Noise disturbance from Manston

A layman's submission on noise

Background

"Noise exposure is depicted in the form of noise contours, i.e. lines joining places of constant Leq, akin to the height contours shown on geographical maps or isobars on a weather chart. In the UK, Leq 16-hour noise contours are normally plotted at levels from 57 to 72 dBA, in 3 dB steps.1 The 57 dBA level denotes the approximate onset of significant community annoyance."

Point 2.14 Environmental Research and Consultancy Department report 1703 Stanstead published 2017 by the Civil Aviation Authority attached as appendix

Comment on experts

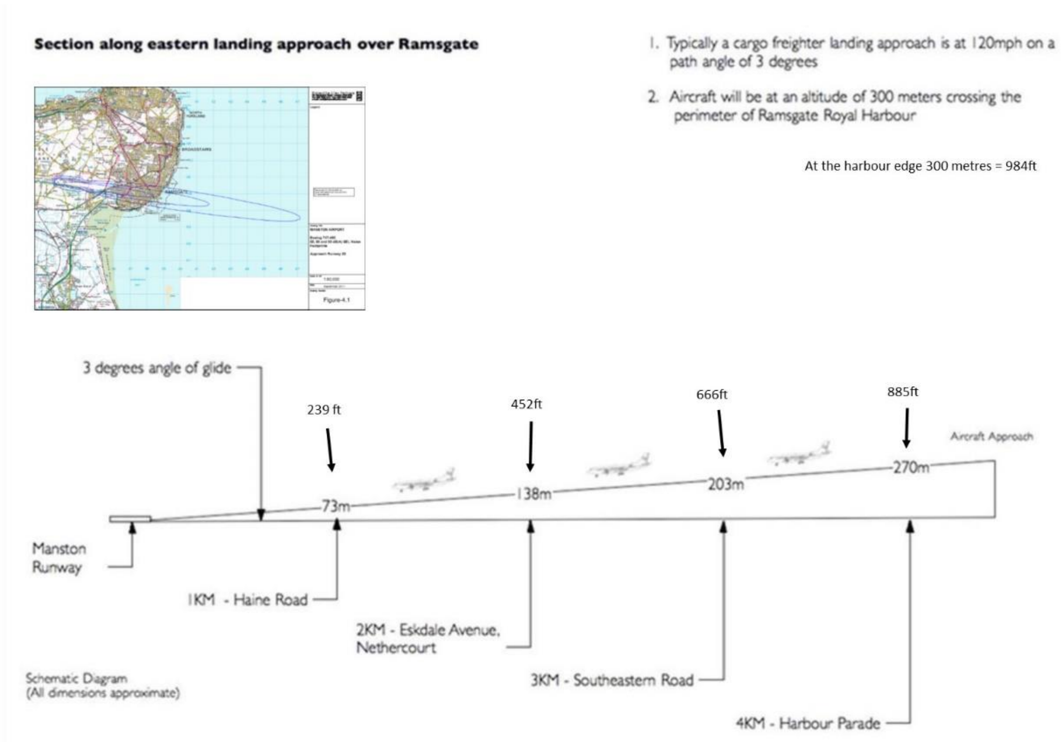
In my experience experts are extremely important when it comes to decisions that affect the quality of people's lives however they all seem to forget the layman has no idea what they are saying when they produce reports that use lots of scientific terminology. It seems to be a confusing morass of various terms which at the end of the day may please the experts but are meaningless to those they are trying to inform. It can also be used to deflect away the real intrusive nature of noise disturbance.

Personal experience

We used to live under the flight path in Ramsgate where planes flew over our heads at about 500 feet and because I worked at home from my loft office I had to stop working or hold a call because of the noise. We were at a high point of Ramsgate so were able to see the planes land. We were also able to take great shots of the planes overhead.

This is a C-17 Globemaster

Noise disturbance from Manston



This is based on a plane landing from the East over Ramsgate

Issue specific meeting Friday 22nd March 2019

After listening to this meeting on Friday we were struck by how different experts explained their conclusions and immediately thought of the following. “There are statistics, more statistics and damn lies” (sic) because it was impossible to draw a single conclusion about how this DCO would affect the quality of life in Ramsgate or Herne Bay so we went back to the submissions and looked at how the CAA reported noise at Stanstead.

We were also confusion, as was Iain Livingstone (TDC Planning), that 7 Ramsgate schools were outside the 60db contour when it is clear they are under or close to the flight path and one Chatham & Clarendon actually had a noise monitor on the roof.

Consultation Documents

RSP stated in their 11500 pages that the quality of life at various receptors would be Significant and Adverse and these receptors are Ramsgate, Stourmouth, Manston and West Stourmouth. These affects will be permanent. It goes without saying that Ramsgate is a town with more than 40,000 people going to be affected in an adverse way.

12.7.67 The change in noise level at the communities described above in the long term, the magnitude of impact resulting from the Proposed Development has been estimated at baseline monitoring and observation locations and presented in **Table 12.29**. This baseline was presented earlier in this Chapter in **Table 12.2** and **Table 12.3**. The magnitude of impact has been estimated using the long-term change criteria presented in **Table 12.8**.

12.7.68 At many of the communities described above the predicted change in daytime and night-time noise is negligible.

12.7.69 During the daytime:

- Moderate adverse impacts are predicted in Ramsgate;
- A moderate adverse impact is predicted at Pegwell Bay; and
- Minor adverse impacts are predicted in Manston.

12.7.70 Considering that the impact is permanent and that a large number of dwellings within the communities are subject to minor to moderate adverse impacts, significant adverse effects have been identified at the communities of Ramsgate, Pegwell Bay and Manston as a result of the Proposed Development. The effect would be characterised as a perceived change in quality of life

for occupants of buildings in these communities or a perceived change in the acoustic character of shared open spaces within these communities during the daytime.

12.7.71 During the night-time:

- Moderate adverse impacts are predicted in Ramsgate;
- Minor adverse impacts are predicted in Manston;
- A minor adverse impact is predicted in Wade; and
- A minor adverse impact is predicted in West Stourmouth;

12.7.72 Considering that the impact is permanent and that a large number of dwellings within the communities are subject to minor to moderate adverse impacts, significant adverse effects have been identified at the communities of Ramsgate, Manston, Wade and West Stourmouth as a result of the Proposed Development. The effect would be characterised as a perceived change in quality of life for occupants of buildings in these communities or a perceived change in the acoustic character of shared open spaces within these communities during the night-time.

Noise Mitigation Plan revised and noise contour maps

Recently RSP have submitted two documents

1. TR020002-003614-Review of Potential Noise Mitigation Measures and
2. TR020002-003637-Updated Noise Contour Maps

Clearly they have had to “move the goal posts” again because various reports from other experts and submissions from affected local people have focussed their minds however it is clear from what they have posted the mitigation changes are worthless and almost impossible to enact and that is the conclusion of their own experts.

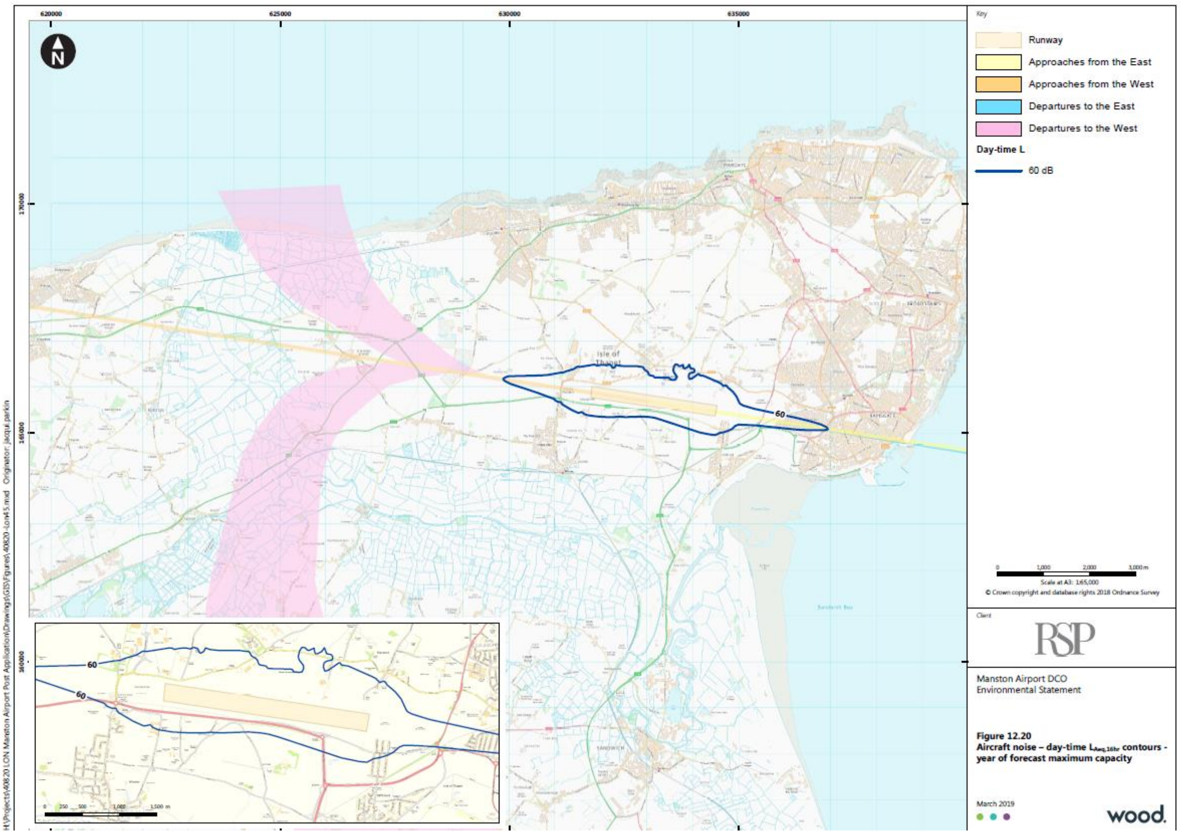
This report considers a number of operational noise mitigation techniques that Manston Airport could consider to create a noise mitigation strategy. It represents a redacted version of the Commercial in Confidence document (Review of Potential Aircraft Noise Abatement Operational Procedures. Report 70992-011 Version 2.1 for RiverOak Strategic Partners 18 December 2017); removing commercially sensitive and proprietary analytical information. Elements of the analysis was conducted by Wood, when Amec Foster Wheeler (AFW). For continuity, the report continues to refer to AFW as the originator of the data.

The report found that based purely on meteorological factors, a preferential runway strategy would have a significant noise reduction effect and was feasible for the majority of the time (67.8%). The biggest limiting factor to preferential runway operations will be the movement rate that Manston Airport would like to be able to achieve. Above a movement rate of 5 freighter / airliner movements per hour, Manston Airport would no longer be able to support opposite runway direction operations.

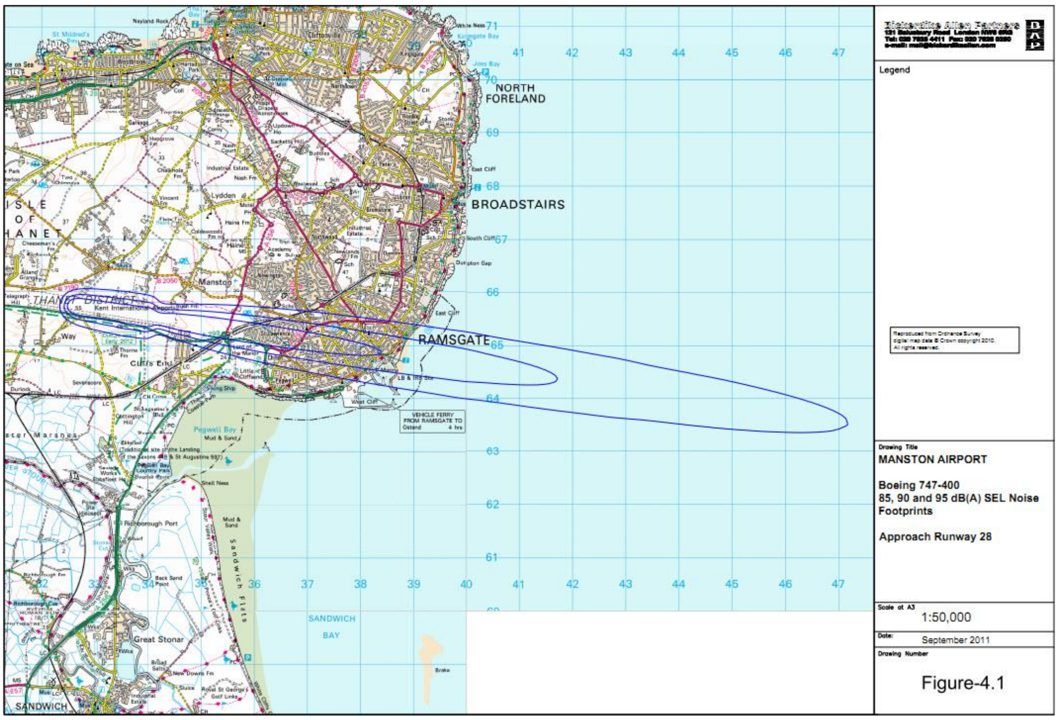
Increased approach angles were also found to have a theoretical effect on the reduction of noise; however, evidence suggests that when actually undertaken, the more technically challenging approach may result in an increased level of aborted approaches nullifying noise benefits.

Noise disturbance from Manston

What is also clear to observers and TDC planning is some of the mapping is suspect.



This is the 60 db contour as displayed in their revised mapping document. This is confusing as Infratil produced a series of noise contour maps in 2010 when operational and when they were pressing for night flights. Infratil's maps show the 80,85 and 90 db contours which imply that the 60 db contour would naturally lie outside of these contours. 4 maps at end of report but this is Landing from the East by a 747,



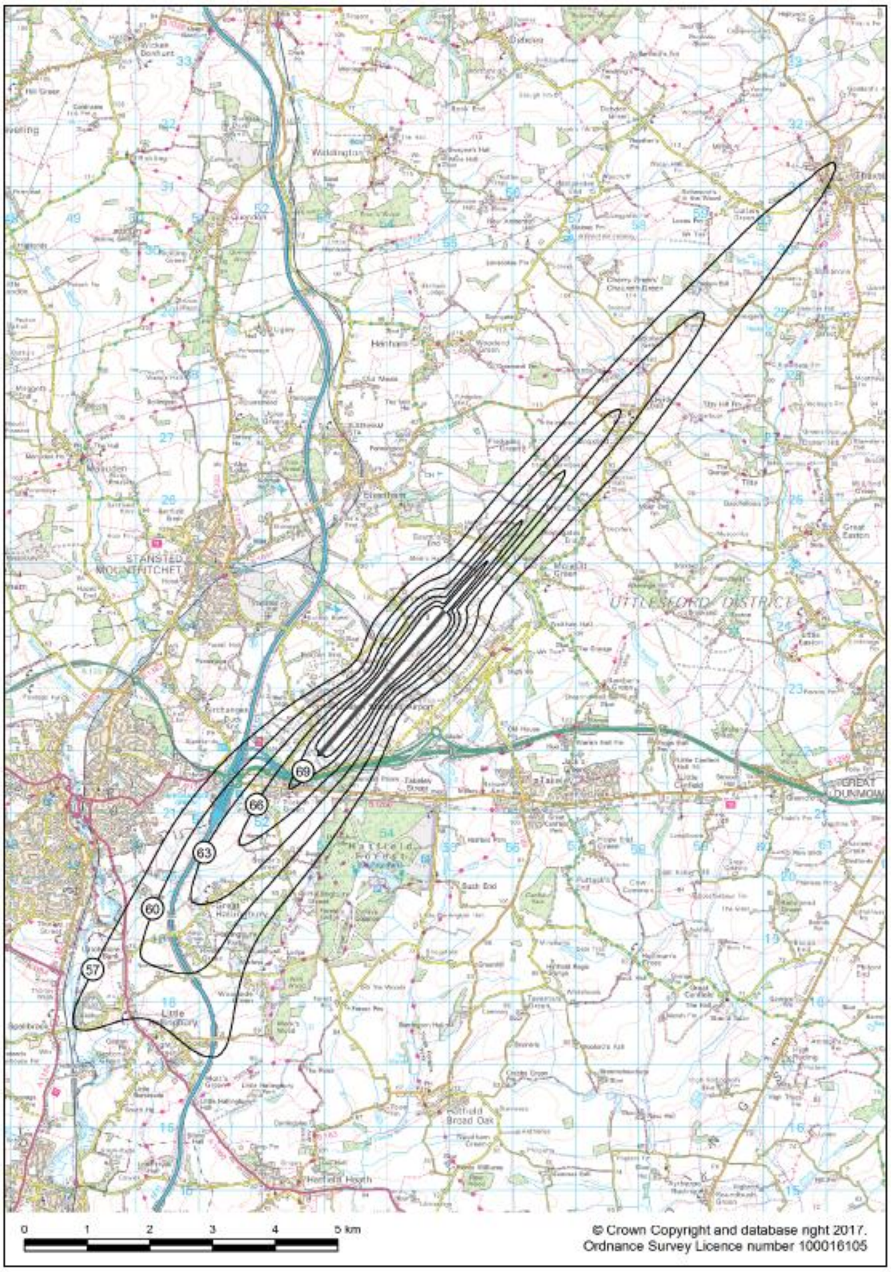
Noise disturbance from Manston

How their 60db can miss out Ramsgate is a very strange thing and should be investigate especially when the CAA says “The 57 dBA level denotes the approximate onset of significant community annoyance.”

From the attached Stanstead report this is the contour map and clearly the 60db contour is 14kms in length. RSP’s 60 db is barely 5km

ERCD REPORT 1703 Appendix B: Figures

Figure 12 Stansted 2016 day actual modal split (86% SW / 14% NE) Leq contours



Conclusion

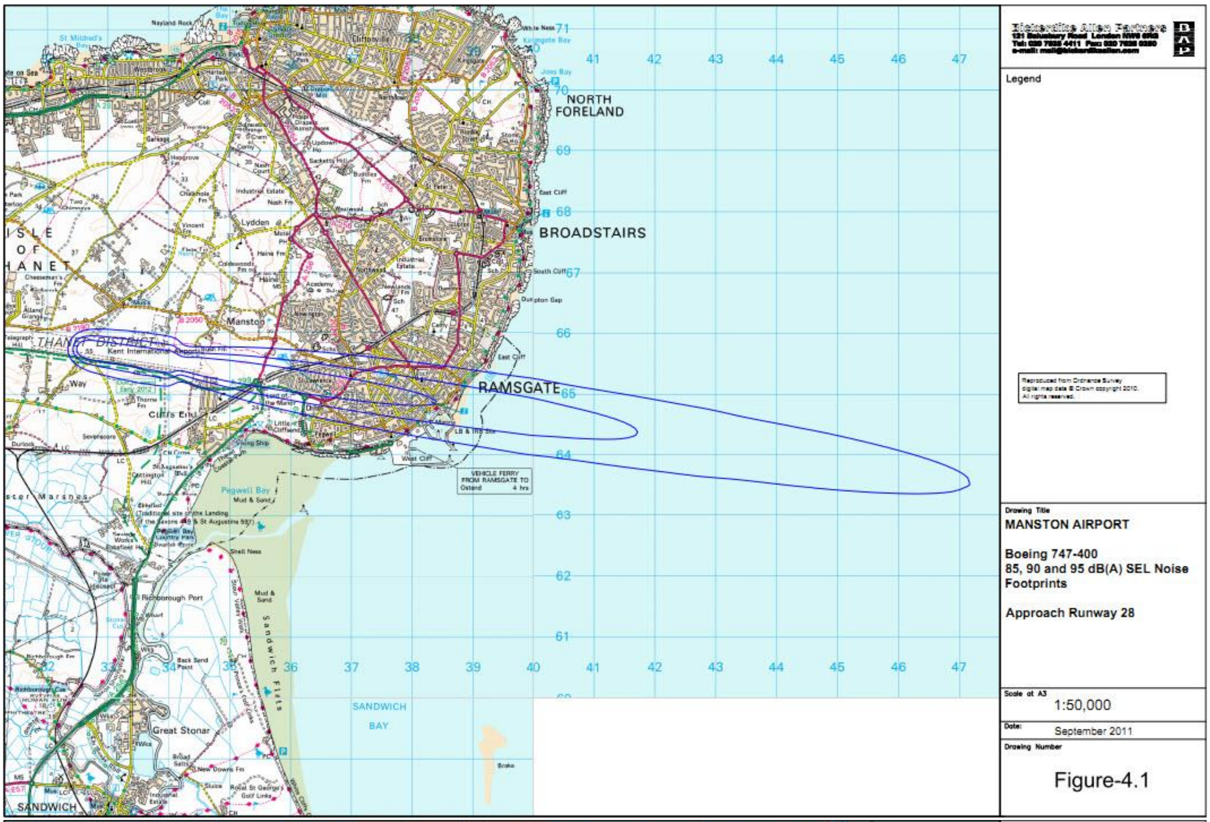
It does seem that there are as many methods of measuring noise as there are experts to measure it but there are two conclusions we make.

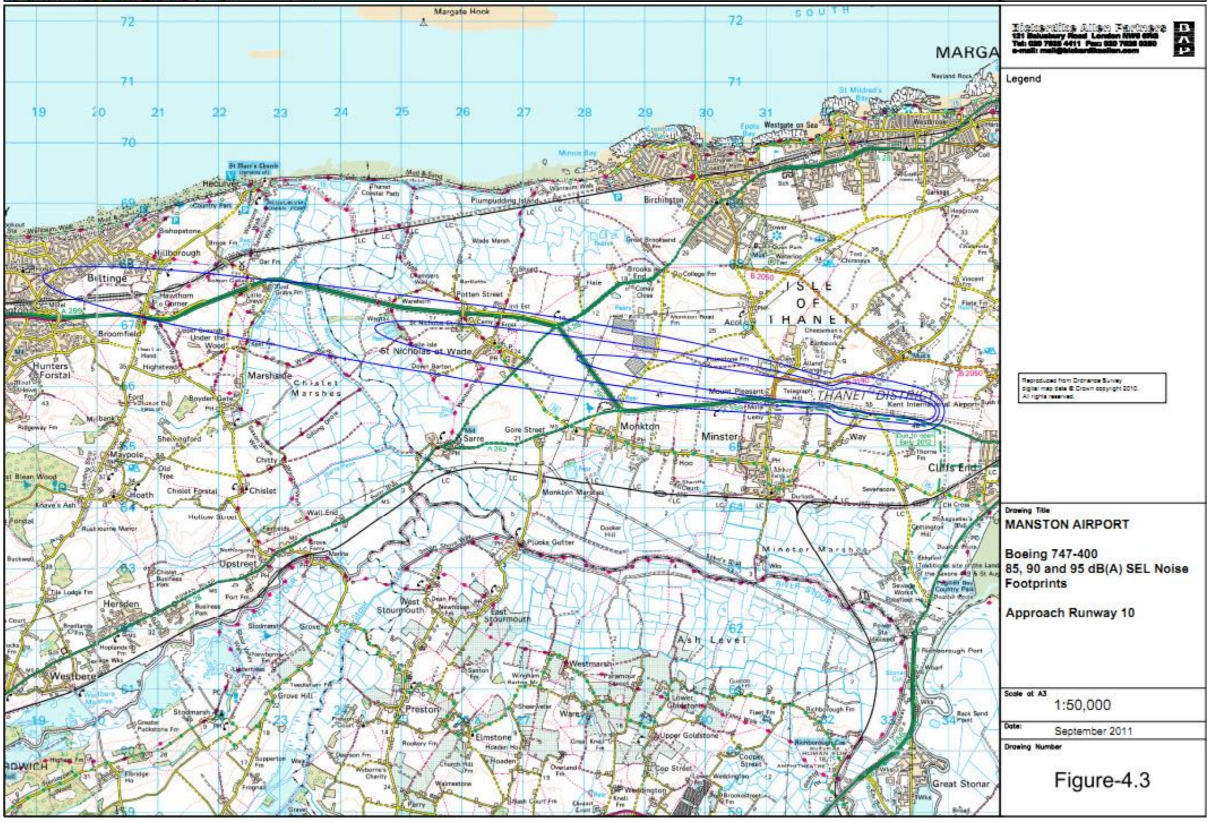
Noise disturbance from Manston

1. The methodology RSP has chosen seems to produce the least number of people suffering blight. Is this an honest mistake or contrived?
2. Noise affects people from the 57db contour and that really should take in 40000+ inhabitants of Ramsgate especially those living in Nethercourt and the soon to be developed Manston Green.

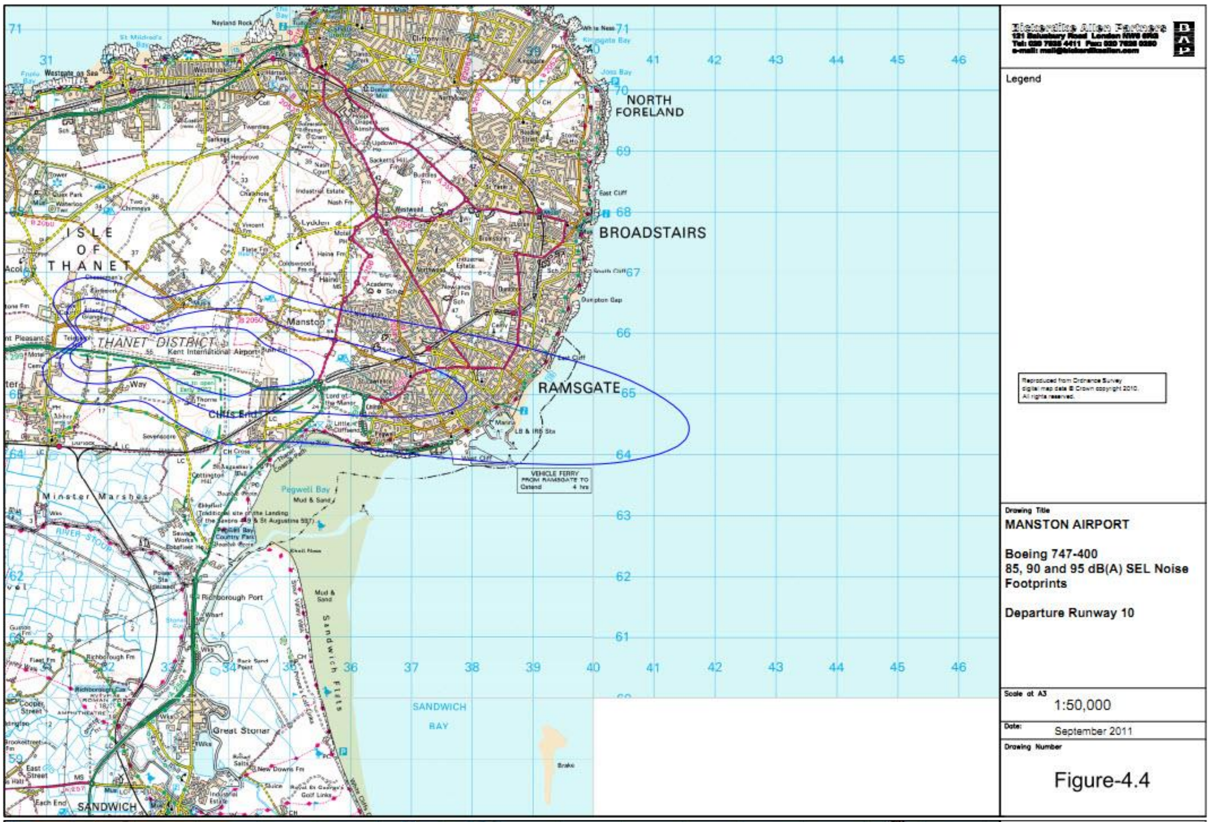
The compensation currently being discussed is inadequate, would not cover the 7 schools affected nor can it be implemented in the many listed building in Ramsgate.

Noise disturbance from Manston





Noise disturbance from Manston



Appendix “2016-noise-contour-stansted” CAA published 2017

Environmental Research and Consultancy Department

Noise Exposure Contours for Stansted Airport 2016

ERCD REPORT 1703

Published by the Civil Aviation Authority, 2017
CAA House, 45-59 Kingsway, London WC2B 6TE

Population data used in this report are based on 2011 Census data (updated for 2016) supplied by CACI Limited.

Enquiries regarding the content of this publication should be addressed to: Environmental Research and Consultancy Department, Civil Aviation Authority, CAA House, 45-59 Kingsway, London, WC2B 6TE.

Contents

Summary

1. This report presents the 2016 average summer day and night noise exposure contours generated for London Stansted Airport.

2. The noise modelling used radar and noise data from Stansted's Noise and Track Keeping (NTK) system. Mean flight tracks and lateral dispersions for each route, and average flight profiles of aircraft height, speed and thrust for each aircraft type, were calculated using these data.

3. Analysis of the 2016 summer traffic data for Stansted revealed that average daily movements for the 16-hour daytime period (451.6) were 7% higher than in the previous year (2015: 420.9). The B738 ANCON aircraft type (i.e. Boeing 737-800) had the largest increase in movements of 28.4 per day. There were on average 82.3 movements per 8-hour night over the 2016 summer period, an increase of 11% on the 2015 figure (74.1).

4. The area of the 2016 day actual modal split (86% south-west / 14% north-east) 57 dBA Leq contour increased by 5% to 24.8 km^2 (2015: 23.6 km^2). This area increase was a consequence of the 7% rise in movements. The population count within the 2016 day actual 57 dBA contour increased by 24% to 2,050 (2015: 1,650), largely due to extensions of the contour over populated areas such as Thaxted and Little Hallingbury.

5. The area of the 2016 day standard modal split (73% south-west / 27% north-east) 57 dBA Leq contour increased by 3% to 24.3 km^2 (2015: 23.5 km^2). This area was still well within the 33.9 km^2 contour area limit imposed by the Stansted Planning Condition AN1. The population count within the 2016 day standard 57 dBA contour was 1,750, the same as in 2015.

6. The area of the 2016 night actual modal split (85% south-west / 15% north-east) 48 dBA Leq contour was 61.9 km^2, an increase of 8% from the previous year (2015: 57.2 km^2). The contour enclosed a population of 7,800, which was a 12% rise from 2015 (6,950). The population increase was mainly due to an extension of the contour over Great Sampford.

7. The area of the 2016 day actual modal split N70 20 events contour was 40.7 km^2 and the contour enclosed a population of 6,250.

Chapter 1

Introduction

Background

1.1 Each year the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) calculates the noise exposure around London Stansted Airport. Up until 2015, this work was carried out on behalf of the Department for Transport (DfT). For this 2016 study, ERCD was commissioned by Stansted Airport Ltd (STAL).

1.2 A computer model, ANCON, validated with noise measurements, is used to estimate the noise exposure. The model calculates the emission and propagation of noise from arriving and departing air traffic.

1.3 The noise exposure metric used is the Equivalent Continuous Sound Level, or Leq 16-hour (0700-2300 local time), which is calculated over the 92-day summer period from 16 June to 15 September. The background to the use of this index is explained in DORA Report 9023 (Ref 1).

1.4 Noise exposure is depicted in the form of noise contours, i.e. lines joining places of constant Leq, akin to the height contours shown on geographical maps or isobars on a weather chart. In the UK, Leq 16-hour noise contours are normally plotted at levels from 57 to 72 dBA, in 3 dB steps.[1] The 57 dBA level denotes the approximate onset of significant community annoyance.

1.5 Following the publication of the Aviation Policy Framework in March 2013 (Ref 2), night-time (2300-0700 local time) Leq noise contours have been produced on an annual basis for the designated airports. Night-time 8-hour Leq contours have therefore been calculated for Stansted from 48 to 72 dBA in 3 dB steps in accordance with standard practice. Average summer night Leq contours were first calculated for Stansted for the year 2013.

1.6 At STAL's request, daytime contours using the supplementary noise metric N70 16-hour have also been produced. N70 contours indicate the number of aircraft

---

[1] Aircraft noise contours are also produced on behalf of airports for the specific purpose of meeting the requirements of the *Environmental Noise (England) Regulations 2006 (as amended)*, which implemented Directive 2002/49/EC, *Assessment and Management of Environmental Noise*, in England. These are based on annual average values and require the use of different parameters (L_{day}, $L_{evening}$, L_{night}, $L_{eq,16hr}$ and L_{den} at 5 dB steps), so it is not possible to draw meaningful conclusions between the two types of contour maps. Further details about Directive 2002/49/EC are available on the Department for Environment, Food and Rural Affairs website at *www.gov.uk/defra* as well as ERCD Reports 1204, 1205 and 1206 (available from *www.caa.co.uk*), which cover Heathrow, Gatwick and Stansted 2011 noise mapping respectively.

noise events exceeding a maximum sound level (L_{max}) of 70 dBA at a given location.

1.7 The objectives of this report are to explain the noise modelling methodology used to produce the year 2016 day and night contours for Stansted Airport, to present the calculated noise contours and to assess the changes from the previous year (Ref 3). Long-term trends are also examined.

Stansted Airport

1.8 Stansted Airport is situated 35 miles (56 km) north-east of London and is surrounded by countryside and small villages to the north, south and east, and by the town of Bishop's Stortford to the west (**Figure 1**, Appendix B).

1.9 Stansted Airport has a single runway, designated 04/22, which is 3,049 m long. The Runway 04 landing threshold[2] is displaced by 300 m. There is one main passenger terminal. The layout of the runway, taxiways and passenger terminal in 2016 is shown in **Figure 2**.[3]

1.10 In the 2016 calendar year there were approximately 180,000 aircraft movements at Stansted (2015: 169,000) and the airport handled 24.4 million passengers (2015: 22.5 million).[4]

1.11 Following the granting of planning permission for the Stansted G1 proposal on 8 October 2008, the following planning condition ('Planning Condition AN1') came into force:

> *"The area enclosed by the 57dB(A) Leq16hr (0700-2300) contour, when calculated and measured by the Civil Aviation Authority's Aircraft Noise Contour Model 2.3 or as may be amended, shall not exceed 33.9 sq km using the standardised average mode from the date of grant of this permission. Any necessary account shall be taken of this requirement in declaring the capacity of Stansted Airport for the purpose of Council Regulation (EEC) No 95/93 of 18 January 1993 on common rules for the allocation of slots at Community airports. Forecast aircraft movements and consequential noise contours for the forthcoming year shall be reported to the Local Planning Authority annually on the 31st January each year."*

1.12 Based on the above planning condition, the area of the standard (i.e. 20-year average) runway modal split 57 dBA Leq 16-hour contour is not to exceed a limit of 33.9 km^2.

---

[2] The runway threshold marks the beginning of the runway available for landing aircraft. A *displaced* threshold is a runway threshold that is not located at the physical end of the runway. A displaced threshold is often employed to give arriving aircraft sufficient clearance over an obstacle.

[3] UK AIP, AD 2-EGSS-2-1 (12 Nov 2015)

[4] Source: Civil Aviation Authority (www.caa.co.uk/airportstatistics)

Chapter 2

Noise modelling methodology

ANCON model

2.1 Noise contours were calculated with the UK civil aircraft noise model ANCON (version 2.3), which is developed and maintained by ERCD on behalf of the DfT. A technical description of ANCON is provided in R&D Report 9842 (Ref 4). The ANCON model is also used for the production of annual contours for Heathrow and Gatwick airports, and a number of other UK airports.

2.2 ANCON is fully compliant with the latest European guidance on noise modelling, ECAC.CEAC Doc 29 (Fourth edition), published in December 2016 (Ref 5). This guidance document represents internationally agreed best practice as implemented in modern aircraft noise models.

Radar data

2.3 The noise modelling carried out by ERCD made extensive use of radar data extracted from Stansted Airport's Noise and Track Keeping (NTK) system. Most large airports have NTK systems, which take data from Air Traffic Control (ATC) radars and combine them with flight information such as call sign, aircraft registration, aircraft type and destination. Analyses of departure and arrival flight tracks, and flight profiles, were based on year 2016 summer radar data.

Flight tracks

2.4 Aircraft departing Stansted are required to follow specific flight paths called Noise Preferential Routes (NPRs) unless directed otherwise by ATC. NPRs were designed to avoid the overflight of built-up areas where possible. They establish a path from the take-off runway to the main UK air traffic routes and form the first part of the Standard Instrument Departure (SID) routes. The Stansted NPR/SID routes are illustrated in **Figure 3**.

2.5 Associated with each NPR is a lateral swathe, which is defined by a pair of lines that diverge at 10 degrees from a point 2,000 m from start-of-roll, leading to a corridor extending 1.5 km either side of the nominal NPR centreline. Within this swathe the aircraft are considered to be flying on-track. The swathe takes account of various factors that affect track-keeping, including tolerances in navigational equipment, type and weight of aircraft, and weather conditions – particularly winds that may cause drifting when aircraft are turning. Aircraft reaching an altitude of 4,000 ft[5] at any point along an NPR may be turned off the

[5] An altitude of 3,000 ft for aircraft on the 'BARKWAY' departure routes in the period 0600-2330.

route by ATC onto more direct headings to their destinations – a practice known as 'vectoring'. ATC may also vector aircraft from NPRs below this altitude for safety reasons, to avoid storms for example.

2.6 Departure and arrival flight tracks were modelled using radar data extracted from the Stansted NTK system over the 92-day summer period, 16 June to 15 September 2016. Mean flight tracks were calculated from 24-hour data since both day and night contours were being produced.

2.7 **Figure 4** shows a sample of radar flight tracks from a day in August 2016. In-house radar analysis software was used to calculate mean departure flight tracks and associated lateral dispersions for each NPR/SID. Arrival tracks for Runways 04 and 22 were modelled using evenly spaced 'spurs' about the extended runway centrelines. The majority of arriving aircraft joined the centrelines at distances between 13 and 22 km from threshold for Runway 22, and between 9 and 19 km from threshold for Runway 04.

Flight profiles

2.8 For each ANCON aircraft type, average flight profiles of height, speed and thrust versus track distance (for departures and arrivals separately) were reviewed and updated where necessary, using year 2016 summer radar data. The engine power settings required for the aircraft to follow the average height and speed profiles were calculated from data describing aircraft performance characteristics within each of the different aircraft type categories.

2.9 Daytime flight profiles were generated as in previous years. Following a check on night-time profile data, it was concluded that the profiles generated from the daytime data were appropriate for use with the night contours.

2.10 At distances greater than about 10 km from the runway threshold, the average aircraft heights for arrivals on Runway 22 were higher than on Runway 04, as in preceding years. This was due to the use of Continuous Descent Approaches (CDAs) on Runway 22, where aircraft generally join the glideslope from a greater height. CDAs have been employed for arrivals to Runway 22 since 1999. Separate Runway 22 and Runway 04 descent profiles were therefore used to model arrivals for all aircraft types.

2.11 The application of reverse thrust following touchdown was modelled for all ANCON types where applicable. Reverse thrust was included in both the day and night contours.

Noise emissions

2.12 At Stansted, the NTK system captures data from both fixed and mobile noise monitors around the airport. Noise event data for individual aircraft operations were matched to operational data provided by the airport. The Stansted NTK system employs 8 fixed monitors positioned approximately 6.5 km from start-of-roll, together with a number of mobile monitors that can be deployed anywhere within the NTK radar coverage area.[6]

2.13 The noise data collected were screened by ERCD with reference to several criteria so that only reliable data were used in the analysis. First of all, noise data that lay outside a 'weather window' were discarded. This ensured that the data used were not affected by adverse meteorological conditions such as precipitation and strong winds. Secondly, the maximum noise level of the aircraft event had to exceed the noise monitor threshold by at least 10 dB to avoid underestimates of the Sound Exposure Level (SEL). Thirdly, only measurements obtained from aircraft operations that passed through a 60-degree inverted cone, centred at the noise monitor, were retained in order to minimise the effects of lateral attenuation and lateral directivity.[7]

2.14 The ANCON model calculates aircraft noise using a noise database expressing SEL as a function of engine power setting and slant distance to the receiver – also known as the 'Noise-Power-Distance' (NPD) relationship. The ANCON noise database is continually reviewed and updated with adjustments made annually when measurements show this to be necessary.

Daytime traffic by ANCON type

2.15 The Leq contours were based on the daily average movements that took place during the 16-hour day (0700-2300 local time) and 8-hour night (2300-0700 local time), over the 92-day summer period from 16 June to 15 September inclusive. The source of this information was the NTK system, which stores radar data supplemented by daily flight plans. Traffic statistics from NTK data were cross-checked with runway logs supplied by NATS[8] and close agreement was found.

2.16 The average number of daily movements at Stansted over the 2016 summer day period (451.6) was 7% higher than in the previous year (2015: 420.9).

2.17 A breakdown of the year 2016 average summer day movements by ANCON aircraft type is provided in **Table C1**. The largest increase in movements was for the ANCON type B738, which was up by 28.4 movements per day (note: descriptions of all the ANCON types can be found in **Table D1** of Appendix D). The largest *decreases* were for the ANCON types LTT (large twin-turboprop) and B733, which decreased by 7.6 and 7.3 movements per day respectively.

[6] Further information on the noise monitors can be found in CAP 1149 (Ref 6).

[7] *Lateral attenuation* is the excess sound attenuation caused by the ground surface, which can be significant at low angles of elevation. *Lateral directivity* is the non-uniform directionality of sound radiated laterally about the roll axis of the aircraft – this is influenced to a large extent by the positioning of the engines.

[8] NATS is the provider of air traffic control services to Stansted Airport.

2.18 **Figure 5** illustrates the numbers of movements by ANCON aircraft type for the 2016 average summer day. The B738 was clearly the most common ANCON aircraft type at Stansted with 315.0 daily movements (70% of the total), followed by the EA319C with 46.9 daily movements (10% of the total).

2.19 The B738 was the noise dominant ANCON type (for both departure and arrival noise) at Stansted during the daytime because it was responsible for the highest contribution of 'noise energy', which is a function of both aircraft noise level and movement numbers.

2.20 An estimated[9] 99% of the aircraft in the 2016 summer day period were compliant with the ICAO Chapter 4 noise standard.

Night-time traffic by ANCON aircraft type

2.21 There were 82.3 aircraft movements on average over the 8-hour night in 2016, an increase of 11% from the previous year (2015: 74.1). Arrivals made up 60% of movements at night, with 40% being departures.

2.22 A breakdown of the year 2016 average summer night movements by ANCON aircraft type is provided in **Table C2**. The highest increase was for the ANCON type B738, which was up by 5.6 movements per night. The largest *decrease* was for the B733, down by 2.4 movements per night.

2.23 **Figure 6** illustrates the numbers of movements by ANCON aircraft type for the 2016 average summer night. Similar to daytime, night traffic was dominated by the B738 with 48.1 movements, representing 58% of the total traffic. The second most frequent type was the EA319C with 7.0 movements per night, which was 9% of the total traffic.

2.24 The B738 was the noise dominant ANCON type (for both departure and arrival noise) at Stansted during the night-time period.

2.25 An estimated 94% of aircraft in the 2016 summer night period were compliant with the ICAO Chapter 4 noise standard.

Daytime traffic distributions by NPR/SID route

2.26 **Figure 7** shows the percentage distribution of departing aircraft by NPR/SID route for the 2016 average summer day period, with distribution figures from 2015 for comparison. On 4 February 2016 the LAMP 1A airspace change was implemented,[10] so traffic that would previously have flown on the DET SID was

---

[9] The percentage figure is an estimate because in some cases, detailed aircraft information (e.g. aircraft weight, engine modifications) was not readily available, so some assumptions had to be made.

[10] https://www.caa.co.uk/Commercial-industry/Airspace/Airspace-change/Decisions/London-Airspace-Management-Programme-Phase-1A/

switched to the CLN SID.[11] The effects of this change are evident in the statistics for Runway 22 DET departures, for which the percentage loading has dropped from 23% in 2015 to 1% in 2016. Conversely, the loading on Runway 22 CLN has increased to 45% (2015: 17%) - this route now having the highest percentage of departing traffic. Part of the percentage increases on the Runway 22 BKY and CLN routes was due to the higher proportion of south-westerly mode operations in 2016 compared to 2015.

2.27 The effects of the switch from the DET to CLN SID can also be seen in the statistics for Runway 04. The Runway 04 DET SID percentage loading decreased from 7% in 2015 to 0% in 2016, whilst the loading on the Runway 04 CLN SID increased from 6% to 8%.

Night-time traffic distributions by NPR/SID route

2.28 **Figure 8** shows the percentage distribution of departing aircraft by NPR/SID route for the 2016 average summer night period, with distribution figures from 2015 for comparison.

2.29 The Runway 22 BKY route had the highest proportion of departure traffic over the summer night period (46%). The increase from 2015 (when the proportion was 37%) resulted from the higher percentage of south-westerly mode operations in 2016.

2.30 The effects of the switch in traffic from the DET to CLN SIDs (following implementation of the LAMP 1A airspace change) resulted in lower percentage loadings on the DET routes at night and higher loadings on the CLN routes.

Runway modal splits

2.31 In general, aircraft will take-off and land into a headwind to maximise lift during take-off and landing. The wind direction, which varies over the course of a year, will therefore have an important influence on the usage of runways. The ratio of south-westerly (i.e. Runway 22) and north-easterly (i.e. Runway 04) operations is referred to as the *runway modal split*.

2.32 Two sets of contours have been produced for the year 2016 summer day:

(a) Using the ‘actual’ modal split over the Leq day period; and

(b) Assuming the ‘standard’ modal split over the Leq day period, i.e. the long-term modal split calculated from the 20-year rolling average. For 2016, this was the 20-year period from 1997 to 2016. Use of the standard modal split enables year-on-year comparisons without the runway usage significantly affecting the contour shape.

[11] The DET SID is not normally available now during daytime hours.

2.33 The actual and standard daytime south-west/north-east (SW / NE) percentage modal splits for 2016 and the previous year are summarised in **Table 1**.

Table 1 Stansted daytime runway modal splits

Year	Actual modal split (SW / NE percentage)	Standard modal split (SW / NE percentage)
2016	86 / 14	73 / 27
2015	75 / 25	72 / 28

2.34 The daytime actual modal split in 2016 (86% SW / 14% NE) had an 11% higher proportion of south-westerly operations compared to 2015. The 2016 standard modal split of 73% SW / 27% NE had a 1% higher percentage of south-westerly operations. Historical runway modal splits at Stansted for the past 20 years are summarised in **Figure 9**.

2.35 The night-time actual runway modal split for the 2016 summer period was 85% south-west / 15% north-east, a 12% shift in the percentage of south-westerly operations from 2015. The night-time modal splits for the past four years (2013-2016) are summarised in **Table 2**.

Table 2 Stansted night-time runway modal splits

Year	Actual modal split (SW / NE percentage)
2016	85 / 15
2015	73 / 27
2014	50 / 50
2013	70 / 30

Topography

2.36 The topography around Stansted Airport was modelled by accounting for terrain height. This was achieved by geometrical corrections for source-receiver distance and elevation angles. Other, more complex effects, such as lateral attenuation from uneven ground surfaces and noise screening/reflection effects due to topographical features, were not taken into account.

2.37 ERCD holds OS terrain height data on a 200-metre by 200-metre grid for the whole of England. Interpolation was performed to generate height data at each of the calculation points on the receiver grid used by the ANCON noise model. The terrain heights in the vicinity of Stansted Airport are depicted diagrammatically in **Figure 10**.

Population and 'Points of Interest' databases

2.38 Estimates were made of the numbers of people and households enclosed within the noise contours. The population data used in this report are a 2016 update of the 2011 Census supplied by CACI Limited.

2.39 The CACI population database contains data referenced at postcode level. Population and household numbers for each postcode are assigned to a single coordinate located at the postcode's centroid. The postcode data points and associated population counts for the area around Stansted Airport are illustrated in **Figure 11**.

2.40 Within the extent of the 2016 day actual 57 dBA Leq contour, the population count using the 2016 population database was 4% higher than with the 2015 database, so the effect of the 2016 population database update was an increase in the population counts around Stansted.

2.41 Estimates have also been made of the numbers of noise sensitive buildings situated within the daytime contours, using the InterestMap™ 'Points of Interest' (2016) database. For the purpose of this study, the noise sensitive buildings that have been considered are schools, hospitals and places of worship.

Chapter 3

Results

2016 day actual contours

3.1 The Stansted 2016 day Leq noise contours generated with the actual 2016 summer day period runway modal split (86% SW / 14% NE) are shown in **Figure 12**. The contours are plotted from 57 to 72 dBA at 3 dB intervals.

3.2 Cumulative estimates of the areas, populations and households within the 2016 day actual modal split contours are provided in **Table 3**.

Table 3 Stansted 2016 day actual contours – area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 57	24.8	2,050	850
> 60	13.0	600	250
> 63	6.9	200	100
> 66	3.6	50	< 50
> 69	1.8	0	0
> 72	1.0	0	0

Note: Populations and households are given to the nearest 50.

3.3 The 2016 day actual 57 dBA Leq contour enclosed an area of 24.8 km^2 and a population of 2,050.

3.4 Estimates of the cumulative numbers of noise sensitive buildings within the 2016 day actual contours are provided in **Table 4**:

Table 4 Stansted 2016 day actual contours – noise sensitive building estimates

Leq (dBA)	Schools	Hospitals	Places of worship
> 57	1	0	4
> 60	1	0	2
> 63	0	0	1
> 66	0	0	0
> 69	0	0	0
> 72	0	0	0

2016 night actual contours

3.5 The Stansted 2016 night Leq noise contours generated with the actual 2016 summer night period runway modal split (85% SW / 15% NE) are shown in **Figure 13**. The contours are plotted from 48 to 66 dBA at 3 dB intervals (note: the 69 and 72 dBA contours have been omitted for clarity).

3.6 Cumulative estimates of the areas, populations and households within the 2016 night actual modal split contours are provided in **Table 5**.

Table 5 Stansted 2016 night actual contours – area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 48	61.9	7,800	3,050
> 51	34.3	4,200	1,700
> 54	18.0	1,000	400
> 57	9.2	350	150
> 60	4.8	50	< 50
> 63	2.5	0	0
> 66	1.4	0	0
> 69	0.8	0	0
> 72	0.5	0	0

Note: Populations and households are given to the nearest 50.

3.7 The 2016 night actual 48 dBA Leq contour enclosed an area of 61.9 km^2 and a population of 7,800.

2016 day standard contours

3.8 The Stansted 2016 day Leq noise contours generated with the standard 2016 summer day period runway modal split (73% SW / 27% NE) are shown in **Figure 14**. The contours are plotted from 57 to 72 dBA at 3 dB intervals.

3.9 Cumulative estimates of the areas, populations and households within the 2016 day standard modal split contours are provided in **Table 6**.

Table 6 Stansted 2016 day standard contours – area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 57	24.3	1,750	650
> 60	13.0	600	250
> 63	6.8	200	100
> 66	3.5	50	< 50
> 69	1.8	0	0
> 72	1.0	0	0

Note: Populations and households are given to the nearest 50.

3.10 The 2016 day standard 57 dBA Leq contour enclosed an area of 24.3 km^2 and a population of 1,750.

3.11 Estimates of the cumulative numbers of noise sensitive buildings within the 2016 day standard contours are provided in **Table 7**.

Table 7 Stansted 2016 day standard contours – noise sensitive building estimates

Leq (dBA)	Schools	Hospitals	Places of worship
> 57	2	0	2
> 60	1	0	2
> 63	0	0	0
> 66	0	0	0
> 69	0	0	0
> 72	0	0	0

2016 day actual contours – comparison with 2015

3.12 The Stansted 2016 day actual modal split Leq contours are compared against the 2015 day actual Leq contours in **Figure 15**.

3.13 **Table 8** summarises the areas, populations and percentage changes from 2015 to 2016.

Table 8 Stansted 2016 day actual contours – area and population estimates for 2015 and 2016

Leq (dBA)	2015 area (km^2)	2016 area (km^2)	Area change	2015 population	2016 population	Population change
> 57	23.6	24.8	+5%	1,650	2,050	+24%
> 60	12.7	13.0	+2%	550	600	+9%
> 63	6.7	6.9	+3%	150	200	+33%
> 66	3.4	3.6	+6%	50	50	0%
> 69	1.8	1.8	0%	0	0	(-)
> 72	1.0	1.0	0%	0	0	(-)

Note: The 2015 and 2016 day actual runway modal splits were 75% SW / 25% NE and 86% SW / 14% NE respectively.

3.14 The effect on the contour shapes of the 11% higher proportion of south-westerly operations in 2016 can be seen in **Figure 15**. The Runway 22 arrival contour tips to the north-east of the airport have lengthened at all levels, and the Runway 22 57 dBA departure lobe pointing to the south-east has expanded over Little Hallingbury. Conversely, the 57 dBA contour tip to the south-west resulting from Runway 04 landings has retracted, whilst the contours to the north-east of the airport near Molehill Green and Gaunt's End have narrowed, reflecting lower numbers of north-easterly departures.

3.15 The 57 dBA contour area increased by 5% in 2016, in line with the 7% rise in total movements. Area increases were also found at the higher contour levels.

3.16 The population count inside the 57 dBA contour for 2016 was 24% higher than the previous year. This was mainly due to contour shape changes, especially the expansion of the contour over Little Hallingbury and Thaxted.

3.17 Percentage changes in contour area are not necessarily accompanied by similar changes in enclosed population because of the uneven distribution of populations around the airport.

2016 night actual contours – comparison with 2015

3.18 The Stansted 2016 night actual modal split Leq contours are compared against the 2015 night actual Leq contours in **Figure 16** (note: the 69 and 72 dBA contours have been omitted from the diagram for clarity).

3.19 **Table 9** summarises the areas, populations and percentage changes from 2015 to 2016.

Table 9 Stansted 2016 night actual contours – area and population estimates for 2015 and 2016

Leq (dBA)	2015 area (km^2)	2016 area (km^2)	Area change	2015 population	2016 population	Population change
> 48	57.2	61.9	+8%	6,950	7,800	+12%
> 51	31.6	34.3	+9%	3,800	4,200	+11%
> 54	16.7	18.0	+8%	950	1,000	+5%
> 57	8.5	9.2	+8%	250	350	+40%
> 60	4.5	4.8	+7%	50	50	0%
> 63	2.3	2.5	+9%	0	0	(-)
> 66	1.3	1.4	+8%	0	0	(-)
> 69	0.8	0.8	0%	0	0	(-)
> 72	0.5	0.5	0%	0	0	(-)

Note: The 2015 and 2016 night actual runway modal splits were 73% SW / 27% NE and 85% SW / 15% NE respectively.

3.20 The large shift in the 2016 runway modal split in favour of south-westerly operations is evident in the shape of the noise contours. The Runway 22 arrival contour tips have all extended. Similarly, the Runway 22 departure lobes turning to the south-east and west have expanded. Conversely, the Runway 04 arrival lobes have shortened because of the lower numbers of arrivals to Runway 04. The 48 dBA contour lobe caused by Runway 04 departures turning to the east has also contracted.

3.21 The 48 dBA contour area increased by 8%, reflecting the 11% rise in night movements. There were also similar percentage area increases at the higher contour levels.

3.22 The 48 dBA contour population rose by 12%, with the contour expanding over populated areas near Great Samford, Hatfield Heath and Bishop's Stortford, but retracting from Sawbridgeworth. The population database update for 2016 also played a part in contributing to the higher overall population count.

2016 day standard contours – comparison with 2015

3.23 The Stansted 2016 day standard modal split Leq contours are compared against the 2015 day standard Leq contours in **Figure 17**.

3.24 **Table 10** summarises the areas, populations and percentage changes from 2015 to 2016.

Table 10 Stansted 2016 day standard contours – area and population estimates for 2015 and 2016

Leq (dBA)	2015 area (km^2)	2016 area (km^2)	Area change	2015 population	2016 population	Population change
> 57	23.5	24.3	+3%	1,750	1,750	0%
> 60	12.7	13.0	+2%	550	600	+9%
> 63	6.7	6.8	+1%	150	200	+33%
> 66	3.4	3.5	+3%	50	50	0%
> 69	1.8	1.8	0%	0	0	(-)
> 72	1.0	1.0	0%	0	0	(-)

Note: The 2015 and 2016 day standard runway modal splits were 72% SW / 28% NE and 73% SW / 27% NE respectively.

3.25 The standard contours normally provide a clearer indication than the actual contours of ‘fleet noise level’ changes from year to year, because they minimise the effects of any differences between the ratios of south-westerly to north-easterly operations.

3.26 The 57 dBA contour area increased by 3% in 2016, with comparable percentage increases also being seen at the higher contour levels. The overall increase in size of the contours for 2016 compared to 2015 is evident in **Figure 17**. The population count within the 57 dBA contour was unchanged.

3.27 The 57 dBA Leq standard modal split contour area of 24.3 km^2 was below the Planning Condition AN1 contour area limit of 33.9 km^2 (see paragraph 1.10).

Day Leq noise contour historical trend

3.28 **Figure 18** shows how the 57 dBA Leq day actual modal split contour has changed in area and population terms since 1988 by comparison with the total annual (365-day) aircraft movements. Actual modal split data are used in this figure because standard modal split contours were not produced prior to 1995.

3.29 Annual movements at Stansted rose steadily between 1990 and 2001, showing rapid growth in particular between 1997 and 1999. The number of movements in 2001 and 2002 were similar, but in 2003, the annual figure rose by 9% over the preceding year. A 7% rise in 2006 was followed by a 1% increase in 2007, when level of annual movements reached a peak.

3.30 The total annual movement figure for 2008 dropped by 7% from the 2007 peak – this can be attributed to the economic downturn and fluctuating oil price. The movement figure declined even further in 2009, by 13%, as the global recession continued to affect the aviation industry.

3.31 Year 2010 saw another fall in traffic for the third year running, this time by 8%. The volcanic ash crisis in April, industrial action in May, adverse winter weather and a continued reduction in demand for leisure travel were some of the factors that caused the decline in traffic.

3.32 Annual traffic dropped by 4% in 2011 and reached a low in 2012 after having fallen for the fifth year in a row, this time by 3%, reflecting the continued reduction in demand for flights over this period. However, 2013 saw the first increase in annual flights (by 2%) following five years of consecutive decline from the 2007 peak. Movements rose by 7% every year from 2014 through to 2016 as demand returned.

3.33 Up to 1998, areas and populations within the 57 dBA Leq contour have generally risen in line with movements, but in 1999, despite the high traffic growth, the area fell by 19%. This decrease was attributable to fewer movements of older, noisier, Chapter 2 aircraft – in particular those by the BAC 1-11 which fell by 64% in that year.

3.34 Areas have generally declined since 2001 following completion of the phase-out of Chapter 2 aircraft. There was a 7% decrease in traffic in 2008 and the area fell by 6% relative to 2007. The area further reduced in 2009 by 17% and again in 2010 by 7% as total movements dropped. The 2011 and then the 2012 areas fell to the lowest levels seen at Stansted since 1990 as traffic continued to decline. The area decreased further in 2013 to 20.0 km^2 as summer period traffic decreased, despite the overall movements increase seen over the annual period - this was also the smallest ever 57 dBA Leq actual contour area calculated for Stansted. The previous smallest area was 20.1 km^2 in 1990. However, the contour area increased from 2014 to 2016 as movements rose each year.

3.35 From 2001 to 2008, population counts fluctuated within a range from approximately 2,000 to 2,900. The years with higher proportions of south-westerly movements have tended to produce the higher population counts. In 2009, the shift in modal split to a lower proportion of south-westerly movements along with lower movement numbers caused the population count to dip to 1,500.

3.36 From 2009 to 2013, population counts were relatively steady, albeit reducing as contour areas continued to fall year-on-year. However, in 2014 the population count rose by 32% as the contour extended over some populated areas. This resulted from an increase in summer movements and a higher proportion of north-easterly operations, which affected the contour shape. In 2015, a return to a more typical runway modal split led to changes in the contour shape, with the net effect being an unchanged population count. A shift to a higher percentage of south-westerly operations in 2016 led to a 24% population increase as the contour stretched over populated areas such as Thaxted and Little Hallingbury.

Supplementary noise metric – N70 day contours

3.37 N70 contours[12] have been produced for the 2016 daytime period, using the same modelling input data as the 16-hour Leq day actual modal split (86% SW / 14% NE) contours.

3.38 The N70 day actual contours are shown in **Figure 19**, plotted at levels 20, 50, 100 and 200 events. Estimates of area, population and households within the N70 day actual contours are summarised in **Table 11**.

Table 11 Stansted 2016 day actual N70 contours – area, population and household estimates

N70	Area (km^2)	Population	Households
> 20	40.7	6,250	2,450
> 50	32.0	5,250	2,050
> 100	23.3	2,800	1,150
> 200	12.7	650	250

Note: Populations and households are given to the nearest 50. The 2016 day actual runway modal split was 86% SW / 14% NE.

3.39 The 2016 day actual N70 20 events contour enclosed an area of 40.7 km^2 and a population of 6,250.

3.40 Estimates of the cumulative numbers of noise sensitive buildings within the 2016 day actual N70 contours are provided in **Table 12**.

Table 12 Stansted 2016 day actual N70 contours – noise sensitive building estimates

N70	Schools	Hospitals	Places of worship
> 20	5	0	7
> 50	5	0	5
> 100	2	0	4
> 200	0	0	2

3.41 N70 contours have also been produced for the 2016 day *standard* modal split. The N70 day standard modal split contours are shown in **Figure 20** plotted at levels 20, 50, 100 and 200 events. Estimates of area, population and households within the N70 day standard contours are summarised in **Table 13**.

[12] N70 contours show the number of aircraft noise events exceeding 70 dBA L_{max}.

Table 13 Stansted 2016 day standard N70 contours – area, population and household estimates

N70	Area (km^2)	Population	Households
> 20	47.6	6,800	2,650
> 50	35.5	5,500	2,150
> 100	22.6	2,700	1,100
> 200	10.6	400	150

Note: Populations and households are given to the nearest 50. The 2016 day standard runway modal split was 73% SW / 27% NE.

3.42 The 2016 day standard N70 20 events contour enclosed an area of 47.6 km^2 and a population of 6,800.

3.43 Estimates of the cumulative numbers of noise sensitive buildings within the 2016 day standard N70 contours are provided in **Table 14**.

Table 14 Stansted 2016 day standard N70 contours – noise sensitive building estimates

N70	Schools	Hospitals	Places of worship
> 20	7	0	9
> 50	4	0	6
> 100	2	0	4
> 200	0	0	2

Chapter 4
Conclusions

4.1 Year 2016 average summer 16-hour day and 8-hour night Leq noise exposure contours have been generated for Stansted Airport using the ANCON noise model.

4.2 The results show that the 2016 day actual modal split (86% south-west / 14% north-east) 57 dBA Leq 16-hour contour area increased by 5% to 24.8 km^2 (2015: 23.6 km^2). This resulted from a 7% rise in movements over the 2016 summer day period, with the B738 ANCON aircraft type having the largest increase of 28.4 movements per day. The population enclosed within the 2016 day actual 57 dBA Leq contour was 2,050, a rise of 24% from the previous year. This population increase was caused by the 57 dBA Leq contour extending over populated areas such as Thaxted and Little Hallingbury, following the shift to a higher percentage of south-westerly operations in 2016. The population database update for 2016 also contributed, to a lesser extent, to the population count increase.

4.3 The year 2016 day standard modal split (73% south-west / 27% north-east) 57 dBA Leq 16-hour contour area increased by 3% to 24.3 km^2 (2015: 23.5 km^2). This area was below the 33.9 km^2 contour area limit imposed by the Stansted Planning Condition AN1. The population count within the 2016 day standard 57 dBA contour of 1,750 was unchanged from the previous year.

4.4 Night-time Leq 8-hour contours have also been produced. The 2016 night actual modal split (85% south-west / 15% north-east) 48 dBA Leq contour enclosed an area of 61.9 km^2, which was 8% higher than the previous year (2015: 57.2 km^2). The 11% growth in night movements in 2016 led to this area increase. The 48 dBA contour population of 7,800 was 12% higher than the previous year (2015: 6,950). The 12% higher proportion of south-westerly operations in 2016 produced changes to the shape of the night contours, which combined with the movement increase, led to an expansion of the contours over some populated areas.

4.5 Contours for the supplementary noise metric N70 have also been produced for the 2016 average summer 16-hour day period, using the same modelling inputs as the Leq 16-hour contours. The area of the N70 20 events actual modal split contour was 40.7 km^2, enclosing a population of 6,250. The area of the same contour assuming the *standard* modal split was 47.6 km^2, whilst the population count was 6,800.

APPENDIX A

References

1. Critchley J B, Ollerhead J B, *The Use of Leq as an Aircraft Noise Index*, DORA Report 9023, September 1990.
2. Department for Transport, *Aviation Policy Framework*, Cm 8584, March 2013.
3. Lee J, Cebrian G, Edmonds L, Patel J, Rhodes D, *Noise Exposure Contours for Stansted Airport 2015*, ERCD Report 1603, January 2017.
4. Ollerhead J B, Rhodes D P, Viinikainen M S, Monkman D J, Woodley A C, *The UK Civil Aircraft Noise Contour Model ANCON: Improvements in Version 2*, R&D Report 9842, June 1999.
5. European Civil Aviation Conference, *Report on Standard Method of Computing Noise Contours around Civil Airports*, ECAC.CEAC Doc 29, Fourth edition, December 2016.
6. Civil Aviation Authority, *Noise Monitor Positions at Heathrow, Gatwick and Stansted Airports*, CAP 1149, Third edition, December 2016.

APPENDIX B

Figures

Figure 1 Stansted Airport and the surrounding area

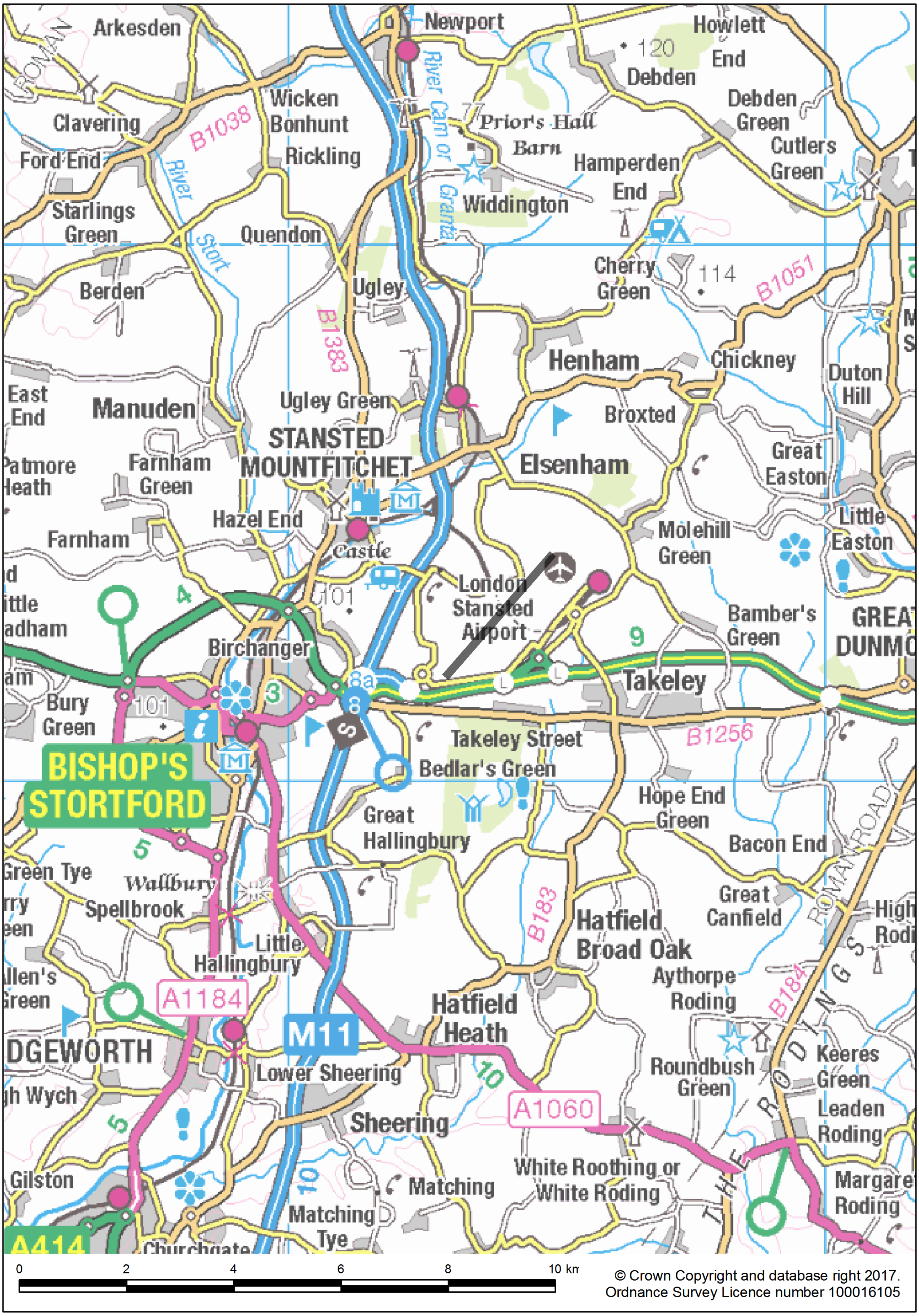


Figure 2 Stansted Airport layout in 2016

Figure 3 Stansted NPR/SID routes

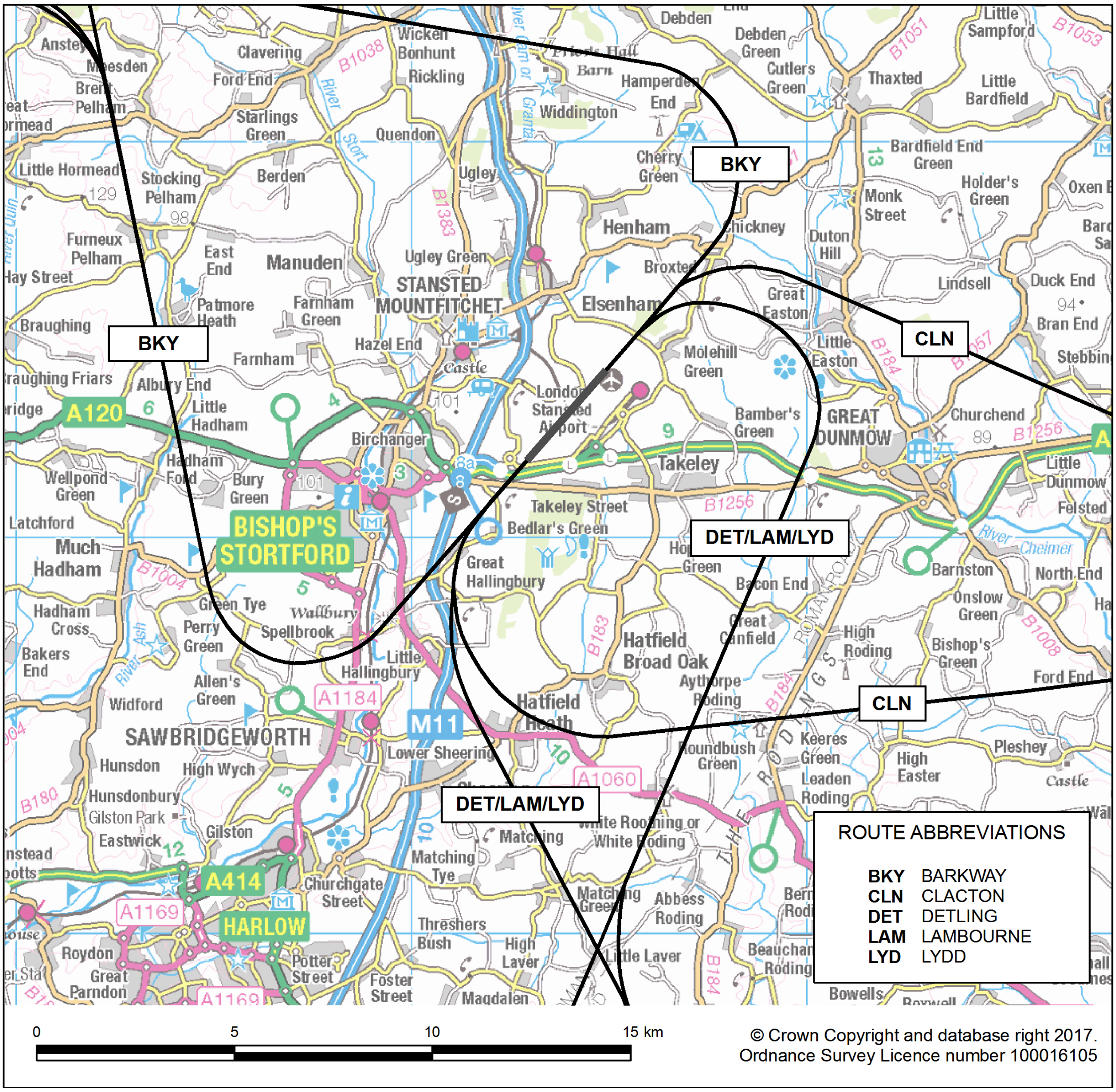


Figure 4 Typical Stansted radar flight tracks

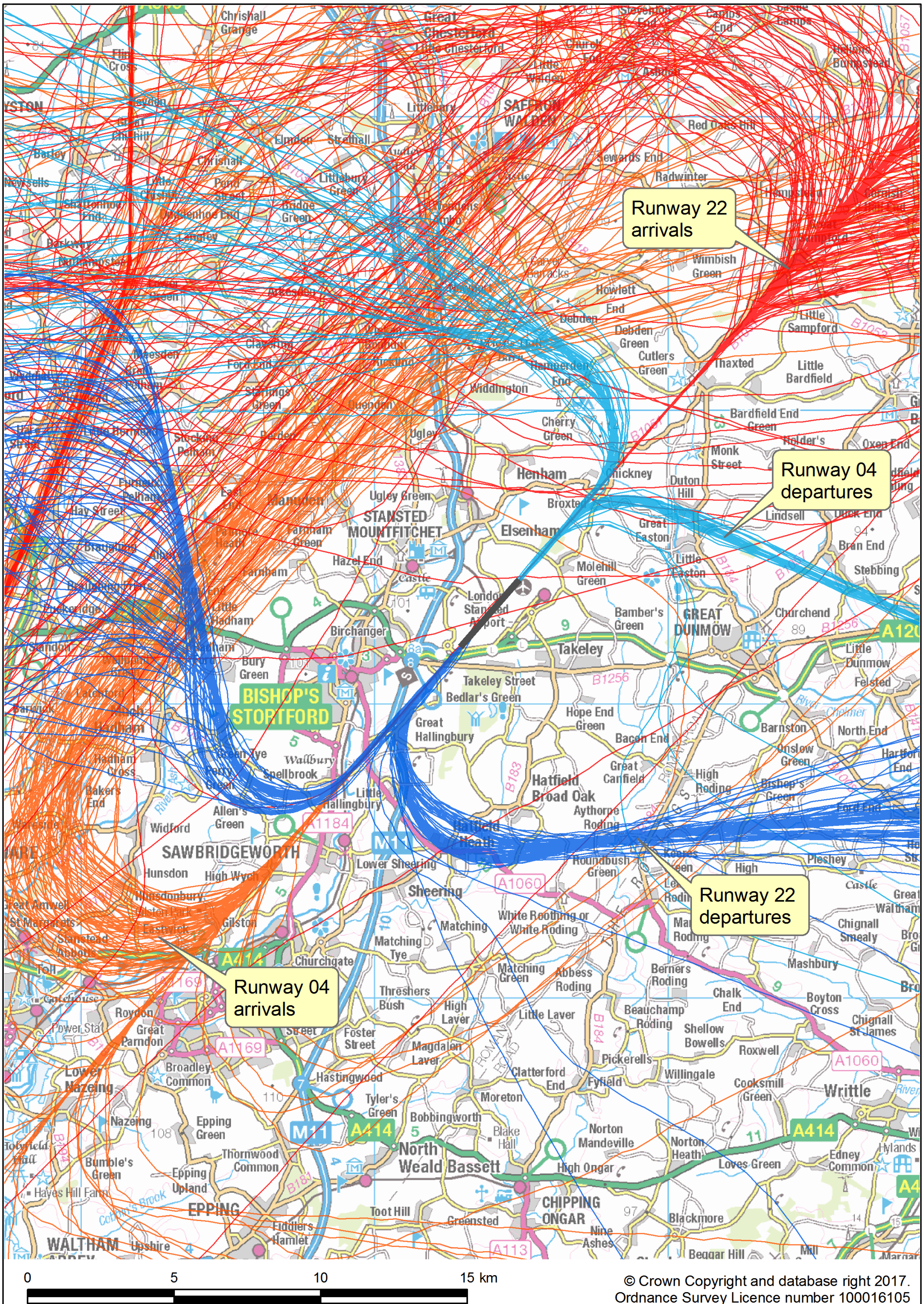
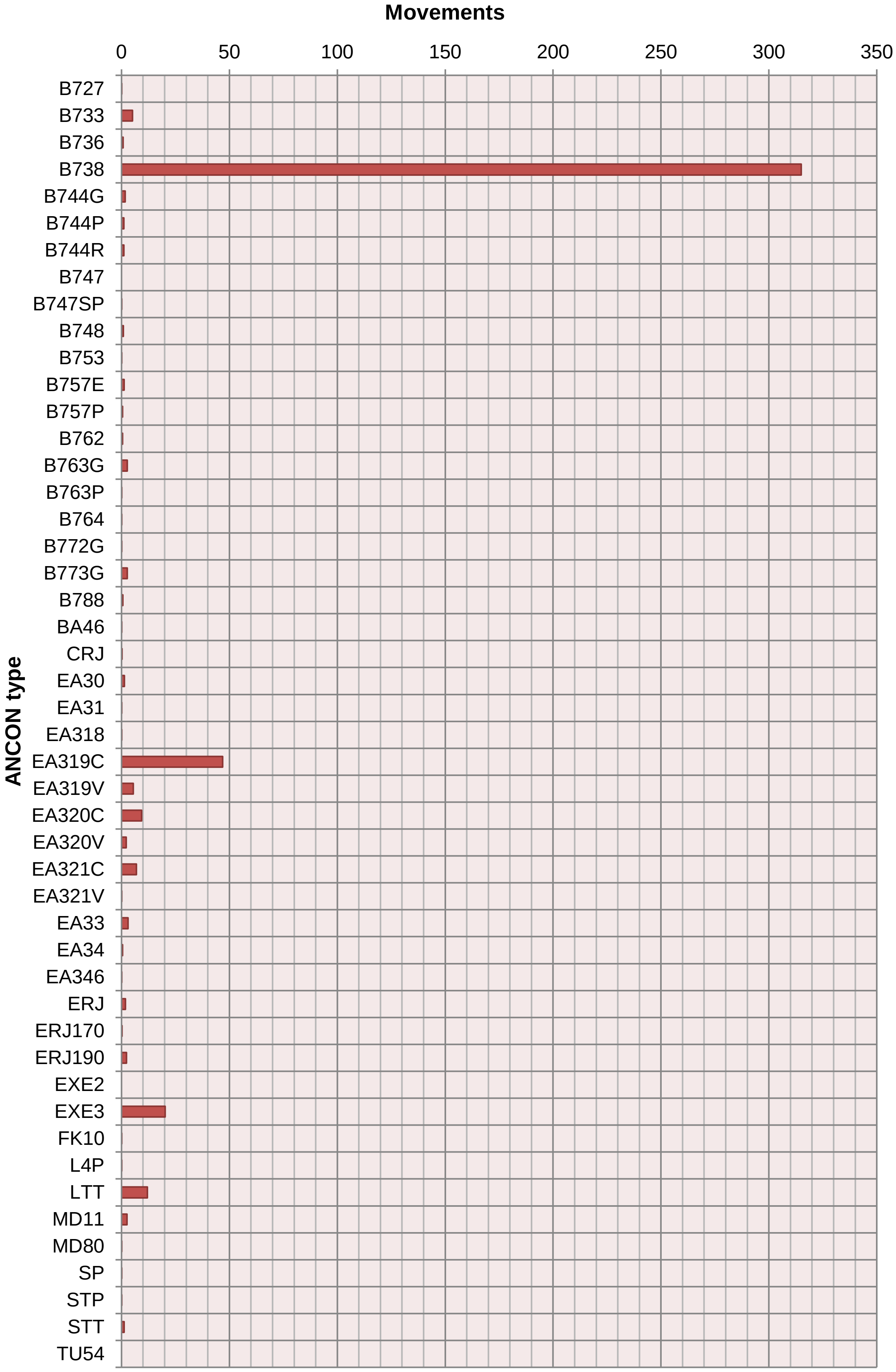
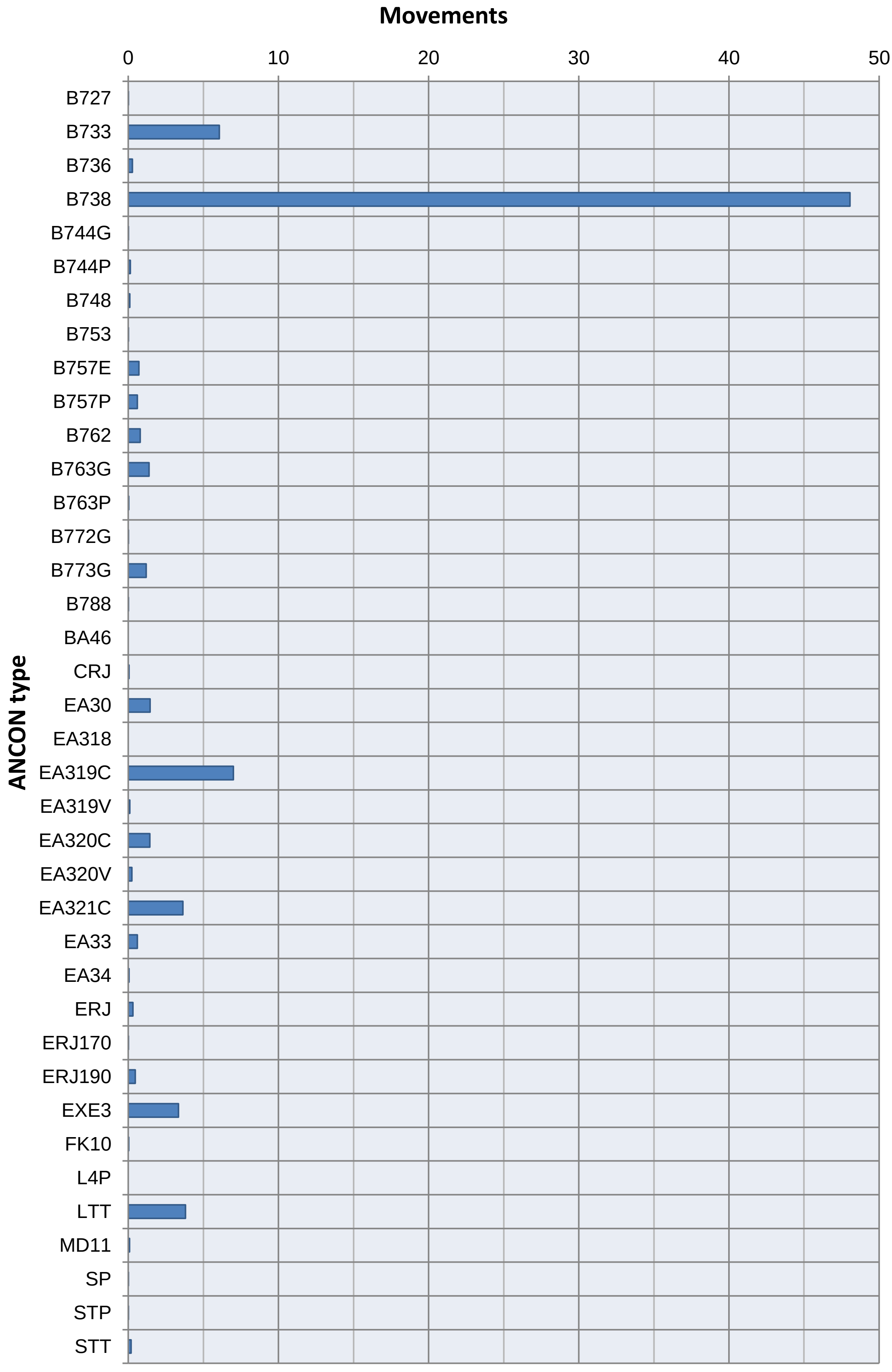


Figure 5 Stansted 2016 average summer day movements by ANCON aircraft type



Note: ANCON types are shown in the same order as **Table C1**.

Figure 6 Stansted 2016 average summer night movements by ANCON aircraft type



Note: ANCON types are shown in the same order as **Table C2**.

Figure 7 Stansted 2016 day departure traffic distributions by NPR/SID

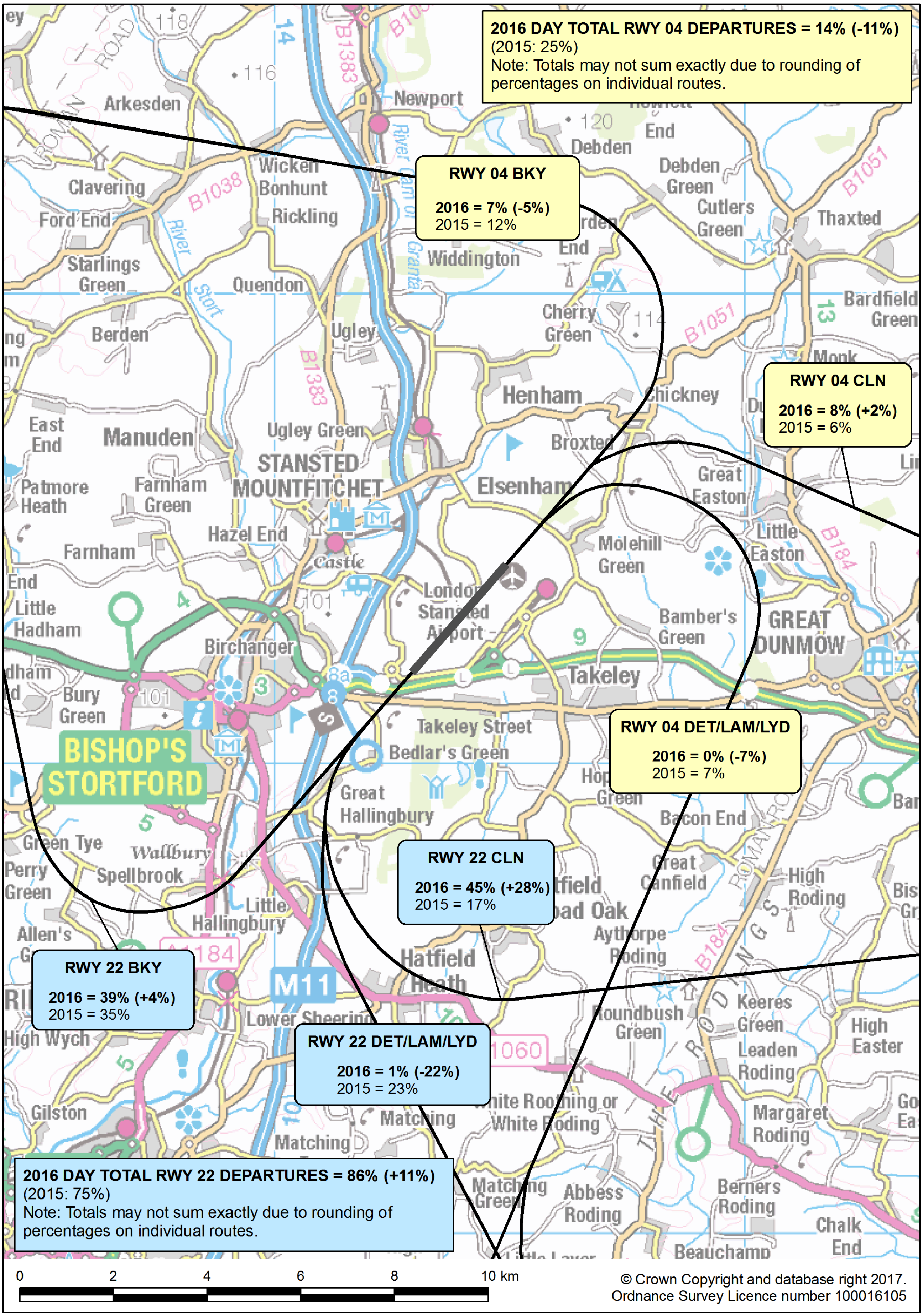


Figure 8 Stansted 2016 night departure traffic distributions by NPR/SID

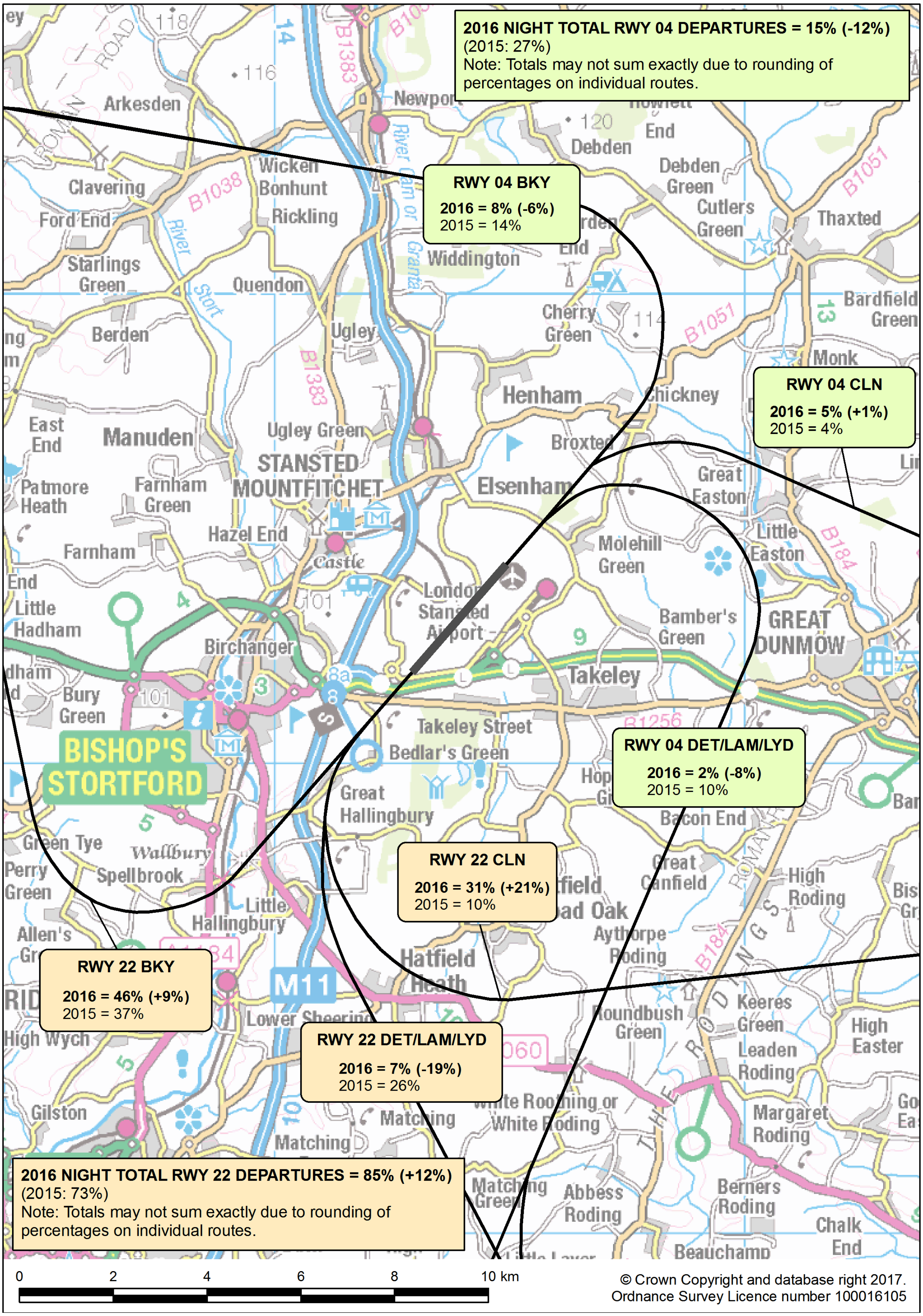


Figure 9 Stansted summer day modal splits 1997-2016

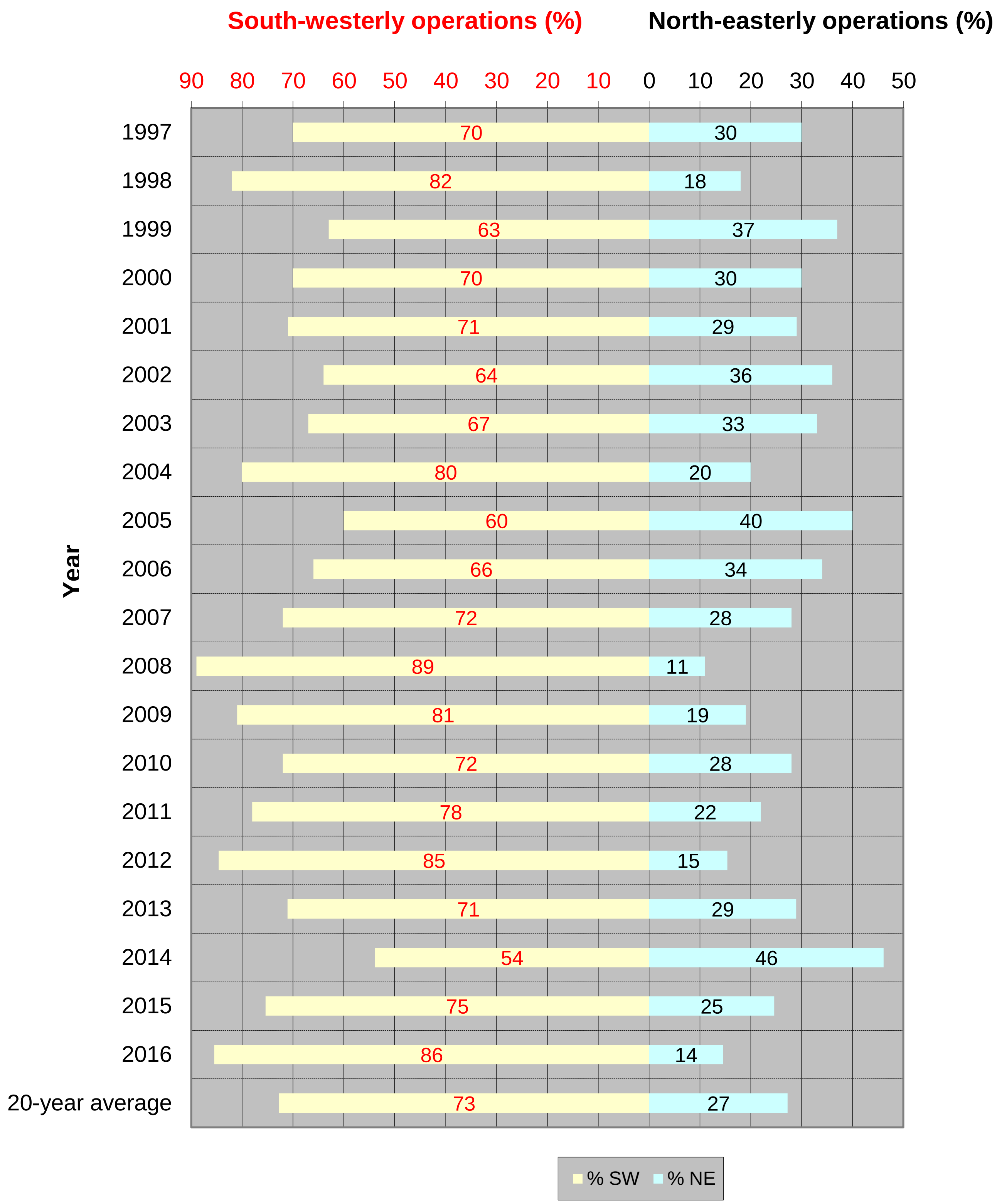


Figure 10 Terrain heights around Stansted Airport

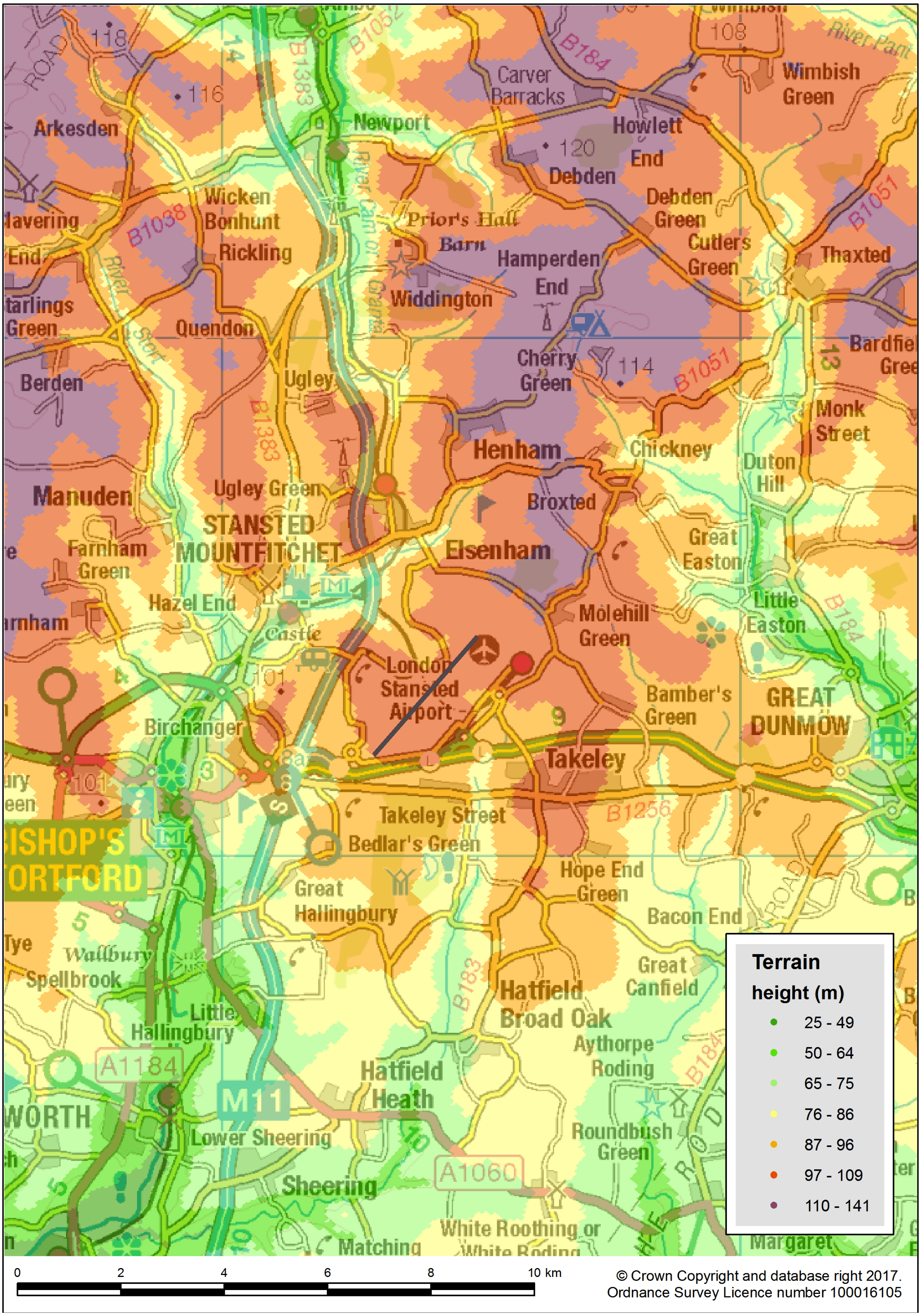


Figure 11 Population data points around Stansted Airport

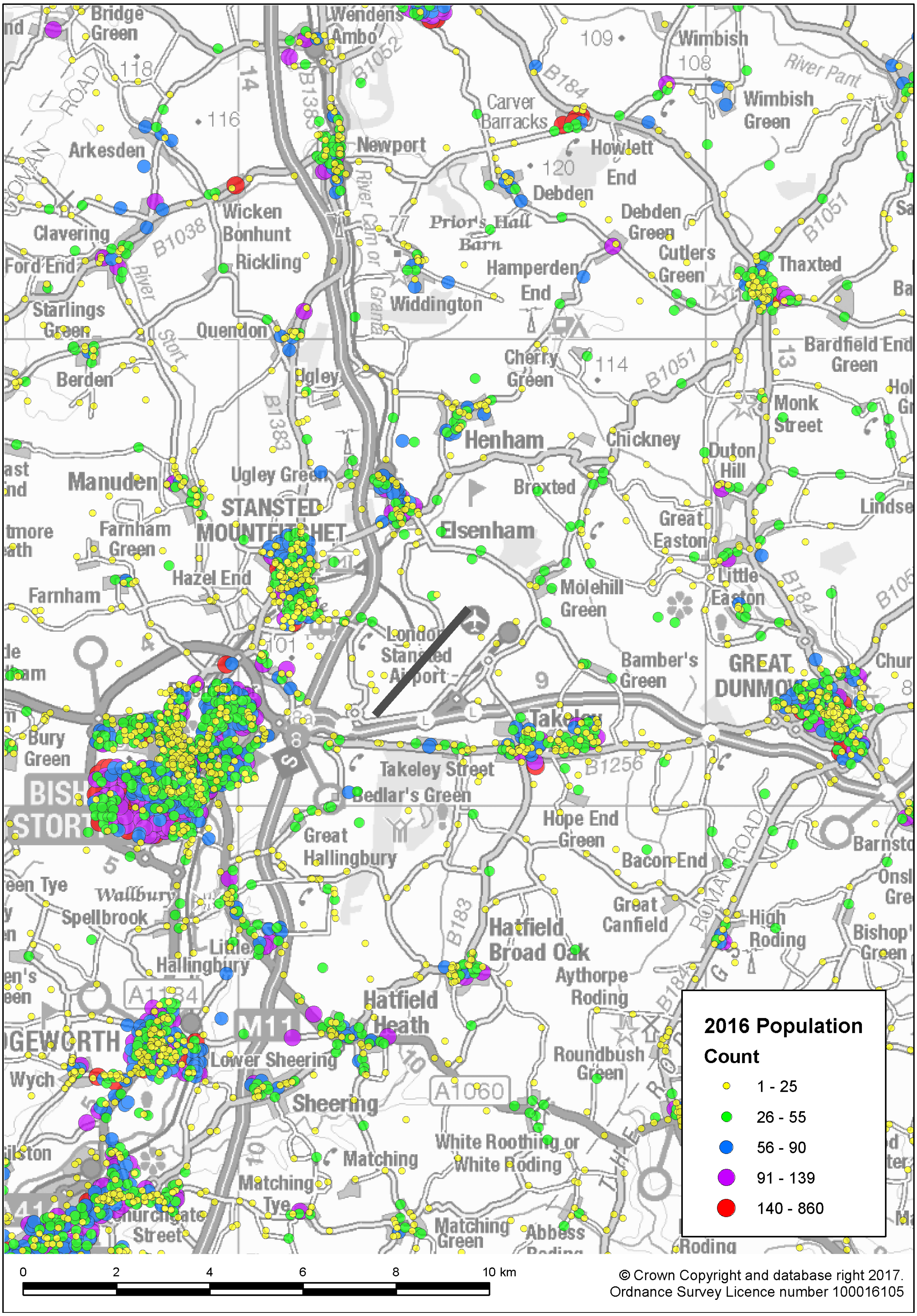
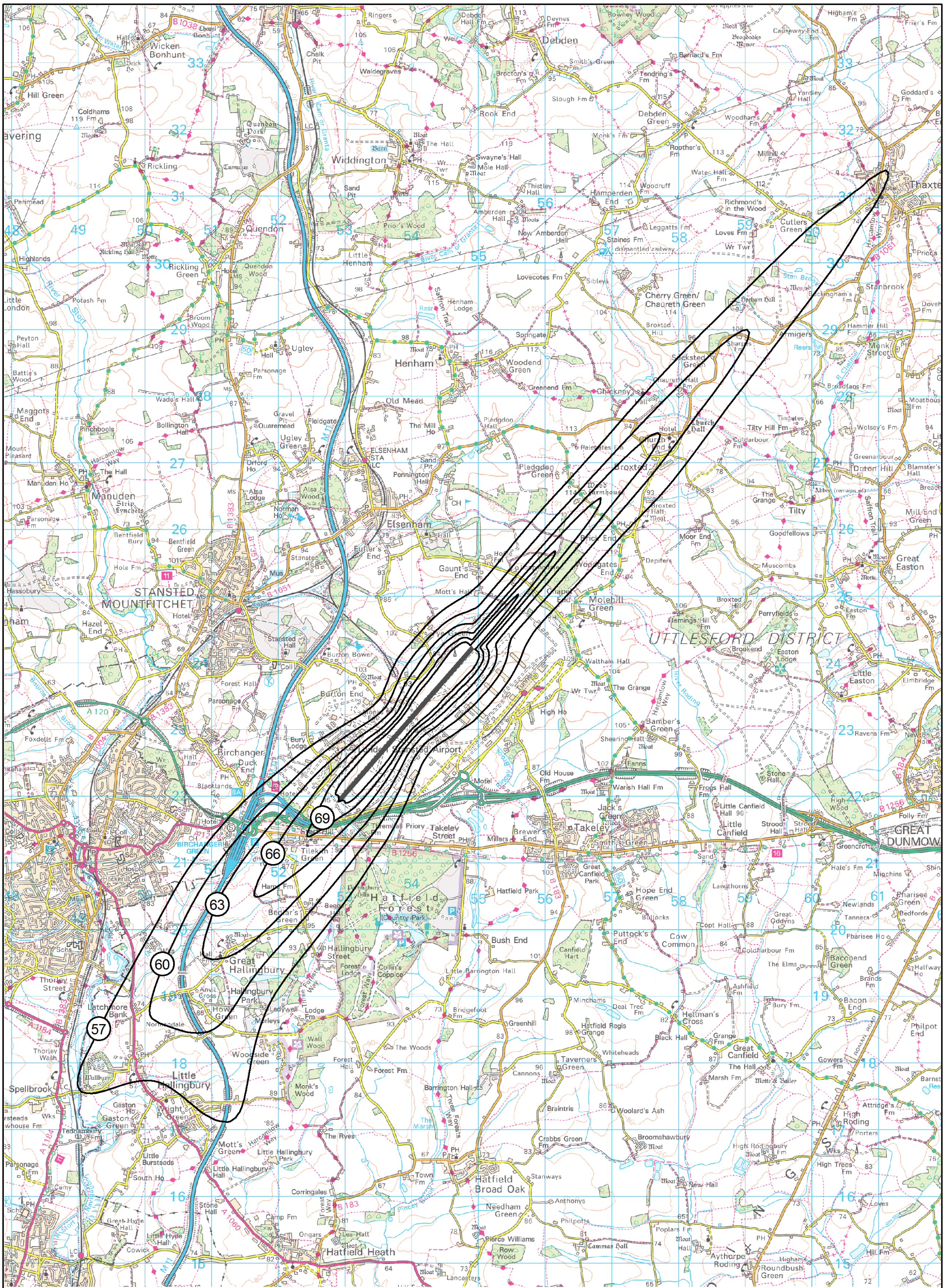


Figure 12 Stansted 2016 day actual modal split (86% SW / 14% NE) Leq contours



0 1 2 3 4 5 km

Figure 13 Stansted 2016 night actual modal split (85% SW / 15% NE) Leq contours

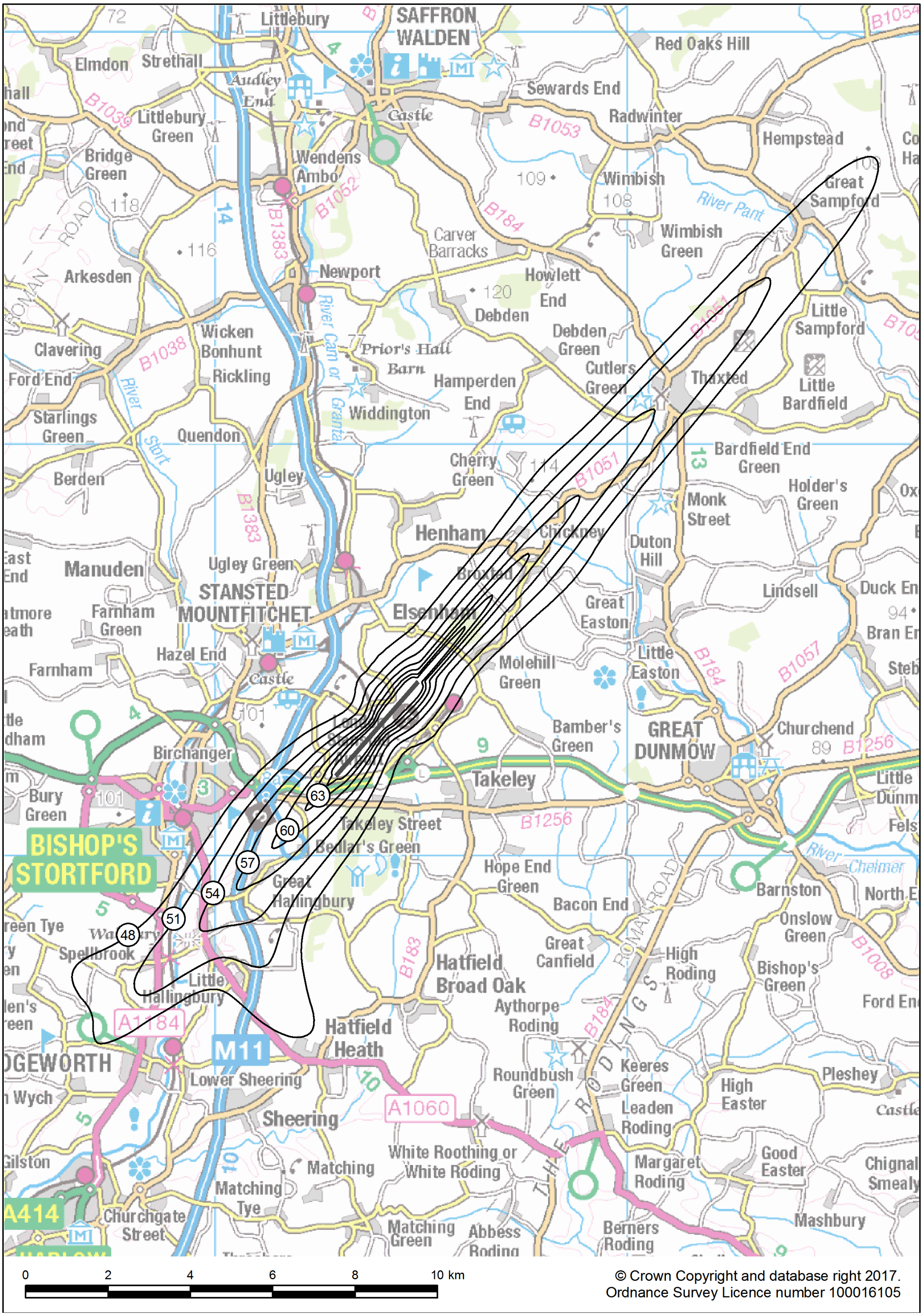


Figure 14 Stansted 2016 day standard modal split (73% SW / 27% NE) Leq contours

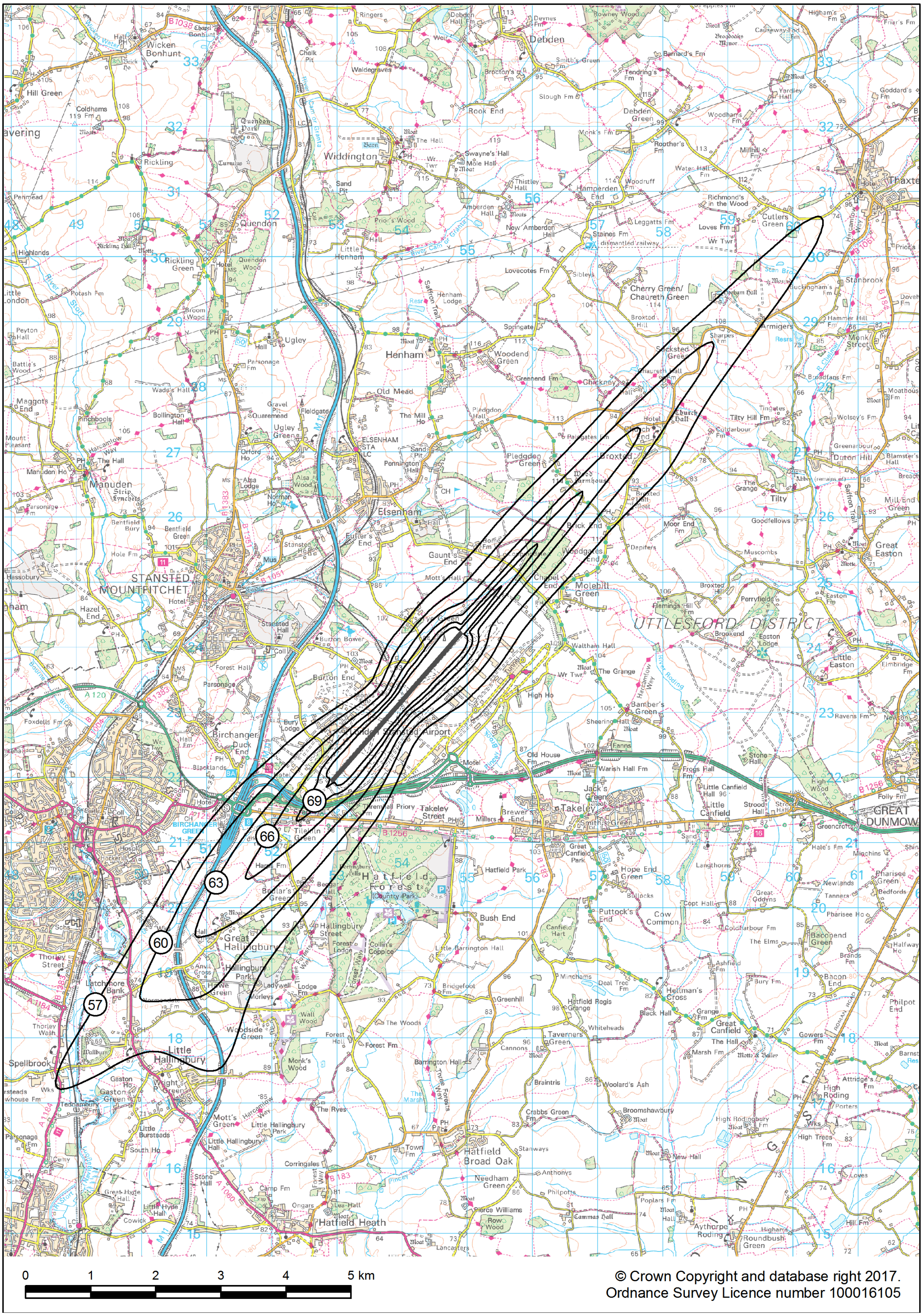


Figure 15 Stansted day actual 2016 (86% SW / 14% NE) and 2015 (75% SW / 25% NE) Leq contours

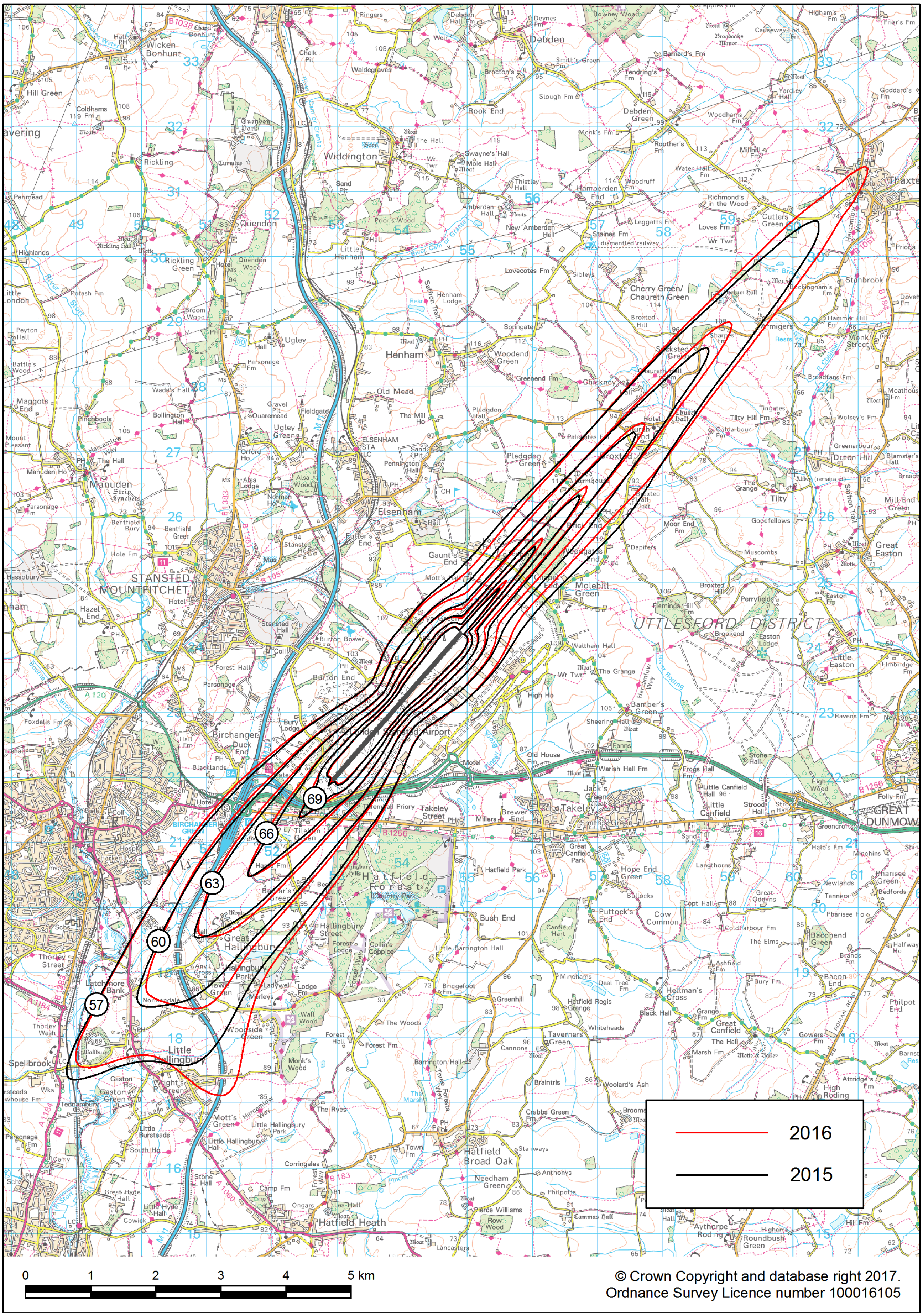


Figure 16 Stansted night actual 2016 (85% SW / 15% NE) and 2015 (73% SW / 27% NE) Leq contours

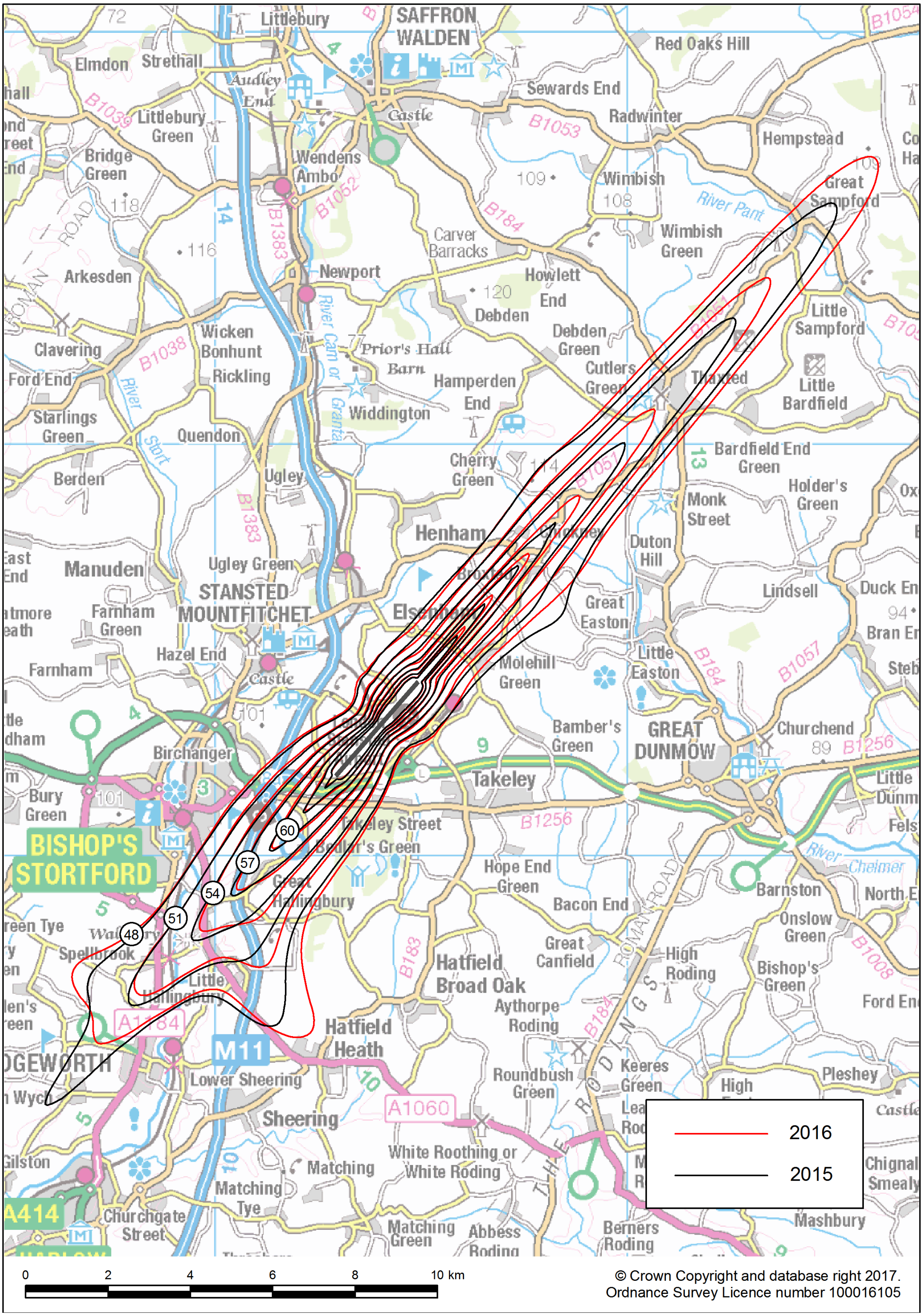


Figure 17 Stansted day standard 2016 (73% SW / 27% NE) and 2015 (72% SW / 28% NE) Leq contours

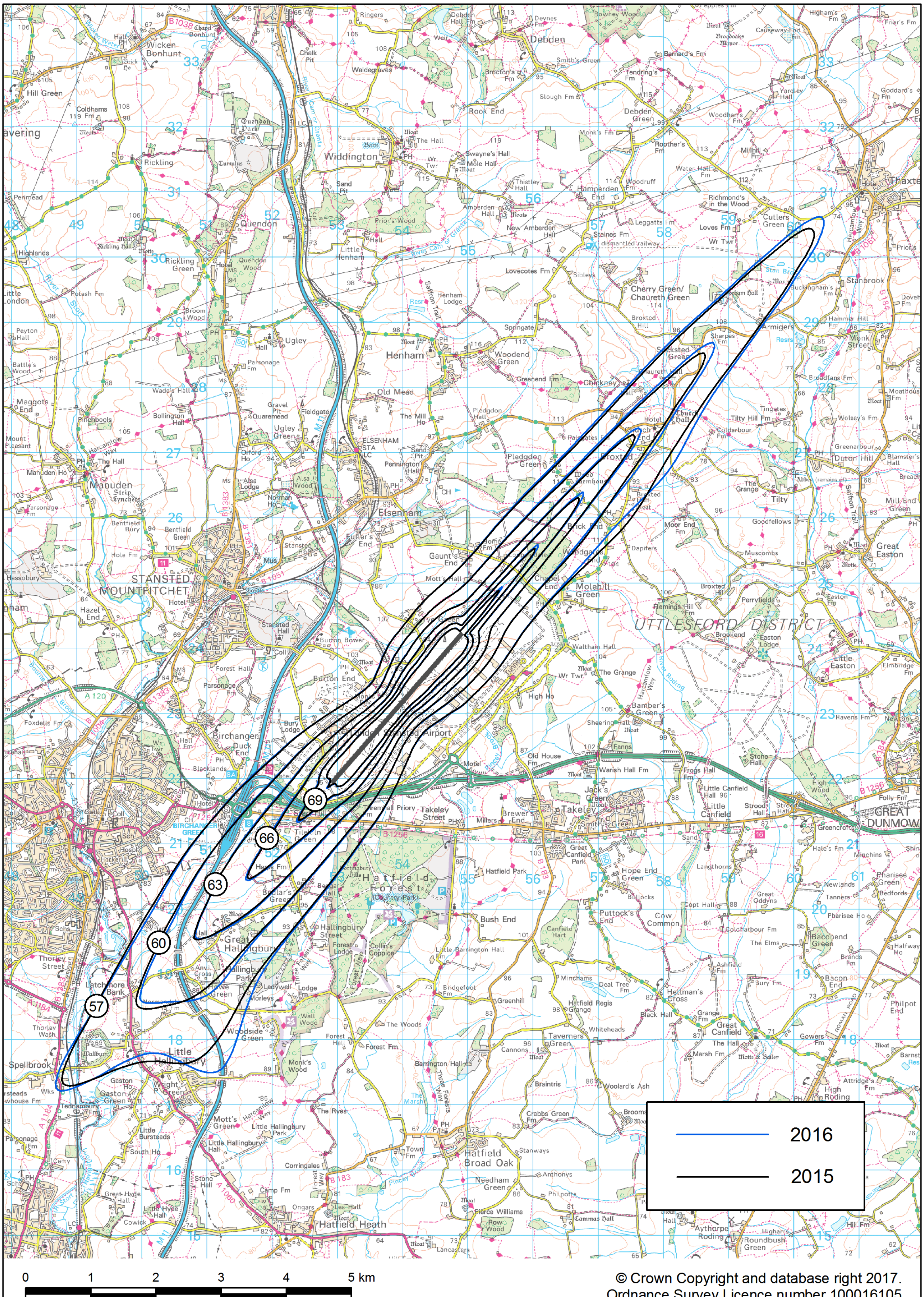


Figure 18 Stansted annual traffic and summer day Leq noise contour area/population trend 1988-2016

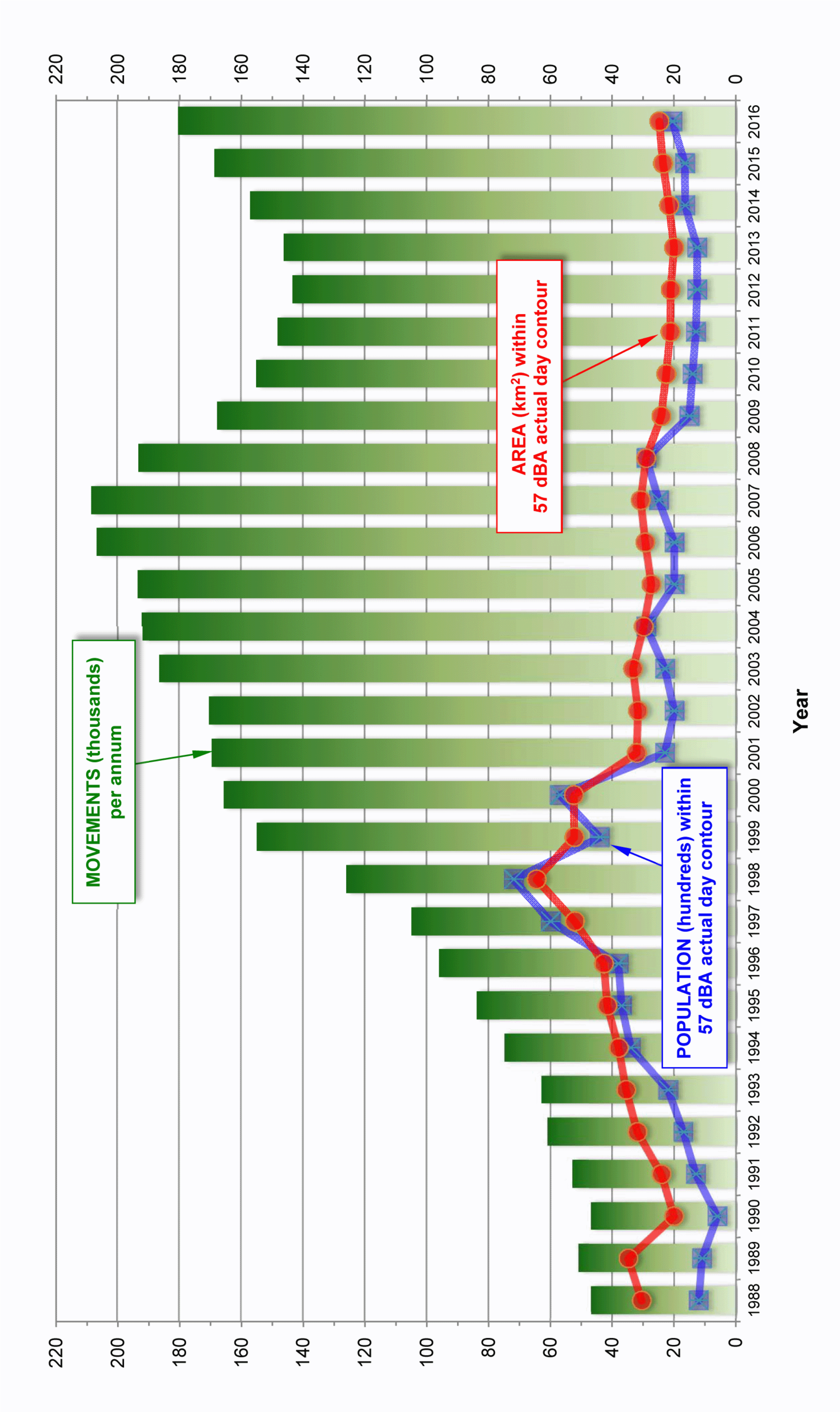


Figure 19 Stansted 2016 day actual modal split (86% SW / 14% NE) N70 contours

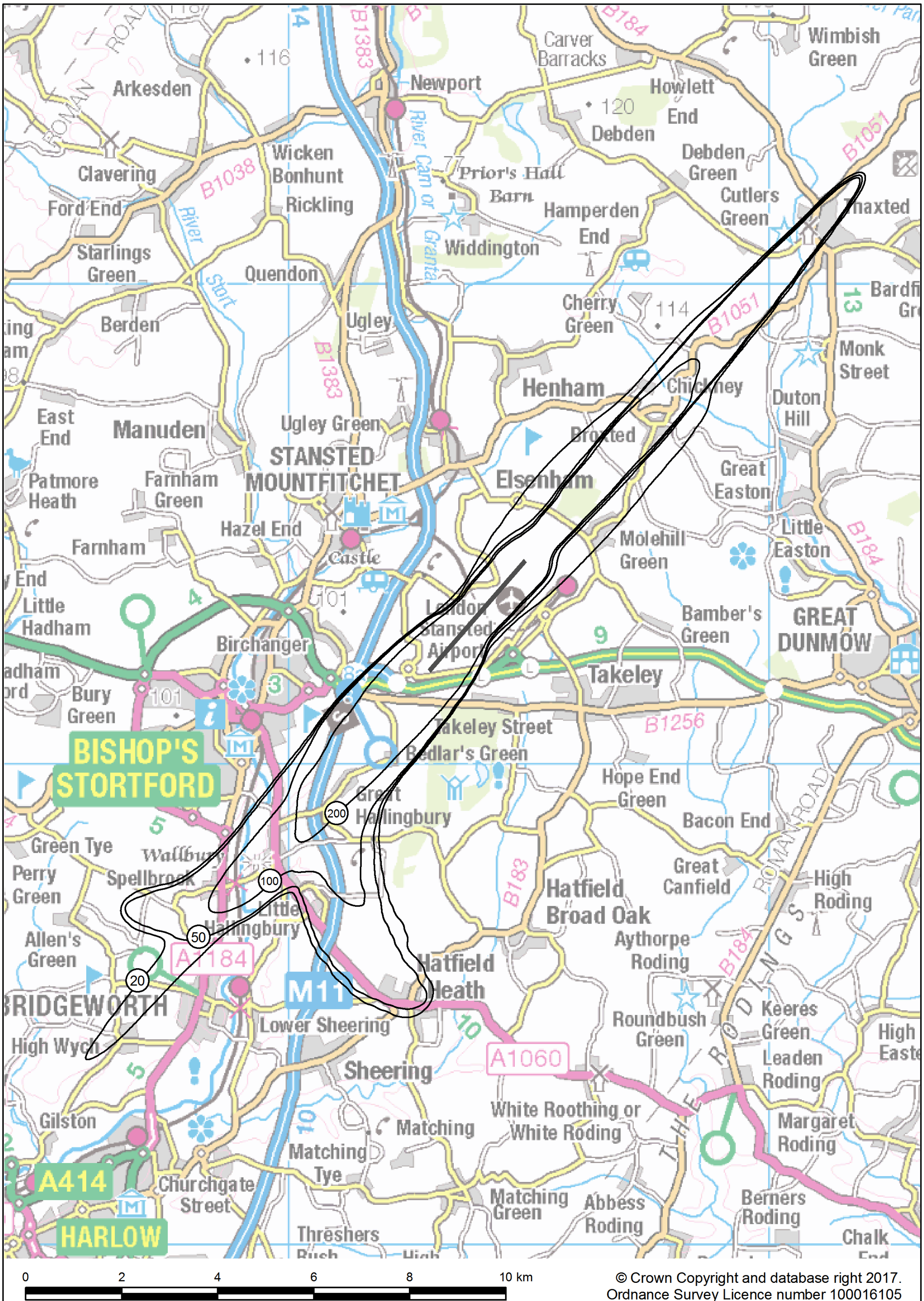
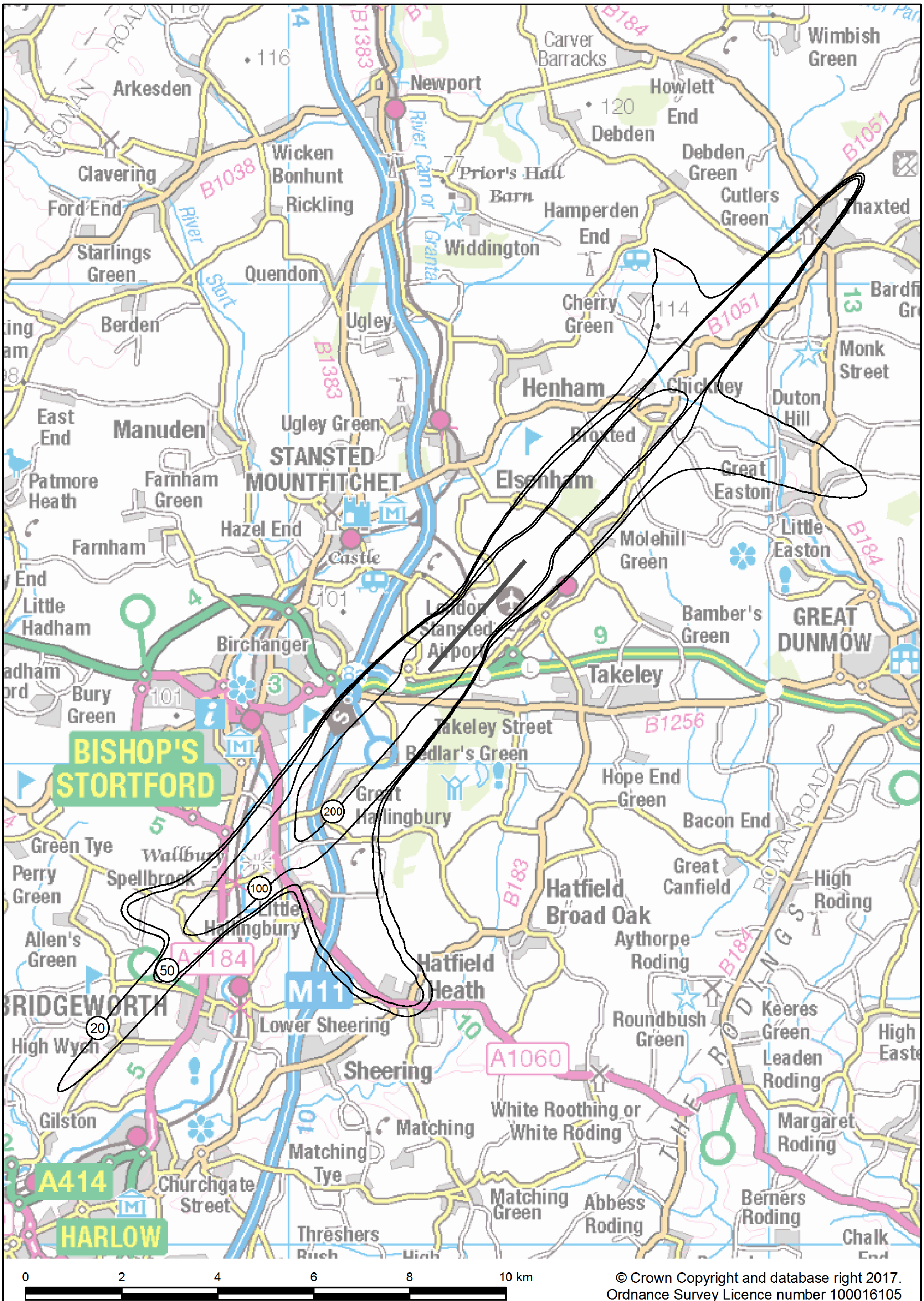


Figure 20 Stansted 2016 day standard modal split (73% SW / 27% NE) N70 contours



APPENDIX C

Tables

Table C1 Stansted 2015 and 2016 average summer day movements by ANCON aircraft type

ANCON type	Description	2015 total movements	2016 total movements	Change
B727	Boeing 727 (Chapter 3)	0.00	0.03	+0.03
B733	Boeing 737-300/400/500	12.38	5.09	-7.29
B736	Boeing 737-600/700	0.76	0.79	+0.03
B738	Boeing 737-800/900	286.57	314.98	+28.41
B744G	Boeing 747-400 (GE CF6-80F engines)	1.14	1.70	+0.55
B744P	Boeing 747-400 (PW4000 engines)	0.50	1.07	+0.57
B744R	Boeing 747-400 (RR RB211 engines)	0.83	1.15	+0.33
B747	Boeing 747-100/200/300	0.02	0.00	-0.02
B747SP	Boeing 747SP	0.37	0.09	-0.28
B748	Boeing 747-8	1.03	0.84	-0.20
B753	Boeing 757-300	0.00	0.01	+0.01
B757E	Boeing 757-200 (RB211-535E4/E4B engines)	1.40	1.26	-0.14
B757P	Boeing 757-200 (PW2037/2040 engines)	0.14	0.46	+0.32
B762	Boeing 767-200	0.55	0.48	-0.08
B763G	Boeing 767-300 (GE CF6-80 engines)	2.58	2.68	+0.11
B763P	Boeing 767-300 (PW PW4000 engines)	0.03	0.09	+0.05
B764	Boeing 767-400	0.04	0.09	+0.04
B772G	Boeing 777-200 (GE GE90 engines)	0.18	0.16	-0.02
B773G	Boeing 777-200LR/300ER (GE GE90 engines)	1.73	2.67	+0.95
B788	Boeing 787-8 Dreamliner	0.04	0.65	+0.61
BA46	BAe 146/Avro RJ	0.50	0.05	-0.45
CRJ	Bombardier CRJ100/200	0.00	0.30	+0.30
EA30	Airbus A300	1.47	1.39	-0.08
EA31	Airbus A310	0.09	0.04	-0.04
EA318	Airbus A318	0.32	0.12	-0.20
EA319C	Airbus A319 (CFM56 engines)	42.62	46.87	+4.25
EA319V	Airbus A319 (IAE V2500 engines)	5.65	5.47	-0.18
EA320C	Airbus A320 (CFM56 engines)	10.11	9.34	-0.77
EA320V	Airbus A320 (IAE V2500 engines)	1.38	2.22	+0.84
EA321C	Airbus A321 (CFM56 engines)	5.65	6.97	+1.32
EA321V	Airbus A321 (IAE V2500 engines)	0.04	0.11	+0.07
EA33	Airbus A330	1.78	3.03	+1.25
EA34	Airbus A340-200/300	0.29	0.45	+0.15
EA346	Airbus A340-500/600	0.05	0.07	+0.01
ERJ	Embraer ERJ 135/145	1.14	1.78	+0.64
ERJ170	Embraer E-170/175	0.07	0.26	+0.20
ERJ190	Embraer E-190/195	0.74	2.30	+1.57

ANCON type	Description	2015 total movements	2016 total movements	Change
EXE2	Executive Business Jet (Chapter 2)	0.02	0.00	-0.02
EXE3	Executive Business Jet (Chapter 3)	13.67	20.27	+6.60
FK10	Fokker 100	0.11	0.08	-0.03
L4P	Large four-engine propeller	0.13	0.07	-0.07
LTT	Large twin-turboprop	19.65	12.03	-7.62
MD11	McDonnell Douglas MD-11	4.54	2.60	-1.95
MD80	McDonnell Douglas MD-80 series	0.04	0.02	-0.02
SP	Single piston propeller	0.04	0.17	+0.13
STP	Small twin-piston propeller	0.20	0.04	-0.15
STT	Small twin-turboprop	0.23	1.25	+1.02
TU54	Tupolev Tu-154	0.04	0.00	-0.04
	TOTAL	420.89	**451.59**	**+30.70**
				(+7%)

Note: Changes have been calculated before rounding.

Table C2 Stansted 2015 and 2016 average summer night movements by ANCON aircraft type

ANCON type	Description	2015 total movements	2016 total movements	Change
B727	Boeing 727 (Chapter 3)	0.00	0.01	+0.01
B733	Boeing 737-300/400/500	8.45	6.07	-2.38
B736	Boeing 737-600/700	0.25	0.27	+0.02
B738	Boeing 737-800/900	42.42	48.07	+5.64
B744G	Boeing 747-400 (GE CF6-80F engines)	0.08	0.02	-0.05
B744P	Boeing 747-400 (PW4000 engines)	0.04	0.14	+0.10
B748	Boeing 747-8	0.16	0.10	-0.07
B753	Boeing 757-300	0.00	0.01	+0.01
B757E	Boeing 757-200 (RB211-535E4/E4B engines)	0.68	0.71	+0.02
B757P	Boeing 757-200 (PW2037/2040 engines)	0.00	0.60	+0.60
B762	Boeing 767-200	0.20	0.79	+0.60
B763G	Boeing 767-300 (GE CF6-80 engines)	1.14	1.38	+0.24
B763P	Boeing 767-300 (PW PW4000 engines)	0.00	0.03	+0.03
B772G	Boeing 777-200 (GE GE90 engines)	0.01	0.01	+0.00
B773G	Boeing 777-200LR/300ER (GE GE90 engines)	0.97	1.20	+0.23
B788	Boeing 787-8 Dreamliner	0.00	0.02	+0.02
BA46	BAe 146/Avro RJ	0.55	0.00	-0.55
CRJ	Bombardier CRJ100/200	0.00	0.04	+0.04
EA30	Airbus A300	1.46	1.45	-0.01
EA318	Airbus A318	0.05	0.00	-0.05
EA319C	Airbus A319 (CFM56 engines)	7.34	7.00	-0.34
EA319V	Airbus A319 (IAE V2500 engines)	0.17	0.11	-0.07
EA320C	Airbus A320 (CFM56 engines)	1.46	1.43	-0.02
EA320V	Airbus A320 (IAE V2500 engines)	0.34	0.24	-0.10
EA321C	Airbus A321 (CFM56 engines)	2.66	3.63	+0.97
EA33	Airbus A330	0.21	0.60	+0.39
EA34	Airbus A340-200/300	0.04	0.05	+0.01
ERJ	Embraer ERJ 135/145	0.12	0.32	+0.20
ERJ170	Embraer E-170/175	0.00	0.01	+0.01
ERJ190	Embraer E-190/195	0.10	0.47	+0.37
EXE3	Executive Business Jet (Chapter 3)	1.95	3.34	+1.39
FK10	Fokker 100	0.00	0.03	+0.03
L4P	Large four-engine propeller	0.20	0.00	-0.20
LTT	Large twin-turboprop	2.74	3.80	+1.07
MD11	McDonnell Douglas MD-11	0.08	0.09	+0.01
SP	Single piston propeller	0.00	0.02	+0.02
STP	Small twin-piston propeller	0.18	0.02	-0.16

ANCON type	Description	2015 total movements	2016 total movements	Change
STT	Small twin-turboprop	0.03	0.20	+0.16
	TOTAL	74.08	**82.27**	**+8.20**
				(+11%)

Note: Changes have been calculated before rounding.

APPENDIX D

ANCON type descriptions

Table D1 ANCON type descriptions

ANCON type	Description
B717	Boeing 717
B727	Boeing 727 (Chapter 2&3)
B732	Boeing 737-200 (Chapter 2&3)
B733	Boeing 737-300/400/500
B736	Boeing 737-600/700
B738	Boeing 737-800/900
B747	Boeing 747-100 & 200/300 series (certificated to Chapter 3)
B744G	Boeing 747-400 with General Electric CF6-80F engines
B744P	Boeing 747-400 with Pratt & Whitney PW4000 engines
B744R	Boeing 747-400 with Rolls-Royce RB211 engines
B747SP	Boeing 747SP
B753	Boeing 757-300
B757C	Boeing 757-200 with Rolls-Royce RB211-535C engines
B757E	Boeing 757-200 with Rolls-Royce RB211-535E4/E4B engines
B757P	Boeing 757-200 with Pratt & Whitney PW2037/2040 engines
B762	Boeing 767-200
B763G	Boeing 767-300 with General Electric CF6-80 engines
B763P	Boeing 767-300 with Pratt & Whitney PW4000 engines
B763R	Boeing 767-300 with Rolls-Royce RB211 engines
B764	Boeing 767-400
B772G	Boeing 777-200 with General Electric GE90 engines
B772P	Boeing 777-200 with Pratt & Whitney PW4000 engines
B772R	Boeing 777-200 with Rolls-Royce Trent 800 engines
B773G	Boeing 777-200LR/300ER with General Electric GE90 engines
B773P	Boeing 777-300 with Pratt & Whitney PW4000 engines
B773R	Boeing 777-300 with Rolls-Royce Trent 800 engines
B788	Boeing 787-8
B789	Boeing 787-9
BA46	BAe 146/Avro RJ series
CRJ	Bombardier CRJ100/200 series
CRJ700	Bombardier CRJ700 series
CRJ900	Bombardier CRJ900 series
DC87	McDonnell Douglas DC-8-70 series

ANCON type	Description
DC10	McDonnell Douglas DC-10
EA30	Airbus A300
EA31	Airbus A310
EA318	Airbus A318
EA319C	Airbus A319 with CFM56 engines
EA319V	Airbus A319 with IAE V2500 engines
EA320C	Airbus A320 with CFM56 engines
EA320V	Airbus A320 with IAE V2500 engines
EA321C	Airbus A321 with CFM56 engines
EA321V	Airbus A321 with IAE V2500 engines
EA33	Airbus A330
EA34	Airbus A340-200/300
EA346	Airbus A340-500/600
EA359	Airbus A350-900
EA38GP	Airbus A380 with Engine Alliance GP7000 engines
EA38R	Airbus A380 with Rolls-Royce Trent 900 engines
ERJ	Embraer ERJ 135/145
ERJ170	Embraer E-170/175
ERJ190	Embraer E-190/195
EXE2	Chapter 2 executive jets
EXE3	Chapter 3 executive jets
FK10	Fokker 70/100
L101	Lockheed L-1011 TriStar
L4P	Large four-engine propeller
LTT	Large twin-turboprop
MD11	McDonnell Douglas MD-11
MD80	McDonnell Douglas MD-80 series
SP	Single piston
STP	Small twin-piston
STT	Small twin-turboprop
TU54	Tupolev Tu-154

Glossary

Glossary	
AIP	Aeronautical Information Publication
ANCON	The UK civil aircraft noise contour model, developed and maintained by ERCD.
ATC	Air Traffic Control
CAA	Civil Aviation Authority
dB	Decibel units describing sound level or changes of sound level.
dBA	Units of sound level on the A-weighted scale, which incorporates a frequency weighting approximating the characteristics of human hearing.
DfT	Department for Transport (UK Government)
ERCD	Environmental Research and Consultancy Department
ICAO	International Civil Aviation Organization
Leq	Equivalent sound level of aircraft noise in dBA, often called ‘equivalent continuous sound level’.
NPD	Noise-Power-Distance
NPR	Noise Preferential Route
NTK	Noise and Track Keeping monitoring system
SEL	Sound Exposure Level – the steady noise level, which over a period of one second contains the same sound energy as the whole aircraft noise event. It is equivalent to the Leq of the noise event normalised to one second.
SID	Standard Instrument Departure
STAL	Stansted Airport Limited