with existing ferry routes to the North strengthened by larger vessels and increased port capacity, and perhaps new routes created to meet demand.

Appendix A

Freight Movements by Commodity



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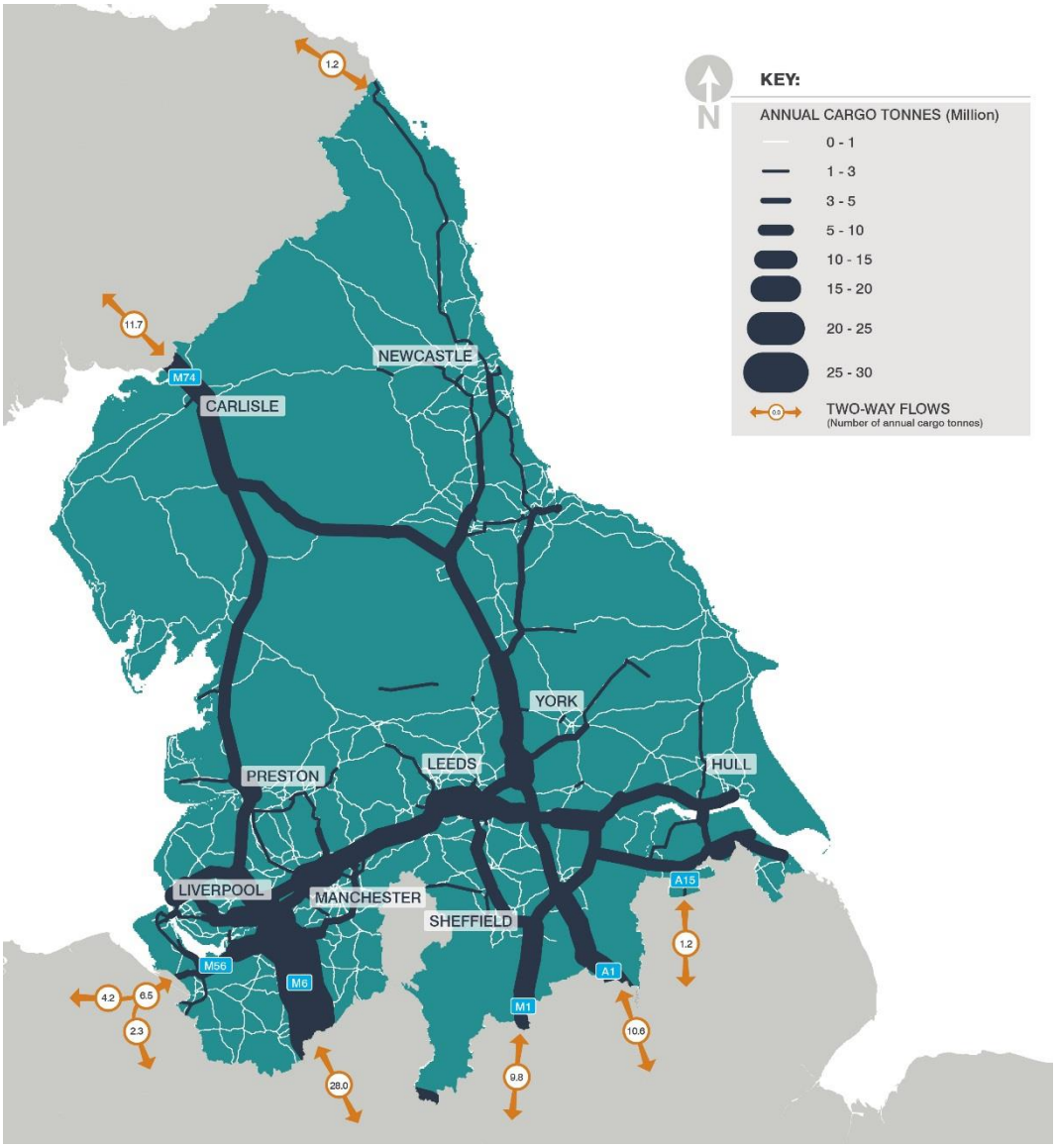
A1 Road Commodities

A1.1 Temperature Controlled Foodstuffs

N
KEY:
ANNUAL CARGO TONNES (Million)
0 - 1
1 - 3
3 - 5
5 - 7
7 - 9
9 - 11
11 - 13
13 - 15
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.3
10.2
M74
CARLISLE
NEWCASTLE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
A15
0.6
M56
M6
A1
M1
7.3
2.9
4.2
1.3
13.8
5.4

Figure 58 Road Freight by Commodity - 2016 - Temperature Controlled Foodstuffs

Page A



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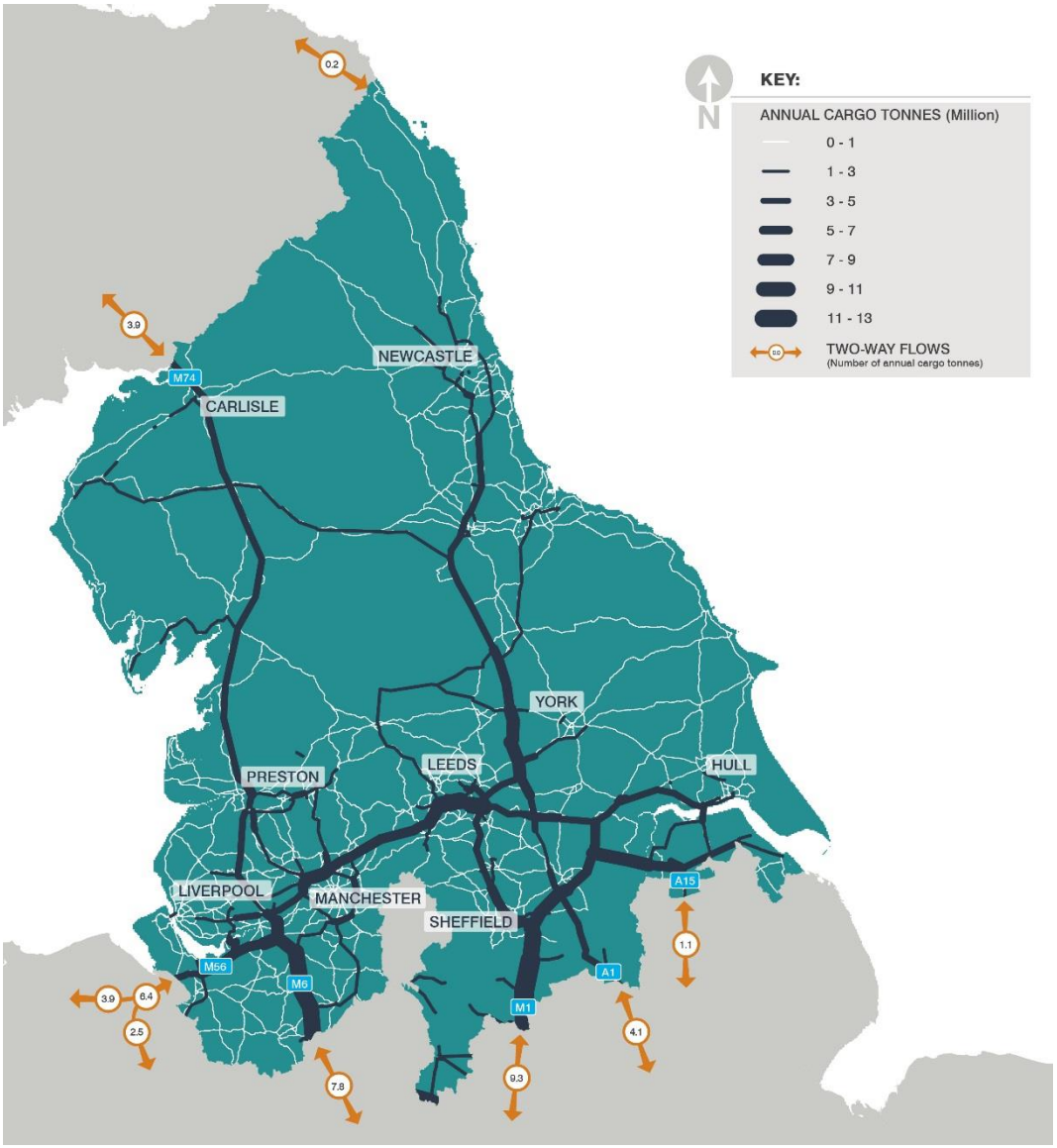
A1.2 Other Foodstuffs

KEY:
ANNUAL CARGO TONNES (Million)
0 - 1
1 - 3
3 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 30
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
1.2
11.7
NEWCASTLE
M74
CARLISLE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
A15
1.2
M56
M6
A1
M1
4.2
6.5
2.3
28.0
9.8
10.6

Figure 59 Road Freight by Commodity - 2016 - Other Foodstuffs

Page A



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[illegible]

A1.3 Construction and Metals

0.2
KEY:
N
ANNUAL CARGO TONNES (Million)
0 - 1
1 - 3
3 - 5
5 - 7
7 - 9
9 - 11
11 - 13
TWO-WAY FLOWS
(Number of annual cargo tonnes)
3.9
NEWCASTLE
M74
CARLISLE
YORK
LEEDS
HULL
PRESTON
A15
LIVERPOOL
MANCHESTER
SHEFFIELD
1.1
M56
M6
A1
M1
3.9
6.4
2.5
4.1
7.8
9.3

Figure 60 Road Freight by Commodity - 2016 - Construction and Metals

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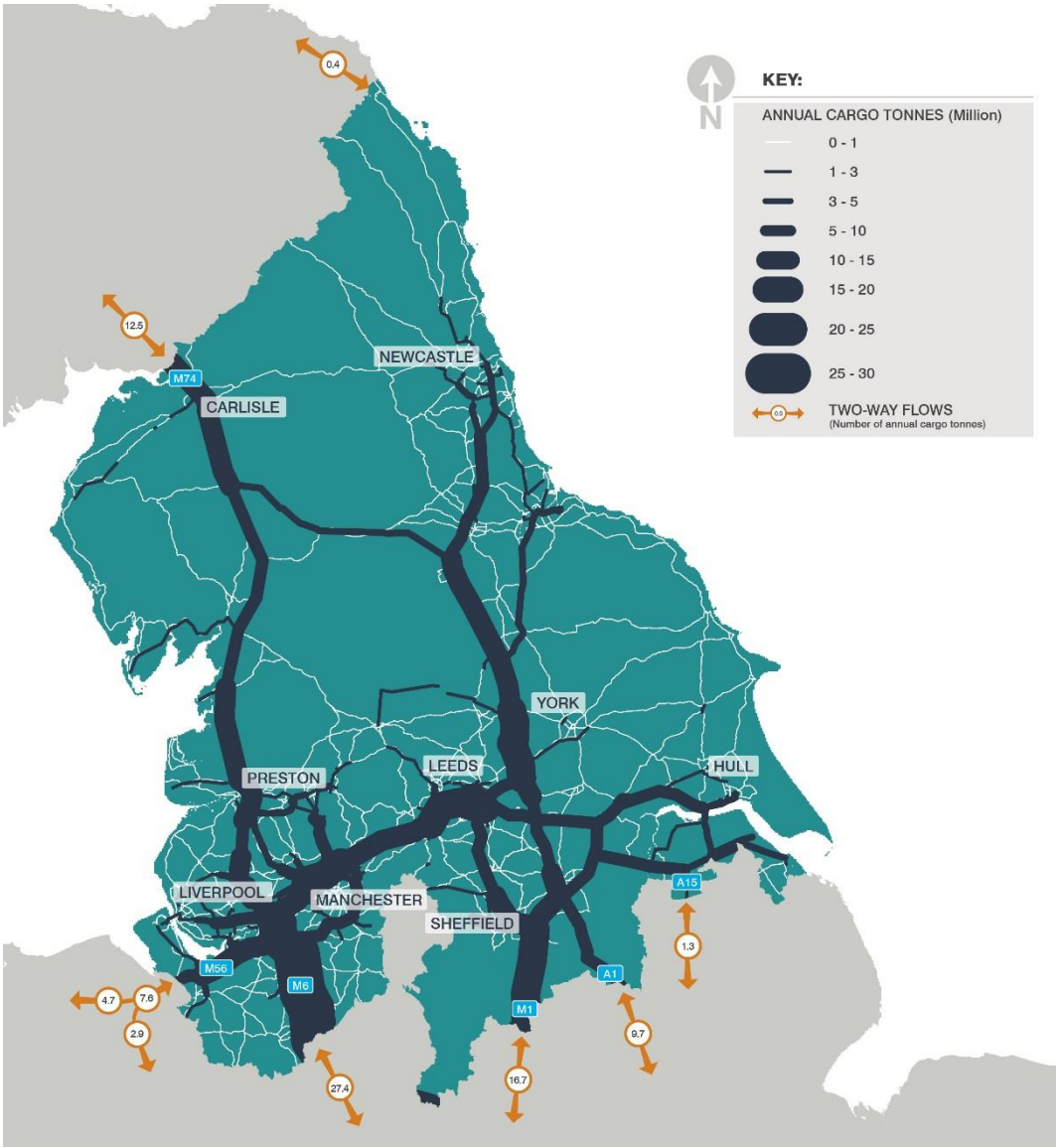

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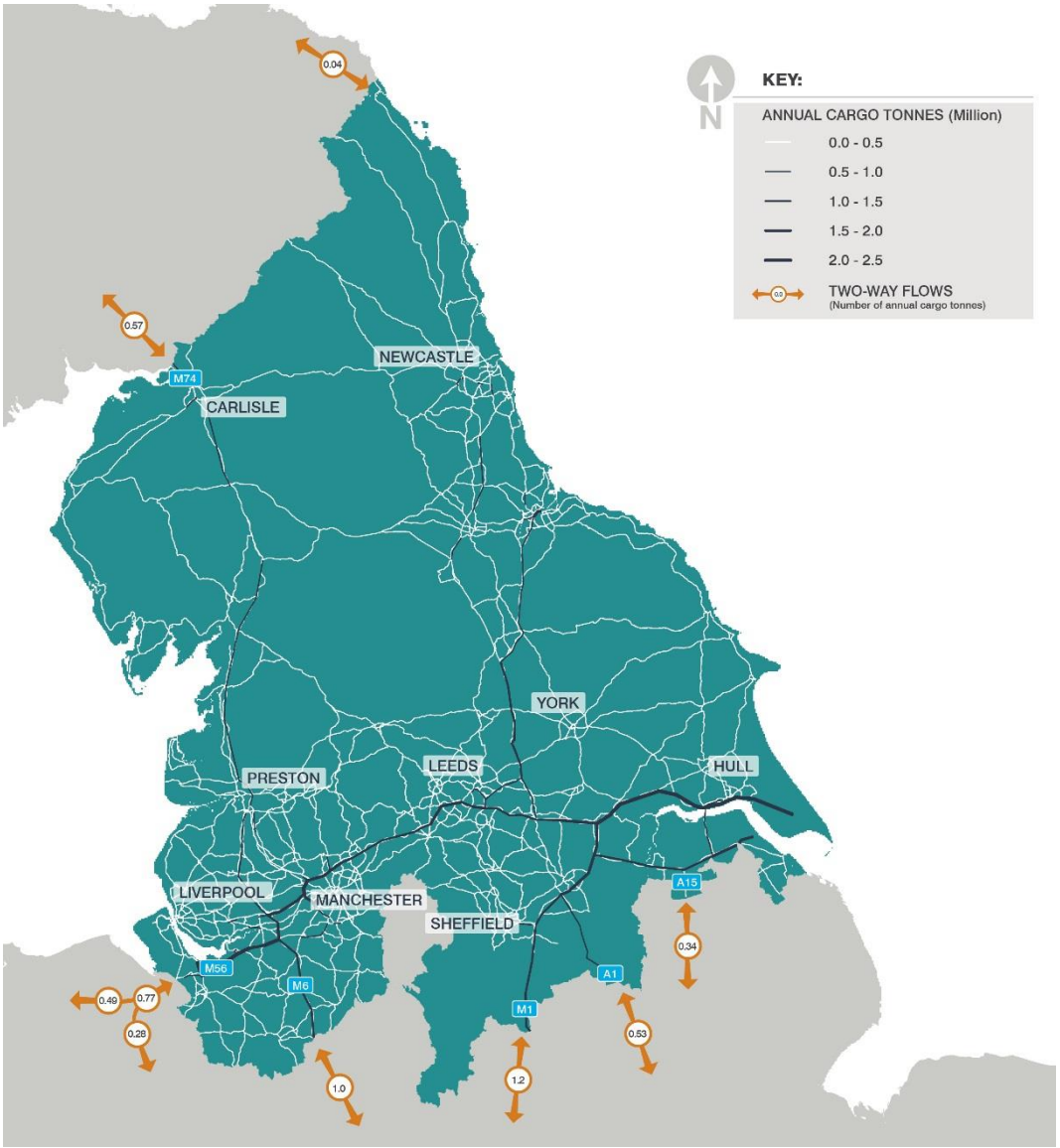
A1.4 Crude Materials and Manufactured Items

N
KEY:
ANNUAL CARGO TONNES (Million)
0 - 1
1 - 3
3 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 30
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.4
12.5
M74
CARLISLE
NEWCASTLE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
A15
1.3
M56
M6
A1
M1
4.7
7.6
2.9
27.4
16.7
9.7

Figure 61 Road Freight by Commodity - 2016 - Crude Materials and Manufactured Items

Page A[illegible]



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A1.5 Petroleum and Petrol Products

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
NEWCASTLE
CARLISLE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
M74
M56
M6
M1
A1
A15
0.04
0.57
0.49
0.77
0.28
1.0
1.2
0.53
0.34

Figure 62 Road Freight by Commodity - 2016 - Petroleum and Petrol Products

Page A□□

A1.6 Other Bulks

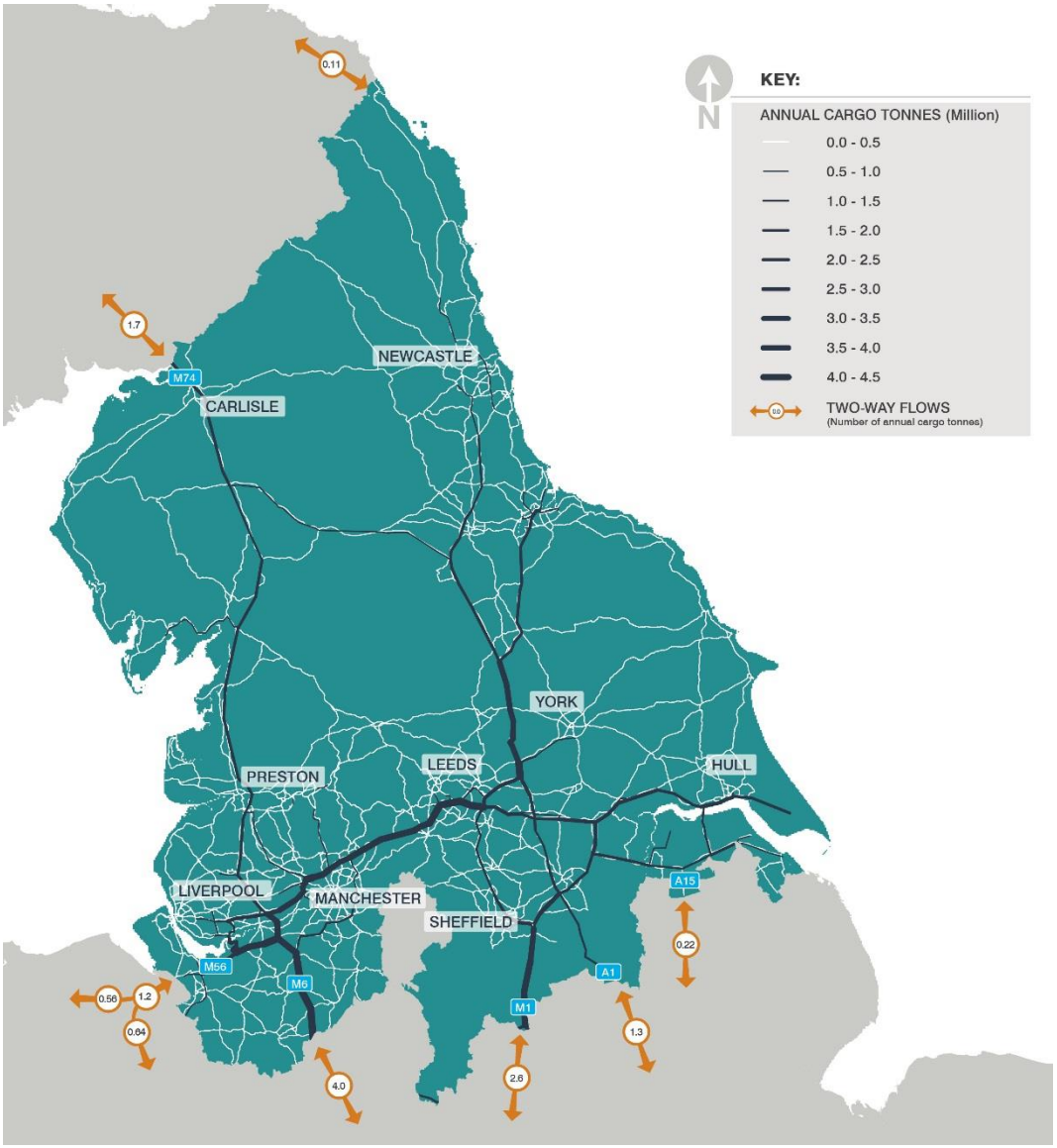
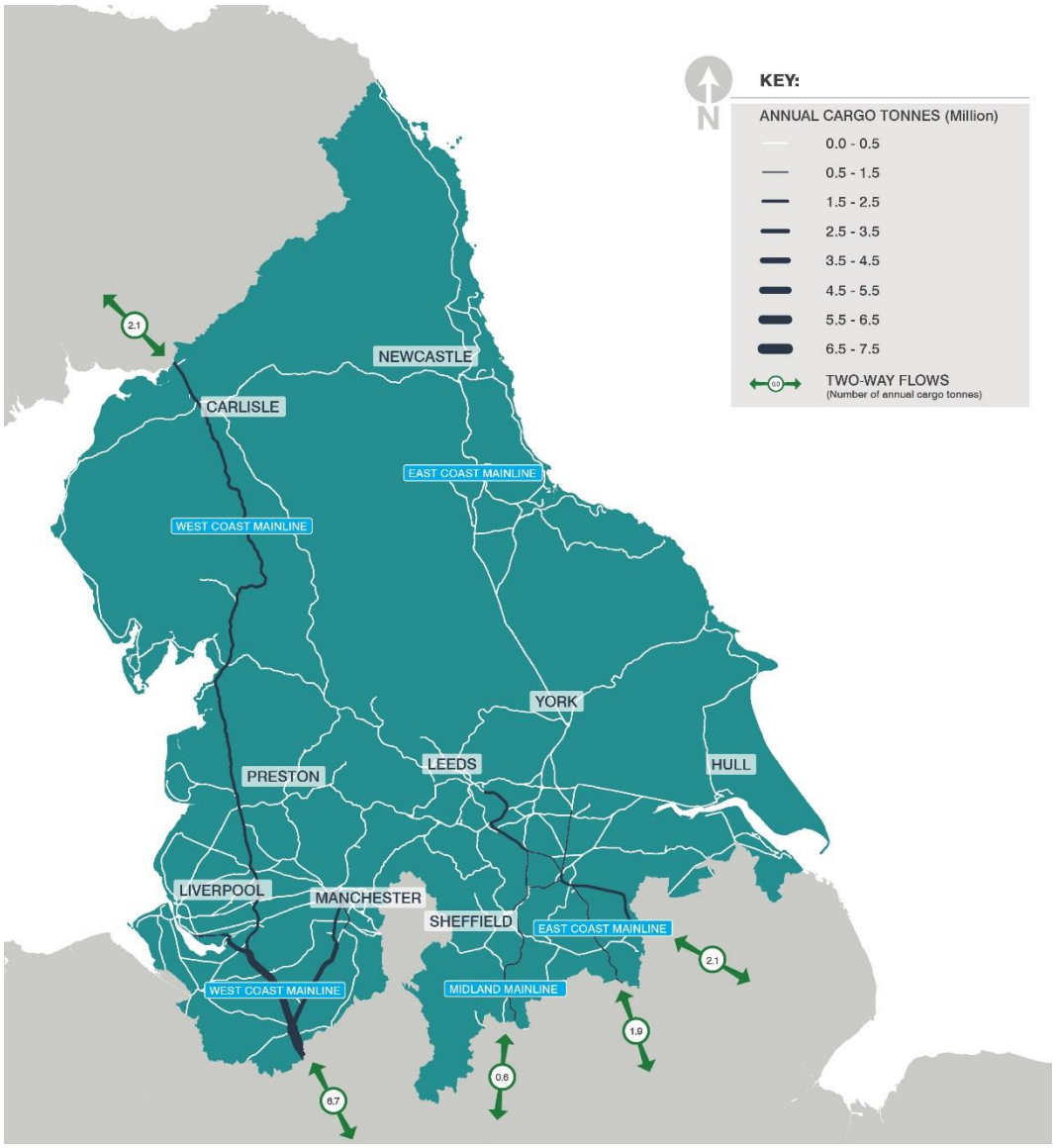


Figure 63 Road Freight by Commodity - 2016 - Other Bulk



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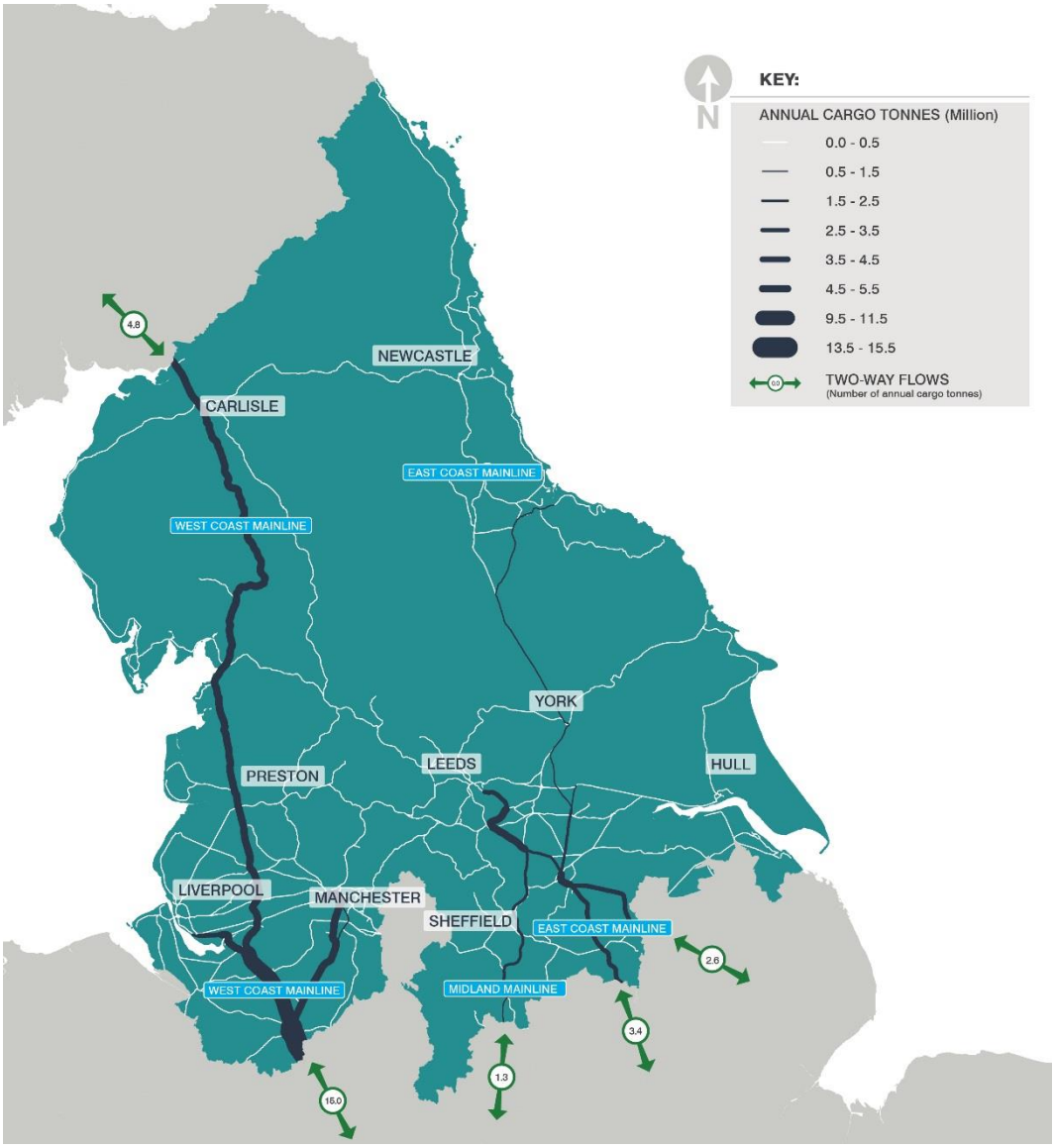
A2 Rail Commodities

A2.1 Intermodal

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.5
1.5 - 2.5
2.5 - 3.5
3.5 - 4.5
4.5 - 5.5
5.5 - 6.5
6.5 - 7.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE
2.1
2.1
1.9
0.6
6.7

Figure 64 Rail Freight by Commodity - 2016 – Intermodal

Page A □



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N
KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.5
1.5 - 2.5
2.5 - 3.5
3.5 - 4.5
4.5 - 5.5
9.5 - 11.5
13.5 - 15.5
0.0
TWO-WAY FLOWS
(Number of annual cargo tonnes)
4.8
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
2.6
WEST COAST MAINLINE
MIDLAND MAINLINE
3.4
1.3
15.0

Figure 65 Rail Freight by Commodity - 2050 – Intermodal

** NB The Great Britain Freight Model does not show growth in flows that do not exist within the baseline unless TfN added assumptions into the model where growth was likely. To keep the standard approach, no assumptions were added hence the growth of intermodal traffic West-East is limited. **

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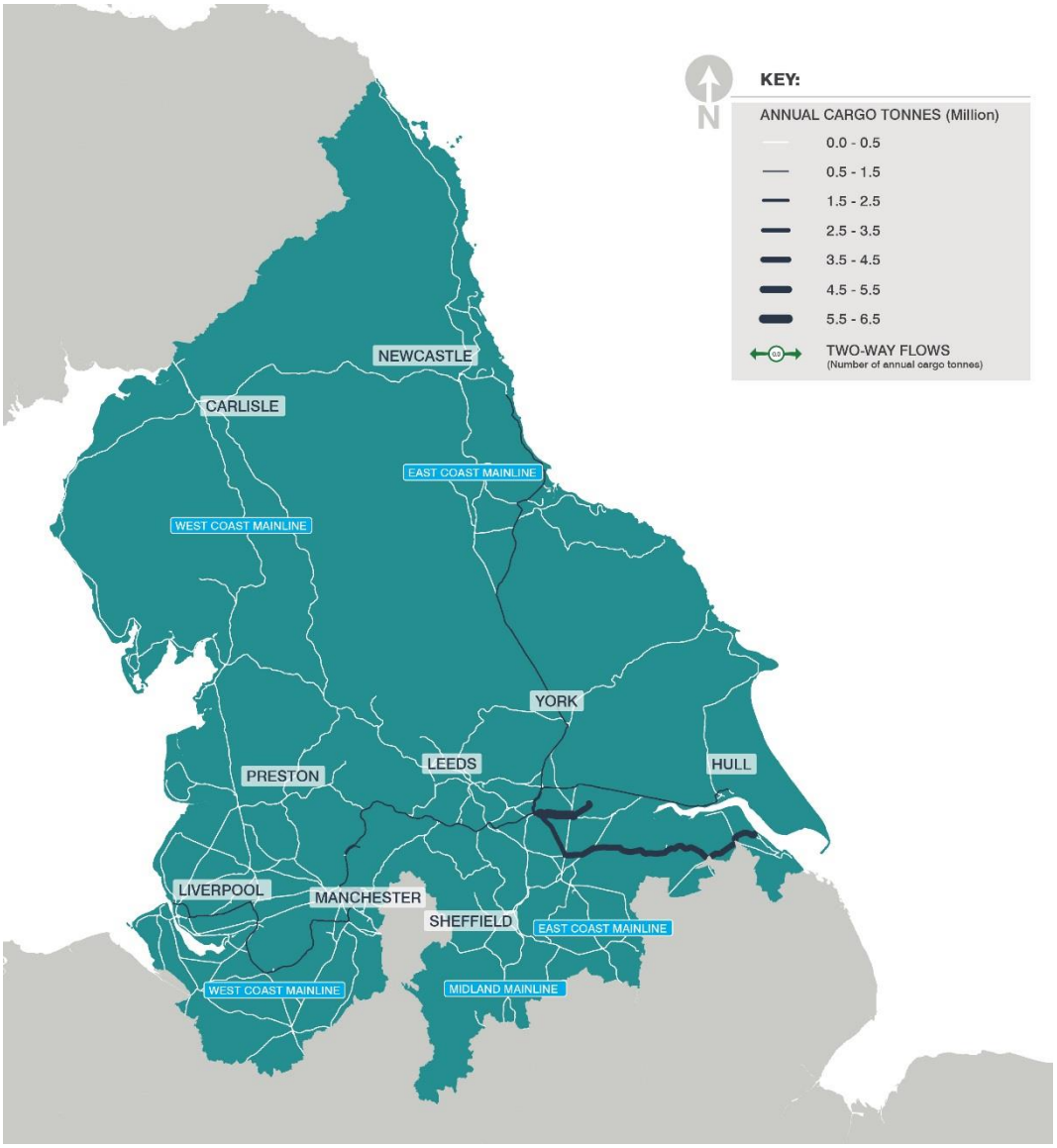

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A2.2 Biomass

KEY:
N
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.5
1.5 - 2.5
2.5 - 3.5
3.5 - 4.5
4.5 - 5.5
5.5 - 6.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.2
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE

Figure 66 Rail Freight by Commodity - 2016 – Biomass

Page A

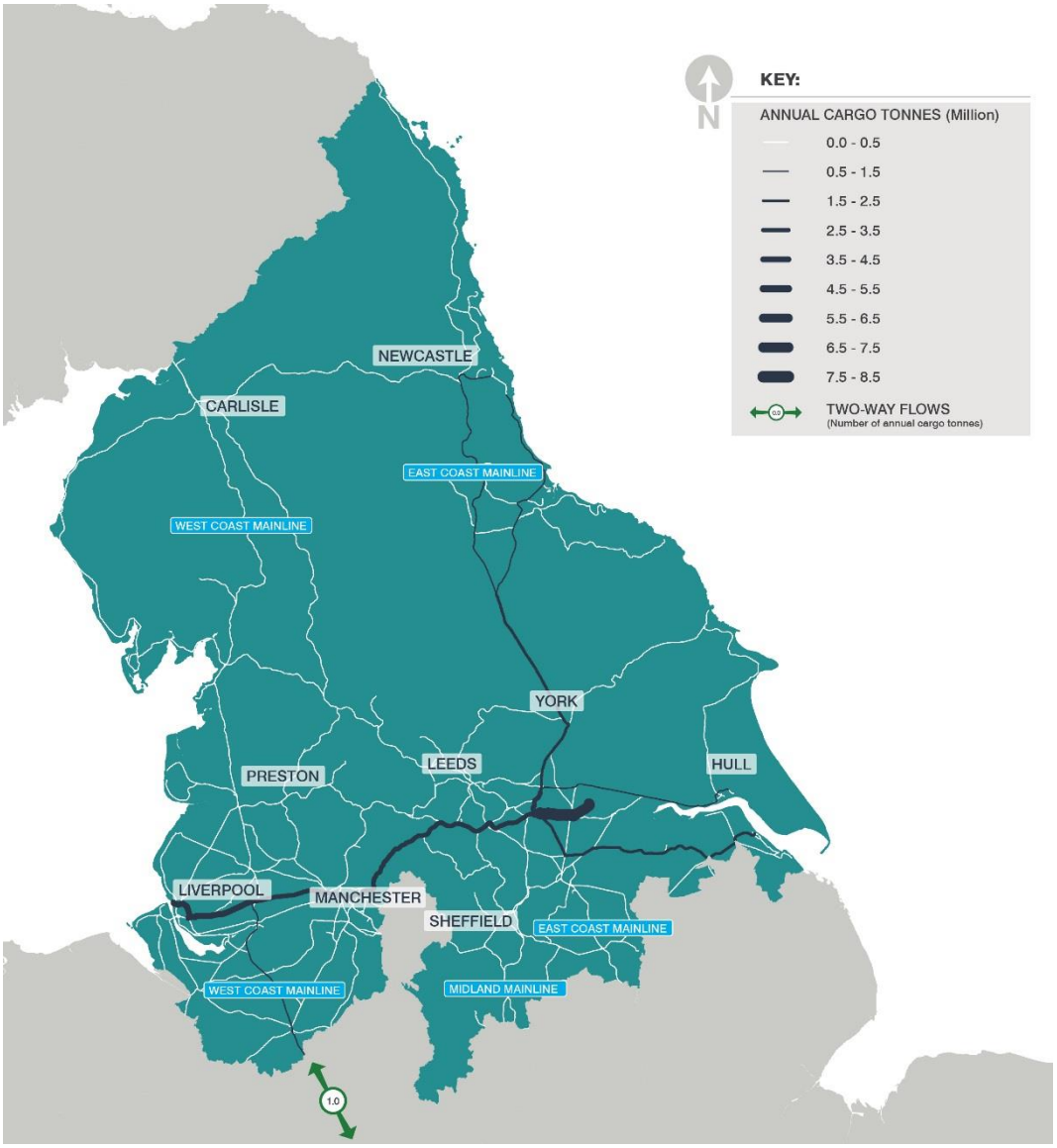
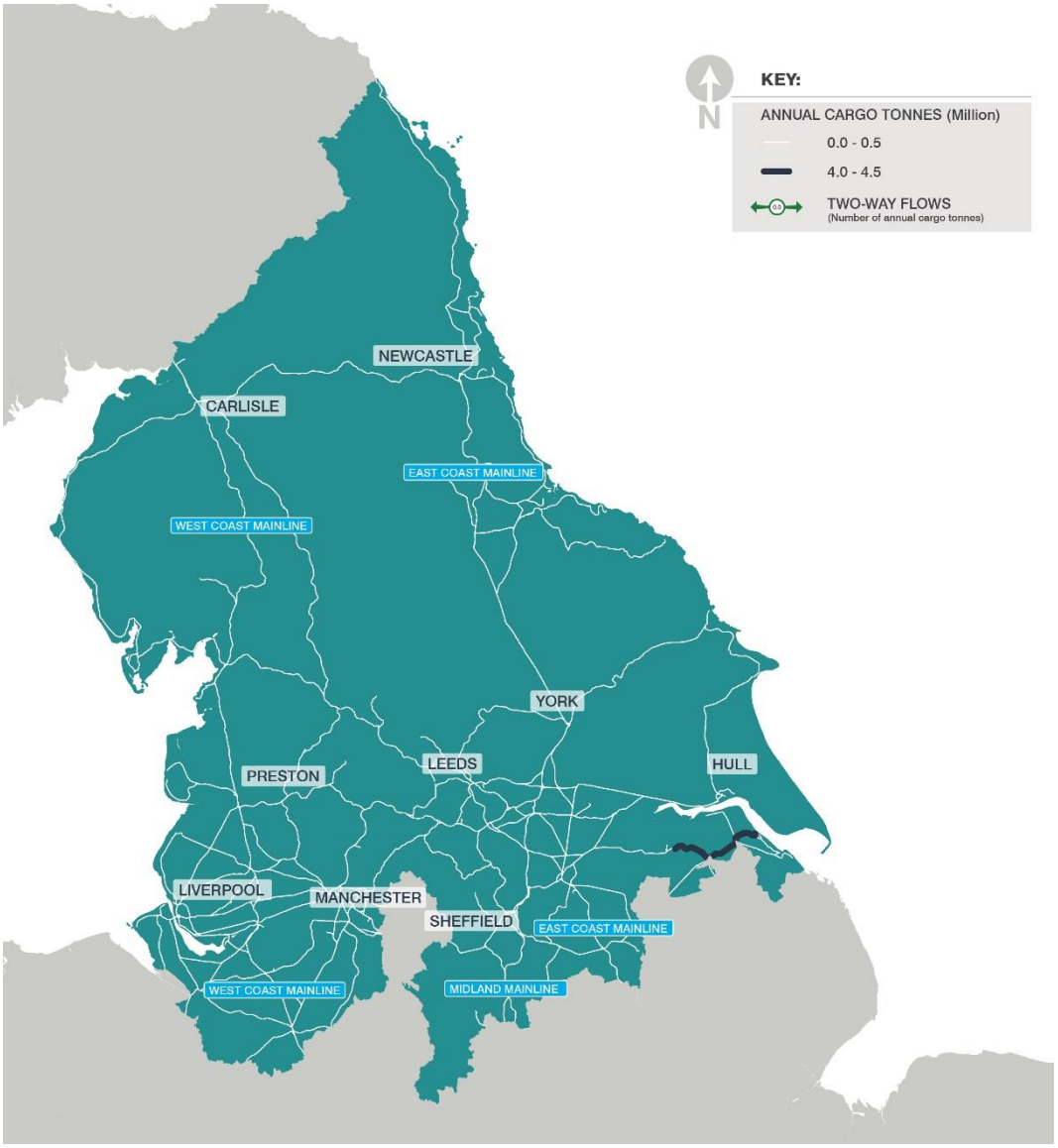


Figure 67 Rail Freight by Commodity - 2050 – Biomass



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□□□□r□

A2.3 Iron Ore

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
4.0 - 4.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE

Figure 68 Rail Freight by Commodity - 2016 - Iron Ore

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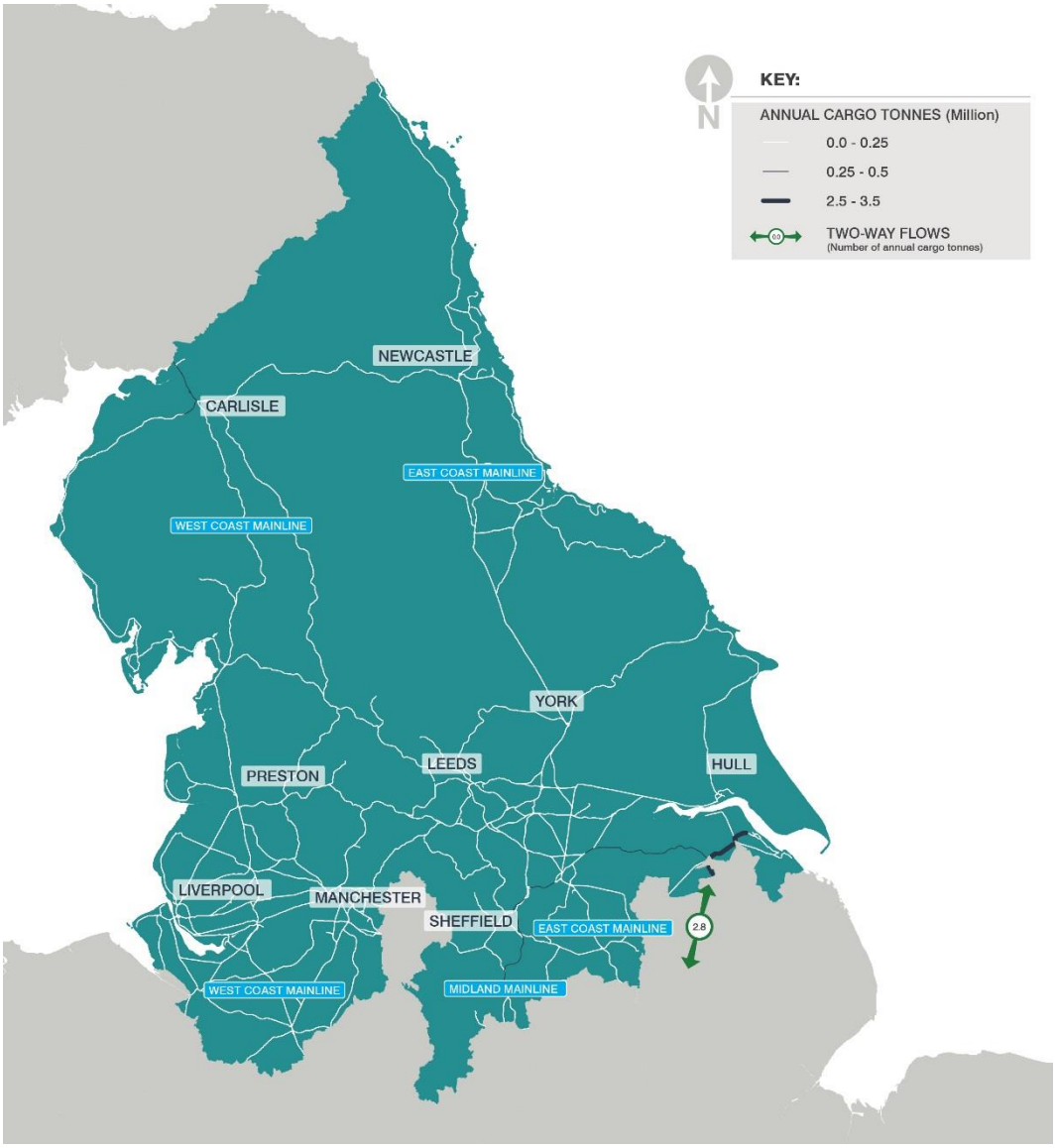
□□□□r□□

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
4.5 - 5.0
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.0
N
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE

Figure 69 Rail Freight by Commodity - 2050 - Iron Ore

Page A1



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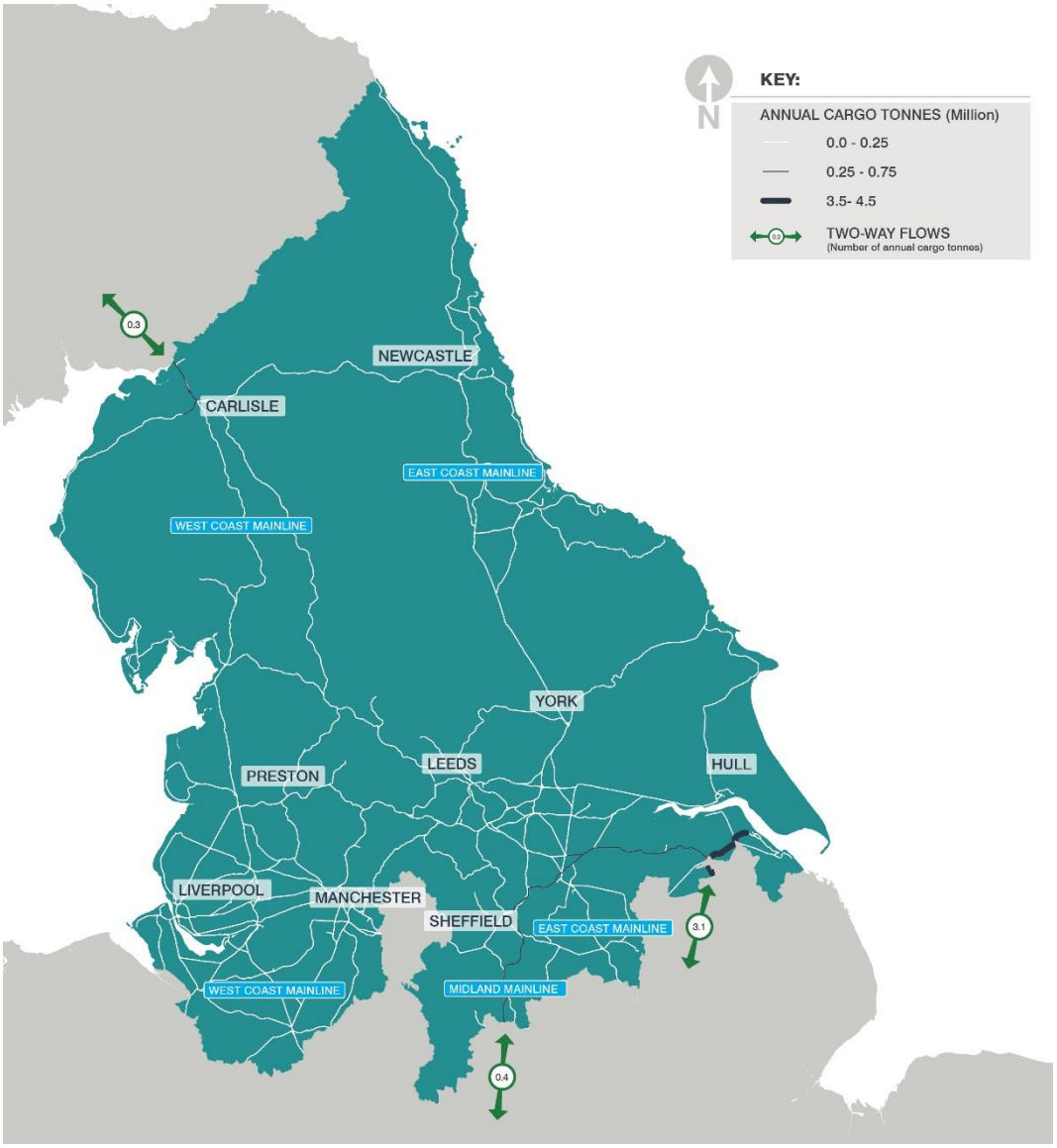
A2.4 Petroleum and Petrol Products

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.25
0.25 - 0.5
2.5 - 3.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
2.8
WEST COAST MAINLINE
MIDLAND MAINLINE

Figure 70 Rail Freight by Commodity - 2016 - Petroleum Products

Page A1



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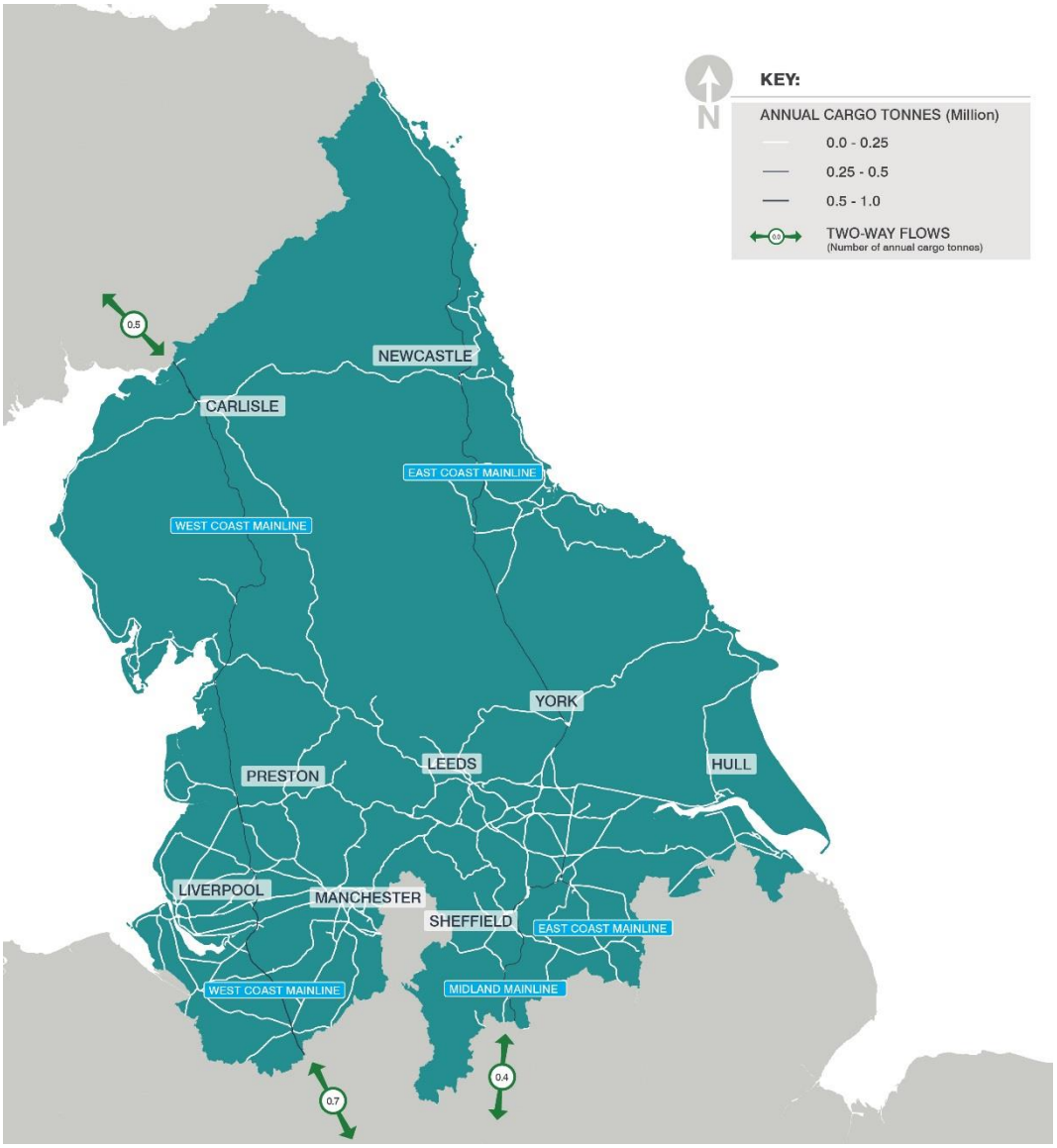
KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.25
0.25 - 0.75
3.5- 4.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
N
0.3
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
3.1
WEST COAST MAINLINE
MIDLAND MAINLINE
0.4

Figure 71 Rail Freight by Commodity - 2050 - Petroleum Products

Page A1



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A2.5 Network Rail Engineering

KEY:
N
ANNUAL CARGO TONNES (Million)
0.0 - 0.25
0.25 - 0.5
0.5 - 1.0
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.0
0.5
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE
0.4
0.7

Figure 72 Rail Freight by Commodity - 2016 - Network Rail Engineering

Page A1

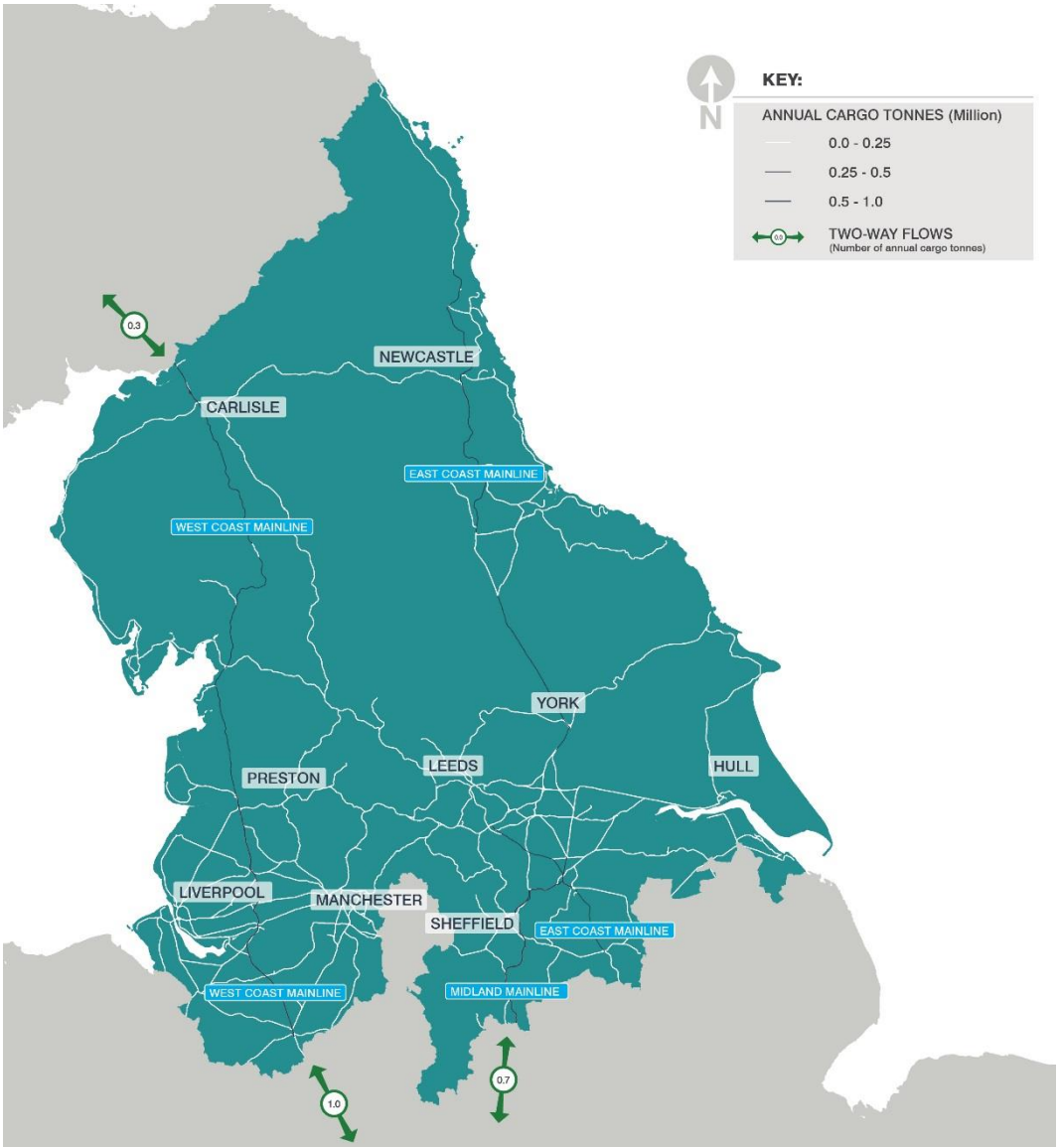
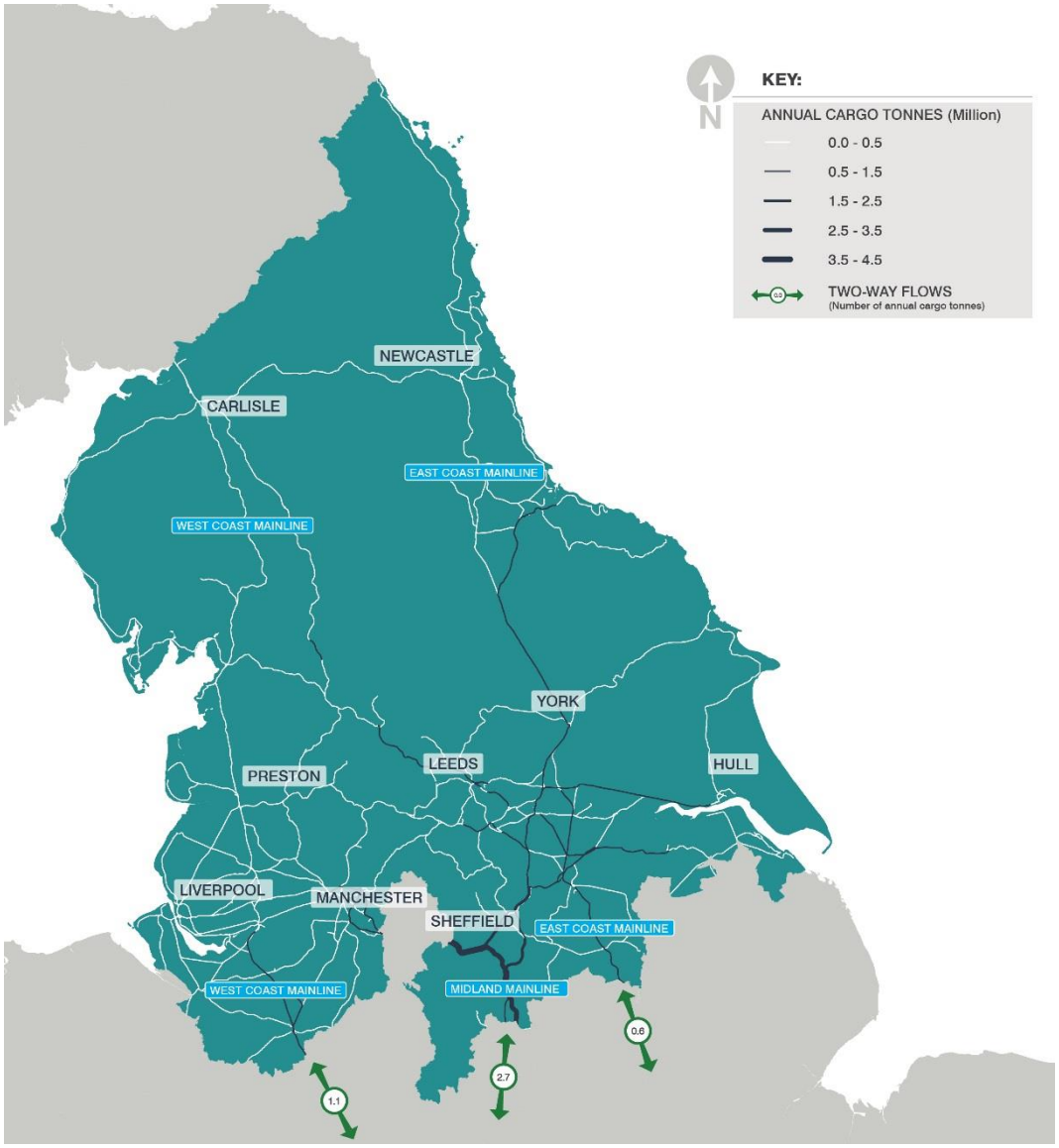


Figure 73 Rail Freight by Commodity - 2050 - Network Rail Engineering



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A2.6 Construction and Metals

KEY:
N
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.5
1.5 - 2.5
2.5 - 3.5
3.5 - 4.5
0.2
TWO-WAY FLOWS
(Number of annual cargo tonnes)
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE
0.6
2.7
1.1

Figure 74 Rail Freight by Commodity - 2016 - Construction and Metals

Page A1 □

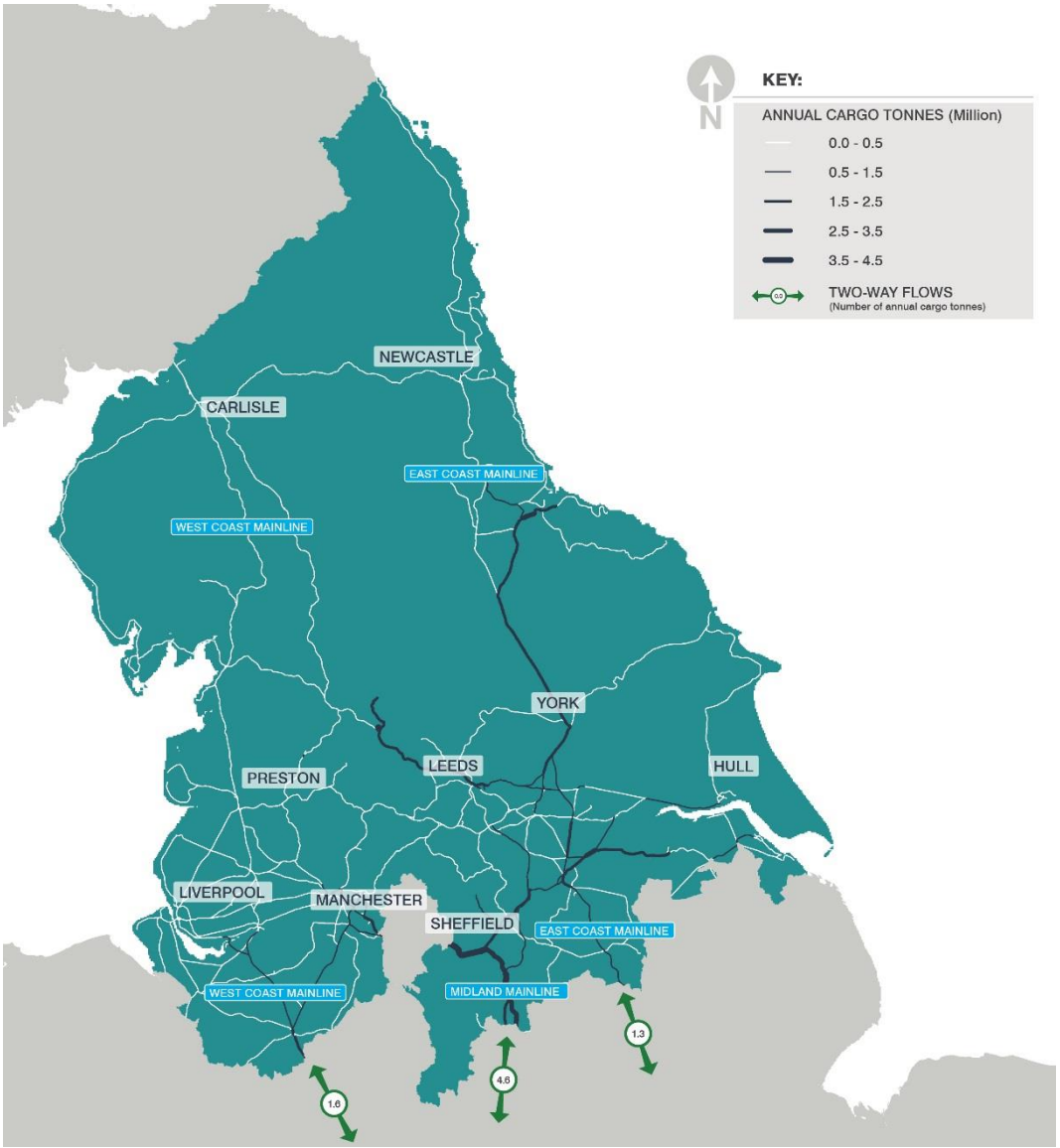
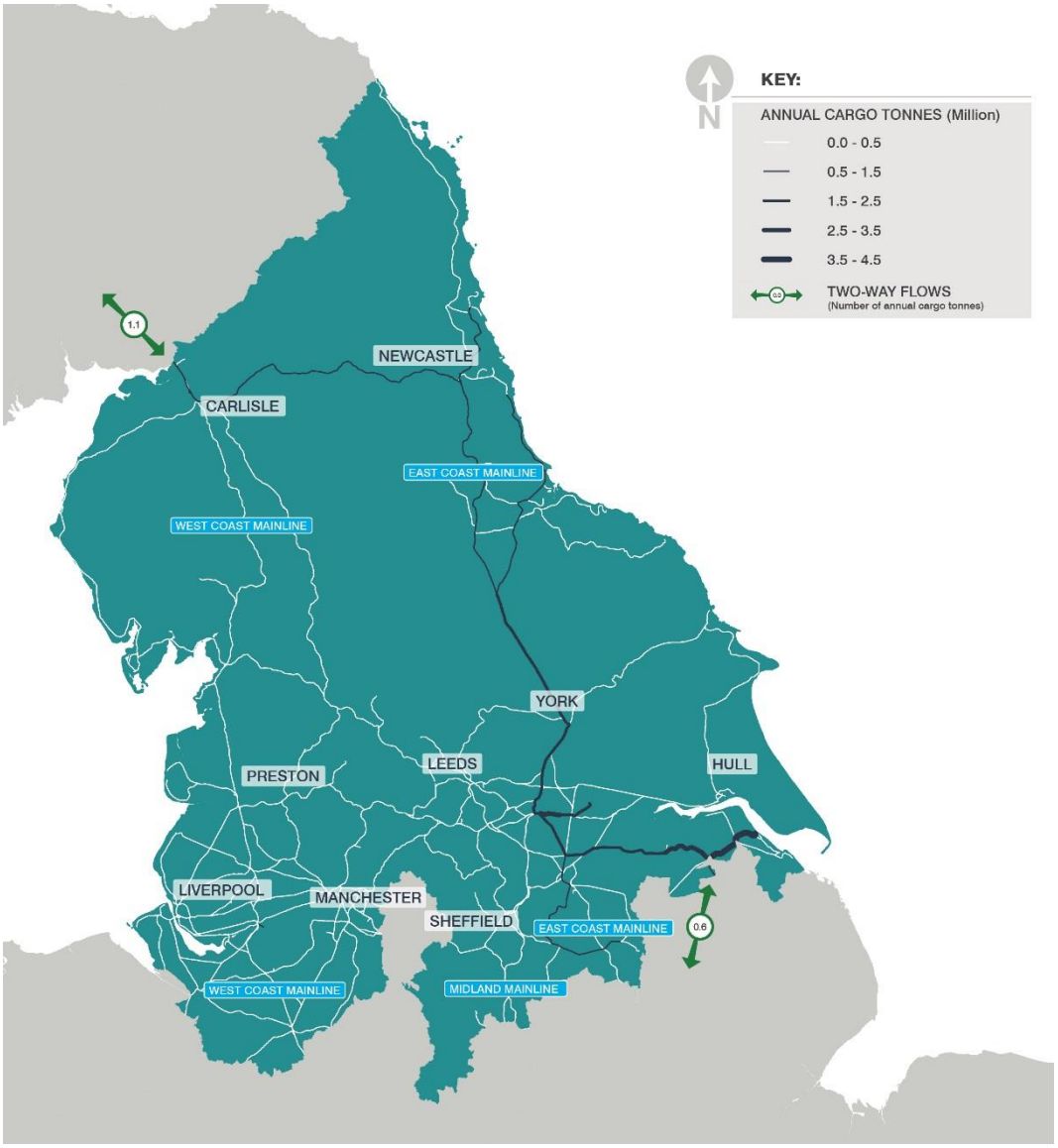


Figure 75 Rail Freight by Commodity - 2050 - Construction and Metals



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A2.7 Coal

KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.5
0.5 - 1.5
1.5 - 2.5
2.5 - 3.5
3.5 - 4.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
0.2
N
1.1
0.6
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE

Figure 76 Rail Freight by Commodity - 2016 – Coal

Page A1

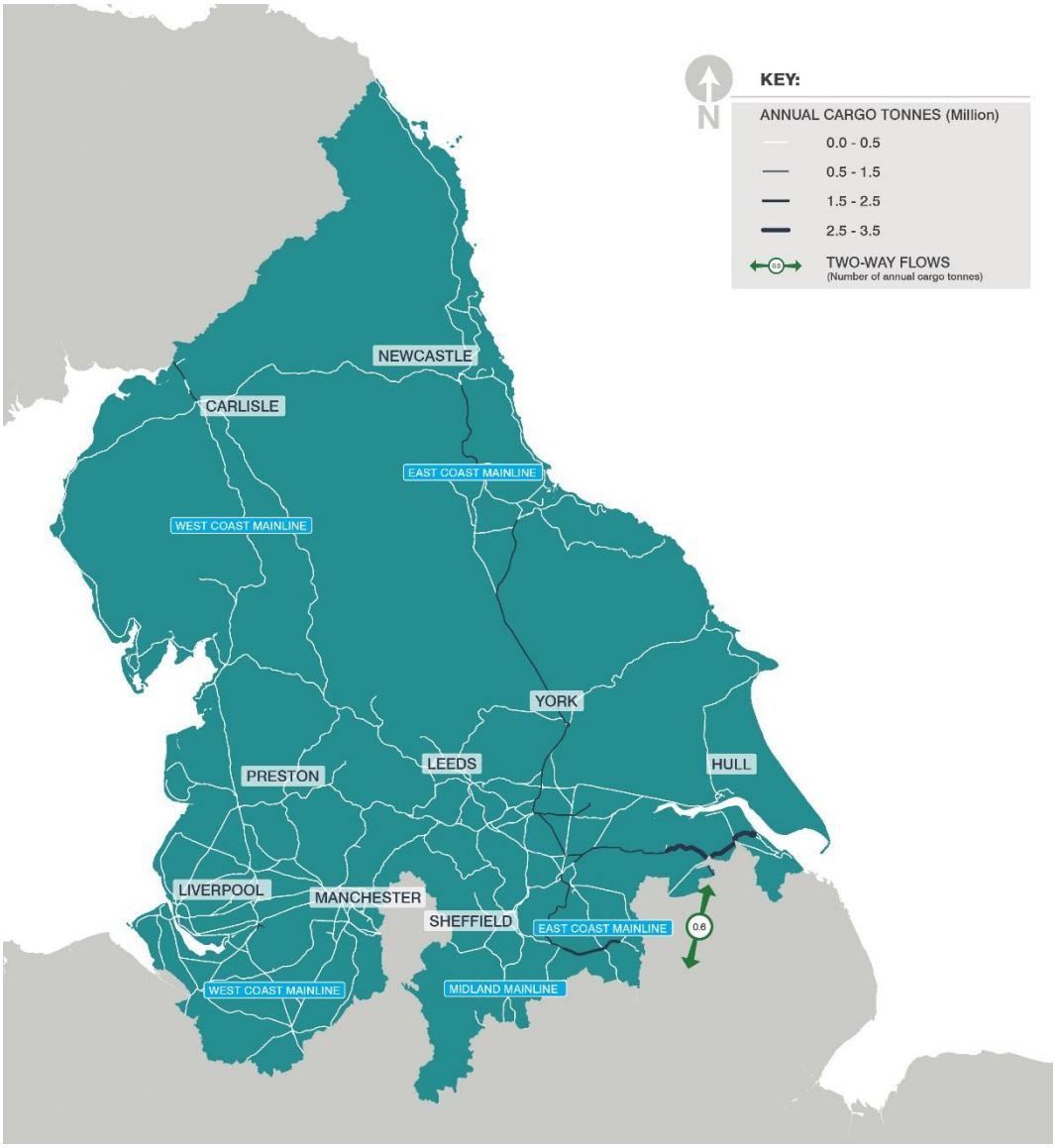
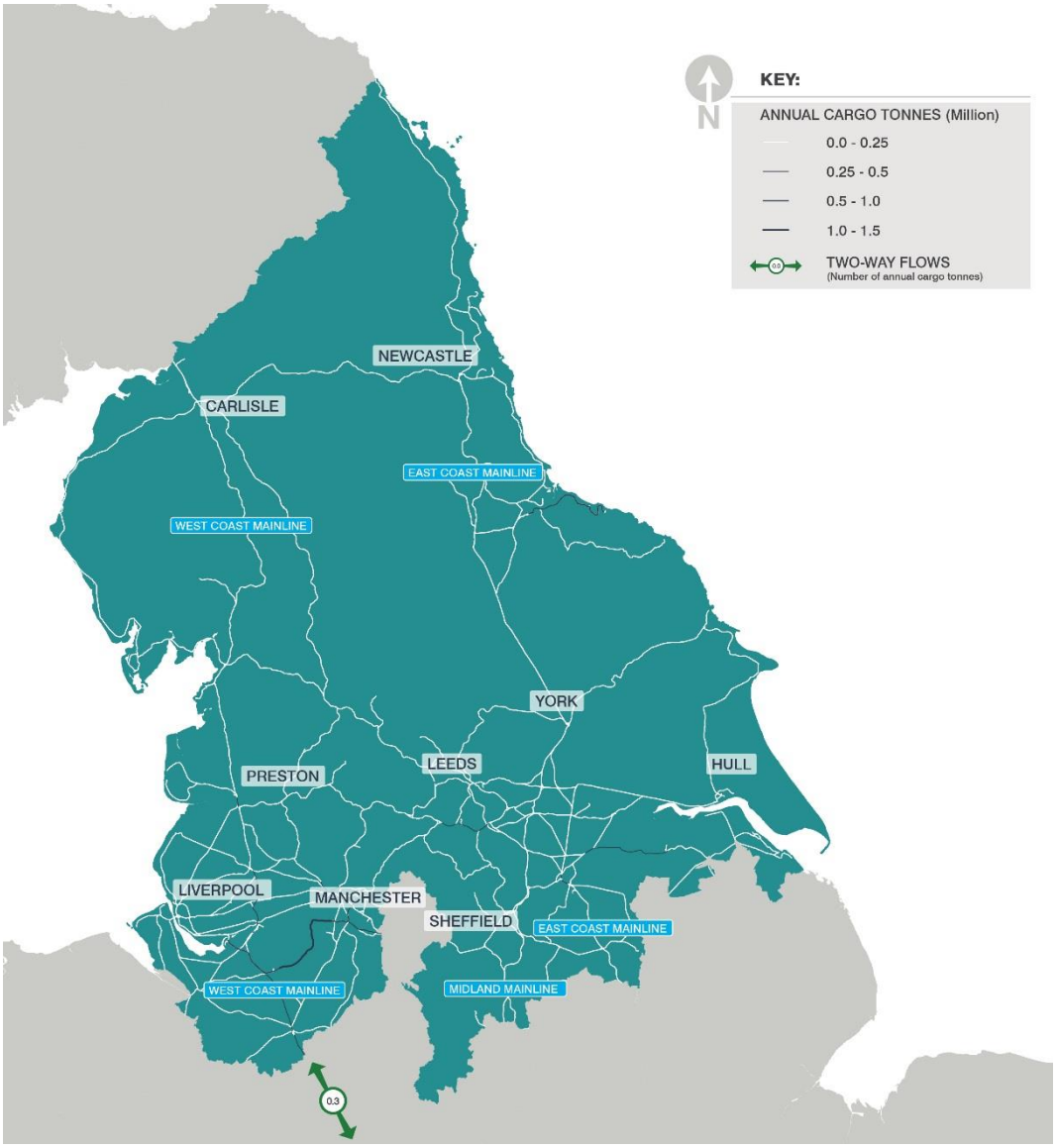


Figure 77 Rail Freight by Commodity - 2050 - Coal



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A2.8 Other

N
KEY:
ANNUAL CARGO TONNES (Million)
0.0 - 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
TWO-WAY FLOWS
(Number of annual cargo tonnes)
NEWCASTLE
CARLISLE
EAST COAST MAINLINE
WEST COAST MAINLINE
YORK
LEEDS
HULL
PRESTON
LIVERPOOL
MANCHESTER
SHEFFIELD
EAST COAST MAINLINE
WEST COAST MAINLINE
MIDLAND MAINLINE
0.3

Figure 78 Rail Freight by Commodity - 2016 – Other

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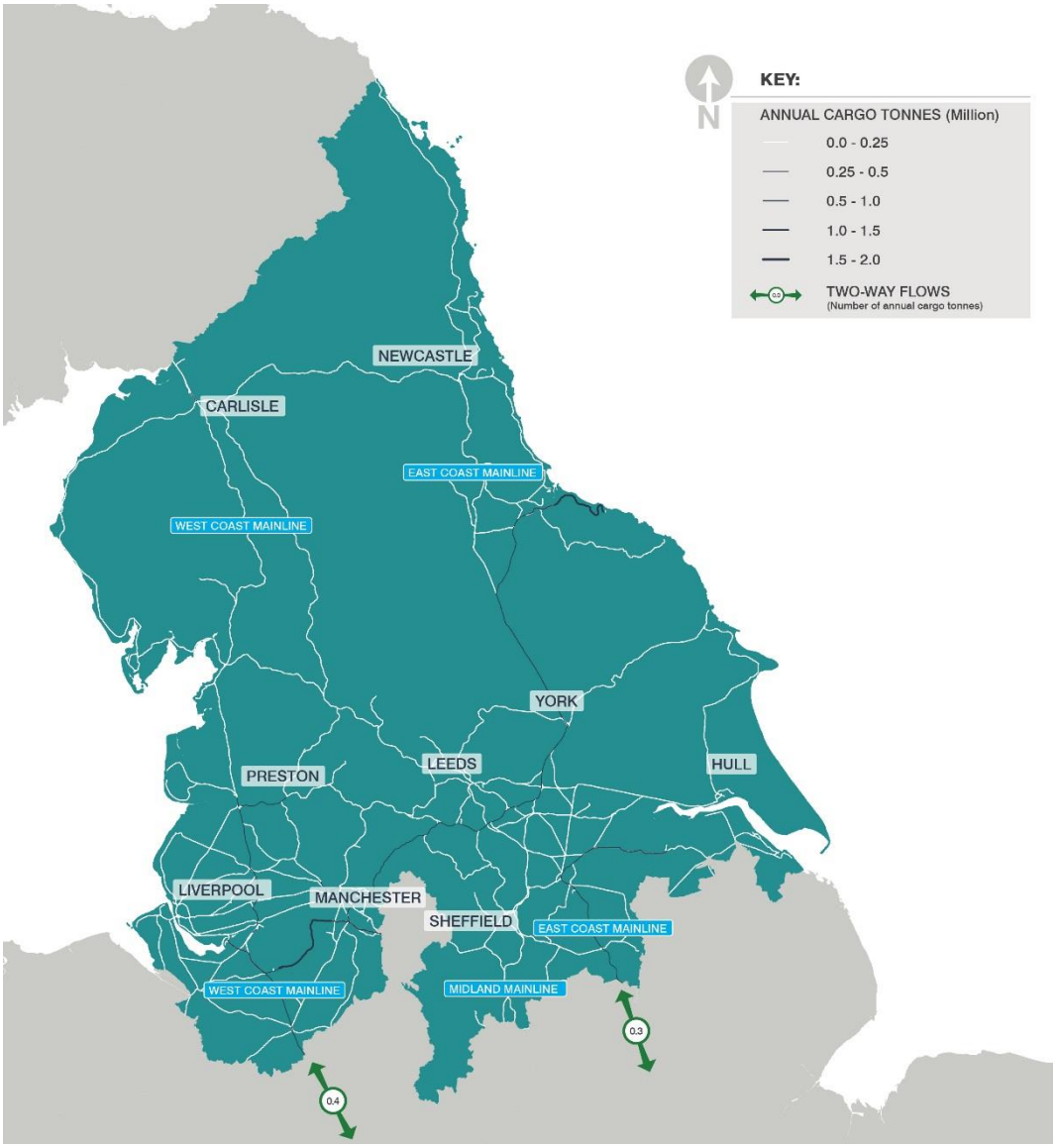

Figure 79 Rail Freight by Commodity - 2050 - Other

Appendix B

Freight Movements by Port Group

B1 Tyne and Wear Ports

The Tyne and Wear Ports group is made up of two major ports, namely the Port of Tyne and the Port of Sunderland. In addition, other ports are located at Berwick, Blyth and Seaham.

The imports via the Tyne and Wear Ports are shown on Figure 80. The majority of the cargo flows imported are from Central and Northern Europe. These are mainly heading for the North-East and Yorkshire and the Humber.

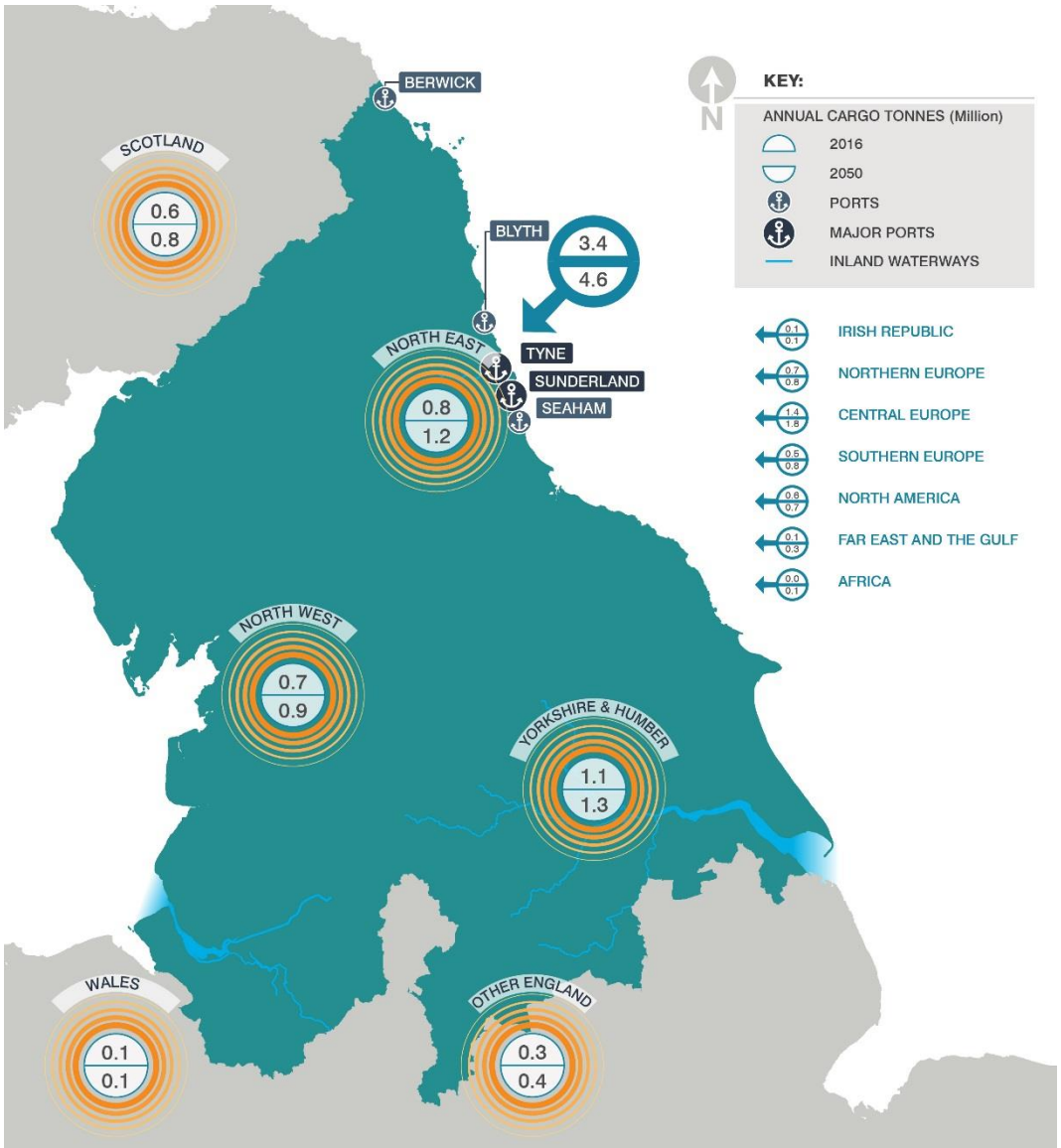

Figure 80 Tyne and Wear Ports – Imports

The freight exported via the Tyne and Wear ports is shown on Figure 81. The vast majority of this freight originates in the North-east and is headed for Central Europe.

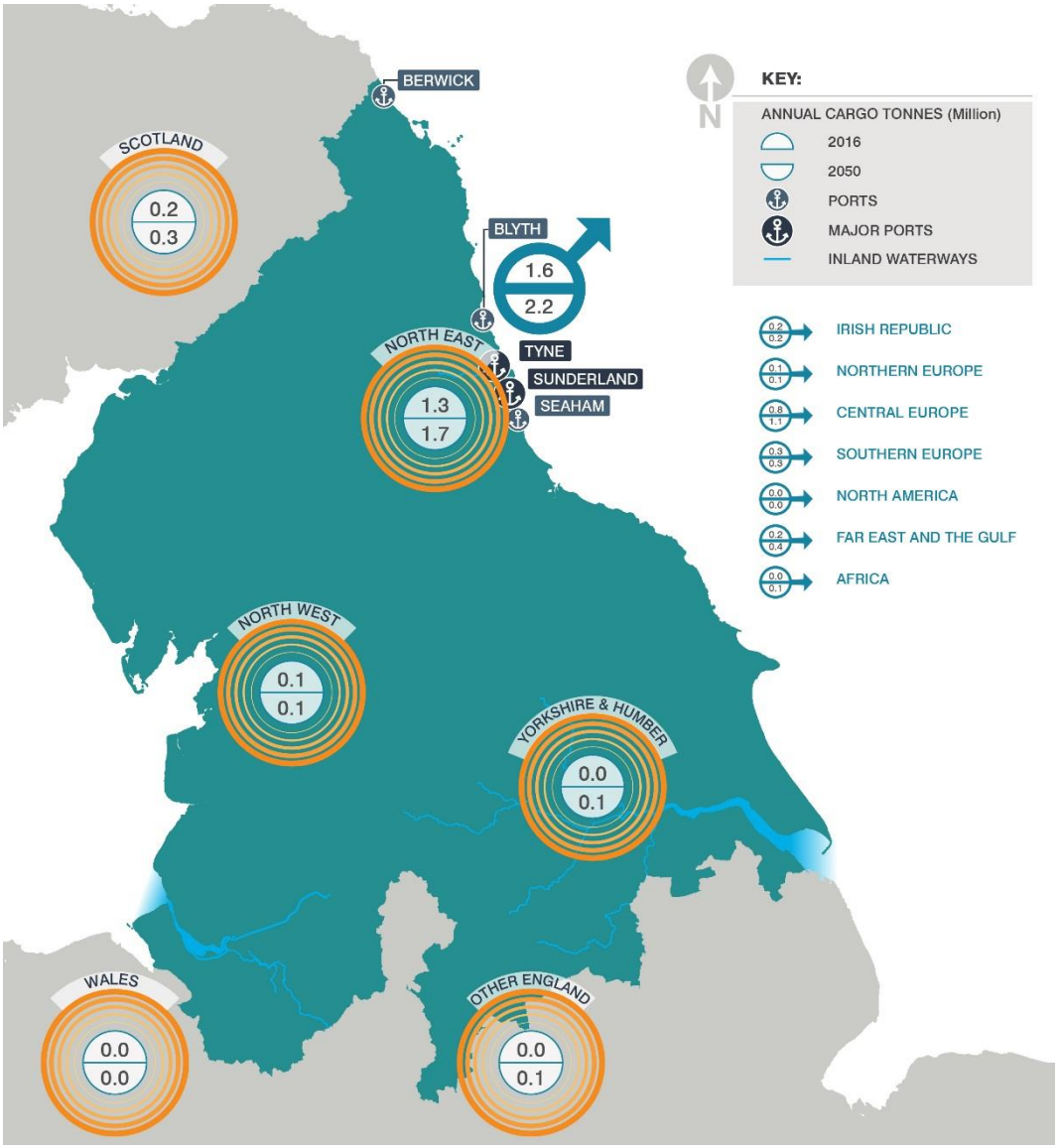

Figure 81 Tyne and Wear Ports - Exports

B2 Tees Ports

The Tees Ports group is made up of two major ports at Hartlepool and the Port of Tees.

The imports via the Tees Ports are shown on Figure 82 and illustrates that the majority of the freight originates in Northern and Central Europe, however there are also significant flows from Southern Europe. The majority of the freight imported through the Tees Ports is headed for Yorkshire and the Humber as well as the North-west. There are also significant flows to the North-east.

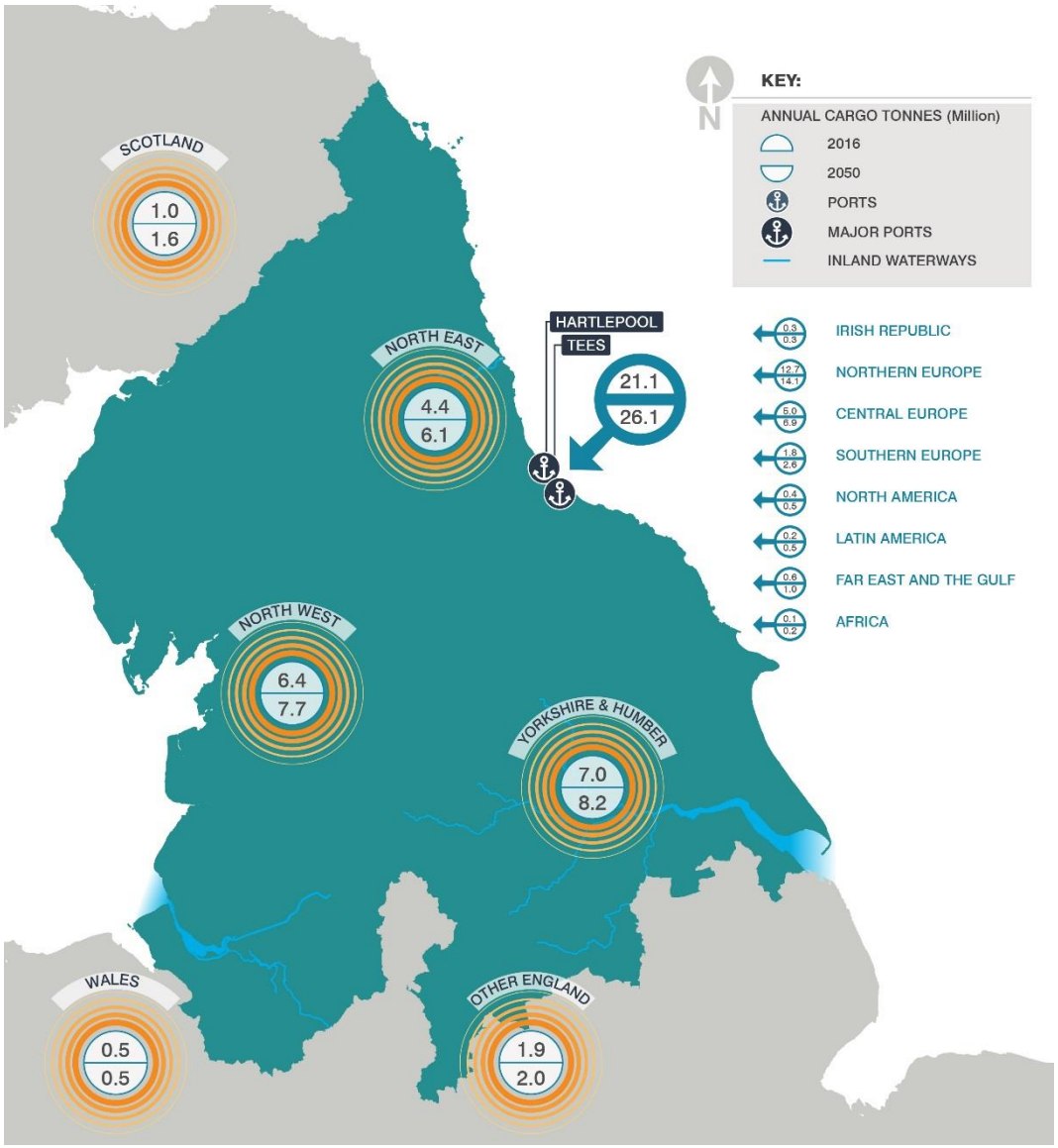

Figure 82 Tees Ports – Imports

Figure 83 illustrates the exports via the Tees Ports, the majority of which are headed for Central Europe within other significant flows to Southern Europe as well as North America and the Far East and the Gulf.

The majority of the exports shipped through the Tees originate in the North-east with other significant flows in Scotland, the North-west and Yorkshire and the Humber.

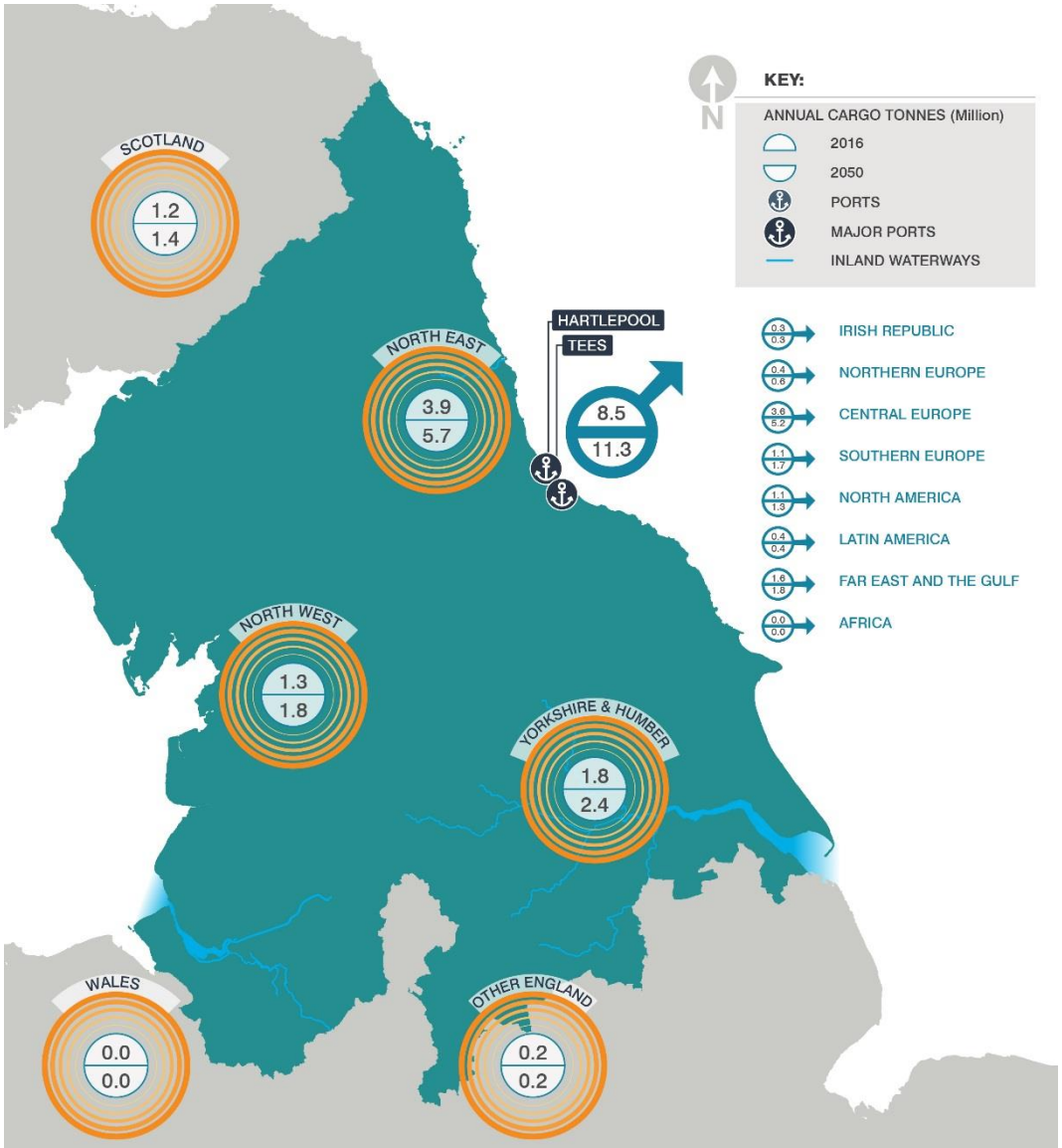

Figure 83 Tees Ports - Exports

B3 Humber Ports

The Humber Ports group is made up of three major ports on the Humber Estuary, namely the Ports of Hull, Port of Grimsby and Port of Immingham. Additional ports are found at the Humber River Wharves and Goole which is located on the Aire and Calder Canal.

Figure 84 illustrates the freight imported via the Humber and shows that the majority of the goods originate in Northern Europe. Significant other flows come from Central and Southern Europe, North America and Latin America.

Of the freight imported via the Humber, the majority is headed for the Yorkshire and Humber region however a significant proportion also heads to Southern England, out with the North completely as well as to the North-west.

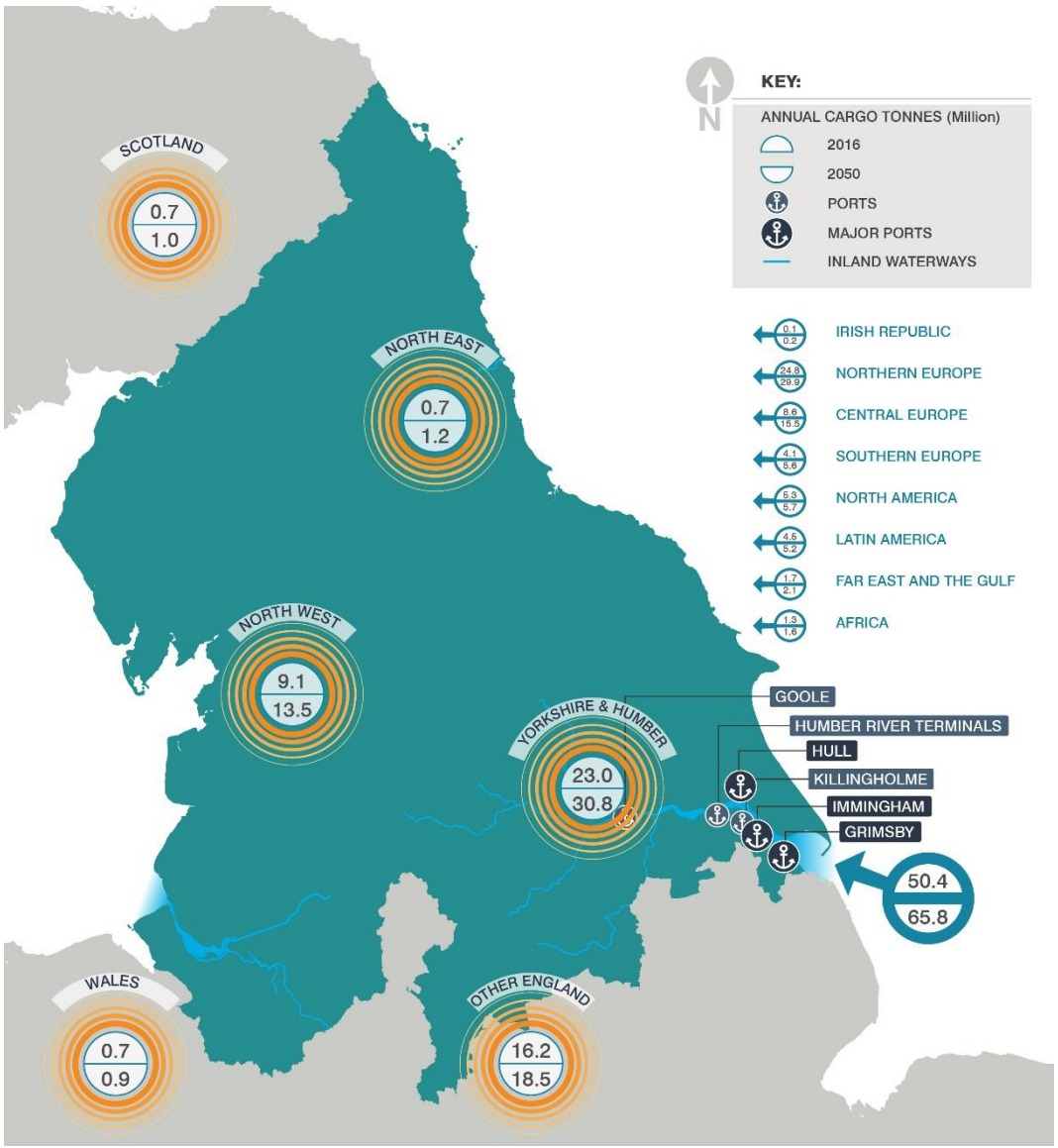

Figure 84 Humber Ports – Imports

The freight exported from the North via the Humber Ports is shown on Figure 85. The majority of the freight is exported to Central Europe with additional significant flows to Northern and Southern Europe as well as North America, the Irish Republic and Africa.

The majority of the export freight originates in the Yorkshire and Humber region however, significant flows also originate in the North-west as well as from Southern England.

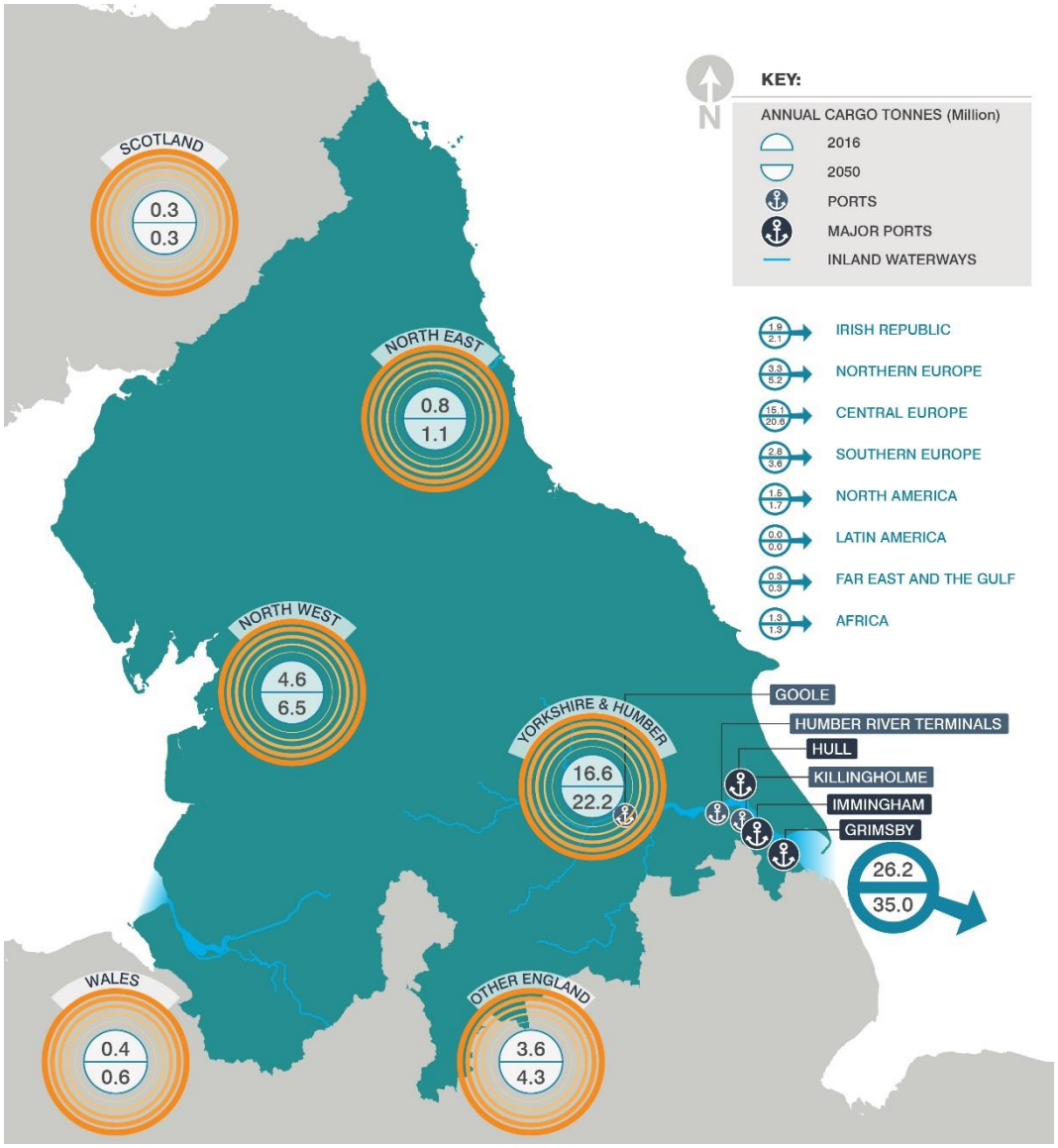

Figure 85 Humber Ports - Exports

B4 Mersey Ports

The Mersey Ports groups consists of three major ports, namely the Port of Liverpool, Port of Birkenhead and Port of Garston. There are also additional ports at Bromborough and on the Manchester Ship Canal accessed via the Mersey at Warrington and Salford.

Figure 86 illustrates the freight imported via the Mersey Ports, the majority of which originates in Northern Europe with significant additional flows from Central and Southern Europe, North America, and Latin America.

Most of the freight is destined for the North-west however there are other significant flows to the Yorkshire and Humber region as well as Southern England and Wales.

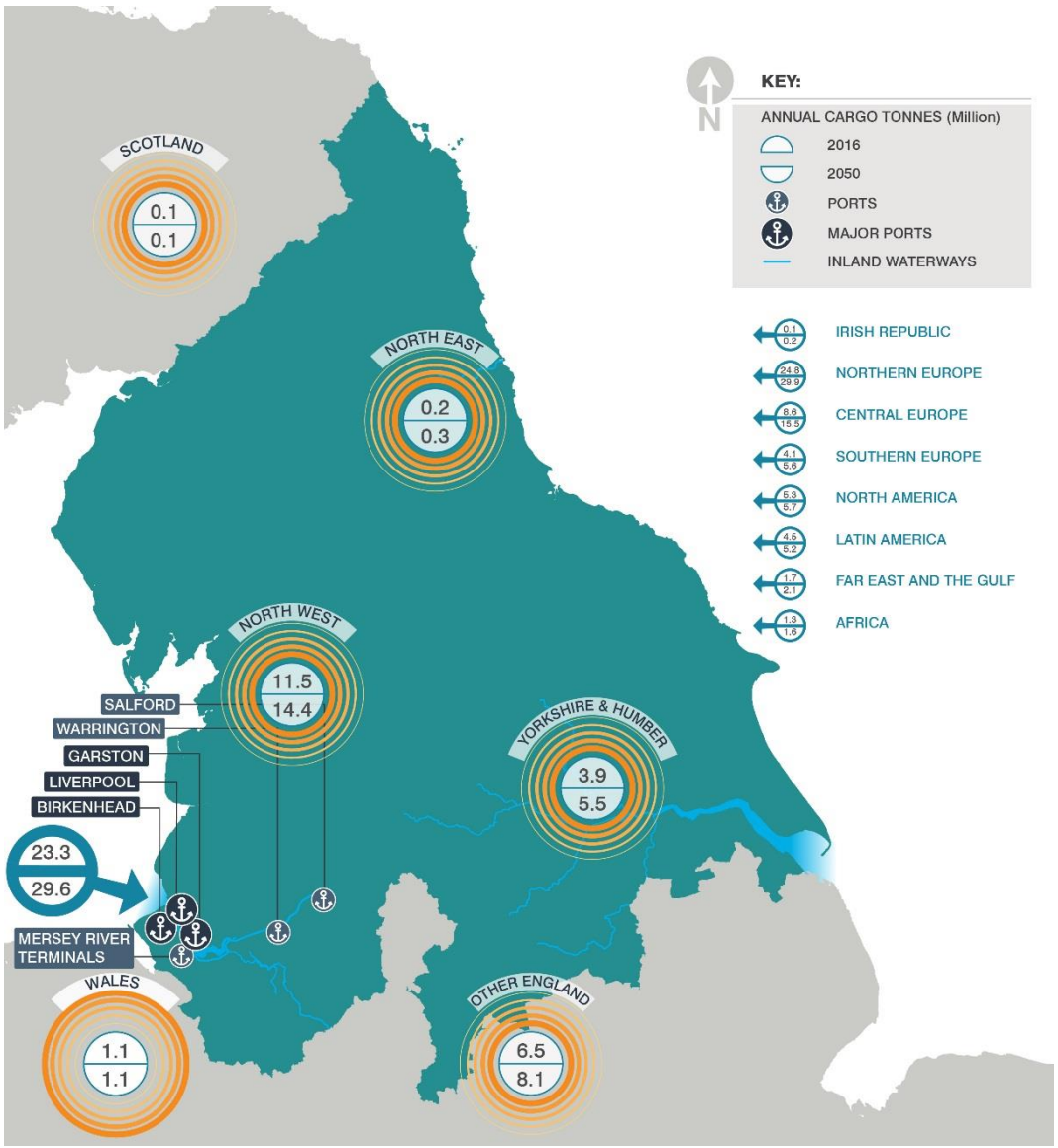

Figure 86 Mersey Ports – Imports

Figure 87 shows the freight exported via the Mersey Ports. This freight is mainly headed for Central Europe and the Irish Republic with significant other flows to Southern Europe.

Most of the freight originates in the North-west and Southern England however there are also significant flows from the Yorkshire and Humber region.

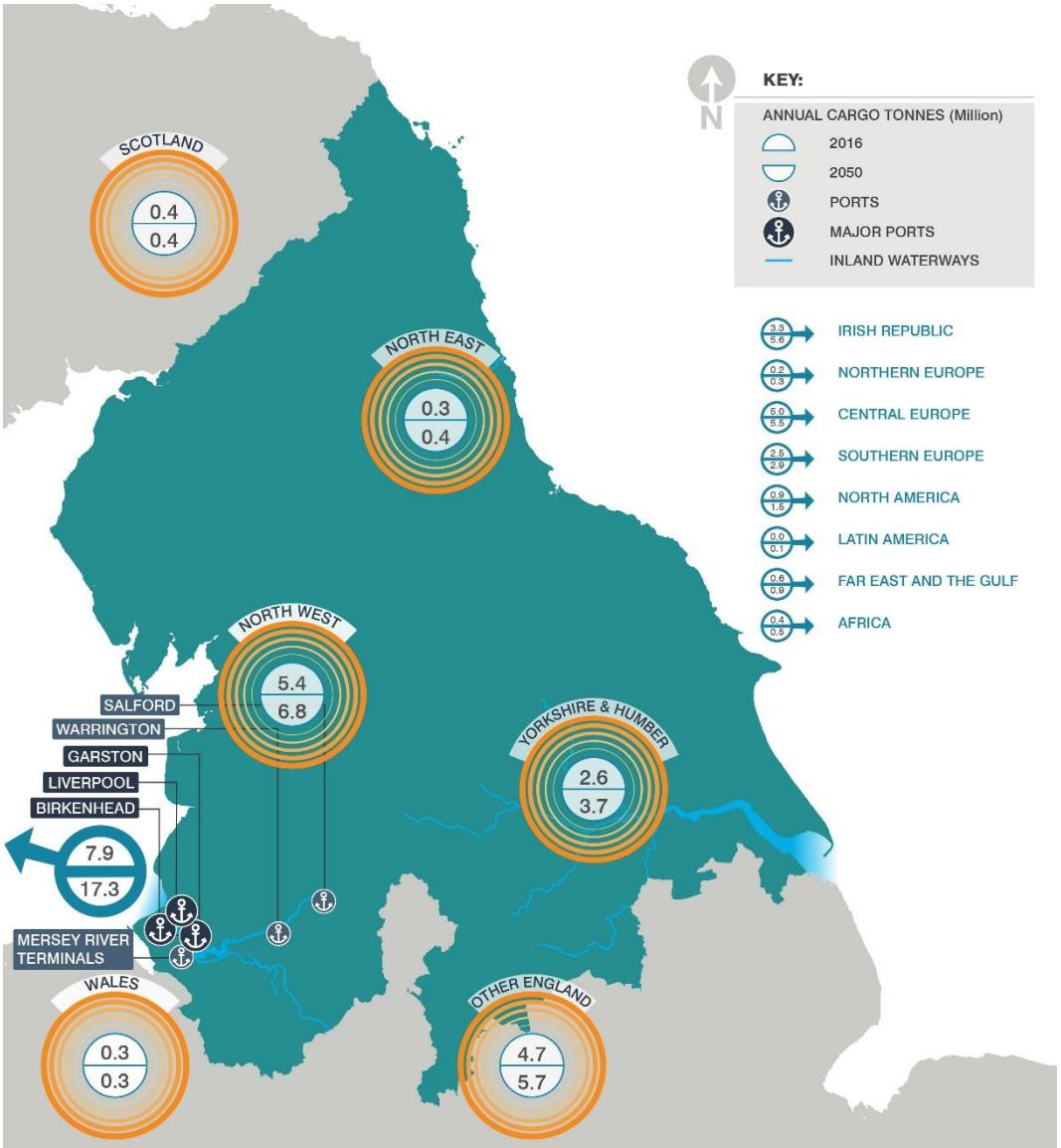

Figure 87 Mersey Ports - Exports

B5 Lancashire Ports

The Port of Heysham is the major port located within the Lancashire Ports group. Additional ports are located at Lancaster and Fleetwood.

Figure 88 illustrates that the volumes of freight imported via the Lancashire ports are less than the other Port groups with the exception of Cumbria. The majority of the freight is imported from the Irish Republic and is headed for the North-west and Scotland.

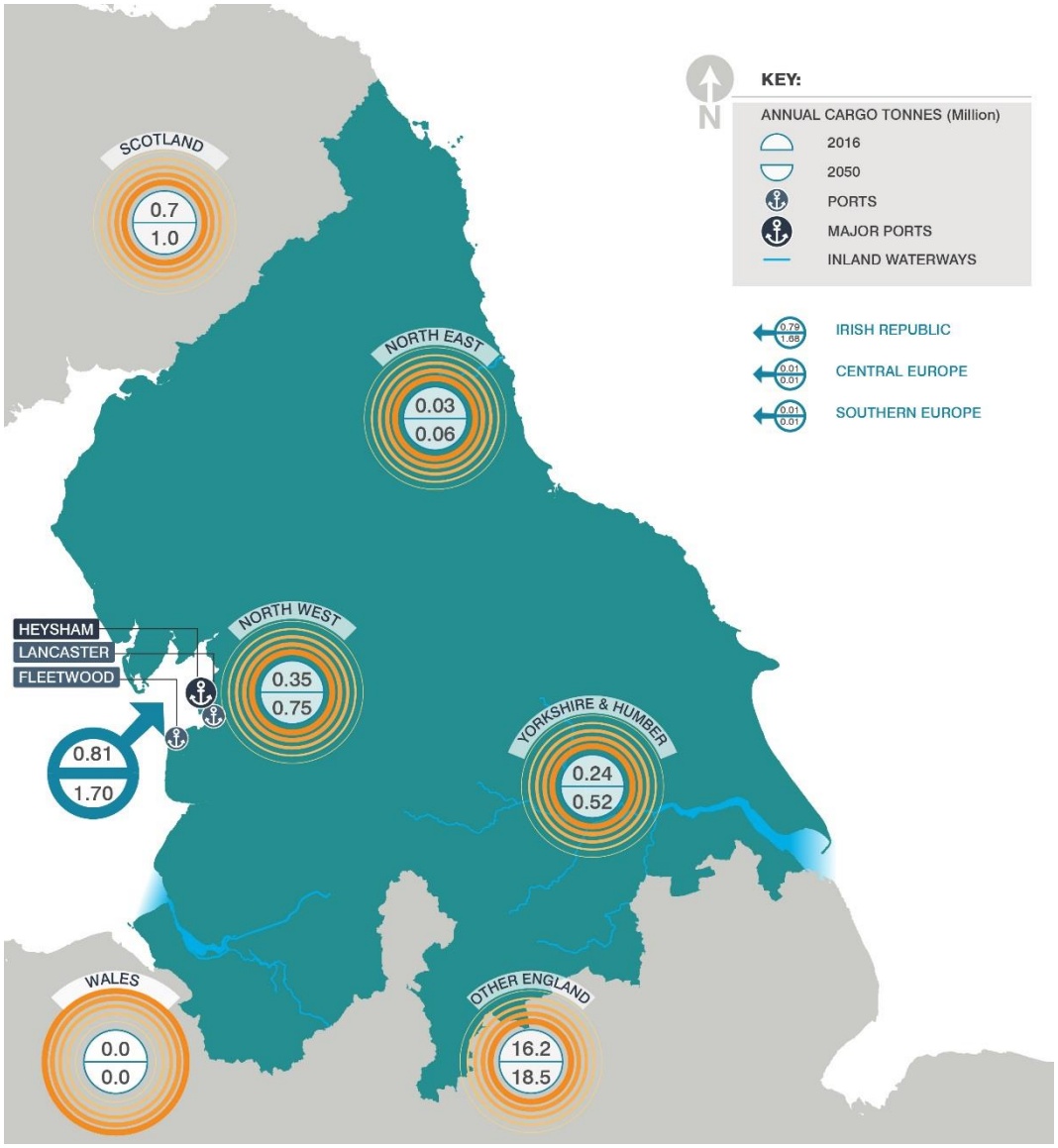

Figure 88 Lancashire Ports – Imports

Figure 89 illustrates the freight exported from the Lancashire ports, the majority of which is headed for the Irish Republic.

The majority of the freight exported originates in the North-west and Yorkshire and Humber region.

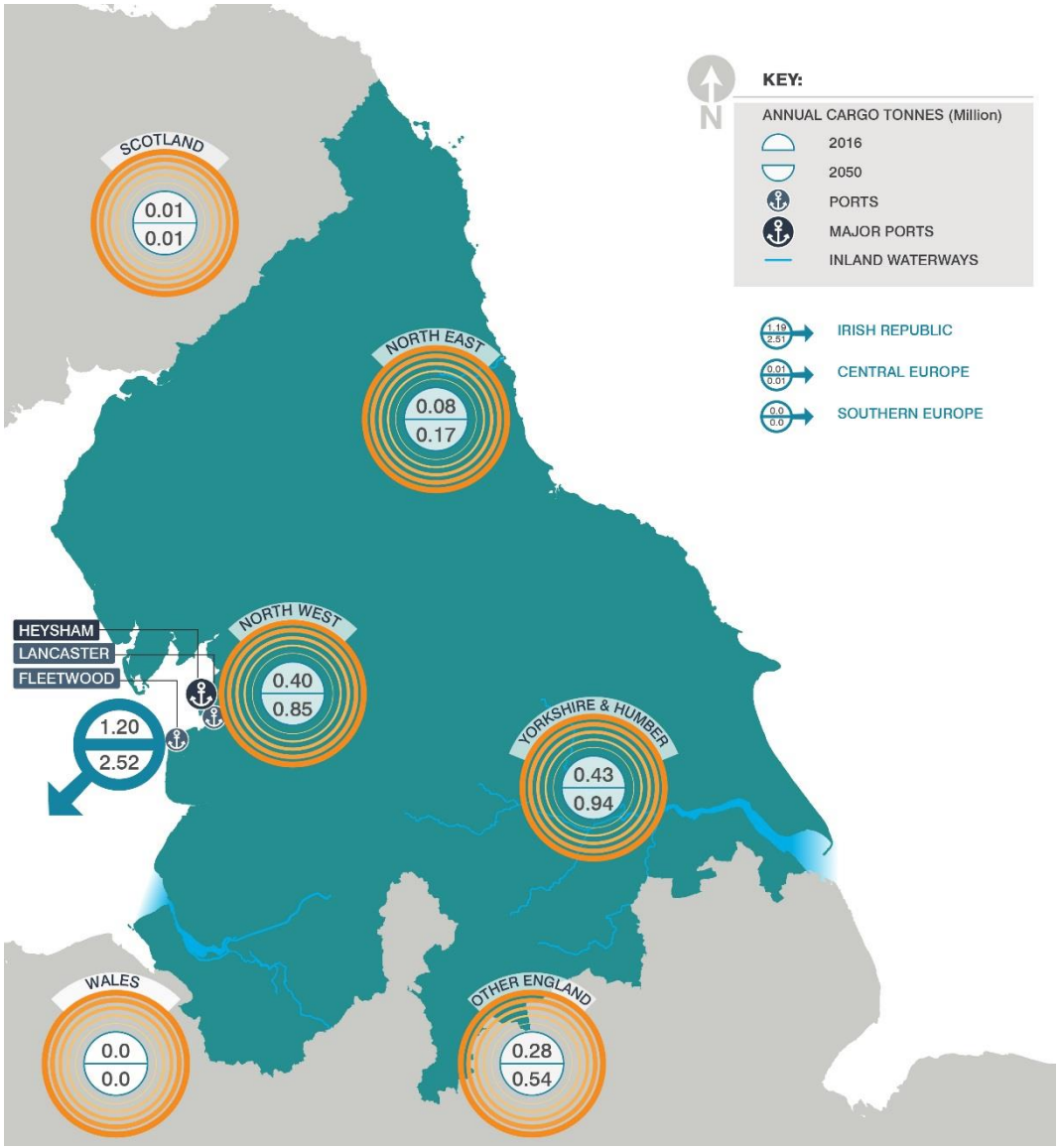

Figure 89 Lancashire Ports - Exports

B6 Cumbrian Ports

There are no major ports in the Cumbrian Ports group however there are three smaller ports located at Barrow-In-Furness, Silloth and Workington.

These ports mainly import from Africa, Southern Europe and Latin America but in small amounts in volume terms as shown on Figure 90.

The majority of the goods imported is destined for the North-west.

The Cumbrian Ports are only involved with the import of freight and as such no freight volumes are exported.

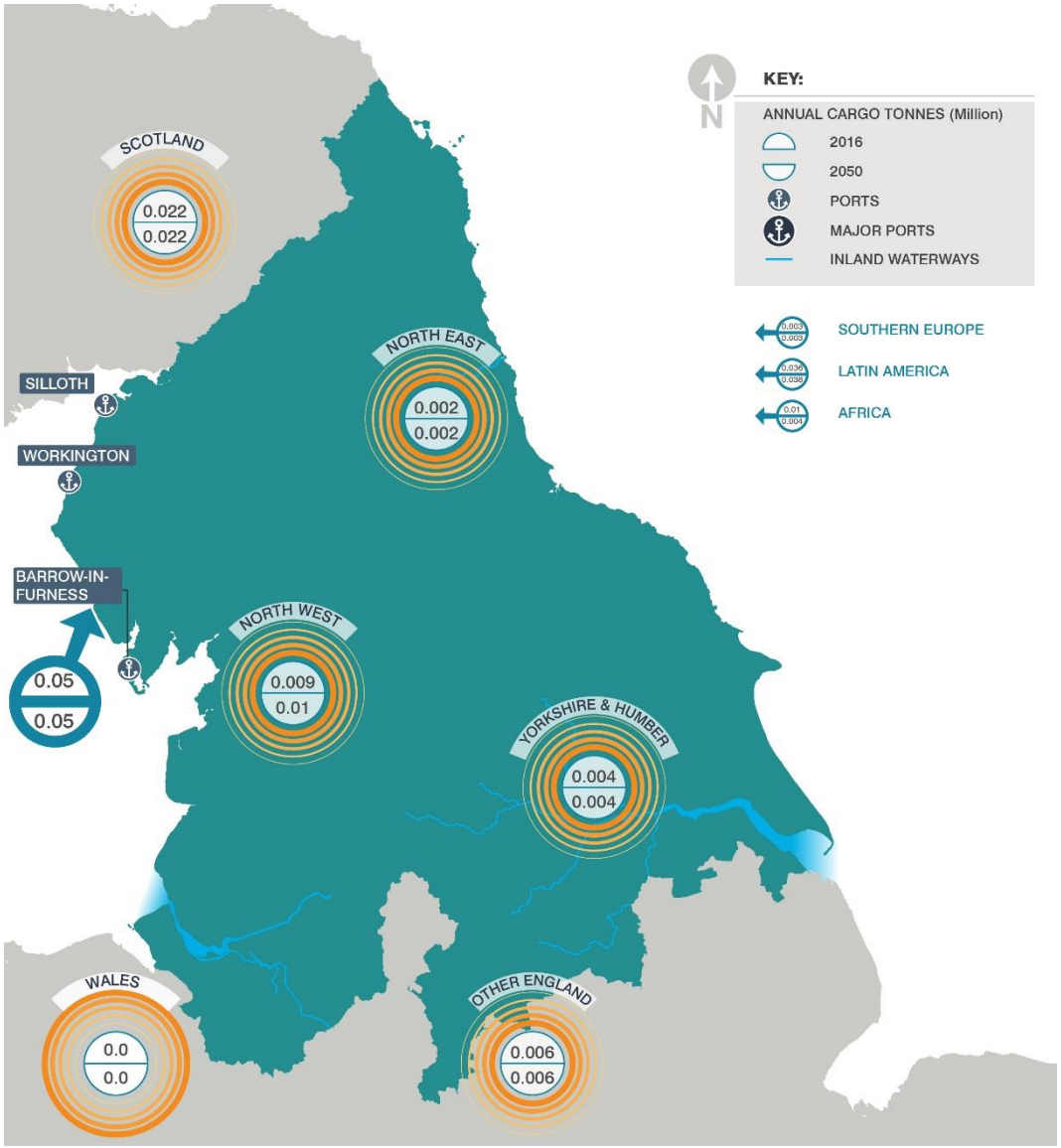

Figure 90 - Cumbrian Ports - Imports

Transport for the North
2nd Floor
4 Piccadilly Place
Manchester
M1 3BN

Transport for the North
Ground Floor
West Gate
Grace Street
Leeds
LS1 2RP

0161 244 0888

engagement@transportforthenorth.com

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Tourism chiefs plan to make 2019 a record year for Southend

8/4/2019 0 Comments

Record numbers of visitors are coming to Southend's shores and they are staying here for longer, the town's tourism leaders have heard.

Businesses, volunteers and council partners were told the welcome news at Southend's fourth Annual Tourism Conference, where representatives of Visit Essex also stated that Southend was experiencing an increase in overnight stays – the only borough in the county to do so.

The conference, held on Southend Pier last week, saw attendees sharing ideas for the upcoming season and reviewing the town's progress against its ambitious tourism strategy, *Destination Southend-on-Sea,* which aims to propel the town to being "England's number one coastal destination."

Delivering excellent customer service was a key theme of the conference, following on from the 'Make Southend Sparkle' campaign, which sees residents and businesses join forces to spruce up the borough's streets with litter picks, beach cleans and planting.

Place branding and developing better communications were also key themes that delegates were keen to highlight.

Scott Dolling, Director of Culture, Tourism and Property, said: "News that more people are visiting Southend and that they are staying longer is a real boon for the town and shows that businesses, volunteers and the council are working well together to deliver against our ambitious tourism strategy.

"That this news comes before the Easter Holidays – which typically sees the year's first large surge of visitors and will this year welcome the Southend Shakedown Resurrection – is especially welcome.

"This conference, now in its fourth year, helps bring like-minded, positive businesses and organisations together to see how we can work better together for the benefit of the town and its economy.

Jacqui Dallimore, chair of the Southend Tourism Partnership, said: "Southend welcomes 7.5 million visitors a year, with tourism supporting 9,500 people through direct employment and bringing £440m into the local economy. It's vital that Southend's visitor offer continues to grow and evolve and the Annual Tourism Conference is crucial in setting the tone and establishing the priorities for the visitor season ahead."

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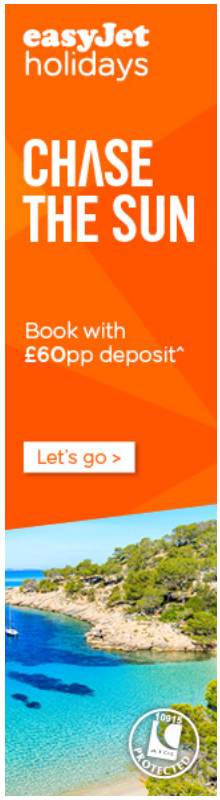

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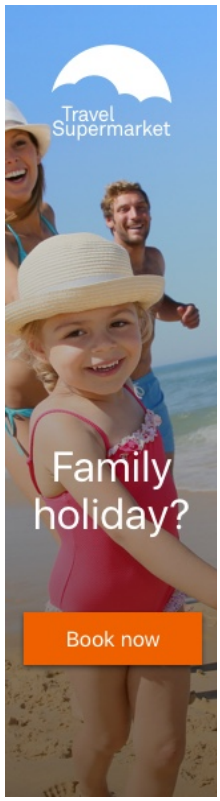

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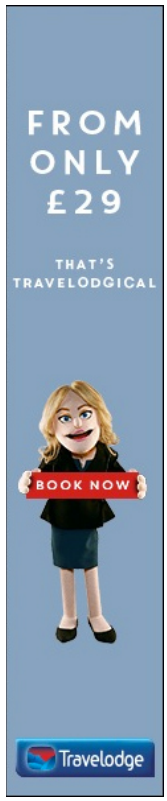

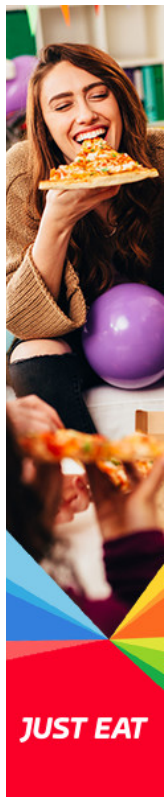

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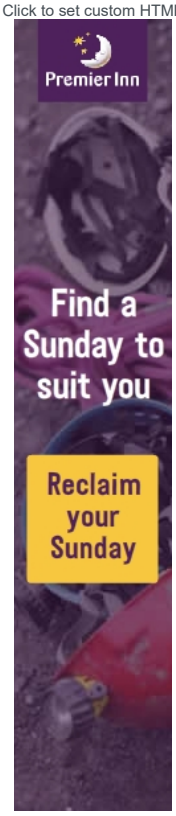

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Visit Kent

VISIT KENT GARDEN of ENGLAND

Economic Impact of Tourism

Thanet - 2017 Results

November 2018

Produced by:

Destination Research
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Introduction

This report examines the volume and value of tourism and the impact of visitor expenditure on the local economy in 2017 and provides comparative data against the previously published data for Kent (2015).

Destination Research was commissioned by Visit Kent to produce 2017 results based on the latest data from national tourism surveys and regionally/locally based data. The results are derived using the Cambridge Economic Impact Model.

In its basic form, the model distributes regional activity as measured in national surveys to local areas using 'drivers' such as the accommodation stock and occupancy which influence the distribution of tourism activity at local level. Whenever possible, results have been enhanced by building in additional local-level data gathered by the district (e.g. local attractions data, boat moorings, language schools in the area, accommodation stock, etc.). See Appendix I for further details.

Contextual analysis

Domestic tourism

In 2017, British residents took 100.6 million overnight trips in England, totalling 299 million nights away from home, with an expenditure of £19.05 billion. £189.31 was spent per trip, and with an average trip length of 2.97 nights, the average spend per night was £63.62. The number of domestic trips was 2% up on 2015, and the amount spent was also up by 2%.

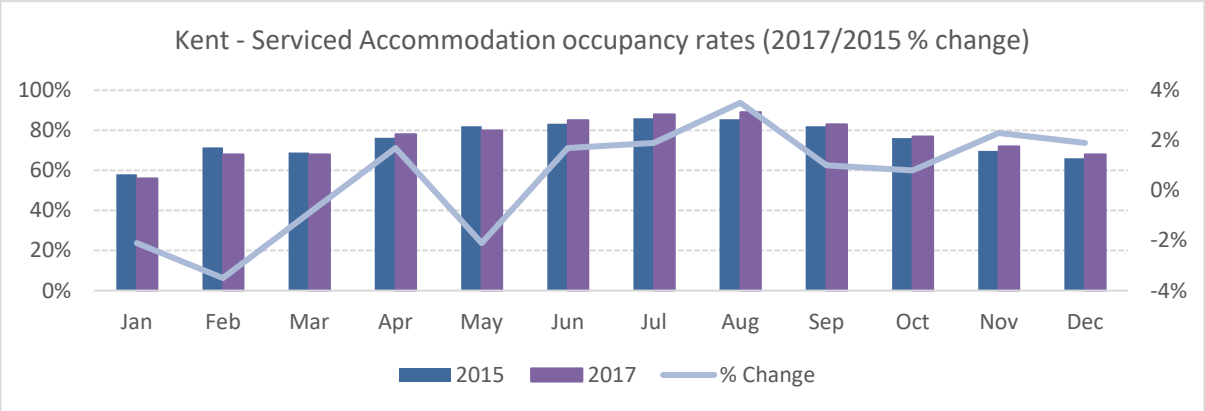
The South East region experienced a 1% increase in overnight trips between 2015 and 2017. Bednights were up 2% on 2015 and expenditure was up by 3%. The region received slightly more visitors in 2017 than in 2015 and visitors spent slightly more per night than in 2015. The average spend per night was up from £56.53 per night in 2015 to £59.01 in 2017.

Domestic visits to Kent

The domestic tourism results for Kent used in this model combine a mixture of supply and demand data. We do this because extracting county level data from national surveys can sometimes lead to inaccurate results due to low sample sizes. According to the GB Tourism Survey (demand side), Kent experienced a 1% decrease in the volume of trips between 2015 and 2017. Nights were down 2% and expenditure was also down by 1%.

In 2017, serviced accommodation providers saw an average occupancy of 76%, compared to the 75.5% witnessed in 2015, an increase of 0.5%. By combining the supply and demand results we estimate that trips to Kent were down by a marginal rate of 0.3%, nights per trip were up by 1.9% and expenditure increased by 2.9%.

Please note that the Cambridge Model uses three year rolling averages to reduce some of the more extreme fluctuations which are due to small sample sizes and high margins or error.



Visits from overseas

As with domestic tourism, the Cambridge Model uses three year averages to estimate changes in overseas tourism to reduce some of the more extreme fluctuations which can be attributed to small sample sizes and high margins or error. At national level, the number of visits in 2017 grew by 10% reaching 33 million. The number of visitor nights spent in the UK increased by 7% between 2015 and 2017 to reach 245.7 million, with the average number of nights per visit standing at 7.4.

Overseas trips to the South England region were 9% up on 2015 to reach 5.2 million overnight trips. The total number of nights was up by 8% to reach 37.4 million in 2017. Spend was unchanged from the levels achieved in 2015.

Kent also experienced growth between 2015 and 2017. Trips were up 4%, nights per trip went up 11% and expenditure was also up by 4%.

The International Passenger Survey (IPS) is conducted by Office for National Statistics and is based on face- to-face interviews with a sample of passengers travelling via the principal airports, sea routes and the Channel Tunnel, together with visitors crossing the land border into Northern Ireland. The number of interviews conducted in England in 2017 was around 35,628.

Day visitors

During 2017, GB residents took a total of 1.5 billion tourism day trip to destinations in England. Around £51 billion was spent during these trips. At national level, the volume of day trips was down by 1% and the expenditure levels were unchanged between 2015 and 2017.

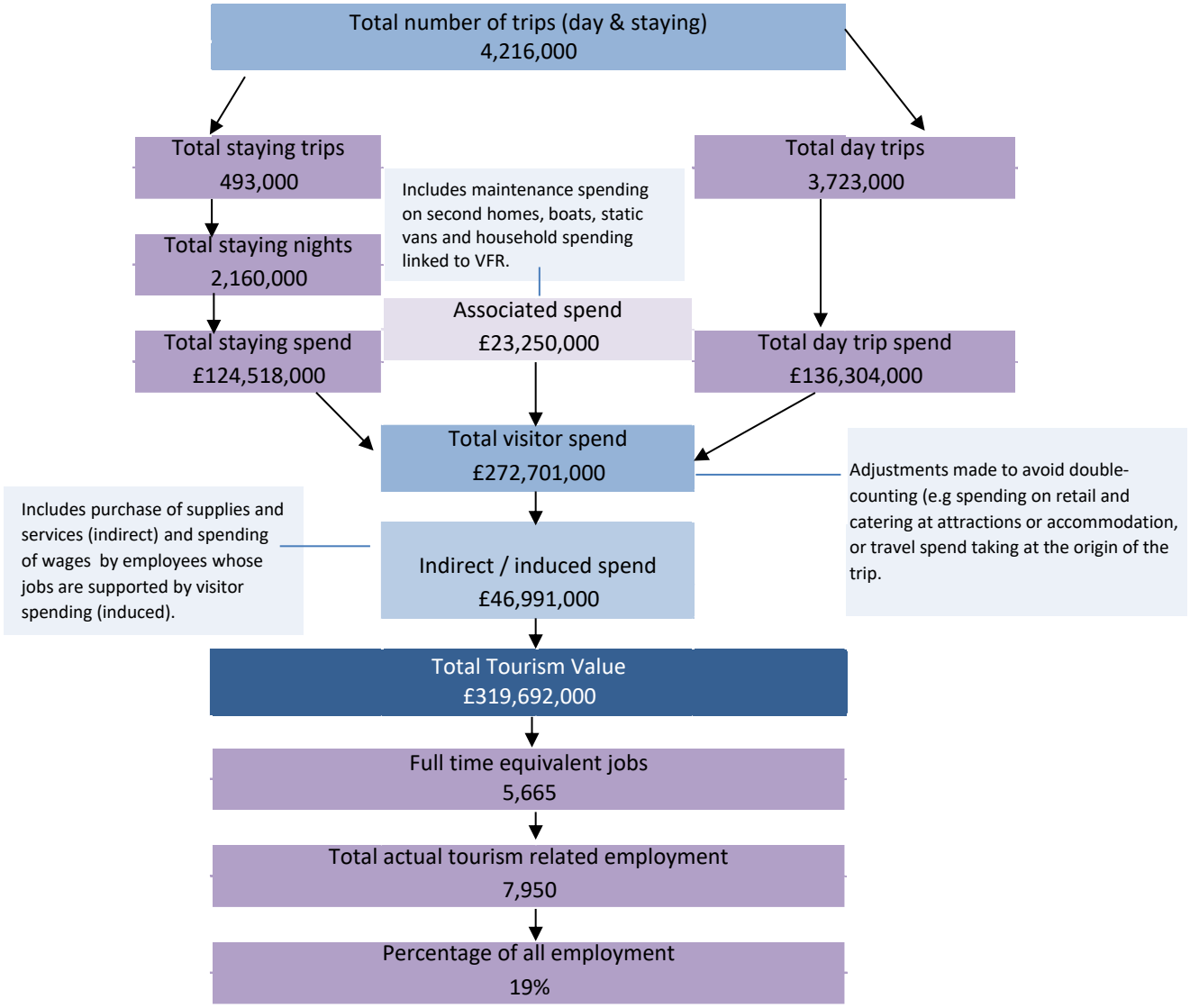
The volume and value of tourism day visits in the South East of England increased by 4% between 2015 and 2017, from 221 million to 230 million. Expenditure levels were up by 5% to £7.4 billion in 2017.

The results for Kent are based on a combination of results from the GB Day Visitor Survey, admissions data from the Visits to Visitor Attractions Survey, the ALVA (Association of Leading Visitor Attractions) Survey and attractions visitor numbers from the Visit Kent Business Barometer.

The GB Day Visitor Survey shows a 15% increase in volume of trips to Kent between 2015 and 2017 and a 20% increase in value for the same period. However, data from the Visits to Visitor Attractions Survey looking at attractions based in Kent shows that the admissions to attractions were up by 5% between 2015 and 2017 and admission charges were also up by 5%. Results from the Visit Kent Business Barometer report an increase of 4% in visitor numbers for the same period.

Based on these results the model assumes that the volume of day trips was up 8% between 2015 and 2017 and expenditure up by 9%.

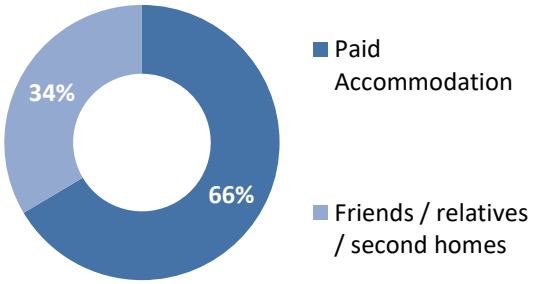
Economic Impact of Tourism – Headline Figures Thanet - 2017 Results



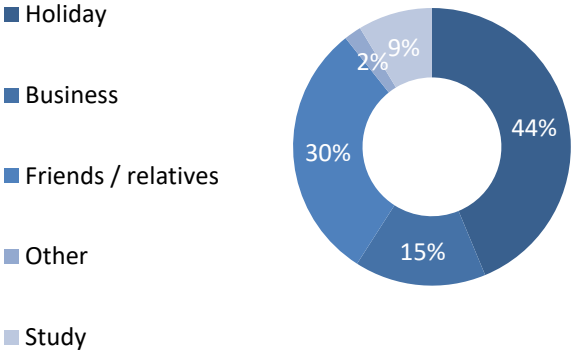
Economic Impact of Tourism – Year on year comparisons		Thanet	
Day Trips	**2015**	**2017**	**Annual variation**
Day trips Volume	3,386,900	3,723,000	9.9%
Day trips Value	£119,391,494	£136,304,000	14.2%
Overnight trips			
Number of trips	494,000	493,000	-0.2%
Number of nights	2,059,000	2,160,000	4.9%
Trip value	£122,087,000	£124,518,000	2.0%
Total Value	£292,877,400	£319,692,000	9.2%
Actual Jobs	7,312	7,950	8.7%

Thanet	2015	2017	Variation
Average length stay (nights x trip)	4.17	4.38	5.1%
Spend x overnight trip	£ 247.14	£ 252.57	2.2%
Spend x night	£ 59.29	£ 57.65	-2.8%
Spend x day trip	£ 35.25	£ 36.61	3.9%

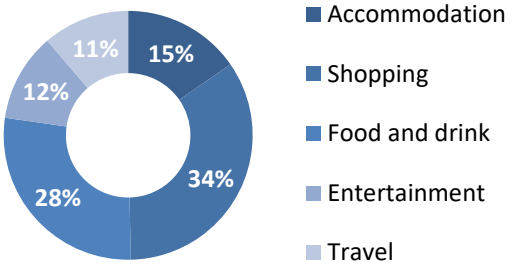
Trips by type of accommodation



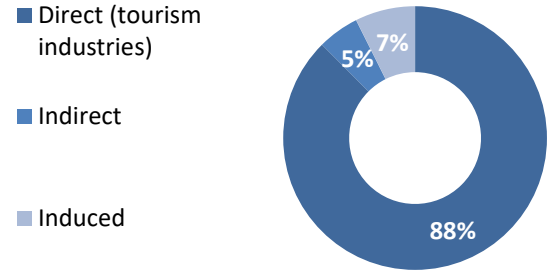
Trips by Purpose



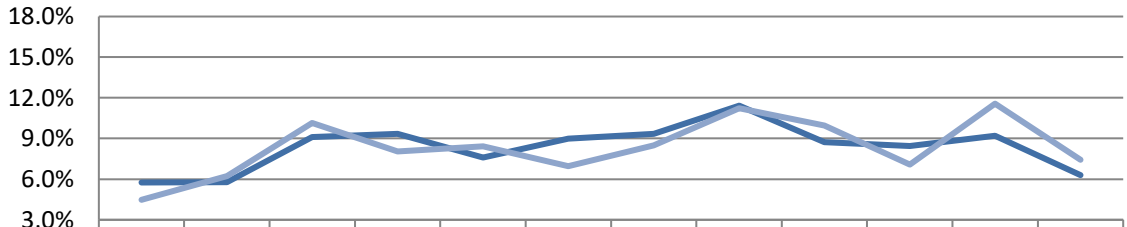
Breakdown of expenditure



Type of employment

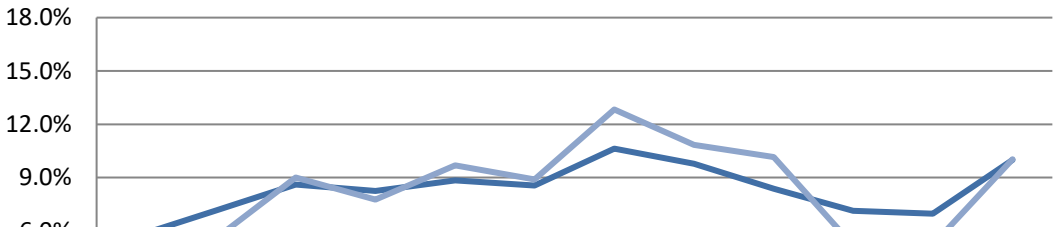


Seasonality - Day visitors (County level)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Day trips	5.8%	5.8%	9.1%	9.3%	7.6%	9.0%	9.3%	11.4%	8.7%	8.5%	9.2%	6.3%
Day spend	4.5%	6.2%	10.2%	8.0%	8.4%	7.0%	8.5%	11.2%	9.9%	7.1%	11.6%	7.4%

Seasonality - Overnight visitors (County level)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Overnight trips	5.7%	7.2%	8.6%	8.3%	8.8%	8.6%	10.6%	9.8%	8.4%	7.1%	7.0%	10.0%
Overnight spend	4.8%	5.6%	9.0%	7.8%	9.7%	8.9%	12.8%	10.8%	10.2%	5.2%	5.2%	10.0%

Volume of Tourism

Staying visits in the county context

Thanet - 2017 Results

Staying trips in the county context	Domestic trips ('000)	Overseas trips ('000)
Ashford	281	110
Canterbury	461	186
Dartford	135	46
Dover	336	86
Gravesham	149	40
Maidstone	288	83
Medway	423	101
Sevenoaks	168	63
Folkestone & Hythe	395	75
Swale	355	43
Thanet	345	148
Tonbridge&Malling	193	49
Tunbridge Wells	246	65
Kent	**3,775**	**1,095**

Staying nights in the county contex	Domestic nights ('000)	Overseas nights ('000)
Ashford	753	504
Canterbury	1,411	1,322
Dartford	386	239
Dover	952	487
Gravesham	389	243
Maidstone	746	525
Medway	1,251	686
Sevenoaks	434	353
Folkestone & Hythe	991	434
Swale	1,244	324
Thanet	1,040	1,120
Tonbridge&Malling	553	300
Tunbridge Wells	748	446
Kent	**10,898**	**6,983**

Expenditure in the county context	Domestic spend (millions)	Overseas spend (millions)
Ashford	£44	£29
Canterbury	£76	£73
Dartford	£19	£12
Dover	£63	£26
Gravesham	£16	£10
Maidstone	£38	£28
Medway	£60	£30
Sevenoaks	£23	£18
Folkestone & Hythe	£62	£20
Swale	£45	£12
Thanet	£54	£70
Tonbridge&Malling	£26	£13
Tunbridge Wells	£41	£21
Kent	**£568**	**£361**

Staying Visitors - Accommodation Type Thanet - 2017 Results

Trips by Accommodation

	UK		Overseas		Total	
Serviced	132,000	38%	73,000	50%	205,000	42%
Self catering	16,000	5%	11,000	7%	27,000	5%
Camping	23,000	7%	5,000	4%	28,000	6%
Static caravans	35,000	10%	0	0%	35,000	7%
Group/campus	2,000	1%	9,000	6%	11,000	2%
Paying guest	0	0%	0	0%	0	0%
Second homes	8,000	2%	1,000	1%	9,000	2%
Boat moorings	6,000	2%	0	0%	6,000	1%
Other	3,000	1%	12,000	8%	15,000	3%
Friends & relatives	120,000	34%	36,000	24%	156,000	32%
Total 2017	**345,000**		**148,000**		**493,000**	
Comparison 2015	**351,000**		**143,000**		**494,000**	
Difference	**-2%**		**3%**		**0%**	

Nights by Accommodation

	UK		Overseas		Total	
Serviced	302,000	29%	328,000	29%	630,000	29%
Self catering	85,000	8%	86,000	8%	171,000	8%
Camping	86,000	8%	44,000	4%	130,000	6%
Static caravans	156,000	15%	0	0%	156,000	7%
Group/campus	8,000	1%	84,000	8%	92,000	4%
Paying guest	0	0%	0	0%	0	0%
Second homes	27,000	3%	2,000	0%	29,000	1%
Boat moorings	28,000	3%	0	0%	28,000	1%
Other	9,000	1%	37,000	3%	46,000	2%
Friends & relatives	339,000	33%	539,000	48%	878,000	42%
Total 2017	**1,040,000**		**1,120,000**		**2,160,000**	
Comparison 2015	**993,000**		**1,066,000**		**2,059,000**	
Difference	**5%**		**5%**		**5%**	

Spend by Accommodation Type

	UK		Overseas		Total	
Serviced	£31,328,000	58%	£39,229,000	56%	£70,557,000	57%
Self catering	£4,356,000	8%	£3,563,000	5%	£7,919,000	6%
Camping	£2,191,000	4%	£1,947,000	3%	£4,138,000	3%
Static caravans	£4,097,000	8%	£0	0%	£4,097,000	3%
Group/campus	£82,000	0%	£5,012,000	7%	£5,094,000	4%
Paying guest	£0	0%	£0	0%	£0	0%
Second homes	£483,000	1%	£98,000	0%	£581,000	0%
Boat moorings	£500,000	1%	£0	0%	£500,000	0%
Other	£497,000	1%	£749,000	1%	£1,246,000	1%
Friends & relatives	£10,588,000	19%	£19,798,000	28%	£30,386,000	25%
Total 2017	**£54,122,000**		**£70,396,000**		**£124,518,000**	
Comparison 2015	**£54,237,000**		**£67,850,000**		**£122,087,000**	
Difference	**0%**		**4%**		**2%**	

Serviced accommodation includes hotels, guesthouses, inns, B&B and serviced farmhouse accommodation. Paying guest refers to overseas visitors staying in private houses, primarily language school students. Other trips includes nights spent in transit, in lorry cabs and other temporary accommodation.

Staying Visitors - Purpose of Trip

Thanet - 2017 Results

Trips by Purpose

		UK		Overseas		Total	
Holiday		167,000	48%	47,000	32%	214,000	44%
Business		48,000	14%	28,000	18%	76,000	15%
Friends & relatives		124,000	36%	26,000	18%	150,000	30%
Other		6,000	2%	4,000	3%	10,000	2%
Study		0	0%	43,000	29%	43,000	9%
Total	**2017**	**345,000**		**148,000**		**493,000**	
Comparison	**2015**	**351,000**		**143,000**		**494,000**	
Difference		**-2%**		**3%**		**0%**	

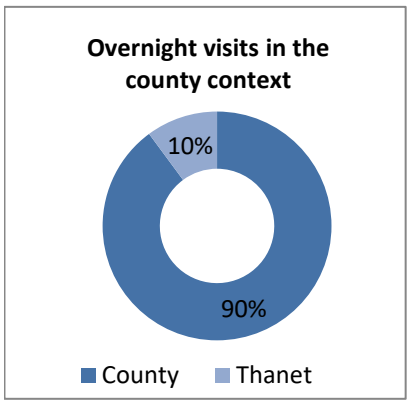
Nights by Purpose

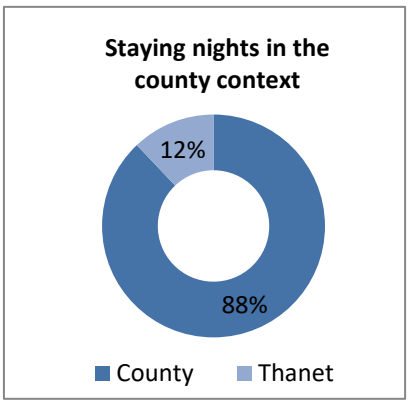
		UK		Overseas		Total	
Holiday		601,000	58%	244,000	22%	845,000	39%
Business		164,000	16%	72,000	6%	236,000	11%
Friends & relatives		258,000	25%	226,000	20%	484,000	23%
Other		17,000	2%	27,000	2%	44,000	2%
Study		0	0%	551,000	49%	551,000	26%
Total	**2017**	**1,040,000**		**1,120,000**		**2,160,000**	
Comparison	**2015**	**993,000**		**1,066,000**		**2,059,000**	
Difference		**5%**		**5%**		**5%**	

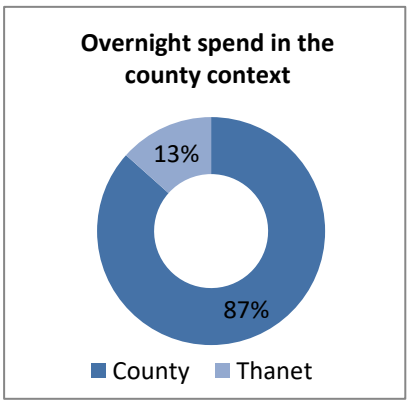
Spend by Purpose

		UK		Overseas		Total	
Holiday		£28,143,000	52%	£17,211,000	25%	£45,354,000	36%
Business		£16,237,000	30%	£5,040,000	7%	£21,277,000	17%
Friends & relatives		£9,201,000	17%	£6,953,000	10%	£16,154,000	13%
Other		£541,000	1%	£2,265,000	3%	£2,806,000	2%
Study		£0	0%	£38,927,000	55%	£38,927,000	31%
Total	**2017**	**£54,122,000**		**£70,396,000**		**£124,518,000**	
Comparison	**2015**	**£54,237,000**		**£67,850,000**		**£122,087,000**	
Difference		**0%**		**4%**		**2%**	

Proportion of staying visits in the county context







Day Visitors

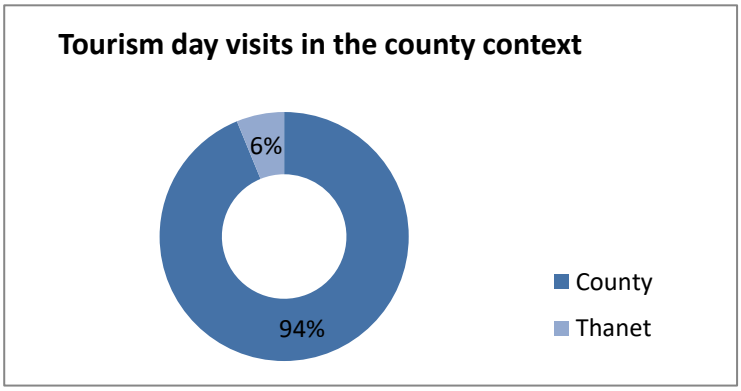
Thanet - 2017 Results

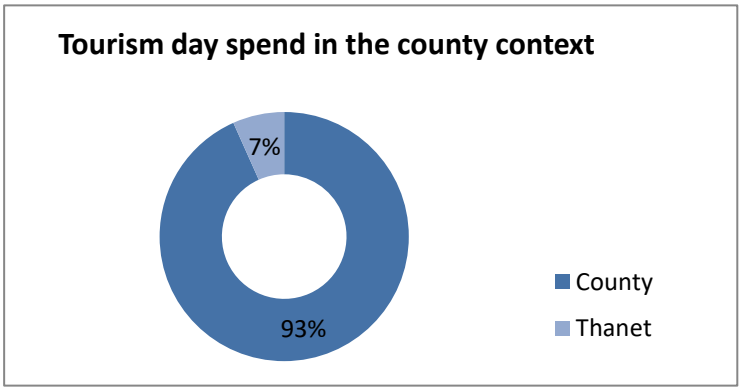
Total Volume and Value of Day Trips

		Trips	Spend
Total	**2017**	**3,723,000**	**£136,304,000**
Comparison	2015	3,386,900	£119,391,494
Difference		10%	14%

Day Visitors in the county context

District	Day Visits (millions)	Day Visit Spend (millions)
Ashford	4.0	£141.4
Canterbury	7.1	£238.1
Dartford	10.6	£404.7
Dover	4.2	£127.0
Gravesham	1.8	£52.6
Maidstone	4.1	£135.7
Medway	4.4	£144.5
Sevenoaks	4.0	£140.4
Folkestone & Hythe	4.3	£127.7
Swale	4.7	£141.4
Thanet	3.7	£136.3
Tonbridge&Malling	2.8	£89.6
Tunbridge Wells	4.3	£157.4
Kent	**60.1**	**£2,036.7**





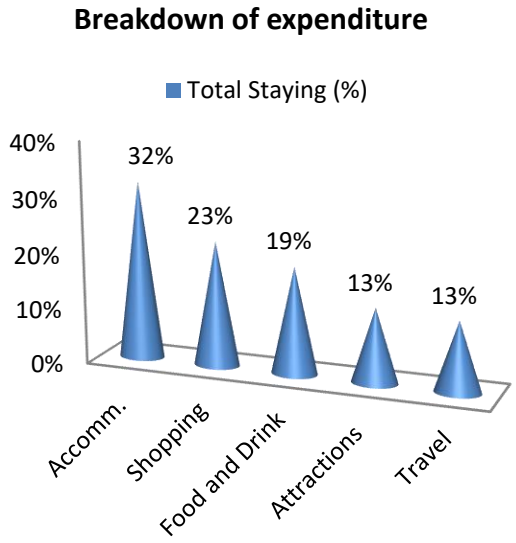
Value of Tourism

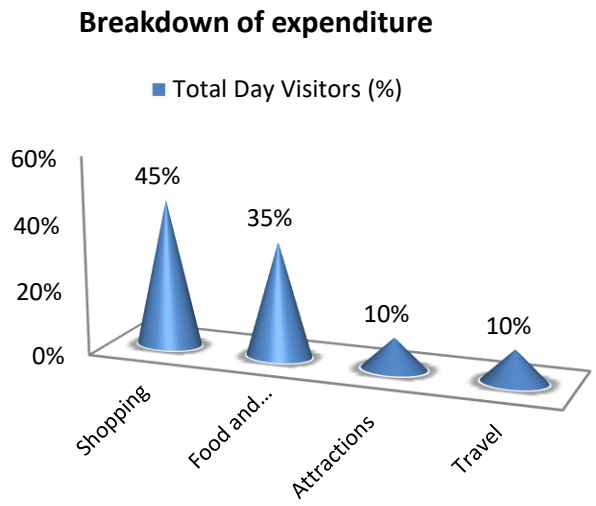
Expenditure Associated with Trips

Thanet - 2017 Results

Direct Expenditure Associated with Trips

		Accomm.	Shopping	Food and Drink	Attractions	Travel	Total
UK Tourists		£19,829,000	£6,641,000	£11,715,000	£5,464,000	£10,473,000	£54,122,000
Overseas tourists		£20,192,000	£21,381,000	£12,294,000	£11,257,000	£5,271,000	£70,396,000
Total Staying		£40,021,000	£28,022,000	£24,009,000	£16,721,000	£15,744,000	£124,518,000
Total Staying (%)		32%	23%	19%	13%	13%	100%
Total Day Visitors		£0	£61,473,000	£47,979,000	£13,221,000	£13,640,000	£136,304,000
Total Day Visitors (%)		0%	45%	35%	10%	10%	100%
Total	**2017**	**£40,021,000**	**£89,495,000**	**£71,988,000**	**£29,942,000**	**£29,384,000**	**£260,831,000**
%		**15%**	**34%**	**28%**	**11%**	**11%**	**100%**
Comparison	**2015**	**£39,622,000**	**£81,071,000**	**£65,272,000**	**£28,160,000**	**£27,353,000**	**£241,478,000**
Difference		**1%**	**10%**	**10%**	**6%**	**7%**	**8%**





Other expenditure associated with tourism activity

Other expenditure associated with tourism activity - Estimated spend				
Second homes	**Boats**	**Static vans**	**Friends & relatives**	**Total**
£912,000	£1,200,000	£210,000	£20,928,000	£23,250,000

Spend on second homes is assumed to be an average of £2,000 on rates, maintenance, and replacement of furniture and fittings. Spend on boats assumed to be an average of £2,000 on berthing charges, servicing and maintenance and upgrading of equipment. Static van spend arises in the case of vans purchased by the owner and used as a second home. Expenditure is incurred in site fees, utility charges and other spending and is estimated at £2,000. Additional spending is incurred by friends and relatives as a result of people coming to stay with them. A cost of £175 per visit has been assumed based on national research for social and personal visits.

Direct Turnover Derived From Trip

Thanet - 2017 Results

Business turnover arises as a result of tourist spending, from the purchase of supplies and services locally by businesses in receipt of visitor spending and as a result of the spending of wages in businesses by employees whose jobs are directly or indirectly supported by tourism spending.

		Staying Visitor	Day Visitors	Total
Accommodation		£40,636,000	£960,000	£41,596,000
Retail		£27,801,000	£60,858,000	£88,659,000
Catering		£23,359,000	£46,540,000	£69,899,000
Attractions		£17,313,000	£14,316,000	£31,629,000
Transport		£9,490,000	£8,178,000	£17,668,000
Non-trip spend		£23,250,000	£0	£23,250,000
Total Direct	**2017**	**£141,849,000**	**£130,852,000**	**£272,701,000**
Comparison	**2015**	**£135,189,000**	**£114,616,000**	**£249,805,400**
Difference		**5%**	**14%**	**9%**

Adjustments have been made to recognise that some spending on retail and food and drink will fall within attractions or accommodation establishments. It is assumed that 40% of travel spend will take place at the origin of the trip rather than at the destination.

Supplier and Income Induced Turnover

		Staying Visitor	Day Visitors	Total
Indirect spend		£8,590,000	£7,102,000	£15,692,000
Non trip spending		£3,488,000	£0	£3,488,000
Income induced		£15,415,000	£12,396,000	£27,811,000
Total	**2017**	**£27,493,000**	**£19,498,000**	**£46,991,000**
Comparison	**2015**	**£25,993,000**	**£17,079,000**	**£43,072,000**
Difference		**6%**	**14%**	**9%**

Income induced spending arises from expenditure by employees whose jobs are supported by tourism spend.

Total Local Business Turnover Supported by Tourism Activity – Value of Tourism

		Staying Visitor	Day Visitors	Total
Direct		£141,849,000	£130,852,000	£272,701,000
Indirect		£27,493,000	£19,498,000	£46,991,000
Total Value	**2017**	**£169,342,000**	**£150,350,000**	**£319,692,000**
Comparison	**2015**	**£161,182,400**	**£131,695,000**	**£292,877,400**
Difference		**5%**	**14%**	**9%**

Employment

The model generates estimates of full time equivalent jobs based on visitor spending. The total number of 'actual' jobs will be higher when part time and seasonal working is taken into account. Conversion of full time equivalent jobs into actual jobs relies on information from business surveys in the sectors receiving visitor spending. A new Full Time Equivalent tourism job is created with every £54,000 increase in tourism revenue.

Direct employment

Full time equivalent (FTE)						
	Staying Visitor		Day Visitor		Total	
Accommodation	949	36%	22	1%	972	20%
Retailing	367	14%	804	37%	1,171	25%
Catering	517	20%	1,031	48%	1,548	32%
Entertainment	256	10%	212	10%	468	10%
Transport	110	4%	95	4%	205	4%
Non-trip spend	431	16%	0	0%	431	9%
Total FTE 2017	**2,631**		**2,164**		**4,795**	
Comparison 2015	**2,509**		**1,895**		**4,405**	
Difference	**5%**		**14%**		**9%**	

Estimated actual jobs						
	Staying Visitor		Day Visitor		Total	
Accommodation	1,405	37%	33	1%	1,438	21%
Retailing	551	15%	1,206	38%	1,757	25%
Catering	776	21%	1,546	48%	2,322	33%
Entertainment	361	10%	299	9%	660	9%
Transport	155	4%	134	4%	289	4%
Non-trip spend	491	13%	0	0%	491	7%
Total Actual 2017	**3,740**		**3,218**		**6,957**	
Comparison 2015	**3,584**		**2,819**		**6,403**	
Difference	**4%**		**14%**		**9%**	

Indirect & Induced Employment

Full time equivalent (FTE)			
	Staying Visitor	Day Visitors	Total
Indirect jobs	224	132	355
Induced jobs	285	230	515
Total FTE 2017	**509**	**361**	**870**
Comparison 2015	**481**	**316**	**798**
Difference	**6%**	**14%**	**9%**

Estimated actual jobs			
	Staying Visitor	Day Visitors	Total
Indirect jobs	255	150	405
Induced jobs	325	262	587
Total Actual 2017	**580**	**412**	**992**
Comparison 2015	**549**	**361**	**909**
Difference	**6%**	**14%**	**9%**

Total Tourism Jobs

Thanet - 2017 Results

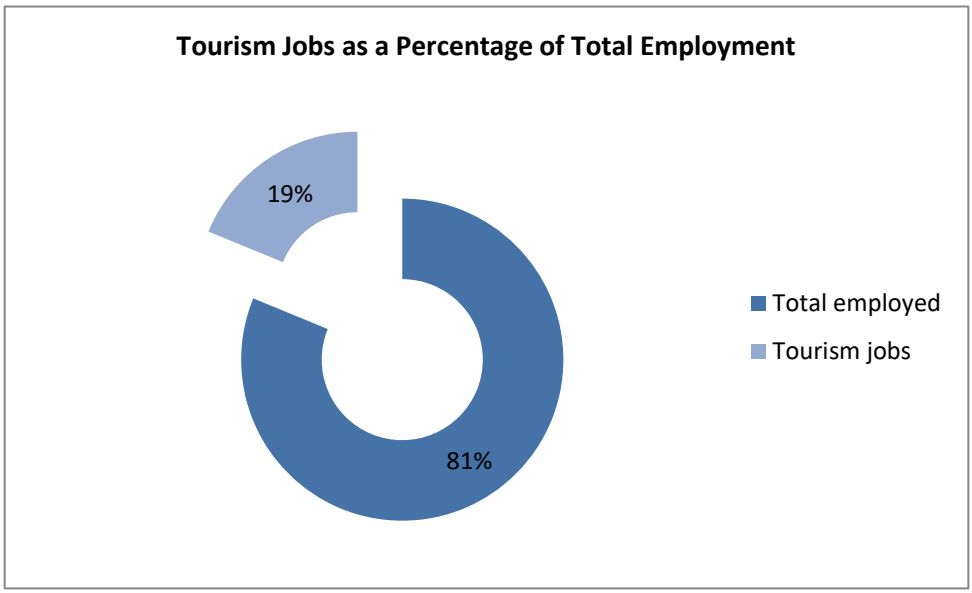
Actual jobs are estimated from surveys of relevant businesses at locations in England and take account of part time and seasonal working.

Full time equivalent (FTE)						
		Staying Visitor		Day Visitor		Total	
Direct		2,631	84%	2,164	86%	4,795	85%
Indirect		224	7%	132	5%	355	6%
Induced		285	9%	230	9%	515	9%
Total FTE	**2017**	**3,140**		**2,525**		**5,665**	
Comparison	**2015**	**2,990**		**2,212**		**5,202**	
Difference		**5%**		**14%**		**9%**	

Estimated actual jobs						
		Staying Visitor		Day Visitor		Total	
Direct		3,740	87%	3,218	89%	6,957	88%
Indirect		255	6%	150	4%	405	5%
Induced		325	7%	262	7%	587	7%
Total Actual	**2017**	**4,320**		**3,630**		**7,950**	
Comparison	**2015**	**4,133**		**3,179**		**7,312**	
Difference		**5%**		**14%**		**9%**	

Tourism Jobs as a Percentage of Total Employment

		Staying Visitor	Day visitors	Total
Total employed		42,300	42,300	42,300
Tourism jobs		4,320	3,630	7,950
Proportion all jobs		**10%**	**9%**	**19%**
Comparison	**2015**	**4,133**	**3,179**	**7,312**
Difference		**5%**	**14%**	**9%**



Economic Impact of Tourism – Headline Figures Thanet - 2017 Results

The key 2017 results of the Economic Impact Assessment are:

4.2 million trips were undertaken in the area
3.7 million day trips
0.5 million overnight visits

2.2 million nights in the area as a result of overnight trips

£273 million spent by tourists during their visit to the area
£23 million spent on average in the local economy each month.

£125 million generated by overnight visits
£136 million generated from day trips.

£320 million spent in the local area as result of tourism, taking into account multiplier effects.

7,950 jobs supported, both for local residents from those living nearby.
6,957 tourism jobs directly supported
992 non-tourism related jobs supported linked to multiplier spend from tourism.

Appendix I - Introduction about Cambridge Model

This report examines the volume and value of tourism and the impact of that expenditure on the local economy. The figures were derived using the Cambridge Economic Impact Model and the research was undertaken by Destination Research.

The model utilises information from national tourism surveys and regionally based data held by Destination Research. It distributes regional activity as measured in those surveys to local areas using 'drivers' such as the accommodation stock and occupancy which influence the distribution of tourism activity at local level.

Limitations of the Model

The methodology and accuracy of the above sources vary. The results of the model should therefore be regarded as estimates which are indicative of the scale and importance of visitor activity in the local area. It is important to note that in the national tourism surveys the sample sizes for each area changes year on year. This is as a result of the random probability nature of the methodology. As such, the results of the Cambridge Model are best viewed as a snapshot in time and we would caution against year-on-year comparisons.

It should be noted that the model cannot take into account any leakage of expenditure from tourists taking day trips out of the area in which they are staying. While it is assumed that these may broadly balance each other in many areas, in locations receiving significant numbers of day visitors from London, there is likely to be an underestimate in relation to the number of overseas day visitors staying in holiday accommodation in London.

Whilst it is important to be aware of these issues, we are confident that the estimates we have produced are as reliable as is practically possible within the constraints of the information available.

Rounding

All figures used in this report have been rounded. Therefore, in some tables there may be a slight discrepancy between totals and sub totals.

Data sources

The main national surveys used as data sources in stage one include:

- Great Britain Tourism Survey (GBTS) - information on tourism activity by GB residents;
- International Passenger Survey (IPS) information on overseas visitors to the United Kingdom;
- Day Visits in the annual Great Britain Day Visitor Survey using information on visits lasting more than 3 hours and taken on an irregular basis

These surveys provide information down to a regional level. In order to disaggregate data to a local level the following information sources are used:

- Records of known local accommodation stock held by Destination Research;
- VisitEngland's surveys of Visits to Attractions, which provide data on the number of visitors to individual tourist attractions ;
- Mid- 2017 estimates of resident population as based on the 2011 Census of Population;
- Selected data from the 2011 Census of Employment;
- Selected data on the countryside and coast including, national designations and length of the coastline.

Staying Visitors
The GBTS provides information on the total number of trips to the region and the relative proportions using different types of accommodation. By matching these figures to the supply of such accommodation, the regional average number of trips per bedspace or unit of accommodation can be derived. The IPS provides information on the total number of trips by overseas visitors to the region. The model uses three year rolling averages to reduce extreme highs and lows which are due to small sample sizes, rather than being a reflection on drastic changes in demand year-on-year.

Day Visitors
Information on day trips at the regional level is available from the Day Visits in Great Britain survey. The survey includes all leisure-related trips from home. It should be noted that a large proportion are local trips made by people resident in the locality. The model uses information from the survey to estimate the number of longer day trips (defined as those lasting at least 3 hours and involving travel of more than 20 miles) and irregular trips lasting more than 3 hours.

Impact of tourism expenditure
This section examines the impact of the tourism expenditure in terms of the direct, indirect and induced expenditure as well as an estimate of the actual jobs (both direct and indirect) supported by tourism expenditure in the district.

The GBTS, IPS and Day Visits to Great Britain survey data on the breakdown of visitor spending. The impact of this initial round of expenditure will be subsequently increased by multiplier effects. These arise from the purchase of supplies and services by the businesses in receipt of visitor expenditure (indirect impacts), and by the income induced-effects arising from the spending of wages by employees in the first round of business and in subsequent expenditure in supplier business (induced impacts).

The New Earnings Survey which provides information on wage levels by industry sector and region; An internal business database which includes data on the structure of business expenditure, local linkages and multiplier ratios drawn from a wide range of business and economic studies carried out by Geoff Broom Associates, PA Cambridge Economic Consultants and others. By applying the breakdown to the estimates of visitor spending, the model generates estimates of total direct spending.

Evidence from national studies suggests that some minor adjustments are required to match visitor spend to business turnover – for example, some expenditure on food and drink actually takes place in inns and hotels that fall in the accommodation sector and within attractions. More significantly, expenditure on travel costs associated with individual trips is equally likely to take place at the origin of the trip as the destination. Therefore the model assumes that only 40% of travel expenditure accrues to the destination area.

Number of full time job equivalents
Having identified the value of turnover generated by visitor spending, it is possible to estimate the employment associated with that spending. Wages for staff and drawings for the proprietors will absorb a proportion of that turnover. By applying these proportions to the overall additional turnover in each sector, the amount of money absorbed by employment costs can be calculated. The New Earnings Survey provides data from which the average costs by business sector, adjusted to take account of regional differences, can be calculated.

After allowing for additional costs such as National Insurance and pension costs, an average employment cost per full time equivalent job can be estimated. The number of such jobs in the local area can then be estimated by dividing the amount of business expenditure on wages and drawings by the average employment cost per job.

Number of Actual Jobs

The model generates estimates of full time equivalent jobs based on visitor spending. However, the total number of actual jobs will be higher when part time and seasonal working is taken into account. The full time equivalent jobs arising directly from visitor spending are converted into actual jobs using information from business surveys in the sectors receiving visitor spending (principally accommodation, food and drink, retail, attractions, transport). In general, the conversion factor between full time equivalent jobs and actual jobs varies around 1.5 in those sectors.

The indirect and induced jobs arise across a much wider range of employment sectors. Therefore, the average 1.16 for all sectors based on Census of Employment data has been used to convert full time equivalent jobs in this sector to actual jobs.

The employment estimates generated by the model include both self-employed and employed people supported by visitor expenditure. The model also includes an estimate of the additional jobs arising in the attractions sector, which are not related to visitor expenditure. However, the numbers do not include other tourism-related employment such as jobs in local authorities arising from their tourism functions, e.g. tourist information staff, additional public health, parks and gardens, public conveniences, maintenance sections and jobs arising from capital investment in tourism facilities.

Local level data for Kent EIA Reports 2017

The Cambridge Model allows for the use of local visitor related data. Local data from visitor survey and other sources is not always sufficiently detailed or available regularly enough to make the results consistent. We rely on partners to collect additional locally source data to feed into the model. We have also used data from Visit Kent's Business Barometer. The following local data has been included in the 2017 Kent results:

Dartford - Bluewater Shopping Centre **-** Bluewater attracted 28 million visitors in 2017. Only about a quarter of these visits is accounted for in the Cambridge Model, equating to about 7.8 million visits.

Dover District - Cruise Passengers data - Port of Dover received about 225,000 cruise passengers in 2017. Official statistics (DfT) suggest that about half of all passengers to Dover would be 'port calls' visits. Furthermore, cruise passengers are included at both departure and arrival if their journey begins and ends at a UK seaport. We made the following assumptions:

A total of 112,000 cruise passengers were classed as 'port call' visits and have been counted as day visitors. For the additional estimated 112,000 that departed or finished their trip in Dover we assume that most would start and finish their trip at Dover. A multiplier factor of 0.6 has been applied to avoid double counting and the additional trips have been added as extra serviced accommodation trips (67,500).

Tonbridge & Malling - Tonbridge Castle visitor numbers have rebounded recently, following a drop in performance between 2014-2016. The latest admission figures have been included in the district results.

Other anecdotal information taken into consideration was the significant growth in high-end independent cafes and restaurants in Tonbridge since 2016, now making it quite a foody destination (includes Tonbridge Old Fire Station, Beyond the Grounds, Basil, Havet, Saltwaters, Verdigris, Fuggles and Paws Cat Café). Outside of Tonbridge, Aylesford Priory attracts hundreds of thousands of visitors each year. The latest admission figures have been included in the district results.

Folkestone & Hythe District Council (previously Shepway District)

The latest admission figures for Romney Marsh Visitor Centre have been included in the district results. Folkestone Triennial 2017 - During September and October 2017 the Triennial attracted record high visitor numbers . The latest admission figures have been included in the district results.

Ashford

Annual footfall figures for the Big Cat Sanctuary in Smarden have been included.
Car park data shows that Ashford carparks saw a 2% drop in users and Tenterden a 1% drop.

Medway

Increase in the number of festivals and events (Sweeps Festival, Dickens Summer Festival, Rochester Castle concerts, Medieval Merriment, Dickensian Christmas Festival, 'The Battle of Medway' (two weeks in June 2017) with additional 200 Dutch yachts and many visitors to the two week series of events. Coach visits (2017) 22,047 coaches and assumed 114,608 visitors (assumes x54 pax per coach).

Swale

We have used selected information from the Destination Intelligence reports submitted as part of their British Destination membership and the data sharing and benchmarking research.

Thanet

Thanet Language Schools – Figures for 2017 compared to 2015 show an 11% increase in volume. Southeastern - Comparison stats for 2015 and 2017 - For travel to Margate, Broadstairs and Ramsgate only, journeys on Off-Peak products increased by 33% from April 2016 to March 2017 compared to the previous year.

Produced by:

Registered in England No. 9096970
VAT Registration No. GB 192 3576 85

45 Colchester Road
Manningtree
CO11 2BA

Sergi Jarques
Director
Tel: 01206 392528
info@destinationresearch.co.uk
www.destinationresearch.co.uk

ENGLISHUK

Supporting the British economy through teaching English as a foreign language

An assessment of the contribution of English language teaching to the United Kingdom economy

A report by Capital Economics for English UK

Justin Chaloner
Andrew Evans
Mark Pragnell

November 2015

This report was commissioned by English UK's late chief executive, Eddie Byers, who understood the significance of amassing robust information about the UK ELT sector in order to put forward the industry's case with opinion-formers and Government.

English UK would like to thank our member centres and other accredited English language centres who took the time to contribute to this report, and Capital Economics for their detailed work.

Produced by

Capital Economics Limited
150 Buckingham Palace Road, London SW1W 9TR
www.capitaleconomics.com
Registered office: as as above. Registered in England No. 2484735 VAT No. GB 713 8940 25

On behalf of

ENGLISHUK

English UK
219 St John Street, London EC1V 4LY, United Kingdom
+44 20 7608 7960 | www.englishuk.com | info@englishuk.com

Supporting the British economy through teaching English as a foreign language

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Disclaimer

This report has been commissioned by English UK. The views expressed remain those of Capital Economics and are not necessarily shared by English UK. Likewise, Capital Economics does not necessarily share the views of those who have commissioned this report.

The report is based on analysis by Capital Economics of information available in the public domain, together with a survey of English language teaching centres. Where survey data are employed, it is clearly stated in the report.

While every effort has been made to ensure that the data quoted and used for the research behind this document is reliable, there is no guarantee that it is correct, and Capital Economics Limited and its subsidiaries can accept no liability whatsoever in respect of any errors or omissions. This document is a piece of economic research and is not intended to constitute investment advice, nor to solicit dealing in securities or investments.

Acknowledgments

We wish to acknowledge and thank those organisations that gave their time to help provide the data used in this report and without which it would not have been possible.

Foreword

The UK has been teaching English to the world for well over a century, but this report is the first serious attempt to quantify the value of our sector in economic, employment and other beneficial ways.

As chair of industry body English UK, I am pleased that Capital Economics' research shows English Language teaching (ELT) must not be underestimated, bringing £1.2bn in export revenue and supporting 26,000 jobs throughout the UK.

It shows that every student who comes here to improve their English and experience our culture is worth £378 per week, contributing £194 million to the Exchequer.

They keep tens of thousands of people in jobs, from highly-skilled teachers, textbook writers and administrators, to taxi drivers, shopkeepers and cafe owners. For thousands of families, hosting students in their spare bedroom is both a financial lifeline and a way of meeting interesting young people from all over the world.

The unquantifiable benefits are even more important in a world interconnected as never before. Over 650,000 students studied English here last year: they return home with happy and positive memories of their time in the UK, influencing friends, family, colleagues - and in the case of many who are high-flyers, bringing soft power benefits.

Why are we producing this report now, a century after the first accredited English school opened in London? Because our once world-beating industry is shrinking, and it is time for us to highlight its worth as part of our campaign to get the Government and opinion-formers working to help us grow for the UK economy. Competitor destinations which are thriving have more Government support, not least in visa matters.

So we ask that our Government works with us to bring more export income and jobs to the UK by recognising that students are not migrants - a status which means they are dragged into the rhetoric of the immigration debate - and to improve the visa rules. We also call for politicians and opinion-formers to work with us to promote UK ELT globally, making students feel welcome and also to fully recognise the educational excellence achieved in our sector.

Our students are some of the most aspirational people in the world: some are teenagers on holiday courses, some are adults improving their language skills to work in a world where business speaks English. In between there are many students for whom improving their English is a first step to further UK study at one of our colleges or universities.

If the UK sends out a message that these students are not welcome, then they take those first steps to study - and all subsequent steps - elsewhere and are lost to us forever. It is time to support our industry.

Steve Phillips
Chair
English UK

Key findings

Capital Economics has been commissioned by English UK to evaluate the contribution of teaching English as a foreign language to the United Kingdom economy.

Key findings:

- Around 650,000 students studied English as a foreign language in the United Kingdom at more than 550 accredited institutions in 2014
- Overall, the industry supported around 26,500 jobs in the United Kingdom through its supply chain, employee and student spending, and its direct teaching activity
- The sector added approximately £1.1 billion of value to the economy over the year, or an average of £378 per student for each week they stay
- The total value of international English language students' spending, including tuition fees, accommodation and other living costs, added £1.2 billion to United Kingdom export revenues in 2014
- The students bring in more money for the government than they take out through their use of public services. They contributed a net £194 million to the exchequer through studying here, or £65 for each week they stayed in 2014
- In addition to net contribution we have modelled, there are likely to be other positive impacts that are more difficult to quantify. Students can continue to contribute to the British economy when they return to their home country; they may be more likely to do business with the United Kingdom in the future, or return as a visitor, as a result of studying here

1. Introduction and summary

Capital Economics has been commissioned by English UK to evaluate the contribution of teaching English as a foreign language to the United Kingdom economy.

English has become the dominant language for international business, science and academia. It is spoken at a useful level by one in every four people worldwide. The removal of language barriers boosts international trade and enhances the prospects for businesses and individuals. More than 1.4 million students worldwide studied English outside their home country in 2014, with over a third of these choosing to come to the United Kingdom. (See chapter 2.)

There are more than 550 accredited English language centres in the United Kingdom including private and state institutions, specialist language schools, further education colleges, universities and summer language camps.

In total, the centres turned over a combined £1.1 billion in 2014, with £0.7 billion of their revenues generated directly from the teaching of English. They provided the equivalent of 9,300 full-time jobs and employed around 12,100 people after taking into account part-time arrangements. Their activities added almost £400 million of value to the British economy and generated in the order of £94 million in taxes in 2014. (See chapter 3.)

The economic value of English language centres does not stop with their direct activities. They stimulate economic activity through their purchases from domestic suppliers to support their teaching activities.

In addition, they support jobs and value creation through employees spending their income in Britain. We estimate that the centres and their employees spent over £500 million in 2014, supporting more than 8,000 jobs and nearly £350 million of gross value added. This gives a jobs multiplier of 1.9; for every ten direct jobs, a further nine are supported in the wider economy. The benefits are spread across the country and through a range of industries. (See chapter 4.)

On top of the contribution of the centres, the international students who come to study English bring benefits to the United Kingdom economy. Around 650,000 students study on English language courses across the United Kingdom each year, staying for 4.6 weeks on average. The majority come from Europe, with over a quarter from Italy alone.[1]

Exhibit 1: Components of the contribution of English language teaching to the UK economy, 2014

	GVA £ millions	Jobs Number	Turnover £ millions	Taxes £ millions
Direct effects from students' spending on English language courses	396	9,300	737	93
Indirect effects from centres' spending on suppliers	216	5,050	530	49
Induced effects from spending of centres' employees	130	3,340	296	28
Induced effects from students' spending*	383	8,950	803	24
Total	1,124	26,650	2,367	194

Source: Capital Economics. Notes: * tax revenues from students spending' includes the estimated value added taxes they pay and their visa application fees. In addition, we net off the students' consumption of public resources so the total shows their overall net fiscal contribution. We have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

[1] In this report we use 'Europe' to mean those countries that are members of the European Union plus Iceland, Liechtenstein, Norway and Switzerland.

The students spent over £450 million in addition to the fees and payments to their centres in 2014, supporting 9,000 jobs and £383 million of gross value added across the country. They bring in more money for the government than they take out through their use of public services. They pay tax when they buy goods or services, support the taxes paid by the centres and their employees and students from outside Europe pay fees for their visa.

Overall they contributed a net £194 million to the exchequer through studying here, or £65 for each week a student stays in the United Kingdom. Meanwhile, the total value of international English language students' spending, including tuition fees, accommodation and other living costs added £1.2 billion to United Kingdom export revenues. (See chapter 5.)

Some students have an impact on the United Kingdom economy after they complete their course. The majority, some 81 per cent, return to their home country. This means they have no direct fiscal or economic impact, but may contribute to the economy as they are more likely to do business with, or return as a visitor to, the United Kingdom in the future as a result of studying here. Of those that stay, three-quarters (or 14 per cent of the total) go on to further study supporting the further and tertiary education sectors and generating more export income for the economy. Of the remainder, almost all remain to take up employment. (See chapter 6.)

Overall, teaching English to international students adds £1.1 billion of value to the economy or £378 for each week a student stays in the United Kingdom. It supports around 26,500 jobs and, after taking into account students' use of public services, generates more than £194 million of net tax revenues for the government.

The economic activity sustained by the sector means that for every direct job, a further two are supported in the wider economy. (See Exhibit 1, Exhibit 2 and chapter 7.)

Exhibit 2: Components of the contribution of English language teaching to the UK economy per week of a student stay, 2014

	GVA	Jobs	Turnover	Taxes
	£	per 1,000 student visits	£	£
Direct effects from students' spending on English language courses	133	14	248	31
Indirect effects from centres' spending on suppliers	73	8	178	16
Induced effects from spending of centres' employees	44	5	100	10
Induced effects from students' spending*	129	14	270	8
Total	378	41	795	65

Source: Capital Economics. Notes: * tax revenues from students spending' includes the estimated value added taxes they pay and their visa application fees. In addition, we net off the students' consumption of public resources so the total shows their overall net fiscal contribution. The columns may not sum to the total due to rounding.

2. Background and context

In this section, we outline the background and context to the English language teaching sector in the United Kingdom.

We discuss briefly the demand for English as a global language, define the English language teaching sector in the United Kingdom and outline the approach we have taken to assess the sector's economic contribution.

2.1 The English language

English has become the dominant language for international business, science and academia. It is spoken at a useful level by one in every four people worldwide, some 1.75 billion people, and the number of non-native speakers now far outnumber native speakers at an estimated ratio of four to one.[2]

English is the lingua franca for many countries and this has important trade implications for economies across the globe; countries with a common language trade more.[3] A language barrier makes trading more costly and more difficult. It increases search costs for companies and individuals trying to find buyers or sellers for products. Removing this barrier encourages traders to seek out new markets and facilitates trade that otherwise would not have happened.[4] Indeed, trade within the European Union might be as much as a fifth larger because of the use of English as a common language.[5]

The ability to communicate across the world with a common language can greatly enhance individuals' prospects as well as businesses. Non-native speakers who learn English become more attractive to prospective employers. A survey of executives globally found that nearly 70 per cent said their workforce will need to master English to realise corporate expansion plans, and a quarter said that more than 50 per cent of their total workforce will need some ability in the language.[6]

The global use of the English language generates significant benefits for British businesses, and in particular for exporting firms. The majority are able to communicate with firms globally in English – helping to limit language as a barrier to trade to just a fifth of British exporters.[7]

Our language is a durable national asset that should continue to deliver benefits in the future. It is unlikely to lose its place as the leading language for international business as the costs of switching would be too high. It has been estimated that the full, long-term economic benefit to the United Kingdom through the use of English, in both international trade with English-speaking countries and in the domestic economy has a net present value of £405 billion.[8]

The prevalence and usefulness of English across international businesses helps to drive the continued desire of non-natives to learn it. More than 1.4 million students worldwide study English outside of their home country.[9] Around 35 per cent of these students choose to come to the United Kingdom to study.[10] Not only do they help to support the economy during their time here but, as a result of studying here, the majority of students are more likely to do business with the United Kingdom thus creating long-term trade benefits.[11]

The popularity of learning English as a foreign language in the United Kingdom has increased in recent years, with the number of students rising from just over 350,000 in 2010 to almost 500,000 in 2014.[12] However, on average each student is staying for a shorter period of time, with total student weeks taught falling from 2.1 million to 2.0 million over the same period. (See Exhibit 3.)

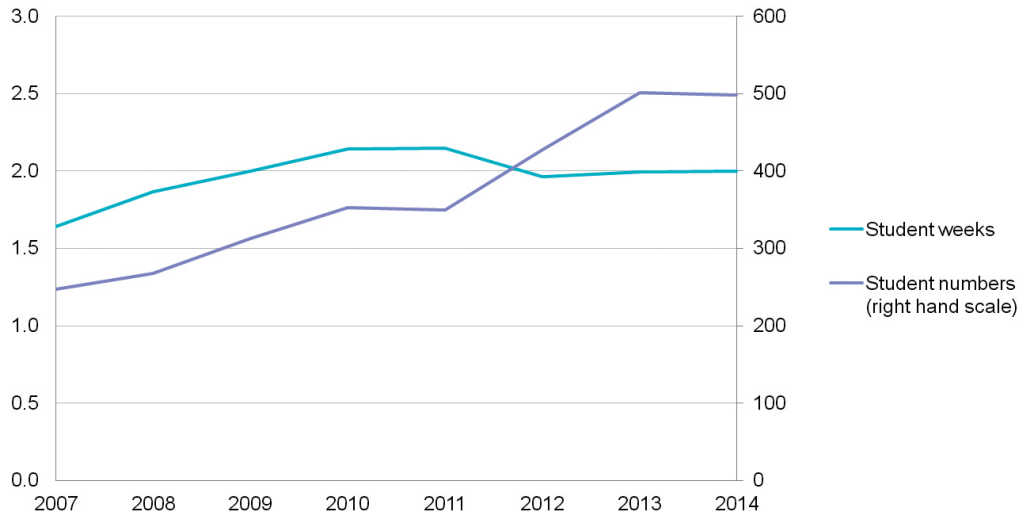
The ability of students to come to the United Kingdom to study English may fluctuate in the short-term due to exchange rate movements. A stronger pound increases the cost to foreign students of staying and studying here. This is reflected in annual fluctuations in the number of taught student weeks. (See Exhibit 4.)

In addition to their activities in the United Kingdom, British

[2] British Council, The English Effect (British Council, London), 2013
[3] Andrew Rose, 'One Reason Countries Pay Their Debts: Renegotiation and International Trade', Journal of Development Economics, v77, 2005
[4] Department for Business Innovation and Skills (BIS), 'International Trade and Investment – the Economic Rationale for Government Support', BIS Economics Paper No. 13, 2011
[5] Jan Fidrmuc and Jarko Fidrmuc, 'Foreign Languages and Trade', CEDI Discussion Paper Series No. 09-03, 2009. Note: this analysis is for the 15 countries that were members of the European Union prior to the accession of ten candidate countries on 1 May 2004. It covers trade flows between 2001 and 2007
[6] Economist Intelligence Unit, Competing across borders: how cultural and communication barriers affect business (Economist Intelligence Unit, London), 2012
[7] BIS, 'International Trade and Investment – the Economic Rationale for Government Support', BIS Economics Paper No. 13, 2011
[8] British Council, The English Effect (British Council, London), 2013
[9] English UK, Student Statistics Report 2014 (English UK, London), 2014
[10] See: www.englishuk.com/en/about-us/overview/who-are-we
[11] London First and PricewaterhouseCoopers, London Calling: International students' contribution to Britain's economic growth (LondonFirst, London), 2015
[12] Note: data are for students studying at English UK private sector centre members

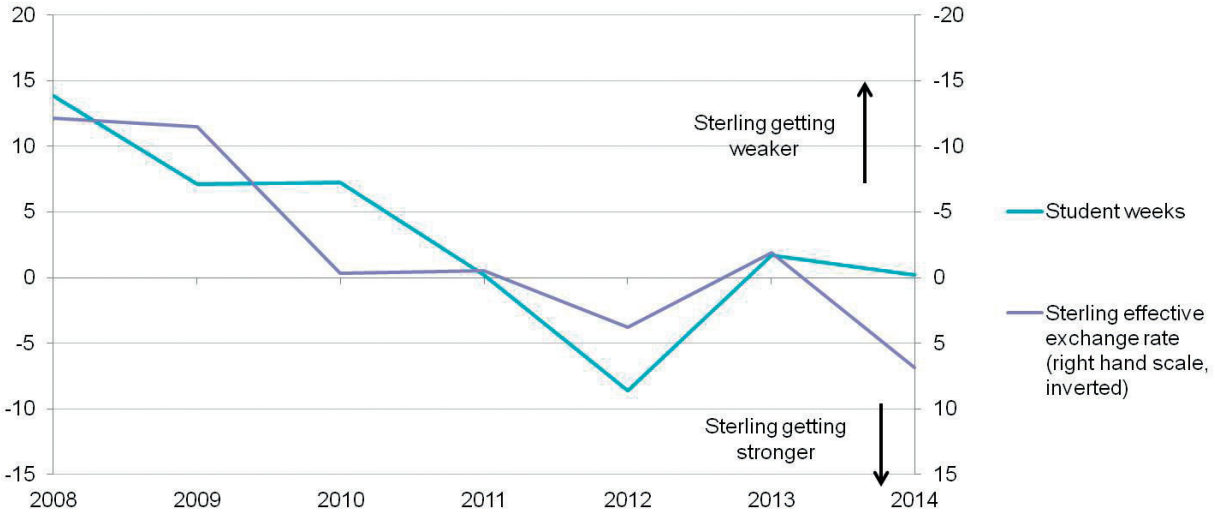
organisations teach English and administer English language exams abroad. Almost £500 million of the British Council's income in the 2013/14 financial year came from their activities that develop a wider knowledge of the English language. What's more, they administer examinations worldwide on behalf of more than 70 United Kingdom examination boards and universities, helping them earn £80 million in fees.[13]

Exhibit 3: Number of student weeks taught (millions) and number of students taught (thousands) at English UK private sector centre members in the United Kingdom



Sources: Capital Economics and English UK. Note: Student weeks represent the number of weeks of tuition provided to students. One student week, as used by English UK and the British Council, is one student undergoing at least ten hours of tuition per week.

Exhibit 4: Year on year change in the number of student weeks taught by private sector English UK member centres and the year on year change in the sterling effective exchange rate, per cent



Sources: Capital Economics, English UK, Datastream and Bank of England

[13] British Council, Annual report 2013-14 (British Council, London), 2014

2. Background and context

2.2 What is the English language teaching sector?

In this report, we focus on the domestic operations of accredited businesses and institutions that teach English to foreign students. The sector covers teaching English as a foreign language to non-native speakers who can study at more than 550 accredited centres across the country.[14]

These centres have to meet strict standards for the quality of teaching, facilities and student care to be awarded accreditation under the Accreditation UK scheme.[15] This is one of several schemes that are approved by the United Kingdom visas and immigration department and accreditation permits the centres to enrol international students with visas.[16]

Some centres exclusively teach English language courses, whereas others might be part of a college or university. In addition some only teach adults whereas others will have courses for children as well. The industry is represented by English UK, which is the national association of accredited English language centres and has 479 members in the private and state sectors.[17]

2.3 Methodology

In order to assess fully the contribution of the English language teaching sector to the British economy, we have undertaken a survey of teaching centres in the United Kingdom, which we have combined with publically available data. Our survey was sent to all 568 centres that are accredited by Accreditation UK – the quality assurance scheme run by English UK and the British Council.[18]

The survey covered a number of key topics:

- The centres' turnover, including the share that is directly attributable to English language teaching courses, the number of permanent and temporary employees, the number of hours these employees typically work and the total wage bill
- The estimated average expenditure of the centres' students per week excluding fees and other expenses paid to the centre
- The post-study activities of English language students, including the share that leave the United Kingdom immediately after their course and those that stay to continue their education or work

Of the full list of 568 centres that were sent the survey, we received 222 responses representing 237 schools, giving an overall response rate of 41.7 per cent. The responses to the survey varied in completeness, so the sample for different questions varies.

Please refer to the appendix for more detailed methodological notes.

[14] Our definition of the sector covers all centres accredited under the Accreditation UK scheme. It does not include institutions that may be accredited under other schemes or those without any accreditation. Other accreditation bodies include the Accreditation Body for Language Services and the British Accreditation Council. For a full list of bodies see: www.gov.uk/study-visit-visa/eligibility

[15] See: www.educationuk.org/global/articles/english-language-centres

[16] British Council, Accreditation UK Handbook 2014 and 2015 (British Council, London), 2014 and www.gov.uk/study-visit-visa/eligibility

[17] Correct as of 1 September 2015

[18] See a full list at: www.britishcouncil.org/education/accreditation/centres. Number of listed centres correct as of 24 August 2015.

3. Direct contribution of the centres

In this section we consider the direct contribution of English language teaching centres to the United Kingdom economy.

3.1 Revenues

There are 568 English language teaching centres in the United Kingdom with accreditation from Accreditation UK.[19] These include private and state institutions and cover specialist language schools, further education colleges, universities and summer language camps.

Combining our survey results with annual accounting information and other publicly available statistics, we estimate that the total revenue of centres was £1.1 billion in 2014.[20] Nearly two-thirds of their revenue, some £0.7 billion, comes directly from English language teaching courses. The rest of their revenues come from a variety of areas, such as teaching other languages, providing exam centres, cafeteria or catering services, and training and developing teachers.

3.2 Employment

We estimate that the centres' English language courses provide more than 9,300 full time equivalent jobs and employ around 12,100 people when taking into account parttime arrangements. This includes skilled occupations, such as teachers, directors of studies and other managers, and unskilled jobs such as administration staff.[21] (See Exhibit 5.)

The English language teaching centres employ more people than JCB or Coca Cola in the United Kingdom. If we look at all of their activities, they employ similar numbers to Vodafone or the Department for Business, Innovation and Skills. (See Exhibit 6.)

There is employment in all regions of the country, with London, the South East and the South West having the largest concentrations.[22] (See Exhibit 7.)

Exhibit 5: Number of employees and full-time equivalent jobs at English language teaching centres in the United Kingdom, 2014

	English language teaching	All activities
Permanent staff	5,350	8,200
Temporary staff	6,750	10,400
Total	12,100	18,600
Full-time equivalent employees	9,300	14,300

Source: Capital Economics

[19] Full list at www.britishcouncil.org/education/accreditation/centres. Number of listed centres correct as of 24 August 2015.
[20] There were seven centres who reported that English language teaching comprised of less than 30 per cent of their turnover. For these centres, we have excluded their turnover from non-English language turnover activities because they are unlikely to be representative of the sector. See the appendix for details.
[21] Most teaching jobs in the sector require a Post Graduate Certificate in Education in teaching English as a foreign language or a Certificate in Teaching English to Speakers of Other Languages. See: www.britishcouncil.org/jobs/careers/english/faqs
[22] We conduct our analysis using the statistical regions used by the Office for National Statistics. These are the level one of the nomenclature of territorial units for statistics set out by Eurostat. For details of which areas and cities fall under each region see: geoportal.statistics.gov.uk/Docs/Maps/NUTS_Level_1_to_NUTS_Level_2_to_NUTS_Level_3_(Jan_2015)_GB_map.pdf

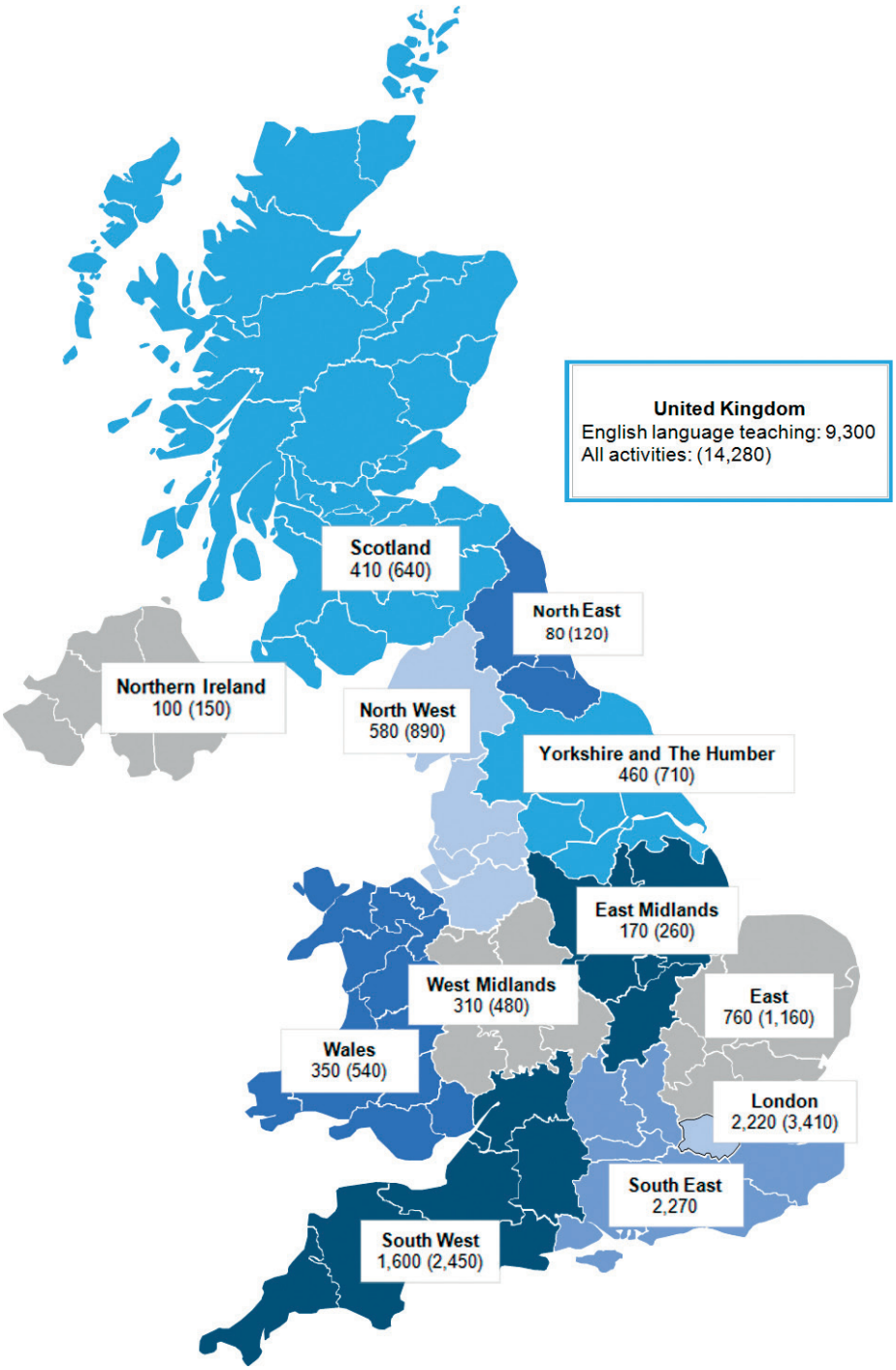
3. Direct contribution of the centres

Exhibit 6: Exemplar companies and organisations with comparable number of employees to the English language teaching sector in the United Kingdom

Organisation	Employees*
BP	18,000
GSK	16,000
Department for Business, Innovation and Skills	15,700
English language teaching centres (all activities)	14,300
Vodafone	12,400
Npower	12,100
Burberry Group	10,300
English language teaching centres (English language teaching)	9,300
JCB	5,000
Coca Cola	4,000
Palmer and Harvey	3,500

Source: Capital Economics. Note: * Data obtained from official company or government sources for the most recent year available. Data are rounded to the nearest 100 employees where applicable.

Exhibit 7: Number of full time equivalent employees at English language teaching centres by region, 2014



Sources: Capital Economics, English UK and British Council. Note: data are rounded to the nearest ten full time equivalent employees. Totals may not sum to the total due to rounding. Figures in parentheses are the number of full time equivalent employees for all activities.

3. Direct contribution of the centres

3.3 Expenditure and surpluses

The sector's total expenditure to support their English teaching programmes was almost £580 million in 2014, including wages, utilities, property fees, equipment for the centres and in some cases accommodation for students.[23] Part of the sector's expenditure on accommodation will be paying host families who let out rooms for students to stay in whilst they study on their English language courses.

We can take away the sector's expenditure from its revenue to estimate the gross surpluses it generates.[24] The value of this was nearly £160 million in 2014. (See Exhibit 8.)

3.4 Value added

Overall, the sector directly added almost £400 million of value to the economy from teaching English or over £610 million through all of their activities in 2014. (See Exhibit 9.)

As such, value added per employee in English language teaching is £42,500 per annum.

As such, value added per employee in English language teaching is £42,500 perannum.[25]

Exhibit 8: Aggregated income statement for English language teaching centres in the United Kingdom, 2014 (£ millions)

	English language teaching	All activities
Revenue	737	1,132
Expenditure	579	889
Gross surpluses	158	243

Source: Capital Economics

Exhibit 9: Estimate of gross value added by English language teaching centres in the United Kingdom, 2014 (£ millions)

	English language teaching	All activities
Compensation of employees	239	368
Gross surpluses	158	243
Value added tax	0	3
Less subsidies or grants	1	2
Gross value added	396	611

Source: Capital Economics

[23] See the appendix for further details

[24] We use 'gross surpluses' to represent gross profits as not all centres are private market entities. Gross trading profit is the operating profit of private market entities. Gross trading surplus is the same concept for public market entitiesas in principle they do not make a profit. It is the trading surplus earned by public bodies and non-profit institutions serving households

[25] We use our estimate for full-time equivalent employees in this calculation.

3.5 Taxation

The sector makes a material contribution to HM Treasury each year through a range of taxes that are generated by their business activity.[26]

In total, we estimate that the payments of business rates, employer and employee related taxes by the centres amounted to £94 million in 2014. The sector receives modest support from the government in the form of grants or subsidies, which reduces the net fiscal contribution to £93 million per annum.[27] (See Exhibit 10.)

Exhibit 10: Fiscal contribution to exchequer by English language teaching centres, 2014 (£ millions)

	English language teaching	All activities
Value added tax	0	3
Business rates	16	25
Corporation tax	17	26
Employer related taxes	20	31
Employee related taxes	42	64
Total taxes paid	94	148
Less grants or subsidies	1	2
Total contribution	93	145

Source: Capital Economics

[26] The centres pay different rates of tax depending on their charitable status.
[27] These include subsidies for teaching English to speakers of other languages, business improvement grants from UK Trade and Investment and local enterprise zone grants.

4. Knock-on impact of the centres

In this section we examine the knock-on effects of the centres' spending on suppliers and the spending of the centres' employees.

4.1 Indirect effects: impact through the supply chain

The centres spent over £521 million on domestic suppliers in 2014, of which £339 million supported their English language tuition. Their expenditure includes renting properties and paying for utilities, office equipment and accommodation for students.

Spending on suppliers stimulates further impact in the supply chain. It supports jobs and generates value at the firms at which the money is spent, who then spend a proportion of the income on their own suppliers where similar benefits accrue. This continues through the supply chain until the amount re-spent on supplies diminishes.

These are known as 'indirect multiplier' effects.

Using our spending estimates, we have deployed the Office for National Statistics' input-output tables and official employment data to estimate the impact of English language teaching centres' spending on the supply chain in different sectors and regions of the economy.

In total, our modelling suggests that English language teaching supports approximately 5,000 jobs and over £210 million of gross value added in the United Kingdom through the spending of centres on goods and services. This gives an indirect multiplier for jobs of 1.5; for every ten direct jobs, a further five are supported in the wider economy through the supply chain. These benefits are spread across the country. Meanwhile, if we include all activities of the centres, they support over 7,500 jobs and around £330 million of gross value added. (See Exhibit 11.)

The benefits are spread across a range of industries which provide goods and supporting services all the way through the supply chain. (See Exhibit 12.)

Exhibit 11: Indirect effects of spending on suppliers by English language teaching centres by region, 2014

	English language teaching			All activities		
	GVA	Jobs	Turnover	GVA	Jobs	Turnover
	£ millions	Number	£ millions	£ millions	Number	£ millions
North East	7	150	20	11	230	30
North West	23	530	58	35	820	89
Yorkshire and The Humber	17	400	43	26	610	67
East Midlands	14	340	36	22	530	55
West Midlands	16	370	40	25	560	62
East	18	430	43	28	660	65
London	36	840	79	56	1,290	121
South East	29	690	68	45	1,060	104
South West	18	450	46	28	690	71
Wales	9	220	25	14	350	39
Scotland	21	480	58	32	740	89
Northern Ireland	6	140	15	9	210	22
United Kingdom	216	5,050	530	331	7,760	814

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

Exhibit 12: Indirect effects of spending on suppliers by English language teaching centres by sector, 2014

	English language teaching			All activities		
	GVA £ millions	Jobs Number	Turnover £ millions	GVA £ millions	Jobs Number	Turnover £ millions
Sectors						
Primary activities including energy	7	50	28	11	80	43
Manufacturing	19	330	106	30	510	163
Construction	7	90	17	10	140	27
Services	182	4,570	379	279	7,020	582
Comprising of:						
Wholesale, retail and other services	50	1,690	145	77	2,590	223
Transport and storage	8	170	19	12	260	29
Financial, business and professional services	44	510	83	68	790	127
Arts, entertainment and recreation	1	40	3	2	60	5
Administrative support	23	870	48	35	1,330	73
Communications	13	170	24	19	250	38
Public services	42	1,140	57	65	1,740	88
Total	216	5,050	530	331	7,760	814

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

4. Knock-on impact of the centres

4.2 Induced effects: impact through employees' spending

In addition to the economic activity stimulated by purchases from their suppliers, the centres support jobs and value creation through their employees' spending income in local shops, online, on their household bills, and elsewhere in the wider economy.

These are known as 'induced' effects.

Based on the results from our survey combined with the Office for National Statistics' Family Spending Survey, we estimate that the 9,300 full time equivalent employees working to support English language teaching spend a total of £169 million on goods and services annually, providing incomes for businesses across the country. This supports over 3,300 jobs and gross value added of around £130 million. (See Exhibit 13.)

Much of the spending by employees goes directly into local retail sectors, which accounts for more than half of the jobs. In turn, this stimulates activity in the supply chain of retailers. There is a positive impact on all sectors of the economy, particularly financial and business activities and the arts, entertainment and recreation sector. (See Exhibit 14.)

Exhibit 13: Induced effects of the English language teaching industry by region, 2014

	English language teaching			All activities		
	GVA	Jobs	Turnover	GVA	Jobs	Turnover
	£ millions	Number	£ millions	£ millions	Number	£ millions
North East	3	70	9	5	110	14
North West	12	320	29	17	430	41
Yorkshire and The Humber	8	210	20	13	330	31
East Midlands	6	150	14	9	220	22
West Midlands	7	180	19	13	340	33
East	10	260	22	16	440	36
London	30	770	62	41	1,060	86
South East	22	590	48	36	970	77
South West	15	400	32	23	630	50
Wales	4	100	10	6	160	16
Scotland	10	230	25	15	330	37
Northern Ireland	2	60	6	4	100	10
United Kingdom	13	3,340	296	199	5,120	454

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

Exhibit 14: Induced effects of the English language teaching industry by sector, 2014

	English language teaching			All activities		
	GVA	Jobs	Turnover	GVA	Jobs	Turnover
	£ millions	Number	£ millions	£ millions	Number	£ millions
Sectors:						
Primary activities including energy	6	30	27	9	50	41
Manufacturing	6	100	38	9	160	58
Construction	4	60	11	7	90	17
Services	113	3140	219	174	4820	337
Comprising of:						
Wholesale, retail and other services	60	1970	108	92	3030	165
Transport and storage	5	100	12	8	150	19
Financial business and professional services	23	320	44	35	490	68
Arts entertainment and recreation 8	330	23	13	500	35	
Administrative support	6	230	13	9	350	19
Communications	6	70	13	10	110	19
Public services	5	130	7	7	190	11
Total	130	3340	296	199	5120	454

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

5. Students' contribution to the economy

In this section we evaluate the students' impacts through their spending on goods and services in addition to their tuition fees, examine the associated knock-on effects for the United Kingdom economy and assess their net benefit to the exchequer.

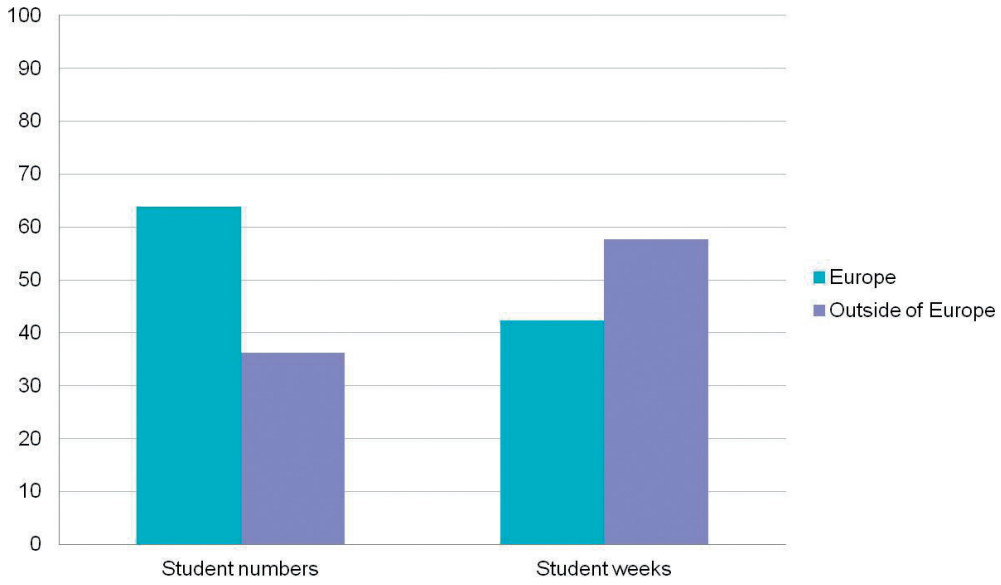
5.1 Direct economic activity of the students

Around 650,000 individual students studied at English language teaching centres in 2014, for an estimated total of 2.6 million student weeks.[28] The language courses allow students to learn skills for life in an English-speaking country, prepare for a course at college or university, or to communicate effectively in work-related situations.[29] The average length of a course was 4.6 weeks in 2014, and it was 5.7 weeks for adult students compared with 3.3 weeks for junior students.[30]

The majority of students come from Europe, with 64 per cent of all students coming from the continent in 2014.[31] The largest market is Italy, which accounts for one quarter of all students, while Spanish, French and German students comprise a further 25 per cent.

The biggest market outside of Europe is Russia, followed by China and Brazil, which make up six, four and three per cent of the total respectively. Although, at 36 per cent, they are responsible for a smaller share by number, students from outside Europe tend to study on longer courses, and they account for 58 per cent of all student weeks. (See Exhibit 15 and Exhibit 16.)

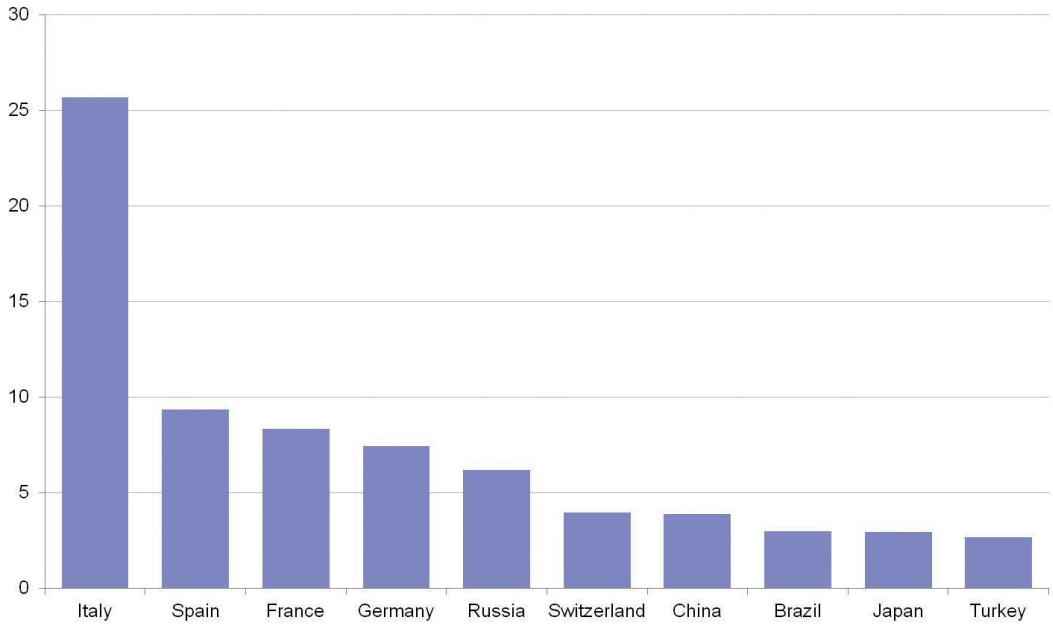
Exhibit 15: Share of English language students from Europe by number of students and student weeks that study at private sector English UK member centres, 2014 (per cent)



Sources: English UK and Capital Economics

[28] There were 580,000 individual students at English UK member centres in 2014. See: English UK, Student Statistics Report 2014 (English UK, London), 2014. We estimate that an additional 70,000 students studied at the other 89 establishments accredited by Accreditation UK that received the survey.
[29] See: www.englishuk.com/en/students/your-study-options/types-of-accredited-courses
[30] English UK, Student Statistics Report 2014 (English UK, London), 2014
[31] Data for private sector English UK member centres in 2014. In this report we use 'Europe' to mean those countries that are members of the European Union plus Iceland, Liechtenstein, Norway and Switzerland.

Exhibit 16: Top ten countries for English language students at private sector English UK member centres by share of total number of student visitors, 2014 (per cent)



Sources: English UK and Capital Economics

The majority of students study in the south of England, and in particular the London and South East regions, which together account for 59.6 per cent of students at private sector English language centres. Along with the South West, these regions have the greatest density of students relative to the region's population. The density is greatest in London, with an average of 1.8 student visitors each week for every 1,000 of population, and smallest in the North East with just 0.1 student visitors each week per 1,000 of population. (See Exhibit 17.)

Our survey results suggest that students spent £737 million on English language centres in 2014. This covered their tuition fees and in some cases their accommodation costs as well. However, their contribution stretches further than this by meeting living costs such as food and leisure, spending on study-related books and travel, and in some cases accommodation not provided through the centres.

Some of this spending will go to families across the county who provide homestay accommodation for students. Letting out a spare room to students can make an important contribution to a household's finances. The 'Rent a Room relief' currently allows individuals who rent out a room in their main residence to earn up to £4,250 per year tax free. This will rise to £7,500 per year from April 2016.[32]

Based on the centres' understanding of their students' activities, we estimate that the average student spends in the order of £150 every week in addition to the fees and payments to their centres. This suggests English language students spent £453 million outside of the centres in 2014 or £693 each on average for a typical length of stay of 4.6 weeks, or £1,121 for students from outside of Europe who stay on average for 7.4 weeks.[33]

[32] HM Treasury, Summer Budget 2015 (HM Treasury, London), 2015

[33] This includes their spending on accommodation not provided through the centres.

5. Students' contribution to the economy

5.2 Impact of students' spending

The spending of students outside of the language centres will stimulate economic activity in the same way as that of the centres employees' spending. We estimate that the 650,000 students each year spend around £450 million on goods and services annually, supporting almost 9,000 jobs and over £380 million of gross value added.

The regional impact of consumer spending largely mirrors the distribution of English language teaching activity across the country. The majority of the jobs supported are in the retail sector, with 5,330 retail jobs supported in the United Kingdom. (See Exhibit 18 and Exhibit 19.)

Exhibit 18: Induced effects of the spending by English language teaching students by region, 2014

	GVA	Jobs	Turnover
	£ millions	Number	£ millions
North East	7	150	21
North West	36	830	78
Yorkshire and The Humber	23	510	52
East Midlands	15	340	34
West Midlands	19	400	43
East	28	670	59
London	95	2,270	183
South East	70	1,690	139
South West	48	1,170	95
Wales	11	230	25
Scotland	26	550	60
Northern Ireland	6	120	13
United Kingdom	383	8,950	803

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

Exhibit 19: Induced effects of the spending by English language teaching students by sector, 2014

	GVA £ millions	Jobs Number	Turnover £ millions
Sectors			
Primary activities including energy	6	40	25
Manufacturing	12	220	74
Construction	19	260	48
Services	345	8,440	656
Comprising of:			
Wholesale, retail and other services	158	5,330	276
Transport and storage	58	1,050	132
Financial, business and professional services	87	950	160
Arts entertainment and recreation	6	260	18
Administrative support	20	590	40
Communications	10	130	18
Public services	6	130	11
Total	383	8,950	803

Sources: Capital Economics' analysis of data provided by individual English language teaching centres, the Office for National Statistics' Business Register and Employment Survey and Input-Output Analytical Tables. Note: we have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

5. Students' contribution to the economy

5.3 Fiscal contribution

The students pay taxes and fees to the exchequer. Their contribution doesn't stop there though as they generate tax revenues that wouldn't otherwise be there including:

- Their tuition fees provide employment and pay for the centres' taxes
- Their spending outside the centres generates further tax revenues
- The economic activity stimulated through the supply chain from the centres'
- and their employees' spending lead to additional tax revenues.

Students from outside Europe have to pay for visas to study in the United Kingdom and in some instances pay a healthcare charge as part of their application. (See Exhibit 20.)

We estimate that foreign English language students contributed £39 million in 2014 to the exchequer through these fees, at an average of £195 for each student requiring a visa. (See Exhibit 21.)

Exhibit 20: Visa application costs for students from outside Europe, 2015 (£)

Visa type	Visa application cost	Healthcare charge if applicable	Total cost of application
Tier four (General) student visa	322	150 per year of visa; Where part of year is six months or less, 75 is charged	Minimum of 472
Tier four (Child) student visa	322	150 per year of visa; Where part of year is six months or less, 75 is charged	Minimum of 472
Short term study visa (six months)	85	Pay at point of use	85
Short term study visa (11 months)	162	Pay at point of use	162

Sources: Capital Economics and HM Government. Note: costs are for applications made outside of the United Kingdom.

Exhibit 21: Number of students with visas by visa type and cost, 2014

Visa type	Students with visas (thousands)	Visa application fee (£)	Health surcharge fee (£)	Total cost of application (£)	Total spend (£, millions)
Tier four	27.5	322	150	472	15.3
Student visitor	94.3	85	0	85	8.1
Child visitor	47.6	85	0	85	4.1
Extended student visitor	19.6	162	0 **	162	3.2
Other*	13.0	450	194	644	8.7
Total	202.0				39.4

Sources: Capital Economics. Note * students with other visas include those who are dependants, on 'Tier 1' entrepreneur visas, 'Tier 2' skilled worker visas and 'Tier 5' temporary worker visas.[34] ** It has been announced that students on short-term study visas up to eleven months (previously extended student visitor visas) will have to pay the health surcharge. No date has been set yet for its introduction so we use the current policy for the purposes of our calculations that no charge is applicable.[35]

The students pay value added tax and duties on some of their expenditure other than tuition fees. To understand the type of purchases that the students make, we use the results from a government survey of higher education students themselves in the United Kingdom.[36] Much of their spending is on goods or services, such as food or travel, that do not attract the full value added tax rate in the United Kingdom, if at all.

We estimate that around six per cent of students' expenditure comprises of value added tax, generating revenue for the exchequer of approximately £28 million or around £43 per student visit.[37] (See Exhibit 22 and Exhibit 23.)

Exhibit 22: Share of value added tax in students' expenditure outside the centres, 2014

	Share of weekly expenditure (per cent)	Share of expenditure on goods or services that is on value added tax (per cent)
Food	20.7	0.0
Household goods	3.8	16.7
Insurance and other living costs	0.4	16.7
Personal items	20.2	16.7
Leisure related travel*	17.2	0.0
Leisure	11.9	12.2
Books and equipment	5.0	13.1
Study related travel*	4.3	0.0
Accommodation**	16.5	0.0
Weighted average		6.2

Source: Capital Economics analysis of results in: Department for Business, Innovation and Skills, 'Student Income and Expenditure Survey 2011/12', BIS Research Paper Number 115, 2013. Note: * This analysis does not include duties payable on goods such as alcohol and fuel; ** we have assumed that half of students pay the centres directly for their accommodation and half pay other providers directly.

[34] We assume that the students on 'other' visas are allocated to the various 'Tier 1', 'Tier 2' and 'Tier 5' visas in proportion to the entry clearance visas granted by type in 2014. We calculate a weighted average visa application fee and health surcharge fee using the applicable fees by visa type. See: Home Office, Immigration Statistics (Home Office, London), 2015; www.gov.uk/healthcare-immigration-application/when-you-need-to-pay; and, www.gov.uk/government/uploads/system/uploads/attachment_data/file/419449/fees_table_for_website_2015_03_30.pdf

[35] Home Office, Short-term students version 2.0 (Home Office, London), 2015

[34] Department for Business, Innovation and Skills, 'Student Income and Expenditure Survey 2011/12', BIS Research Paper Number 115, 2013

[35] Note: this is likely to be an underestimate of the total taxes they pay on their expenditure as we do not estimate the value of duties payable on their purchases of goods such as alcohol and fuel.

5. Students' contribution to the economy

Exhibit 23: Average value added tax paid per student visit, 2014

	Value
Students' expenditure on goods and services outside the centres	£452.9 million
Value added tax	£28.0 million
Total duration of students' stay in the United Kingdom each year	3.0 million weeks
Typical duration of student's visit	4.6 weeks
Value added tax per student visit	£43

Source: Capital Economics

The students' expenditure, including tuition fees, generates further tax revenues through the economic activity that it stimulates. We estimate that the jobs and profits supported by the spending of the students generate £85 million for the exchequer through income tax, national insurance and corporation tax. Similarly, the spending of employees of the English language centres supports £28 million in taxation. This is in addition to the £93 million of taxes generated by the direct activities of the centres themselves. (See Chapter 2.) In total the students support tax revenues of around £323 million each year. (See Exhibit 24.)

Exhibit 24: Tax revenues supported by English language tuition in the United Kingdom, 2014

	Tax revenues (£ millions)
Paid by English language centres	93
Generated by spending of centres' on suppliers	49
Generated by spending of centres' employees	28
Visa application fees	39
Value added tax on students' spending outside the centres	28
Generated from the wages and profits supported by students' spending outside the centres	85
Total	323

Source: Capital Economics

English language students are not without cost to the taxpayer, as they use resources through their access to certain public services when they are studying in the United Kingdom, for example police and fire protection. Although students may not use all of these services directly, they are still provided at a cost to the taxpayer. On average, we estimate that international students cost the taxpayer £197 for each visit. There are different ways of thinking about their consumption of public expenditure and we explain our approach below. (See Exhibit 25.)

First, we calculate the cost of public services assuming they were shared equally across the population of the United Kingdom. In 2013/14, the British government spent £686 billion on public services at an average cost of £10,600 per head across the whole population. However, this does not reflect the cost of English language students who don't stay in the country for a full year – on average students study on courses lasting for just 4.6 weeks.[38] If English language students had access to, and used, public services in the same way as the general population, they would consume £929 of taxpayer funded resources each visit.

Second, we adjust for the access to public services that English language students have and for how much they are likely to use them. They won't use all of the public services the government provides. Students from outside Europe enter the United Kingdom on visas allowing them to study, but one of the conditions stipulates that they are not able to gain access to public funds. This prevents these students from claiming a range of income-related benefits, together with housing and homelessness support.

Accordingly, they do not benefit from social protection spending and their cost to the exchequer per student visit for this public service is zero.

Exhibit 25: Estimated fiscal cost of international students, 2014 (£)

	Per capita cost of all public services for the United Kingdom general population, £ per 4.6 week period (which is the average duration of student visit)	Cost of public services accessible by foreign English language students allocated in proportion to likely usage, £ per capita per 4.6 week period (which is the average duration of a student visit)	Estimated additional or incremental cost to the United Kingdom government of provision of public services to foreign English language students, £ per student visit
European Union transactions	7	0	0
Housing and community amenities	15	6	0
Environment protection	15	15	0
Recreation, culture and religion	16	16	0
Public order and safety	41	84	84
Defence	49	49	0
Economic affairs	53	53	28
General public services	95	27	0
Education	122	5	5
Health	175	81	80
Social protection	340	0	0
Total	929	336	197

Source: Capital Economics, HM Treasury and Office for National Statistics

[38] Average course length is the weighted average of both adult and child students in 2014. See English UK, Student Statistics Report 2014 (English UK, London), 2014.

5. Students' contribution to the economy

Although students who are from Europe don't face the same restriction on access to public funds, rules in the United Kingdom exclude students from many benefits irrespective of nationality.[39] In addition, European students have to have sufficient resources not to become a burden on the social assistance system of the United Kingdom during their period of residence.[40] As such, any international student would not add to the government's bill for social protection.

Students are typically quite young and are likely to be less demanding of the National Health Service than the average member of the population. Evidence suggests that the cost of healthcare provision for sixteen to 44 year olds is under half that of the average for the whole population.[41]

There may be some areas where student visitors consume more public resources than the average member of the population. The age profile of students is such that they are more likely to be a victim of, or commit, crimes, placing a larger burden on police resources.[42] In addition, we allocate the cost of running the immigration department to non-United Kingdom nationals.

These effects are outweighed by the students' reduced, or in some cases zero, usage of social protection, health, education and other public services. This puts the cost of public services accessible by foreign English language students allocated in proportion to their likely usage in a 4.6 week period at £336 per capita. It is important to note that this is not what the government actually pays for each additional student.

Third, we estimate the marginal cost to the government of providing public services to foreign English language students studying in the United Kingdom. This is relevant as it reflects the actual incremental amount the government would have to pay for each student visit. The government would not alter its spending plans for many public services, such as environmental protection, defence and housing and community amenities, because of an additional student visitor.

The additional cost is likely to be minimal for other services, such as public order and safety and health, but we conservatively use our adjusted average cost figures as upper bound marginal cost estimates.

We estimate the incremental cost to the exchequer of a foreign student studying on an English language course of typical duration, excluding any fiscal benefits they bring, to be £197. This is materially lower than the £929 average cost of providing services to the general population in a 4.6 week period.

Overall, international students on English language courses generate £318 million of tax revenues for the exchequer and cost £129 million through their use of public services, creating a net positive fiscal benefit of around £189 million, or £291 for the average student visit. (See Exhibit 26.)

Exhibit 26: Net fiscal contribution of English language students, 2014

	Total (£ millions)	Average per student visit (£)
Tax revenues generated	323	494
Less students' consumption of public resources	129	197
Net fiscal contribution	194	297

Sources: Capital Economics

[39] See: www.ukcisa.org.uk/International-Students/Fees--finance/Welfare-benefits/EEA-and-Swiss-students
[40] Great Britain, Immigration (European Economic Area) Regulations 2006. SI 2006/1003 (The Stationary Office, Norwich), 2006
[41] Office of Health Economics, Compendium of Health Statistics: 19th edition (Office of Health Economics, London), 2008
[42] Ministry of Justice, Criminal Justice Statistics, England and Wales 2010 (Ministry of Justice, London), 2011

5.4 Exports

With 99.7 per cent of the students coming from abroad, their spending on tuition fees, visa applications and other goods and services contribute to United Kingdom export revenues.[43] We estimate the total value of exports generated by the English language teaching sector to be £1.2 billion in 2014. Due to the international nature of the students, this represents all net additional income for the United Kingdom.

The money would not be spent in the United Kingdom if it were not for the domestic language teaching sector and there are no displacement effects of activity within the country. (See Exhibit 27.)

Exhibit 27: United Kingdom exports to foreign English language students, 2014

	Exports (£ millions)
Centres' revenues*	737
Spending on goods and services outside the English language centres	453
Visa and healthcare charges	39
Total	1,229

Source: Capital Economics. Note: * this may include accommodation for some students.

[43] Data for origin of students is for private sector English UK members in 2014

6. Post-study impact of English language students

In this section we examine how English language teaching benefits the British economy after the students have completed their courses. We assess the post-study activities of the students and the contribution of the current visa system to this and evaluate the implications of these for the United Kingdom.

The post-study activities of students depend, in part, on whether or not they are from Europe. Students from outside Europe must have a valid visa to study in the United Kingdom. The type of visa they have imposes restrictions on how long they can stay and what they can do in the United Kingdom immediately after their course has ended. (See Exhibit 28.)

Exhibit 28: Visa types for English language students

	Requirements	Permissions	Restrictions	Cost
Short-term study visa	• Study course at an institution that holds sponsor licence under tier four of the points-based system or is accredited by a Home Office-approved body • Have enough money to support yourself and pay for your course - this will vary depending on your circumstances	• Stay in the UK for up to six months to study an English language course	• Study at a state school • Work • Extend the visa • Bring family members • Receive public funds	• £85 for six months
Extended student visitor visa	• Study course at an institution that holds sponsor licence under tier four of the pointsbased system or is accredited by a Home Office-approved body • Have enough money to support yourself and pay for your course - this will vary depending on your	• Stay in the UK for between six and eleven months to study an English language course	• Study at a state school • Work • Extend the visa • Bring family members • Receive public funds	• £162 for eleven months
Tier four student visa	• Offered a place on a course • Speak, read, write and understand English • Have enough money to support yourself and pay for your course - this will vary depending on your circumstances	• Study • Work as a student union sabbatical officer • Apply to extend your stay if at an 'embedded college' • Work - depending on what level your course is and what kind of sponsor you have • Bring dependents	• Receive public funds • Work as a professional sports-person, including a sports coach	• £322 per person • £322 per person for each dependent
Standard visitor visa	• Studying should not be the main reason for the visit • Have enough money to support yourself and pay for your course - this will vary depending on your circumstances	• Study for up to 30 days	• Work • Receive public funds	• £85 per person

Sources: Capital Economics, UK Visas and Immigration and English UK

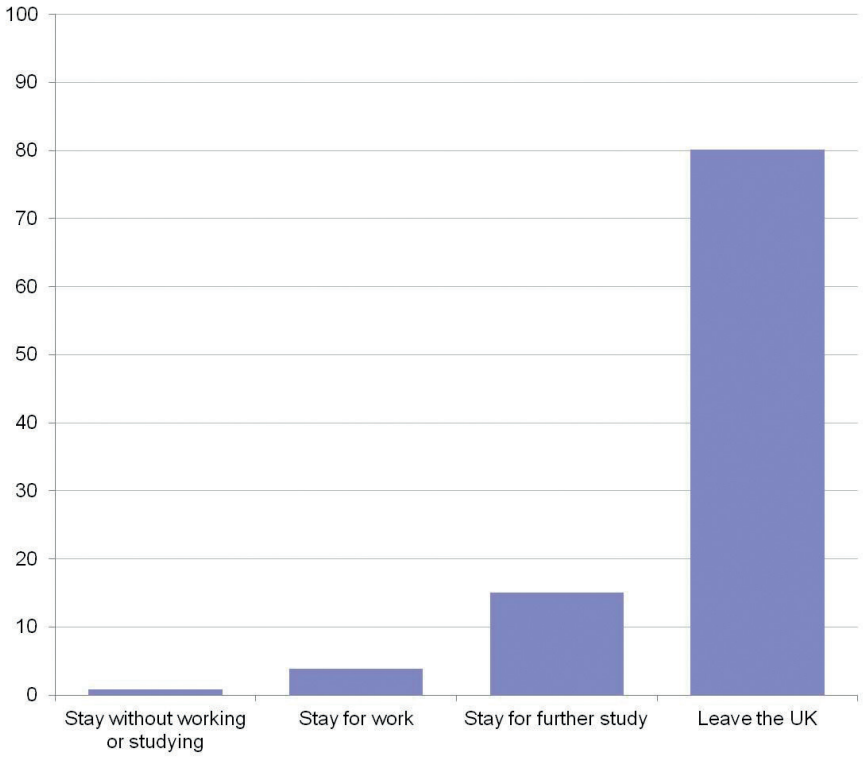
Data provided by English UK show that 45 per cent of students from outside Europe held a short-term study visa in 2014, a further quarter of students came using a child visitor visa, 15 per cent of students had a tier four student visa and the remainder came on other visas. This means that the majority of students from outside of Europe that come to the United Kingdom to study English are not entitled to stay once their course is completed.

A student's decision to stay or leave after their course has finished affects whether they impose additional fiscal costs on the British taxpayer or generate benefits for the economy from inside or outside the United Kingdom.

Our survey results suggest that the majority, some 81 per cent, of international English language students don't stay in the United Kingdom after their course has finished. This is consistent with the findings of other studies.

For example a recent assessment of international university students in London found that 88 per cent returned home immediately following their studies.[44] Meanwhile only four per cent of students go on to work in the United Kingdom, 14 per cent continue to study in the country and less than one per cent remain without working or studying while their visa permits them to. (See Exhibit 29.)

Exhibit 29: Post English language course activity by share of students, 2014 (per cent)



Source: Capital Economics

[44] London First and PricewaterhouseCoopers, London Calling: International students' contribution to Britain's economic growth (LondonFirst, London), 2015

6. Post-study impact of English language students

The majority of students return to their home country, which means that they impose no additional fiscal burden on the United Kingdom. However there could be future benefits for British trade as a result of their experiences studying here. A number of respondents to our survey commented how students often return on holiday or recommend Britain as a place to visit to friends and family. Meanwhile the majority of international students who have studied here are more likely to do business with the United Kingdom in the future.[45]

A 14 per cent share of English language students take up further study in the United Kingdom once they finish their English language course. The tuition provided by the centres helps to support the tertiary education sector in the United Kingdom by increasing the number of international students who attend.

This could either be because they now have the necessary English qualifications to study at universities or that their positive experiences here encourage them to apply. Although our survey results suggest that only 14 per cent of students stay for further study after their course finishes, this doesn't capture those students who return home first and then come back to further their education. Often the terms of their visa will mean they have to leave the country before they can apply to study here again.

The students that continue to live in the United Kingdom to undertake higher education courses will have a positive economic impact.[46]

Domestic full-time students in the United Kingdom typically spend £21,500 on subsistence and course fees in a 39 week academic year.[47] If this is representative of the students who stay on after their English language course for further study, their expenditure could total in the order of £1.9 billion each year.[48] This does not take into account that university fees paid by international students are typically higher and is therefore a cautious estimate.

Studies of international students on higher education courses have found that students do make a positive contribution to the economy. One study has estimated that the overall spending by students and associated visitors from outside the United Kingdom supported £3.5 billion of gross value added in 2011/12,[49] while another has estimated that London's international students bring a net benefit of £2.3 billion per annum to our economy or around £34,100 per student on average.[50]

The proportion of students that stay in the United Kingdom to work is small — only four per cent of students proceed to find employment after their course. But by teaching students the English language, the centres play a role in expanding the potential labour pool for businesses in the United Kingdom and can release the full potential of international workers in the United Kingdom. Highly skilled immigrants can be under-utilised by employers if they aren't proficient speakers of the English language.[51] Improving their English language skills can enhance their economic potential and contribution.

There are a small number of students that aren't known to go directly into further study or employment immediately after their course finished. This group makes up less than one per cent of the total. This is immaterial and their consumption of public services would be outweighed by the net positive contributions of those that work or stay on to study.

[45] London First and PricewaterhouseCoopers, London Calling: International students' contribution to Britain's economic growth (LondonFirst, London), 2015
[46] We do not include these impacts in our headline numbers
[47] See www.nus.org.uk/en/news/press-releases/nus-figures-show-new-students-face-cost-of-living-crisis/. We use the figure for students outside of London and uprate it to 2014 prices.
[48] Our survey results suggest that 14 per cent of students on English language courses or around 90,000 students stay on for further study in the United Kingdom.
[49] Universities UK, The impact of universities on the UK economy (Universities UK, London), 2014
[50] London First and PricewaterhouseCoopers, London Calling: International students' contribution to Britain's economic growth (LondonFirst, London), 2015
[51] Christian Dustmann, Tommaso Frattini and Ian Preston, 'The Effect of Immigration along the Distribution of Wages', Review of Economic Studies, 80(1), 2013

7. Overall impact

In this section, we bring together the overall contribution of English language teaching centres and their students to the United Kingdom economy.

7.1 Overall impact

The English language teaching sector makes a significant contribution to the United Kingdom economy. This includes the money that students bring in to the country to spend on tuition fees and other goods and services, the activities of the centres themselves and the expenditure of their employees.

In 2014, there were 9,300 jobs in English language centres related to the teaching of English to international students, which added nearly £400 million of value to the economy. The centres' spending on suppliers supported more than 5,000 jobs and over £200 million of gross value added. Furthermore, the spending of English language teaching employees on businesses around the country supports over 3,300 British jobs.

International English language students do not only create income for the centres that teach them. In 2014 their spending outside of the centres (on goods and services including food, drink, leisure activities and accommodation) supported nearly 9,000 jobs and £380 million in gross value added to the economy.

In total, the industry's activity supported more than £1.1 billion of value to the United Kingdom economy in 2014, supporting more than 26,500 jobs and generating more than £194 million of net tax revenue for the government. This is 2.6 times more than the number of permanent jobs at the Westfield shopping centre in Stratford or similar to the number of full time equivalent employees working at the Department for Business, Innovation and Skills and Department for Transport combined.[52] On average, each student visit supported the addition of £1,700 of value to the economy or £378 for each week of their stay. (See Exhibit 30 and Exhibit 31.)

Exhibit 30: Components of the contribution of English language teaching to the United Kingdom economy, 2014

	GVA	Jobs	Turnover	Taxes
	£ millions	Number £	£ millions	£ millions
Direct effects from students' spending on English language courses	396	9,300	737	93
Indirect effects from centres' spending on suppliers	216	5,050	530	49
Induced effects from spending of centres' employees	130	3,340	296	28
Induced effects from students' spending*	383	8,950	803	24
Total	1,124	26,650	2,367	194

Source: Capital Economics. Notes: * tax revenues from students spending' includes the estimated value added taxes they pay and their visa application fees. In addition, we net off the students' consumption of public resources so the total shows their overall net fiscal contribution. We have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

[52] We have used data for the number of full time equivalent employees by government department available in the Office for National Statistics' Public Sector Employment, Q2 2015 data tables. See: www.westfieldcorp.com/centre/westfield-stratford-city/ (accessed 6 November 2015).

7. Overall impact

Exhibit 31: Components of the contribution of English language teaching to the United Kingdom economy per week of a student stay, 2014

	GVA	Jobs	Turnover	Taxes
	£	No. per 1,000 student visits	£	£
Direct effects from students' spending on English language courses	133	14	248	31
Indirect effects from centres' spending on suppliers	73	8	178	16
Induced effects from spending of centres' employees	44	5	100	10
Induced effects from students' spending*	129	14	270	8
Total	378	41	795	65

Source: Capital Economics. Notes: * tax revenues from students spending' includes the estimated value added taxes they pay and their visa application fees. In addition, we net off the students' consumption of public resources so the total shows their overall net fiscal contribution. We have rounded our estimate of the number of jobs to the nearest ten. The columns may not sum to the total due to rounding.

The data show that for each of the 9,300 English language teaching jobs, almost two more are supported in the wider economy through both the indirect and induced effects.[53] This is equivalent to 27 jobs for every 1,000 student visits or one job for every 171 student weeks taught.

Unlike most other industries, the income that international English language students generate for the United Kingdom is all net additional export revenue for the United Kingdom. In total, the spending of international students both on language centres and in the wider economy represents over £1.2 billion of export revenue.

On top of the jobs and value added supported through the English language teaching sector, the students that come to the United Kingdom to study provide a net gain to the Exchequer by bringing in more money for the government than they take out through their use of public services. They contribute to and support a number of taxes including the tax they pay when they buy goods or services, the taxes paid by the centres and their employees and students from outside Europe pay fees for their visa.

Overall they contributed a net £194 million to the exchequer through studying here, or £65 for each week a student stays in the United Kingdom.

The value of the sector is not confined to the impacts that we have quantified in this report and there could be future benefits for British trade as a result of the students' experiences studying here. Students often return on holiday or recommend Britain as a place to visit to friends and family and the majority of international students who have studied here are more likely to do business with the United Kingdom in the future.

In addition, students that continue to live in the United Kingdom to undertake higher education courses will have a positive economic impact, generating further export revenues for the British economy.[54]

[53] Multipliers are used to show the additional economic activity supported by a company or industry on top of their direct contribution. Our estimate is a type two multiplier, which includes the effects of students' spending outside of the centres. Type one multipliers cover the indirect effects while type two multipliers also include the impact of the induced effects. Our estimate for the sector's type one jobs multiplier is 1.5; for every ten direct jobs a further five are supported in the economy.
[54] We do not include these impacts in our headline numbers

Appendix: methodology

Distribution of the survey

Our survey was sent to 568 English language teaching centres that are accredited by Accreditation UK – the quality assurance scheme run by English UK and the British Council.[55]

The survey covered a number of key topics:

- The centres' turnover, including the share that is directly attributable to English language teaching courses, the number of permanent and temporary employees, the number of hours these employees typically work and the total wage bill
- The estimated average expenditure of the centres' students per week excluding fees and other expenses paid to the centre
- The post-study activities of English language students, including the share that leave the United Kingdom immediately after their course and those that stay to continue their education or work

The survey was distributed as a web link to fill in via an online form. The information was collected between May and August 2015. The data were collected for 2014.

Survey response rate

Of the full list of centres that were sent the survey, we received 222 responses representing 237 schools, giving an overall response rate of 41.7 per cent.

Supplementary information

In addition, we have been able to extract relevant information from quarterly and annual statistics collected by English UK from its members and by the British Council.

Estimation techniques

We estimate the total number of students who studied at the 568 centres with accreditation from Accreditation UK in 2014 using data provided by English UK and the British Council.

For centres without data from those sources, we estimate the number of students by their revenues from English language teaching from our survey results. We assume that the centres that we have no data for are equivalent to the average of the other centres.

We use detail on the centres' characteristics to scale up our survey results for revenues from English language teaching to estimate an industry total.

Our survey captures the centres' revenues from English language teaching for 27 per cent of the 568 centres with accreditation from Accreditation UK. We estimate the revenue per student week taught, adjusting for the centre's region and whether it operates in the private or state sector, and use these data and the number of student weeks taught for centres which did not respond to the survey to scale up to an industry total.

Our survey captures the centres' total expenditure for 25 per cent of the 568 centres with accreditation from Accreditation UK. We estimate the expenditure of centres for which we had no response by the number of full-time equivalent employees at the centres.

We assume that the proportion of expenditure that relates to English language teaching is equivalent to the share of their total revenues from teaching English as a foreign language.

Indirect effects: impact through the supply chain

To estimate the 'indirect effects' we deployed the Office for National Statistics' input-output tables, which provide data on the linkages between different sectors of the economy.

We use our survey results to estimate the industry's spending on different sectors, which we feed through the input-output tables in an iterative process which allows us to estimate employment and gross value added supported each time the spending is recycled through the supply chain.

Induced effects: impact through employees' spending

Our survey results provide salary costs for 26 per cent of the 568 accredited centres. We estimate the salary bill for other centres by the number of full time equivalent employees, and adjust for the centre's region and whether or not it is private or state sector.

This provides us with a total of salaries paid by the industry. We deduct taxes using the average effective taxation rate for the average wage. We further deduct our assumed savings ratio of five per cent to leave total net consumer spending.

[55] See a full list at: www.britishcouncil.org/education/accreditation/centres. Number of listed centres correct as of 24 August 2015.

Appendix: methodology

We allocate spending to sectors within the standard industrial classification (2007) based on spending patterns taken from the Family Spending Survey, the majority of which goes directly into the retail and services sectors.

This is fed into iterations of the input-output tables to get estimates of the jobs and gross value added supported by the spending of employees as it is recycled through the economy.

Impact of students' spending

The average weekly expenditure of the centres' students, in addition to the fees and expenses they pay the centres directly, was taken from our survey.

We scale this up by the number of student visitors each year and the average duration of stay in the United Kingdom to estimate the total spending by students outside of the centres.

We allocate their spending to sectors within the standard industrial classification (2007) based on spending patterns taken from the student income and expenditure survey 2011 to 2012. We assume that half of the students pay the centres directly for their accommodation and the remaining half pay other providers.

The majority of spending goes directly into the retail and services sectors. This is fed into iterations of the input-output tables to get estimates of the jobs and gross value added supported by the spending of students as it is recycled through the economy.

Fiscal contribution

We estimate the fiscal contribution of the students on English language courses at the centres to the exchequer from several sources and deduct the resources they consume through their use of public services when they stay in the United Kingdom.

First, we estimate the tax revenues paid by the English language centres as a result of their English language tuition. We use our survey results to estimate the average rate of corporation tax paid by private sector centres and apply this to their actual or estimated profits. We assume that state sector centres pay no corporation tax. We estimate business rates using our survey results and adjusting for the region the centre is located in and whether it is private or state sector. Data for corporation tax and business rates were taken from our survey. From our estimate of total salaries, we calculate employer and employee related taxes using the average effective taxation rate for the average wage of employees in the industry as per our survey results.

Second, we estimate the tax revenues generated by the spending of centres on suppliers, the spending of the centres' employees and from the wages and profits supported by the students' spending outside the centres. We assume that businesses pay corporation tax at a rate of 20 per cent on the profits supported and use the average effective taxation rate for the jobs supported.

Third, we estimate the fees paid by students from outside Europe for their visas. We use the fees set out in current government policy and use data from English UK and the British Council to estimate the number of students on different visa types.

Fourth, we estimate the value added tax on students' spending outside the centres. We allocate the students' spending to different products using the results of the Student Income and Expenditure survey 2011/12. We then determine what rate of tax is applicable for that expenditure.

[55] See a full list at: www.britishcouncil.org/education/accreditation/centres. Number of listed centres correct as of 24 August 2015.

englishuk.com

Destination Southend-on-Sea

A Tourism Strategy and destination plan for the Borough of Southend

Draft Version

SOUTHEND TOURISM PARTNERSHIP

Foreword

Southend-on-Sea is one of England's most popular seaside destinations. The world famous pier, seafront attractions and proximity to London has shaped Southend's development over the last century and now welcomes over 6.5M visitors each year.

With a seven mile coastline on offer and an insatiable desire by today's discerning tourists for more, the business community and public sector have come together to set out a vision and action plan for the coming 10 years. By working collectively and sharing a set of goals, and means to achieve them, Southend-on-Sea will keep ahead of the competition during the unchartered financial and social changes we face.

The Southend Tourism Partnership has already pooled great resources and is showing that working together delivers more. There is still much more for us to do however as competition increases and the need to ensure that our message breaks through the noise of the multi-media landscape of destination marketing.

This strategy is aspirational yet will be focused on delivery. Success will require willing participation by stakeholders who value the past but look to the future needs of our visitors and how our economy can be stronger with coordinated tourism activity at its heart.

We are confident of bringing our three coastal community teams closer together to ensure a healthy and prosperous future for all our residents and businesses connected to the tourism agenda.

Southend-on-Sea was built on tourism and this strategy will position the resort for future generations providing jobs, wealth and an attractive place for all to live, work and visit.

Jacqui Dallimore

Chair - Southend Tourism Partnership

Councillor Ann Holland

Executive Councillor for Culture, Tourism and the Economy

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1. Executive Summary
2. Overview
3. Vision
4. Key Themes/ Objectives
5. Benchmark
6. Monitoring & Evaluation
7. 2017 Destination Action Plan

1. Executive Summary

This strategic plan sets out a vision for the visitor economy across the Borough of Southend on Sea over the next 10 years 2017-27.

The aims of the strategy are to provide joint direction to the private, public and third sector for a united ambition to become England's leading coastal tourism destination and to develop the visitor economy prosperously for the whole Borough to benefit from.

It is developed in consultation with key partners already established across the Borough and in particular The Southend Tourism Partnership, The Leigh Coastal Community Team, The Southend Business Improvement District, The Shoeburyness Coastal Community Team, The Southend Business Partnership and Southend Borough Council.

The strategy is jointly owned by various relevant groups in Southend and is for the town's overall prosperity to reach its potential through the social and economic development, recognising the key role that tourism has played and will continue to play in future years to the area. The Borough Council will play a leading role in facilitating and enabling many areas and in particular have significant responsibility in public realm and infrastructure, but the action plan is for all partners to contribute towards and is not intended as a Council only document, rather a joint vision with broad participation from multiple partners. It should help provide confidence to existing tourism businesses and potential investors that the tourism, cultural, creative and leisure sector in Southend is a ripe location for growth.

The action plan shows practical steps towards delivery covering a range of cross cutting themes and shows how the strategic aspirations will be reached. The strategy is not setting out to tackle every issue but will focus of 5 key themes that are pivotal to success.

The document's action plan will be live and updated annually charting progress towards the ambitions incorporating contributions and additions from partners. An annual tourism conference facilitated by the Southend Tourism Partnership will present the strategy and action plan updates each year to provide accountability to stakeholders and ensure a progressive trajectory.

Tourism is one of several key sectors in Borough and has a special place in shaping the town's past. The traditional tourist day visitor offer remains firmly part of the Central Southend offer and will be added to for future visitors. Significant investment by the public and private sector in recent years have developed firm foundations for a stronger and broader tourism offer that supports jobs, prosperity and communities throughout the borough.

A series of metrics such as volume and value studies and consumer research information are identified to measure progress and an initial benchmarking status will present data to baseline the destination's status. In this way our progress and successes can be captured and reviewed along with identifying any areas that may need re-focusing to respond to fast changing macro economic issues.

2. Overview

Southend On Sea is a unitary borough serving 180,000 residents in South Essex. Boasting nine railway stations, an international airport and the world's longest pleasure Pier, the area is one of England's favourite tourist destinations and is on a continuing journey of regeneration and growth. The largest urban area in Essex is also a strategic site for economic growth and a cultural centre of excellence featuring significantly in the Local Enterprise Partnership's (SELEP) growth deal priorities on a number of key projects.

Southend's economy is mixed with approx. 6,000 businesses many of which are small and medium sized enterprises. Tourism is one of the key employment sectors supporting around 7,000 jobs. The developing local plan and Central Area Action Plan identify ambitions to continue to support a thriving visitor economy into the future.

3. Vision - To be England's Number One Coastal Destination

Southend-on-Sea will deliver excellence for visitors and our aim is to be the number one Coastal destination in the country. A range of SMART (Specific, measurable, achievable, realistic and timed) objectives over the lifetime of the journey of this strategy are set out to monitor success and validate the claim.

Southend's tourism offer has been growing over recent years with the emergence and development of new hotels, leisure offer and a burgeoning creative and cultural sector. Visitor numbers have been rising and associated spend increasing in line with the ambitions of the previous business and tourism strategy.

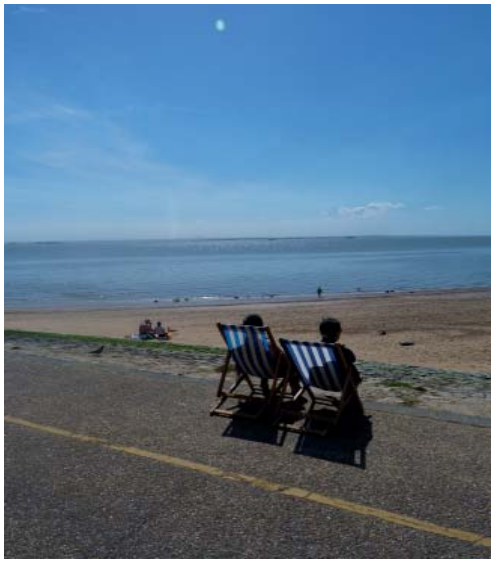
The attraction and demand of Southend as a visitor destination has remained high during good weather periods and development of an increasing events programme to attract out of season visitors has had success. Recent examples led by the Business Improvement District such as fireworks displays and Christmas shopping the areas ability to perform strongly outside the summer period. An eclectic range of cultural events and exhibitions have brought people from further afield to try Southend for new reasons and this strength will be developed further to increase the value of the visitors coming to the area.

The core tourism proposition requires good infrastructure to support the business community whilst developing new products to keep the customer excited and engaged with the offer. By 2027 Southend central seafront will boast a new nationally renown visitor attraction telling the story of the Thames - the river that built the world. Internationally significant stories of HMS London, and the Prittlewell Prince Saxon finds will be presented in stories that light up the imagination and bring the past to life. This year-round attraction will be complemented by a resurgent Pier boasting an excellent visitor offer and experience befitting the longest pleasure pier in the world.

The whole Borough will be alive with cultural experiences and the visitor welcome will be second to none with an offer to support longer stays needing overnight accommodation.

Tourism will be regarded as a proud sector to work in and relevant skills will support the local economy with new, high quality accommodation on offer.

The Borough will be smart enabled with digital technology at its forefront helping visitors find their every need, efficiently.



Measures of success by 2027:

- Destination benchmark survey of 95% or higher
- Growth of volume and value of tourism ahead of national average
- Double numbers of staying visitors

4. Key Themes/ Objectives

Whilst there are multiple projects that impact upon the tourism sector across Southend, five key themes will feature as necessary components for success of this strategy.

i) Communications & Marketing

External communication

By 2027 the external communication and marketing of Southend's tourism offer will be streamlined to provide a coherent and targeted message to segmented consumer groups. A single delivery team will coordinate the activity across a range of partnerships and agendas recognising the collective value of encouraging visitors to the wider local economy.

The annual destination plan will include events and tactical opportunities planned in advance and used to reinforce messages of the offer being a year-round destination resort that needs more than one day to enjoy.

The day visitor market will continue to be reached through marketing channels reminding consumers of the offer at key times and in advance of major events and new developments.

Connecting the wider offer across the Borough and beyond will help position a 'resort' wide approach spreading the value and impact of tourism. Key propositions however such as the beaches, Pier, Adventure Island, nightlife will always factor strongly in messages as these have high consumer recall and resonance.

Linking retail, tourism, culture and the wider area's benefits will develop the two key strategic messages that will significantly improve that value of tourism - attracting visitors to stay longer and to lengthen the season.

Southend residents

The significance of visiting friends and relatives in the mix of the visitor economy needs to be reflected in the communication strategy. Whilst the focus is to increase economic impact from tourists from outside the area, a clear means for all residents to be reached with targeted 'what's on' information and an understanding of the visitor offer will be in place. Social media links will reach at least 50% of households in the borough by 2027.

With 180,000 residents Southend offers a sustainable year-round destination able to support a varied cultural offer unlike many smaller coastal towns. Maximising the year round programme to grow off peak audiences will be communicated to targeted markets.

Trade communications

The travel trade and group operators will have quarterly updates and Southend will feature in tour programmes from operators in the south East of England.

Southend will work with appropriate partners such as visit Essex to maximise trade communications and build an Essex-wide profile that includes the Southend offer at its heart.

Within the tourism sector in Southend and wider Essex, a monthly newsletter of forthcoming events activities and highlights will increase awareness and enable businesses capable of reaching wider consumer groups through their own promotional routes.

ii) Infrastructure - Getting here and moving around by 2027

Road

Pre arrival information provided on the VisitSouthend website will help ensure visitors have the information needed to plan their stay. Partners across Southend will provide clear information on their own promotional material to assist with the best way to reach their particular destination. Partnership working between the Business Improvement District and the Council will ensure accurate and useful information is provided.

Variable Message System communication and smart city technology will communicate with mobile devices when in the borough so that drivers can be assisted to the optimum routes and find parking locations quickly.

Clear signage will help drivers to find all areas and optimum parking routes efficiently whether seeking the central seafront, blue flag beaches at Shoeburyness and Thorpe Bay or Leigh.

Investment already made in road improvements help to improve access to the central seafront at peak times will be supplemented by park and ride options development and traffic management arrangements to ensure as efficient a journey as possible is achieved.

Council investment planned in 2017/18/19 will have secured additional parking provision in the central area of Southend.

Public parking will be clearly signposted with long stay and short stay locations with pricing tariffs to match expectations and competitive with other destinations of similar demand. Parking provision will have been reviewed and refreshed through a comprehensive parking strategy to address needs of the visitor economy and to support the growth agenda.

Coaches will be welcomed in Southend with dedicated parking facilities away from the central area but with ample drop off and pick up points at the key seafront and popular locations. Coach operators will be able to make short break tours as part of their programme providing coach groups with itineraries to match needs including history, activities, seaside fun, theatre etc. These overnight packages will enhance the value of tourism from this sector from the traditional day visitors only. Coach group itineraries will be prepared to assist organisers with finding new ways to explore the wider Borough throughout the year.

Disabled groups will be welcomed on our beaches with dedicated facilities at City Beach, Three Shells beach and its lagoon and at Thorpe Bay (Tram Stop shelter). Mobi-chairs supported by Southend Dial will be in place. Disabled drop off bays on City Beach will assist at this busy location where also ramp access to the beach and disabled toilet facilities ensure a welcome for all.

Public transport

Rail partners on both routes to Southend will be key to providing promotional and marketing messages of the destination. They will add value to the travel planning by visitors to the area and moving them around with minimal impact on the road network. A modern fleet of trains running on a reliable network will make travel by train an easy choice. Rail operators will play a key and regular part of the Tourism Partnership.

Promotional offers to reach Southend outside of the peak will deliver our strategic objectives of extending the season throughout the year. Ticket deals will develop to

enable good value ticket prices that provide for visitors to stop overnight.

Smart ticketing and inter-operability between bus and rail operators will enable visitors to easily select public transport as a preference with both ease of access and value for money.

Moving visitors around the borough by rail and also by linking in the cycle network will add to sustainable models of enjoying the area and reduce the impact on road network

Bus operators across the borough will be engaged with the Tourism Partnership to link travel promotion and provide options for residents and visitors to explore the area. Cycling will also be promoted to visitors as a way to explore the wider borough once here.

Staying for a short break in Southend using public transport will be made easy with ticketing options allowing overnight visits.

Sea

Southend Pier will be a gateway for visiting ships and craft providing access by water in an increasingly congested national road network. Leisure arrivals and links to London by water will be a premium and relaxing way to access the visitor offer at Southend.

Further work towards a Southend Marina will be developing, adding significant value from the private yacht market to the local economy supporting associated supply chain sector.

Leigh on Sea's ability to welcome visiting yachts will be well known and the Council's recent investment in the areas infrastructure and wharves will attract regular visitors. The North Thames Fisheries Local Action Group (NTFLAG) supporting a thriving port at Leigh-on-Sea will link to cultural and tourism projects to boost the local economy.

Air

Passengers passing through London Southend Airport (LSA) will understand that they are not just at an international transport hub but are entering a destination in its own right.

Whether recognising the opportunity for a future visit to Southend by domestic travellers heading abroad or capturing the interest of inbound tourists to visit the area in future, the Airport will present Southend's visitor offer linking messages to key attractions and joint brand values. The brands will connect to create stand-out positioning for both the airport and the resort of Southend to reinforce the synergies and quality of offer.

European city locations served by the airportwill be familiar with the Southend proposition and touch down space for any businesses seeking trade with London and the UK market will be promoted.

Digital

Visitors to Southend will experience free wifi across key sections of the destination. Use of our destination app will help visitors to be fully aware of the benefits in the Borough pre-arrival and once on site with the ability to pre book hotels, meals and attractions, cultural experiences and even parking. Digital tourism is Southend will support the increased awareness of the wider offer.

Data from mobile devices will be tracked and enable onward communication with visitors through the borough's network due to be installed in 2017.

Big Data will be understood and used to acquire more 'like minded' visitors.

Technology through the smart city agenda will allow targeted management of bins, movement of traffic and people and link to messaging of the variable message system across the borough to manage traffic and signalling.

iii) Destination Development

The attraction of Southend as a visitor destination with its natural seaside offer and traditional attractions for family fun will continue to inspire day trips from the local catchment and London. Continued investment in the core seaside offer in the public realm will support tourism businesses and attract day and longer staying consumer markets. Awareness of a broader and higher quality offer across the whole 'resort' area will inspire visitors to stay longer and attract those from further afield.

Southend Pier by 2027 will be welcoming 1 million visitors per year with a renewed offer at the shore. An improved transport offer will allow easy access to the Pier Head and a range of leisure options there will enable longer visits and enjoyment. The Pier offer will include a mix of retail and entertainment utilising interactive technology to enhance the visitor offer and link with other attractions across the town and in particular the Cliff Lift, conservation area and new seafront visitor attraction (Thames Estuary Experience). This will ensure that visitors understand there is more than they can possibly do in one day encouraging longer staying visits. Improved access, additional facilities and more covered areas on the Pier will provide year round attraction opportunities along with an event programme to maintain interest by new markets. The Borough Council invests significant funds to ensure that the Pier infrastructure remains fit for purpose.

The Pier Museum will be promoted and linked more closely to the Pier offer making a seamless experience for the visitor.

Retail and the town centre environment will be transformed to be recognised regionally as a great place for events led entertainment and therefore high footfall. Consumer trends are constantly changing with 'Digital High Streets' evolving, providing interaction and omni-channel options, whether it's store, online, TV and any new technologies appearing on the horizon. Therefore town centres cannot rely on retail alone. High Streets will have to become meeting places once more, where education, leisure, health and housing meets local needs.

Southend town centre has already started to put good building blocks in place with community functions, such as libraries, art galleries, education, health centres and leisure activities as part of the current offer with multi million pound investment from the Council and academic sectors. It recognises the need to be more inclusive and build strong communities, improving the infrastructure to reflect future changes and enable good connectivity. The success of the Business Improvement District, (Southend BID) trading since April 2013, has allowed businesses and the local authority to work together to improve the local economy and deliver additional services.

These evolutionary challenges will continue to be met with good leadership and partnership working between local authority, business, academic sector and community groups to safeguard everyone's needs. The High Street environment will be developed to provide more opportunities for dwell time and improved public realm with particular focus on new paving scheme to enhance the offer

The London Road end of Southend High Street will be transformed to incorporate planting and improved spaces with provision for the development of a changing market space to encourage a diverse and eclectic offer. Other retail areas in the borough similarly will develop their offer to remain vibrant and offering a complementary visitor offer.

City Beach has demonstrated significant improvements to the enjoyment of the central seafront area in particular the fountains have helped increase visitor stays and added to the local economy by providing water play at all states of the tide.

The new **lagoon** opened in 2016 and saw yet further opportunities for to increase dwell time at the sea front. In 2017 the associated new toilet block will open and there will be improved landscaping and public space adding more capacity for visitors to enjoy this part of the seafront.

Plans to develop **City Beach** phase 2 will focus on the space west of the Pier lagoon and provide outstanding public realm for this part of the seafront currently under-developed. Progress towards developing west will make a well-planned link to the new Thames Estuary Experience in the cliffs which also provides a year-round offer to visitors from the wider region. The internationally relevant stories of The Thames Estuary, HMS London and Saxon England will be presented in an exciting and interactive format in this new attraction on the Seafront.

Adventure Island is the largest single attraction in the area drawing in vast numbers of visitors to the town in its own right. The brand recognition, investment and customer base has supported continuing growth and the owners' desire for improving the offer gives confidence to the wider seafront community. The Tourism Partnership and Council will work closely with Stockvale and meet regularly to identify opportunities and develop the extension of the season.

Sealife Adventure also owned by Stockvale offers a year round attraction for residents and visitors and continues to refresh its appeal to welcome new and repeat visitors. Expansion of the offer in 2017 to include new features have shown the centre's appetite to inspire more visitors. Links with the University of Essex and marine biology also add to a high value skills mix within the sector.

Southend's museums and planetarium operated by the Council will link more closely to the visitor offer providing a continuing mix of reasons to visit Southend throughout the year. Increased awareness of the events taking place that bring history to life along with improved awareness of the exhibition programme through the links to the local business community will give visitors diverse options to enjoy Southend whatever the weather. Itineraries for visitors arriving as groups or individuals will be available via web based applications and experiencing historic venues such as Prittlewll Priory and Southchurch Hall will be strongly promoted as part of the offer. The developing programme for a new Thames Estuary attraction on the seafront will link the wider museums offer encouraging longer stays and increased dwell time.

Seaway multiplex cinema development will add a year-round leisure offer in the central seafront adding footfall opportunities pre and post film screenings for the tourism businesses on the seafront. This additional feature will provide an enviable year round attraction supporting longer dwell times for visitors and residents in this location throughout the year.

Hotel development in Southend will be supported to increase the value of tourist visits and offer more choices for visitors, Boutique independent hotels and national brands will facilitate year round business tourism and conferences. A focus on attracting conference delegates to Southend to enhance the value of tourism and broaden the seasonal offer will be established through the tourism partnership network.

The **Roslin Beach Hotel** will be a 5 star venue providing the best quality assured accommodation in Essex.

Thorpe Bay's excellent water conditions will be complemented by continued accreditation by the coastal awards and blue flags or equivalent standards.

Southend United FC will have developed a new ground offering facilities for top quality football along with a wider destination led retail / leisure offer including conference facilities attracting new and year round visitor facilities supporting business tourism and the wider destination.

Casinos, Theatres and night life Southend's night time offer will provide considerable draw for visitors to need to stay overnight. The casinos will have continued to diversify their appeal into the wider leisure offer. Investment in the theatres will have ensured they are prepared for the long term providing both major regional theatre shows attracting audiences from overseas as well as the regional catchment.

Essex University and South Essex College campus in the central area will link to the tourism sector for skills development. A tourism degree will be established for study via UoE's business school and will provide high quality practical experience for students in addition to post-graduate employment opportunities. Students from UoE Edge Hotel school will help develop projects and programmes for tourism in the area and International conferences tailored to destination management will be a regular feature on the annual calendar of events.

Nature and wider offer the leisure, open spaces, nature reserves and parks will be linked together with the existing cluster of offers in the Borough to create a haven for the nature lover making experiential breaks to discover enjoy the 'discovery coast' linking to work with the county partnership's - (visit-Essex) key theme.

Leigh-on-Sea and **Shoeburyness**

This tourism strategy includes clear actions and references to both Shoeburyness and Leigh-on-Sea as destinations in their own right but part of the overarching Borough of Southend-on-Sea. Both contribute to the diversity of offer for visitors and help to widen the tourist experience and economic impact. What is good for the local economy and tourism sector in Leigh and Shoeburyness will add value for the whole economy and tourism sector in Southend.

Leigh-on-Sea is relatively affluent and has a good local economic mix and sense of place that appeals to locals and visitors alike. It is a visitor destination in its own right. This is based on the appeal of Old Leigh as an active fishing port and historic centre, quality independent shops offer and thriving hospitality sector. However it is important for all partners to reflect on the potential challenges that this successful economic mix faces – threats to the very survival of the port and the fishing industry, higher rents for small businesses, need for start-up space etc. The emergence of the NTFLAG in Leigh-on-Sea offers a chance to properly analyse the challenges to the port and the industry, and to provide insight into how tourism is related to these cornerstones of the area's cultural identity. More work probably needs to take place on developing the heritage offer of the area (including interpretation).

Shoeburyness's offer for visitors is less well defined than that of Leigh's. There is a clear need to promote the area better both to incoming visitors and local communities. Gunners Park is becoming more popular as a destination, and investment in the Garrison has helped to preserve the unique heritage of the area as well as supporting the local economy. What is lacking is a sense of a destination point for visitors, communities and schools, and this is something that the Shoeburyness CCT has been focusing on through the efforts to progress the Cart & Wagon Shed into a Heritage Centre. Potential impact from improved heritage interpretation of the military and more ancient heritage of the area will be developed during the lifetime of this strategy and actions towards this are referenced in the

section of this strategy. The development of new facilities and events can have on the local economy is being explored currently through the Government funded Community Economic Development (CED) programme through the Shoeburyness CCT and Cultural Engine.

Below we explore some of the key issues relevant to a Borough Wide Tourism strategy covered in the Economic Plans for Leigh-on-Sea and Shoeburyness CCTs.

Shoeburyness CCT Economic Plan

'The Vision' for Shoeburyness is that the area is promoted and recognised as a Coastal Park with a range of quality natural, cultural and heritage assets, with thriving local businesses and resilient local economy, excellent transport links and community facilities.

The Vision of Shoeburyness will ensure that the area contributes to the overall offer that the whole Borough of Southend has for visitors and residents.

The Economic Plan recognises that developing the offer for visitors to Shoeburyness is an important driver for the local economy, and the wider Southend economy. The Vision, centered around a coastal 'Country Park' concept builds on previous work relevant to regeneration.

- Southend Regeneration Framework 2007-2021: This document recognised the 'country park' concept and how this fed into supporting local economic resilience and an 'exemplar village centre'
- South Essex Greengrid: Shoeburyness, and Gunners Park in particular, recognised as a 'strategic destination' with excellent views across the Estuary
- Urban Habitats and Three Rivers Trail: EU Interreg IVA project that recognised Shoeburyness as an important destination with a wealth of green space and strong coastal identity.

The Shoeburyness CCT has six Key Themes. Those most relevant to the Tourism Strategy are listed below:

- Key Theme 1: Develop the Coastal Park Brand and Destination Management Plan
- Key Theme 2: Develop the Heritage and Cultural Offer and Interpretation
- Key Theme 3: Enhancements to Green and Open Spaces
- Key Theme 5: Develop a strategic approach to Transport

The projects to emerge from the Themes are obviously related to developing the Cart & Wagon Shed as the key publically owned heritage and cultural asset that is right at the heart of the visitor area (Gunners Park near the Garrison with easy access to estuary views and not far from East Beach). The Cart & Wagon Shed can become an initial hub for activity relating to heritage interpretation and education for example.

Improving and promoting the wider green space offer of Shoeburyness (as well as the beaches) is also important to a rounded visitor offer, and understanding how important it is to promote travel by train and bicycle to Shoeburyness is also important. The area also has many car parks which are relatively under-utilised compared to Southend's central sites at peak times.

To develop the Carriage & Wagon Shed the Shoeburyness CCT has supported the establishment of a new not-for-profit company – Shoebury Coastal CIC – with a remit to develop the business plan and wider interpretation strategy for the area, lease the building from Southend Council and work with all partners to secure the funding needed to get the building open for heritage interpretation, archives, community facilities, education space and a café/food offer. Shoebury Coastal CIC creates new capacity for supporting tourism strategies and taking on projects in the area.

The Poppies Wave installation by 14-18Now on Barge Pier at Gunners Park provided a significant interest in the heritage of the area, and volunteer and visitor numbers during this project has shown what can be developed for a tourism destination at this site. This will be delivered in partnership during 2017 and will provide a solid opportunity to explore further initiatives in the area.

Essex Wildlife Trust are an important partner at Shoeburyness for the CCT and for tourism as they manage significant areas of Gunners Park and the nature reserve, and they will also take responsibility for a number of the heritage buildings at Gunners Park.

Leigh-on-Sea Economic Plan

'A thriving local area which celebrates its long fishing and maritime heritage, recognising the primary importance of the port and fisheries industries to the cultural, economic and environmental vibrancy of Leigh. A strong and resilient local economy with an excellent offer for visitors, residents and business.'

The Leigh-on-Sea Economic Plan has identified 6 Objectives, all of which relate to the Borough Wide Tourism Strategy

Objective 1: Ensure the future sustainability of Old Leigh as an active Fishing Port

Objective 2: Enhance the cultural and heritage offer of Leigh-on-Sea

Objective 3: Local business initiatives and support the local economic resilience of Leigh

Objective 4: Ensure that Leigh has the highest quality open spaces and public realm and community facilities

Objective 5: Produce a Destination Management Plan and promotion of local offer to visitors

Objective 6: Work with partners to achieve a coherent approach to transport to support the local economy

Unlike Shoeburyness, there are a number of different formally constituted organisations in Leigh that play a key role taking forward the above Objectives. These include Leigh Town Council, Leigh Society, Leigh Port Partnership, Leigh Maritime CIC and fishing/cockling representative groups. All are represented on the CCT.

The emergence of the North Thames Fishing Local Action Group (FLAG) that is largely focused on Leigh is an opportunity to secure the future of the port and the fishing industry, and this therefore is directly relevant to tourism in the area. The FLAG does have a focus on Culture & Heritage, although the majority of funding is likely to go on feasibility work on infrastructure challenges, as well as on marketing and promotion of the fishing catch (Leigh Cockles in particular). This is therefore also very relevant to tourism (local produce, local distinctiveness).

A new Leigh Heritage Centre to improve / update the offer for visitors and develop a digital town trail concept to encourage people to explore the area was part of a recent funding bid and remains a priority.

v) Make Southend Sparkle

Southend will offer a high quality, service led welcome across all touchpoints and customer service arenas.

A programme of support for the industry will be in place to provide a consistent approach to customer service. Taxi drivers, public transport and hospitality sector workforce will all be aware of the Southend tourism product and confident of talking about and helping their customers find what they need.

Visitors will be welcomed by trained customer focused volunteers at multiple locations such as the high street, parks, museums, public spaces and transport hubs.

Travel and tourism graduates, course leaders and students at the campus will work with the tourism sector to link skills development to the local economy. Southend will be renowned for its friendly welcome and the nature of engagement with visitors.

A welcome programme based on the 'Raving Fans' model where our customers and visitors are provided with such outstanding service across the destination that perceptions of visiting Southend are exceptional.

iv) Events and cultural tourism

An eclectic events programme throughout the year will bring new audiences to experience the Southend-on-Sea offer.

Well managed and safe major events will continue to be facilitated in appropriate key locations using the breadth of the borough's offer and spreading the economic impact across the year. The seafront's unique selling points will be the focus for many events such as fireworks displays and regatta's etc. Organisers will be directed to ensure the seafront remains open for business and that events need to support the economy.

Southend's National Portfolio Organisations recognised by the Arts Council - Focal Point Gallery and METAL - will spearhead cultural activity to inspire participation and deliver an inclusive and wide ranging programme. They will ensure that the programme of events are edgy, fun and engaging and attract significant media coverage to challenge historic perceptions of the area. Other gallery spaces will host exhibitions to enliven the offer and encourage repeat visits.

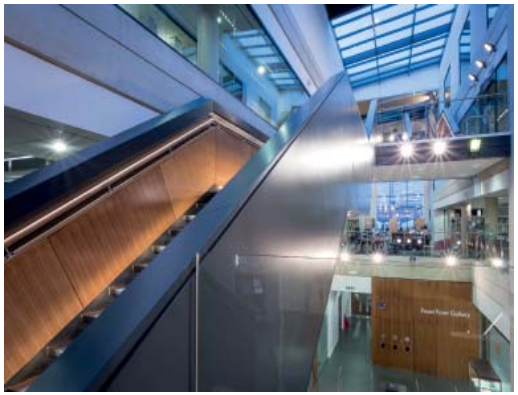
Cultural tourism visits will be making an increased impact within the mix of visitors choosing Southend, which itself will be as recognised as the East of England's cultural capital.

External cultural organisations will recognise the massive benefit of the strong cluster of creative businesses thriving in the area and the support network that they offer.

Galleries, museums and venues will be alive with performance to bring exhibitions to life and animate the experience. Dwell times as a result will be high ensuring consumers are able to stay longer, spending more. Southend will be recognised for its cultural assets far beyond its own resident population.

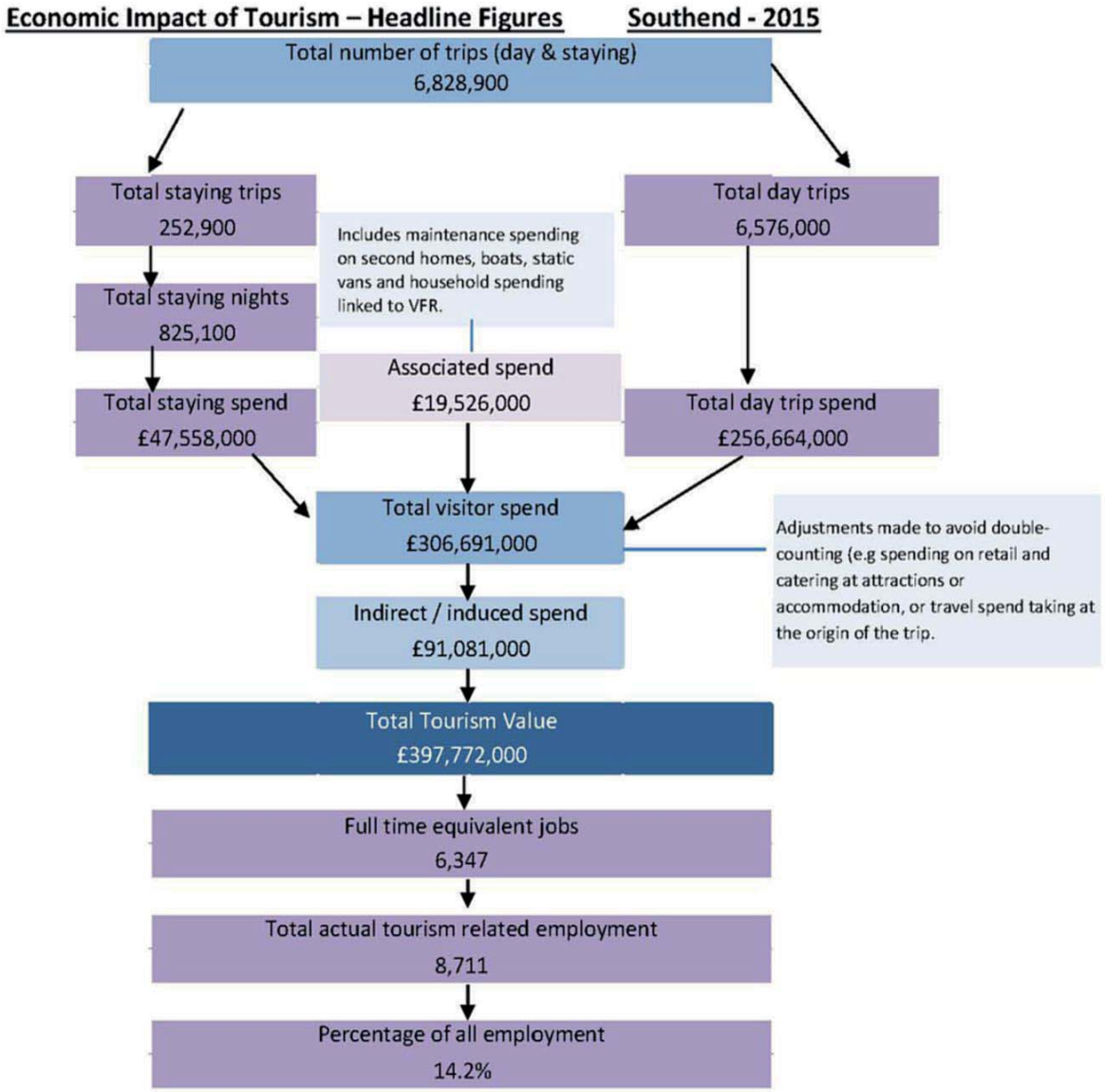
The High Street offer will target increased footfall through an exciting range of markets and events to maintain continued relevance to changing shopper behaviours.

Public Parks and the foreshore will provide venues for visitors to enjoy outdoor activities to enrich their lives. Visiting friends and relatives will be presented with Southend's open spaces by proud residents. The open spaces will be professionally managed, cleaned to a high standard and operate a volunteer programme to ensure collective ownership by the community.



5. Benchmark

Southend's visitor offer was benchmarked with an industry standard qualitative destination review in the summer of 2016. Whilst this is only a single measure and a snapshot of a particular time it acts as a useful starting point in determining progress during the life of the strategy of how the destination 'feels' to a visitor. There are also statistics available from 2015 outlining the volume and value of tourism to the economy to use as the base information as shown below.



	Accommodation	Shopping	Food & Drink	Attractions	Travel	Total
UK Tourists	£10,085,000	£3,825,000	£8,102,000	£3,141,000	£6,572,000	£31,725,000
Overseas Tourists	£4,178,000	£4,569,000	£3,611,000	£1,852,000	£1,622,000	£15,832,000
Total Staying	£14,263,000	£3,394,000	£11,713,000	£4,993,000	£8,194,000	£47,557,000
Total Staying %	30%	18%	25%	10%	17%	100%
Total Day Visitors	£0	£92,738,000	£104,045,000	£25,431,000	£34,449,000	£256,663,000
Total Day Visitors	0%	36%	41%	10%	13%	100%
Total 2015	**£14,263,000**	**£101,132,000**	**£115,758,000**	**£30,424,000**	**£42,643,000**	**£304,220,000**
%	**5%**	**33%**	**38%**	**10%**	**14%**	**100%**
Comparision	**£13,823,000**	**£96,862,000**	**£110,965,000**	**£29,096,000**	**£40,866,000**	**£291,612,000**
Difference	**3%**	**4%**	**4%**	**5%**	**4%**	**4%**

Destination review scores based on visits in summer 2016.

Aspect	High Street	Seafront
General	88%	87%
Market	91%	N/A
Toilets	50%	75%
Retail and Catering	86%	85%
Information Provision	N/A	64%
Overall Score	**79%**	**78%**

Aspect	Museums
	88%
Arrival	91%
Sold Experience	50%
Facilities	86%
Pre-visit	N/A
Overall Score	**79%**

6. Monitoring and evaluation

Monitoring the success of the strategy should take place against a set of performance indicators. The table below shows a range of objectives and indicators to reflect progress over time.

Objectives	Key Tasks	Monitoring	Target
Objective 1: increase the volume and value of tourism and jobs supported by tourism activity.	Attract more domestic and overseas staying visitors	Number of visits by domestic and overseas residents	Improve from 4% to 8% by 2027
	Improve productivity of the local tourism economy (business turnover)	Total value of tourism	6% growth annually
	Increase the employment in tourism and tourism related businesses (direct and indirect employment)	Tourism related jobs (direct and indirect)	3% growth annually
	Visitor counts at key attractions (incl. cultural sites managed by SBC)	Visitor counts	4% growth annually
Objective 2: To raise the profile of Southend-on-Sea as a visitor destination	Performance of destination website	Unique visitors and dwell time	Increase unique website visitors each year
	Social media presence (twitter followers, Facebook likes, etc.)	Count	Increase social media followers and interaction
Objective 3: Enhance quality and distinctiveness of the tourism product	Number new accommodation bedrooms	Undertake / update hotel capacity analysis	created 500 new bedspaces by 2027
	Number of establishments with Trip Advisor Certificate of Excellence	Count	increase annually
	Number of green flags / purple flag accreditation and scores	Count	Maintain current standard
	Number of national accredited beaches	Count of beaches	Increase to Four Blug flags

Objectives	Key Tasks	Monitoring	Target
Objective 4: Improve levels of awareness and satisfaction	Mystery shopper and destination appeal	Undertake regular destination wide survey of visitors	improve visitor satisfaction levels from 79% to 95%
	Visitors - understanding motivations, barriers, needs and expectations among current visitors	British Destinations membership	Top ranking for key indicators among similar type destinations
New Products: performance benchmarking	Develop theme packages to reach new consumers on experience based breaks	Product development itineraries, sales and feedback	10 new itineraries ,1000 new visitors (short break)

7. 2017 Destination Action Plan

Within the five themes of this strategy an annual action plan will highlight activity to deliver the overarching objectives. These actions are summarised below.

Theme 1 – Communications and marketing

Joined up 'place making' communication programme for 2017 – events guide, destination guide to be published

Further integration of visit southend platforms with Southend BID leading – reducing websites

Events guide co-ordinated in partnership with the Southend BID and Council will be distributed to high footfall collection points and replicated on visit-southend.

Tourism organisations will add their own content to ensure that the web events programme is up to date and populated effectively.

Visit Southend brand marketing material will be prominently displayed at Airport in a campaign

Visit Southend and partner facebook sites will use seasonal 'films' produced in 2016 to promote the destination.

Monthly e-newsletter of events to tourism stakeholders will be sent out

Door-drop communication of all Southend households with key events

PR messages and themes to be issued each month targeting new audiences
Londen aan zee exhibition to take place in Groningen

Attend excursions exhibition to promote destination to the group / coach offer.

Promotional activity with bus operators to link non-car explanation of the area

Promotional plan with both rail companies to highlight Southend offer and arrival by train

Tourism conference and networking event for stakeholders to be delivered UofE hospitality students to review Southend marketing activity with recommendations fed back to Southend Tourism Partnership.

Understanding brand essence in partnership with EU funded visit Essex project to enable better communications programme in future years.

Theme 2 infrastructure

Roads – Investment of £5M at Kent Elms improve traffic flows on A127 access road - SBC

Council parking strategy and visitor access management plan will be completed informing improved options for access to Southend car parks and tourism offer

Council budget to include feasibility on new central area parking options
Rail – widget for booking tickets added to visit southend – SBC / Greater Anglia

Train rolling stock improvements to both lines underway C2C / Greater Anglia

New Coach park offer and drop off / pick up points to be developed

Theme 3 Destination development

Pier pavilion technical design work to be commissioned (SBC)

Pier Shelters, decking and toilet programme to be delivered (SBC)

Pier entrance to be enhanced, rickshaw offer and pier craft units introduced. (SBC)

New shelter on City Beach seafront to be installed (SBC)

New gallery space to be developed at Pier Arches (SBC)

Thames Estuary Experience (new museum) design review to be completed and preparation for gateway review (SBC)

Jazz centre to be developed at Beecroft basement level and plans for next stage to be presented. JCUK/SBC)

Seaway development planning application (Turnstone)

Develop Carriage and Wagon Shed for visitor / heritage centre (Shoebury CIC)

New boutique hotel to open

Roslin Hotel preparations for 5 star accreditation

New meerkat, otter and penguin attraction at Sealife Adventure
Dashboard understanding of destination (Visit Essex – EU funded)

Brand essence research – (visit Essex EU funded_

Theme 4 Make Southend Sparkle

Customer service training plan (raving fans) to be developed –

Volunteer programme implemented with Poppies exhibition (SBC)

Develop existing volunteering programme to welcome visitors – Council museums (SBC)

Engage college lecturers with student project to involve in DMO activity (UofE SEC / SBC)

Establish customer service project with Hospitality post graduates at Edge (UoE)

Theme v Events

Cultural artport exhibition (FPG / AIRPORT)

New event – Festival of two wheels (BID/ SBC / KIWI)

New food festival based event (Carnival)

Alternative City of culture programme and associated events delivered (Sir David Amess & Team)

Radical Essex programme delivered (FPG)

125 Anniversary / 100 years of Priory events to be delivered (SBC/ METAL)

Poppies Wave commemoration to be delivered (SBC)

New Jazz festival development (JCUK)

New open air cinema screening (Pinewood / ACC17)

2018 indicative Action plan

Improvement of The Bell junction of £5M to improve access to Southend A127. (SBC)

Implementation of additional central parking provision (SBC £5M over 2 years)

Exhibition / promotional activity with the network of overseas routes developed through Southend Airport. (LSA)

Enhancement of Greater Anglia rolling stock implementation.
Tourism degree course students in first year (Uof E)

'Estuary 18' festival delivered to highlight the developing Thames Experience programme (METAL)

407

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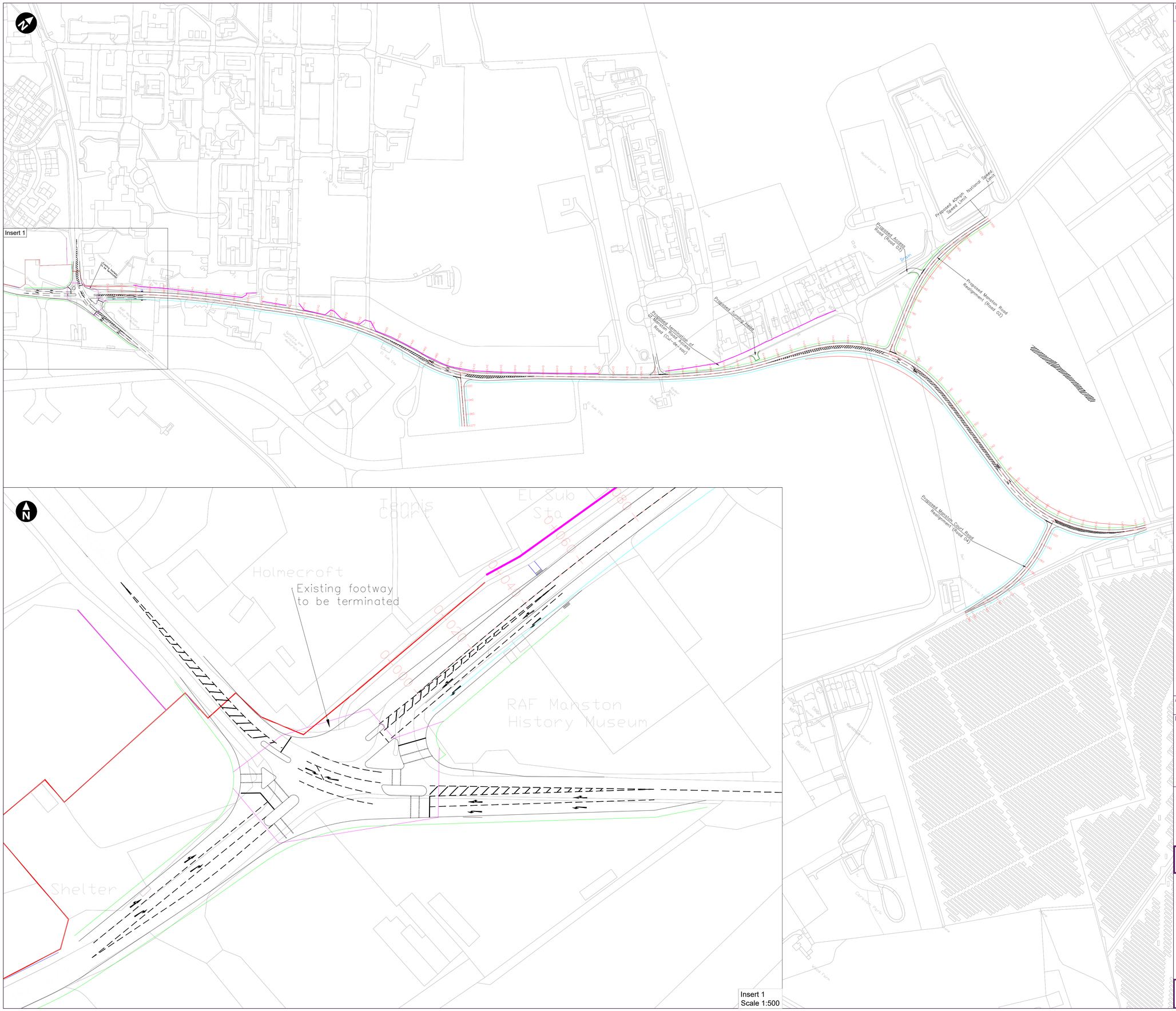
Appendix Tr.2.6

Date of 1st Issue	Description	Drawn by	Checked by
21/02/2019	FIRST ISSUE	FORDL	COUPB

Notes:
1. All dimensions are in metres unless otherwise noted.
2. This drawing is not to be used for construction.



A1 SCALE
1:2500

Drawing Title
Manston Airport DCO
Transport Addendum - Appendi□H
Proposed Link Road indicative corridor and
Spitfire Way / Manston Road Signalised Junction Design

Client
RSP

Drawing Status
FOR DISCUSSION

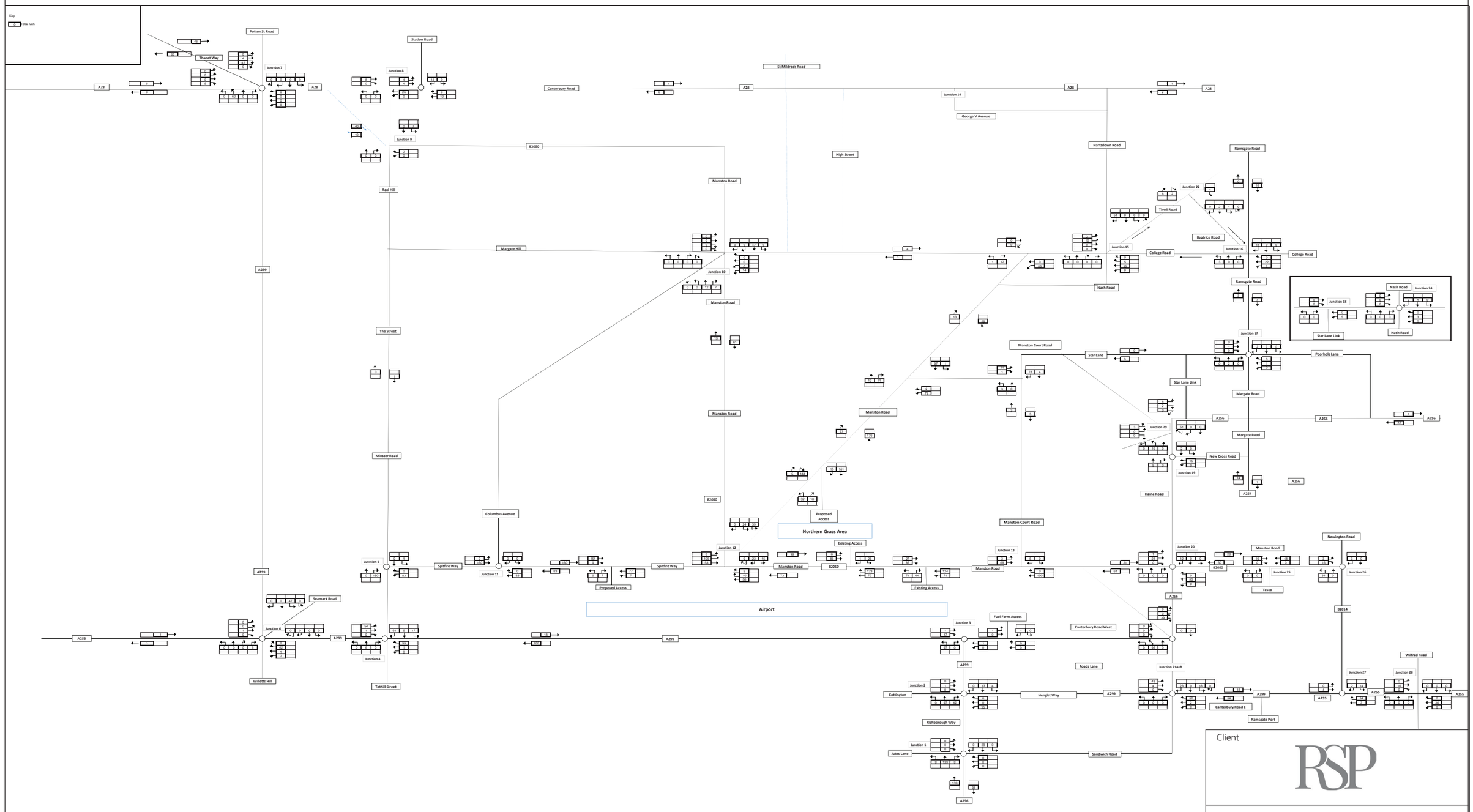
LEAMINGTON SPA
GABLES HOUSE, KENILWORTH
ROAD, LEAMINGTON SPA,
WARWICKSHIRE CV32 6JX
01926 439000

wood.

Drawing Number
40820- Lon01□a

Revision
A

Appendix Tr.2.11



Client

RSP

Manston Airport DCO
Transport Assessment Addendum
Appendix F

Figure TR2.11.1
Select Link Analysis – Strategic Model – Manston Development Traffic Flow (AM)

April 2019

wood.

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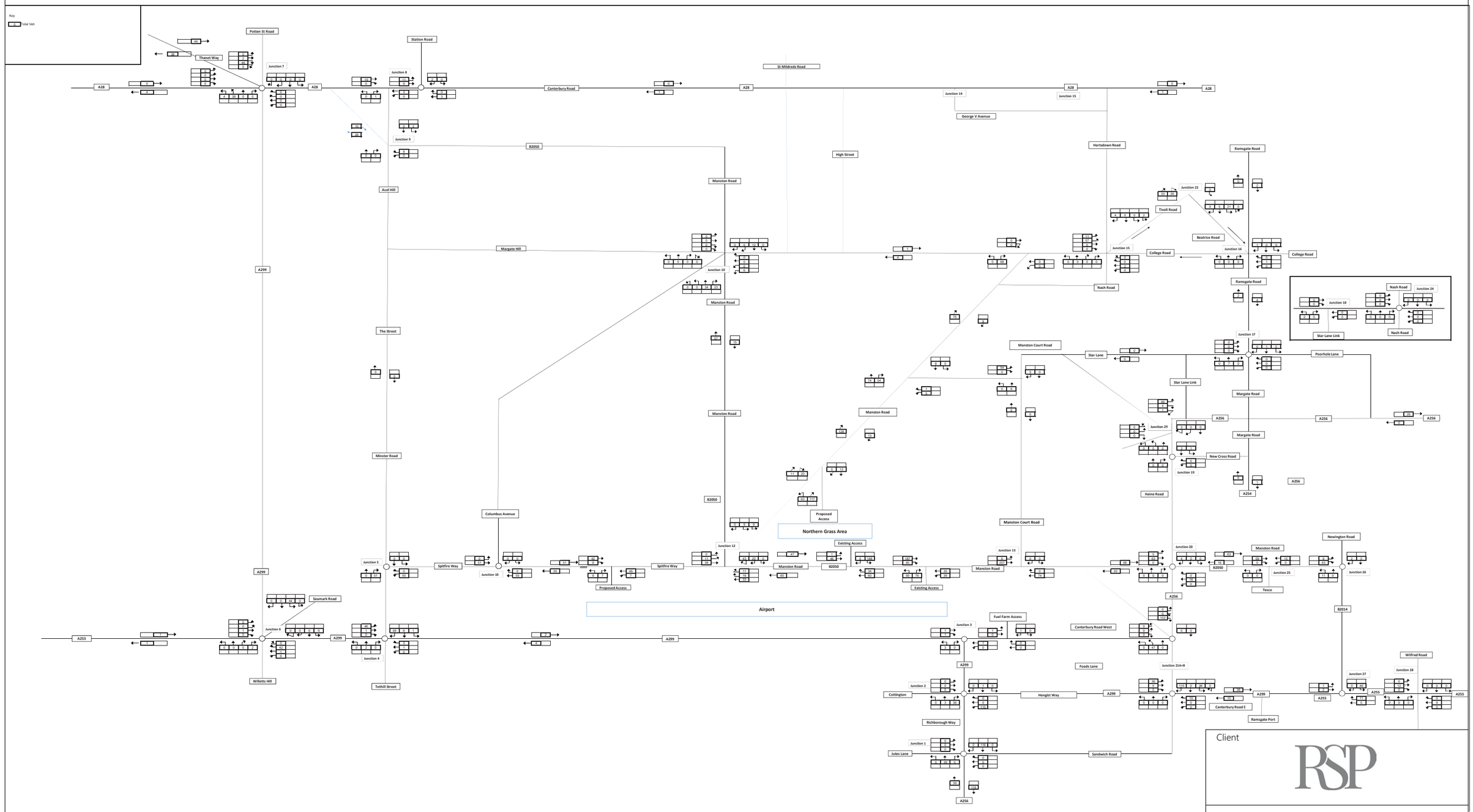

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RSP

Manston Airport DCO
Transport Assessment Addendum
Appendix F

Figure TR2.11.2
Select Link Analysis – Strategic Model – Manston Development Traffic Flow (PM)

April 2019

wood.

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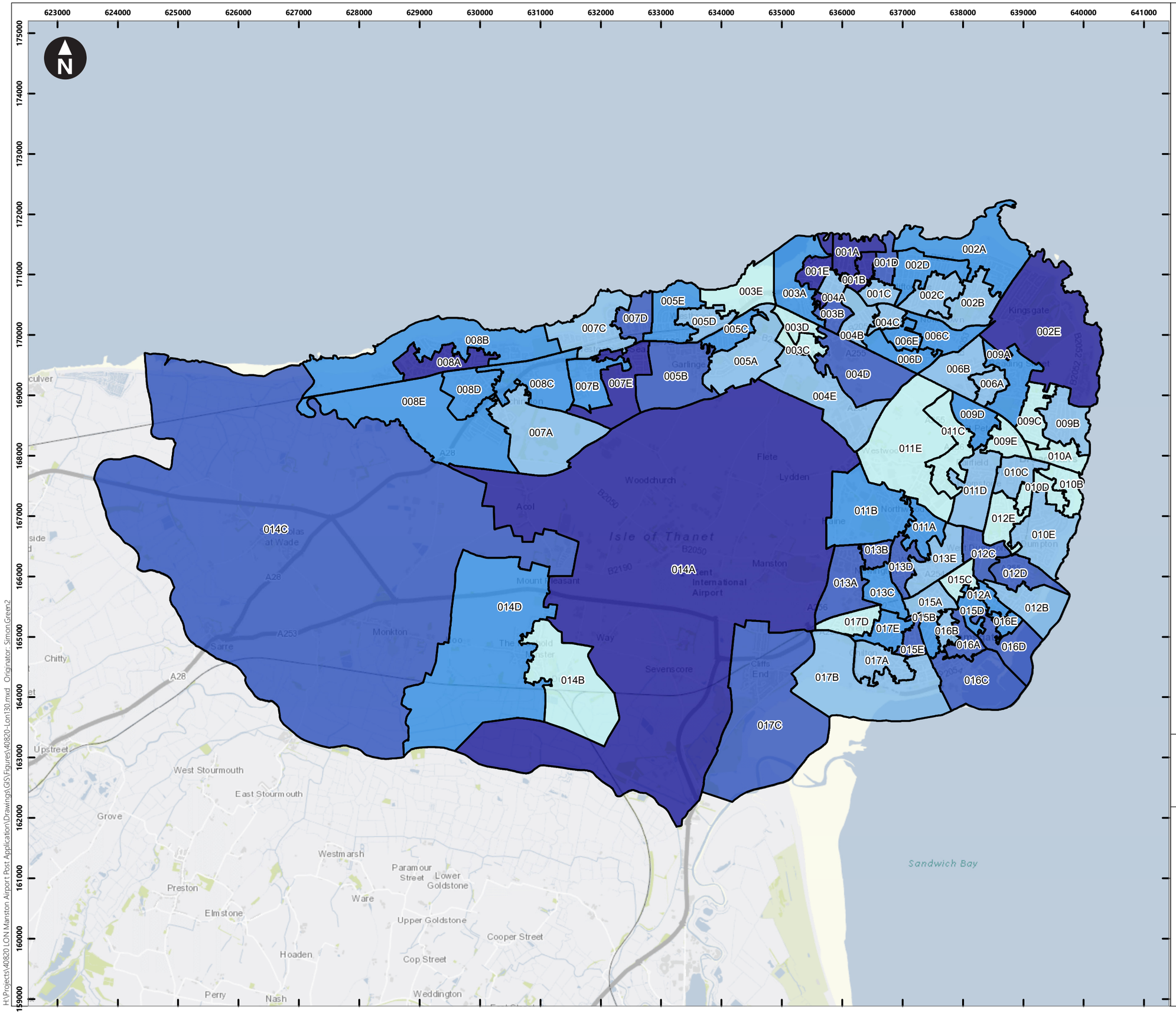
Appendix Tr.2.22



Key

Population (2011)

- 1100 - 1400
- 1400 - 1550
- 1550 - 1700
- 1700 - 1900
- 1900 - 2300

0 500 1,000 1,500 2,000 2,500 3,000 m

Scale at A3: 1:60,000

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Client

RSP

Manston Airport DCO

Figure TR2.22.1
Output Areas (Thanet)

April 2019

wood.

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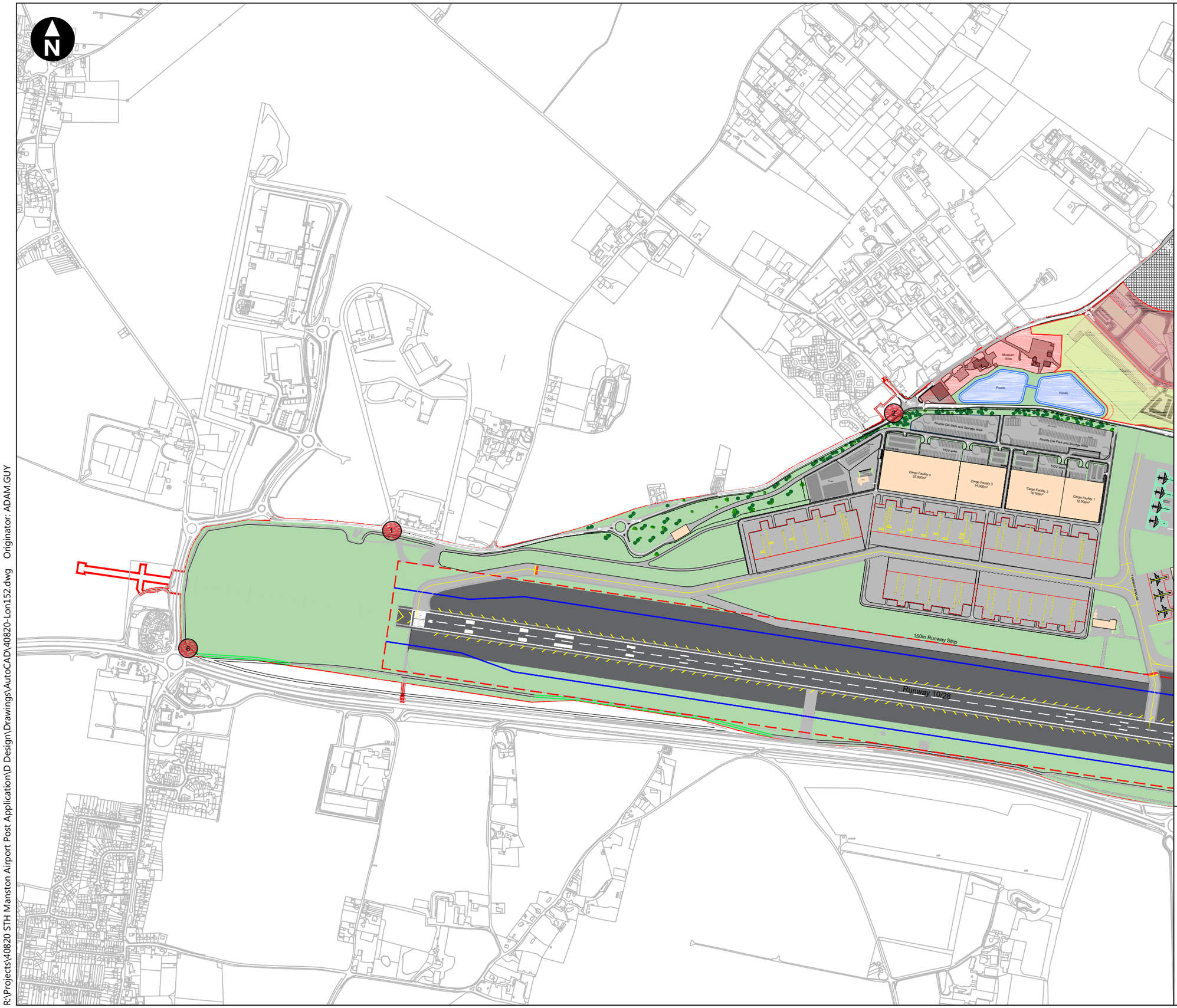
Appendix Tr.2.47



Key

1 Proposed emergency access location

0 m 500 m

Scale 1:10,000 @ A3

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Manston Airport DCO

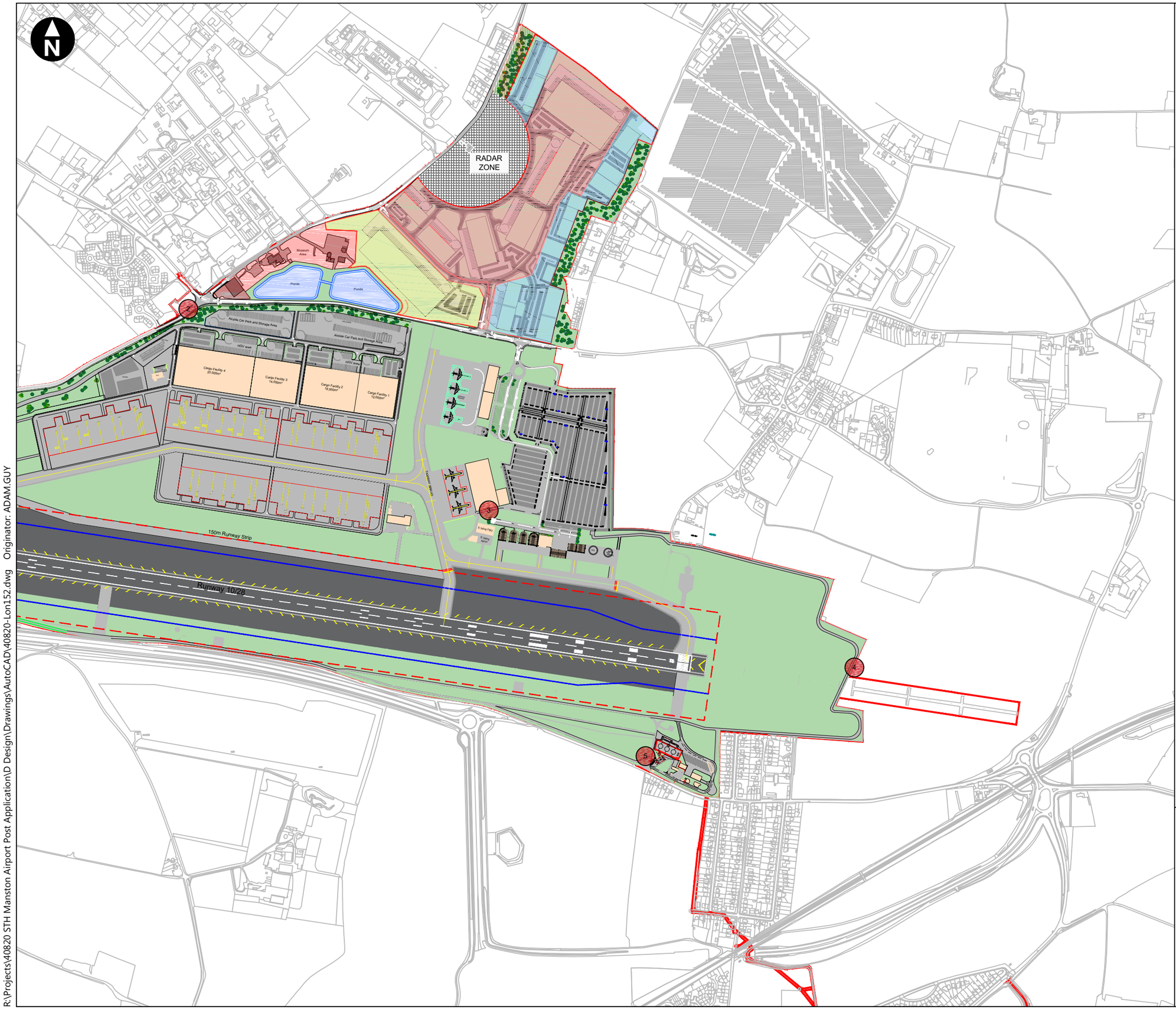
Figure TR2.47 - Proposed emergency Access Locations

Sheet 1

May 2019

wood.

R:\Projects\40820 STH Manston Airport Post Application\D Design\Drawings\AutoCAD\40820-Lon152.dwg Originator: ADAM.GUY



Key

1 Proposed emergency access location

0 m 500 m

Scale 1:10,000 @ A3

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Manston Airport DCO

Figure TR2.47 - Proposed Emergency Access Locations

Sheet 2

May 2019

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Appendix Tr.2.69

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2039+Dev(Link+Sig)	AM	Dedicated left turn from Manston Road (W)	ONE HOUR	07:45	09:15	15	✓
D2	2039+Dev(Link+Sig)	PM	Dedicated left turn from Manston Road (W)	ONE HOUR	16:45	18:15	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2039+Dev(Link+Sig), AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (min)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	0.17	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	A256 (N)	
2	Manston Road (E)	
3	A256 (S)	
4	Manston Road (W)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	7.30	8.30	5.9	30.0	60.0	18.0	
2	3.70	7.10	12.8	20.0	60.0	20.0	
3	3.70	7.10	12.7	20.0	60.0	13.0	
4	3.70	7.10	7.9	50.0	60.0	17.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.719	2548
2	0.572	1736
3	0.586	1775
4	0.571	1670

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2039+Dev(Link+Sig)	AM	Dedicated left turn from Manston Road (W)	ONE HOUR	07:45	09:15	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.54	0.06	1.2	A	958	1437
2	0.54	0.11	1.2	A	530	796
3	0.12	0.07	0.1	A	90	135
4	0.90	0.37	7.8	C	1120	1681

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	786	196	379	2252	0.349	784	719	0.0	0.5	0.041	A
2	435	109	658	1356	0.321	433	506	0.0	0.5	0.065	A
3	74	18	980	1187	0.062	74	111	0.0	0.1	0.054	A
4	919	230	184	1549	0.593	913	869	0.0	1.4	0.094	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	939	235	454	2198	0.427	938	860	0.5	0.7	0.048	A
2	520	130	787	1281	0.406	519	605	0.5	0.7	0.079	A
3	88	22	1173	1074	0.082	88	133	0.1	0.1	0.061	A
4	1098	274	221	1528	0.718	1094	1040	1.4	2.5	0.137	A

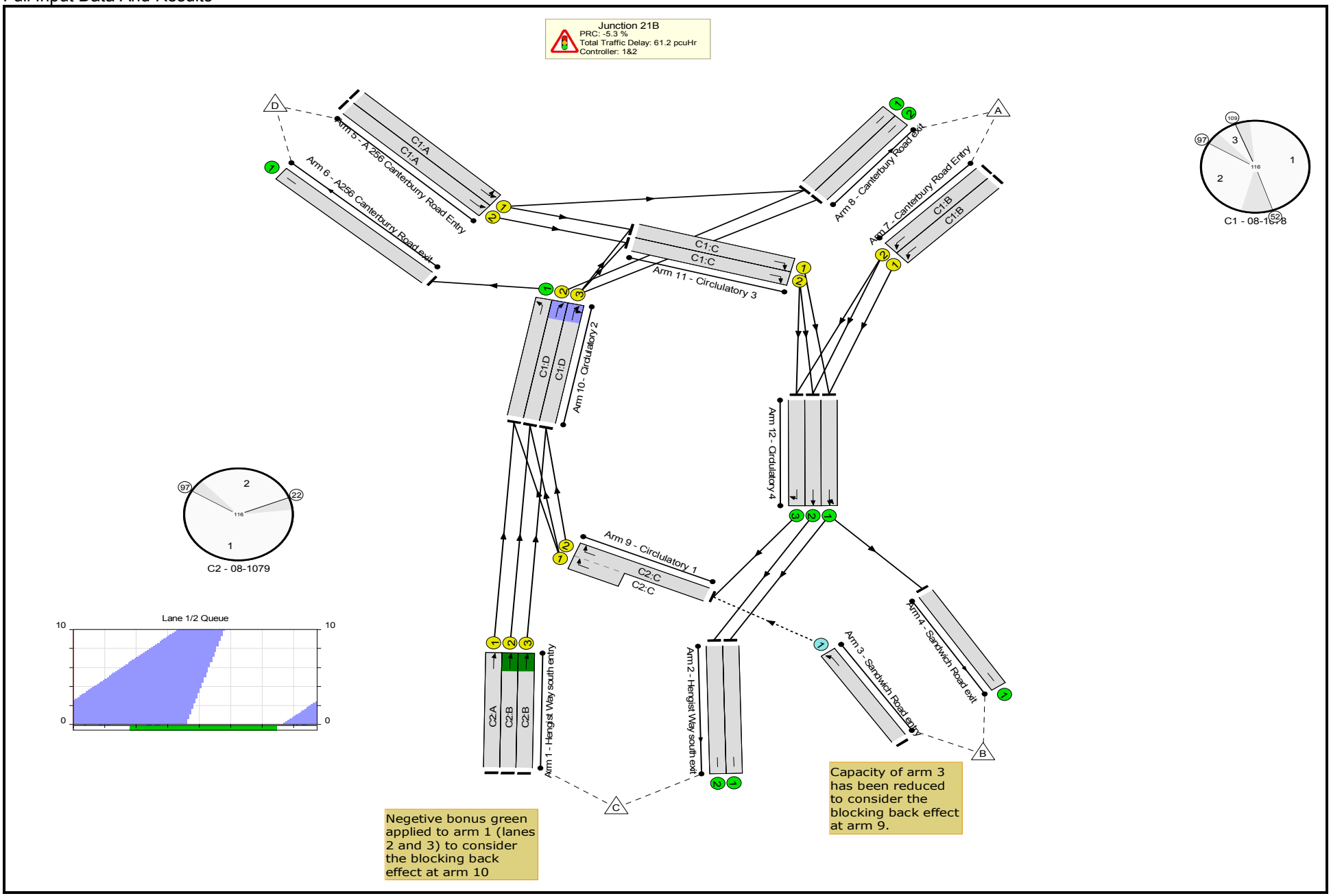
17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	1149	287	551	2129	0.540	1148	1045	0.7	1.2	0.061	A
2	636	159	963	1179	0.540	634	736	0.7	1.2	0.110	A
3	108	27	1435	921	0.117	108	162	0.1	0.1	0.074	A
4	1344	336	270	1500	0.896	1326	1273	2.5	7.2	0.314	C

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	1149	287	557	2124	0.541	1149	1055	1.2	1.2	0.062	A
2	636	159	964	1178	0.540	636	742	1.2	1.2	0.111	A
3	108	27	1438	920	0.117	108	163	0.1	0.1	0.074	A
4	1344	336	271	1500	0.896	1342	1275	7.2	7.8	0.367	C

Full Input Data And Results



Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - Newington Road north		ONE HOUR	✓	469	100.000
2 - Newington Road south		ONE HOUR	✓	759	100.000
3 - Manston Road		ONE HOUR	✓	671	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	1	331	137
	2 - Newington Road south	419	3	337
	3 - Manston Road	280	391	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	3	4
	2 - Newington Road south	4	0	1
	3 - Manston Road	4	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1 - Newington Road north	0.82	0.50	4.1	D	430	646
2 - Newington Road south	0.85	0.40	5.3	C	696	1045
3 - Manston Road	1.46	15.94	151.3	F	616	924

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	353	88	285	640	0.551	348	516	0.0	1.2	0.202	B
2 - Newington Road south	571	143	102	1015	0.563	566	531	0.0	1.3	0.132	A
3 - Manston Road	505	126	316	582	0.867	485	353	0.0	5.0	0.540	D

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2039 Base	PM	Dedicated left turn from Manston Road (W)	ONE HOUR	16:45	18:15	15	✓

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	min	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

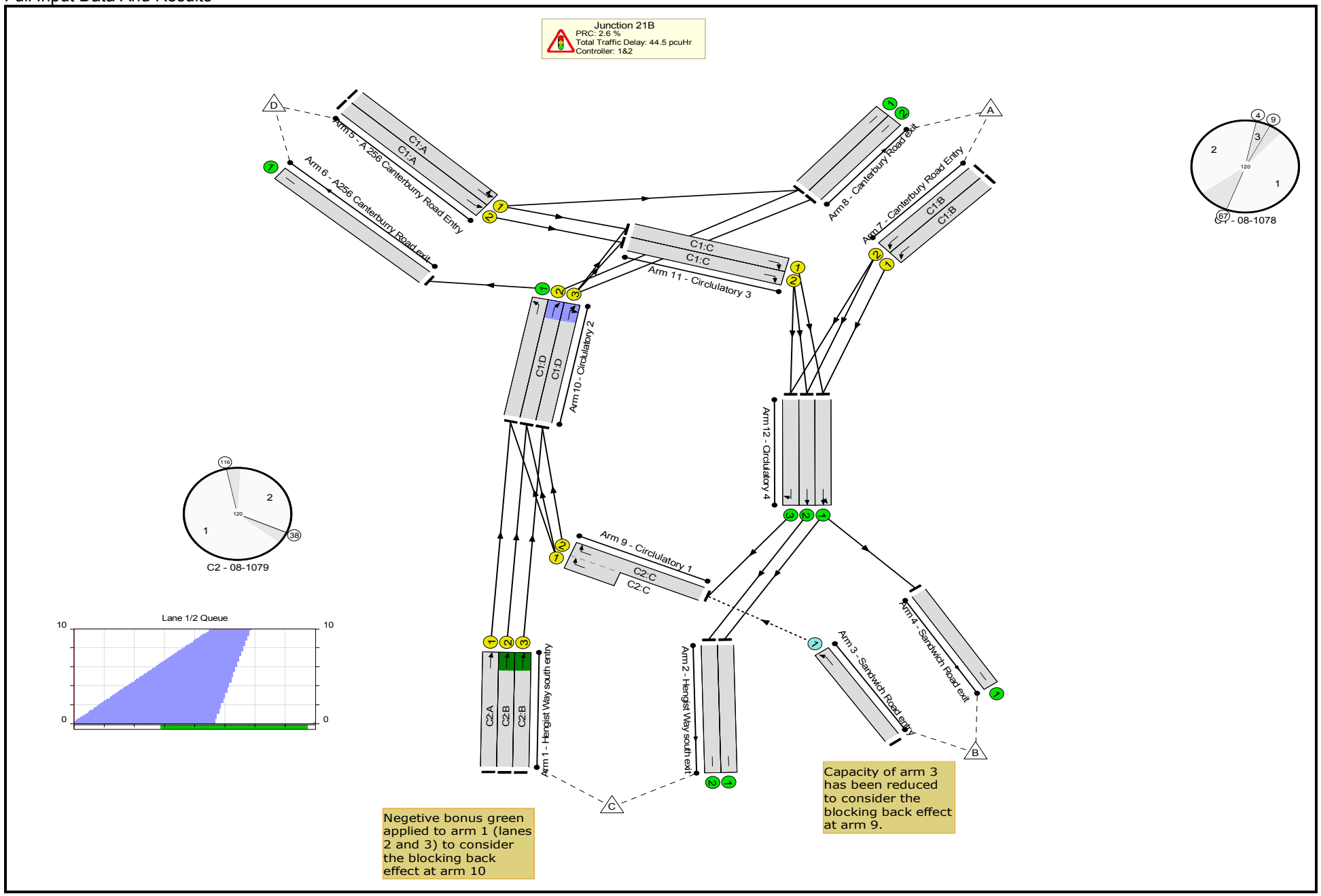
Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2039 Base	PM	ONE HOUR	16:45	18:15	15	✓

Full Input Data And Results



Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - Newington Road north		ONE HOUR	✓	468	100.000
2 - Newington Road south		ONE HOUR	✓	755	100.000
3 - Manston Road		ONE HOUR	✓	678	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	337	131
	2 - Newington Road south	427	0	328
	3 - Manston Road	285	393	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	3	4
	2 - Newington Road south	4	0	1
	3 - Manston Road	4	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1 - Newington Road north	0.81	0.48	4.0	D	429	644
2 - Newington Road south	0.84	0.38	5.0	C	693	1039
3 - Manston Road	1.48	16.81	160.3	F	622	933

Main Results for each time segment

07:45 - 08:00

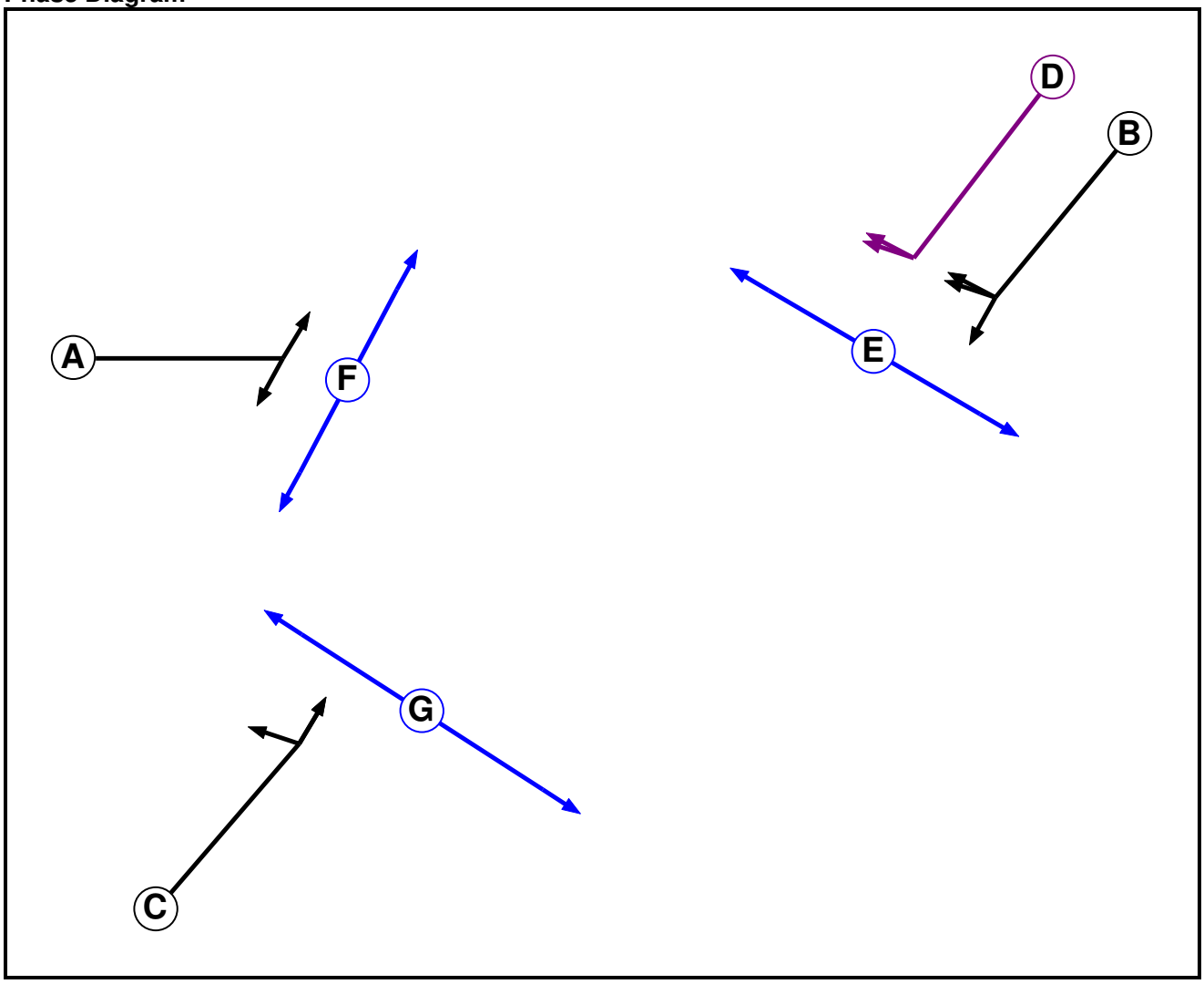
Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	352	88	283	641	0.550	348	524	0.0	1.2	0.201	B
2 - Newington Road south	568	142	97	1019	0.558	563	534	0.0	1.2	0.130	A
3 - Manston Road	510	128	319	581	0.879	489	342	0.0	5.3	0.566	D

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	421	105	311	626	0.672	418	607	1.2	1.9	0.283	C
2 - Newington Road south	679	170	117	1005	0.675	676	611	1.2	2.0	0.180	B
3 - Manston Road	610	152	382	549	1.111	536	410	5.3	23.7	1.963	F

Full Input Data And Results

Phase Diagram



Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Ind. Arrow	B	4	4
E	Pedestrian		6	6
F	Pedestrian		6	6
G	Pedestrian		6	6

Lane Saturation Flows

Junction: Junction 15_ B2052 / Nash Road / Empire Ter / Shottendane Rd

Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (Manston Road south (Entry))	3.46	0.00	Y	Arm 4 Ahead	124.26	47.6 %	1872	1872
				Arm 5 Left	18.80	52.4 %		
1/2 (Manston Road south (Entry))	2.25	0.00	N	Arm 4 Ahead	71.38	100.0 %	1939	1939
2/1 (College Road)	3.29	0.00	Y	Arm 6 Ahead	70.25	100.0 %	1903	1903
2/2 (College Road)	3.31	0.00	Y	Arm 5 Right	14.18	98.6 %	1759	1759
				Arm 7 Right	9.40	1.4 %		
3/1 (Hartsdown Road Entry)	3.68	0.00	Y	Arm 4 Left	12.64	52.9 %	1816	1816
				Arm 6 Right	24.22	47.1 %		
4/1 (Tivoli Road Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Tivoli Road Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Hartsdown Road Exit Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Manston Road south (Exit) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (College Road to Tivoli Road)	3.25	0.00	Y	Arm 4 Right	15.00	100.0 %	1764	1764

Scenario 2: '2039 PM Peak' (FG2: '2039 BASE PM', Plan 2: '2039 Base PM')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	12	250	228	490
	B	818	0	275	1093
	C	435	235	0	670
	Tot.	1265	485	503	2253

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Appendix Tr.2.57

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Technical note:
RSA Stage 1:Designers Response- Sevenscore Roundabout – Junction 2

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve Sevenscore Roundabout located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is to increase the entry widths on the Cottington Link Road, A256 Richborough way and A299 Hengist Way arms and increase the entries on the A299 Hengist Way and A256 Richborough Way to three lanes. Additionally the central island will be white lined.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Sevenscore Roundabout.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage type collisions or over-running of the verge.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Designer's response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 3.2

Location: Sevenscore Roundabout.

Summary: Potential for collisions arising from high speeds.

The long straight horizontal alignments of the A299 and A256 encourage drivers to approach this junction at speed, which is continued through the roundabout, which has a large central island. High circulatory speeds

were noted during the site inspection. This is a risk of late braking, skidding and loss-of-control type collisions on the approaches and side-swipe damage-type collisions on the circulatory carriageway.

Recommendation: It is recommended that measures are introduced to reduce vehicles speeds approaching and through the junction.

Designers Response: The recommendation to explore the use of speed reduction measures the approaches to the A299 and A253 has been noted. A package of measures, including for anti-skid surfacing / rumble strips and advanced signage, which are noted to assist in speed reduction will be investigated through the detailed design process.

Problem 3.3

Location: Sevenscore Roundabout.

Summary: Three-lane circulatory potential for collisions.

The proposed change to three-lane circulatory marking is considered unsafe, there is potential for drivers to attempt to negotiate the junction at speed. Three lanes reduce available lane width and increase the opportunities for weaving manoeuvres and side impact type collisions, particularly on the egress merge.

Recommendation: It is recommended that if spiral markings are to be implemented only a two-lane circulatory can be introduced.

Designers Response: Section 4.17 of TA 78/97 notes that spiral markings use should only be considered where the circulatory carriageway has sufficient width to cater for two or more lanes of traffic. The examples listed in DMRB permit a three lane gyratory. Spiral lane markings in particular are noted in the DMRB TD1607 as being able to improve lane discipline on the circulatory carriageway. Spiral markings are more appropriate on large roundabouts where they can be used to guide drivers around the roundabout to their desired exit, whilst maximising the use of the circulating space and reducing potential conflict between adjacent vehicles. The markings can also cater for heavily biased turning proportions, since the circulatory width may be divided according to traffic demand. Designation on lanes on the approach can also help.

Section 2.4 of TA78/97 notes that the use or road marking may be beneficial in reducing three types of accidents at roundabouts:-

a) Side-to-side collisions on the carriageway;

b) Drivers being forced onto the central island; and,

c) Collisions between entering and circulating vehicles.

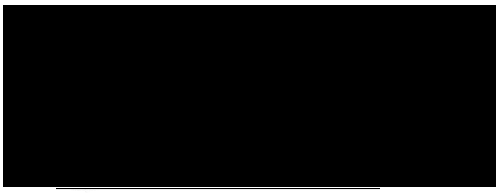
It is concluded that there is no justification to reduce the three lane gyratory where required for capacity reasons to two lane. As noted previously SPA will follow this initial response along with any required design amendments.

3. General Comments

Sections 5-7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by



.....

Chris Morris

Approved by

Bev Coupe

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Appendix A
Road Safety Audit – Stage 1

A299/A256 Sevenscore Roundabout, Manston, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

29th April 2019

Badingham

Transport Planning & Highway Engineering Consultants

16 Ashley Piece

Ramsbury, Marlborough

Wiltshire

SN8 2QE

T. +44(0)1672 521320

contact@badinghamuk.com

www.badinghamuk.com

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DOCUMENT ISSUE

Issue / Revision:	Issue 1			
Description / Status:	Final			
Date:	29/04/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
File Reference:	0781 Manston Airport - 2 - RSA1 - Issue 1.docx			

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SECTION 5:	ROAD MARKINGS AND SIGNAGE	9
SECTION 6:	STREET LIGHTING	10
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FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed modifications to the A299 Hengist Way/A256 Sevenscore roundabout junction, Manston, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 12.35pm and 12.50pm. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise proposed kerb modifications and spiral circulatory markings. Street lighting is provided and gradients in the area are minimal. The junction lies within a derestricted speed zone and approach speeds were noted to be high, as well as circulatory speeds. A dedicated left-turn lane is provided from the A229 north Hengist Way. A299 (east), Richborough Way (A256) and A299 (north) are standard dual carriageway. Cottington Link Road is a two-way single carriageway.

1.12 Loose gravel and other debris was noted around the junction presenting a hazard to two-wheelers. Several keep-left bollards on the dedicated left-turn slip were noted to be damaged. There is no provision for pedestrians or cyclists at the junction.

1.13 A total of six collisions are recorded at this junction over the latest 5-year period. One was categorised as serious and involved a motorcyclist losing grip on the highway. The remaining collisions were slight. Two involved motorcyclists with the major cause identified as driver error. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Sevenscore Roundabout.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Photo 1 – HGV negotiating junction.

3.2 PROBLEM

Location: Sevenscore Roundabout.

Summary: Potential for collisions arising from high speeds.

3.2.1 The long straight horizontal alignments of the A299 and A256 encourage drivers to approach this junction at speed, which is continued through the roundabout, which has a large central island. High circulatory speeds were noted during the site inspection. This is a risk of late braking, skidding and loss-of-control type collisions on the approaches and side-swipe damage-type collisions on the circulatory carriageway.

RECOMMENDATION

3.2.2 It is recommended that measures are introduced to reduce vehicle speeds approaching and through the junction.

Photo 2 - A299 Hengist Way view north - note straight, high-speed, downhill approach.

Photo 3 - Large HGV trailer access. Note damaged bollards (possibly from too high an approach speed) and motorcyclist at risk from loose material.

3.3 PROBLEM

Location: Sevenscore Roundabout.

Summary: Three-lane circulatory potential for collisions.

3.3.1 The proposed change to three-lane circulatory markings is considered unsafe. There is potential for drivers to attempt to negotiate the junction at speed. Three lanes reduce available lane width and increase the opportunities for weaving manoeuvres and side-impact type collisions, particularly on the egress merge.

RECOMMENDATION

3.3.2 It is recommended that if spiral markings are to be implemented only a two-lane circulatory be introduced.

Photo 4 – Insufficient safe width for three-lane circulatory.

SECTION 4: NON-MOTORISED USERS

4.1 No observations.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 Limited signing and marking details have been provided. A suitable package of markings and sign information will need to be provided as part of any further detailed design.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 29th April 2019

Audit Team Member

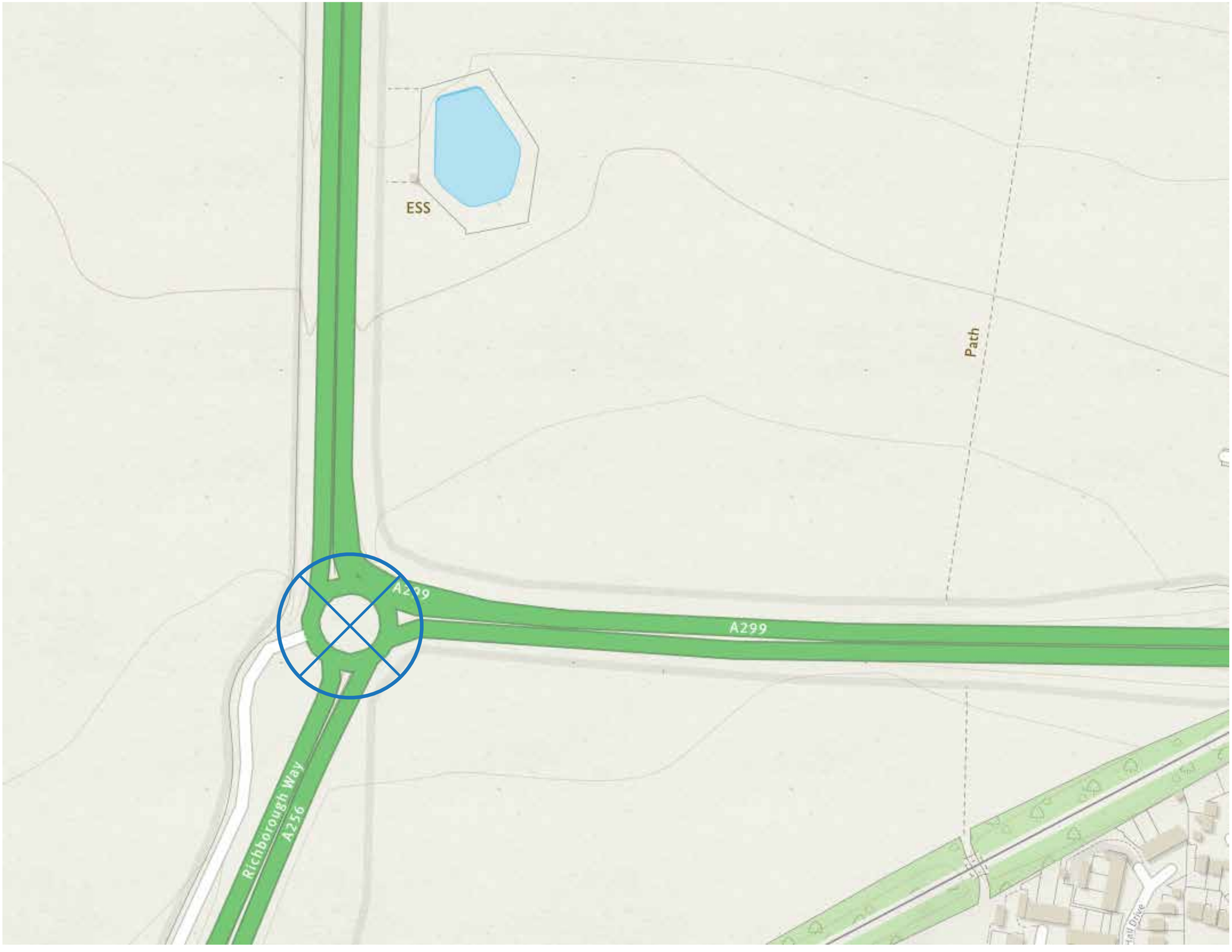
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 29th April 2019

FIGURES



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Client
RSP

Project
Manston Airport

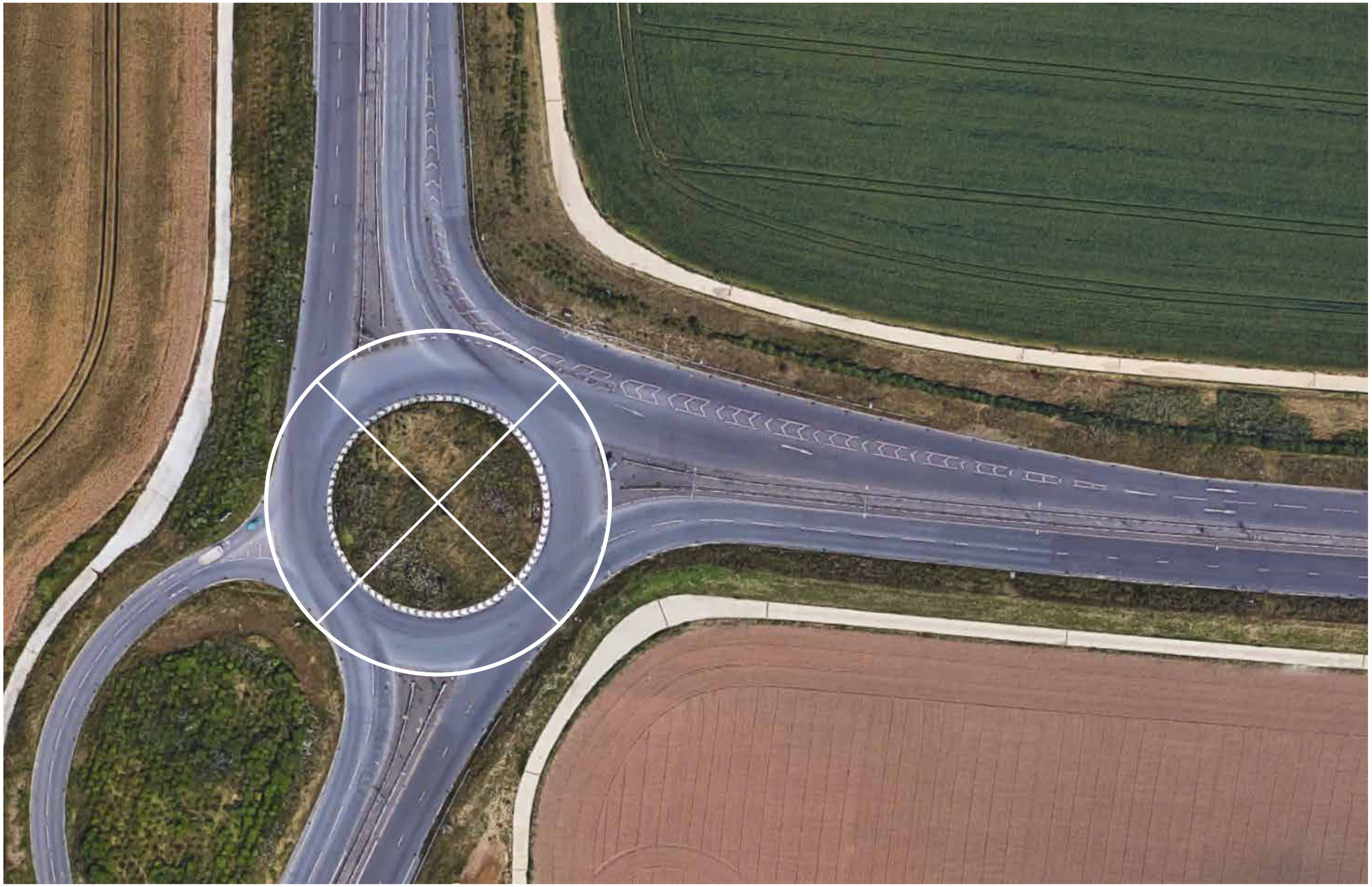
Title
Location Plan

Date	Status
23/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



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Project
Manston Airport

Title
Aerial Photo

Date	Status
23/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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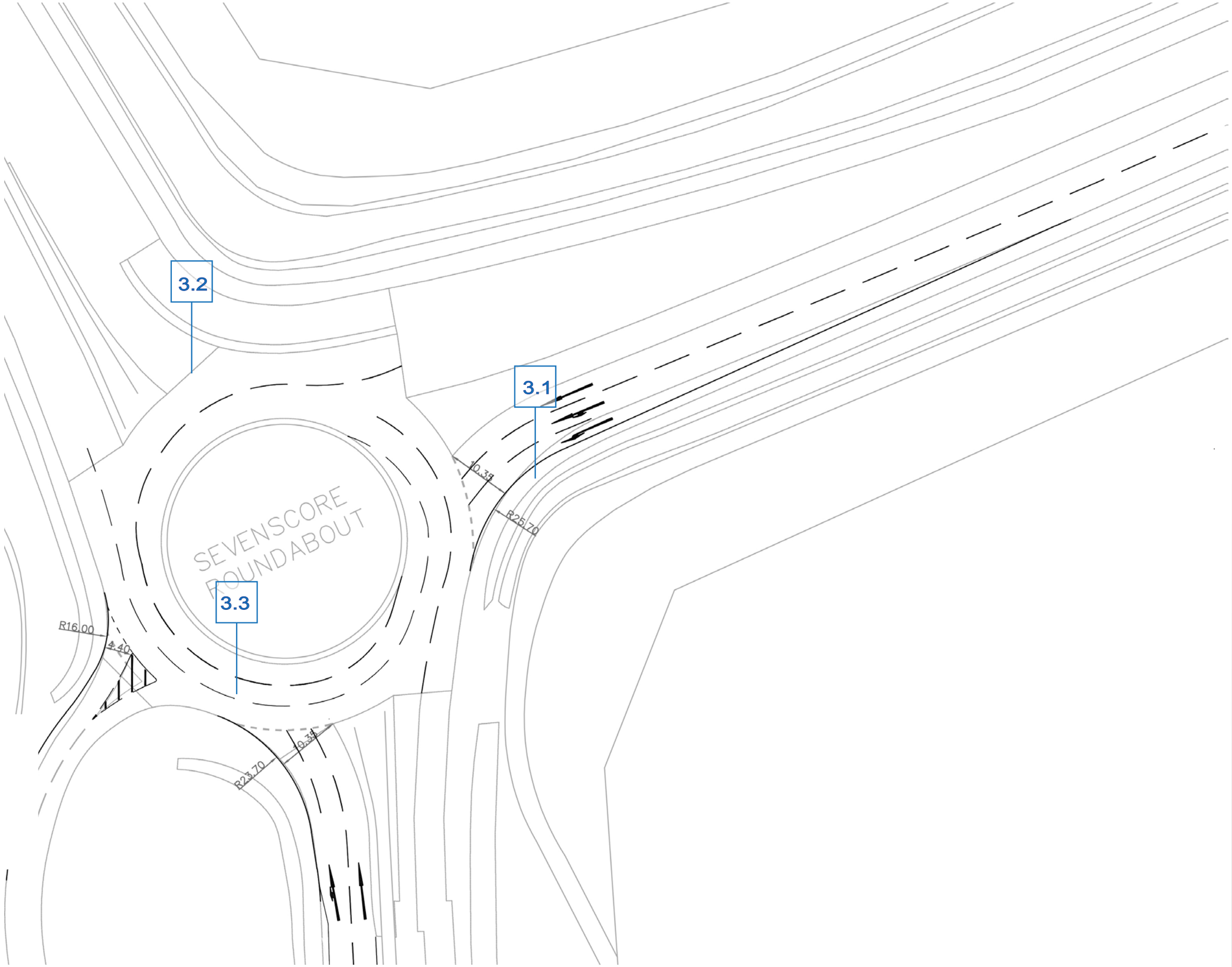

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Source: Site Location & Scheme

Rev.	Date	Initials	Amendments

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Client
RSP

Project
Manston Airport

Title
Audit Plan

Date	Status
30/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	12/04/2019
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Junction A256/A299 Mitigation Proposal
Report title:	Manston Airport – Junction A256/A299 Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	12/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

<table>
<tr><th colspan="5">General Details</th></tr>
<tr><td colspan="2">Highway Scheme Name & Road Number</td><td colspan="3">Manston Airport – Junction A256/A299 Mitigation Proposal – A299 (east), Richborough Way (A256), Cottington Link Road, A299 (north)</td></tr>
<tr><td colspan="5">Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.</td></tr>
<tr><td colspan="5">Road realignment and marking</td></tr>
<tr><td rowspan="2">RSA Stage
Tick as appropriate ✓</td><td>1 √</td><td>2</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Interim</td></tr>
<tr><td colspan="2">Overseeing Organisation Details</td><td colspan="3">Design Organisation Details</td></tr>
<tr><td colspan="2">16 Charles II Street
London SW1Y 4NW</td><td colspan="3">Wood
Glyn Price
Associate Director
Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK</td></tr>
<tr><td colspan="2">Police Contact Details (RSA3 Only)</td><td colspan="3">Maintaining Agent Contact Details</td></tr>
<tr><td colspan="2">N/A</td><td colspan="3">N/A</td></tr>
<tr><td colspan="5">RSA Team Membership</td></tr>
<tr><td colspan="5">A.R.J. Setter (Team Leader) — BA (Hons) MSc CMILT MCIHT AMICE MSoRSA
Highways England Certificate of Competence
& Compliant with EU Directive 2008/96/EC
Badingham Limited

D. F. Rogers (Team Member) — JP, CEng BEng (Hons) MICE MSoRSA FIHE
Ashburn Consultants</td></tr>
<tr><td colspan="5">Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.</td></tr>
<tr><td colspan="5">DMRB and Traffic Signs Regulations and General Directions (TSRGD)</td></tr>
</table>

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing A256/A299 roundabout junction by providing road marking and aligning arms.

Entry width and radius will be amended of arms A299 (east), Richborough Way (A256) and Cottington Link Road. New road markings will be provided accordingly.

It is unknown when this junction would be constructed as this is to be agreed with KCC as part of ongoing discussions. Complete should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB and Traffic Signs Regulations and General Directions (TSRGD) have been used to design the proposed scheme.

Design Speeds
Provide details of applied and/or existing design speeds.

Existing:
A229 (east) – 70mph (at junction approach); Richborough Way (A256) – 70mph; Cottington Link Road – 60mph; A299 (north) – 70mph

Speed Limits
State whether mandatory or advisory, available speed data.

Existing:
A229 (east) – 70mph (at junction approach); Richborough Way (A256) – 70mph; Cottington Link Road – 60mph; A299 (north) – 70mph

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

There is no facility for non-motorist road users as this junction is located in a rural area.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located northwest of Cliffsend and surrounded by green fields.

General Description
Include road network, road type, relevant land uses etc.

A299 (east), Richborough Way (A256) and A299 (north) are standard dual carriageway. Cottington Link Road is a two-way single carriageway.

As this junction is located in a rural area without non-motorist demand, there is no facility for non-motorists.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total six accidents have been recorded at the junction. These are accidents 35, 483, 488, 342, 493 and 501.

One of the six accidents was serious. This serious accident occurred when a motorbike lost its grip on the road.

Five of the six accidents were slight. Two of the slight accidents involved motorbike and occurred due to careless driving. The major cause for the slight accidents was driver's error.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – A256-A299 – ATC results		12.04.2019
RSA – A256-A299 – future Year Traffic Flows (2039)		12.04.2019
RSA – A256-A299 – Accident Data		12.04.2019

Drawings

Reference/Revision	Title	Date
RSA – A256-A299 – Site Location and scheme		12.04.2019
RSA – A256-A299 – Cad file		12.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

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Technical note:
RSA Stage 1:Designers Response- Minster Roundabout – Junction 4

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve Minster Roundabout located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to increase the entry widths on all arms and increase the entries on the A299, A299 Hengist Way and B2190 Spitfire Way to three lanes. Additionally the central island will be white lined with spiral markings.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Minster Roundabout.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge or footways, endangering users.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Designers Response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 3.2

Location: Minster Roundabout/Smugglers Leap exit.

Summary: Potential for collisions.

The change to three lane entry at the approach may lead to a large vehicle on the nearside lane of the A299 and another in the central lane both attempting to turn north to the B2190. The HGV may obscure visibility

for drivers egressing the (one-way) access from Smugglers Leap leading to possible collisions. The egress from Smugglers Leap directly into the roundabout junction is considered unsafe.

Recommendation: It is recommended that Smugglers Lane (one-way) exit is closed.

Designers Response: It is noted that two vehicles can currently exit the A299 and turn left into the B2190. This is an existing situation which the personal injury accident data supports as not having a significant accident issue. The recommendation to close Smugglers Lane (one-way) exit is not considered necessary based on the accident data, although if required vehicles could exit onto the B2190 and U-turn at the roundabout to the north. Amending the Smugglers Leap exit only access into the roundabout gyratory does not materially impact on the mitigation scheme and as such either option could be absorbed within the mitigation measure as required by the local highway authority.

Problem 3.3

Location: Minster Roundabout-A299 east approach.

Summary: Potential for tipping.

The change to three lane entry at the approach and widening will encroach closer to the existing services where there is a level difference. Without sufficient barrier restraint there is a risk that vehicles, particularly HGVs may leave the carriageway and proceed down the embankment resulting in collisions.

Recommendation: It is recommended that appropriate barrier restraint systems are located in this location.

Designers Response: As part of the detailed design process adequate barrier restraints will be investigated and provided as required.

Problem 4.1

Location: Minster Roundabout/B2190.

Summary: Crossing distance.

An existing uncontrolled crossing facility is provided across this arm. It links to a shared footway/cycleway facility on the northern side of the A299 east although no signs or markings are present. It appears there is a bus stop on the B2190 southbound with no connecting pedestrian links. The increase in crossing distance on the approach and change to three lanes makes this crossing hazardous, particularly for the visually or mobility impaired. A bollard in the central waiting area presents an obstruction to users, the crossing on the western side of the B2190 terminates within the access arrangement serving the smugglers leap car park and is considered unsafe. There is a risk of collisions between pedestrians/cyclists with vehicles egressing the roundabout and approaching from the north on the B2190 as well as traffic utilising the Smugglers Leap access.

Recommendation: It is recommended that a controlled crossing is introduced to the north of the present arrangement.

Designers Response: Section 7.12 of DMRB TD 16/07 states that hatching should not be used to reduce the entry width in areas adjacent to pedestrian facilities. The current design provides hatching on the northern arm which extends past the central refuge used for crossing this arm contrary to the design standards. The proposed removal of this hatching and tying into the existing kerb lines removes this non-compliance and does not increase the walking distance.

The bollard in the central reserve could be removed if required. The western side of this crossing is noted to be located between the left in / left out arrangement and whilst this is not considered to be a typical arrangement, it is not shown to be an accident hot spot. Should an improvement be required at this location

a kerbed central reserve could be considered. It is noted that the proposed development is not likely to intensify the movements to/from this access and as such this existing form of access is considered not to be directly linked to the proposed development. The level of pedestrian flows using this courtesy crossing facility are considered to be low and as such not trigger the requirement for a signalled crossing.

Problem 4.2

Location: Footway/cycleway at Smugglers Leap accesses.

Summary: Unclear right-of-way.

It is unclear whether vehicles or non-motorised users have right-of-way at the access points serving the Residential Park. Confusion may lead to possible collisions between vehicles utilising the access and non-motorised users of the footway/cycleway.

Recommendation: It is recommended that measures are introduced to clarify which users have priority in this location.

Designers Response: The provision of entry treatment including for white line giveway markings to pedestrians could be implemented at this location as part of the detailed design if required. The current arrangement uses surface treatment (colour and surface change) to indicate there is a change of priority.

Problem 5.2

Location: A299 west of Minster Roundabout.

Summary: Lack of signing for cyclists.

Presumably, the facility on the north side of the A299 in this location is a shared footway/cycleway although there is no signing for cyclists to indicate as such. There is a risk of cyclists being "squeezed" by large vehicles turning left at the B2190 approach leading to collisions.

Recommendation: It is recommended that signing for cyclists are incorporated within the design.

Designers Response: As part of the detailed design package of works a signage strategy will be provided.

3. General Comments

Sections 5-7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Bev Coupe

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Appendix A
Road Safety Audit – Stage 1

A299/B2190 Minster Roundabout, Manston, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

29th April 2019

Badingham

Transport Planning & Highway Engineering Consultants

16 Ashley Piece

Ramsbury, Marlborough

Wiltshire

SN8 2QE

T. +44(0)1672 521320

contact@badinghamuk.com

www.badinghamuk.com

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Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed modifications to the Minster Roundabout junction, Manston, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 11.45am and 12.00pm. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise modifications to entry widths and kerb radii together with the proposed introduction of spiral circulatory surface markings. The A299 is a bus route. Street lighting is provided and the junction lies within a 50mph speed limit. Gradients in the area are minimal. Services and a hotel are situated either side of Tothill Street to the south. A footway/cycle facility is provided on the western side of Tothill Street that links to a staggered toucan crossing on the western arm of the A299. The shared footway/cycleway continues north on the west side of the B2190. On the northwest quadrant of the junction is an access arrangement serving the Smugglers Leap Residential Park.

1.11 Nineteen collisions are recorded within the latest five-year period 2013-2018. One collision was fatal with six categorised as serious. There were 12 slight collisions. A total of seventeen casualties were involved. No highway deficiencies were noted as contributory factors. A cluster of eight collisions is noted around the A299 (West) roundabout entry and nine around the A299 (East) entry.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Minster Roundabout.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge or footways, endangering users.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Photo 1 - Large vehicle turning at Minster Roundabout.

3.2 PROBLEM

Location: Minster Roundabout / Smugglers Leap exit.

Summary: Potential for collisions.

3.2.1 The change to three lane entry at the approach may lead to a large vehicle on the nearside lane of the A299 and another in the central lane both attempting to turn north to the B2190. The HGV may obscure visibility for drivers egressing the (one-way) access from Smugglers Leap leading to possible collisions. The egress from Smugglers Leap directly into the roundabout junction is considered unsafe.

RECOMMENDATION

3.2.2 It is recommended that the Smugglers Lane (one-way) exit is closed.

Photo 2 - Potential for HGVs to obstruct visibility at Smugglers Leap exit.

Photo 3 - Smugglers Leap exit.

3.3 PROBLEM

Location: Minster Roundabout – A299 east approach.

Summary: Potential for tipping.

3.3.1 The change to three lane entry at the approach and widening will encroach closer to the existing services where there is a level difference. Without sufficient barrier restraint there is a risk that vehicles, particularly HGVs may leave the carriageway and proceed down the embankment resulting in collisions.

RECOMMENDATION

3.3.2 It is recommended that appropriate barrier restraint systems are located in this location.

Photo 4 - Level difference on south side of A299 (east).

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: Minster Roundabout / B2190

Summary: Crossing distance.

4.1.1 An existing uncontrolled crossing facility is provided across this arm. It links (presumably?) to a shared footway/cycleway facility on the northern side of the A299 east although no signs or markings are present. It appears there is a bus stop on the B2190 southbound with no connecting pedestrian links. The increase in crossing distance on the approach and change to three lanes makes this crossing hazardous, particularly for the visually or mobility impaired. A bollard in the central waiting area presents an obstruction to users. The crossing on the western side of the B2190 terminates within the access arrangement serving the Smugglers Leap Park and is considered unsafe. There is a risk of collisions between pedestrians/cyclists with vehicles egressing the roundabout and approaching from the north on the B2190 as well as traffic utilising the Smugglers Leap access.

RECOMMENDATION

4.1.2 It is recommended that a controlled crossing is introduced to the north of the present arrangement.

Photo 5 - View east across B2190.

Photo 6 - View north on the B2190

4.2 PROBLEM

Location: Footway/cycleway at Smugglers Leap accesses.

Summary: Unclear right-of-way.

4.2.1 It is unclear whether vehicles or non-motorised users have right-of-way at the access points serving the Residential Park. Confusion may lead to possible collisions between vehicles utilising the access and non-motorised users of the footway/cycleway.

RECOMMENDATION

4.2.2 It is recommended that measures are introduced to clarify which users have priority in this location.

Photo 7 - Smugglers Leap access.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 No signing details have been provided. A suitable package of signage information will need to be provided as part of any further detailed design.

5.2 **PROBLEM**

Location: A299 West of Minster Roundabout.

Summary: Lack of signing for cyclists.

5.2.1 Presumably, the facility on the north side of the A299 in this location is a shared footway/cycleway although there is no signing for cyclists to indicate as such. There is a risk of cyclists being 'squeezed' by large vehicles turning left at the B2190 approach leading to collisions.

RECOMMENDATION

5.2.2 It is recommended that signing for cyclists are incorporated within the design.

Photo 8 - View west on A299 (east) - note loose chippings.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 29th April 2019

Audit Team Member

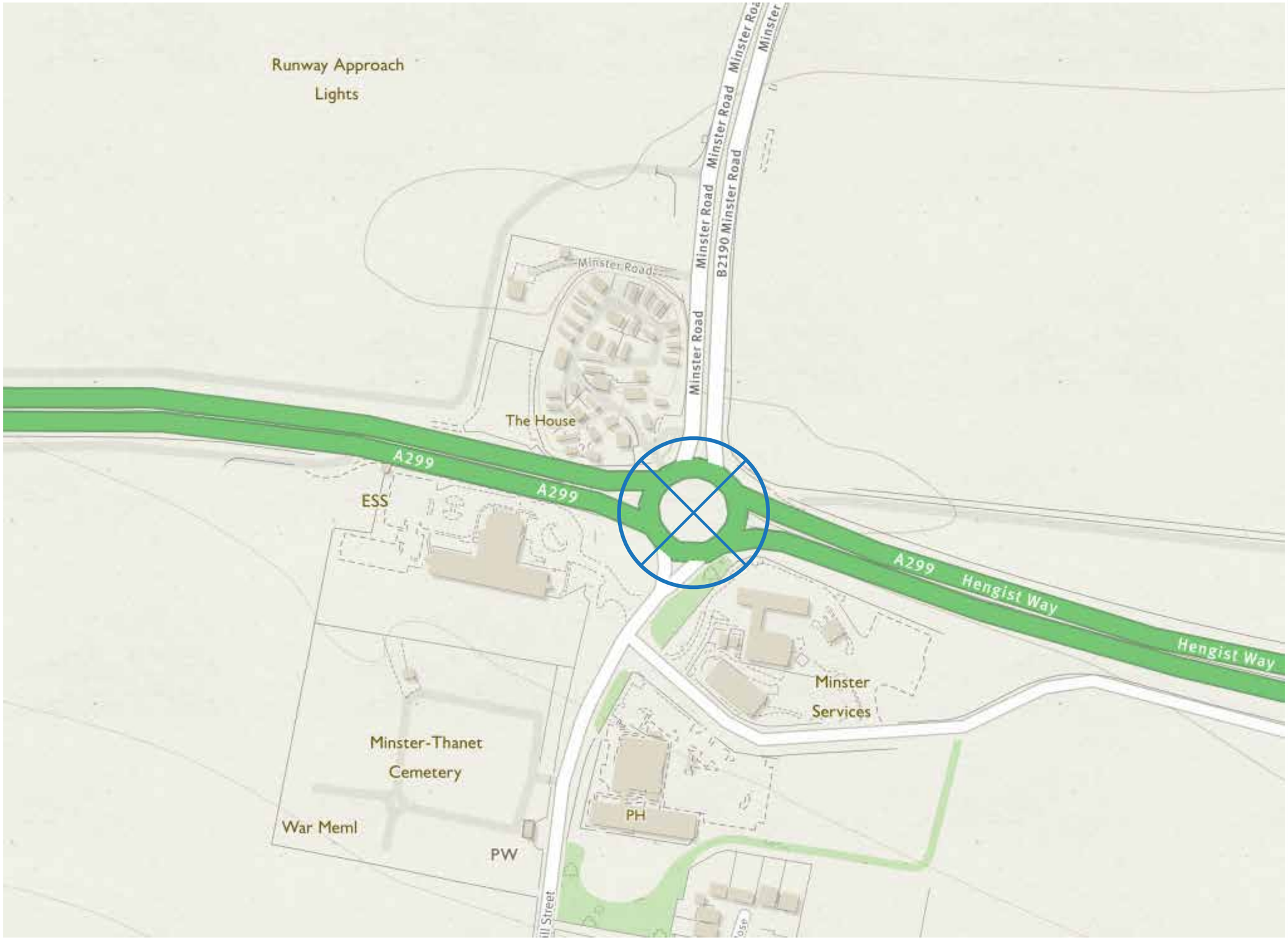
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 29th April 2019

FIGURES



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Rev.	Date	Initials	Amendments

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Client: RSP

Project: Manston Airport

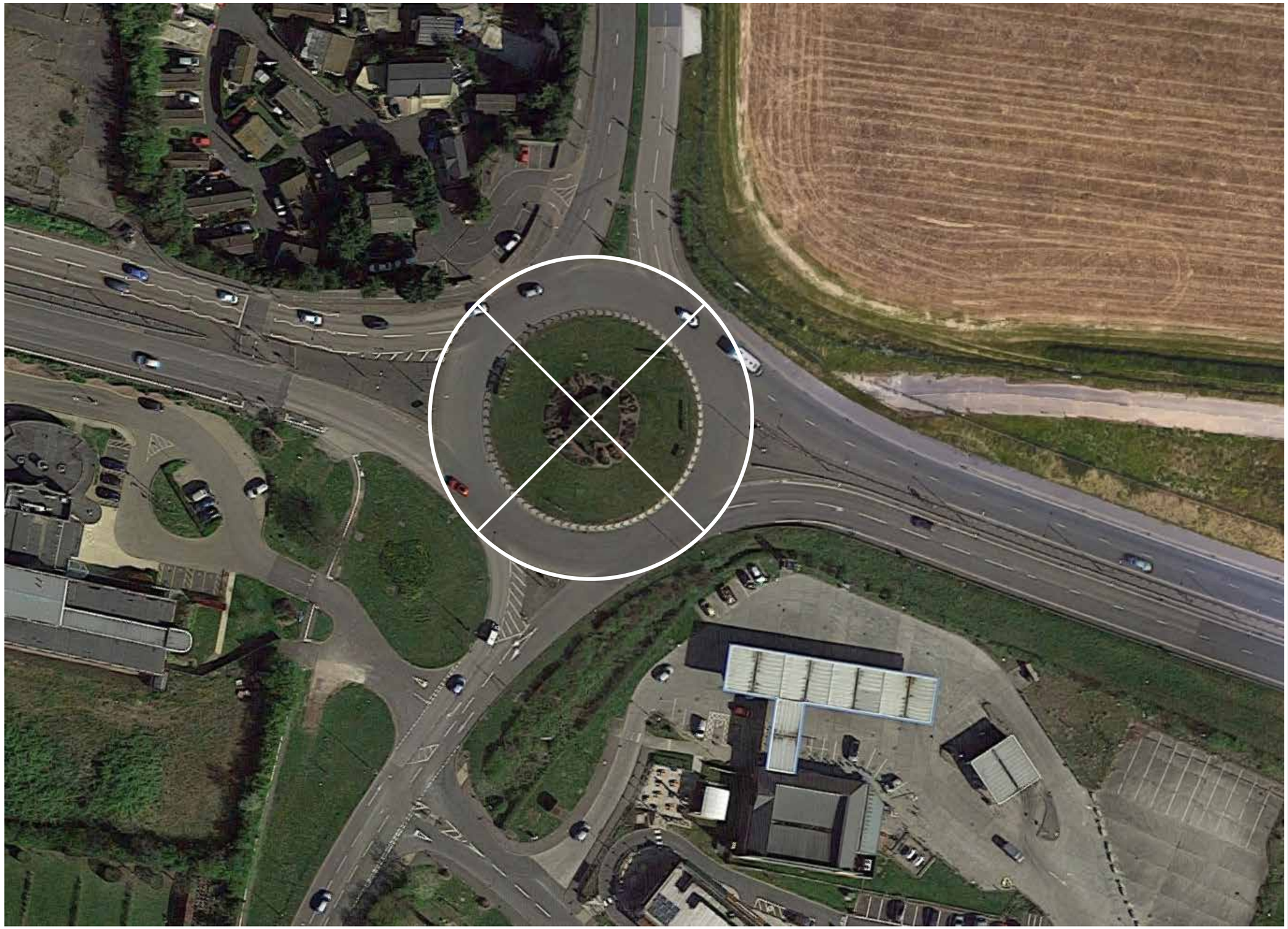
Title: Location Plan

Date	Status
23/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



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Client
RSP

Project
Manston Airport

Title
Aerial Photo

Date	Status
23/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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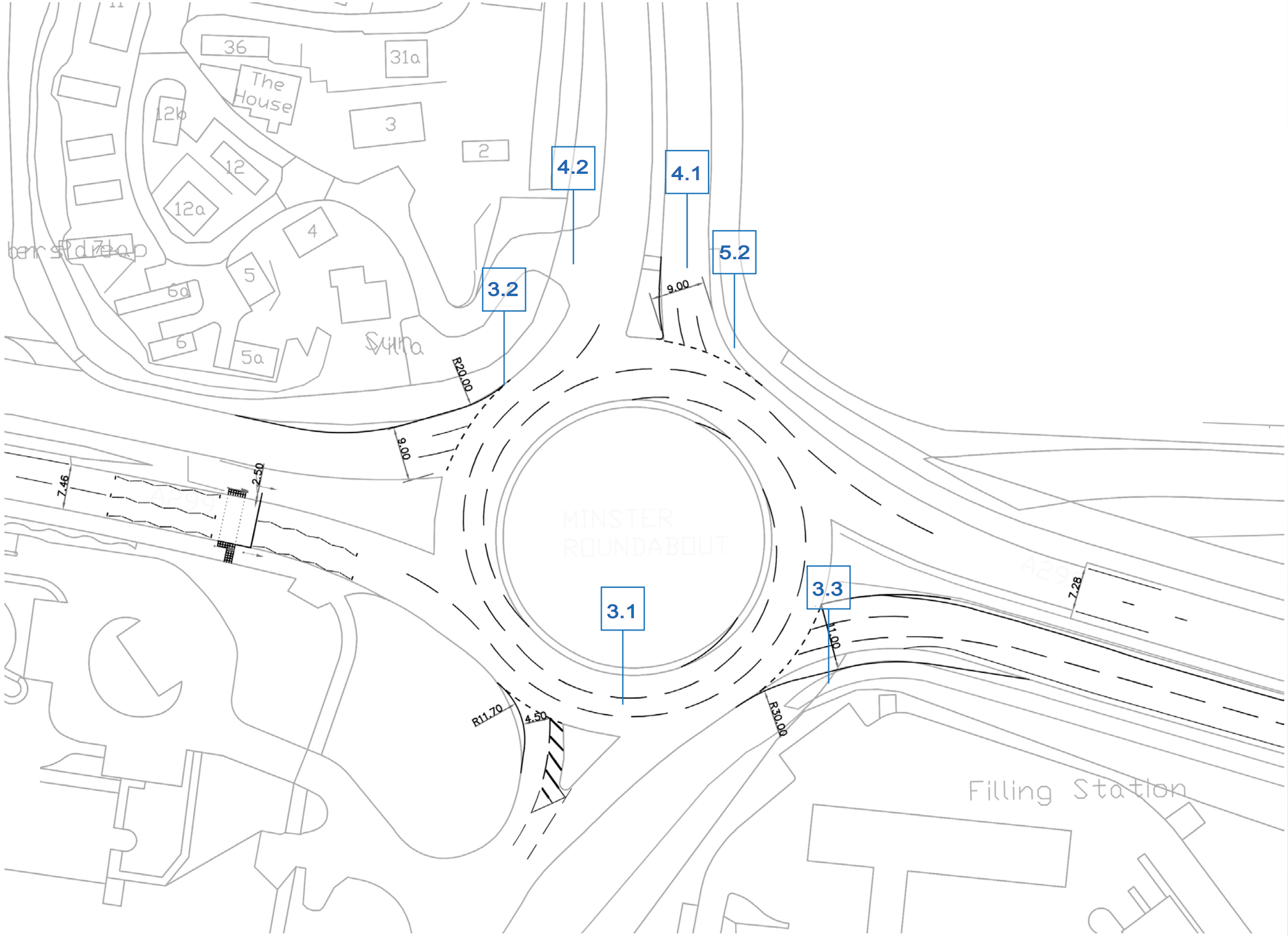

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Notes:

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Source: Site Location & Scheme

Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
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Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
29/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

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APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	12/04/2019
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Junction A299/B2190 Mitigation Proposal
Report title:	Manston Airport – Junction A299/B2190 Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	12/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

<table>
<tr><th colspan="5">General Details</th></tr>
<tr><td colspan="2">Highway Scheme Name & Road Number</td><td colspan="3">Manston Airport – Junction A299/B2190 Mitigation Proposal – Hengist Way (A299), Tothill Street, A299 (west), Minster Road (B2190)</td></tr>
<tr><td colspan="5">Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.</td></tr>
<tr><td colspan="5">Road realignment and marking</td></tr>
<tr><td rowspan="2">RSA Stage
Tick as appropriate ✓</td><td>1 √</td><td>2</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Interim</td></tr>
<tr><td colspan="2">Overseeing Organisation Details</td><td colspan="3">Design Organisation Details</td></tr>
<tr><td colspan="2">16 Charles II Street
London SW1Y 4NW</td><td colspan="3">Wood
Glyn Price
Associate Director
Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK</td></tr>
<tr><td colspan="2">Police Contact Details (RSA3 Only)</td><td colspan="3">Maintaining Agent Contact Details</td></tr>
<tr><td colspan="2">N/A</td><td colspan="3">N/A</td></tr>
<tr><td colspan="5">RSA Team Membership</td></tr>
<tr><td colspan="5">A.R.J. Setter (Team Leader) — BA (Hons) MSc CMILT MCIHT AMICE MSoRSA
Highways England Certificate of Competence
& Compliant with EU Directive 2008/96/EC
Badingham Limited

D. F. Rogers (Team Member) — JP, CEng BEng (Hons) MICE MSoRSA FIHE
Ashburn Consultants</td></tr>
<tr><td colspan="5">Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.</td></tr>
<tr><td colspan="5">DMRB and Traffic Signs Regulations and General Directions (TSRGD)</td></tr>
</table>

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing A299/B2190 roundabout junction by providing road marking and re-aligning arms.

The kerb lines of all the arms will be re-aligned and new road marking will be provided accordingly. The proposed alignment will affect the entry radius of arms Hengist Way (A299), Tothill Street, A299 (west).

It is unknown when this junction would be constructed as this is to be agreed with KCC as part of ongoing discussions. Completion should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB and Traffic Signs Regulations and General Directions (TSRGD) have been used to design the proposed scheme.

Design Speeds
Provide details of applied and/or existing design speeds.

50mph (at junction approach)

Speed Limits
State whether mandatory or advisory, available speed data.

50mph (at junction approach)

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

The existing pedestrian crossing at A299 (west) exit arm will be improved.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located north of Minster and surrounded by private properties and a green field.

General Description
Include road network, road type, relevant land uses etc.

Hengist Way (A299) is a standard dual carriageway with reduced speed at junction approach. Tothill Street is a two-way standard single carriageway. A299 (west) is a standard dual carriageway with reduced speed at junction approach. Minster Road (B2190) is a dual carriageway without crash barriers, grass verge separates the inbound and outbound traffic.

As this junction is in the rural area, there is limited facility for non-motorists.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total fifteen accidents have been recorded at the junction. These are accidents 58, 82, 93, 109, 114, 138, 266, 270, 290, 298, 311, 411, 441, 494 and 502.

One of the fifteen accidents was fatal. The fatal accident occurred when a car collided with junction and street furniture due to loss of control.

Four of the fifteen accidents were serious. The serious accidents occurred due to driver's errors such as failed to stop in time, speeding and failure to negotiate the junction.

Ten of the fifteen accident were slight. Two of the accidents involved pedal cycle and occurred due to careless driving. The major cause of the slight accidents was driver's error.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – A299-B2190 – MCC results		12.04.2019
RSA – A299-B2190 – future Year Traffic Flows (2039)	-	12.04.2019
RSA – A299-B2190 – Accident Data		12.04.2019

Drawings

Reference/Revision	Title	Date
RSA – A299-B2190 – Site Location and scheme		12.04.2019
RSA – A299-B2190 – Cad file		12.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

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Technical note:
RSA Stage 1:Designers Response- Monkton Roundabout

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve Monkton Roundabout located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to increase the entry widths on the A299 east, A299 North West and the A253 arms and increase the entries on these arms to three lane entries. Additionally the central island will be white lined with spiral markings.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Monkton Roundabout.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions when over-running narrow spiral circulatory markings, endangering users, particularly motor cyclists.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Designers Response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 3.2

Location: Monkton Roundabout.

Summary: Potential for collisions arising from high speeds.

The long straight horizontal alignment of the A299 in particular encourages drivers to approach this junction at speed, which is continued through the roundabout, which has a large central island. High circulatory

speeds were noted during the site inspection, making crossing of the various arms hazardous. This is a risk if late braking, sliding and loss-of –control type collisions on the approaches and side-swipe damage-type collisions on the circulatory carriageway.

Recommendation: It is recommended that measures are introduced to reduce vehicles speeds approaching and through the junction.

Designers Response: The recommendation to explore the use of speed reduction measures the approaches to the A299 and A253 has been noted. A package of measures, including for anti-skid surfacing / rumble strips and advanced signage, which are noted to assist in speed reduction will be investigated through the detailed design process.

Problem 3.3

Location: Monkton Roundabout.

Summary: Three-lane circulatory potential for collisions.

The change to three lane entries and circulatory markings is considered unsafe. There is potential for drivers to attempt to negotiate the junction at speed. Three lanes increase the opportunities for weaving manoeuvres and side impact type collision, particularly on the egress merge.

Recommendation: It is recommended that a two lane circulatory is introduced and two-lane entries maintained on the approaches.

Designers Response: Section 4.17 of TA 78/97 notes that spiral markings use should only be considered where the circulatory carriageway has sufficient width to cater for two or more lanes of traffic. The examples listed in DMRB permit a three lane gyratory. Spiral lane markings in particular are noted in the DMRB TD1607 as being able to improve lane discipline on the circulatory carriageway. Spiral markings are more appropriate on large roundabouts where they can be used to guide drivers around the roundabout to their desired exit, whilst maximising the use of the circulating space and reducing potential conflict between adjacent vehicles. The markings can also cater for heavily biased turning proportions, since the circulatory width may be divided according to traffic demand. Designation on lanes on the approach can also help.

Section 2.4 of TA78/97 notes that the use or road marking may be beneficial in reducing three types of accidents at roundabouts:-

a) Side-to-side collisions on the carriageway;

b) Drivers being forced onto the central island; and,

c) Collisions between entering and circulating vehicles.

It is concluded that there is no justification to reduce the three lane gyratory where required for capacity reasons to two lane. As noted previously SPA will follow this initial response along with any required design amendments.

Problem 4.1

Location: Monkton Roundabout.

Summary: Crossing distance.

Increasing approach entries to three lanes increases the complexity and difficulty for non-motorised users to cross, particularly for the mobility and visually impaired. High traffic speeds make judging safe gaps to cross difficult, which would be more difficult if three circulatory traffic streams are involved,. No tactile paving is provided at the existing arrangements and the crossing on the A299 east does not align, which can create

difficulties for some users. There is a risk of collisions between vehicles and non-motorised users at the crossings, particularly as drivers will be concentrating on the merge on egress from three lanes to two.

Recommendation: It is recommended that two lane entries and circulatory is maintained and that tactile paving introduced at the existing pedestrian crossings, which should be aligned correctly.

Designers Response: It is proposed to explore the use of speed reduction measures on approach to the junction. A package of measures, including for anti-skid surfacing / rumble strips and advanced signage, which are noted to assist in speed reduction will be investigated through the detailed design process.

The addition of tactile paviors could be implemented within the design at the crossing locations. The crossing widths remain the same or have reduced slightly resulting in no material effect to walk distances at crossing locations. The spiral markings help to improve driver lane discipline and as such help users of the crossing to understand where drivers are heading and as such aid crossing safety.

Problem 5.2

Location: Monkton Roundabout.

Summary: Worn markings.

Segregated lane markings on the footway/cycle ways are worn and indistinct reducing their efficacy. There is a risk of collisions between pedestrians and cyclists.

Recommendation: It is recommended that the lane markings are refreshed.

Designers Response: The segregated foot/cycleway lane markings are not proposed to be altered as part of the mitigation scheme. The existing condition of these markings are the responsibility of the local highway authority and should be updated as part of their maintenance programme.

General Comments

Sections 5-7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by

[redacted]

Chris Morris

Approved by

[redacted]

.....

Bev Coupe

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Appendix A
Road Safety Audit – Stage 1

A299/A253 Monkton Roundabout, Manston, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

29th April 2019

Badingham
Transport Planning & Highway Engineering Consultants
16 Ashley Piece
Ramsbury, Marlborough
Wiltshire
SN8 2QE

T. +44(0)1672 521320
contact@badinghamuk.com
www.badinghamuk.com

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Date:	29/04/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
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Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed modifications to the Monkton Roundabout junction, Manston, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 12.00pm and 12.15pm. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise modifications to entry widths and kerb radii together with the proposed introduction of spiral circulatory surface markings. The A299 (east) is a standard dual carriageway. Willetts Hill is a two-way narrow single carriageway, most of the section of this road has no central road marking. Canterbury Road (A253) is a standard two-way single carriageway. A299 (northwest) is a standard dual carriageway. Seamark Road is a two-way single carriageway. This junction is in the rural area with some facilities for non-motorists. It lies within a derestricted speed limit zone. There is a general gradient falling from the northeast to southwest. Street lighting is provided. A footway/cycleway is provided on the west side of Willetts Hill that leads to a similar facility on the south side of the A299 west and continues to the west side of Seamark Road.

1.11 A total of fifteen collisions are recorded at this junction over the latest 5-year period. Five were categorised as serious. Two involved motorbikes and one involved a pedal cycle. The serious collisions occurred due to driver error. Ten collisions were slight with three involving a motorbike and one a pedal cycle. The major cause for the slight collisions was careless driving at the roundabout junction. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Monkton Roundabout.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions when over-running narrow spiral circulatory markings, endangering users, particularly motor cyclists.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Photo 1 - Potential for HGVs to straddle circulatory markings.

3.2 PROBLEM

Location: Monkton Roundabout

Summary: Potential for collisions arising from high speeds.

3.2.1 The long straight horizontal alignment of the A299 in particular encourages drivers to approach this junction at speed, which is continued through the roundabout, which has a large central island. High circulatory speeds were noted during the site inspection, making crossing of the various arms hazardous. This is a risk of late braking, skidding and loss-of-control type collisions on the approaches and side-swipe damage-type collisions on the circulatory carriageway.

RECOMMENDATION

3.2.2 It is recommended that measures are introduced to reduce vehicle speeds approaching and through the junction.

Photo 2 - Straight horizontal alignment encourages fast approach speeds.

3.3 PROBLEM

Location: Monkton Roundabout

Summary: Three-lane circulatory potential for collisions.

3.3.1 The change to three-lane entries and circulatory markings is considered unsafe. There is potential for drivers to attempt to negotiate the junction at speed. Three lanes increase the opportunities for weaving manoeuvres and side-impact type collisions, particularly on the egress merge.

RECOMMENDATION

3.3.2 It is recommended that a two-lane circulatory is introduced and two-lane entries maintained on the approaches.

Photo 3 – Three-lane circulatory creating potential hazard at egress.

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: Minster Roundabout / B2190

Summary: Crossing distance.

4.1.1 Increasing approach entries to three lanes increases the complexity and difficulty for non-motorised users to cross, particularly for the mobility and visually impaired. High traffic speeds make judging safe gaps to cross difficult, which would be made more difficult if three traffic circulatory traffic streams are involved. No tactile paving is provided at the existing arrangements and the crossing on the A299 east does not align, which can create difficulties for some users. There is a risk of collisions between vehicles and non-motorised users at the crossings, particularly as drivers will be concentrating on the merge on egress from three lanes to two.

RECOMMENDATION

4.1.2 It is recommended that two lane entries and circulatory is maintained and that tactile paving introduced at the existing pedestrian crossings, which should be aligned correctly.

Photo 4 - No tactile paving and misaligned crossing.

Photo 5 - Lack of tactile paving.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 No signing details have been provided. A suitable package of signage information will need to be provided as part of any further detailed design.

5.2 **PROBLEM**

Location: Monkton Roundabout.

Summary: Worn markings.

5.2.1 Segregated lane markings on the footway/cycleways are worn and indistinct reducing their efficacy. There is a risk of collisions between pedestrians and cyclists.

RECOMMENDATION

5.2.2 It is recommended that the lane markings are refreshed.

Photo 6 - Worn surface markings.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 29th April 2019

Audit Team Member

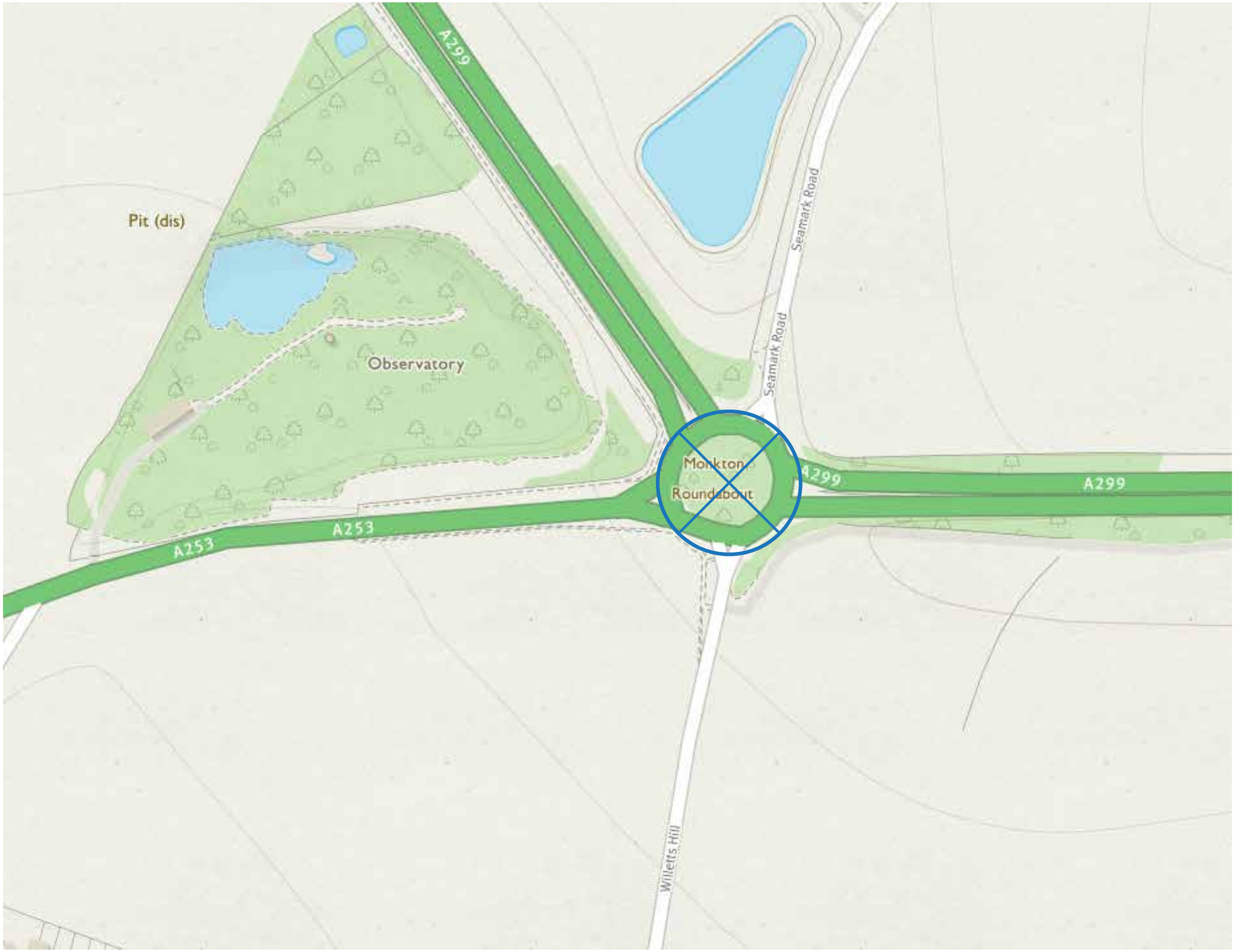
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 29th April 2019

FIGURES



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Rev.	Date	Initials	Amendments

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Transport Planning
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Concept | Consult | Construct
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Client
RSP

Project
Manston Airport

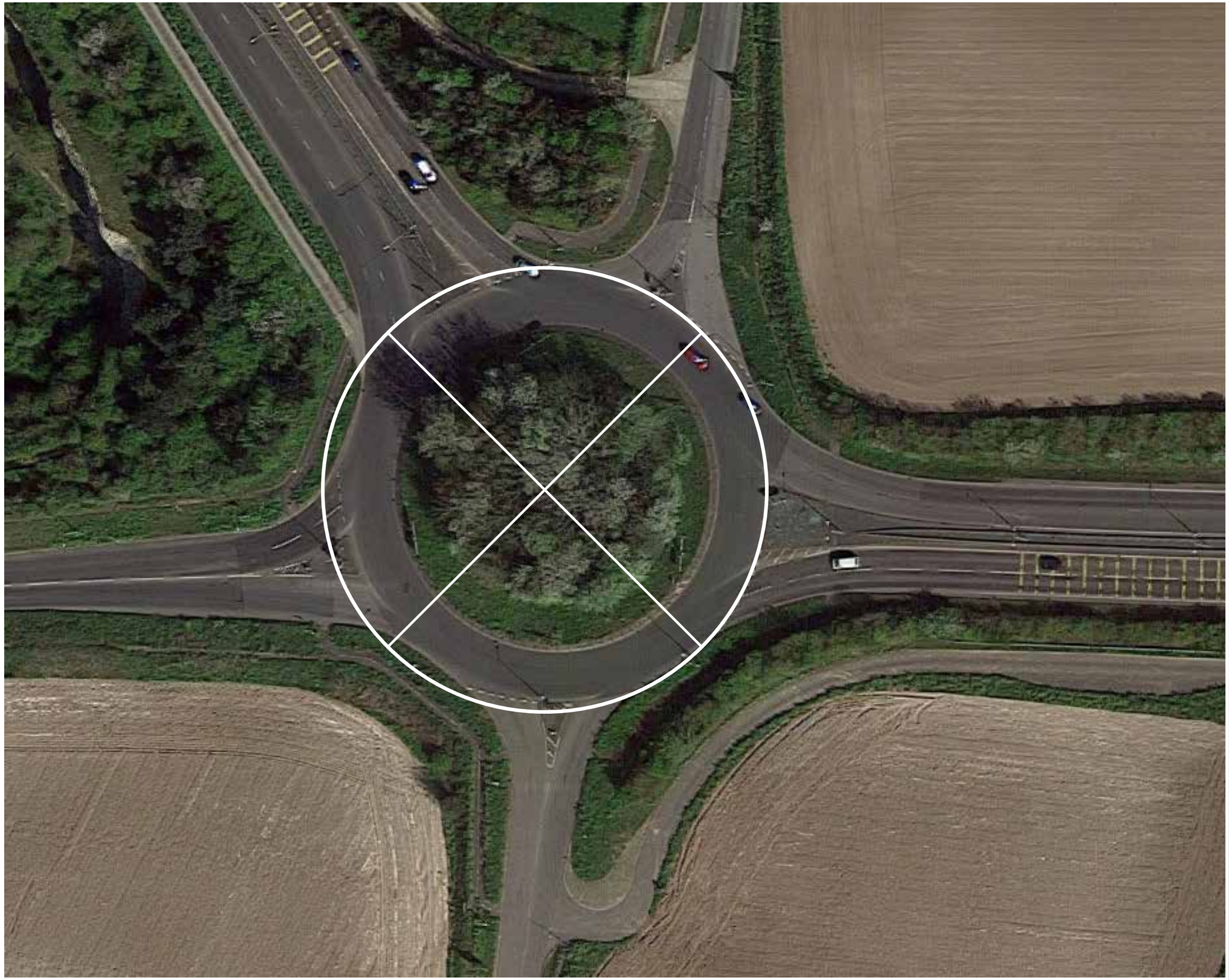
Title
Location Plan

Date	Status
23/03/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



North

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Highway Engineering
Concept | Consult | Construct
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Client
RSP

Project
Manston Airport

Title
Aerial Photo

Date	Status
23/08/2019	FINAL
Scale: NTS	Original Size: A3
Drawn: AS	Checked: AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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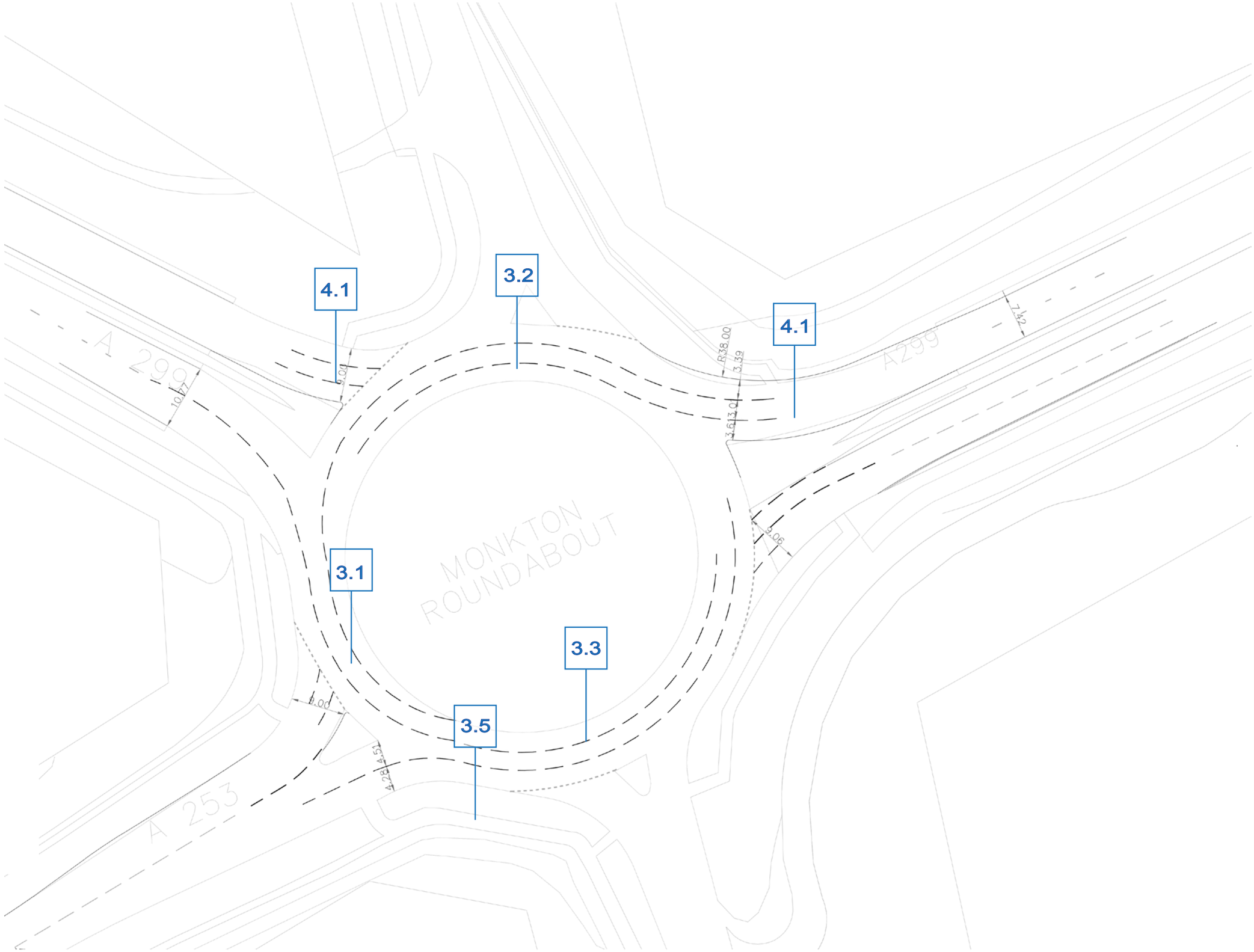

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Source: Site Location & Access Design

Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
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www.badinghamuk.com

Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
29/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	11/04/2019
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Junction A253/A299 Mitigation Proposal
Report title:	Manston Airport – Junction A253/A299 Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	11/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

<table>
<tr><th colspan="5">General Details</th></tr>
<tr><td colspan="2">Highway Scheme Name & Road Number</td><td colspan="3">Manston Airport – Junction A253/A299 Mitigation Proposal – A299 (east), Willetts Hill, Canterbury Road (A253), A299 (northwest), Seamark Road</td></tr>
<tr><td colspan="5">Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.</td></tr>
<tr><td colspan="5">Road realignment and marking</td></tr>
<tr><td rowspan="2">RSA Stage
Tick as appropriate ✓</td><td>1 √</td><td>2</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Interim</td></tr>
<tr><td colspan="2">Overseeing Organisation Details</td><td colspan="3">Design Organisation Details</td></tr>
<tr><td colspan="2">16 Charles II Street
London SW1Y 4NW</td><td colspan="3">Wood
Glyn Price
Associate Director
Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK</td></tr>
<tr><td colspan="2">Police Contact Details (RSA3 Only)</td><td colspan="3">Maintaining Agent Contact Details</td></tr>
<tr><td colspan="2">N/A</td><td colspan="3">N/A</td></tr>
<tr><td colspan="5">RSA Team Membership</td></tr>
<tr><td colspan="5">A.R.J. Setter (Team Leader) — BA (Hons) MSc CMILT MCIHT AMICE MSoRSA
Highways England Certificate of Competence
& Compliant with EU Directive 2008/96/EC
Badingham Limited

D. F. Rogers (Team Member) — JP, CEng BEng (Hons) MICE MSoRSA FIHE
Ashburn Consultants</td></tr>
<tr><td colspan="5">Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.</td></tr>
<tr><td colspan="5">DMRB and Traffic Signs Regulations and General Directions (TSRGD)</td></tr>
</table>

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing A253/A299 roundabout junction by providing road marking and re-aligning arms.

The kerb lines of arms A299 (east), Canterbury Road (A253) and A299 (northwest), will be adjusted.

It is unknown when this junction would be constructed as this is to be agreed with KCC as part of ongoing discussions. Complete should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB and Traffic Signs Regulations and General Directions (TSRGD) have been used to design the proposed scheme.

Design Speeds
Provide details of applied and/or existing design speeds.

Existing speed limit of relevant arms:
A299 (east) – 70mph; Cantebury Road (A253) – 60mph; A299 (northwest) – 70mph

Speed Limits
State whether mandatory or advisory, available speed data.

A299 (east) – 70mph; Willetts Hill – 60mph; Cantebury Road (A253) – 60mph; A299 (northwest) – 70mph; Seamark Road

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

In terms of non-motorist mode, there will be no physical change in the existing facilities apart from slight changes where footway touches the road kerbs which will be realigned slightly.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located north of Monkton and surrounded by green fields.

General Description
Include road network, road type, relevant land uses etc.

A299 (east) is a standard dual carriageway. Willetts Hill a two-way narrow single carriageway, most of the section of this road has no central road marking. Canterbury Road (A253) is a standard two-way single carriageway. A299 (northwest) is a standard dual carriageway. Seamark Road is a two-way single carriageway. The section of this road located further east of the junction is narrow and doesn't have centre road marking.

As this junction is in the rural area, there is limited facility for non-motorists.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total fifteen accidents have been recorded at the junction. These are accidents 4, 6, 50, 79, 80, 103, 105, 204, 354, 386, 441, 463, 477, 503 and 526.

Five of fifteen accidents were serious. Two of serious accidents involved motorbikes and one involved pedal cycle. The serious accidents were occurred due to the driver's error such as careless driving, failed to look properly, failed to stop in time.

Ten of fifteen accidents were slight. Three of the slight accident involved motorbike and one involved pedal cycle. The major cause for the slight accidents was careless driving at the roundabout junction.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – A253-A299 Monkton – MCC results		12.04.2019
RSA – A253-A299 Monkton – future Year Traffic Flows (2039)		12.04.2019
RSA – A253-A299 Monkton – Accident Data		12.04.2019

Drawings

Reference/Revision	Title	Date
RSA – A253-A299 Monkton – Site Location and Access design		25.03.2019
RSA – A253-A299 Monkton – Cad file		25.03.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

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Technical note:
RSA Stage 1:Designers Response- St Nicholas Roundabout

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve St Nicholas Roundabout located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to provide lane markings and signage to inform drivers of the lanes to use to travel through the junction to their desired route with the desire to achieve a more equal lane use on the approaches to the junction.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 5.1

Location: St Nicholas Roundabout.

Summary: Lack of lane direction arrows.

The proposed lane markings help drivers to select the correct lane position themselves in when approaching the junction. If the markings are blocked by slow moving or large vehicles they could be missed, leading to late braking decisions and possible skid, or loss of control type collisions.

Recommendation: It is recommended that the indicated lane markings are supplemented by additional arrow markings at each entry to further enhance the legibility and safety of the scheme.

Designers Response: The recommendation to additionally provide lane direction arrows as part of the scheme is noted and will be added through the detailed design. It is however noted that alongside the carriageway markings advanced warning signage detailing lane destinations are proposed to add information when the lanes are heavily trafficked. The detailed design will include for full road markings and a comprehensive signage strategy.

Problem 5.2

Location: St Nicholas Roundabout. High speed approaches,

Summary: Potential for collisions with sign posts.

New signs are proposed on the A299 approaches. The posts present a potential hazard to traffic if involved in a collision, particularly at high speed.

Recommendation: It is recommended that any new signs are of the passive safe variety.

Designers Response: The recommendation to use passive safe signage is noted and consideration for this type of signage can be made during detailed design.

3. General Comments

Sections 6 -7

As part of the detailed design package of works a lighting and drainage strategy will be provided.

Issued by

[redacted]

.....

Chris Morris

Approved by

[redacted]

Bev Coupe

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Management systems

This document has been produced by Wood Environment & Infrastructure Solutions UK Limited in full compliance with our management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

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Appendix A
Road Safety Audit – Stage 1

A299/A28 St Nicholas Roundabout, Manston, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

29th April 2019

Badingham
Transport Planning & Highway Engineering Consultants
16 Ashley Piece
Ramsbury, Marlborough
Wiltshire
SN8 2QE

T. +44(0)1672 521320
contact@badinghamuk.com
www.badinghamuk.com

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DOCUMENT ISSUE

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Description / Status:	Final			
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Prepared:	A. R. J. Setter			
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Signature:				
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FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed modifications to the St Nicholas roundabout junction, Manston, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 12.15pm and 12.30pm. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise lane direction markings and associated signing. The A28 Canterbury Road (north) is a rural dual carriageway without physical barrier, subject to 50mph speed limit. The A299 (south) and Canterbury Road (south) are standard two-way single carriageway. A temporary off-road parking facility is located off Potten Street Road at northwest corner of the junction.

1.11 Street lighting is provided to this five-arm junction and gradients in the area are minimal. Potten Street Road is subject to a 50mph speed limit. The junction lies within a derestricted speed zone and approach speeds from the A229 in particularly were noted to be high, as well as circulatory speeds. Separate cycleways are provided either side of the A299 (south) although their presence is not obvious to users. Footways are provided around the junction with substandard (lack of tactile paving) crossings. It was noted during the site inspection that the busy junction and speed of traffic made use of the pedestrian crossings hazardous.

1.12 A total of thirteen collisions are recorded at this junction over the latest 5-year period. One was categorised as serious and involved a motorcyclist failing to stop in time and colliding with a moving vehicle. One of the slight collisions involved a motorcyclist losing control during bad weather. The major cause for the slight collisions was careless driving at the roundabout junction. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 No observations.

SECTION 4: NON-MOTORISED USERS

4.1 No observations.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 PROBLEM

Location: St Nicholas Roundabout.

Summary: Lack of lane direction arrows.

5.1.1 The proposed lane markings help drivers to select the correct lane to position themselves in when approaching the junction. If the markings are blocked by slow moving or large vehicles they could be missed, leading to late braking decisions and possible skid, or loss-of-control type collisions.

RECOMMENDATION

5.1.2 It is recommended that the indicated lane markings are supplemented by additional arrow markings at each entry to further enhance the legibility and safety of the scheme.

Photo 1 - A229 northbound approach - lack of lane direction arrow markings.

5.2 PROBLEM

Location: St Nicholas Roundabout. High speed approaches.

Summary: Potential for collisions with sign posts.

5.2.1 New signs are proposed on the A229 approaches. The posts present a potential hazard to traffic if involved in a collision, particularly at high speed.

RECOMMENDATION

5.2.2 It is recommended that any new signs are of the passive safe variety.

Photo 2 - Existing damaged sign.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley P[redacted], Wiltshire, SN8 2QE

Signed: [redacted] Date: 29th April 2019

Audit Team Member

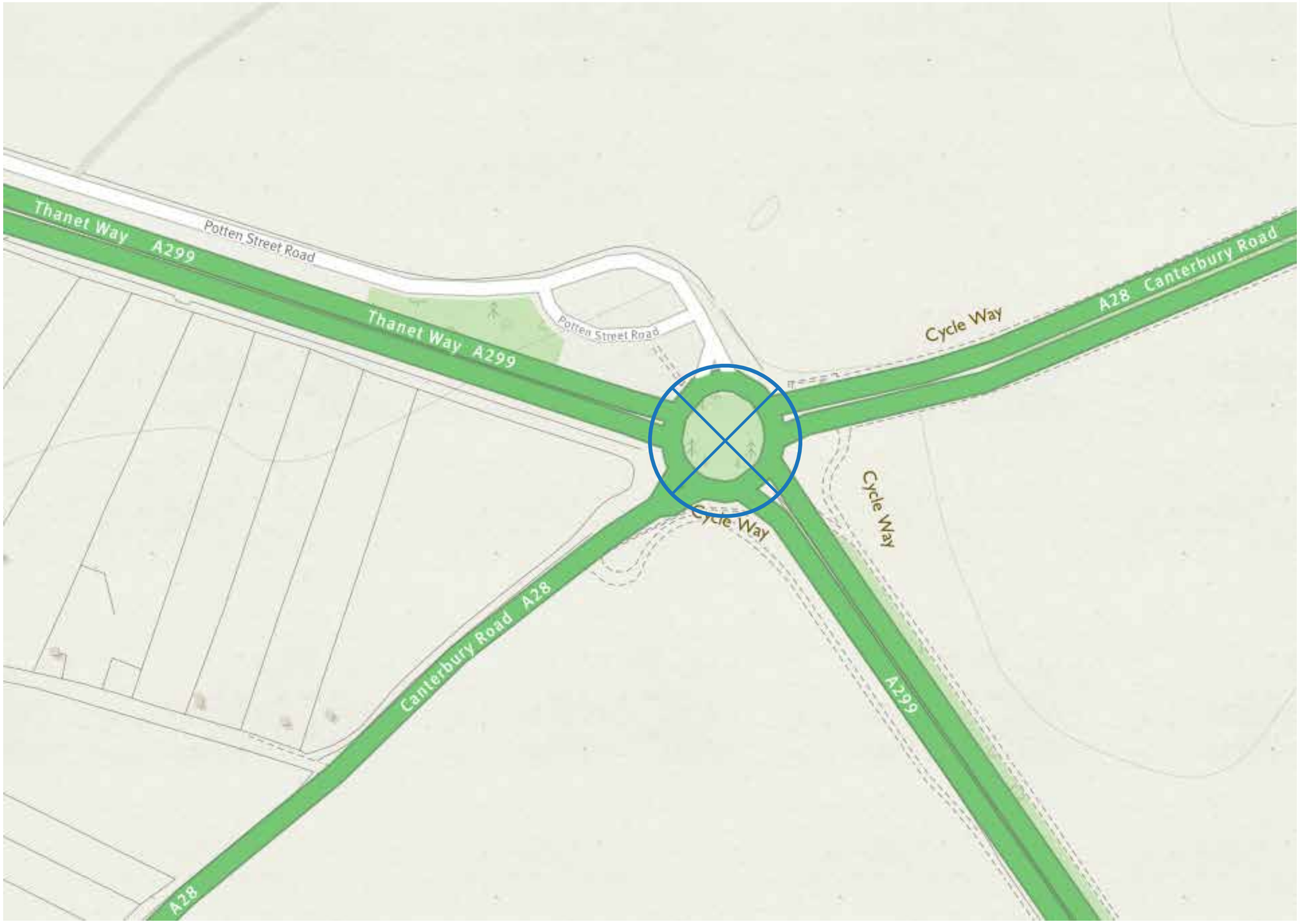
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 29th April 2019

FIGURES



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Client: RSP

Project: Manston Airport

Title: Location Plan

Date	Status
23/04/2019	FINAL

Scale	Original Size
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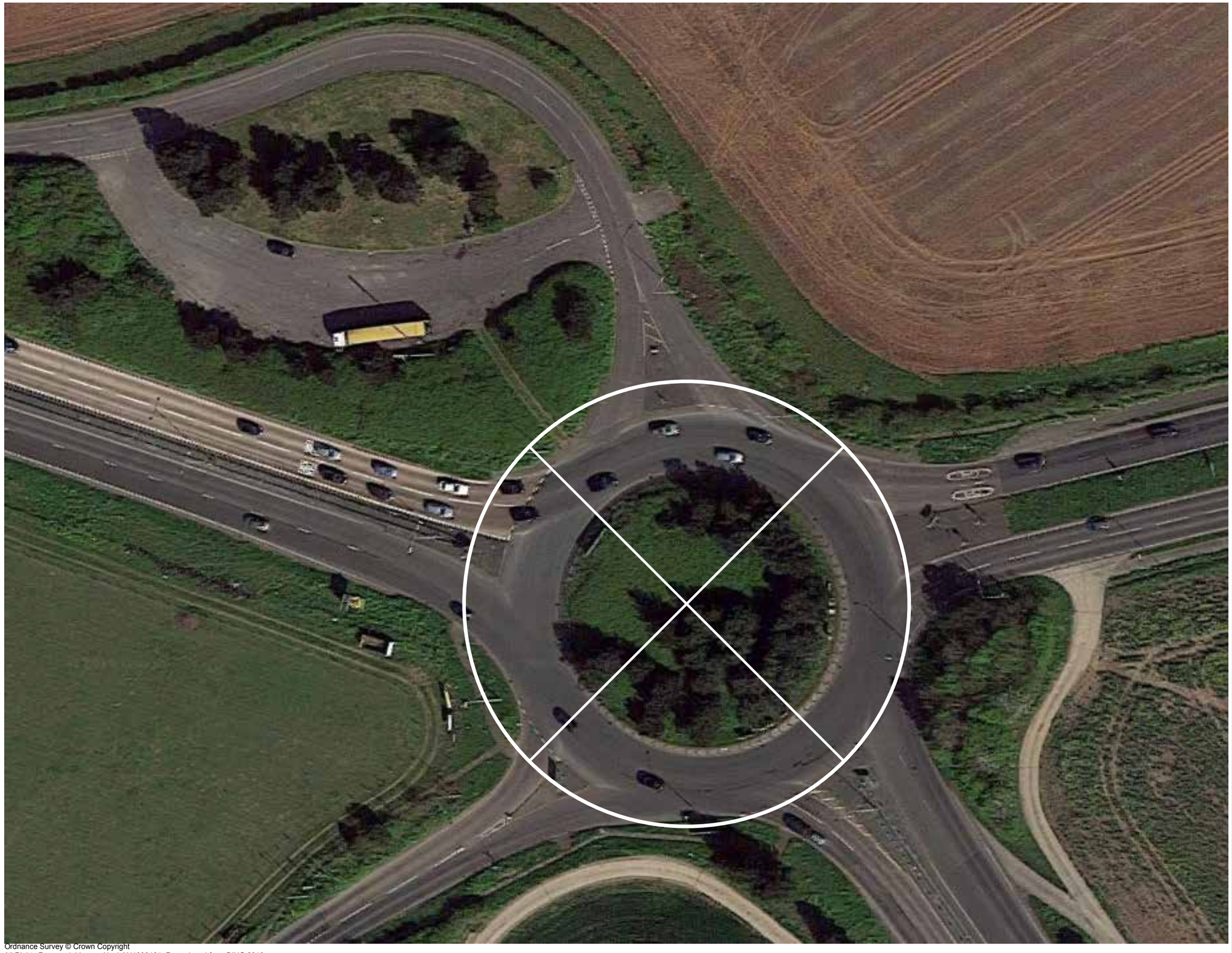
Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



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Project
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Title
Aerial Photo

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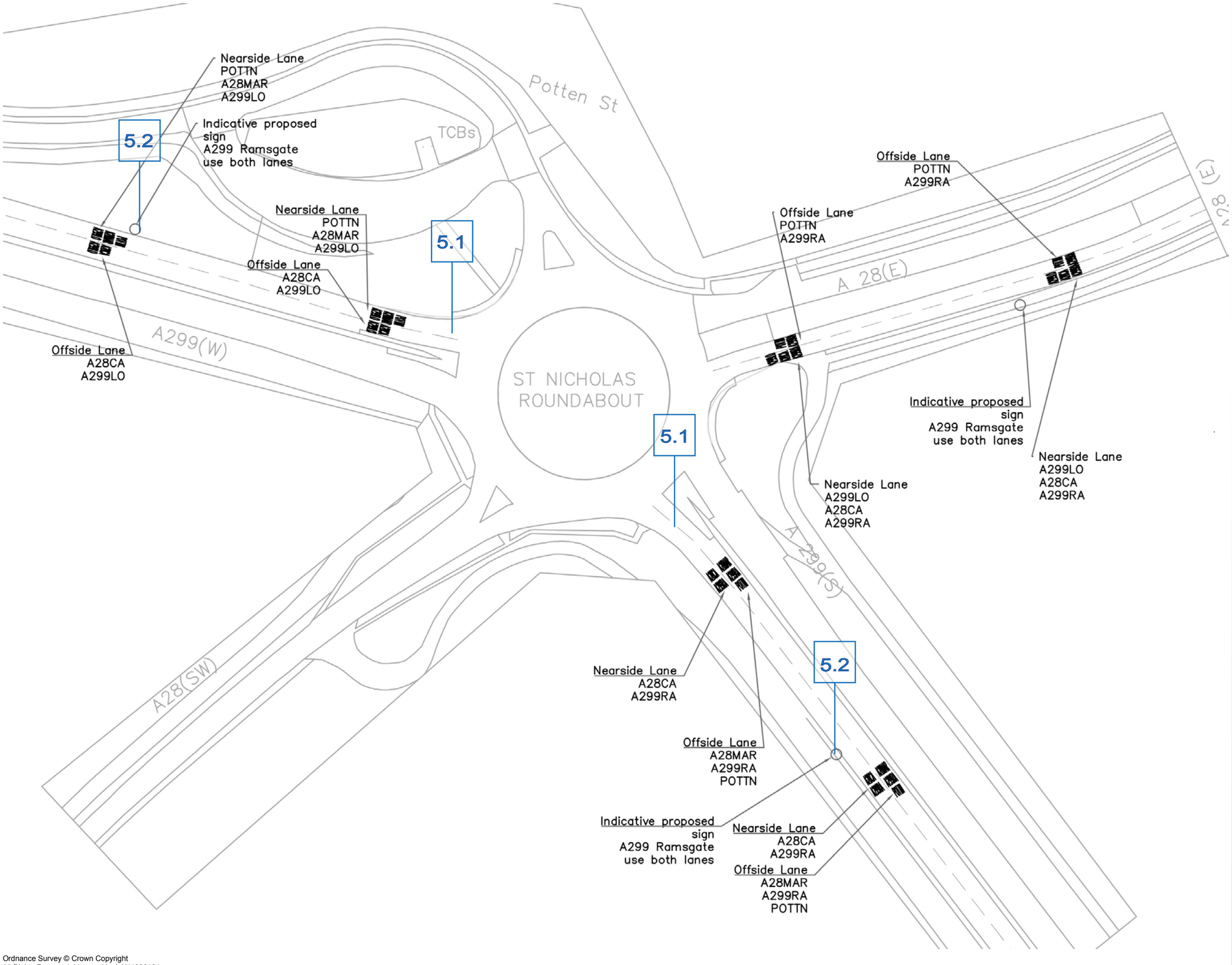
Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-



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Source: Site Location & Access Design

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RSP

Project
Manston Airport

Title
Audit Plan

Date	Status
29/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	11/04/2019
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Junction A299/A28 Mitigation Proposal
Report title:	Manston Airport – Junction A299/A28 Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	11/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

General Details

Highway Scheme Name & Road Number	Manston Airport – Junction A299/A28 Mitigation Proposal – Canterbury Road (east), A299 (south), Canterbury Road (west), Thanet Way (A299), Potten Street Road

Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.

Junction improvement at the A299/A28 roundabout junction.

RSA Stage *Tick as appropriate ✓*	1 √	2	3	4
	Interim			

Overseeing Organisation Details	**Design Organisation Details**
16 Charles II Street London SW1Y 4NW	Wood Glyn Price Associate Director Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK
Police Contact Details (RSA3 Only)	**Maintaining Agent Contact Details**
N/A	N/A

RSA Team Membership

A.R.J. Setter (Team Leader)	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA Highways England Certificate of Competence & Compliant with EU Directive 2008/96/EC Badingham Limited
D. F. Rogers (Team Member)	JP, CEng BEng (Hons) MICE MSoRSA FIHE Ashburn Consultants

Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.

Traffic Signs Manual, Design Manual for Roads and Bridges TD16/07.

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing A299/A28 roundabout junction by providing additional road markings and road signs.

Additional lane marking, and road signs will be provided to improve the traffic distribution to maximise the lane utilisation on Canterbury Road (east), A299 (south) and Thanet Road (A299).

At the moment it is unknown when construction will take place, there are ongoing discussions. Completion should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

Traffic Sings Manual from Department of Transport has been used to design the proposed scheme and TD16/07 of DMRB geometric design of roads and bridges.

Design Speeds
Provide details of applied and/or existing design speeds.

It is not proposed to change the speed limits on the approaches to the junction.

Speed Limits
State whether mandatory or advisory, available speed data.

Canterbury Road (east) – 50mph; A299 (south) – 70mph; Canterbury Road (west); Thanet Way (A299) – 70mph; Potten Road – 60mph.

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

In terms of non-motorist mode, there will be no physical change in the existing facilities.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located east of the St Nicholas At Wade and surrounded by green field.

General Description
Include road network, road type, relevant land uses etc.

Canterbury Road (east) is a dual carriageway without physical barrier, subject to 50mph speed limit. A299 (south) is a standard dual carriageway. Canterbury Road (west) is a standard two-way single carriageway. Thanet Way (A299) is a standard dual carriageway.

A temporary off-road parking facility is located off Potten Street Road at northwest corner of the junction.

As this junction is in the rural area, there is limited facility for non-motorists.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total thirteen accidents have been recorded at the junction. These are accidents 19, 35, 51, 52, 148, 263, 288, 376, 380, 389, 497, 515 and 534.

One of the thirteen accidents was serious which involved a motorcycle. This accident occurred when a biker failed to stop in time and collided with a moving vehicle.

One of the slight accidents involved motorcyclist who lost control due to bad weather. The main cause for the slight accidents was careless driving.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – A299/A28 – MCC results	-	11.04.2019
RSA – A299/A28 – Future Year Traffic Flows (2039)	-	11.04.2019
RSA – A299/A28 – Accident Data		11.04.2019

Drawings

Reference/Revision	Title	Date
RSA – A299/A28 – Site Location and Access design		11.04.2019
RSA – A299/A28 – Cad file		11.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

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Technical note:
RSA Stage 1:Designers Response- Spitfire Way/Manston Road

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve Spitfire Way/Manston Road junction located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to change the junction from a staggered priority junction to a signal controlled four arm junction, this will require realignment of the junction and arms and the addition of a road mark scheme to compliment the new layout and signal controls.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Proposed junction.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge/crossings.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Designers Response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 3.2

Location: Proposed junction.

Summary: Short central stacking length.

The central stacking length within the junction, particularly from the west, appears short and is situated on a curve, there appears to be insufficient storage for an HGV such as an articulated vehicle, which may lead to blocking back into the approach and damage type collisions as vehicles attempt to travel ahead or left.

Recommendation: It is recommended that sufficient storage is provided within the junction or the signal staging modified to allow removal if the storage area completely.

Designers Response: It is not uncommon for a HGV movement to block a right turn storage area within a signalled junction. The regularity of such an event is considered to be such that the impact on the junction performance is considered to be low. To put this into context during the future year AM peak hour one HGV is estimated to use this facility, with none estimated to use this during the PM peak hour. It is therefore not considered to be a matter of significance.

Problem 4.1

Location: Proposed junction.

Summary: Lack of facilities for cyclists.

No facilities for cyclists are provided. There is a risk of collisions between cyclists and vehicles, particularly involving HGVs squeezing cyclists when turning left.

Recommendation: It is recommended that facilities for cyclists are incorporated within the design.

Designers Response: The recommendation to provide facilities for cyclists at the junction has been noted and consideration for providing facilities within the design will be considered at the detailed design stage. Consideration of the likely number of cyclists and the high frequency routes will help to inform where best placed facilities such as advance stop lines could be located, noting the existing constraints, should the local highway authority deem these are required.

3. General Comments

Sections 5-7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by	Approved by
[redacted]	[redacted]
.....	
Chris Morris	**Bev Coupe**

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Appendix A
Road Safety Audit – Stage 1

B2190 Spitfire Way/B2050 Manston Road, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

26th April 2019

Badingham

Transport Planning & Highway Engineering Consultants

16 Ashley Piece

Ramsbury, Marlborough

Wiltshire

SN8 2QE

T. +44(0)1672 521320

contact@badinghamuk.com

www.badinghamuk.com

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DOCUMENT ISSUE

Issue / Revision:	Issue 1			
Description / Status:	Final			
Date:	26/04/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
File Reference:	0781 Manston Airport - 12 - RSA1 - Issue 1.docx			

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SECTION 2:	ITEMS RAISED AT PREVIOUS AUDITS	3
SECTION 3:	VEHICULAR AND HIGHWAY ISSUES	4
SECTION 4:	NON-MOTORISED USERS	9
SECTION 5:	ROAD MARKINGS AND SIGNAGE	10
SECTION 6:	STREET LIGHTING	11
SECTION 7:	DRAINAGE	12
SECTION 8:	AUDIT STATEMENT	13

FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed highway works at the B2190 Spitfire Way/B2050 Manston Road associated with the redevelopment of Manston Airport, Kent.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has been made aware of a departure from standard relating to part of an intervisibility zone being outside of the highway boundary.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 10.50am and 11.05am. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise the proposed conversion of an existing uncontrolled staggered crossroads arrangement to a signalised crossroads junction. Manston Road (north) is subject to a 30mph speed limit and is a single carriageway with double-yellow line restrictions. There is a footway on the western side of the carriageway. Manston Road (east) also has double-yellow line restrictions and is subject to a 40mph speed limit beyond the junction. It has a straight approach alignment. No footways are provided. Manston Road (west) bends to the north at the junction. A footway is provided on its southern side. Bus stops are situated to the south of the junction on the single carriageway Spitfire Way. No footways are provided on either side of the highway leading from the junction although a short section is provided leading to Belle-Davies Drive beyond which the speed limit changes to 60mph. Gradients in the area are minimal. Controlled crossing facilities are to be provided across the Manston Road (east) and Spitfire Way arms.

1.11 Nine collisions are recorded for the latest 5-year period 2013-2018. Two were serious and seven are categorised as slight. A total of 12 casualties resulted. The highway was not identified as a contributory factor in any of the collisions.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Proposed junction.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge/crossings.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Photo 1 - Manston Road view west.

3.2 PROBLEM

Location: Proposed junction.

Summary: Short central stacking length.

3.2.1 The central stacking length within the junction, particularly from the west, appears short and is situated on a curve. There appears to be insufficient storage for an HGV such as an articulated vehicle, which may lead to blocking back into the approach and damage-type collisions as vehicles attempt to travel ahead or left.

RECOMMENDATION

3.2.2 It is recommended that sufficient storage is provided within the junction or the signal staging modified to allow removal of the storage area completely.

Photo 2 - Manston Road view east.

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: Proposed junction.

Summary: Lack of facilities for cyclists.

4.1.1 No facilities for cyclists are provided. There is a risk of collisions between cyclists and vehicles, particularly involving HGVS 'squeezing' cyclists when turning left.

RECOMMENDATION

4.1.2 It is recommended that facilities for cyclists are incorporated within the design.

Photo 3 -Manston Road view west.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 No signing details have been provided. A suitable package of signage information will need to be provided as part of any further detailed design.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 26th April 2019

Audit Team Member

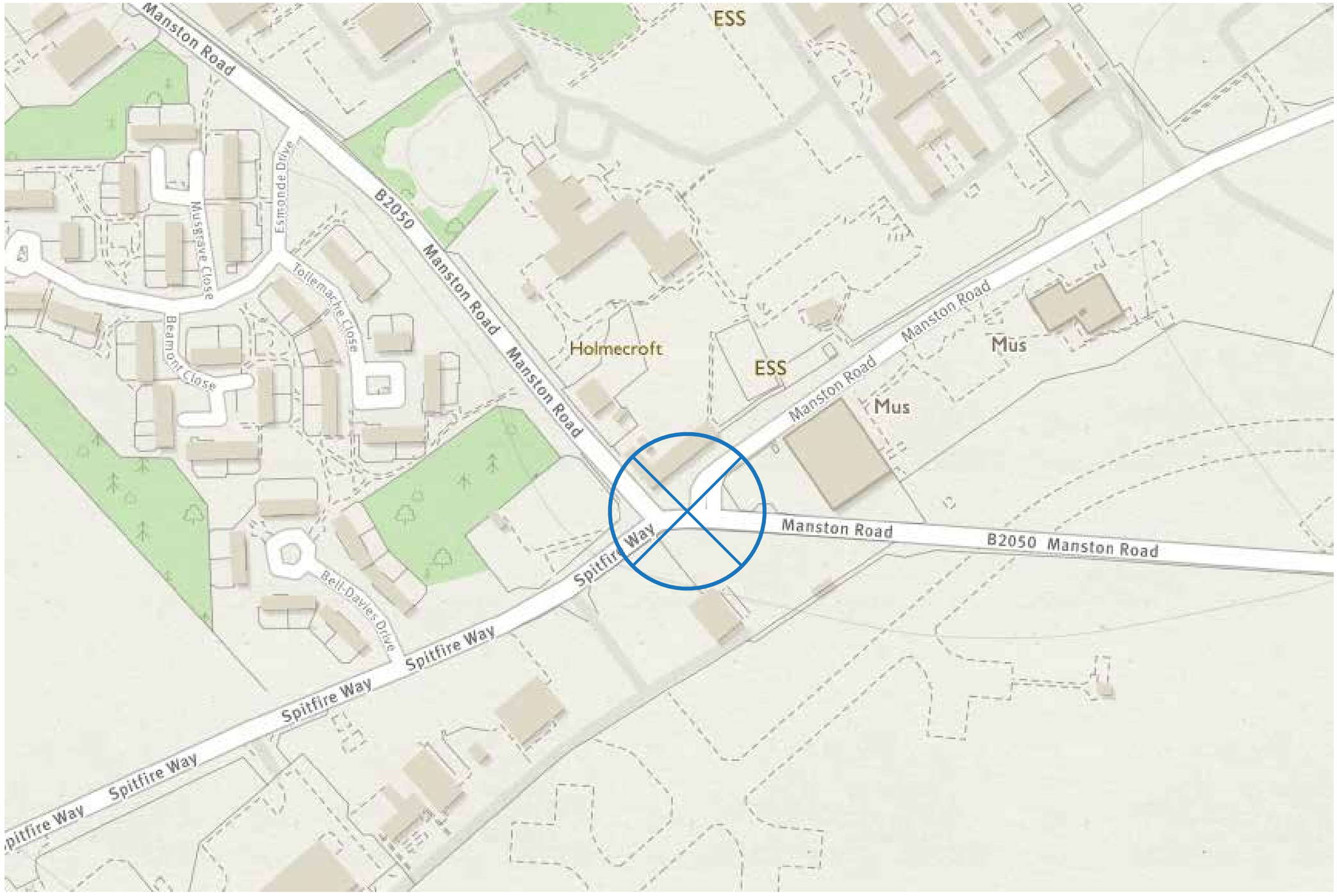
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 26th April 2019

FIGURES



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Project
Manston Airport

Title
Location Plan

Date	Status
24/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
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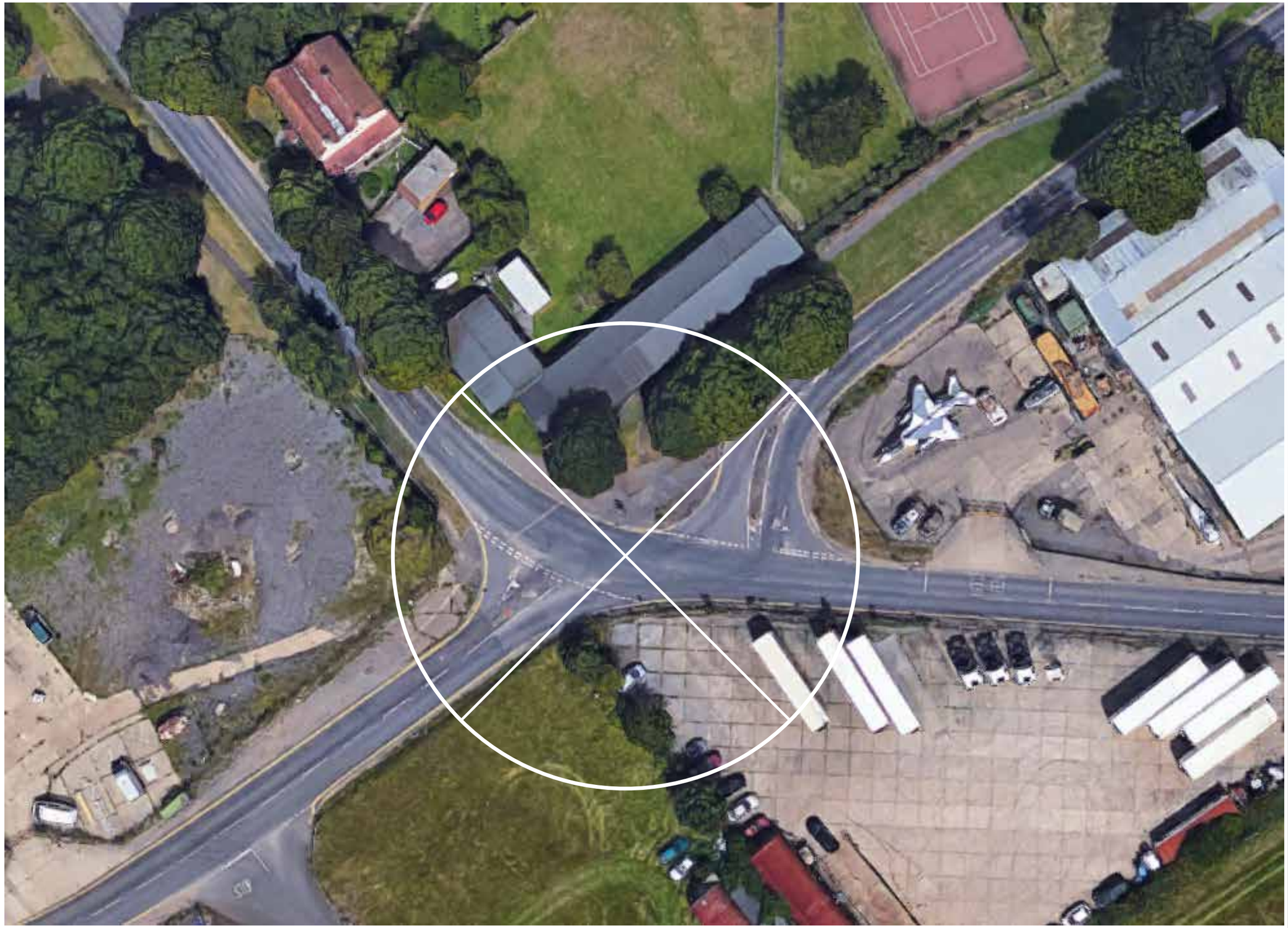

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Client
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Project
Manston Airport

Title
Aerial Photo

Date	Status
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Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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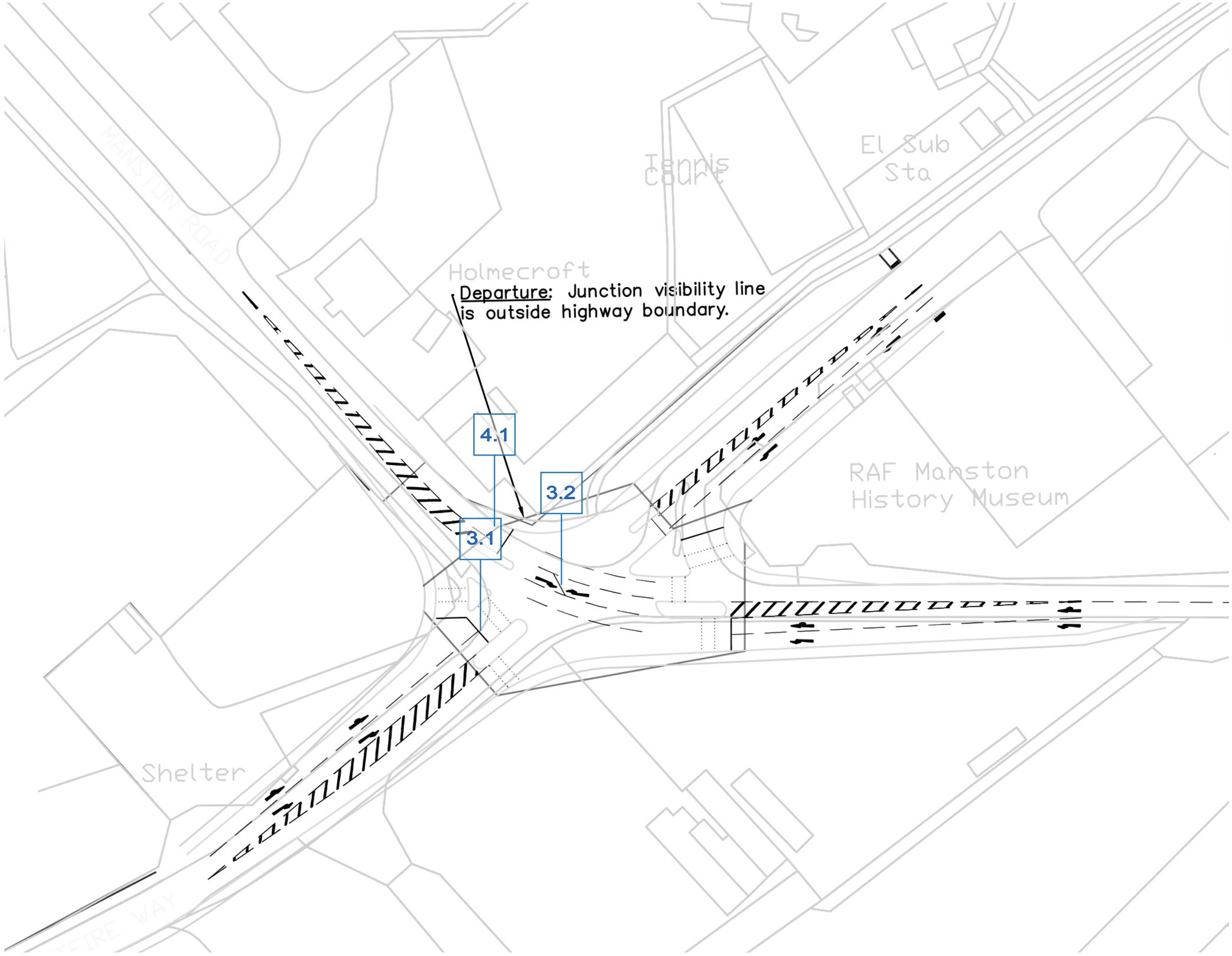

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Source: Site Location & Access Design

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Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
24/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	22/03/19
Document Reference:	N/A
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport DCO
Report title:	Manston Airport - B2190 Spitfire Way/B2050 Manston Road/Manston Road Junction
PREPARED BY:	
Name:	Glyn Price
Signed:	
Organisation:	Wood
Date:	22/03/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

General Details				
Highway Scheme Name & Road Number	Manston Airport – Spitfire Way/Manston Road – Signlaised Cross Road			
Type of Scheme *e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.*				
New Roundabout Junction with the B2190				
RSA Stage *Tick as appropriate ✓*	1 √	2	3	4
	Interim			
Overseeing Organisation Details	**Design Organisation Details**			
16 Charles II Street London SW1Y 4NW	Wood Glyn Price Associate Director Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK			
Police Contact Details (RSA3 Only)	**Maintaining Agent Contact Details**			
N/A	N/A			
RSA Team Membership				
A.R.J. Setter (Team Leader)	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA Highways England Certificate of Competence & Compliant with EU Directive 2008/96/EC Badingham Limited			
D. F. Rogers (Team Member)	JP, CEng BEng (Hons) MICE MSoRSA FIHE Ashburn Consultants			
Terms of Reference *Make reference to relevant DMRB documents and other guidance where appropriate.*				
DMRB – TD50/04 THE GEOMETRIC LAYOUT OF SIGNALCONTROLLED JUNCTIONS AND SIGNALISED ROUNDABOUTS				

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposals are for a new signalised junction layout at the existing B2190 Spitfire Way/B2050 Manston Road/Manston Road junction.

The extent of the design is shown on drawing 38199-Lon155 provided in the pack of information for this junction, this includes the revised junction layout and approaches.

The objectives of this scheme are to provide an improved junction in terms of capacity and safety as this junction forms part of the route into the proposed Manston Airport development AND would form he southern junction of the Manston to Haine Link Road.

Construction would be proposed within the early years of the project (2-4) life cycle which will be 2021-2023 depending on the approvals process of a DCO that is going through examination. Completion should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB and Traffic signs regulations and general directions have been used in the design of this junction.

Design Speeds
Provide details of applied and/or existing design speeds.

30MPH

Speed Limits
State whether mandatory or advisory, available speed data.

The existing speed limit at the B2190 Spitfire Way/B2050 Manston Road junction is 30 mph. it is not proposed to change this as part of the proposed scheme at the junction.

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

MCC Traffic Turning Counts were taken at the junction 2017 and the results of these counts will be provided. This also included queue information.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the access for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

The proposed design provided for in drawing 38199-Lon155 set out that pedestrian movements will be accommodated across the junction, with signalised crossings as necessary.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

The proposed junction is proposed at the existing location of the Manston Road/Spitfire Way Junction, slightly off set.

General Description
Include road network, road type, relevant land uses etc.

The existing Spitfire Way carriageway is a two-lane carriageway. There are no footways either side of the carriageway and the road is subject to the NSL.

Manston Road is a two-lane carriageway. There are no footways either side of the carriageway.

The existing junction is an offset staggered cross roads junction (Priority) there are no footways on the junction and no dedicated pedestrian crossing points.

The junction is on the boundary of the Manston Airport site.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

At the existing Manston Road/Spitfire Way junction 8 accidents have been recorded which in assessment within the Manston Airport Transport Assessment triggered further detailed assessment and the need for a highways safety mitigation scheme. As such the design of the proposed junction has been provided to improve road safety as well as provide additional capacity.

The details for accidents the 8 accidents are provided.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction that has been recorded will be included with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

This is a key strategic junction for the Manston Airport Development as it forms one of the key junctions for access to the passenger terminal and northern grass area. As such the design has been prepared along with junction modelling to balance road safety improvement requirements and needed capacity improvements.

The junction would also form the southern element of a proposed Manston to Haine Link Road which also increases traffic at the junction so consideration of the this was also required. KCC propose that this junction should be a roundabout junction but RiverOak have also through this design attempted to show that a signalised layout can work in this location also.

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
	RSA – Manston Road/Spitfire Way – MCC results	11.04.2019
	RSA – Manston Road/Spitfire Way – future Year Traffic Flows (2039)	11.04.2019
	RSA – Manston Road/Spitfire Way – Accident ZIP	11.04.2019
	RSA – Manston Road/Spitfire Way - LINSIG	11.04.2019

Drawings

Reference/Revision	Title	Date
	RSA – Manston Road/Spitfire Way – Site Location and Access design	11.04.2019
	RSA – Manston Road/Spitfire Way – Cad file	11.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan	✓	Scale Layout Plans	✓
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis	✓	Road Traffic Collision Plot	
Traffic Signal Staging	✓	Traffic Counts	✓
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	✓
Design Standards Used		Adjacent Land Uses	✓

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Technical note:
RSA Stage 1:Designers' Response- Coffin House Corner Junction

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve Coffin House Corner signal junction located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to change the stage sequence following the removal of Nash road from the junction and to change to lane widths on the Shottendane Road approach to the junction and provide a road marking scheme.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Proposed junction and Nash Road turning head.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage type collisions or over-running of the verge or footways, endangering users. Nash Road may also experience large HGV traffic including waste collection and delivery vehicles. Insufficient turning head space may lead to over-running of the adjacent footways leading to collisions with pedestrians or damage-type collisions with parked vehicles.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

Designers Response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 4.1

Location: College Road.

Summary: Lack of facilities for cyclists.

The existing advanced cycle storage facility is proposed to be replaced with a pedestrian crossing. No facilities for cyclists are provided on this approach. There is a risk of collisions between cyclists and vehicles, particularly involving HGVs squeezing cyclists against barrier fencing when turning right.

Recommendation: It is recommended that facilities are incorporated within the design.

Designers Response: The local plan improvement scheme for this junction provides the same level of cycle advanced stop lines (ASLs) as the proposed mitigation design. The Local Plan mitigation scheme is provided in **Appendix B**. ASLs are provided on the southern and western approaches which is therefore considered acceptable.

3. General Comments

Sections 5-7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by

[redacted]

.....

Chris Morris

Approved by

[redacted]

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Appendix A
Road Safety Audit – Stage 1

Coffin House Corner, Margate, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

28th April 2019

Badingham
Transport Planning & Highway Engineering Consultants
16 Ashley Piece
Ramsbury, Marlborough
Wiltshire
SN8 2QE

T. +44(0)1672 521320
contact@badinghamuk.com
www.badinghamuk.com

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DOCUMENT ISSUE

Issue / Revision:	Issue 1			
Description / Status:	Final			
Date:	28/04/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
File Reference:	0781 Manston Airport - 15 - RSA1 - Issue 1.docx			

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Page No

TEXT

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SECTION 2:	ITEMS RAISED AT PREVIOUS AUDITS	3
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SECTION 4:	NON-MOTORISED USERS	5
SECTION 5:	ROAD MARKINGS AND SIGNAGE	6
SECTION 6:	STREET LIGHTING	7
SECTION 7:	DRAINAGE	8
SECTION 8:	AUDIT STATEMENT	9

FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed modifications to the Coffin House Corner signal junction, Margate, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 13.30pm and 13.45pm. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise modifications to the existing five-arm signal-controlled junction at Coffin House Corner including the closure of Nash Road. The junction is an unconventional layout arrangement with significant gradients on some approaches and one-way approach and exit arms. It lies within a 30mph speed limit. Footways and street lighting are provided. A school is situated a short distance west of the junction. Pedestrian crossing facilities are proposed across all arms.

1.11 Three collisions are recorded within the latest five-year period. All collisions were categorised as slight resulting in three casualties. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Proposed junction and Nash Road turning head.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The junction is likely to experience a significant number of large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge or footways, endangering users. Nash Road may also experience large HGV traffic including waste collection and delivery vehicles. Insufficient turning head space may lead to over-running of the adjacent footways leading to collisions with pedestrians or damage-type collisions with parked vehicles.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the junction to demonstrate safe and efficient access.

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: College Road.

Summary: Lack of facilities for cyclists.

4.1.1 The existing advanced cycle storage facility is proposed to be replaced with a pedestrian crossing. No facilities for cyclists are provided on this approach. There is a risk of collisions between cyclists and vehicles, particularly involving HGVS 'squeezing' cyclists against barrier fencing when turning right.

RECOMMENDATION

4.1.2 It is recommended that facilities for cyclists are incorporated within the design.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 No signing details have been provided. A suitable package of signage information will need to be provided as part of any further detailed design.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: Date: 28th April 2019

Audit Team Member

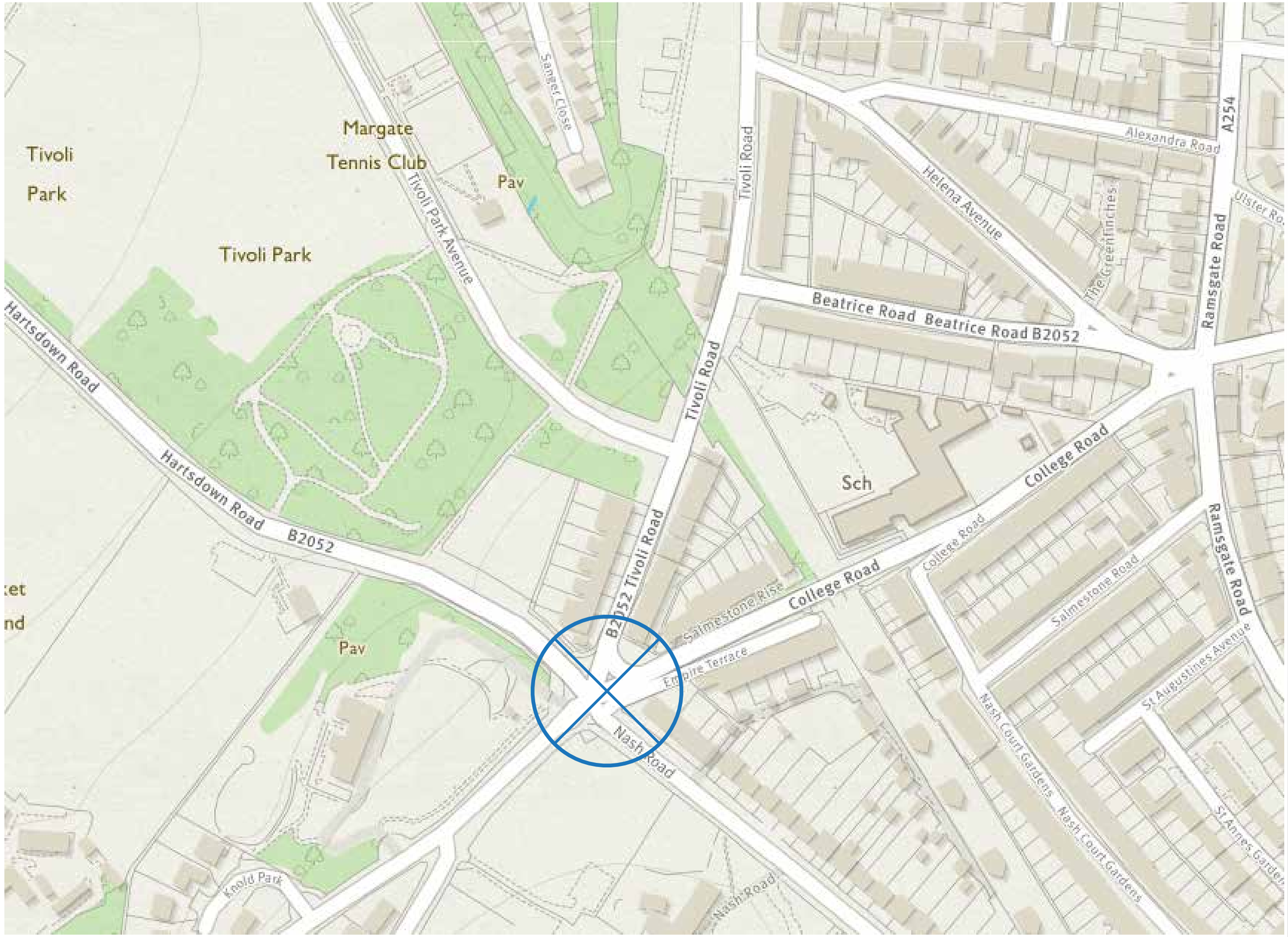
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: Date: 28th April 2019

FIGURES



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Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

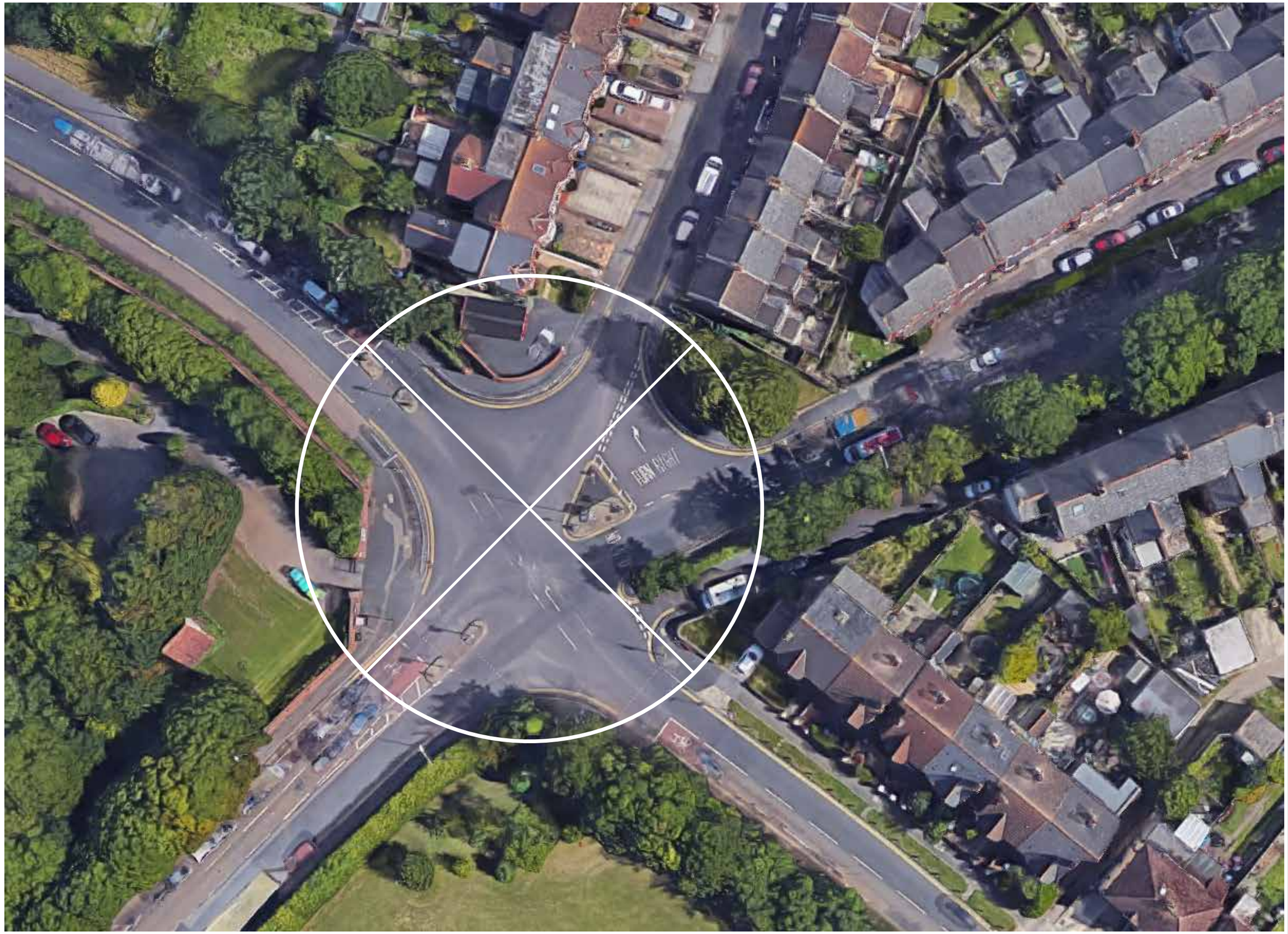
Client: RSP

Project: Manston Airport

Title: Location Plan

Date	Status
24/04/2019	FINAL
Scale: NTS	Original Size: A3
Drawn: AS	Checked: AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



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Rev.	Date	Initials	Amendments

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Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client
RSP

Project
Manston Airport

Title
Aerial Photo

Date	Status
24/04/2019	FINAL
Scale	**Original Size**
NTS	A3
Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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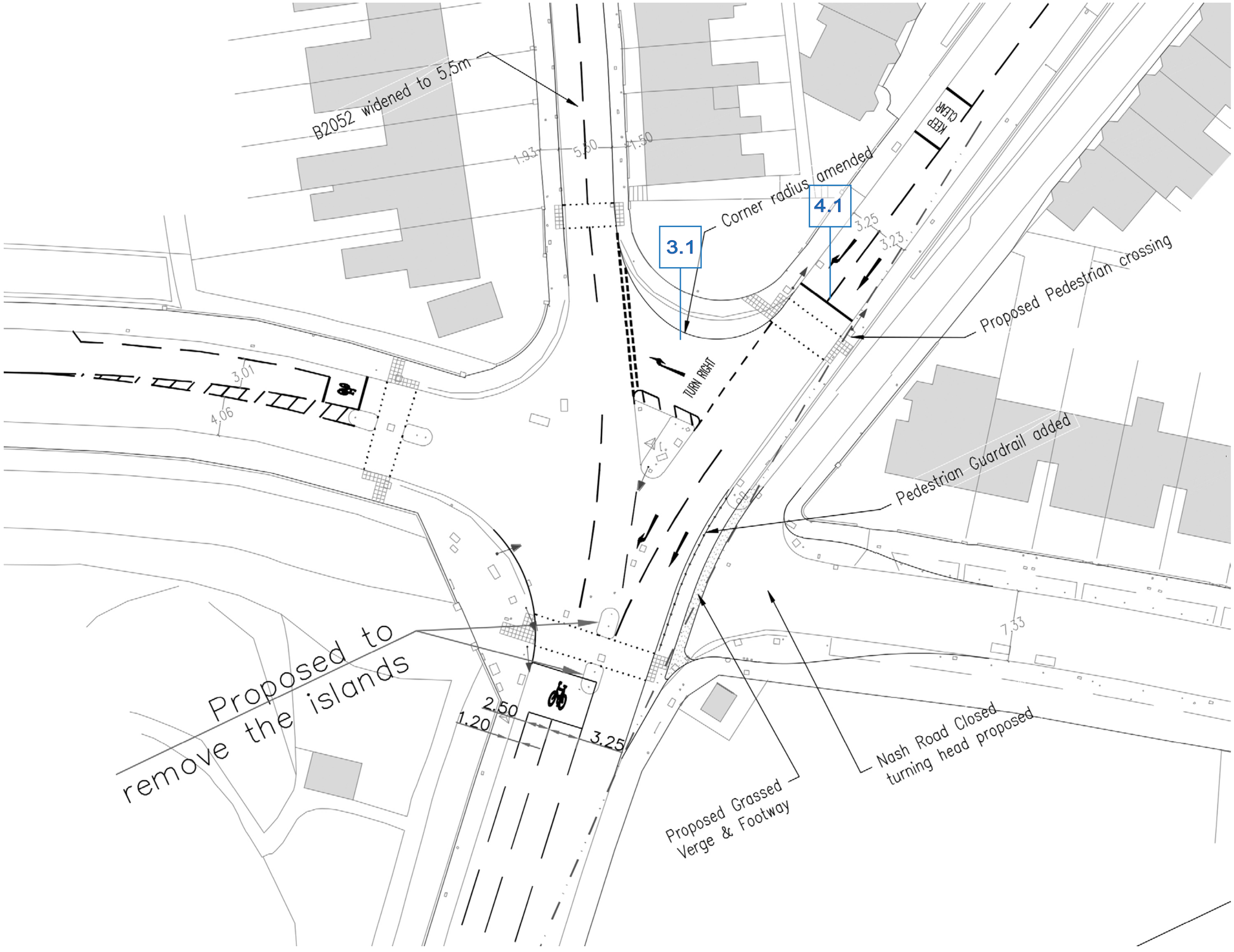

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Source: Site Location & Access Design

Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
29/04/2019	FINAL
Scale	**Original Size**
NTS	A3
Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	10/04/2019
Document Reference:	N/A
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Nash Road/Shottendane Road Mitigation Proposal
Report title:	Manston Airport - Nash Road/Shottendane Road Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	10/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

<table>
<tr><th colspan="5">General Details</th></tr>
<tr><td>Highway Scheme Name & Road Number</td><td colspan="4">Manston Airport – Nash Road/Shottendane Road Mitigation Proposal – Nash Road, Shottendane Road, Hartsdown Road, Tivoli Road, College Road</td></tr>
<tr><td colspan="5">Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.</td></tr>
<tr><td colspan="5">New Roundabout Junction with the B2190</td></tr>
<tr><td rowspan="2">RSA Stage
Tick as appropriate ✓</td><td>1 √</td><td>2</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Interim</td></tr>
<tr><td colspan="2">Overseeing Organisation Details</td><td colspan="3">Design Organisation Details</td></tr>
<tr><td colspan="2">16 Charles II Street
London SW1Y 4NW</td><td colspan="3">Wood
Glyn Price
Associate Director
Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK</td></tr>
<tr><td colspan="2">Police Contact Details (RSA3 Only)</td><td colspan="3">Maintaining Agent Contact Details</td></tr>
<tr><td colspan="2">N/A</td><td colspan="3">N/A</td></tr>
<tr><td colspan="5">RSA Team Membership</td></tr>
<tr><td colspan="5">A.R.J. Setter (Team Leader) — BA (Hons) MSc CMILT MCIHT AMICE MSoRSA
Highways England Certificate of Competence
& Compliant with EU Directive 2008/96/EC
Badingham Limited

D. F. Rogers (Team Member) — JP, CEng BEng (Hons) MICE MSoRSA FIHE
Ashburn Consultants</td></tr>
<tr><td colspan="5">Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.</td></tr>
<tr><td colspan="5">DMRB – TD 50/04 – The Geometric Layout of Signal-controlled Junctions and Signalised Roundabout</td></tr>
</table>

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing Nash Road/Shottendane Road/Hartsdown Road/Tivoli Road/College Road signalised junction.

Junction access from Nash Road will be discontinued and layout of the junction will be modified accordingly.

It is unknown when this junction would be constructed as this is to be agreed with KCC as part of ongoing discussions. Complete should take between 3-6 months.

NOTE THAT THIS JUCNTION IS KNOWN LOCALLY AS COFFIN HOUSE CORNER

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB has been applied to the design of the proposed roundabout. DMRB TD 50/04 – The Geometric Layout of Signal-controlled Junctions and Signalised Roundabout

Design Speeds
Provide details of applied and/or existing design speeds.

30MPH

Speed Limits
State whether mandatory or advisory, available speed data.

The existing speed limit around the junction is 30mph.

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

A pedestrian guardrail will be added at the side of closed Nash Road. A straight footway link between College Road and Shottendane Road will be established in the section of closed Nash Road. The existing pedestrian refuge island located at Shottendane Road arm will be removed. A new signal-controlled pedestrian crossing will be provided on College Road arm.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located southwest of the Margate and surrounded by private properties.

General Description
Include road network, road type, relevant land uses etc.

Nash Road, Shottendane Road and Hartsdown Road are two-way single carriageway. College Road is a one-way single carriageway with two-lane entry approach. Tivoli Road is also a one-way single carriageway which is an exit only arm of the junction.
Most of the corners of the junction is secured by guardrails. Footway and pedestrian crossing facilities are available at the junction.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total seven slight accident have been recorded at the junction. These are accidents 10, 42 (additional year) 67, 194, 211, 216 and 255.

One of the accidents involved a pedestrian who was hit by wing mirror, when walking on the road in dark.

One of the accidents involved a cyclist who was hit by a car due to dazzling. Two of the slight accidents which involved motorcyclist, occurred due to careless driving.

Most of the accident occurred due to careless driving.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – COFFIN HOUSE CORNER – MCC Results	-	11.04.2019
RSA – COFFIN HOUSE CORNER – future Year Traffic Flows (2039)	-	11.04.2019
RSA – COFFIN HOUSE CORNER – Accident Data		11.04.2019
RSA – COFFIN HOUSE CORNER – LINSIG output		11.04.2019

Drawings

Reference/Revision	Title	Date
RSA – COFFIN HOUSE CORNER – Site Location and Access design		11.04.2019
RSA – COFFIN HOUSE CORNER – Cad file		11.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan	✓	Scale Layout Plans	✓
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis	✓	Road Traffic Collision Plot	
Traffic Signal Staging	✓	Traffic Counts	✓
Speed Surveys	✓	Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	✓
Design Standards Used		Adjacent Land Uses	

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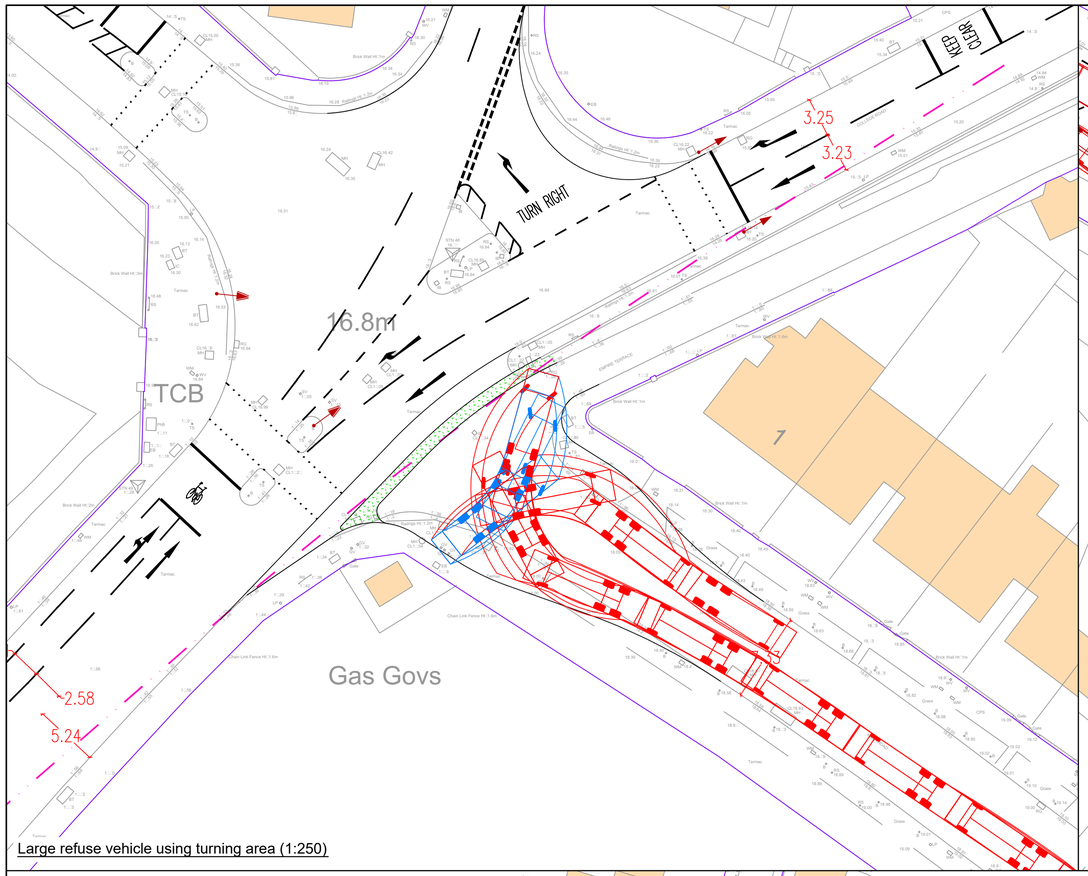
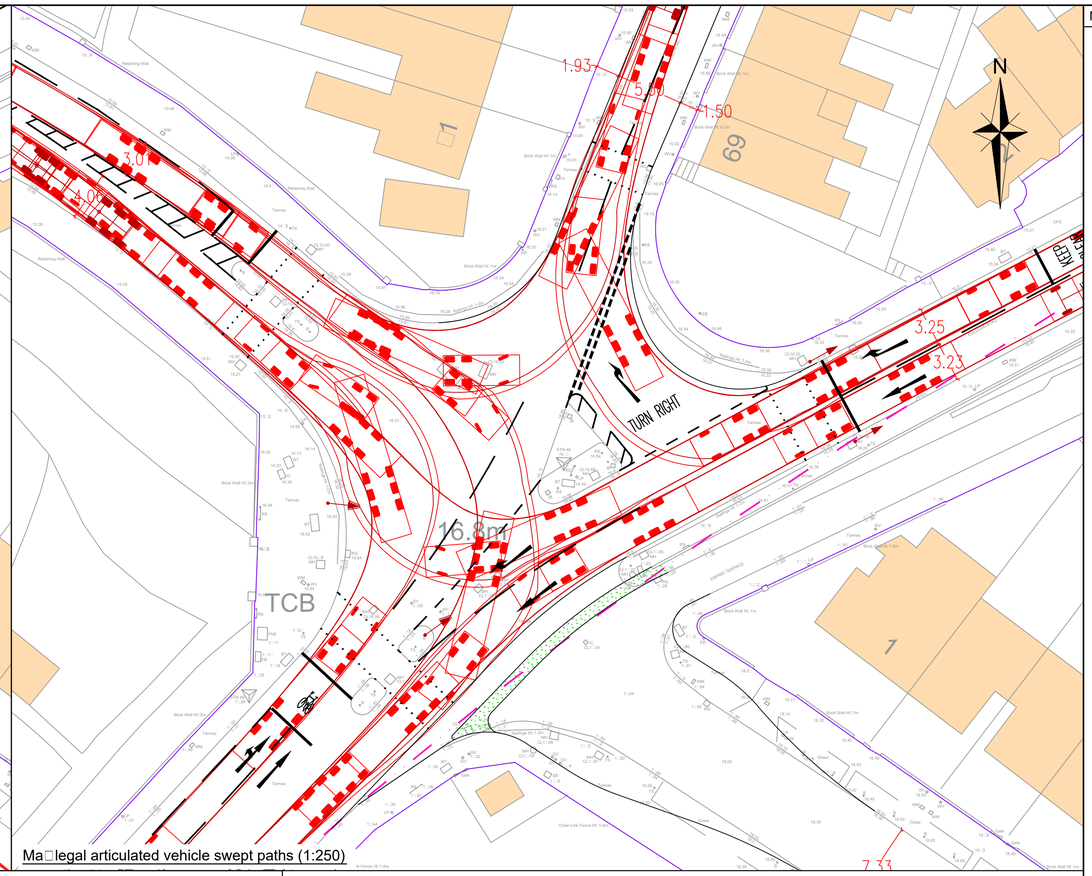
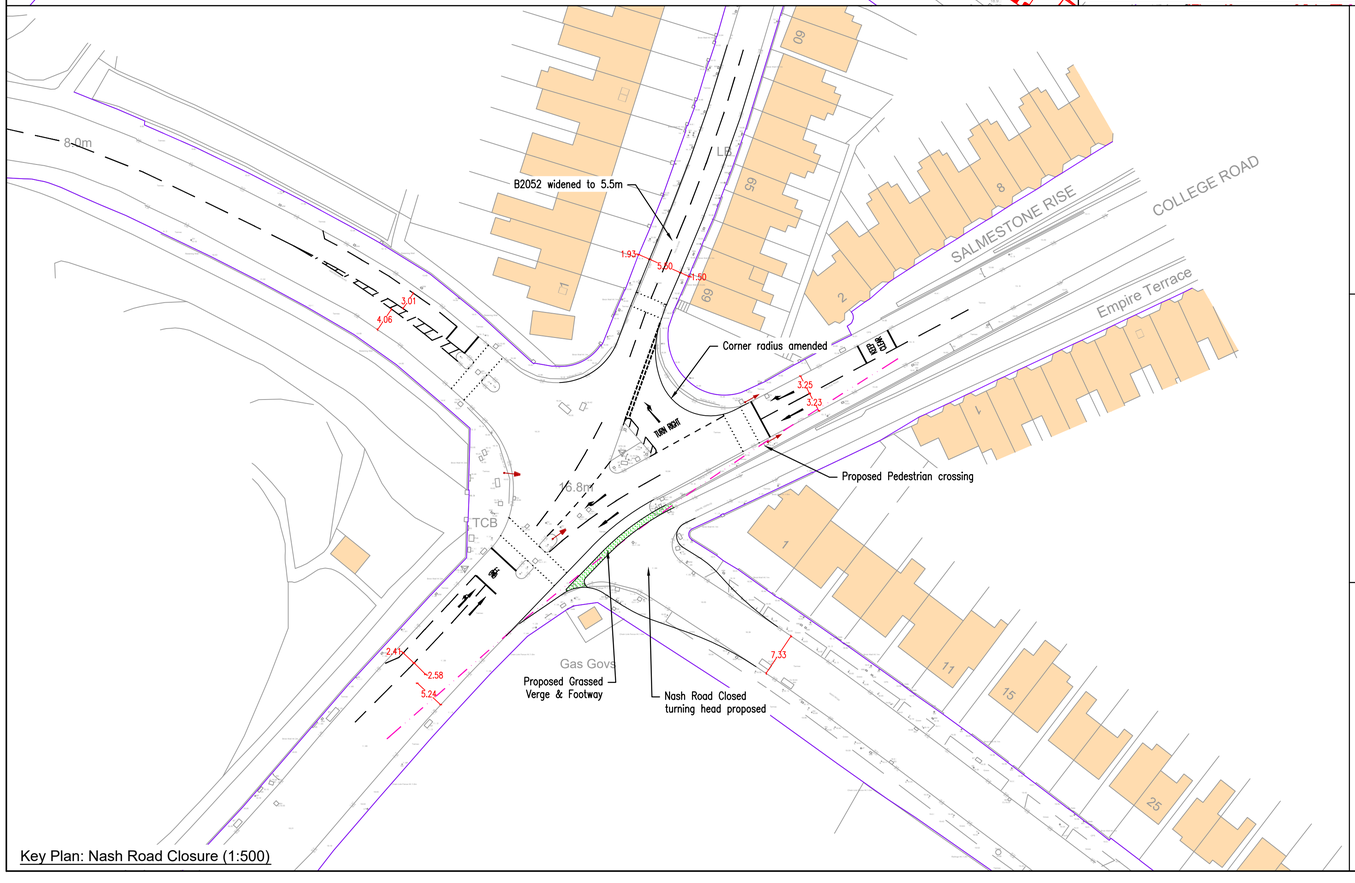
Appendix B
Local Plan mitigation scheme



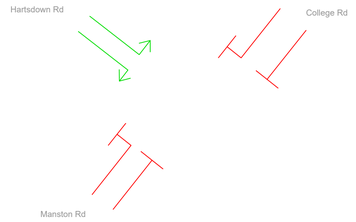
Large refuse vehicle using turning area (1:250)



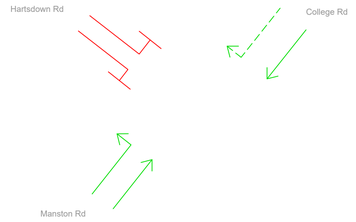
Ma□legal articulated vehicle swept paths (1:250)



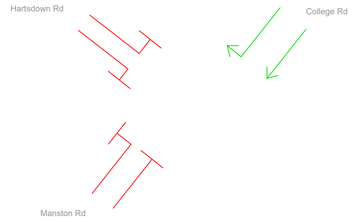
Key Plan: Nash Road Closure (1:500)



Stage 1



Stage 2



Stage 3

Traffic Signal: Stages Diagram

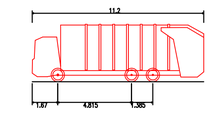
NOTES

70m FORWARD VISIBILITY IN ACCORDANCE WITH DMRB TD9/93 TABLE 3

PROPOSED PRIMARY SIGNAL

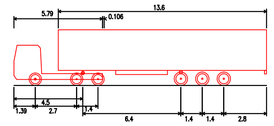
PROPOSED SECONDARY SIGNAL

HIGHWAY BOUNDARY



Phoenix 2 Duo (P2-15W with Elite 6x4 chassis)

Overall Length	11.200m
Overall Width	2.530m
Overall Body Height	3.751m
Min Body Ground Clearance	0.304m
Track Width	2.500m
Lock to Lock Time	4.00s
Curb to Curb Turning Radius	9.500m



Max Legal Articulated Vehicle (16.5m)

Overall Length	16.500m
Overall Width	2.500m
Overall Body Height	3.632m
Min Body Ground Clearance	0.396m
Max Track Width	2.500m
Lock to Lock Time	6.00 sec
Kerb to Kerb Turning Radius	6.870m

Rev	Amendments	Dm	Chk	App	Date
A	Ped crossing north of College Road added & KCC Refuse tracked	DH	FM	JW	Mar 17

Consulting Engineers Ltd

Offices 8 & 9
Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot Hampshire
GU11 2PW
01252 939000

Issued by

Office 17
Wealden Place
Bradbourne Vale Road
Sevenoaks
Kent
TN13 3QQ
01732 448120

enquiries@c-a.uk.com
www.c-a.uk.com

Job Title

Nash Road, Margate

Drawing Title

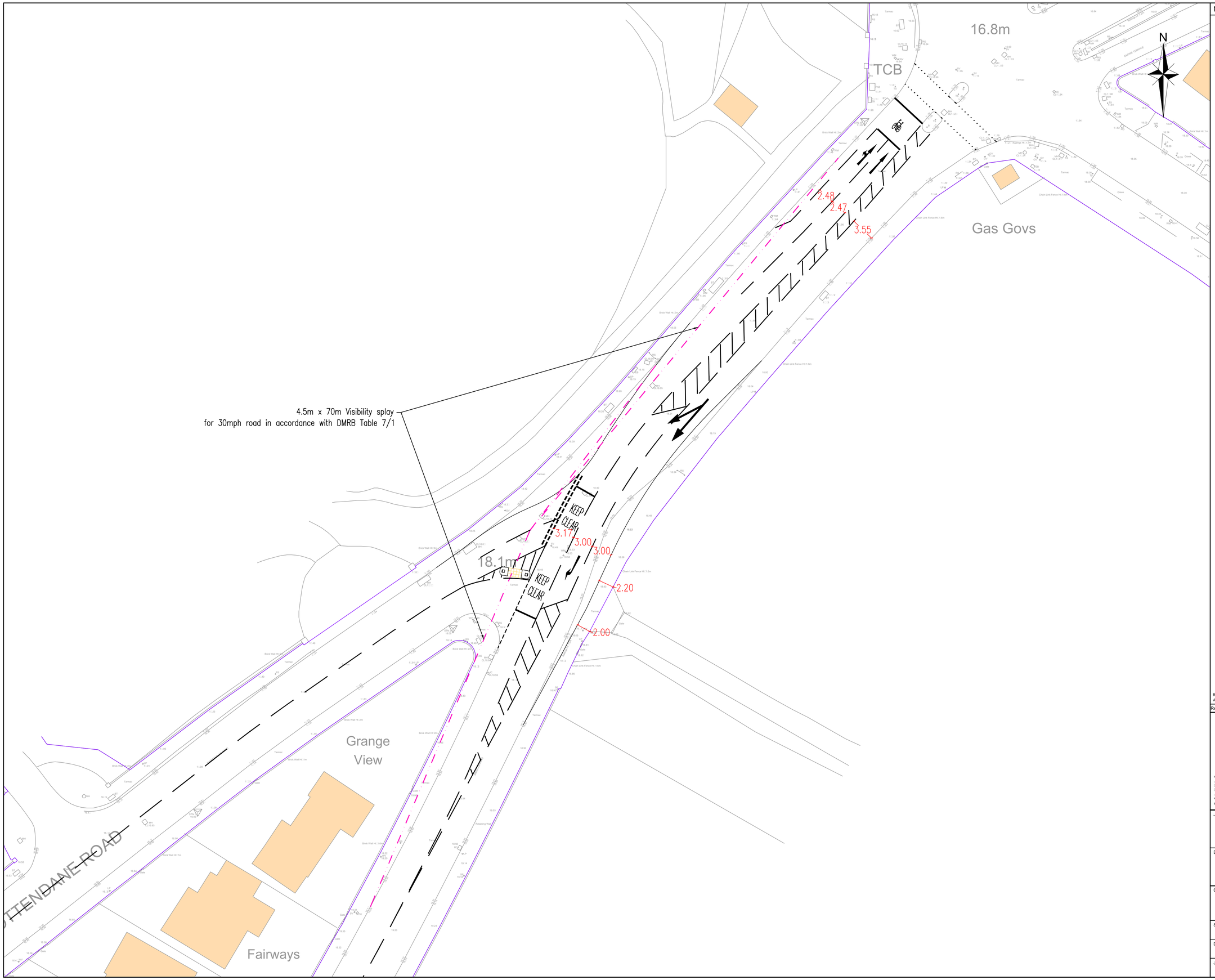
Nash Road Closure

Client

Hume Planning Consultancy Ltd

Scale	Date	Designed
As Shown	Aug 16	DH
Drawn	Checked	Approved
DH	FM	JW

Job No	Drawing No	Rev
14-011	14-011-005	A



NOTES

HIGHWAY BOUNDARY

Rev	Amendments	Dm	Chk	App	Date
B	Kerb amended to provide defection & ped refuge island introduced	DH	FM	JW	Mar 17
A	Keep Clear road markings added	DH	FM	JW	Oct 16

Consulting Engineers Ltd

Offices 8 & 9
Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot Hampshire
GU11 2PW
01252 939000

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Office 17
Wealden Place
Bradbourne Vale Road
Sevenoaks
Kent
TN13 3QQ
01732 448120

enquiries@c-a.uk.com
www.c-a.uk.com

Job Title

Nash Road, Margate

Drawing Title

Manston Road / Shottendane Road
Priority Shift

Client

Hume Planning Consultancy Ltd

Scale	Date	Designed
1:250	Sept 16	DH

Drawn	Checked	Approved
DH	FM	JW

Job No	Drawing No	Rev
14-011	14-011-00□	B

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Technical note:
RSA Stage 1:Designers Response- A254/B2052 Junction

1. Introduction

This Technical note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited for works associated with a Mitigation Scheme to improve the A254/B2052 junction located in Thanet. The junction was identified to require mitigation works as part of the Manston Airport TA.

Badingham Limited has been provided with the latest preliminary mitigation scheme designs, at this junction the mitigation scheme is proposed to add pedestrian crossings to the A254 north and B2052 College Road east arms of the junction, provide an appropriate road marking scheme to compliment the new pedestrian crossings and also to revise the stage sequence to include the new pedestrian crossings and additional capacity at the junction.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 4.1

Location: College Road (east) and Ramsgate Road (north)

Summary: Lack of facilities for cyclists.

No cycling facilities are provided on these approaches. There is a risk of collisions between cyclists and vehicles, particularly involving HGVs squeezing cyclists against barrier fencing when turning left.

Recommendation: It is recommended that facilities are incorporated within the design.

Designers Response: The recommendation to provide cycle facilities at this junction has been noted. In the next stage of design consideration will be made of any potential cycle facilities that could be provided as part of the scheme. It is however noted that the current signalled scheme does not provide any cycle advanced stop lines.

3. General Comments

Sections 5 -7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by	Approved by
[redacted]	[redacted]
.....	
Chris Morris	

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Appendix A
Road Safety Audit – Stage 1

A254 Ramsgate Road/B2052 College Road, Margate, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

26th April 2019

Badingham
Transport Planning & Highway Engineering Consultants
16 Ashley Piece
Ramsbury, Marlborough
Wiltshire
SN8 2QE

T. +44(0)1672 521320
contact@badinghamuk.com
www.badinghamuk.com

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DOCUMENT ISSUE

Issue / Revision:	Issue 1			
Description / Status:	Final			
Date:	27/04/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
File Reference:	0781 Manston Airport - 16 - RSA1 - Issue 1.docx			

CONTENTS

Page No

TEXT

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SECTION 2:	ITEMS RAISED AT PREVIOUS AUDITS	3
SECTION 3:	VEHICULAR AND HIGHWAY ISSUES	4
SECTION 4:	NON-MOTORISED USERS	5
SECTION 5:	ROAD MARKINGS AND SIGNAGE	6
SECTION 6:	STREET LIGHTING	7
SECTION 7:	DRAINAGE	8
SECTION 8:	AUDIT STATEMENT	9

FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to proposed highway works at the A254 Ramsgate Road/B2052 College Road junction, Margate. The works are associated with the redevelopment of Manston Airport, Kent.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 10.00am and 10.30am. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise proposed improvements to the existing 5-arm signal crossing. This is a busy urban junction, with crossing facilities, lying within a 30mph speed limit. Some approaches are situated on downhill gradients.

1.11 Thirteen collisions are recorded within the latest five-year period 2013 to 2018. Four resulted in serious injuries and there were nine slight injury accidents. A total of seventeen casualties were reported. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 No observations.

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: College Road (east) & Ramsgate Road (north).

Summary: Lack of facilities for cyclists.

4.1.1 No facilities for cyclists are provided on these approaches. There is a risk of collisions between cyclists and vehicles, particularly involving HGVS 'squeezing' cyclists against barrier fencing when turning left.

RECOMMENDATION

4.1.2 It is recommended that facilities for cyclists are incorporated within the design.

Photo 1 -View north on Ramsgate Road.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 No signing details have been provided. A suitable package of signage information will need to be provided as part of any further detailed design.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 27th April 2019

Audit Team Member

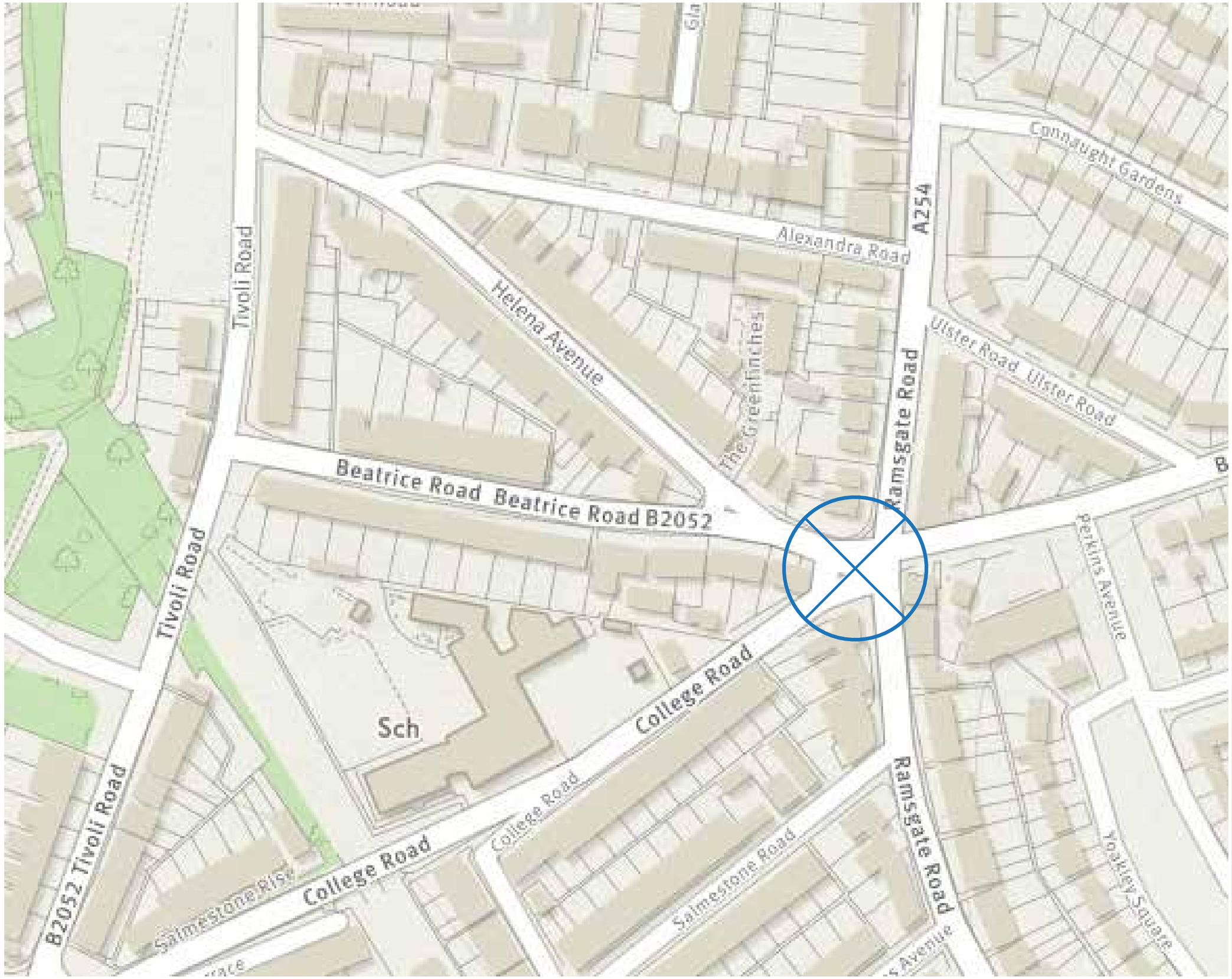
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 27th April 2019

FIGURES



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Rev.	Date	Initials	Amendments

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Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

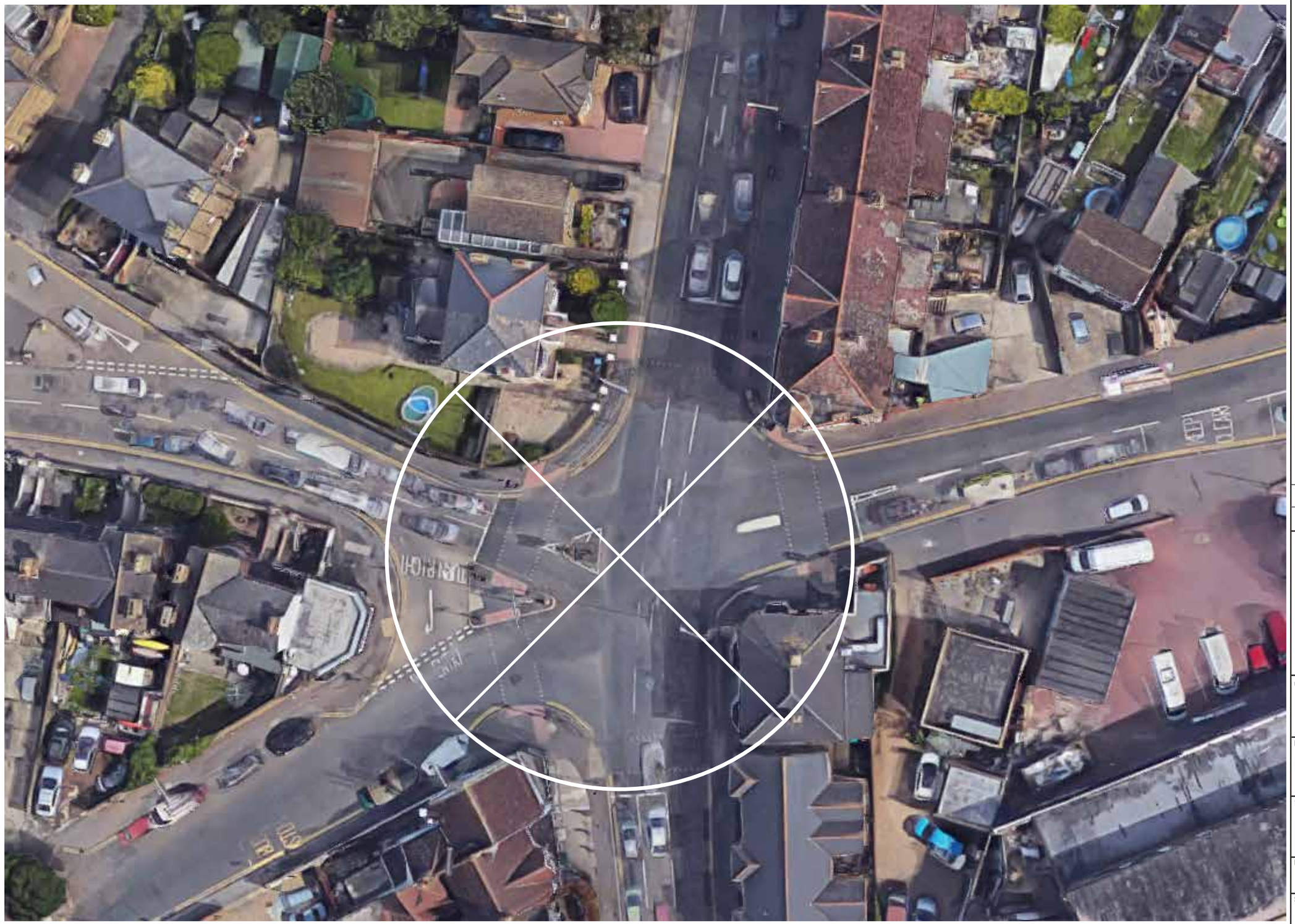
Client: RSP

Project: Manston Airport

Title: Location Plan

Date	Status
24/04/2019	FINAL
Scale	**Original Size**
NTS	A3
Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-



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Rev.	Date	Initials	Amendments

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&
Highway Engineering
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Client
RSP

Project
Manston Airport

Title
Aerial Photo

Date	Status
24/04/2019	FINAL
Scale	**Original Size**
NTS	A3
Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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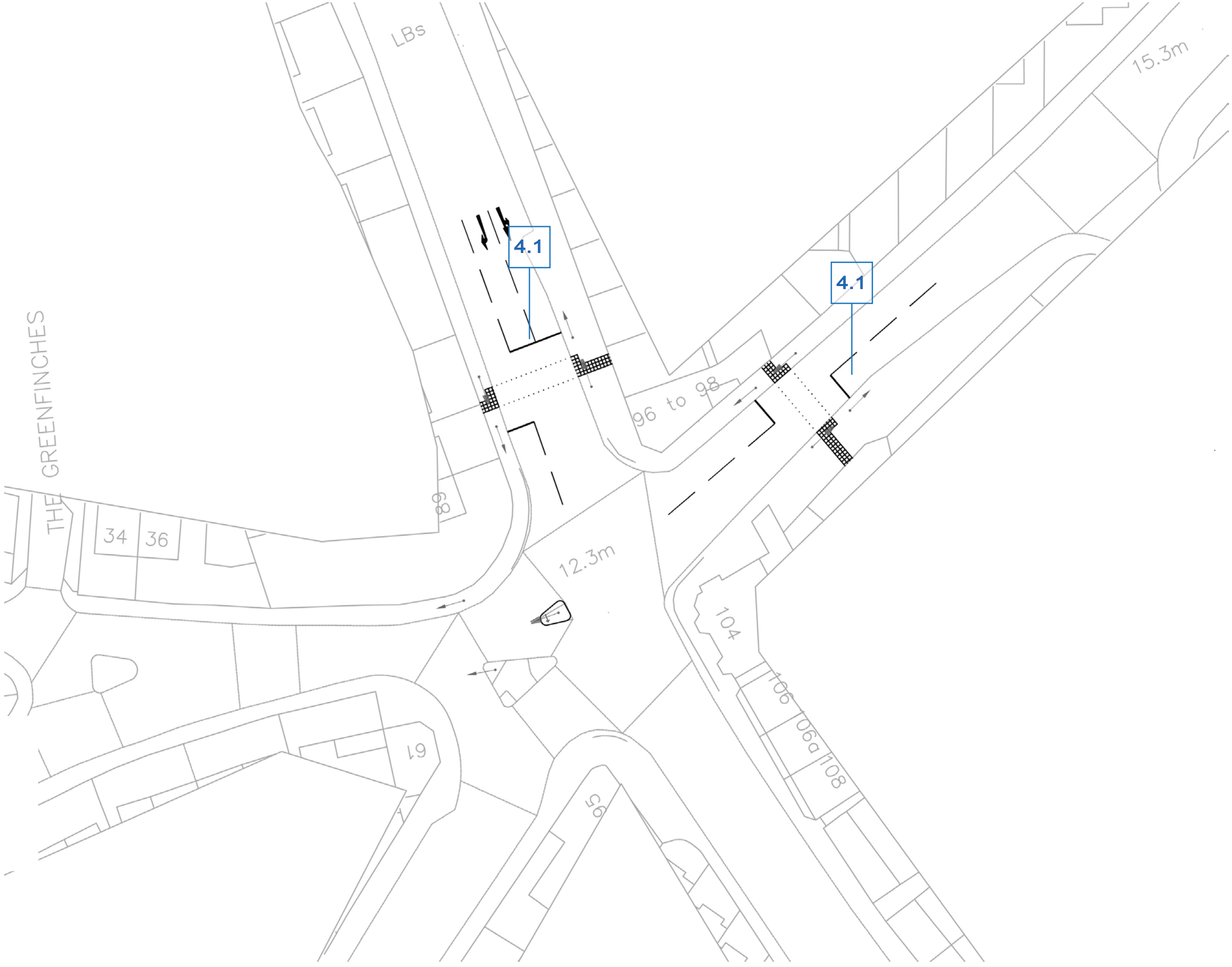

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Source: Site Location & Access Design

Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
27/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	11/04/2019
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Junction A254/B2052 Mitigation Proposal
Report title:	Manston Airport – Junction A254/B2052 Mitigation Proposal - RSA Stage 1
PREPARED BY:	
Name:	Pranav Yadav
Signed:	
Organisation:	Wood
Date:	11/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

<table>
<tr><th colspan="5">General Details</th></tr>
<tr><td>Highway Scheme Name & Road Number</td><td colspan="4">Manston Airport – A254/B2052 Mitigation Proposal – College Road (east), Ramsgate Road (south), College Road (west), Beatrice Road, Ramsgate Road (north)</td></tr>
<tr><td colspan="5">Type of Scheme
e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.</td></tr>
<tr><td colspan="5">New Roundabout Junction with the B2190</td></tr>
<tr><td rowspan="2">RSA Stage
Tick as appropriate ✓</td><td>1 √</td><td>2</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td colspan="3">Interim</td></tr>
<tr><td colspan="2">Overseeing Organisation Details</td><td colspan="3">Design Organisation Details</td></tr>
<tr><td colspan="2">16 Charles II Street
London SW1Y 4NW</td><td colspan="3">Wood
Glyn Price
Associate Director
Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK</td></tr>
<tr><td colspan="2">Police Contact Details (RSA3 Only)</td><td colspan="3">Maintaining Agent Contact Details</td></tr>
<tr><td colspan="2">N/A</td><td colspan="3">N/A</td></tr>
<tr><td colspan="5">RSA Team Membership</td></tr>
<tr><td colspan="5">A.R.J. Setter (Team Leader) — BA (Hons) MSc CMILT MCIHT AMICE MSoRSA
Highways England Certificate of Competence
& Compliant with EU Directive 2008/96/EC
Badingham Limited

D. F. Rogers (Team Member) — JP, CEng BEng (Hons) MICE MSoRSA FIHE
Ashburn Consultants</td></tr>
<tr><td colspan="5">Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.</td></tr>
<tr><td colspan="5">DMRB – TD 50/04 – The Geometric Layout of Signal-controlled Junctions and Signalised Roundabout</td></tr>
</table>

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposal is for a scheme to improve the existing College Road/Ramsgate Road/Beatrice Road signalised junction.

The existing stop line located on College Road (east) will be moved away from the junction to accommodate a new stop line on the exit lane.

A new stop line will be provided on the exit arm of Ramsgate Road (north).

It has not been decided when this junction will be constructed as this is part of ongoing discussions with KCC. Complete should take between 3-6 months.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB has been applied to the design of the proposed roundabout. DMRB TD 50/04 – The Geometric Layout of Signal-controlled Junctions and Signalised Roundabout

Design Speeds
Provide details of applied and/or existing design speeds.

40MPH

Speed Limits
State whether mandatory or advisory, available speed data.

The existing speed limit around the junction is 30mph.

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

The traffic flow of the junction will be provided from the MCC taken at this junction.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows at the junction for the AM and PM Peak will be provided in a matrix format.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

The existing pedestrian crossings located on College Road (east) and Ramsgate Road (north) will be relocated slightly back from the junction.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

Junction is located southwest of the Margate and surrounded by residential properties.

General Description
Include road network, road type, relevant land uses etc.

College Road (east) is a two-way single carriageway. Ramsgate Road (south) is a two-way single carriageway with two lane entry approach. College Road (west) is a one-way (exit only) single carriageway with on-street parking. Beatrice Road is a one-way (entry only) single carriageway with on-street parking along the south side of the road. Ramsgate Road (north) is a two-way single carriageway.

There is a dedicated right turn lane with giveaway from Beatrice Road to College Road (west).

Most of the corners of the junction is secured by guardrails. Footway and pedestrian crossing facilities are available at the junction.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Total eight accidents have been recorded at the junction. These are accidents 30 (additional year), 89 (additional year), 206,247,283,300,313, 322, 429, 475, 476, 485.

Three of the eight accidents were serious. One of the serious accidents involved a pedestrian who stepped into the path of a moving vehicle to cross the road and collided with the vehicle. Two of the serious accidents occurred due to careless driving.

One of the slight accidents involved a pedestrian who stepped into the path of a moving vehicle and collided with the vehicle. A motorbike and pedal cycle were also involved into different slight accidents which were cause by carelessness.

Most of the accident occurred due to careless driving or movement within the junction.

The details of these accidents will be provided with this brief.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Accident data for the junction will be provided with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

N/A

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – A254/B2052 – MCC results		11.04.2019
RSA – A254/B2052 – future Year Traffic Flows (2039)		11.04.2019
RSA – A254/B2052 – Accident Data		11.04.2019
RSA – A254/B2052 – LINSIG output		11.04.2019

Drawings

Reference/Revision	Title	Date
RSA – A254/B2052 – Site Location and Access design		11.04.2019
RSA – A254/B2052 – Cad file		11.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

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Technical note:
RSA Stage 1:Designers Response- Manston to Haine Link Road

1. Introduction

This Technical Note forms the Designers Response to the Stage 1 Road Safety Audit (RSA) conducted by Badingham limited of an alternative alignment identified by Wood for the Manston-Haine Link Road, which is included in the draft Local Plan and Thanet Transport Strategy.

Badingham Limited has been provided with feasibility scheme designs for a single carriageway way road between the B2050 Manston Road/B2190 Spitfire Way/Manston Road junction and Manston Court Road. New junctions are identified to link with Manston Road north and Manston Court Road. The design of the road is according to the standards identified by KCC.

The designer's response to each of the issues raised by the safety audit team is provided in the following sections. The text included within the RSA has been transposed into this document, a full copy of the original RSA is provided within **Appendix A**.

2. Designers Response

Problem 3.1

Location: Proposed Link road and junctions.

Summary: Potential collisions arising from large vehicle access.

No swept path assessment is provided. The road and junctions are likely to experience large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge or footway/cycleway.

Recommendation: It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the road and junction to demonstrate safe and efficient access.

Designers Response: A swept path assessment is being undertaken and the supporting information will follow this initial designers' response once completed.

Problem 3.2

Location: Proposed link road.

Summary: Potential for collisions arising from overtaking.

The proposed link road has a curved horizontal alignment widening in places to provide ghost-island right turn arrangements. The wider carriageway and hatched areas may encourage some driver to attempt to overtake and collide with turning or opposing traffic.

Recommendation: It is recommended that the hatched area are enclosed with single continuous white lines to discourage overtaking together with the introduction of splitter islands.

Designer Response: As part of the detailed design process DMRB compliant safety features can be added including for solid white lines, solid coloured surfaces, illuminated bollards and signage to reinforce no overtaking through these sections.

Problem 3.3

Location: Proposed link road and junctions.

Summary: Potential for collisions arising from lack of visibility.

No junction or forward visibility is shown. Lack of sufficient visibility can lead to misjudged gap-acceptance and collisions between vehicles at junction and late-braking decisions and loss-of-control type collisions on the carriageway link.

Recommendation: It is recommended that suitable visibility is provided appropriate to the intended design speed for the highway.

Designer Response: Forward visibility information will be provided once completed to follow this initial designers' response.

Problem 4.1

Location: Proposed shared cycleway/footway.

Summary: Lack of tactile paving and access details.

No uncontrolled crossing arrangement with tactile paving are shown at the proposed junctions. It is understood that the footway is proposed on the north/east side of the carriageway. No details are provided showing how the proposed provision is intended to integrate with existing/proposed provision at either end of the scheme. No details are provides to show how cyclists are to access/egress between the highway and the shared facility. Lack of suitable crossing facilities can cause difficulties for users, particularly the mobility and visually impaired leading to trips and falls. Lack of suitable merge/diverge facilities can lead to cyclists bumping up or down kerbs leading to potential loss of control type incidents and possible collisions with vehicles on the highway.

Recommendation: It is recommended that uncontrolled crossings with tactile paving are provided together with suitable merge/diverge facilities for the cycleway.

Designers Response: As part of the detail design tactile paviors and dropped kerbs can be added to the designs. Foot/cycleways will also be noted onto the design along the link road to add the relevant detail for these modes of transport.

3. General Comments

Sections 5 -7

As part of the detailed design package of works a signage, lighting and drainage strategy will be provided.

Issued by	Approved by
[redacted]	[redacted]
.....	
Chris Morris	

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Appendix A
Road Safety Audit – Stage 1

Manston to Haine Link Road, Manston, Kent
Proposed Highway Works

Road Safety Audit – Stage 1
(Preliminary Design)

Client: RSP

1st May 2019

Badingham

Transport Planning & Highway Engineering Consultants

16 Ashley Piece

Ramsbury, Marlborough

Wiltshire

SN8 2QE

T. +44(0)1672 521320

contact@badinghamuk.com

www.badinghamuk.com

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DOCUMENT ISSUE

Issue / Revision:	Issue 1			
Description / Status:	Final			
Date:	01/05/2019			
Prepared:	A. R. J. Setter			
Signature:				
Document Check:	D. F. Rogers			
Signature:				
Technical Check:	D. F. Rogers			
Signature:				
Authorised:	A. R. J. Setter			
Signature:				
File Reference:	0781 Manston Airport - Link Road - RSA1 - Issue 1.docx			

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TEXT

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SECTION 5:	ROAD MARKINGS AND SIGNAGE	7
SECTION 6:	STREET LIGHTING	8
SECTION 7:	DRAINAGE	9
SECTION 8:	AUDIT STATEMENT	10

FIGURES

Figure 1	Site Location Plan
Figure 2	Aerial Photo
Figure 3	Audit Plan

APPENDICES

Appendix 1	Road Safety Audit Brief

SECTION 1: INTRODUCTION

General

1.1 This Road Safety Audit Stage 1 (Preliminary Design) report has been undertaken at the request of the Highway Authority. It has been prepared on behalf of RSP and relates to a proposed link road and upgrade of existing highway at Manston, Kent. The works are associated with the redevelopment of Manston Airport.

1.2 Thanet District Council is the local planning authority. Kent County Council is the local highway authority for the area.

Audit Team

1.3

A. R. J. Setter	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC Badingham Limited
D. F. Rogers	JP CEng BEng (Hons) MICE FIHE MSoRSA Ashburn Partnership

Audit Brief

1.4 The Road Safety Audit has been undertaken in accordance with the Road Safety Audit Brief contained in Appendix 1.

1.5 The terms of reference for this Road Safety Audit are described in GG119. The Audit Team has not been made aware of any departures from standard.

1.6 The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

Main Parties to the Audit

1.7 The following are the main parties to the audit:

- Client Organisation: RSP
- Overseeing Organisation: Kent County Council
- Design Organisation: Wood Plc

1.8 The Audit Team visited the site together on Tuesday 26th March 2019 between 10.00am and 10.15am. The weather was fine and surfaces were dry. There were no adverse traffic conditions to affect the audit. Photographs of the site and surrounding area are included where relevant.

1.9 The location of the site is shown on Figure 1 Site Location Plan and Figure 2 Aerial Photo. The area of the audit extends solely to the works shown on the drawings included in the Audit Brief. Any issues identified are cross-referenced by paragraph number to the Audit Plan (Figure 3).

1.10 The works comprise a proposed link road and upgraded existing highway between the Spitfire Way/Manston Road junction and Manston Court Road. The design includes two simple priority junctions with a change in priority. A shared footway/cycleway is proposed along the east side of the carriageway.

1.12 Collision data is available for the section of existing highway to be upgraded. A collision is recorded on Manston Court Road at the junction with Preston Road and involved a car that travelled wide on the bend in the road and collided with an oncoming vehicle. A single serious collision is recorded on Manston Road when a driver lost control with no other vehicles involved. A further collision is recorded on Manston Road and due to driver error; a car left a garage and entered the highway heading northbound, the driver lost control and collided with fencing and a telegraph pole. No highway deficiencies were noted as contributory factors.

SECTION 2: ITEMS RAISED AT PREVIOUS AUDITS

2.1 No previous audits have been undertaken.

SECTION 3: VEHICULAR AND HIGHWAY ISSUES

3.1 PROBLEM

Location: Proposed link road and junctions.

Summary: Potential collisions arising from large vehicle access.

3.1.1 No swept path assessment is provided. The road and junctions are likely to experience large HGV movements that without sufficient carriageway space, particularly when turning, may lead to damage-type collisions or over-running of the verge or footway/cycleway.

RECOMMENDATION

3.1.2 It is recommended that a swept path assessment is undertaken for the largest typical vehicles anticipated to regularly and frequently use the road and junctions to demonstrate safe and efficient access.

Photo 1 - Manston Road view east.

3.2 **PROBLEM**

Location: Proposed link road.

Summary: Potential for collisions arising from overtaking.

3.2.1 The proposed link road has a curved horizontal alignment widening in places to provided ghost-island right turn arrangements. The wider carriageway and hatched areas may encourage some drivers to attempt to overtake and collide with turning or opposing traffic.

RECOMMENDATION

3.2.2 It is recommended that the hatched areas are enclosed with single continuous white lines to discourage overtaking together with the introduction of splitter islands.

3.3 **PROBLEM**

Location: Proposed link road and junctions.

Summary: Potential for collisions arising from lack of visibility.

3.3.1 No junction or forward visibility is shown. Lack of sufficient visibility can lead to misjudged gap-acceptance and collisions between vehicles at junctions and late-braking decisions and loss-of-control type collisions on the carriageway link.

RECOMMENDATION

3.3.2 It is recommended that suitable visibility is provided appropriate to the intended design speed for the highway.

SECTION 4: NON-MOTORISED USERS

4.1 PROBLEM

Location: Proposed shared footway/cycleway.

Summary: Lack of tactile paving and access details.

4.1.1 No uncontrolled crossing arrangement with tactile paving are shown at the proposed junctions. It is understood that the footway is proposed on the north/east side of the carriageway. No details are provided showing how the proposed provision is intended to integrate with existing/proposed provision at either end of the scheme. No details are provided to show how cyclists are to access/egress between the highway and the shared facility. Lack of suitable crossing facilities can cause difficulties for users, particularly the mobility and visually impaired leading to trips and falls. Lack of suitable merge/diverge facilities can lead to cyclists 'bumping' up or down kerbs leading to potential loss of control type incidents and possible collisions with vehicles on the highway.

RECOMMENDATION

4.1.2 It is recommended that uncontrolled crossings with tactile paving are provided together with suitable merge/diverge facilities for the cycleway.

SECTION 5: ROAD MARKINGS AND SIGNAGE

5.1 Limited signing and marking details have been provided. A suitable package of markings and sign information will need to be provided as part of any further detailed design.

SECTION 6: STREET LIGHTING

6.1 No street lighting details have been provided. A suitable package of street lighting information will need to be provided as part of any further detailed design.

SECTION 7: DRAINAGE

7.1 No drainage information is provided. A suitable package of drainage information will need to form part of any further detailed design.

SECTION 8: AUDIT STATEMENT

8.1 This audit has been undertaken in accordance with DMRB Standard GG119.

Road Safety Audit Team Leader

A. R. J. Setter BA (Hons) MSc CMILT MCIHT AMICE MSoRSA CoC

Director - Badingham Limited

16 Ashley Piece, Ramsbury, Marlborough, Wiltshire, SN8 2QE

Signed: [redacted] Date: 1st May 2019

Audit Team Member

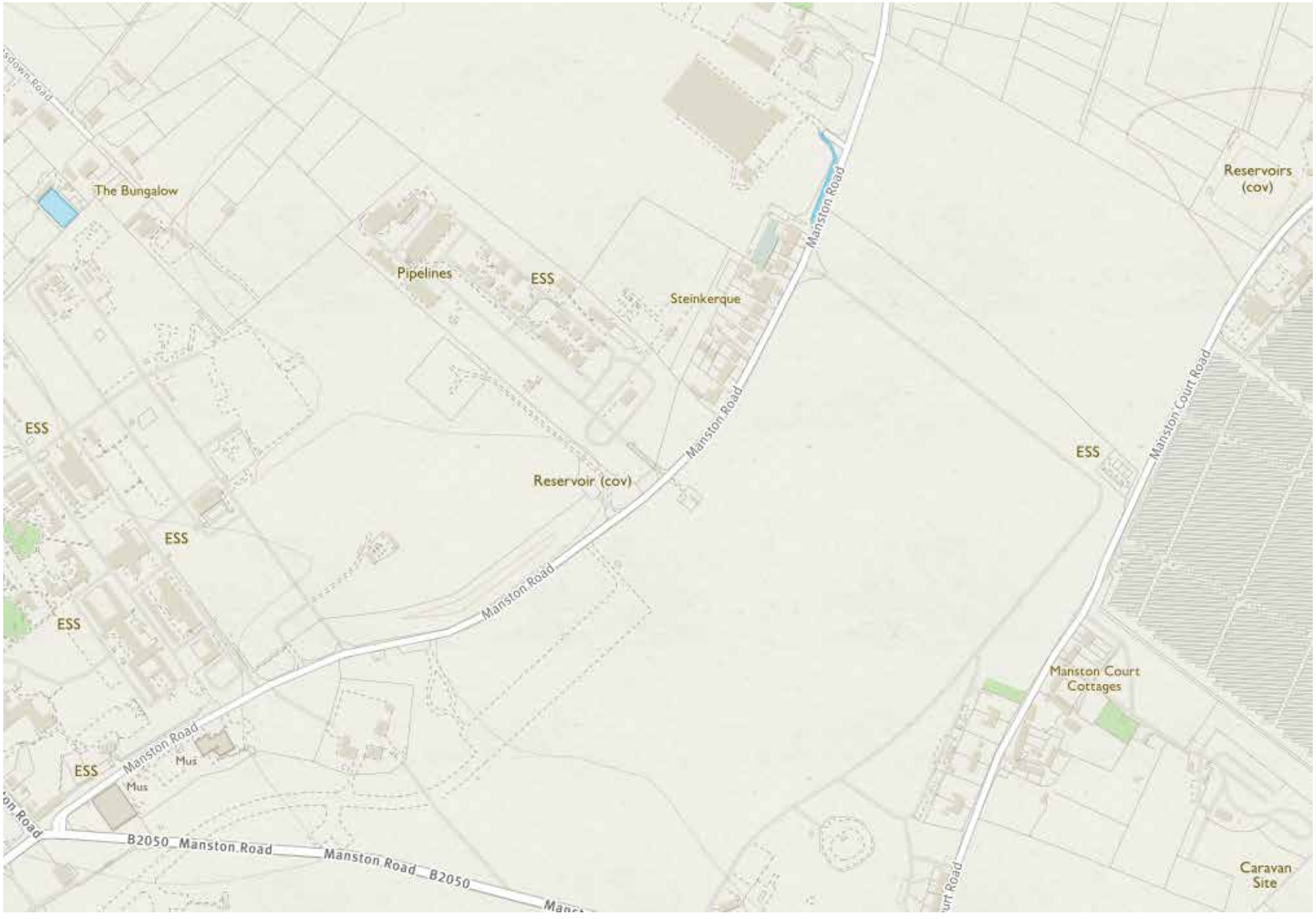
D. F. Rogers JP CEng BEng (Hons) MICE MSoRSA FIHE

Partner - Ashburn Partnership

5 Mayfield, Upper Wanborough, Swindon, SN4 0ED

Signed: [redacted] Date: 1st May 2019

FIGURES



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North

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Notes:

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Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client: RSP

Project: Manston Airport

Title: Location Plan

Date	Status
24/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 1	-

North

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Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client
RSP

Project
Manston Airport

Title
Aerial Photo

Date	Status
24/04/2019	FINAL

Scale	Original Size
NTS	A3

Drawn	Checked
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 2	-

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Source: Site Location & Access Design

Rev.	Date	Initials	Amendments

Badingham
Transport Planning
&
Highway Engineering
Concept | Consult | Construct
www.badinghamuk.com

Client: RSP

Project: Manston Airport

Title: Audit Plan

Date	Status
01/05/2019	FINAL
Scale	**Original Size**
NTS	A3
Drawn	**Checked**
AS	AS

Job No.	Drawing No.	Rev.
0781	FIGURE 3	-

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APPENDIX 1

Road Safety Audit Brief

ROAD SAFETY AUDIT BRIEF

Project Summary	
Date:	12/04/19
Document Reference:	
Prepared by:	Wood
On Behalf of:	RiverOak Strategic Partners
AUTHORISATION SHEET	
Project:	Manston Airport – Manston to Haine Link Road
Report title:	Manston Airport - Manston to Haine Link Road - RSA Stage 1
PREPARED BY:	
Name:	Glyn Price
Signed:	
Organisation:	Wood
Date:	11/04/2019
I APPROVE THE RSA BRIEF AND INSTRUCT THE RSA TO TAKE PLACE ON BEHALF OF THE OVERSEEING ORGANISATION:	
Name:	Tony Freudmann
Signed:	
Organisation:	RiverOak Strategic Partners
Date:	

General Details

Highway Scheme Name & Road Number	Manston Airport – Manston to Haine Link Road			
Type of Scheme *e.g. new road scheme, smart motorway, junction improvement, traffic signs and road markings improvement, traffic calming, etc.*				
New Road Scheme				
RSA Stage *Tick as appropriate ✓*	1 √	2	3	4
	Interim			

Overseeing Organisation Details	**Design Organisation Details**
16 Charles II Street London SW1Y 4NW	Wood Glyn Price Associate Director Canon Court, Abbey Lawn, Abbey Forgate, Shrewsbury, SY2 5DE, UK
Police Contact Details (RSA3 Only)	**Maintaining Agent Contact Details**
N/A	N/A

RSA Team Membership

A.R.J. Setter (Team Leader)	BA (Hons) MSc CMILT MCIHT AMICE MSoRSA Highways England Certificate of Competence & Compliant with EU Directive 2008/96/EC Badingham Limited
D. F. Rogers (Team Member)	JP, CEng BEng (Hons) MICE MSoRSA FIHE Ashburn Consultants

Terms of Reference
Make reference to relevant DMRB documents and other guidance where appropriate.

DMRB – TD42/95 – Geometric Design of Major/Minor Priority Junctions
DRMB - TD 9/93 – Highways Link Design
DRMB – TD50/40 - THE GEOMETRIC LAYOUT OF SIGNALCONTROLLED JUNCTIONS AND SIGNALISED ROUNDABOUTS
KCC Requirements for the Inner Loop Road within the Local Transport Plan
KCC advice and guidance on the design and general alignments of the road.

Scheme Details

Scheme Description/Objective

General
Define the extents of the RSA, include a brief scheme description, the scheme objectives, a start date for construction if known and a completion date. In addition, for stage 4 RSAs, confirm when all related traffic management has been removed.

The proposals are for a section of link roads between the spitfire Way/Manston Road Junction and Manston Court Road. Elements of this link road will be an upgrade to Manston Road north of the Spitfire Way/Manston Road junction and the remaining section will include a new road across fields to the North of the Northern Grass area.

The design includes for two new small priority junctions with Manston Road and Manston Court Road with a change of priority with sections of both roads becoming the minor arm. It also includes a revised junction layout at Manston Road/Spitfire Way (also a junction a road safety audio has been requested for as part of this wider commission)

It also includes for an access junction into the Northern grass area that Baddingham have previously undertaken a Stage 1 RSA for (Ref AS/0781)

The extents are the extents of the provided drawings of the scheme to the point where road leaves the Manston Road/Spitfire Way junction and at the other end joins the Manston Court Road.

The objectives of the scheme are to provide a link from Manston towards Haine Road and Broadstairs. This is required as part of proposals for the KCC Local Transport Plan. KC have envisaged the route to be though the land holding of the airport. This alignment is proposed as part of the Manston Airport DCO to provide an alternative alignment.

Due to ongoing discussions with KCC regards the link road alignment, route and other details it is not known when this route would be required however the Transport Assessment for the DCO considered this would be at least 6 years after the commencement of operations at the airport. Completion should take a year or longer.

Design Standards Applied to the Scheme Design
For example, DMRB.

DMRB – TD42/95 – Geometric Design of Major/Minor Priority Junctions
DRMB - TD 9/93 – Highways Link Design
DRMB – TD50/40 - THE GEOMETRIC LAYOUT OF SIGNALCONTROLLED JUNCTIONS AND SIGNALISED ROUNDABOUTS

Design Speeds
Provide details of applied and/or existing design speeds.

40MPH

Speed Limits
State whether mandatory or advisory, available speed data.

The existing speed limit on Manston Road (B2109) is 30mph, however as part of wider proposal to widen the Manston Road as part of the Manston to Haine Link Road it is proposed the speed limit will be increased to 40MPH.

An ATC was undertaken just to the north of the proposed junction to the Northern Grass access, where the new link road alignment realign with the existing Manston Road alignment. ATC data indicated that northbound the average 85th percentile speed was 43.6mph and southbound 42.7mph.

An ATC was undertaken on Manston Road to the north of the proposed Link road. Traffic from this link would be required to route along a new alignment of Manston Road and join the link road via a priority junction. ATC Data indicated that northbound average 85th percentile speed was 55mph and southbound 85th percentile speed 54.1mph

An ATC was undertaken on Manston Court Road to the north of the proposed link road alignment. ATC data indicated that eastbound average 85th percentile speed was 28.5mph and the westbound average 85th percentile speed was 25.5mph.

An ATC was undertaken on Manston Court Road to the south of the proposed link road alignment, traffic from this link would be required to route along a new alignment of Manston Court Road and join the Link Road via a priority junction. ATC data indicated that northbound average 85th percentile speed was 38.3mph and the southbound average 85th percentile speed was 38.4mph.

Existing Traffic Flows/Queues
To include current automatic traffic counter (ATC) data, up-to-date turning count and queue information etc.

There are no existing traffic flows as the link road is yet to be constructed. The ATC Data provided gives a comprehensive view of the traffic characteristics either side of the proposed link road alignment on Manston Road and Manston Court Road.

Forecast Traffic Flows
Where available and relevant, provide future traffic flow data including vehicle proportions.

Future Traffic flows for three elements of the proposed link road are provided with this brief. These are

1. New Manston to Haine Link – Between Junction of Spitfire Way/Manston Road and the Access to the NGA North;
2. New Manston to Haine Link – Between Access to the NGA (North) and the new link across fields to the north of the NGA;
3. New Manston to Haine Link – On the NEW link between Manston Road and Manston Court Road. A small plan setting out the location of these traffic flows is provided with this brief.

Pedestrian, Cyclist & Equestrian Desire Lines
Include details of pedestrian, cyclist and equestrian movements in the vicinity of the scheme and, when applicable the relevant walking, cycling and horse-riding assessment and review reports HD 42/17 [Ref 7.1].

The design includes for a shared cycleway/footway on the east side of the carriageway.

The clear design pedestrian line across the junction is across the minor arm and pedestrian facilities have been designed to accommodate this movement with a central splitter island.

Environmental Constraints
Include all environmental constraints within the scheme extents, for example sites of special scientific interest (SSSI), conservation areas, listed properties etc.

No environmental constrains have been observed.

Locality

Description of Locality
Include all environmental constraints within the scheme extents, e.g. (SSSI), conservation areas, listed properties etc.

The link runs between the junction of Manston Road and Spitfire Way and Manston Court Road.

General Description
Include road network, road type, relevant land uses etc.

The existing Manston Road carriageway is a two-lane carriageway. There are no footways either side of the carriageway and the road is subject to a 30mph speed limit. To the east of the carriageway is the disused element of the Manston Airport site which is proposed to become the Northern Grass area Business Park. To the West is open fields.

As mentioned as part of wider KCC proposals for a Manston to Haine Link Manston Road is proposed to be widened and upgraded to a 7.3m wide carriageway when the junction is constructed which is what is being assessed within this brief.

Relevant Factors Which May Affect Road Safety
Factors known to the Design Organisation and considered as part of the design. This should also include anything that would not be immediately obvious to the RSA Team – such as school crossing patrols and large events, for example.

Accident data has been provided for the section of road which is proposed to be upgraded as part of the link road proposals.
Accident 9 was recorded on Manston court Road at the junction with Preston Road. The accident happened when a car travelled wide on the bend in the road and collided with an oncoming vehicle.
On Manston Road in the vicinity of the northern grass junction, one accident was recorded (256) which was a serious accident when a driver lost control with no other vehicles involved. With the road being upgraded and widened its noted that the existing accident record review is not as relevant. It is not considered the road has a significant accident issue in the vicinity of the junction. The details for accident 256 are provided.
Accident 127 was recorded on a section of road on Manston road proposed to be upgraded on the approach from Manston Road to the link road from the north. Details of the accident are provided, briefly, the accident was due to driver error. A car left a garage and entered the highway heading northbound, the driver lost control and collided with fencing and a telegraph pole.

Analysis

Collision Data Analysis
Stages 1,2, and 3 provide a summary of road traffic collision data covering both the extent of the scheme and the adjoining sections of highway. As a minimum, the most recent 36 month of data. At Stage 4, provide 12 months of post-opening validated road traffic collision data. Raw data should be provided as an appendix.

Data for the Manston Road Link AND Manston Court Road which would effected by these proposals has been included with this brief.

Departures from Standards
Include status details, i.e. approved/pending/rejected, and any design strategy records produced for improvements to existing trunk roads and motorways.

N/A

Previous Road Safety Audit Stage Reports, Road Safety Audit Response Reports & Evidence of Agreed Actions
Attach previous reports to the RSA Brief, or provide an explanation where these are not available.

Previous RSA for the junction with the Northern Grass Area is Reference AS/0781.

Strategic Decisions
Includes items outside the scope of this RSA, which will not change irrespective of the RSA, for example route choice, junction type, approved departures from standard.

N/A

List of Included Documents and Drawings
For example: previous RSA reports; Design Responses; Departures; Road Traffic Collision Data; Walking, Cycling and Horse-Riding Assessment and Reviews. This could include any relevant operational data such as damage-only collision data or incident logs.
This list could be included as an attachment to the RSA Brief or a hyperlink to a shared electronic location where the RSA Brief information has been collated.

Documents

Reference/Revision	Title	Date
RSA – Link Road – ATC results		12.04.2019
RSA – Link Road – future Year Traffic Flows (2039)		12.04.2019
RSA – Link Road – Accident Data		12.04.2019

Drawings

Reference/Revision	Title	Date
RSA – Link Road – Site Location and scheme design		12.04.2019
RSA – Link Road – Cad file		12.04.2019

Checklist			
Tick all that are included and provide reasons for those that are not included.	✓		
Site Location plan		Scale Layout Plans	
Departures and Relaxations from Standards		Construction/Typical Details	
Previous RSA Reports		Previous RSA Response Reports & Evidence of Agreed Actions	
Collision Data and Collision Data Analysis		Road Traffic Collision Plot	
Traffic Signal Staging		Traffic Counts	
Speed Surveys		Pedestrian, Cyclist, Horse-Riding Desire Lines & Volumes	
Walking, Cycling and Horse-Riding Assessment & Reviews		Items Outside the Scope of the RSA/Strategic Decisions	
Other Factors that may Impact Upon Road Safety		Design Speeds/Speed Limits	
Design Standards Used		Adjacent Land Uses	

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2039+Dev(Link+Sig)	AM	Dedicated left turn from Manston Road (W)	ONE HOUR	07:45	09:15	15	✓
D2	2039+Dev(Link+Sig)	PM	Dedicated left turn from Manston Road (W)	ONE HOUR	16:45	18:15	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2039+Dev(Link+Sig), AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (min)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	0.17	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	A256 (N)	
2	Manston Road (E)	
3	A256 (S)	
4	Manston Road (W)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	7.30	8.30	5.9	30.0	60.0	18.0	
2	3.70	7.10	12.8	20.0	60.0	20.0	
3	3.70	7.10	12.7	20.0	60.0	13.0	
4	3.70	7.10	7.9	50.0	60.0	17.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.719	2548
2	0.572	1736
3	0.586	1775
4	0.571	1670

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2039+Dev(Link+Sig)	AM	Dedicated left turn from Manston Road (W)	ONE HOUR	07:45	09:15	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.54	0.06	1.2	A	958	1437
2	0.54	0.11	1.2	A	530	796
3	0.12	0.07	0.1	A	90	135
4	0.90	0.37	7.8	C	1120	1681

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	786	196	379	2252	0.349	784	719	0.0	0.5	0.041	A
2	435	109	658	1356	0.321	433	506	0.0	0.5	0.065	A
3	74	18	980	1187	0.062	74	111	0.0	0.1	0.054	A
4	919	230	184	1549	0.593	913	869	0.0	1.4	0.094	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	939	235	454	2198	0.427	938	860	0.5	0.7	0.048	A
2	520	130	787	1281	0.406	519	605	0.5	0.7	0.079	A
3	88	22	1173	1074	0.082	88	133	0.1	0.1	0.061	A
4	1098	274	221	1528	0.718	1094	1040	1.4	2.5	0.137	A

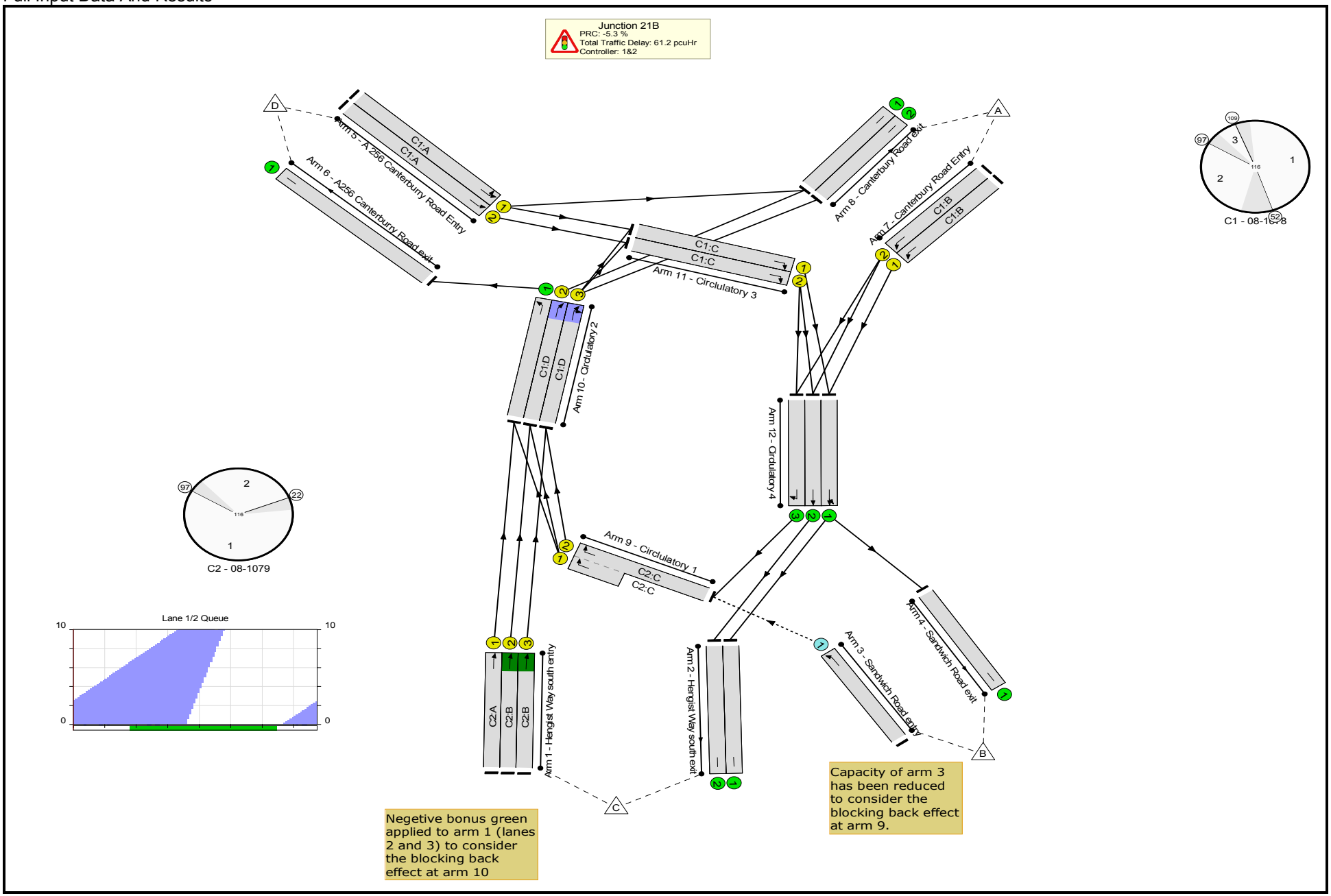
17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	1149	287	551	2129	0.540	1148	1045	0.7	1.2	0.061	A
2	636	159	963	1179	0.540	634	736	0.7	1.2	0.110	A
3	108	27	1435	921	0.117	108	162	0.1	0.1	0.074	A
4	1344	336	270	1500	0.896	1326	1273	2.5	7.2	0.314	C

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1	1149	287	557	2124	0.541	1149	1055	1.2	1.2	0.062	A
2	636	159	964	1178	0.540	636	742	1.2	1.2	0.111	A
3	108	27	1438	920	0.117	108	163	0.1	0.1	0.074	A
4	1344	336	271	1500	0.896	1342	1275	7.2	7.8	0.367	C

Full Input Data And Results



Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - Newington Road north		ONE HOUR	✓	469	100.000
2 - Newington Road south		ONE HOUR	✓	759	100.000
3 - Manston Road		ONE HOUR	✓	671	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	1	331	137
	2 - Newington Road south	419	3	337
	3 - Manston Road	280	391	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	3	4
	2 - Newington Road south	4	0	1
	3 - Manston Road	4	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1 - Newington Road north	0.82	0.50	4.1	D	430	646
2 - Newington Road south	0.85	0.40	5.3	C	696	1045
3 - Manston Road	1.46	15.94	151.3	F	616	924

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	353	88	285	640	0.551	348	516	0.0	1.2	0.202	B
2 - Newington Road south	571	143	102	1015	0.563	566	531	0.0	1.3	0.132	A
3 - Manston Road	505	126	316	582	0.867	485	353	0.0	5.0	0.540	D

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Description	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2039 Base	PM	Dedicated left turn from Manston Road (W)	ONE HOUR	16:45	18:15	15	✓

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	min	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (min)	Queue threshold (PCU)
5.75				0.85	0.60	20.00

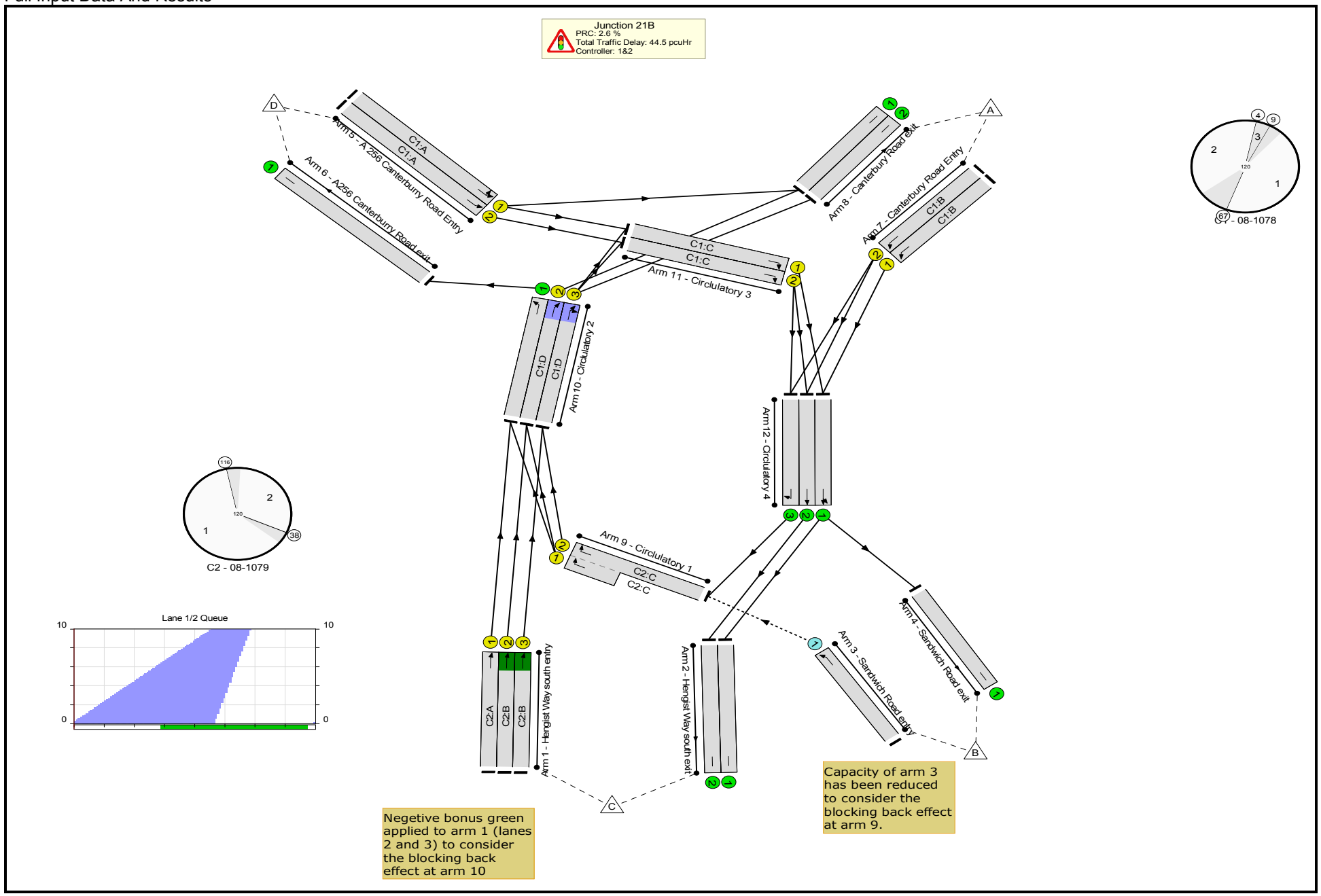
Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2039 Base	PM	ONE HOUR	16:45	18:15	15	✓

Full Input Data And Results



Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - Newington Road north		ONE HOUR	✓	468	100.000
2 - Newington Road south		ONE HOUR	✓	755	100.000
3 - Manston Road		ONE HOUR	✓	678	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	337	131
	2 - Newington Road south	427	0	328
	3 - Manston Road	285	393	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Newington Road north	2 - Newington Road south	3 - Manston Road
From	1 - Newington Road north	0	3	4
	2 - Newington Road south	4	0	1
	3 - Manston Road	4	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (min)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1 - Newington Road north	0.81	0.48	4.0	D	429	644
2 - Newington Road south	0.84	0.38	5.0	C	693	1039
3 - Manston Road	1.48	16.81	160.3	F	622	933

Main Results for each time segment

07:45 - 08:00

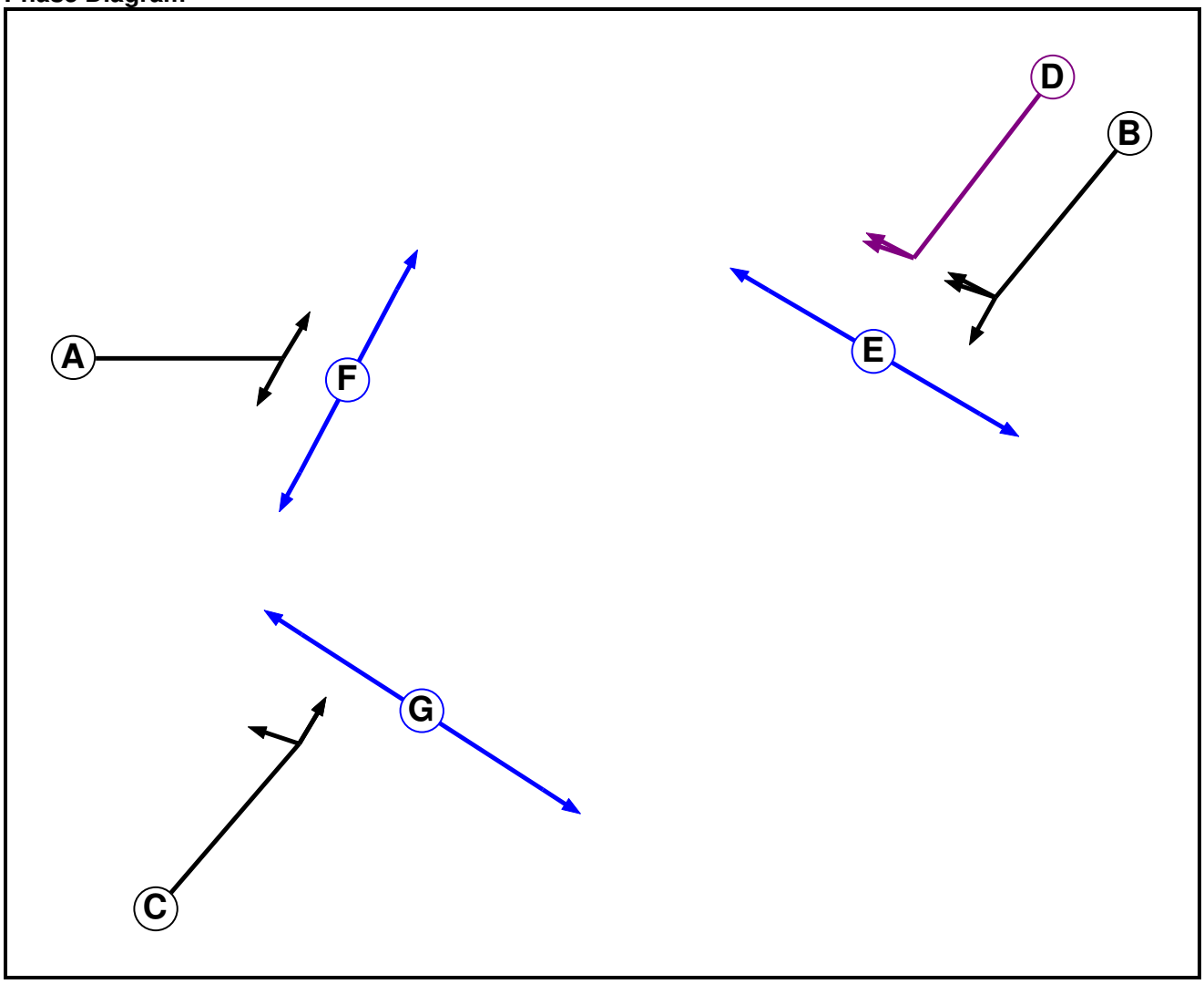
Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	352	88	283	641	0.550	348	524	0.0	1.2	0.201	B
2 - Newington Road south	568	142	97	1019	0.558	563	534	0.0	1.2	0.130	A
3 - Manston Road	510	128	319	581	0.879	489	342	0.0	5.3	0.566	D

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (min)	Unsignalised level of service
1 - Newington Road north	421	105	311	626	0.672	418	607	1.2	1.9	0.283	C
2 - Newington Road south	679	170	117	1005	0.675	676	611	1.2	2.0	0.180	B
3 - Manston Road	610	152	382	549	1.111	536	410	5.3	23.7	1.963	F

Full Input Data And Results

Phase Diagram



Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Ind. Arrow	B	4	4
E	Pedestrian		6	6
F	Pedestrian		6	6
G	Pedestrian		6	6

Lane Saturation Flows

Junction: Junction 15_ B2052 / Nash Road / Empire Ter / Shottendane Rd

Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (Manston Road south (Entry))	3.46	0.00	Y	Arm 4 Ahead	124.26	47.6 %	1872	1872
				Arm 5 Left	18.80	52.4 %		
1/2 (Manston Road south (Entry))	2.25	0.00	N	Arm 4 Ahead	71.38	100.0 %	1939	1939
2/1 (College Road)	3.29	0.00	Y	Arm 6 Ahead	70.25	100.0 %	1903	1903
2/2 (College Road)	3.31	0.00	Y	Arm 5 Right	14.18	98.6 %	1759	1759
				Arm 7 Right	9.40	1.4 %		
3/1 (Hartsdown Road Entry)	3.68	0.00	Y	Arm 4 Left	12.64	52.9 %	1816	1816
				Arm 6 Right	24.22	47.1 %		
4/1 (Tivoli Road Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Tivoli Road Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Hartsdown Road Exit Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Manston Road south (Exit) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (College Road to Tivoli Road)	3.25	0.00	Y	Arm 4 Right	15.00	100.0 %	1764	1764

Scenario 2: '2039 PM Peak' (FG2: '2039 BASE PM', Plan 2: '2039 Base PM')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	12	250	228	490
	B	818	0	275	1093
	C	435	235	0	670
	Tot.	1265	485	503	2253