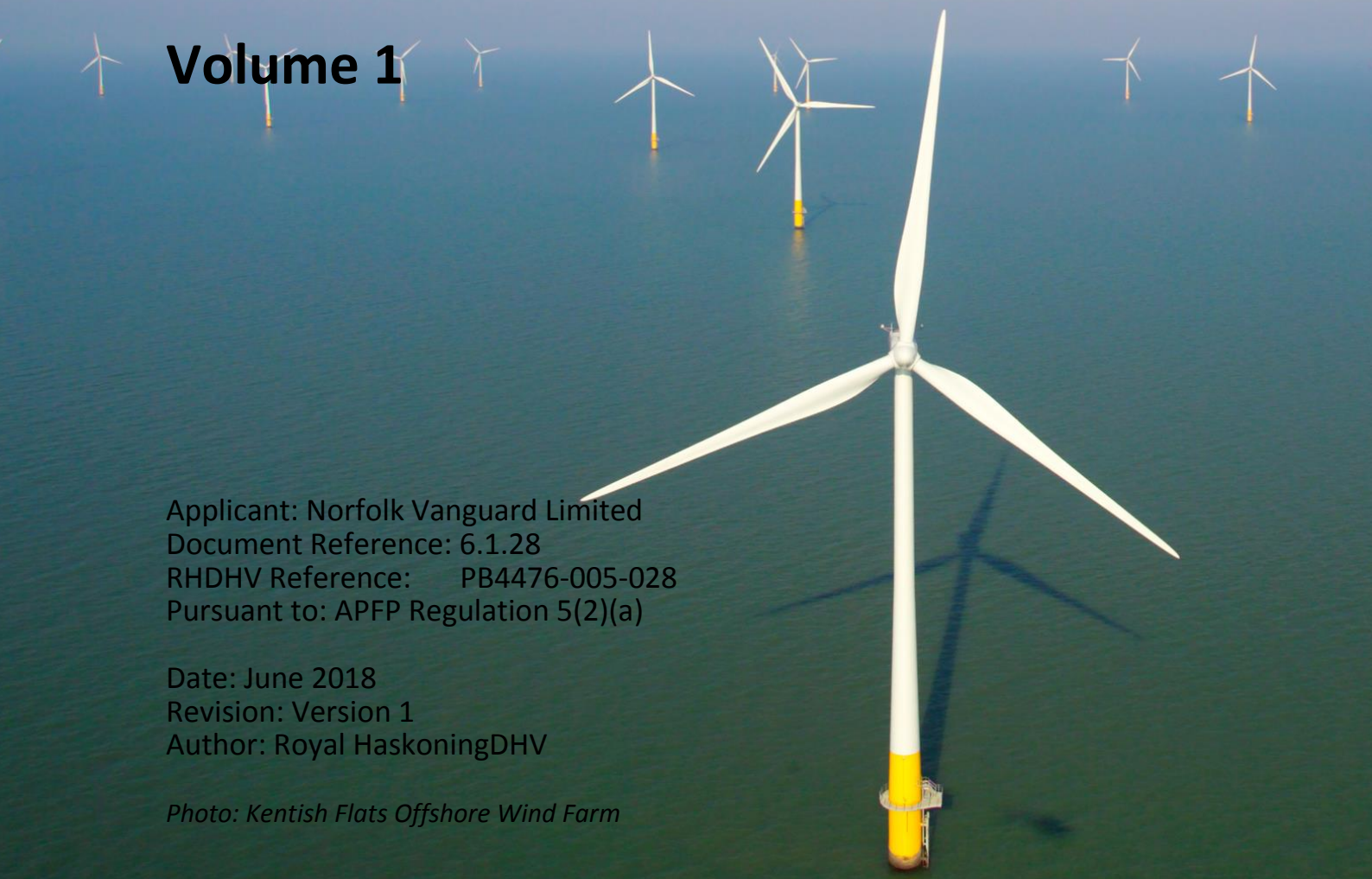
Norfolk Vanguard Offshore Wind Farm

Chapter 28

Onshore Archaeology and Cultural Heritage

Environmental Statement

Volume 1



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For and on behalf of Norfolk Vanguard Limited

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Glossary

AAA	Areas of Archaeological Activity
ADBA	Archaeological Desk Based Assessment
AHOB	Ancient Human Occupation of Britain (Project)
AIS	Air-Insulated Switchgear
BGS	British Geological Survey
BNG	British National Grid
CFB	Cromer Forest Bed
CIA	Cumulative Impact Assessment
CMS	Construction Method Statement
CoCP	Code of Construction Practice
CPRE	Campaign to Protect Rural England
CRS	Cable Relay Station
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
GI	Ground Investigation
GIS	Geographic Information System
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HE	Historic England
HLC	Historic Landscape Character
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IPC	Infrastructure Planning Commission
JCS	Joint Core Strategy
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
LVIA	Landscape and Visual Impact Assessment
MA	Mobilisation Area
MHWS	Mean High Water Springs
N2RS	No To Relay Stations
NCC HES	Norfolk County Council Historic Environment Service
NHER	Norfolk Historic Environment Record
NPPF	National Planning Policy Framework
NPS	National Policy Statements
NSIPs	Nationally Significant Infrastructure Projects
OLEMS	Outline Landscape and Ecological Management Strategy
PAB	Pathways to Ancient Britain (Project)
PEIR	Preliminary Environmental Information Report

PLBCAA	Planning Listed Buildings and Conservation Areas Act
PPG	Planning Practice Guidance
RPG	Registered Park and Garden
SoS	Secretary of State
TC	Trenchless Crossing
WCS	Worst Case Scenario
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility

Terminology

Attenuation pond zone	Zone within which the attenuation pond at the onshore project substation or Necton National Grid substation will be located.
Cable Relay Station	Primarily comprised of an outdoor compound containing reactors (also called inductors, or coils) and switchgear to increase the power transfer capability of the cables under the HVAC technology scenario as considered in the PEIR. This is no longer required for the project as the HVDC technology has been selected.
Indicative mitigation planting	Areas identified for mitigation planting at the onshore project substation and Necton National Grid substation.
Jointing pit	Underground structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	Where the offshore cables come ashore at Happisburgh South.
Landfall compound	Compound at landfall within which HDD drilling would take place.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
Mobilisation area	Areas approx. 100 x 100m used as access points to the running track for duct installation. Required to store equipment and provide welfare facilities. Located adjacent to the onshore cable route, accessible from local highways network suitable for the delivery of heavy and oversized materials and equipment.
Mobilisation zone	Area within which the mobilisation area will be located.
National Grid new / replacement overhead line tower	New overhead line towers to be installed at the National Grid substation.
National Grid overhead line modifications	The works to be undertaken to complete the necessary modification to the existing 400kV overhead lines.
National Grid substation extension	The permanent footprint of the National Grid substation extension.
National Grid temporary works area	Land adjacent to the Necton National Grid substation which would be temporarily required during construction of the National Grid substation extension.
Necton National Grid substation	The existing 400kV substation at Necton, which will be the grid connection location for Norfolk Vanguard.
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation.
Onshore cable corridor	200m wide onshore corridor within which the onshore cable route would be located as submitted for PEIR.

Onshore cable route	The 45m easement which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take the electricity from landfall to the onshore project substation.
Onshore project area	All onshore electrical infrastructure (landfall; onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling) zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modification).
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. In an HVDC system the substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
Onshore project substation temporary construction compound	Land adjacent to the onshore project substation which would be temporarily required during construction of the onshore project substation.
Running track	The track along the onshore cable route which the construction traffic would use to access workfronts.
The Applicant	Norfolk Vanguard Limited.
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.
Trenchless crossing zone (e.g. HDD)	Temporary areas required for trenchless crossing works.
Workfront	The 150m length of onshore cable route within which duct installation would occur.

28 ONSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

28.1 Introduction

1. This chapter of the Environmental Statement (ES) summarises the existing baseline conditions for the onshore archaeological and cultural heritage environment (the historic environment) within the onshore project area of Norfolk Vanguard ('the project').

2. Baseline conditions (set out in section 28.6), comprising an account of the known archaeological and cultural heritage resource (including designated and non-designated heritage assets) and a summary of the potential for currently unrecorded sites and finds to exist within the onshore project area, have been established through an Archaeological Desk Based Assessment (ADBA - Appendix 28.1) prepared in compliance with the Written Scheme of Investigation (WSI): ADBA (Terrestrial Archaeology) (Document reference: PB4476.003.039 - Royal HaskoningDHV, 2017a), agreed with Norfolk County Council (NCC) Historic Environment Service (HES) and Historic England (HE).

3. The baseline conditions outlined in this ES chapter, specifically in relation to below ground archaeological remains and earthworks, take into account the aerial photographic and LiDAR[1] data assessment work (Appendix 28.1, Annex 28.1.3), which forms a primary, project-specific, dataset and the results of a priority programme of archaeological geophysical survey (Appendix 28.5) undertaken in compliance with the WSI: Priority Archaeological Geophysical Survey (Terrestrial Archaeology) (document reference: PB4476.003.046 - Royal HaskoningDHV, 2017b), agreed with NCC HES and HE. Those features identified as potentially being present as sub-surface remains within the onshore project area have not been ground-truthed through intrusive (e.g. trial trenching) evaluation approaches. It has been discussed and agreed with NCC HES and HE that this will be conducted in the post-consent stages of the project if a Development Consent Order (DCO) is granted (see Outline WSI – document reference 8.5). Assessment and reporting at this stage with respect to below ground archaeological remains is based on archaeological potential as indicated by the results of non-intrusive evaluation techniques only.

4. This chapter assesses the potential impacts to the onshore archaeology and cultural heritage resource from the project and describes the embedded and additional mitigation which has been / will be applied (sections 28.7 and 28.8). The approach to impact assessment outlined in section 28.4 differs slightly from the standard approach adopted more generally for other technical disciplines. The impact assessment methodology specific to onshore archaeology and cultural heritage is

[1] Light Detection and Ranging

consistent with that outlined in the Onshore Archaeology and Cultural Heritage Method Statement document reference: PB4476-003-034 (Royal HaskoningDHV, 2017), as agreed with NCC HES and HE, and rests on the notion that the matrix-based approach must be qualified through descriptive analysis (e.g. a narrative) and professional judgement.

5. Figures which accompany the text in this chapter are provided in Volume 2 Figures.

6. Archaeology and cultural heritage considerations beyond Mean High Water Springs (MHWS) are assessed separately within Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage. Although reported on separately, cross-correlation between the assessment methodology utilised in the onshore and offshore and intertidal archaeological and cultural heritage chapters has been ensured, where relevant, in order to produce an integrated and coherent account of the historic environment and the degree to which the project may interact with the archaeological and cultural heritage resource as a whole.

7. Inter-relationships have been identified between the following assessment topics. This chapter provides cross references where relevant and should therefore be read in conjunction with these (section 28.9). The relevant chapters are:

- Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage;
- Chapter 25 Noise and Vibration; and
- Chapter 29 Landscape and Visual Impact Assessment.

8. This chapter has been prepared in regular consultation with HE and NCC HES (section 28.3 and Appendix 28.2) and in accordance with legislation, policy and industry standards and guidance documents relevant to onshore archaeology and cultural heritage (section 28.2), with specific reference to the relevant National Policy Statements (NPS), the NPPF and associated Planning Practice Guidance (PPG).

28.2 Legislation, Guidance and Policy

28.2.1 Legislation

9. A detailed summary of the legislation, policy and guidance applicable to the assessment of onshore archaeology and cultural heritage is presented in Appendix 28.1, as part of the ADBA.

10. The NPSs (the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs)), of relevance to the project are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

11. Table 28.1 sets out how specific NPS policies relevant to onshore archaeology and cultural heritage are addressed within this chapter.

12. Further detail on legislation and policy in relation to the wider project is provided in Chapter 3 Policy and Legislative Context.

Table 28.1 NPS assessment requirements for the historic environment

NPS requirement	NPS reference	ES reference
EN-1 Overarching NPS for Energy		
'As part of the ES 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 importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset.'	Section 5.8.8	The significance and value of the archaeological receptors (heritage assets) considered in this ES have been detailed in sections 28.4 and 28.6. An initial settings assessment was undertaken as part of the ADBA (Appendix 28.1), the results of which have been updated and informed this ES, where relevant. The ADBA identified heritage assets considered to benefit from additional site visits to further assess any potential impact upon setting. The results of this further assessment, as provided in this ES, have thus been updated in this regard (sections 28.6, 28.7 and Appendix 28.7).
'Where a development site includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact.'	Section 5.8.9	This ES has been informed by an ADBA (see Appendix 28.1) and staged programme of 'evaluation' works (e.g. aerial photographic / LiDAR data assessment, priority geophysical survey and geoarchaeological monitoring of Ground Investigation (GI) works) (Appendices 28.1, 28.5 and 28.6), which have helped identify the presence / absence of archaeological receptors (heritage assets) within the onshore extent of the Norfolk Vanguard project. Archaeological information has informed the Iterative Design Process (Cable Routeing / Refinement considerations), see Section 28.7.2. As noted above. The ADBA identified heritage assets considered to benefit from additional site visits to further assess any potential impact upon setting. The results of this further assessment, as provided in the ES, have thus been updated in this regard (sections 28.6, 28.7 and Appendix 28.7).
'The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents.'	Section 5.8.10	This ES provides an account of the potential impact of the Norfolk Vanguard Project upon heritage assets and their significance (section 28.7). This ES has been informed by an ADBA (see Appendix 28.1) and staged

NPS requirement	NPS reference	ES reference
		programme of 'evaluation' works (e.g. aerial photographic / LiDAR data assessment, priority geophysical survey and geoarchaeological monitoring of GI works) (Appendices 28.1, 28.5 and 28.6). Archaeological information has informed the Iterative Design Process (Cable Routeing / Refinement discussions), see Section 28.7.2.
'In considering applications, the Infrastructure Planning Commission (IPC) [now the Planning Inspectorate and the Secretary of State] should 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: • Evidence provided with the application; • Any designation records; • The Historic Environment Record, and similar sources of information; • The heritage assets themselves; • The outcome of consultations with interested parties; and • Where appropriate and when the need to understand the significance of the heritage asset demands it, expert advice'	Section 5.8.11	This ES assesses the potential for impacts to occur upon the onshore archaeology and cultural heritage resource as a result of the project. Impacts of a direct (e.g. physical) and indirect (e.g. non-physical) nature are considered within the context of the project in a manner that is proportionate to those assets present (and their perceived heritage significance), as agreed in consultation with HE and NCC HES. This approach is outlined in section 28.4 with the heritage assets set out in the baseline conditions section in section 28.6 and assessment detailed in sections 28.7 and 28.8.
'In considering the impact of a proposed development on any heritage assets, the IPC [now the Planning Inspectorate and the Secretary of State] should take into account the particular nature of the significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between conservation of that significance and	Section 5.8.12	Heritage significance is assigned in line with the methodology set out in section 28.4.1.1 based on available data. With regards to potential below ground remains, this data is predominantly non-intrusive in nature and as such, heritage significance is based on professional judgement and experience, rather than any fully substantiated and established levels of heritage significance, as part of intrusive ground truthing for instance. Because of this, a precautionary approach has been adopted which will be

NPS requirement	NPS reference	ES reference
proposals for development.'		further substantiated post-consent following an initial informative stage of mitigation work (e.g. further geophysical survey and archaeological trial trenching).
'The IPC [now the Planning Inspectorate and the Secretary of State] should 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 they can make to sustainable communities and economic vitality… This can be by virtue of: • heritage assets having an influence on the character of the environment and an area's sense of place; • heritage assets having a potential to be a catalyst for regeneration in an area, particularly through leisure, tourism and economic development; • heritage assets being a stimulus to inspire new development of imaginative and high quality design; • the re-use of existing fabric, minimising waste; and • the mixed and flexible patterns of land use in historic areas that are likely to be, and remain, sustainable. …The IPC [now the Planning Inspectorate and the Secretary of State] should 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 and use. The IPC [now the Planning Inspectorate and the Secretary of State] should have regard to any relevant local authority development plans or local impact report on the proposed development in respect of the factors set out [above]'.	Section 5.8.13	In order to assess the positive contributions of the project in the context of onshore archaeology and cultural heritage, the magnitude of positive effect has also been subject to consideration in this ES chapter. The magnitude of positive effect directly relates to the level of public value associated with an individual beneficial impact and may correspond directly to the project itself (e.g. by means of route refinement / micrositing which seek to avoid heritage assets) or where a project will enhance the historic environment and / or public understanding (e.g. by adding to the archaeological record). This is discussed in section 28.4 and assessed in section 28.7). Opportunities to minimise harm to the onshore historic environment have been fully considered and feedback from community and stakeholder consultation taken on-board. This has been directly reflected in the commitment made by Vattenfall to utilise High Voltage Direct Current (HVDC) technology, meaning that the required cable route has been narrowed from 100 metres wide to 45 metres wide (the onshore cable route). There is also no longer a need for a Cable Relay Station (CRS) following the decision to use HVDC technology. The HVDC onshore project substation has been subject to sensitive siting considerations, and mitigation planting and acoustic enclosures will be adopted to reduce any landscape and visual and noise concerns. Archaeological information has informed the Iterative Design Process (Cable Routeing / Refinement discussions), see Section 28.7.2.

NPS requirement	NPS reference	ES reference
'There should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be. 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. Loss affecting any designated heritage asset 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 assets of the highest significance, including Scheduled Monuments; registered battlefields; grade I and II* listed buildings; grade I and II* registered parks and gardens; and World Heritage Sites, should be wholly exceptional.'	Section 5.8.14	The onshore project area and onshore works will avoid physical impacts upon known (e.g. previously listed / scheduled) designated heritage assets and as such, no direct physical impacts are anticipated to occur to designated heritage assets (section 28.6.2). This is with the exception of the Blickling Conservation Area (356) through which cable installation works will take place, as previously discussed with NCC HES and HE. Although the occurrence of such works constitutes a direct physical impact on the landscape character of the Conservation Area (see section 28.6.2.1), the landscape elements of the Conservation Area subject to impact are considered to have been largely subject to certain levels of alteration and 'recent' change already, as part of agricultural use. Sensitive backfilling and reinstatement will be undertaken following construction and field boundaries and hedgerows returned to their pre-construction condition (see Outline WSI document reference 8.5 and Outline Landscape and Ecological Management Strategy (OLEMS) (document reference 8.7). The impact assessment as presented in this chapter highlights that this impact will therefore be temporary in nature and confined to the construction period and is not considered to constitute harm to the significance of the Conservation Area following the completion of construction works (section 28.7).
'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 harm to the significance of the heritage asset the greater the justification will be needed for any loss. Where the application will lead to substantial harm to or total loss of significance of a designated heritage asset the IPC [now the Secretary of State] should refuse consent unless it can be demonstrated that the substantial harm to or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm.'	Section 5.8.15	The onshore project area and onshore works will avoid physical impacts upon known (e.g. previously listed / scheduled) designated heritage assets. As such, no direct physical impacts are anticipated to occur to designated heritage assets (section 28.6.2). As above, this is with the exception of cable installation works through the Blickling Conservation Area (356). Although the occurrence of such works constitutes a direct physical impact on the landscape character of the Conservation Area (see section 28.6.2.1), the landscape elements of the Conservation Area subject to impact are considered to have been largely subject to certain levels of alteration and 'recent' change already, as part of agricultural use. Sensitive backfilling and reinstatement will be

NPS requirement	NPS reference	ES reference
		undertaken following construction and field boundaries and hedgerows returned to their pre-construction condition (see Outline WSI document reference 8.5 and OLEMS document reference 8.7). The impact assessment as presented in this chapter highlights that this impact will therefore be temporary in nature and confined to the construction period and is not considered to constitute harm to the significance of the Conservation Area following the completion of construction works (section 28.7). Designated heritage assets have also been considered as part of a heritage settings assessment (Appendix 28.7) to ensure that indirect (non-physical) impacts arising as a result of the project are fully considered. This assessment has been undertaken in line with guidance outlined in The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (Historic England, 2017) (see sections 28.6 and 28.7, and Appendix 28.7).
'Not all elements of a World Heritage Site or Conservation Area will necessarily contribute to its significance. The policies set out in paragraphs 5.8.11 to 5.8.15 above apply to those elements that do contribute to the significance. When considering proposals the IPC should take into account the relative significance of the element affected and its contribution to the significance of the World Heritage Site or Conservation Area as a whole.'	Section 5.8.16	There are no World Heritage Sites within the study areas considered within this ES Chapter. Cable installation works through the Blickling Conservation Area will directly impact landscape elements of the Conservation Area. The areas of Blickling Conservation Area associated with the onshore project area and onshore works are predominantly owned by the National Trust (Figure 28.1 – Map 4 of 9), and subject to tenant farming. The landscape elements subject to impact are therefore considered to have been largely subject to certain levels of alteration and 'recent' change already, as part of agricultural use. Sensitive backfilling and reinstatement will be undertaken following construction and field boundaries and hedgerows returned to their pre-construction condition - see Outline WSI document reference 8.5 and OLEMS document reference 8.7) any impact will be temporary in nature and confined to the construction period. Direct impacts upon the Blickling Conservation Area as a result of cable installation works are therefore not considered to constitute harm to the significance of the

NPS requirement	NPS reference	ES reference
		Conservation Area following the completion of construction through into the operation stage (section 28.7).
'Where loss of significance of any heritage asset is justified on the merits of the new development, the IPC [now the Secretary of State] should consider imposing a condition on the consent or requiring 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.'	Section 5.8.17	This ES chapter has concluded that the project will not result in the loss of significance of (or harm to) any designated heritage assets identified in this chapter (section 28.7). This conclusion has been based on the results of a staged programme of assessment comprising desk-based review, site visits and the incorporation and use of Landscape and Visual Impact Assessment (LVIA) tool-kits (e.g. Zone of Theoretical Visibility (ZTV) and photomontages), with respect to heritage setting. The approach to assessment has been agreed with HE and NCC HES as part of the pre-application consultation process. The significance of non-designated heritage assets has to date been established through an ADBA (see Appendix 28.1) and staged programme of 'evaluation' works (e.g. aerial photographic / LiDAR data assessment, priority geophysical survey and geoarchaeological monitoring of GI works) (Appendices 28.1, 28.5 and 28.6).
'When considering applications for development affecting the setting of a designated heritage asset, the IPC [now the Planning Inspectorate and the Secretary of State] should treat favourably applications that preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset. When considering applications that do not do this, the IPC [now the Planning Inspectorate and the Secretary of State] should weigh any negative effects against the wider benefits of the application. The greater the negative impact on the significance of the designated heritage asset, the greater the benefits that will be needed to justify approval.'	Section 5.8.18	This ES chapter has concluded that indirect impacts arising as a result of the project with respect to setting will be no more than minor / negligible adverse (section 28.7), with no impact in the majority of cases. As outlined above, this conclusion has been based on the results of a staged programme of assessment comprising desk-based review, site visits and the incorporation and use of LVIA tool-kits (e.g. ZTVs and photomontages). The approach to assessment has been agreed with HE and NCC HES as part of the pre-application consultation process. Archaeological information has informed the Iterative Design Process (Cable Routeing / Refinement discussions), see Section 28.7.2, in order to avoid those most sensitive and significant heritage assets identified to

NPS requirement	NPS reference	ES reference
		date. If / when a DCO is granted an initial informative stage of mitigation work (e.g. further geophysical survey and archaeological trial trenching) will be undertaken in agreement with NCC HES and HE in order to further establish specific and bespoke mitigation requirements on a case-by-case basis.
EN-3 NPS for Renewable Energy Infrastructure		
'Consultation with the relevant statutory consultees should be undertaken by the applicants at an early stage of the development.'	Section 2.6.140	Regular consultation has been undertaken with the relevant statutory consultees (including NCC HES and HE), following the Scoping Opinion, and through the application of the Evidence Plan Process (EPP), as outlined in section 28.3 and Appendix 28.2. Consultation with the ETG (Expert Topic Group) as part of the EPP has been ongoing throughout the process.
'Assessment should be undertaken as set out in Section 5.8 of EN-1. Desk-based studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design.'	Section 2.6.141	This ES has been undertaken in accordance with section 5.8 of EN-1, as detailed above. It has also been informed by an ADBA (see Appendix 28.1) and staged programme of 'evaluation' works (e.g. aerial photographic / LiDAR data assessment, priority geophysical survey and geoarchaeological monitoring of GI works) (Appendices 28.1, 28.5 and 28.6). The results of the ADBA, including Aerial Photographic and LiDAR data assessment (Appendix 28.1, Annex 28.1.3), were used to identify areas for the targeted programme of priority onshore archaeological geophysical survey (as agreed with NCC HES and HE), which was undertaken between October 2017 and March 2018 (Appendix 28.5).

13. This ES chapter has also been undertaken in a manner consistent with the NPPF, published by the Department for Communities and Local Government (DCLG) in March 2012, replacing Planning Policy Statement 5. Provision for the historic environment is principally given in Section 12: Conserving and enhancing the historic environment of the NPPF, which directs local authorities to set out "*a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. In doing so, they should recognise that heritage assets are an irreplaceable resource and conserve them in a manner appropriate to their significance.*" (DCLG, 2012).

14. The aim of NPPF Section 12 is to ensure that Regional Planning Bodies and local authorities, developers and owners of heritage assets adopt a consistent and holistic approach to their conservation and to reduce complexity in planning policy relating to proposals that affect them.

15. To summarise, government guidance provides a framework which:

- Recognises that heritage assets are an irreplaceable resource;
- Requires applicants to provide proportionate information on the significance of heritage assets affected by the proposals and an impact assessment of the project on that significance;
- Takes into account the desirability of sustaining and enhancing the significance of heritage assets and their setting;
- Places weight on the conservation of designated heritage assets (which include world heritage sites, scheduled monuments, listed buildings, protected wreck sites, registered parks and gardens, registered battlefields or conservation areas); and
- Requires developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and impact, and to make this evidence (and any archive generated) publicly accessible.

16. The NPPF's associated PPG 'Conserving and enhancing the historic environment' (DCLG, 2014) includes further information and guidance on how national planning policy is to be interpreted and applied locally. Although the PPG is an important and relevant consideration in respect to this project, EN-1 (the Overarching NPS for Energy) is the key decision making document.

17. Works affecting Listed Buildings and Conservation Areas are subject to the Planning (Listed Buildings and Conservation Areas) Act 1990 ("PLBCAA"), while those affecting Scheduled Monuments and Archaeological Areas of Importance must consider the Ancient Monuments and Archaeological Areas Act 1979 (as amended). Additionally, certain hedgerows may be deemed to be historically important under the criteria set

out in the Hedgerow Regulations 1997, as amended by The Hedgerows (England) (Amendment) Regulations 2002.

18. In the context of listed buildings, regulation 3 of the Infrastructure Planning (Decisions) Regulations 2010 (the 'Decisions Regulations') sets out that it is necessary for the Secretary of State (SoS) to "*have regard to the desirability of preserving the listed building or its setting or any features of special architectural or historic interest which it possesses*". This language differs from the duty in section 66 of the PLBCAA 1990 for a decision maker to have "*special regard*" and indicates that Parliament intends that a particular approach be taken in the case of NSIPs. The Decisions Regulations have been taken into account in the preparation of this chapter.

28.2.2 Guidance and Policy

19. This chapter further takes into account local policy and further national guidance relevant to the onshore project area.

28.2.2.1 Local Planning Policy

20. Local policies relevant to the study area comprise:

- North Norfolk: Local Development Framework - Core Strategy (North Norfolk District Council 2008, Updated 2012);
- Greater Norwich Development Partnership (2012) – Joint Core Strategy (JCS) for Broadland, Norwich and South Norfolk (adopted March 2011, amendments adopted January 2014). The Greater Norwich Emerging Local Plan consultation closed March 2018;
- The Broadland Development Management Development Plan Document (Broadland District Council, 2015); and
- Breckland: Adopted Core Strategy and Development Control Policies Development Plan Document (Breckland Council, 2009).

21. The local development plan documents listed above each include policies which state that development proposals must ensure the protection, conservation, management and enhancement of the historic environment. Further details can be found in Appendix 28.1.

28.2.2.2 Further National Guidance

22. In demonstrating adherence to industry good practice, this chapter has also been compiled with respect to available archaeological and cultural heritage guidance for onshore development, including:

- The Historic Environment in Local Plans: Historic Environment Good Practice Advice in Planning Note 1 (Historic England, 2015);
- Managing Significance in Decision-Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning Note 2 (Historic England, 2015a); and
- The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (Historic England, 2017).

28.3 Consultation

23. Consultation is a key driver of the EIA and ES, and is an ongoing process throughout the lifecycle of the project, from the initial stages through to consent and post-consent. To date, a significant amount of consultation in relation to onshore archaeology and cultural heritage has been conducted through the ETG meetings held in February 2017, July 2017 and January 2018, the Scoping Report (Royal HaskoningDHV, 2016) and the Preliminary Environmental Information Report (PEIR) (Norfolk Vanguard Limited, 2017) and associated responses. A separate meeting was held in May 2017 with the Ancient Human Occupation of Britain (AHOB) and Pathways to Ancient Britain (PAB) Team in respect to the landfall at Happisburgh South.

24. This process has enabled key issues arising from the project in relation to onshore archaeology and cultural heritage to be articulated and examined in a transparent and efficient manner within this ES, in advance of submission of the DCO application. This includes feedback on the three 'survey-specific' WSIs to date, one for Onshore ADBA, a second for Geoarchaeological Monitoring of GI Works and thirdly the WSI for Priority Archaeological Geophysical Survey.

25. Full details of the project consultation process are presented within Chapter 7 Technical Consultation.

26. Consultation responses and how they have been addressed to date in relation to onshore archaeology and cultural heritage are detailed in Appendix 28.2. A summary of consultation undertaken to date is presented in Table 28.2.

Table 28.2 Consultation summary

Consultation stage	Consultees	Purpose of consultation
Scoping Opinion November 2016	The Planning Inspectorate (SoS), NCC, HE	Establish scope of the archaeology and cultural heritage assessment
EPP ETG Onshore Archaeology Meeting February 2017	NCC HES / HE	To discuss main archaeological considerations and data sources and the approach to impact assessment

Consultation stage	Consultees	Purpose of consultation
EPP ETG Coastal, Intertidal and Nearshore Archaeology Meeting May 2017	AHOB and PAB Representatives, including: Natural History Museum British Museum Queen Mary University of London NCC HES North Norfolk District Council	Coastal, intertidal and nearshore archaeological considerations at the landfall options – focusing on Happisburgh
Interim consultation (pre-PEIR submission - via e-mail) May 2017	HE / NCC HES	1) Onshore Archaeology Method Statement; 2) Minutes of the Onshore Archaeology Topic Group Meeting (1st Feb); 3) Onshore Archaeology Topic Group Meeting Log; and 4) WSI for ADBA (Terrestrial Archaeology).
Interim consultation (pre-PEIR submission - via e-mail) May 2017	HE	To discuss scope, sources, methodologies/approach to assessment as set-out in WSI for ADBA (Terrestrial Archaeology)
Interim consultation (pre-PEIR submission - via e-mail) June 2017	HE	To discuss scope / approach to survey and geoarchaeological assessment as set out in the Geoarchaeological Watching Brief WSI
EPP ETG Onshore Archaeology Meeting July 2017	NCC HES / HE / Broadland District Council / North Norfolk District Council	To discuss progress in relation to the staged programme of assessment and the PEIR, high-level approach to priority geophysical survey and to provide an update on the geoarchaeological monitoring / Site investigation works
Interim consultation (pre-PEIR submission - conference call meeting) September 2017	NCC HES	To discuss priority archaeological geophysical survey and heritage settings
Interim consultation (pre-PEIR submission - via e-mail) September 2017	NCC HES	To discuss scope / approach to geophysical survey and assessment as set out in the Priority Archaeological Geophysical Survey WSI

Consultation stage	Consultees	Purpose of consultation
Interim consultation (pre-PEIR submission - via e-mail) October 2017	NCC HES	To discuss scope / approach to geophysical survey and assessment as set out in the Priority Archaeological Geophysical Survey WSI
PEIR Responses Review November 2017	Breckland Council, Broadland District Council, Campaign to Protect Rural England (CPRE), East Ruston Parish Council, Happisburgh Parish Council, HE, No To Relay Stations (N2RS), National Trust, Necton Parish Council, Norfolk Coast Partnership, NCC, North Norfolk District Council, St. Peter's Ridlington - Church Warden	To gain feedback on PEIR, with comments made on onshore archaeology and cultural heritage assessment methodology, content and structure, assessment findings and mitigation.
EPP ETG Onshore Archaeology Meeting January 2018	NCC HES / HE / North Norfolk District Council / National Trust	To provide a summary of PEIR responses, heritage setting and cross-correlation with the LVIA, priority geophysical survey update, geoarchaeological monitoring, other ES-related surveys, the National Trust's interests and the mitigation strategy approach / Outline WSI
Interim consultation (post-PEIR / pre-ES submission - via e-mail) March 2018	NCC HES / HE	To provide a project design update
EPP ETG Onshore Archaeology and Cultural Heritage Meeting (Norfolk Boreas) March 2018	NCC HES / HE	To establish scope of the archaeology and cultural heritage assessment for Norfolk Boreas - common themes between the Norfolk Vanguard and Norfolk Boreas project were discussed.
Interim consultation (post-PEIR / pre-ES submission - via e-mail) March 2018	NCC HES	To discuss consideration of Smugglers Lane Necton / Bradenham
Interim consultation (post-PEIR / pre-ES submission - meeting)	National Trust	To discuss archaeology and Norfolk Vanguard within the Blickling Estate

28.4 Assessment Methodology

27. Chapter 6 EIA Methodology details the general impact assessment methodology, and the following sections describe more specifically the methodology used to assess the potential impacts of the project on onshore archaeology and cultural heritage, as consulted on and agreed via ETG meetings held in February 2017, July 2017 and February 2018, the Scoping Report (Royal HaskoningDHV, 2016) and PEIR (Norfolk Vanguard Limited, 2017) and associated opinions and responses. The impact assessment methodology for onshore archaeology and cultural heritage is consistent with that outlined in the Onshore Archaeology and Cultural Heritage Method Statement (document reference: PB4476-003-034 - Royal HaskoningDHV, 2017), as agreed with NCC HES and HE.

28. This section details the methodology used to determine the significance of the impacts of the onshore works of the project on onshore archaeological receptors (herein referred to as heritage assets). The assessment criteria and assignment of significance with respect to onshore archaeology and cultural heritage considerations are based on available standards and guidance (see section 28.2), good practice, consultation and on professional judgement.

29. The impact assessment methodology adopted for onshore archaeology and cultural heritage defines those assets likely to be impacted by the project. The assessment is not limited to direct physical impacts, but also assesses possible indirect impacts upon the setting of designated and non-designated heritage assets, whether visually, or in the form of noise, dust and vibration, spatial associations and a consideration of historic relationships between places.

30. More specifically the impact assessment presents:

- The perceived heritage significance (importance) of any heritage assets identified as being affected, both designated and non-designated;
- The anticipated magnitude of effect (change) upon those assets and their settings (where relevant);
- The significance of any identified impacts upon those assets and their settings; and
- The level of any harm (or benefit) and loss of heritage significance.

31. In the absence of a specific industry standard methodology for heritage impact assessment within the framework of EIA, the impact assessment methodology adopted will be broadly in line with the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 2: Cultural Heritage (Highways Agency document 208/07) (2008), in conjunction with various recent policy and guidance documents, including:

- EN1 Overarching NPS for Energy (DECC, 2011a);
- The NPPF (DCLG, 2012);
- National Planning Policy Guidance: Conserving and enhancing the historic environment (DCLG, 2014);
- The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (Historic England, 2017); and
- Conservation Principles: Policy and Guidance for Sustainable Management of the Historic Environment (Historic England, 2008).

32. The consideration of designated heritage assets will take account of the PLBCAA (1990) and the Ancient Monuments and Archaeological Areas Act (1979).

28.4.1.1 Sensitivity (Heritage Significance / Importance)

33. The sensitivity of a receptor (heritage asset) is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. However, while impacts to a heritage asset's setting or character can be temporary, impacts which result in damage or destruction of the assets themselves, or their relationship with their wider environment and context, are permanent. Once destroyed a heritage asset cannot recover. The heritage significance (or archaeological importance) of an asset, the determination of which is outlined below, can therefore be regarded as equating to its sensitivity.

34. The assessment of the significance of any identified impact is largely a product of the heritage significance (importance) of an asset and the perceived magnitude of the effect on it, assessed and qualified by professional judgement.

35. An assessment of effects on an asset involves an understanding of the heritage significance of the asset and in the case of an effect on the setting of that asset, the contribution that the setting makes to the heritage significance of the asset. Policy sets out that the level of detail should be proportionate to the significance of the heritage asset and no more than is sufficient to understand the potential impact of the project (NPPF paragraph 128, 2012).

36. The initial indicative (outline) criteria for determining the heritage significance of any relevant heritage assets are described below. This criteria provides a provisional guide to the assessment of perceived heritage significance, which is to be based upon professional judgement incorporating the evidential, archaeological, historical, aesthetic, architectural and communal heritage values of the asset or assets. However, due to the nature of the archaeological record, it is often the case that information regarding individual assets may, at times, be limited. As such, the categories and definitions of heritage significance do not necessarily reflect a definitive level of importance of an asset. Instead they should be regarded as providing a preliminary or likely level of heritage significance based on information

available to date. The heritage significance of an asset can therefore be amended or revised as more information comes to light. Archaeological assessments that may alter the perceived heritage significance of an asset may be undertaken pre- and post-consent and include non-intrusive and intrusive survey programmes. For this project it will include a post-consent initial informative stage of mitigation work (e.g. further geophysical survey and archaeological trial trenching).

37. Establishing heritage significance (or likely heritage significance) of an asset or group of assets, and the related impact significance by considering the perceived magnitude of effect on the asset or assets, assists in the development of appropriate evaluation (or initial informative stages of mitigation work) and mitigation approaches.

38. Where uncertainty occurs, a precautionary approach is to assign high heritage significance (importance). This precautionary approach represents good practice in archaeological impact assessment and reduces the potential for impacts to be under-estimated.

Table 28.3 Indicative (outline) criteria for determining heritage significance (importance)

Heritage significance (importance)	Definitions / example assets
High (perceived International / National Importance)	• World Heritage Sites; • Scheduled Monuments; • Grade I, II* and II Listed Buildings or structures; • Designated historic landscapes of outstanding interest; • Conservation Areas containing very important buildings; • Assets of acknowledged international / national importance; or • Assets that can contribute significantly to acknowledged international / national research objectives.
Medium (perceived Regional Importance)	• 'Locally Listed' buildings or structures; • Conservation Areas containing buildings that contribute significantly to its historic character; • Designated special historic landscapes; • Assets that contribute to regional research objectives; or • Assets with regional value, educational interest or cultural appreciation.
Low (perceived Local Importance)	• Assets that contribute to local research objectives; • Assets with local value, educational interest or cultural appreciation; or • Assets that may be heavily compromised by poor preservation and / or poor contextual associations.
Negligible	• Assets with no significant value or archaeological / historical interest.
Uncertain (unknown)	• The importance / existence / level of survival of the asset has not been ascertained (or fully ascertained / understood) from available evidence.

39. It is important that there is a narrative behind the assessment, for example as a modifier (qualifier) for the heritage significance assigned to an asset, or the perceived magnitude of effect on the asset.

28.4.1.2 Magnitude of Effect (Change)

40. The classification of the magnitude of effect on known heritage assets takes account of such factors as:

- The physical scale and nature of the anticipated impact; and
- Whether specific features or evidence would be lost that are fundamental to the historic character and integrity of a given asset, and its understanding and appreciation.

41. Both direct physical and indirect non-physical (e.g. visual, setting) impacts on heritage assets are considered relevant. Impacts may be adverse or beneficial. Depending on the nature of the impact and the duration of development, impacts can also be temporary and / or reversible or permanent and / or irreversible.

42. The finite nature of archaeological remains means that physical impacts are almost always adverse, permanent and irreversible; the 'fabric' of the asset and, hence, its potential to inform our historical understanding, will be removed. By contrast, impacts upon the setting of heritage assets will depend upon the scale and longevity of the project and the sensitivity with which the landscape is re-instated subsequent to decommissioning / demolition, if applicable.

43. The indicative criteria used for assessing the magnitude of (negative) effect with regard to onshore archaeology and cultural heritage are presented in Table 28.4.

Table 28.4 Indicative criteria for assessing (adverse) magnitude of effect

Magnitude	Definition
High	• Total loss of or substantial harm to an asset; or • Complete and permanent loss of, or changes to, those characteristics of an asset's setting which contribute to its significance, such as could be caused by its disassociation with its historical setting.
Medium	• Partial loss of, harm to or alteration of an asset which will substantially affect its significance; or • Substantial changes to the key characteristics of an asset's setting, which falls short of being a total disassociation with the historical context, or a more total loss which is temporary and / or reversible.
Low	• Minor loss of or alteration to an asset which leave its current significance largely intact; or • Minor and / or short term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact.
Negligible	• Minor alteration of an asset which does not affect its significance in any notable way;

Magnitude	Definition
	or • Minor and short term, or very minor and reversible, changes to its setting which do not affect the key characteristics of the asset's significance.

44. The magnitude of positive effect with regard to archaeology and cultural heritage directly relates to the level of public value associated with an individual effect. Benefits may correspond directly to the project itself where a project will enhance the historic environment (e.g. through measures which will improve the setting of a heritage asset or public access to it) or ensure that a direct impact is avoided where possible (e.g. by ensuring archaeological / cultural heritage input into the iterative project design process so that route refinement / micrositing can be factored into the application boundary). Alternatively, benefits may occur on the basis of data gathering exercises undertaken for the purpose of a project which will enhance public understanding by adding to the archaeological record (e.g. through the accumulation of publicly available data). The measure of positive effect (high / medium / low) is, therefore, necessarily situational and specific to a given site, area or subject. For this reason, magnitude of positive effect is discussed within the narrative of the assessment according to criteria defined on a case-by-case basis, and not defined by overarching indicative criteria as for adverse magnitude of effect in Table 28.4.

45. One such example of a beneficial magnitude of effect specific to this project is the acquisition and coverage of the geophysical (magnetometer) survey data gathered to date as part of the priority programme agreed with NCC HES, which was targeted to cover the full 200m cable corridor under consideration as part of the PEIR. This has not only enabled the geophysical survey data (alongside aerial photo, cropmark and LiDAR data) to feed directly into the Iterative Design Process (cable routeing / refinement discussions and considerations) in order to avoid the most sensitive and significant known sub-surface archaeological remains wherever possible, as part of the project design (see section 28.7.2), but it has also resulted in a significant amount of new data, which will ultimately be made publicly accessible through the Norfolk Historic Environment Record (NHER) for both public and planning related enquiries.

28.4.1.3 Impact Significance

46. An initial indication of impact significance can be gained by combining the predicted magnitude of effect and heritage significance (importance) in accordance with the impact assessment matrix provided in Table 28.5.

Table 28.5 Significance of an impact resulting from each combination of receptor sensitivity (heritage significance) and the magnitude of the effect

		Negative magnitude of effect				Positive magnitude of effect			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Receptor Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

Table 28.6 Indicative (adverse) impact significance categories

Impact significance	Definition
Major	May equate to substantial harm or total loss of the value of a designated heritage asset (or asset potentially worthy of designation) such that development may not be consented unless substantial public benefit is delivered by the project. Effective / acceptable mitigation options are still likely to be possible, to offset and / or reduce residual impacts to satisfactory levels.
Moderate	Less than substantial harm to the value of a designated heritage asset (or asset potentially worthy of designation) such that the harm should be weighed against the public benefit delivered by the project to determine consent. Effective / acceptable mitigation options are likely to be possible, to offset and / or reduce residual impacts to satisfactory levels.
Minor	Harm to a designated or non-designated heritage asset that can be adequately compensated through the implementation of a programme of industry standard mitigation measures.
Negligible	Impact that is nil, imperceptible and not significant.
No Impact	No change, therefore no impact on receptor (asset) condition.

47. Where an impact is assessed as causing no discernible change to the receptor (asset) this is defined as “no impact” within the Potential Impacts section (section 28.7).

48. Note that ‘major’ and ‘moderate’ impacts are generally deemed to be significant in EIA terms for the purposes of this ES. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant (negligible) impacts as they may contribute to significant impacts cumulatively or through interactions between heritage assets or elements of the historic environment (or historic landscape).

49. Embedded mitigation (for example where potential impacts may be avoided where possible through detailed design, and hence heritage assets are therefore preserved '*in situ*', where possible, and / or through the use of trenchless crossing techniques (e.g. Horizontal Directional Drilling (HDD) for instance) will be referred to and included in the assessment of impacts as part of the ES and DCO application. If mitigation is not proposed (or none is possible) the residual impact will remain the same. If, however, mitigation is proposed then there will be an assessment of the post-mitigation residual impact, if / where required.

50. With regard to beneficial impacts, as outlined for magnitude in section 28.4.1.2, definitions will be dependent upon the level of public value relevant to a given area, site or subject and will be discussed within the narrative on a case-by-case basis.

28.4.1.4 Cumulative Impact Assessment

51. Potential cumulative impacts arising from the project are considered in line with Chapter 6 EIA Methodology. Potential impacts will be identified and assessed in terms of significance and magnitude using the same methodology outlined above and where appropriate potential mitigation measures outlined.

52. For further details of the methods used for the Cumulative Impact Assessment (CIA) for archaeology and cultural heritage, see section 28.8.

28.4.1.5 Transboundary Impact Assessment

53. No transboundary impacts are anticipated as a result of the project in respect to onshore archaeology and cultural heritage as the onshore project area is entirely within the UK and is not sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

28.5 Scope

28.5.1 Study Area

54. The onshore project area includes the following elements:

- Landfall;
- Onshore cable route, accesses, trenchless crossing technique (e.g. HDD) zones and mobilisation areas;
- Onshore project substation; and
- Extension to the Necton National Grid substation and overhead line modification.

55. Two study areas have been established for this assessment, defined as follows:

- Non-designated Heritage Assets study area: defined by a 500m boundary around (and including) the onshore cable route, the landfall and onshore project substation, a 50m boundary around (either side of) the accesses and 100m boundary around the cable logistics area (a storage area required during the cable pull phase) (Figure 28.2, maps 1-23).
- Designated Heritage Assets study area: defined by a 1km boundary around (and including) the onshore cable route, the landfall, onshore project substation and National Grid substation extension and overhead line modification works area (Figure 28.1, maps 1-9).

56. The non-designated heritage assets study area was determined based on previous experience and knowledge of similar projects and follows a standard approach. Both the non-designated and designated heritage assets study areas were set out in the WSI for ADBA (Royal HaskoningDHV, 2017a) and agreed previously in consultation with HE and NCC HES. With respect to designated heritage assets and specifically the setting of designated heritage assets, the initial study area was established relevant to assets within a 1km buffer of all onshore infrastructure. In some instances, highly designated heritage assets recorded beyond this 1km parameter have also been considered with respect to the potential implications of the project upon their heritage setting. Any heritage assets that lie beyond 1km from the onshore infrastructure which have been screened into the assessment are stated (sections 28.6, 28.7 and Appendix 28.7). The assessment has been undertaken with reference to the LVIA produced for the project and use of associated tool kits such as ZTVs and heritage specific viewpoints (see section 28.6.2.2, Appendix 28.7 and Chapter 29 Landscape and Visual Impact Assessment).

57. Due to the extent of the onshore project area and study areas subject to assessment, this chapter incorporates references to numbered mobilisation areas (MA ID) and trenchless crossing compounds (TC ID), which serve as useful points for reference and orientation to a given section of the onshore project area (see Figures 28.1 to 28.6).

28.5.2 Data Sources

58. The data sources consulted to inform this chapter, and the confidence levels associated with each data source, are presented in Table 28.7.

Table 28.7 Data sources

Data	Year	Coverage	Confidence	Notes
National Heritage List for England	Accessed January – June 2017; and September 2017 – April 2018	Designated heritage assets.	High. Comprehensive database of all heritage assets subject to designation within the study area.	Designated heritage assets were assigned a project-specific ID number (see Appendix 28.3).
NHER	Accessed 25/05/17; and September 2017 – April 2018	Non-designated heritage assets and historic landscape characterisation data.	Medium. The NHER is not a complete record of all surviving elements of the historic environment resource, but is a record of the discovery of a wide range of archaeological and historical components. It does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.	Non-designated heritage assets were assigned a project-specific ID number (see Appendix 28.4).
Local Authorities Heritage Conservation Areas	Accessed January – June 2017	Conservation Areas.	High. Conservation Areas within North Norfolk District Council, Broadland District Council and Breckland Council have been digitised from the available local authority resources on-line. Conservation Area plans were generally available in .pdf format.	Geographic Information System (GIS) Shapefiles were requested (20/06/2017) from North Norfolk District Council, Broadland District Council and Breckland Council for the Conservation Areas within each of the District Council areas. No shapefiles were available or have been received to date.
Regional, Local and Period Archaeological Studies and Journals	Accessed January – June 2017; and September	Historic and archaeological data consulted to inform the wider baseline context.	Medium. The studies / journals consulted do not constitute an exhaustive account of all historical /	Includes the East Anglia Archaeology and Norfolk Archaeology Journal Series.

Data	Year	Coverage	Confidence	Notes
	2017 – April 2018		archaeological data identified within the study area but inform upon the wider context, where relevant.	
The Archaeology Data Service	Accessed January – June 2017	Consulted to inform the wider baseline context and previous archaeological investigations in the study area.	Medium. A non-exhaustive directory of archaeological research undertaken in the wider environment of the study area.	The results of archaeological research projects in the wider area were incorporated into the baseline environment review and assessment of potential, where relevant.
The AHOB and PAB Projects	Accessed January – June 2017	Archaeological investigation on data for key Pleistocene sites in Britain that document early hominin occupation in north-western Europe.	High. Thorough evidence-based research based on available known archaeological / palaeoenvironmental data for Britain that document early hominin occupation. High confidence regarding the known resource but non-exhaustive account.	Consulted with respect to Happisburgh South and known sites of international importance, associated with the 'Cromer Forest Bed deposits'.
The Environment Agency's removal of failed sea defences – archaeological evaluation report re: Happisburgh (Birks, 2016)	Accessed June 2017	Archaeological investigation with a focus on the wider vicinity of the Happisburgh South landfall.	High. Targeted assessment of archaeological monitoring and borehole survey. An expert in Palaeolithic archaeology oversaw the borehole survey. High confidence in the data assessed, although restricted to the assessment area.	The results of this assessment were integrated into an account of the potential for geo-archaeological / palaeoenvironmental remains to exist at the landfall.
Other documentary sources relevant to the archaeological and historical background of the study area	Accessed January – June 2017; and September 2017 – April 2018	Historic and archaeological data from the wider area, from local investigations to region-wide assessments.	Medium. These studies / journals do not constitute an exhaustive account of all historical / archaeological data identified within the study area, but inform upon the wider context, where relevant.	Historic and archaeological data consulted to inform the wider baseline context.
Cartographic sources	Accessed	Historic mapping	Medium. Comprises 19th	Includes 19th century

Data	Year	Coverage	Confidence	Notes
(the NHER, NCC's Historic Map Explorer, Envirocheck Report and oldmapsonline.org)	June 2017; and September 2017 – April 2018	data for the study area.	/ 20th century mapping across the study area. Some cartographic data is fragmentary for the study area.	Enclosure and Tithe maps, and 1st, 2nd and later edition Ordnance Survey maps.
Aerial Photographic Data obtained from the HE Archive and the NHER, and ortho-rectified mosaics of vertical aerial photographs at Google Earth	Accessed April – June 2017	Aerial photographic data for the study area.	Medium. Aerial photographic evidence is limited by seasonal, agricultural, meteorological and environmental factors, which affect the extent to which either buried or upstanding archaeological features can be detected from the air. The visibility of archaeological features may therefore differ from year to year. Individual photographs often thus record only a small percentage of the actual extent of buried or upstanding features.	The archaeological assessment of this data was commissioned specifically for the project. This ES chapter integrates the results of the Aerial Photographic assessment undertaken by Air Photo Services. The full report is included as Annex 28.1.3 within Appendix 28.1.
LiDAR survey data	Accessed April 2017	LiDAR Data, available over *c.* 75% of the study area.	Low. The accuracy of the surface model derived from processing Lidar data is limited by the resolution of the original survey. The only area where 25cm resolution data was available was in the coastal region near Bacton, and even this finer model did not show significant extant archaeological features.	The archaeological assessment of this data was commissioned specifically for the project. This ES chapter integrates the results of the LiDAR assessment undertaken by Air Photo Services. The full report is included as Annex 28.1.3 within Appendix 28.1.
Geotechnical Data (geoarchaeological watching brief of onshore engineering GI works (Phase 1)	Survey undertaken July – August 2017	This project-specific survey focussed on two landfall sites at the Happisburgh South landfall and at seven key crossing locations where the current onshore cable route	Medium. The assessment sought to establish the presence and / or absence of deposits of archaeological and geoarchaeological potential (particularly deposits of Palaeolithic	See Appendix 28.6. Although the survey data are targeted and cannot be considered as providing a conclusive account on all deposits / material of

Data	Year	Coverage	Confidence	Notes
		intersects major transport routes or waterways where trenchless methods will be required.	age such as the Cromer Forest Bed 'CFB'). No deposits resembling the CFB were encountered in boreholes in the landfall areas. The landfall sediments were considered to be glacial in origin. These results tally with suggestions from the AHOB team that a large doline-type geological feature in filled with glacial deposits may be present.	geoarchaeological and palaeoenvironmental interest present or absent within the study area as a whole, data assessed indicates that if CFB do survive, they are likely to be found at significant depth.
Geotechnical Data (geoarchaeological watching brief of onshore engineering GI works (Phase 2)	Survey undertaken November 2017 - January 2018	This project-specific survey focussed on four proposed crossing locations at Wooden Copse, North Walsham and Dilham Canal, Kings Beck and Wendling Beck.	Medium. The assessment sought to further establish the presence and / or absence of deposits of archaeological and geoarchaeological potential.	Initial monitoring on some cable percussion boreholes was undertaken (at Crossing 3 Kings Beck, 4 Wendling Beck and 2 North Walsham and Dilham Canal), with no CFB related deposits being recorded. The main focus of interest was to be the window sampling works at CRS and Substation sites, but these were put on hold, so the geoarchaeological monitoring was halted to reserve resources pending reactivation of these sites.
British Geological Survey (BGS) data (surface geology)	Accessed June 2017	Focussed on the Phase 1 and Phase 2 GI works areas, outlined above.	Medium. BGS data is based on a wide range of datasets and is regarded with high confidence, although the accuracy of the extent of mapped deposits at a large scale is unknown.	The assessment of this data was broadly incorporated within the Phase 1 and Phase 2 geoarchaeological watching brief of onshore engineering GI works.
Geophysical Survey	Survey	*c*.164Ha of the	High. Ground conditions	The acquisition of

Data	Year	Coverage	Confidence	Notes
Data[2]	undertaken between October 2017 - March 2018	onshore project area (*c.* 536Ha in total) has been subject to pre-consent geophysical survey. This equates to some 31% of the onshore project area.	were generally good across the priority archaeological geophysical survey areas and the data quality is correspondingly good throughout (see Appendix 28.5).	this data was commissioned specifically for the project. The survey programme approach and methodology has been detailed in a survey-specific WSI, prepared in agreement with HE and NCC HES, which includes survey requirements, areas and methodologies as discussed during a meeting held on the 6th September 2017 with NCC HES.

28.5.3 Assumptions and Limitations

59. Data used to compile this ES chapter includes secondary information derived from a variety of sources. The assumption is made that the secondary data, as well as those derived from other secondary sources, are accurate enough to help inform assessment and the data sources have been previously agreed with NCC HES and HE.

60. The records held by the sources used in this assessment are not a record of all surviving heritage assets, rather a record of the discovery of a range of archaeological and historical components of the historic environment for the study area. The information held within these sources is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.

61. In support of the DCO application, an aerial photographic and LiDAR data assessment and priority geophysical survey programme have been undertaken to inform the baseline environment and impact assessment, as presented in this chapter. Whilst the results of these surveys highlight the potential for sub-surface remains and / or earthworks to be present across the onshore project area, their capacity to reveal archaeological features is dependent on a number of environmental and agricultural factors prevalent at the time of survey (see Appendix 28.1, Annex 28.1.1 and

[2] It has been calculated that c. 601.5 ha of the priority geophysical survey areas were surveyed, alongside an additional c. 11 ha of contingency areas. Excluding the contingency, this equates to c. 80.2% of the 750 ha outlined for priority survey (see Royal HaskoningDHV, 2017b) as agreed with NCC HES and HE.

Appendix 28.5). The potential for additional buried remains not indicated by the survey results must therefore not be discounted.

62. In addition, the geophysical survey data acquired to date has also been subject to access restrictions. Of the *c*. 750ha identified for priority archaeological geophysical survey, *c*. 150ha were not available for survey pre-consent, due to having been deep ploughed, still containing crops and / or wild bird cover, whilst access was not granted in others. Where warranted, and still relevant to the onshore project area, a number of these areas will be subject to survey post-consent, to be agreed in consultation with HE and NCC HES (see Outline WSI - document reference 8.5), the results of which will inform upon additional mitigation strategies, as and where required (see section 28.7.2). The onshore project substation and associated infrastructure will be considered as a priority area for geophysical survey post-consent due to no access being granted in the pre-consent stages of the project.

63. With respect to above ground archaeological and built heritage remains, it should be noted that it is not always possible to ascertain whether or not features are still extant (for example, a record may exist for a pillbox which has since been removed). Those heritage assets considered to represent potential above ground remains are therefore based on data available to date and may require verification as part of a ground-truthing exercise post-consent to ascertain what, if any, level of survival exists at their recorded locations.

28.6 Existing Environment

28.6.1 Introduction

64. The following section provides a summary of the known and potential archaeological and cultural heritage resource within the defined study areas. The baseline environment as presented below has been enhanced through the implementation of a staged programme of survey and evaluation, as outlined in the Method Statement (Royal HaskoningDHV, 2017) and agreed in further consultation with HE and NCC HES. For the purposes of the ES and DCO application this has included:

- The baseline data and information gathering exercise and assessment undertaken as part of the ADBA[3];
- A programme of aerial photographic and LiDAR data assessment;
- Site visits to inform a heritage settings assessment study;
- Two phases of geoarchaeological watching brief focussing on two sites at the landfall and seven key crossing locations as part of Phase 1 GI works and four proposed crossing locations as part of the Phase 2 GI works; and
- A priority programme of targeted archaeological geophysical survey.

65. Survey and evaluation of a more intrusive nature (initial informative stages of mitigation work) will be undertaken within the post-consent stage of the project (see 28.7.2 and Outline WSI document reference 8.5). Although the results of these post-consent surveys will not feed directly into the DCO application with respect to the historic environment baseline, they will directly inform the mitigation strategy to ensure that potential impacts upon the onshore historic environment arising from the project are fully identified, and mitigated where possible.

66. An inventory of known designated and non-designated heritage assets has been compiled using information from the data sources listed in section 28.5.2. The data were subsequently compiled into two gazetteers, one for designated heritage assets and another for non-designated heritage assets (Appendices 28.3 and 28.4) and incorporated into a project GIS using ArcGIS 10.5.1 so that they could be spatially analysed.

67. All heritage assets have been allocated a unique project-specific reference number as illustrated on the accompanying figures (Figure 28.1 and Figure 28.2). Further details can be found in the ADBA (Appendix 28.1). However, due to the refinement of the onshore project area, a number of the assets referred to in the ADBA (based upon the initial boundary), no longer fall within the study areas. These assets are nonetheless retained in the ADBA and inform the wider context of the baseline assessment. The original project-specific reference numbers attributed as part of the ADBA have been retained for cross-referencing purposes.

68. The archaeological periods referred to in the text are broadly defined by the following date ranges:

[3] The ADBA is a 'point in time' document prepared during the initial stages of the iterative project design process. The project description, study areas and baseline information referred to therein have thus been refined and superseded by those set out in this chapter.

- Palaeolithic: 960,000 BP – 8,500 BC;
- Mesolithic: 8,500 – 4,000 BC;
- Neolithic: 4,000 – 2,200 BC;
- Bronze Age: 2,200 – 700 BC;
- Iron Age: 700 BC – AD 43;
- Romano-British: AD 43 – 410;
- Early medieval (Saxon): AD 410 – 1066;
- Medieval: AD 1066 – 1499;
- Post-medieval: AD 1500 – 1799;
- 19th Century: AD 1800 – 1899; and
- Modern: AD 1900 – present day.

28.6.2 Designated Heritage Assets within the Study Area

69. There are 293 designated heritage assets within the Designated Heritage Assets study area (Appendix 28.3, Figure 28.1, maps 1 – 9) comprising:

- Two Scheduled Monuments;
- Three Registered Parks and Gardens (RPGs);
- 279 Listed Buildings; and
- 9 Conservation Areas.

70. Ten additional heritage assets recorded beyond the parameters of the Designated Heritage Assets study area (located in the wider vicinity of the onshore project substation and associated infrastructure) have also been subject to assessment. Their inclusion within this assessment was considered necessary to ensure that any indirect (non-physical) setting impacts upon these assets arising as a result of the onshore project infrastructure (specifically the onshore project substation) are captured and reported on given their highly designated status or due to their potential intervisibility with the onshore project substation. These heritage assets comprise three Scheduled Monuments and seven Listed Buildings, as follows:

- 'Two moated sites at Huntingfield Hall' (RHDHV 5, Scheduled Monument);
- 'Moated site 430m south-west of Bradenham Hall' (RHDHV 6, Scheduled Monument);
- 'Mona Hill' (RHDHV 7, Scheduled Monument);
- The 'Church of St. Andrew' (Bradenham) (RHDHV 34, Grade I Listed Building);
- The 'Church of St. Mary' (FranshamDHV 35, Grade I Listed Building);
- The 'Church of All Saints', Necton (RHDHV 36, Grade I Listed Building);
- The Church of St. Mary, Bradenham (1825);
- The Church of St. Andrew, Holme Hale (1826);
- The Church of All Saints, Fransham (1827); and
- Holme Hale Hall (and associated assets) (1828).

71. These assets have been included in the figures (Figure 28.1, map 9), the project gazetteer (Appendix 28.3) and are discussed further in relation to the settings assessment in section 28.6.2.2, where relevant.

72. Of the designated heritage assets captured in the project gazetteer, all but one are beyond the parameters of the onshore project area. The only designated heritage asset identified as having a direct interaction with the onshore project area (through being intersected by cable installation works) is the Blickling Conservation Area (356) (Figure 28.1, map 4 and Appendix 28.3). On the basis of this interaction, the character of the Blickling Conservation Area is discussed separately in section 28.6.2.1 below and informs the subsequent assessment of potential impacts of the project upon this designated heritage asset (see section 28.7).

28.6.2.1 Blickling Conservation Area (356)

73. As outlined in the Blickling Conservation Area Character Appraisal, '… *Conservation Areas can take on a much wider role in protecting larger areas of the countryside and in Norfolk historic parkland estates are suitable areas to be treated in this way*.' (Broadland District Council, 2007).

74. The Blickling Rural Conservation Area was first designated in June 1991 and was enlarged in 2007. With respect to the location and setting of the Conservation Area the Character Appraisal states:

75. '*The majority of the Conservation Area lies within an Area of Landscape Value as defined in the Broadland Local Plan. Blickling is one of a number of park or estate landscapes which occupy a belt between the rivers Wensum and Bure north west of Norwich. Blickling Hall and Park are a significant part of the Conservation Area but the wider landscape also has an influence on character*.' (Broadland District Council, 2007).

76. The primary focus of the Conservation Area is the Grade I Listed Blickling Hall (23), and the Conservation Area also covers and predominantly incorporates the Historic Park also named Blickling Hall (10), which is designated at Grade II* on the Historic England Register of Parks and Gardens (Figure 28.1, map 4). The area of the parkland encompasses much the same area today as it did in the mid-19th century.

77. Blickling Hall (23), the Parish Church of St. Andrew (49) and the village of Blickling are '*a natural focal point of the Conservation Area, but Silvergate to the south and the farms, mill and landscape along the Bure also contribute to the character of the area*.' (Broadland District Council, 2007).

78. The character of the Conservation Area is, however, undoubtedly dominated by Blickling Hall (23) as its centrepiece, as well as associated built heritage and related features within the park landscape (e.g. 24, 25, 48, 213, 214, 215, 216, 218 and 221), (see Figure 28.1, map 4).

79. In the wider Conservation Area '… *settlements have a small, linear character with, in general, two storey cottages*.' (Broadland District Council, 2007).

80. The onshore cable route runs across the southern extent of the Conservation Area, to the south and south-east of Blickling Hall (23) and Blickling Park (10), for approximately 3.8km over predominantly arable land (mainly tenant farmed and owned by the National Trust). Silvergate is perhaps the most significant element of the Conservation Area that falls in closest proximity to the onshore cable route. Silvergate has a more unified character than for example Oulton Street and its associated buildings, consisting as it does of 18th and 19th century estate cottages (e.g. 226). Whereas, '*the dispersed farmsteads which border the River Bure and the south western part of the Conservation Area are largely of 18th century date*.' and '… *Despite the presence of three villages or hamlets and several farmsteads, the Conservation Area has a strong rural character*.' (Broadland District Council, 2007).

81. Trenchless crossing zones (e.g. HDD) and associated indicative trenchless crossing compounds are located either side of the River Bure. On the western side the trenchless crossing zone features within the Conservation Area, towards its eastern most extent. There are also eight accesses that feature within the Conservation Area, varying in length and representing a mixture of construction and operation related, which will be used in order to gain access to the onshore cable route. Operation related vehicle movement will be far less in terms of volume, size of vehicle and frequency compared with that associated with the temporary construction period.

82. Under the description of 'landscape and the wider setting of the Conservation Area', the Conservation Area Character Appraisal goes onto state that:

83. '*Much of the woodlands associated with the park have a high beech content, though ash, oak, horse chestnut and conifers are all present. Blickling Park is especially noted for its veteran oaks and sweet chestnuts, and the narrow winding lanes often have veteran oaks within the hedgerows or in the fields. The latter is particularly true of the area south of Silvergate and north of Park Farm*.' (Broadland District Council, 2007).

84. The majority of Blickling Park (10) is located to the north, north-west and west of Blickling Hall (23). '*The park is effectively encircled by cultivated agricultural land mainly used for cereals and root crops. These fields can be large and past hedgerow removal has exacerbated the open feel of this part of the Conservation Area*.' With the exception of the River Bure crossing and Silvergate, this more recent agricultural character perhaps also most accurately reflects the landscape of the Conservation Area through which the onshore cable route will pass.

85. '*Apart from the park, grassland is largely confined to the water meadows along the River Bure and the watercourses north and south of Silvergate. Abel Heath on the southern boundary of the Conservation Area was historically a common and is a remnant of the land use which was once more widespread… In broad terms the subtle undulation of the landform, combined with the extensive woodlands of Blickling make it difficult to get an overview of the entire Conservation Area from any one location, even with the predominantly low cut thorn dominated hedges of the wider farmland*.' (Broadland District Council, 2007).

86. In the south-west of the Conservation Area through which the onshore cable route passes, '*views can be glimpsed at field gates or road junctions across farmland*.' However, away to the north and north-west, '*… it is from the park that the best overall impression of the landscape can be obtained*.' (Broadland District Council, 2007).

87. In terms of 'Detractors', The Conservation Area Character Appraisal states that '*the special character of the Conservation Area can be easily undermined by minor alterations such as unsuitable replacement windows and doors, use of inappropriate materials, unsympathetic paintwork*' and perhaps of most likely relevance to the construction of the onshore cable route '*the removal of walls, trees or traditional boundary features*.'

88. Features that already detract from the special character of Blickling Conservation Area include, '*overhead cables which detract from the appearance of Oulton Street and to a lesser degree have an impact at Silvergate*.' (Broadland District Council, 2007).

28.6.2.2 Settings Assessment (Designated Assets)

89. The onshore project area and onshore works will avoid direct physical impacts upon known (e.g. previously listed / scheduled) designated heritage assets. As such, with the exception of cable installation works through the rural and arable elements of the Blickling Conservation Area, no direct physical impacts are anticipated to occur to designated heritage assets. Although the construction of the onshore cable route through the Blickling Conservation Area represents a direct physical impact on the landscape character of this Conservation Area, with the implementation of proposed mitigation work (i.e. sensitive / controlled backfilling and reinstatement and the returning of field boundaries and hedgerows to their pre-construction condition - see Outline WSI document reference 8.5 and OLEMS document reference 8.7) , this impact will be temporary in nature and is not considered to constitute harm to the significance of the Conservation Area following the completion of construction works (see section 28.7 for further discussion).Designated heritage assets have also been considered as part of a heritage settings assessment, the results of which are discussed below, in Appendix 28.7 and incorporated into the impact assessment presented in this ES, thus enabling potential indirect non-physical impacts resulting from the project to be understood.

90. The heritage settings assessment initially focussed on all designated heritage assets (i.e. Scheduled Monuments, Listed Buildings, Conservation Areas and Historic Parks and Gardens), which are regarded as heritage assets with a high heritage significance, in line with criteria outlined in Table 28.3. Throughout the assessment, more detailed attention was given to those assets in the immediate vicinity of the above ground infrastructure and / or to those assets of significant height or those situated on particularly high ground, as this increases the chances of long range views (visual links) from such assets towards the above ground infrastructure options (e.g. the onshore project substation) and vice versa.

91. An overview of the settings assessment work undertaken previously as part of the PEIR in relation to designated heritage assets can be found within Appendix 28.1 (and Annex 28.1.1 of Appendix 28.1). Further details outlining the settings assessment process are provided in section 28.7 and in Appendix 28.7, the key points of which are summarised below. Non-designated assets have also been subject to settings considerations, with particular reference to those assets with perceived intervisibility with above ground infrastructure (e.g. the onshore project substation), further information on which is outlined in section 28.6.3.

28.6.2.2.1 Designated heritage assets subject to settings assessment

92. The assessment of a heritage asset's setting (and if / how it contributes to the asset's heritage significance) is based on a staged approach, as outlined in HE's guidance on the Setting of Heritage Assets: Historic Environment Good Practice Advice in

Planning Note 3 (Second Edition) (Historic England, 2017). This approach enables proportionate decision-making with respect to managing change within the setting of heritage assets.

Onshore project substation

93. Step 1 of the approach identifies which heritage assets and their settings are potentially affected. Those assets initially screened into the settings assessment on the basis of being potentially vulnerable to the onshore project substation and associated infrastructure with respect to their setting are as follows (Figure 28.1, map 9 and Figure 28.5):

- Two moated sites at Huntingfield Hall (5);
- Moated site 430m south-west of Bradenham Hall (6);
- Mona Hill (7);
- Church of St. Andrew, Bradenham (34);
- Church of St. Mary, Fransham (35);
- Church of All Saints, Necton (36);
- The Old Hall, Fransham (58); and
- Bradenham Hall (347).

94. Those underlined above have been identified and captured as heritage-specific viewpoints for further consideration and visual representation in this chapter (section 28.7 and Appendix 28.7).

95. Upon further cross referencing with the LVIA viewpoint locations for the onshore project substation, the majority were found to be to the south and south-west of the project substation and associated infrastructure locations (Chapter 29 Landscape and Visual Impact Assessment, Figure 29.4). As such a further check was also undertaken for areas where visibility is potentially greater based on the LVIA approaches / findings, i.e. those areas to the south of the substation, for example along or in the vicinity of St. Andrew's Lane and Hale Road.

96. As a result of this further check this brought the following assets into consideration (see Appendix 28.7, Figure 28.5):

- The Church of St. Mary, Bradenham (1825);
- The Church of St. Andrew, Holme Hale (1826); and
- Holme Hale Hall (and associated assets) (1828).

97. As above, those underlined have been identified and captured as heritage-specific viewpoints for further consideration and visual representation in this chapter (section 28.7 and Appendix 28.7).

98. The cultural heritage specific viewpoints identified, captured and subject to assessment as part of this ES chapter are shown in Table 28.8.

Table 28.8 Cultural Heritage Viewpoints

Viewpoint Name	Cultural Heritage Viewpoint No.	British National Grid (BNG)	
		Easting	Northing
Church of St Andrew, Bradenham (34)	CH1	591711	309148
All Saints, Necton (36)	CH2	587872	309726
Old Hall, Fransham (58)	CH3	590191	311793
The Church of St Mary, Bradenham (1825)	CH4	593069	308410
The Church of St Andrew, Holme Hale (1826)	CH5	588711	307543
Hale Road, East of Holme Hale	LVIA Viewpoint (10)	590576	307795

99. Finally, with respect to the onshore project substation and associated infrastructure, the following assets to the north and north-east were also subject to further checks (Figure 28.1, map 9 and Figure 28.5):

- Wendling Abbey, Scheduled Monument (4); and
- The Church of All Saints, Fransham (1827).

100. Section 28.7 and Appendix 28.7 details and describes the assets identified above in more detail, including their heritage significance and setting. It also includes the outcome of the settings assessment process in each case (taking primarily intervisibility into account with the onshore project substation and associated infrastructure which is considered to represent the Worst Case Scenario (WCS) with regards to the setting of heritage assets insofar as it represents the introduction of new above ground infrastructure into the landscape), and includes whether further action was required or not beyond the initial stage(s) of the stepped approach to the heritage setting assessment.

101. In brief summary, however, none of the assets identified above were found to share intervisibility with the onshore project substation and associated infrastructure, and due to their distance from the above ground onshore project infrastructure, no impacts to heritage setting (and associated significance) were identified and no further action is considered to be required. This is, however, further evidenced in section 28.7 and Appendix 28.7.

102. Cultural Heritage Viewpoint No. 1 (CH1) (Appendix 28.7) does, however, show a very small corner section of the proposed Norfolk Boreas substation as being visible in the photomontage view (seen at a distance of c. 1.6 km) from the grounds of the Church

of St Andrew, Bradenham (34). This will be further assessed as part of the Norfolk Boreas project, PEIR and subsequent ES.

103. Cultural Heritage Viewpoint No. 3 (CH3) (Appendix 28.7) shows a corner section of the proposed Norfolk Vanguard substation as being visible in the photomontage view (seen at a distance of c. 1.25 km), on the same level as the existing tree line. Viewpoint CH3 is located on the field boundary to the south-west of Old Hall (58), and visibility from the Hall itself is considered unlikely, as it is enclosed by outbuildings, farm sheds and a certain degree of tree cover. This view should also be seen in the context of the existing overhead powerlines featuring prominently within views in this direction.

Construction works

104. The designated heritage assets shown in Table 28.9 have been screened into the settings assessment (section 28.7) on the basis of their proximity to construction works (excluding those in relation to the onshore project substation, National Grid substation extension and overhead line modification which are captured above).

Table 28.9 Heritage assets screened into settings assessment with regards to construction works

Construction works	Heritage Assets
Landfall (Figure 28.1, map 1)	Happisburgh Conservation Area (352), including: Happisburgh Manor RPG (8); St. Mary's including 2 Summerhouses (38); the Encircling Wall to St. Mary's (37); and the Church of St. Mary, Happisburgh (11)
	Happisburgh Lighthouse / Lighthouse Cottages (61)
Onshore cable route, trenchless crossing zones and mobilisation zones (Figure 28.1, map 1-9)	Church of St. Peter, Ridlington (13)
	Friends Meeting House, North Walsham (43) and the Thatched Cottage (117). Including the non-designated Old Quaker Burial Ground (1408)
	Keepers Cottage (145)
	Church of St. Botolph, Colby (20)
	Aylsham Conservation Area (355)
	Abbots Hall Farmhouse (156)
	Blickling Conservation Area (356)
	Salle Park (9) / Salle Park (52)
	Pettywell Farm and associated buildings (307, 308, 309 and 310)
	Scarning Dale (346)
Accesses (construction and operation) (Figure 28.1, map 1-9)	Colby Hall Farm House and adjoining outbuildings (148)
	Blickling Hall Registered Park and Garden (10)
	Blickling Conservation Area (356)
	Flashpit Farmhouse (206)
	Old Hall Farmhouse (325)

28.6.2.3 Heritage Significance (Importance)

105. Based on the criteria shown in section 28.4, the designated heritage assets outlined in section 28.6.2.2 (Figure 28.1, map 1-9) are considered to be assets of high heritage significance with perceived national importance.

28.6.3 Non-Designated Heritage Assets and Archaeological Potential within the Study Area

106. There are 712 non-designated heritage assets recorded within the non-designated heritage assets study area, of which 179 fall within or intersect the onshore project area. These assets are shown on Figure 28.2 (maps 1 – 24) and are detailed in a gazetteer in Appendix 28.4. These assets have been assessed alongside various source material outlined in section 28.5.2 and referenced in section 28.12 in order to inform an archaeological and historical baseline account of the study area and onshore project area.

107. Table 28.10 draws out areas of archaeological potential identified in the ADBA (Appendix 28.1) and provides a high-level overview of the nature of archaeological evidence for each archaeological period, with reference to notable non-designated heritage assets. Not all assets are discussed within the table, but all are tabulated within Appendix 28.4 and / or Appendix 28.1, Annex 28.1.2 depending on their recorded location in relation to the study area[4].

[4] In order to provide an archaeological and historical context for the wider project area, reference may be made to non-designated heritage assets that are recorded beyond the study area parameters as assessed in this ES chapter. Those within the onshore project area red line boundary are stated as such. Assets beyond the study area were included as part of the ADBA, with further information provided in the relevant gazetteer (Annex 28.1.2).

Table 28.10 Summary of areas of archaeological potential and evidence by period

Period	Summary of potential and evidence
Palaeolithic	Palaeolithic discoveries in the study area indicate that potential archaeological material of this date will most likely to be representative of subsistence activities associated with a nomadic lifestyle. The study area at the landfall is recognised as an internationally important region for Lower Palaeolithic archaeology. This importance is due to a number of discoveries, including a footprint surface in Early Pleistocene estuarine muds (RHDHV 367), which provides indirect anatomical evidence of the first hominins in northern Europe. *In situ* laminated silts, considered to be laterally equivalent to the estuarine muds in which the footprints were recorded, have been recorded in the Happisburgh area (Birks, 2016: 16) and sediments of the Cromer Forest-bed Formation are known to be intermittently exposed in this area of the coast. The lithic working site known as 'Happisburgh 1' (RHDHV 372) provides further evidence for *in situ* remains in the study area of this date. However, although the potential for encountering *in situ* discoveries of a Lower Palaeolithic date in the coastal region cannot be discounted in the vicinity of the Happisburgh landfall location, the results of the Phase 1 geoarchaeological watching brief of GI works revealed no deposits resembling the CFB Formation (a pre-glacial deposit of Palaeolithic age) in the boreholes undertaken in the landfall areas (Appendix 28.6). The assessment concluded that if CFB deposits do survive, they will be found at significant depth. Artefactual remains attributed to the Middle and Upper Palaeolithic are less frequent in the archaeological record of the study area, and are predominated by isolated and presumably derived lithic discoveries. The evidence base thus indicates that further material of this date within the study area will be predominated by isolated finds, although the *in situ* remains of a mammoth and associated Mousterian stone tools and debitage discovered within fill deposits of a palaeochannel at Lynford Quarry, Mundford (Boismier *et al*., 2012) in the wider environs of the study area suggests that *in situ* material cannot be discounted. Upper Palaeolithic finds across East Anglia as a whole are poorly represented. As such, discoveries of this date are likely to be rare.
Mesolithic	Mesolithic discoveries in the study area are likely to be representative of activities associated with a nomadic / seasonal hunter-gatherer lifestyle. The archaeological record primarily consists of lithic artefacts, with evidence for pits, hearths and traces of ephemeral structures rare in Norfolk as a whole (Dennis, 2006). Mesolithic finds within the study area comprise isolated lithic artefacts. Potential Mesolithic discoveries are therefore likely to be isolated and / or derived in nature, although the discovery of larger Mesolithic assemblages in the wider area such as those at Kelling Heath (North Norfolk Coast) and Great Melton (west of Norwich) suggest that the potential larger assemblages should not be discounted.
Neolithic	Neolithic discoveries in the study area are likely to be representative of agricultural settlement of an increasingly sedentary nature, revolving around more static farming activities. Evidence representative of ritual activities is also possible. The archaeological record of the study area predominantly comprises discoveries relating to lithic artefacts, scattered variously across the study area with no significant areas of concentration apparent. However, the archaeological record also indicates an increase in landscape features from this date onwards, in the form of long and later round barrows which could have served as territorial markers as well as a means to inter the dead (Aldridge, 2005). The potential remains for further barrows of this date to exist within the study area. Such sites are likely to be visible in the form of cropmarks, which are at present either currently unidentified and / or undated. The aerial photographic and LiDAR data assessment identified two features of possible

Period	Summary of potential and evidence
	Neolithic date within the study area; comprising two possible long barrows (AP 209 / RHDHV 570 and AP 235 / RHDHV 574) and a possible enclosure (AP 254 / RHDHV 621).
Bronze Age	Bronze Age discoveries in the study area are likely to be representative of activities associated with settlement, subsistence and ritual activity, with the introduction of bronze metalworking, changes in pottery styles, the increased occurrence of single burial traditions and changes in monumental building. The archaeological record for the study area is predominated by ring ditches / round barrow features. Other finds include isolated stone and metal artefact discoveries. Other landscape features of this date are rare, with some indications for small farmsteads. On the basis of this evidence, potential sites and finds of this date are likely to be in the form of round barrows, either currently unidentified and / or undated likely to be visible in the form of cropmarks or isolated artefactual remains. The aerial photographic and LiDAR data assessment identified numerous ring-ditch features of possible Bronze Age date within the study area, one of which is within the onshore project area (AP 270).
Iron Age	Iron age discoveries in the study area are likely to be representative of activities associated with settlement and subsistence, with the introduction of artefactual evidence in the form of weapons and tools made out of iron. Settlements of the period likely formed small farmsteads and villages, with a few larger settlements or towns known as oppida sites developing in the late Iron Age. The archaeological record within the study area comprises numerous cropmarks identified as field boundaries, trackways and enclosures of Iron Age date, with evidence of settlement in the form of a possible round house (RHDHV 824) and a number of farmsteads. Artefactual remains comprise various artefacts with a scattered distribution throughout the study area, many of which comprise a multi-period assemblage. It is considered that potential sites and find spots of Iron Age date in the study area will most likely comprise evidence of farming-related activities, such as trackways and field boundaries shown as either currently unidentified and / or undated cropmarks. Evidence for small scale settlement (e.g. in the form of post-holes suggestive of a round house) is also possible. Artefactual discoveries of this date are also possible. The aerial photographic and LiDAR data assessment identified a number of features of possible Iron Age date within the study area, indicative of settlement and / or farming activities during this period. Of those identified, eight lie within or intersect the onshore project area (AP 6 / RHDHV 811, AP 80, AP 91, AP 231, AP 234, AP 240, AP 250 and AP 262).
Romano-British	Romano-British discoveries in the study area are likely to be representative of a continuation of farming activities alongside an intensification of settlement, production-related activities and an increase in military presence. The archaeological record for the study area largely includes evidence for field systems, boundaries, trackways and farmsteads signifying the continuation of farming activities in the area as well as small-scale settlements. Military presence in the study area is rare, provided by a probable Roman fort (AP 29 / RHDHV 837) located south of the onshore project area between Reepham and Aylsham. This evidence indicates that potential sites and finds of this date are expected to be predominated by features signifying farming activities in the study area, with artefactual remains also possible. The aerial photographic and LiDAR data assessment identified a number of features of possible Romano-British date within the study area, indicative of settlement and / or farming activities during this period. Of those identified, 14 lie within or intersect the onshore project area (AP 6 / RHDHV 811, AP 34, AP 80, AP 91, AP 120, AP 131, AP 137, AP 225, AP 231, AP 233, AP 234, AP 240, AP 250 and AP 262).
Saxon	The Saxon period is characterised by the migration of Saxon, and later Norse and Danish settlers into Britain, which saw the establishment of a network

Period	Summary of potential and evidence
	of trade and migration routes to the Continent. Discoveries in the study area, where present, may be representative of settlement, production, agricultural or ritual activities. The archaeological record for this period is relatively sparse, with a predominance of findspots. Features of this period are rare, and where present, commonly relate to field boundaries. Evidence of settlement, including a possible Early Saxon grubenhauser (sunken featured building) in Happisburgh (RHDHV 955) are present in the wider area, as is the presence of religious and / or ceremonial activity (RHDHV 956, 977 and 988). This evidence suggests that potential discoveries will likely occur in the form of field boundaries represented by cropmarks, although the potential for significant Saxon sites to be discovered should not be discounted, as indicated by the discovery of a Saxon cemetery site at Fulmodeston during the Dudgeon Offshore wind farm (Onshore Electrical Connection) project and the Anglo-Saxon Cemetery at Tittleshall found along the route of the Bacton to King's Lynn Gas Pipeline. The aerial photographic and LiDAR data assessment identified numerous undated features which may be assigned to the Saxon period, such as a linear feature to the north of the onshore project area (AP 238), south-west of Bacton, which may date from the Saxon period, although later dates are also possible.
Medieval	Medieval discoveries in the study area may be representative of the development growth of a number of East Anglian towns into busy trading centres, with discoveries representative of production and farming activities also possible. The archaeological record for the study area includes numerous settlements, tofts, buildings, manors, moats, chapels, enclosures and field boundaries, although findspots continue to dominate the record. Evidence suggests that potential archaeological sites and finds within the study area will most likely comprise features representative of farming activities, with evidence for settlement and production-related activities also possible. Artefactual discoveries of this date are likely to occur. The predominance of land-use of an agricultural nature is supported by the results of the aerial photographic and LiDAR data assessment, which identified numerous features considered to represent former field systems of possible medieval date within the study area, of which 16 such sites are identified within or intersecting the onshore project area (AP 1 / RHDHV 1015, AP 6 / RHDHV 811, AP 42 / RHDHV 1038, AP 78, AP 80, AP 84, AP 91, AP 116, AP 120, AP 128, AP 136, AP 137, AP 162, AP 164, AP 220 and AP 237).
Post-medieval and 19th century	Post-medieval discoveries in the study area may be representative of advances in transport, communications, industry and agriculture. This period is characterised by the Industrial Revolution. Agriculture also took on a more prominent role during this period, with East Anglia at the forefront of the 'Agricultural Revolution' in the 18th century with the improved communications developed to serve the farming economy and to facilitate the diverse trade of Norfolk (Gilman, 1997:67). The archaeological record for the study area is varied and includes records relating to transport (e.g. the introduction of the railway), industry (e.g. production represented by mills, brickworks etc.), settlement, religious activity and agriculture. A review of cartographic sources indicates that potential archaeological discoveries of this date will most likely relate to agricultural activities which characterised a vast extent of the land-use during this period, with the potential for artefactual remains also possible. The discovery of other such features should not be discounted but are not expected to predominate.
Modern	Modern discoveries in the study area are likely to be representative of the two World Wars.

Period	Summary of potential and evidence
	The archaeological record comprises a predominance of defensive measures employed in the area, including pill boxes, spigot mortar / gun emplacements, tank traps (e.g. anti-tank ditches and blocks), barbed wire, search light batteries and observation posts. The introduction of aviation-related assets is also witnessed in this period, as indicated by Oulton Airfield (RHDHV 1816) which intersects the onshore project storage area boundary. Potential archaeological remains of this date within the study area can be expected to be varied. Currently unknown sites may include the sites of no longer extant military infrastructure, which may be visible as cropmarks, or on aerial photographic / LiDAR data.

28.6.3.1 Potential Sub-Surface Archaeological Remains

108. An understanding of the nature, extent and character of below ground archaeological remains is limited by their very nature of being buried and as such, there is an intrinsic 'unknown' factor relating to this resource. In order to assess the potential presence of sub-surface archaeological remains within the project area, the results of the aerial photographic and LiDAR data assessment (Appendix 28.1, Annex 28.1.3), the archaeological assessment of geophysical survey data (Appendix 28.5) and the records for non-designated heritage assets as recorded by the NHER were considered, alongside historical cartographic sources for the onshore project area.

109. The purpose of this cross referencing exercise was to identify areas in which there is considered to be heightened potential for currently unrecorded / unconfirmed archaeological remains to be discovered based on available data with a view to enhancing this understanding and further informing embedded and additional mitigation strategies in a manner that is both appropriate and proportionate to the remains that may be present and the condition in which they may survive.

110. In order to provide an overview of sub-surface archaeological potential within the context of the project, the onshore project area has been conceptually divided between the landfall and onshore project substation by mobilisation area (MA) (which are shown on Figures 28.1 – 28.4), as follows:

- The Onshore project substation;
- Onshore project substation to MA 1b;
- MA 1b to MA 2;
- MA 2 to MA 3;
- MA 3 to MA 4;
- MA 4 to MA 5a;
- MA 5a to MA 5b;
- MA 5b to MA 6;
- MA 6 to MA 7;
- MA 7 to MA 8;
- MA 8 to MA 9;
- MA 9 to MA 10;
- MA 10 to MA 10a;
- MA 10a to MA 11;
- MA 11 to Landfall; and
- Landfall.

111. Key aspects relating to potential sub-surface archaeology for each area outlined above have been drawn out, as indicated by available data, and are detailed in Appendix 28.8.

112. The aerial photographic and LiDAR data assessment identified 270 sites of possible archaeological interest within the original (much wider) survey area (Figure 28.4, maps 1 – 24). These sites were each allocated a unique project-specific site number (Aerial Photographic (AP) ID) as referred to in Appendix 28.8. The aerial photographic and LiDAR data assessment results informed upon a priority programme of geophysical survey undertaken pre-consent, as part of the non-intrusive evaluation work undertaken for the project. Appendix 28.8 therefore also contains a high-level review of the geophysical survey results in association with the aerial photographic and LiDAR data assessment. The archaeological assessment of geophysical survey data tabulated the areas surveyed with a project-specific field number (assigned by Headland Archaeology, the geophysical survey contractor). Reference to these field numbers, and the archaeological features (anomalies) potentially present therein, are also included in Appendix 28.8. Twenty distinct Areas of Archaeological Activity (AAA) were also identified as part of the archaeological assessment of geophysical survey data, ranging from individual features to extensive areas of settlement or enclosure. Reference to these AAAs, where relevant, are also included in Appendix 28.8. A more detailed narrative of the results of both the aerial photographic and LiDAR data assessment and the archaeological assessment of geophysical survey data can be found in Appendix 28.1 (Annex 28.1.3) and Appendix 28.5, respectively. Reference is also included to data held by the NHER in Appendix 28.8, where relevant.

113. Appendix 28.8 identifies those features that are within or intersect the refined onshore project area (red line boundary) considered within this ES. Those within or intersecting the onshore project area are considered to have a potential interaction ('pathway') between receptor (asset) and the project and are taken forward into the impact assessment for further review and consideration (section 28.7).

28.6.3.2 Above Ground Non-Designated Heritage Assets

114. In order to assess the potential for the project to physically impact any above ground non-designated heritage assets, the NHER records and aerial photographic and LiDAR data assessment results were consulted with a view to identifying those which may relate to above ground archaeological and built heritage remains (extant structures / features, buildings and earthworks). It should be noted that due to the nature of the archaeological record, it is not always possible to ascertain whether or not features are still extant (for example, a record may exist for a pillbox which has since been removed). Those heritage assets considered to represent potential above ground remains are therefore based on data available to date and may require verification as part of a ground-truthing exercise post-consent to ensure what, if any, degree of survival exists at their recorded locations.

115. The non-designated heritage assets (considered to be representative of above-ground remains) identified within or intersecting the onshore project area are shown below in Table 28.11.

Table 28.11 Above ground non-designated heritage assets within the onshore project area

RHDHV ID / NHER / AP ID	Name	Description / Justification for Inclusion	Anticipated Heritage Significance
RHDHV 1101 NHER 29500 Figure 28.2 (map 8)	Undated earthworks and post-medieval bank.	Described in the NHER as a 'hollow way extending south from farm buildings, for approximately 200m... 0.3m deep and banked in part on both sides. Higher level to west than to east. Appears to correspond to common edge roadway shown on Faden's map'.	Low - Medium
RHDHV 1379 NHER 7361 Figure 28.2 (map 16)	Sparham Limekiln.	A post-medieval limekiln that ceased to function in the 19th century and was then converted into two cottages. The NHER refers to the demolition of the upper cottage - no mention is made of the lower cottage.	Low
RHDHV 1456 NHER 55475 Figure 28.2 (map 4)	Witton Park.	Witton Park is described in the NHER record as having been 'partially destroyed through compulsory ploughing during World War II'. This indicates that elements of the park may still remain.	Low
RHDHV 1529 NHER 15918 Figure 28.2 (map 1)	World War Two pillbox.	A Type 26 pillbox recorded as 'still present' in the NHER and visible on satellite imagery for the area.	Low
RHDHV 1559 NHER 40950 Figure 28.2 (map 18)	World War Two buildings and the site of a World War Two antenna array.	The NHER states that 'some of the buildings survive but are derelict'.	Low
RHDHV 1673 NHER 50412 Figure 28.2 (map 3)	Series of low banks in Witton.	Described in the NHER as a 'series of low banks, 0.2 - 0.3 metres high, up to 2 metres spread, forming incomplete enclosures'. Last visited and surveyed in 1993, as part of an earthwork survey conducted by B. Cushion.	Low

RHDHV ID / NHER / AP ID	Name	Description / Justification for Inclusion	Anticipated Heritage Significance
RHDHV 1682 NHER 7295 Figure 28.2 (map 22)	Smugglers' Lane.	The landowner has indicated that a section of this feature survives as a hollow way (earthwork). This asset has been assigned a precautionary medium heritage significance until such a time as the survival and condition of this feature can be more fully ascertained.	Medium
RHDHV 1816 NHER 7364 Figure 28.2 (map 11)	Oulton Airfield.	The NHER states that 'the runways were used as foundations for battery farm sheds. Some of the buildings remain, including the control tower'. The record also notes that the 'Hangar remains to the south-east. Several Nissen huts visible.'	Low - Medium
AP 6 RHDHV 811 NHER 2999 Figure 28.4 (map 16)	Extensive area of likely multi period eroded field boundaries, tracks, ditches and possible enclosures.	Three slight banks are recorded running parallel to one another in a north-south orientation across the cable route. A possible candidate for Earthwork Condition Survey, post-consent.	Medium - High
AP 48 RHDHV 1615 NHER 36454 Figure 28.4 (map 8)	A series of former field boundaries and trackways of unknown date. These features are likely to be more widespread than their visible extent.	A possible former field boundary recorded as a bank / earthwork is mapped intersecting (perpendicular to) the proposed cable route.	Low

116. There are also records relating to a number of linear features across the onshore cable route, predominantly comprising former railway lines, often dismantled and no longer extant, (RHDHV 1490, 1499, 1501, 1494, 1498, 1486 and 1487). Although the majority of these railway lines are no longer in use, a number of former railway buildings are still present (e.g. in relation to RHDHV 1494). The location of these structures is not 100% clear from the records and their existence may need to be verified as part of post-consent initial informative stages of mitigation should an impact upon these assets be considered possible to occur. These heritage assets are subject to consideration in section 28.7.

28.6.3.3 Settings Assessment (Non-Designated Assets)

117. In addition to the potential for non-designated heritage assets to be subject to direct physical impacts as a result of the project, indirect non-physical impacts also have the potential to occur. In view of this potential, as outlined in section 28.6.2.2, select non-designated heritage assets which may be subject to indirect impacts with regards to their settings have also been considered as part of the heritage settings assessment. The following non-designated assets have been identified as potentially being vulnerable with regards to their setting:

- Onshore cable route and associated trenchless crossing technique (e.g. HDD) and mobilisation areas:
    - Barn, opposite the east wall of Ridlington churchyard (1423);
    - Witton Park (1456);
    - Old Quaker Burial Ground (1408); and
    - The Kerdiston Cross (1041).
- Access Routes:
    - Cottages associated with Old Hall Farm House (1394); and
    - Park Farm (1449).

118. The anticipated level of impact significance is, however, considered to be negligible, with the exception of the Burial Ground (1408), which is considered further in section 28.7 below. The duration of the impact on these assets is confined to the length of construction programme only within the sections of the onshore cable route in which they are situated.

28.6.4 Historic Landscape Characterisation

119. The Historic Landscape Character (HLC) (Figure 28.3, maps 1 – 9) of the non-designated heritage assets study area can be summarised as comprising the following broad character types:

- 18th – 19th century enclosure;
- 20th century agriculture;
- Built up areas – historic;
- Built up areas – modern;
- Coastal – managed wetland;
- Commons, wastes and heaths;
- Historic earthwork;
- Horticulture;
- Industry;
- Inland – drained enclosure;
- Inland – managed wetland;
- Marginal;
- Military;
- Mineral;
- Parks, gardens and recreation;
- Pre-18th century enclosure;
- Water features; and
- Woodland.

120. The non-designated heritage assets study area is predominantly characterised by 20th century agriculture, with post-medieval enclosures of an 18th and 19th century date also well represented. Further information regarding HLC can be found in Appendix 28.1, which divided the study area into four principal areas (Areas 1 – 4) so that the character could be analysed in a manner that can be more meaningfully understood than that afforded by a broad scale characterisation of the study area as a whole.

121. The predominant HLC types of 20th century agriculture and post-medieval enclosures of an 18th and 19th century date are anticipated to be able to accommodate a temporary level of change to HLC during construction with fields / areas being returned to their preconstruction condition and character post-construction, as part of a sensitive programme of backfilling and reinstatement / landscaping. Certain hedgerows and field boundaries (e.g. parish boundaries) may require recording prior to the construction process and enhanced provisions made during backfilling and reinstatement.

28.6.5 Anticipated Trends in Baseline Conditions

122. The existing environment for onshore archaeology and cultural heritage in section 28.6 has been shaped by a combination of factors, with the most prevalent considered to be previous land use and onshore development activity (see Appendix 28.1, section 28.6.3).

123. For the majority of the study area(s), the predominant form of previous impacts to buried archaeological remains from former and current land use are likely to have arisen as a result of farming regimes and activities such as ploughing. For the most part, the onshore project area has been subject to heavy agricultural use, and the aerial photographic and LiDAR assessment results indicate a marked plough erosion effect across the whole area (see Appendix 28.1, Annex 28.1.3). Given that the study area(s) extends across a largely rural landscape, the trend in agricultural land use is likely to continue. Although agricultural (farming) activities have the potential to result in the gradual degradation and / or disturbance of sub-surface archaeological remains, due to the longevity of agricultural activity within and surrounding the onshore project area, physical impacts upon buried archaeological remains are considered likely to have largely already occurred resulting in their loss in part or to disturbing relationships between assets and their wider surroundings. Depending on the depths of modern farming practices, it is possible that ongoing impacts are occurring, resulting in new and further loss and / or disturbance, especially where deep ploughing activity is employed.

124. The landfall element of the onshore project area has also been subject to rapid coastal erosion, thought to at least in part arise as a result of sea-level and climate change. Historical records indicate the loss of over 250m of land between 1600 and 1850 at Happisburgh (http://www.bgs.ac.uk/landslides/happisburgh.html), with the parish of Whimpwell (formerly to the east of Happisburgh), long since eroded away with many once terrestrial heritage assets lost to the sea. Coastal erosion will likely continue, resulting in the erosion and exposure of heritage assets currently present within and along this stretch of the coastline. The sub-surface archaeology which is exposed, investigated and recorded to professional standards may, however, be considered a public benefit in terms of understanding of and building upon the archaeological record, as at Happisburgh and Pakefield for example, and certainly preferable to assets and remains being lost altogether.

125. The development of both small and larger scale modern infrastructure within the onshore project and surrounding areas has also shaped the existing environment, with the historic environment having been and continuing to be vulnerable to the impacts of development in both a physical (direct) and non-physical (indirect - e.g. relating to the setting of heritage assets) manner. With regards to physical impacts, many developments undertaken to date have resulted in the uncovering and discovery of a range of archaeological sites, monuments, features and find spots, as recorded within the NHER. Those identified and archaeologically recorded to date are included within the baseline conditions outlined in section 28.6.

126. The onshore project area passes adjacent to a number of urban centres and 21st century expansion is considered likely to continue to further alter the hinterland of

many such towns into larger areas of modern settlement. Other developments (e.g. industrial development, modern highway development / expansion) may also occur. However, due to the policy trend in the UK (see section 28.2), which recognises that heritage assets are an irreplaceable resource, it is anticipated that whilst the development of modern infrastructure will likely result in some large scale changes to buried archaeological remains, the information acquired from any archaeological site or feature subject to direct impact will be retained and made publicly available following proportionate mitigation approaches, recorded in the NHER and considered as part of the baseline resource. Development also presents opportunities to develop and further enhance the archaeological record.

127. There is a requirement in UK policy to take into account the desirability of sustaining and enhancing the significance of heritage assets and their setting (see section 28.2). As such, the historic character and setting of heritage assets may be subject to change, although the degree of change will depend on the public benefit of proposed developments as part of a weighted approach to decision making, in order for sustainable development to take place and for heritage assets to be safe-guarded in a manner that is both proportionate and appropriate to the significance of known assets, as well as any new sites / remains identified, their level of survival, as well as other factors.

128. The baseline conditions for onshore archaeology and cultural heritage (particularly with respect to non-designated sub-surface remains) are therefore considered to be subject to a gradual decline on the basis of ongoing land use and development within the onshore project and surrounding area, although the degree to which any change is likely to occur is difficult to predict based on information available to date. The sensitivity of onshore archaeology and cultural heritage as a non-renewable resource has been considered within this chapter and informs the embedded and ongoing mitigation strategy to be further developed and adopted by the project post-consent (see section 28.7.2) so that impacts can be avoided, reduced or offset, as and where appropriate.

28.7 Potential Impacts

28.7.1 Introduction

129. This section outlines potential impacts as a result of the project and their significance, using the assessment methodology described in section 28.4 and Chapter 6 EIA Methodology. Impacts to onshore archaeology and cultural heritage could include direct impacts to non-designated heritage assets, indirect impacts on both designated and non-designated heritage assets and changes to HLC.

28.7.1.1 Direct Impacts

130. Direct impacts, as stated in the NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b: 49), encompass direct effects from the physical siting of the project. Potential direct impacts thus comprise both direct damage to archaeological deposits and material and the disturbance or destruction of relationships between deposits and material and their wider surroundings. This may include buried archaeological remains. Consequently, all aspects of the project which involve intrusive groundworks have the potential to directly impact archaeological receptors (heritage assets).

131. Direct impacts to designated heritage assets (receptors) are not anticipated to occur as these receptors will be avoided, with the exception of cable installation works through landscape character elements of the Blickling Conservation Area (which will need to be sensitively managed and subject to full, thorough and strictly controlled backfilling and reinstatement) (as set out in section 28.7.2, the Outline WSI document reference 8.5 and the OLEMS - document reference 8.7). Direct impacts upon the landscape character of Blickling Conservation are discussed in further detail in section 28.7.6.2.

132. Direct impacts upon non-designated heritage assets, including both those above and below ground, do however, have the potential to occur. In the absence of appropriate mitigation, groundworks associated with the project have the potential to impact below ground archaeological remains and above ground archaeological remains (receptors) such as earthworks or non-designated historic structures, although avoidance by means of route-refinement or micrositing provides a mitigation measure which seeks to remove this impact from occurring (see section 28.7.2). It is, however, not always possible to avoid direct impacts to all potential buried archaeological receptors (heritage assets) as the locations of such sites are not always known, and where they are, there may not always be opportunities to route around such assets.

133. The impact significance of unavoidable direct impacts to potential archaeological receptors (heritage assets) would generally be significant, although agreed measures (see section 28.7.2) to address these impacts, if they should occur, generally allow such impacts to be reduced (or offset) and as such are deemed acceptable.

28.7.1.2 Indirect Impacts

134. Indirect impacts on the historic environment, as stated in NPS EN-3 (DECC, 2011b: 67), include effects on the setting of heritage assets. Indirect impacts upon the setting of heritage assets arising from the onshore project substation works have the potential to occur throughout the lifetime of the project, thus encompassing all phases, from construction, into operation and subsequent decommissioning.

135. Indirect impacts upon the setting of heritage assets arising from the landfall, onshore cable route, associated trenchless crossing zones (e.g. HDD) and mobilisation areas are likely to only occur throughout the duration of construction and subsequent decommissioning works. This is on the basis that, during operation, there is no above ground infrastructure in association with these elements of the project that are considered likely to have any implications with regards heritage setting harms heritage setting and associated heritage significance (see section 28.7.7.1).

28.7.2 Mitigation

28.7.2.1 Embedded Mitigation

136. Norfolk Vanguard Limited has committed to a number of techniques and engineering designs/modifications inherent as part of the project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the project design is a type of primary mitigation and is an inherent aspect of the EIA process.

137. A range of different information sources has been considered as part of embedding mitigation into the design of the project (for further details see Chapter 5 Project Description, Chapter 4 Site Selection and Assessment of Alternatives and the Consultation Report (document reference 5.1)) including engineering requirements, feedback from communities and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice.

138. The following sections outline the key embedded mitigation measures relevant for this assessment. These measures are presented in Table 28.12. The impact assessment presented in sections 28.7.6 to 28.7.8 takes into account this mitigation embedded into the project.

139. Where embedded mitigation measures have been developed into the design of the project with specific regard to the historic environment, these are described in Table 28.13.

Table 28.12 Embedded mitigation

Parameter	Mitigation measures embedded into the project design	Notes
Strategic approach to delivering Norfolk Vanguard and Norfolk Boreas	Subject to both Norfolk Vanguard and Norfolk Boreas receiving development consent and progressing to construction, onshore ducts will be installed for both projects at the same time, as part of the Norfolk Vanguard construction works. This would allow the main civil works for the cable route to be completed in one construction period and in advance of cable delivery, preventing the requirement to reopen the land in order to minimise disruption. Onshore cables would then be pulled through the pre-installed ducts in a phased	The strategic approach to delivering Norfolk Vanguard and Norfolk Boreas has been a consideration from the outset.

Parameter	Mitigation measures embedded into the project design	Notes
	approach at later stages. In accordance with the Horlock Rules, the co-location of Norfolk Vanguard and Norfolk Boreas onshore project substations will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.	
Commitment to HVDC technology	Commitment to HVDC technology minimises environmental impacts through the following design considerations; • HVDC requires fewer cables than the HVAC solution. During the duct installation phase this reduces the cable route working width (for Norfolk Vanguard and Norfolk Boreas combined) to 45m from the previously identified worst case of 100m. As a result, the overall footprint of the onshore cable route required for the duct installation phase is reduced from approx. 600ha to 270ha; • The width of permanent cable easement is also reduced from 54m to 20m; • Removes the requirement for a CRS; • Reduces the maximum duration of the cable pull phase from three years down to two years; • Reduces the total number of jointing bays for Norfolk Vanguard from 450 to 150; and • Reduces the number of drills needed at trenchless crossings (including landfall).	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design. One of these decisions is to deploy HVDC technology as the export system.
Site Selection	The project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules for onshore project substations and National Grid infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts. Key design principles from the outset were followed (wherever practical) and further refined during the EIA process, including; • Avoiding proximity to residential dwellings; • Avoiding proximity to historic buildings; • Avoiding designated sites; • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures; • Utilising open agricultural land, therefore	Constraints mapping and sensitive site selection to avoid a number of impacts, or to reduce impacts as far as possible, is a type of primary mitigation and is an inherent aspect of the EIA process. Norfolk Vanguard Limited has reviewed consultation received to inform the site selection process (including local communities, landowners and regulators) and in response to feedback, has made a number of decisions in relation to the siting of project infrastructure. The site selection process is set

Parameter	Mitigation measures embedded into the project design	Notes
	reducing road carriageway works; • Minimising requirement for complex crossing arrangements, e.g. road, river and rail crossings; • Avoiding areas of important habitat, trees, ponds and agricultural ditches; • Installing cables in flat terrain maintaining a straight route where possible for ease of pulling cables through ducts; • Avoiding other services (e.g. gas pipelines) but aiming to cross at close to right angles where crossings are required; • Minimising the number of hedgerow crossings, utilising existing gaps in field boundaries; • Avoiding rendering parcels of agricultural land inaccessible; and • Utilising and upgrading existing accesses where possible to avoid impacting undisturbed ground.	out in Chapter 4 Site Selection and Assessment of Alternatives.
Duct Installation Strategy	The onshore cable duct installation strategy is proposed to be conducted in a sectionalised approach in order to minimise impacts. Construction teams would work on a short length (approximately 150m section) and once the cable ducts have been installed, the section would be back filled and the top soil replaced before moving onto the next section. This would minimise the amount of land being worked on at any one time and would also minimise the duration of works on any given section of the route.	This has been a project commitment from the outset in response to lessons learnt on other similar NSIPs. Chapter 5 Project Description provides a detailed description of the process.
Long HDD at landfall	Use of long HDD at landfall to avoid restrictions or closures to Happisburgh beach and retain open access to the beach during construction. Norfolk Vanguard Limited have also agreed to not use the beach car park at Happisburgh South.	Norfolk Vanguard Limited has reviewed consultation received and in response to feedback, has made a number of decisions in relation to the project design. One of those decisions is to use long HDD at landfall.
Trenchless Crossings	Commitment to trenchless crossing techniques to minimise impacts to the following specific features; • Wendling Carr County Wildlife Site; • Little Wood County Wildlife Site; • Land South of Dillington Carr County Wildlife Site; • Kerdiston proposed County Wildlife Site; • Marriott's Way County Wildlife Site / Public	A commitment to a number of trenchless crossings at certain sensitive locations was identified at the outset. However, Norfolk Vanguard Limited has committed to certain

Parameter	Mitigation measures embedded into the project design	Notes
	Right of Way (PRoW); • Paston Way and Knapton Cutting County Wildlife Site; • Norfolk Coast Path; • Witton Hall Plantation along Old Hall Road; • King's Beck; • River Wensum; • River Bure; • Wendling Beck; • Wendling Carr; • North Walsham and Dilham Canal; • Network Rail line at North Walsham that runs from Norwich to Cromer; • Mid-Norfolk Railway line at Dereham that runs from Wymondham to North Elmham; and • Trunk Roads including A47, A140, A149.	additional trenchless crossings as a direct response to stakeholder requests.

Table 28.13 Embedded mitigation for onshore archaeology

Parameter	Embedded mitigation measures for onshore archaeology	Notes
Avoidance, Micrositing and Route Refinement	The onshore project area has undergone an extensive site selection process to avoid direct physical impacts on designated heritage assets from the outset (Chapter 4 Site Selection and Assessment of Alternatives). In addition, the access strategy for the project has incorporated a preference for utilising and upgrading existing accesses where possible (see Chapter 5 Project Description section 5.5.2 and Chapter 24). As such, the embedded mitigation of the project in this regard ensures that no designated heritage assets will be subject to direct physical impacts arising from the project. The exception being where the cable installation works run through landscape character elements of Blickling Conservation Area (see section 28.7.6.2). Non-designated above ground heritage assets and potential sub-surface archaeological remains have also been avoided by means of micrositing and route refinement where possible. Heritage assets recorded by the NHER, the results of the aerial photographic and LiDAR data assessment and the results of the priority programme of archaeological geophysical survey have been input directly into the iterative design process and reviewed throughout a series of workshops so that features and areas indicative of more substantial sub-surface archaeological remains identified to date have been avoided, wherever possible. This process has enabled the project design to be developed in a manner which takes into account known and suspected features of likely high heritage significance (e.g. possible Prehistoric ring ditches) or concentrated areas of complex archaeological features indicative of Prehistoric, Roman and medieval enclosures and settlement activity so that direct impacts can be avoided (where possible). This approach is directly in-line with the wider project aims of minimising the environment and historic environment impacts of the project, and represents a good practice example of detailed and methodical embedded mitigation.	More information on the site selection process can be found in Chapter 4 Site Selection and Assessment of Alternatives.

Parameter	Embedded mitigation measures for onshore archaeology	Notes
	The decision to deploy HVDC cable technology has further facilitated this process, with the maximum onshore cable route width of 45m affording a greater level of flexibility with a view to routeing around areas where extant non-designated heritage assets or potentially significant sub-surface archaeological remains may be present. In the event that non-designated heritage assets cannot be avoided, initial informative stages of mitigation work will be employed and undertaken post-consent, followed by additional mitigation measures, as required (see section 28.7.2.2).	
Landscape Screening and Planting	The project has made a further a commitment to incorporate effective, appropriate and suitable landscape screening and planting (as part of the ongoing onshore project substation design).	See Chapter 29 Landscape and Visual Impact Assessment for more details.

28.7.2.2 Additional Mitigation

28.7.2.2.1 Temporary suspension of works in the event of an archaeological discovery

140. Should previously unknown buried archaeological remains of a significant nature be encountered during construction works, the project has made a commitment to the temporary suspension of intrusive groundworks upon agreement with HE and NCC HES. The provision for the temporary suspension of works in the event of a significant archaeological discovery will be achieved through the implementation of an industry standard archaeological reporting protocol, at times when intrusive groundworks are being carried out where an archaeologist is not present. This will be achieved through the application of the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Protocol) (The Crown Estate, 2014).

141. Although The Protocol refers primarily to the offshore schemes of development, it has been designed in such a way so as to operate in inshore, inter-tidal, and in fully terrestrial localities where an archaeologist is not present (The Crown Estate, 2014, section 1.2.).

142. The main objective of The Protocol will be to reduce direct impacts from occurring on currently unrecorded heritage assets by enabling people working on the project to report unexpected archaeological discoveries in a manner that is conducive to their everyday work and that allows for efficient reporting so that archaeological advice can be provided in a timely manner.

143. The Protocol sets out a sequence of reporting and outlines the relevant roles and responsibilities required for its effective implementation. The Protocol is supported by an Implementation Service, whose duties include providing advice about immediate actions upon an archaeological discovery. Should a significant

archaeological discovery be reported (as assessed on a case-by-case basis in consultation with the Archaeological Contractor, Archaeological Consultant, NCC HES and HE), groundworks would continue elsewhere until the remains have been subject to appropriate archaeological investigation and any further requirements from an archaeological perspective ascertained and undertaken. In the event of such a discovery, archaeological requirements and necessary 'next steps' will be agreed in consultation with NCC HES and HE.

144. Further details regarding the application of The Protocol will be included in a WSI specific to the construction related package(s) of works considered to require the application of this type of mitigation measure. Tool-box talks will be provided to construction crews in-advance, with the aim being both to help ensure the identification and protection of archaeological remains (not previously known) and to ensure any associated disruption / delay to construction activities is minimised wherever possible.

28.7.2.2.2 Reinstatement of field boundaries and hedgerows

145. Impact to the HLC has been minimised through careful route selection and will be mitigated further by returning field boundaries / hedgerows to their preconstruction condition and character post-construction, wherever possible (see OLEMS document reference 8.7).

28.7.2.2.3 Commitment to undertake initial informative stages of mitigation works

146. As part of the embedded mitigation, the project has also submitted a project-specific draft (outline) WSI as part of the DCO application (document reference 8.5), the approach to which has been prepared in agreement with NCC HES and HE, outlining a commitment to undertake additional programmes of survey and evaluation post-consent (to be referred to as initial informative stages of mitigation work). It is anticipated that any intrusive archaeological investigations (pre-mitigation) such as project-wide trial-trenching and targeted metal detecting / fieldwalking will take place between 2020 and 2021 as part of a post-consent / pre-construction programme. Intrusive archaeological surveys have the potential to indicate the presence of previously unknown buried archaeology (and further verify previously known / anticipated buried site remains as indicated by the previous non-intrusive survey methods), enabling it to be safe-guarded by means of mitigating any impacts in a manner that is proportionate to the significance of the remains present. These measures will comprise additional mitigation measures adopted by the project (section 28.7.2.2), and will be determined as the project progresses.

147. Specific and bespoke mitigation requirements will be tailored on a case-by-case / area-by-area basis (as required) accordingly and in response to the combination of archaeological and cultural heritage assessment undertaken to date, alongside the results of the non-intrusive priority programme of geophysical survey. Further

evaluation (initial informative stages of mitigation) and subsequent mitigation requirements (see Outline WSI - document reference 8.5) are expected to comprise a combination of the following recognised standard approaches both in advance of and / or during construction:

- Additional project-wide geophysical survey;
- Targeted metal detecting and field walking;
- Earthwork condition survey;
- Archaeological Trial-trenching;
- Set-piece (open-area) Excavation. Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate);
- Preservation *in situ* (avoidance / micrositing);
- Strip, Map and Sample Excavation. Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate); and
- Watching Brief (targeted and general monitoring and recording). Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate).

148. In addition to those outlined above, once the project design has been further finalised (in the post-consent / pre-construction stages), certain hedgerows and field boundaries (e.g. parish boundaries) may require recording prior to / during the construction process and enhanced provisions made during backfilling and reinstatement. This has provisionally been included in the Outline WSI that forms part of the DCO application (document reference 8.5) and will be further agreed in consultation with NCC HES and HE post-consent.

28.7.3 Monitoring

149. Monitoring specific to onshore archaeology and cultural heritage will be undertaken in relation to each post-consent initial informative stage of mitigation work. Such works will be subject to a bespoke survey-specific WSI (Method Statement) to be prepared in consultation with and ultimately approved by NCC HES and HE. Having agreed the survey-specific WSIs in each case, the Archaeological Consultant / Coordinator / Contractor(s) will inform NCC HES and HE of the likely and then actual commencement dates of fieldwork for each survey / investigation type, and then provide regular updates on the progress of the surveys / investigations on site. Reasonable and regular access to the site will be arranged for representatives of NCC HES and HE, as appropriate, for inspection and monitoring visits. These will be accompanied by the Archaeological Consultant / Coordinator and Archaeological Contractor(s).

150. Archaeological investigations undertaken as part of subsequent, additional and further mitigation measures (e.g. Set-Piece Excavation, Strip, Map and Sample and

Archaeological Monitoring / Watching Brief) will also be agreed with NCC HES and HE as part of pre-construction related and construction related WSIs and the archaeological works will be subject to regular monitoring visits by Norfolk Vanguard Limited's Archaeological Consultant / Coordinator to ensure that it is being carried out to the required standards and that it will achieve the stated aims and objectives. Monitoring progress meetings between Norfolk Vanguard Limited, the Archaeological Consultant / Coordinator and the Archaeological Contractor(s) will be held on site during the course of the Set-Piece Excavation, Strip, Map and Sample works and any area excavated archaeologically during monitoring / watching brief. Representatives from NCC HES and HE (where applicable) shall be invited to attend in order to monitor the works on behalf of the county and district councils.

151. Further details regarding monitoring in relation to onshore archaeology and cultural heritage considerations are set out in the Outline WSI (document reference 8.5).

28.7.4 Worst Case

152. The WCS with regard to onshore archaeology and cultural heritage are presented in Table 28.14. By employing a WCS approach for each project phase, this assessment presents the maximum possible effect upon the onshore archaeological and cultural heritage resource within the study areas and onshore project area. As such, impacts of greater adverse significance would not arise should any other project scenario (from those described in Chapter 5 Project Description) than that assessed within this chapter be taken forward in the final project design. The implementation of embedded and additional mitigation measures (strategies) (see section 28.7.2) will ensure the application of appropriate levels of protection / off-set mitigation responses for archaeological receptors (heritage assets) when the project design is finalised.

Table 28.14 Worst case assumptions

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
Landfall			
Construction	Transition pit maximum footprint	10m x 15m x 5m deep (per bore / circuit)	Norfolk Vanguard only.
	Maximum number of transition pits	2	
	Maximum number of drills	3	Norfolk Vanguard only, allowing for one failed drill.
	Approximate transition pit distance from shore	200m	Micrositing required.

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
	Maximum drill length	1,000m	
	Maximum bore diameter	500-750mm	
	Target depth of drill	20m (relative to mean sea level)	
	Temporary works area and total footprint	6,000m^2	
	Temporary access track width	6m	
	Excavated material	1,991m^3	
	Expected noise level	See Chapter 25 Noise and Vibration	
	Maximum total HDD construction time	20 weeks based on 7am-7pm normal working hours	Includes set up and access road works. For more details on the access strategy for the project, see Chapter 5 Project Design section 5.5.2.
HDD compounds	Maximum number and maximum land take for temporary HDD compounds	Assumes 2 at 3,000m^2 to support parallel drilling rigs	Norfolk Vanguard only.
Onshore cable route			
Construction	Method	Open cut trenching	Cable installation footprints include the running track and joint bay (Norfolk Vanguard only).
	Maximum working width and length	45m and 60km	
	Cable installation maximum footprint	447,688m^2	
	Onshore cable route maximum footprint	2,700,000m^2	This width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m.
	Maximum gaps at hedgerow / other crossing points	20m	
	Maximum number of running tracks	1	

Worst case assumptions Parameter	Worst case criteria	Worst case definition	Notes
	Running track width and length	6m and 60km	
	Total permanent route width	20m	
	Number of trenches	4	
	Running track excavated material	108,000m^3	
	Cable trench width and depth	1m per trench, 1.5m deep	Cable trench width and depth are indicative, depending on ground conditions.
	Trench excavated material	360,000m^3	
	Expected noise level	See Chapter 25 Noise and Vibration	
Permanent joint pits	Maximum number and required dimensions	Assume 150 at 90m^2 and 2m deep each	Norfolk Vanguard only, spaced approximately one per circuit per 800m cable.
Link boxes	Dimensions	Below ground 1.5m x 1.5m Above ground cabinets 1.2m x 0.8m x 1.8m	Typically sited on a 0.15m deep concrete slab
Mobilisation Areas	Maximum number and required dimensions	Assumes 14 at 10,000m^2	
Central storage facility	Size	4,188m^2	
Trenchless launch and reception sites	Maximum number and maximum land take for trenchless launch and reception sites	Assumes 17 pairs at 7,500m^2 and 5,000m^2 respectively	
Decommissioning		Joint pits and ducts left *in situ*	Where cables are in pre-installed ducts, cables may be extracted once de-energised.
Construction programme	Total construction duration	6 years	

Worst case assumptions Parameter	Worst case criteria	Worst case definition	Notes
Onshore 400kV cable route			
Construction	Number	2 trenches, 3 cables per trench, 2 circuits, total of 12 cables	Norfolk Vanguard only.
	Method	Direct laid in trenches	
	Indicative cable route length	1,750m	
Onshore project substation			
Construction	Maximum land take for temporary works area	20,000m^2 (200m x 100m)	Norfolk Vanguard only. Vehicle movements include for associated temporary works compound.
	Converter hall dimensions	110m x 70m	
	AC switch yard dimensions	110m x 70m	
	Maximum duration	30 months	Indicative construction timing 24 months
	Access track width	6m	
	Vehicle movements	4,711 (total one-way deliveries)	2.4m palisade fence + 1m electrified fence
	Construction noise level	See Chapter 25 Noise and Vibration	
	Height	19m building with 25m lightning protection masts, fences 3.4m high	
	Appearance of building	Steel framed with cladding and palisade fencing	
	Foundations	Piled	For converter station and plinth
Operation	Maximum land take for permanent footprint	75,000m^2	
	Expected noise level	See Chapter 25 Noise and Vibration	

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
	Design life	30 years	
	Maintenance visits	1 per week approximately (temporary lighting may be required)	
Decommissioning	No decision has been made regarding the final decommissioning policy for the onshore project substation, as it is recognised that industry best practice, rules and legislation change over time. However, the onshore project equipment will likely be removed and reused or recycled. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a WCS, impacts are assumed to be no worse than impacts assessed for the construction phase.		
National Grid substation extension and overhead line modification			
Construction	Maximum land take for temporary works area – substation extension	67,500m^2	Vehicle movements include for temporary mobilisation area.
	Maximum land take for temporary works area – overhead line	174,264m^2	Inclusive of existing Necton National Grid substation
	Maximum duration	30 months	Indicative construction timing 24 months
	Maximum height of temporary towers	45m	
	New towers (permanent)	2	
	Landing gantries	2	
	Tower foundations	Piled (4 piles required per tower)	
	Vehicle movements	3,585 (total one-way deliveries)	
	Construction noise level	See Chapter 25 Noise and Vibration	
	AIS bays	Up to 7 installed along busbar extension, total length 340m	
	Fencing height and type	2.4m palisade (outer) and 4m electrified	

Worst case assumptions Parameter	Worst case criteria	Worst case definition	Notes
		(inner)	
	Access road width	6m	
Operation	Maximum land take for substation extension permanent footprint	49,300m^2	Includes existing Necton National Grid substation area
	Substation extension tallest structure	15m (outdoor Air-Insulated Switchgear (AIS) busbar and landing gantries)	
	Maximum land take for overhead line permanent footprint	9,250m^2	
	Overhead line tallest structure	50m (new permanent junction tower)	
	Design life	30 years	

28.7.5 Assessment Scenarios

153. Chapter 5 Project Description outlines the scenarios to be assessed in relation to the phasing of the works. The phasing of the construction works is as follows:

- The offshore project may be constructed as one or two phases and elements of the onshore construction would also be phased to reflect this;
- Pre-construction works (e.g. hedgerow clearance) for the onshore cable route to be conducted over a two year period, prior to duct installation;
- Cable ducts would be installed in one operation over two years, regardless of the offshore strategy;
- Cable pull through would be done in either one or two phases;
- The onshore project substation ground preparation and enabling works would be done in one phase, anticipated to take two years for pre-construction works and two years for primary works;
- The required electrical infrastructure and plant within the onshore project substation would then be installed as required for each phase if the one or two phase options were adopted for offshore construction; and
- Total construction window for the one phase scenario is anticipated to be five years, and six years for the two phase scenario.

28.7.6 Potential Impacts During Construction

28.7.6.1 (1) Direct Impact on (Permanent Change to) Buried Archaeological Remains

154. Impacts resulting in potential effects as part of construction work are those associated with intrusive groundworks, including:

- The removal of topsoil anywhere across the onshore project area;
- The excavation of transition pits at the landfall;
- The application of trenchless techniques at the landfall and at crossing locations;
- Open cut trenching as part of the cable installation works;
- The excavation of jointing pits along the onshore cable route;
- The excavation for link box installation;
- Groundworks associated with the onshore cable route easement, mobilisation areas, and associated access trackways; and
- Groundworks associated with onshore infrastructure (e.g. onshore project substation, and to the National Grid substation extension and overhead line modifications).

155. The extent of any impact will depend on the presence, nature and depth of any such remains, in association with the depth of construction-related groundworks. However, all direct impacts to archaeological heritage assets are considered permanent. Once archaeological deposits and material, and the relationships between deposits, material and their wider surroundings have been damaged or disturbed, it is not possible to reinstate or reverse those changes. As such, direct impacts to the fabric or physical setting would represent a total loss of an asset, or part of it, and the character, composition or attributes of the asset would be fundamentally changed or lost from the site altogether.

156. Direct impacts on buried archaeological remains are therefore generally considered to be of high magnitude.

157. Areas in which sub-surface archaeological remains may be present (based on available data) have been identified as part of a staged programme of assessment (see section 28.6.3.1). Those considered to be most vulnerable with regards to the various elements of construction are highlighted below. Post-consent initial informative stages of mitigation work (see section 28.7.2) have the potential to verify previously known / anticipated buried site remains (as indicated by previous non-intrusive survey works) and may further inform the nature and extent of any features present. Such mitigation work therefore has the potential to alter the perceived heritage significance of assets encountered as indicated by current available data.

158. Post-consent initial informative stages of mitigation work and / or construction works may also indicate the presence of previously unknown buried archaeology not currently represented by available data. In the absence of further data regarding the

'potential' archaeological resource, such assets must be considered as potentially having a high perceived heritage significance based upon a WCS.

28.7.6.1.1 Landfall

159. Construction activities in the landfall area that have the potential to directly impact buried archaeological remains are those associated with HDD works (up to a maximum of three onshore bores), the excavation of the transition pit (to be sited within the landfall compound zone) and groundworks associated with the HDD compound area and associated access routes.

160. Potential sub-surface remains of archaeological interest that intersect the landfall are outlined in Table 28.15.

Table 28.15 Interaction between the landfall and archaeological remains

Route Section	ID (AP, RHDHV, NHER) (Headland Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
Landfall Figures 28.2, 28.4 and 28.6 (map 1)	AP 80 RHDHV 814 NHER 36495 (F162 and F164 to F166)	Medium	**Yes**: the landfall compound zone intersects a small number of cropmark features captured as AP 80, although there is only a slight interaction with these cropmarks and the landfall indicative compounds, as a result of micrositing undertaken as part of the engineering design PEIR to ES.	Low - Medium	**Minor - Moderate**
	AP 91 RHDHV 828 NHER 16015 (F165 and F166)	High (as a WCS)	**Yes**: the landfall compound zone intersects a small number of cropmark features captured as AP 91, although there is only a slight interaction with these cropmarks and the landfall indicative compounds, as a result of micrositing undertaken as part of the engineering design PEIR to ES.	Low	**Moderate** (as a WCS)
	AP 84 RHDHV 1143 NHER 38773 (F165)	Low	**No**. This feature is located beyond the landfall compound zone and will not be subject to direct impact.	N/A	**No impact**
	AP 86 RHDHV 1529 NHER 15918 (F165)	Low - Medium	**No**. This feature is located beyond the landfall compound zone and will not be subject to direct impact.	N/A	**No impact**
	AP 88 RHDHV 1627 NHER 38776 (F165)	Low	**No**. This feature is located beyond the landfall compound zone and will not be subject to direct impact.	N/A	**No impact**
	RHDHV 916 / NHER 38778	Low	**No**. This feature is located beyond the indicative landfall compounds and will not be subject to direct impact.	N/A	**No impact**

161. The landfall compound zone and the landfall indicative compounds intersect a small number of potential linear features captured as AP 80 (Extensive area of multi period cropmarked ditches - likely field systems tracks and boundaries) and AP 91 (Extensive cropmarked multi period landscape, field trackways, and ditches). These linear features are, in part, corroborated by the geophysical survey data acquired in F163-166. The proposed access route to the landfall also interacts with a small number of linear features (cropmarks) captured as AP 80.

162. In the absence of mitigation, all direct impacts to areas of possible archaeological interest (as signified by AP80 and AP91) as part of construction works at the landfall could result in a **minor - moderate** adverse impact significance, based upon a WCS. However, with the application of site-specific additional mitigation measures, (where required) it is anticipated that such impacts can be reduced to levels considered **non-significant** in EIA terms. If / when a DCO is granted initial informative stages of mitigation work (see section 28.7.2 and the Outline WSI - document reference 8.5) will be undertaken in agreement with NCC HES and HE in order to further establish specific and bespoke mitigation requirements on a case-by-case / area-by-area basis, as required.

28.7.6.1.2 Onshore Cable Route

163. Construction activities along the onshore cable route that have the potential to directly impact buried archaeological remains are those associated with top-soil stripping, cable trenching, trenchless techniques (e.g. HDD) at key crossing points, excavation for jointing pits and link boxes and groundworks associated with construction work areas (e.g. mobilisation areas and trenchless crossing compounds), the central storage facility and the running track.

164. Due to the extent (60km length and up to 45m width) of the onshore cable route, there is potential for interaction to occur between the construction activities and a large number of potential areas of sub-surface archaeological remains. In order to help identify the interactions which have the potential to occur, the various project elements relating to the onshore cable route have been drawn out in Table 28.16 and identified in relation to the area in which there is considered to be potential for buried archaeological remains to be present.

165. As sub-surface archaeological remains have not as yet been evaluated through intrusive survey techniques (e.g. ground-truthed through archaeological trial trenching), the exact condition, presence / absence, nature and extent of many features currently identified within the cable route is unknown. In addition, prior to ground truthing exercises, there is an inherent inability to accurately ascertain the presence / absence and extent of the potential buried remains therein. Table 28.1 has therefore been devised based on information available to date and incorporates a WCS (precautionary) approach.

Table 28.16 Interaction between the cable route and archaeological remains

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
Onshore project substation to MA 1b (Figures 28.2, 28.4 and 28.6, maps 21-23)	Cable route	AP 3 (F10)	Low	**Minimal**: Cable route intersects the outer-most mapped boundary of this feature by *c.* 7m. The cable has been routed southwards in this location to avoid these cropmark features.	Low	**Minor**
		AP 4 (F10)	Low	**Yes:** Cable route interacts with small sections of these linear features (former field system, post-enclosure field boundaries now removed and visible only as cropmarks) identified and captured as AP 4.	Medium	**Minor**
		Wood Farm and Grove Farm	Low	**Yes (in part):** Level of surviving sub-surface remains unquantifiable based on current data.	Medium	**Minor**
MA 1b to 2 (Figures 28.2, 28.4 and 28.6, map 21)	No features of possible archaeological interest were identified by the aerial photographic and LiDAR data assessment within this section of the route and as such, it has not been subject to priority geophysical survey pre-consent. It will, however, be further considered as part of the initial informative stages of mitigation work (e.g. further geophysical survey, targeted metal detecting / field walking and archaeological trial trenching) post-consent.					
MA 2 to 3 (Figures 28.2, 28.4 and 28.6, maps 19-21)	Trenchless Crossing Zone (Little; Wood): TC3a/b	AP 5 (F14 and F16)	Low	**Yes:** There is a limited interaction between the trenchless crossing zone to the west of Gressenhall and a small number of cropmark features (ditches) identified and captured as AP 5. Some of the cropmark features intersect the proposed Indicative Trenchless Crossing Footprint in this area.	Medium	**Minor**
		(F18 and F19)	Low	**Yes:** There is an interaction between the trenchless crossing zone to the east of Gressenhall Road and a number of linear features (former field boundaries) shown in geophysical data acquired in F18 / 19.	Low	**Minor**
MA 3 to MA 4 (Figures	Cable route	AP 159 RHDHV 1180 NHER 50699	Medium	**Yes (in part):** Cable route interacts with the southern extent of this medieval / post-medieval road.	Low	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
28.2, 28.4 and 28.6, maps 18-19)	Trenchless Crossing Zone: TC4	(F20 and F22)	Low	**Yes:** Interaction between indicative trenchless crossing footprint and field boundary feature in F22.	Low	**Minor**
MA 4 to MA 5a (Figures 28.2, 28.4 and 28.6, maps 16-18)	Trenchless Crossing Zone: TC5a/b	(F25 to F29)	Low	**No**: Ferrous material from a demolished structure on historical maps (F27) is within a trenchless crossing location and unlikely to be directly impacted.	Negligible	**Negligible**
	Trenchless Crossing Zone: TC5a/b	AP 6 RHDHV 811 NHER 2999 (F32, F33 and F38 / 39)	Medium - High (as a WCS)	**Yes (in part)**: There is an interaction between the trenchless crossing zone to the east of the River Wensum and a number of cropmark features (field boundaries, trackways and ditches) identified and captured as AP 6. A number of these features are within the proposed Indicative Trenchless Crossing Footprint in this area. Geophysics appears to show less density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)
	Cable route			**Yes**: Cable route interacts with a number of linear features (field boundary, field system, trackway and ditch) identified and captured on the periphery of AP 6. Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor-Moderate** (as a WCS)
	Side access: South of Bylaugh Road (between River Wensum and Mill Street)			**Minimal:** Slight interaction between side access and the northernmost extent on a small number of cropmark features.	Low	**Minor – Moderate** (as a WCS)
	Cable route	RHDHV 1524 NHER 50771	Low	**Yes:** The possible WWII roadside ammunitions stores / defences follow the route of Bylaugh / Lime Kiln Road. Sub-surface remains, if present are, however, likely to be minimal.	Low	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	RHDHV 947 NHER 14228 F40/41	Low - Medium	**Yes**: cropmarks of an undated possible Roman road intersect the cable route at this location.	Medium	**Minor – Moderate** (as a WCS)
	Cable route	AP 14 RHDHV 1104 NHER 3024 (F40b and F41b)	Low	**Minimal**: Cable route interacts with a single linear feature, features (field boundary, field system, extractive pit) identified and captured as AP 14.	Low	**Minor**
MA 5a to MA 5b (Figures 28.2, 28.4 and 28.6, maps 15-16)	MA 5a			**Minimal:** Mobilisation zone MA 5a interacts with a number of linear features (post-medieval field boundary, field system or extractive pit) identified and captured as AP 14, although only one feature intersects the indicative mobilisation area footprint (in the north-eastern extent of the mobilisation zone).	Medium	**Minor**
		AP 15 RHDHV 1523 NHER 50770	Low	**Yes:** MA5a (including the indicative mobilisation area compound) interacts with former WWII features (sub-surface remains may be present) identified and captured as AP 15.	Medium	**Minor**
	Cable route			**Yes (in part)**: Cable route interacts with former WWII features (sub-surface remains may be present) identified and captured as AP 15.	Medium	**Minor**
MA 5b to MA 6 (Figures 28.2, 28.4 and 28.6, maps 12-15)	Cable route	RHDHV 434 NHER 2796	Medium	**Yes**: The Fen Causeway Roman road intersects the cable route at this location.	Medium (as a WCS)	**Moderate** (as a WCS)
	Trenchless Crossing Zone: TC6	RHDHV 1499 NHER 13585	Low	**No**: Interaction between this asset (the Midland and Great Northern Joint Railway) and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
	Trenchless Crossing Zone: TC7	RHDHV 1498 NHER 13587	Low	**No**: Interaction between this asset (the Route of East Norfolk Railway, Aylsham Branch, including Bure Valley Railway) and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
		RHDHV 966 / NHER 56980	High (as a WCS)	**Yes**: Level of sub-surface remains unquantifiable based on current data. The indicative trenchless crossing footprint is located within an area in which metal finds of Anglo-Saxon date have been previously	Unknown	**Unknown**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
				discovered.		
	Cable route			**Yes**: Level of sub-surface remains unquantifiable based on current data. The cable route intersects an area in which metal finds of Anglo-Saxon date have been previously discovered.	Unknown	**Unknown**
	Cable route	AP 27 (F49 to F52)	Low	**Yes**: Cable route interacts with linear features (field boundary ditches) identified and captured as AP 27 and visible in F49 and 52. Additional linear features (former field boundaries) are also visible in F49 and intersected by the cable route.	Medium	**Minor**
	Trenchless Crossing Zone: TC8			**Minimal**: There is an interaction between the trenchless crossing zone and a small number of cropmark features (ditches / field boundaries) identified and captured as AP 27. A number of linear features (possible former field boundaries) are shown on geophysical survey data acquired in F50 / 51. Features within the proposed Indicative Trenchless Crossing Footprint in this area are confined to a curved feature identified as being possible archaeology within the geophysical survey data for F50.	Medium	**Minor**
	Side access: South of the Cawston Road (B1145) to the west of Cawston			**Yes**: Interaction between side access and two minor cropmark features.	Medium	**Minor**
MA 6 to MA 7 (Figures 28.2, 28.4 and 28.6, maps 11-12)	MA 6	F54 AAA3	Medium - High (as a WCS)	**Yes**: Mobilisation zone MA 6 interacts with a number of linear features (possible former field boundaries / enclosures) identified in geophysical survey data acquired in F54. The indicative mobilisation area footprint (in the south-eastern extent of the mobilisation zone) is proposed in an area which intersects a few linear features (former field boundaries only).	Low	**Minor – Moderate** (as a WCS)
	Cable route			**Yes:** the cable route intersects a relatively high concentration of	Medium - High	**Moderate –**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
				potential sub-surface remains as indicated in the geophysical survey data for F54. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	(as a WCS)	**Major** (as a WCS)
	Cable route	F55 and F56	Low	**No**: the cable route does not intersect features identified as being of archaeological interest within this area.	Negligible	**Negligible**
	Cable route	AP 28 RHDHV 1183/698 NHER 51469/21848 AAA4 (F57)	Low - Medium	**Yes** (slight): The cable route intersects a small number of linear features identified as being of possible archaeological interest in F57. The main concentration of archaeological features in the northern extent of this field, and within the wider extent of AP 28, are avoided by the cable route.	Low	**Minor**
	Cable route	RHDHV 1266 NHER 23276 (F58)	Low	**Yes**: the cable route intersects an area in which ferrous material has been identified in the geophysical survey data (area of a former brickyard) and a linear feature identified as being of possible archaeological interest.	Medium	**Minor**
	Cable route	AP 34 (F59)	Medium	**Yes (in part)**: the cable route intersects a small number of linear features (ditches) identified and captured as AP 34 and visible in F59.	Medium	**Moderate**
	Cable route	AP 30 RHDHV 1597 / NHER 22903 AAA5 F60 and F61	Medium - High (as a WCS)	**Yes**: although the cropmark features captured as AP 30 are avoided, the geophysical survey data indicates archaeological features in the north-west of F60 (rectilinear enclosure and trackway), which are intersected by the cable route. These features may be associated with AP 30 in F61. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	High (as a WCS)	**Major** (as a WCS)

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	AP 36 RHDHV 1600 NHER 29565 (F62 and F63)	Low	**Yes**: the cable route intersects linear features (potential ditches and trackways) identified and captured as AP 36. These features are not visible on the geophysical survey data for F62 and F63.	Medium	**Minor**
	Cable route	(F65)	Low	**Yes** (slight): the cable route intersects at least two former field boundaries identified in the geophysical survey data for F65.	Low	**Minor**
	Cable route	AP 37 (F64)	Medium	**Yes** (slight): the cable route intersects a possible ditch identified and captured as AP 37 (not visible on geophysical survey data for F64).	Medium	**Minor - Moderate**
MA 7 to MA 8 **(includes National Trust Land)** (Figures 28.2, 28.4 and 28.6, maps 9-11)	MA 7			**Yes** (slight): Mobilisation zone MA 7 interacts with two linear features (ditches) identified and captured as AP 37. The indicative mobilisation area footprint (in the northern extent of the mobilisation zone) is proposed in an area which intersects one such linear feature (ditch) observed in AP 37.	Low	**Minor**
	MA 7	RHDHV 1490 NHER 13581	Low	**Yes**: the Mobilisation zone MA 7 (including the indicative mobilisation area footprint) intersects the route of the Midland and Great Norfolk Joint Railway at this location, now dismantled.	Medium	**Minor**
	Cable route			**Yes**: the cable route intersects the route of the Midland and Great Norfolk Joint Railway at this location, now dismantled.	Medium	**Minor**
	Cable route	AP 39 RHDHV 1588 NHER 12974 (F67 and F68)	Medium – High (as a WCS)	**Yes**: the cable route intersects a number of linear features (field systems and trackways) identified and captured as AP 39 and shown in F67-68 although the 45m wide cable route has been routed to avoid the densest concentration of cropmarks, where possible. Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate - Major** (as a WCS)
	Side access:			**Yes**: Interaction with linear features (possible archaeology) visible in	Low	**Minor -**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Descending south from Whitetop Lane (to the west of Silvergate Lane)			geophysical survey data acquired in the east of F68, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.		**Moderate** (as a WCS)
	Cable route	AP 40 RHDHV 1589 NHER 12975 (F70 to F74)	Medium – High (as a WCS)	**Yes**: the cable route intersects a few linear features (former field boundaries / ditches) identified and captured as AP 40 and shown in F70, although many of the cropmark features captured in AP 40 are avoided. Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)
	Side access: Descending south-west from Blickling Road (to the east of Silvergate Lane)			**Yes** (slight): the side access intersects the end of a cropmark feature in this location. Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)
	Cable route	(F75 and F76)	Low (for traditional shallow sub-surface)	**Yes** (slight): cable route interacts with a single field boundary visible in the geophysical survey data acquired for F75.	Low	**Minor**
	Side access: Adjacent and	AP 43 RHDHV 1616	Low	**Yes** (very slight): Interaction with cropmark feature identified and captured as AP 43.	Low	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	parallel to Drabblegate Road (east of the River Bure)	NHER 36453 (F79 and F80)				
	Trenchless Crossing Zone: TC9a/b			**Yes:** To the east, there is an interaction between the trenchless crossing zone and a small number of cropmark features (ditches) identified and captured as AP 43. These linear features are not corroborated by geophysical data acquired in F79 / 80. No features have been identified based on data available to date within the indicative trenchless crossing compound to the west in this area.	Medium	**Minor**
	Trenchless Crossing Zone: TC10			**Yes**: There is an interaction between the trenchless crossing zone and cropmark features identified and captured as AP 43, with one cropmark feature (former field boundary) located within the indicative trenchless crossing compound.	Medium	**Minor**
		AP 46 RHDHV 531/1614 NHER 60062/3370 (F80 to F83)	Medium - High (as a WCS)	**Yes**: There is an interaction between the trenchless crossing zone and cropmark features identified and captured as AP 46, with a number of cropmark features (ditches / trackways) located within the indicative trenchless crossing compound. Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent. The most significant looking feature (the Henge Monument) has been deliberately and proactively avoided.	Medium (as a WCS)	**Moderate - Major** (as a WCS)
MA 8 to MA 9	MA 8			**Yes:** Mobilisation zone MA 8 (including the indicative mobilisation area footprint) intersects a trackway captured in AP 46.	Medium (as a WCS)	**Moderate - Major**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
(Figures 28.2, 28.4 and 28.6, maps 7-9)				Geophysics appears to show a lesser density and complexity of remains, requires ground truthing (as part of the programme of archaeological trial trenching) post-consent. The most significant looking feature (the Henge Monument) has been deliberately and proactively avoided.		(as a WCS)
	MA 8	AP 44 RHDHV 531 NHER 60062 (F82)	Medium - High (as a WCS)	**Yes:** AP 44 is intersected by the mobilisation zone but is beyond the parameters of the indicative mobilisation area footprint. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate**
	Side access: Running westwards from Banningham Road and northwards directly adjacent to the A140			**Yes**: there is an interaction with cropmark features identified and captured as AP 44, including a possible enclosure (which is in the location of the A140, but with only partial survival likely at best). Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate**
	Trenchless Crossing Zone: TC10	AP 45 RHDHV 531 NHER 3370 (F82)	High	**No**: although the outer mapped feature boundary intersects the trenchless crossing zone, the ring-ditch (Henge Monument) feature has been deliberately and proactively avoided by the project design.	Negligible	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	AP 48 RHDHV 1615 NHER 36454 (F85 and F86)	Low	**Yes** (slight): the cable route intersects a feature mapped as an earthwork (bank - possible former field boundary). This feature is considered in relation to above ground archaeological remains. Sub-surface remains intersected by the cable route in this location are confined to a possible trackway visible in the geophysical survey data for F86.	Medium	**Minor**
	Cable route	AP 50 AAA7 and AAA8 (F87, F88, F91)	Medium – High (as a WCS)	**Yes**: the cable route intersects a number of linear features (former field boundaries, ditches, trackways and enclosures) identified and captured as AP 50, with additional field boundaries and enclosures also seen in F87/F88. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate - Major** (as a WCS)
	Trenchless Crossing Zone: TC11			**Yes**: there is an interaction between the trenchless crossing zone and cropmark features identified and captured as AP 50. These features include former field boundaries, ditches, trackways and possible enclosures. Two cropmark features are recorded within the indicative trenchless crossing compound in this area, as is an archaeological feature identified in the geophysical survey data for F91. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate - Major** (as a WCS)
	Trenchless Crossing Zone: TC11	AP 51 RHDHV 1607 NHER 36499 AAA9 (F93)	High (as a WCS)	**Yes**: there is an interaction between the trenchless crossing zone and cropmark features identified and captured as AP 51. These features, which include a possible ring-ditch, are corroborated by geophysical data acquired in F93. Features within the indicative trenchless crossing compound in this area comprise an extensive complex of criss-crossing linear and rectilinear anomalies forming multiple interlinking enclosures.	High (as a WCS)	**Major** (as a WCS)

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
				Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.		
	Cable route	(F95)	Low	**Yes**: the cable route intersects a number of former field boundaries.	Medium	**Minor**
	Cable route	AP 53 RHDHV 1612 NHER 35549 (F95 and F96)	Medium	**Yes**: the cable route interacts with a number of linear features (ditches / possible enclosure) identified and captured as AP 53 (not observed on geophysical survey data for F95 and F96) Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate**
	Side access: Extending eastwards from Rectory Road, south of Brick Kiln Lane			**Yes**: Slight interaction with three recorded cropmark features identified and captured as AP 53.	Low	**Minor**
	Cable route	AP 54 (F98)	Low - Medium	**Yes** (slight): although the continuation of cropmark features into the cable route cannot be discounted, based on information to date, no cropmark features indicative of sub-surface remains are intersected by the cable route at this location. The geophysical survey data acquired in F98 suggests that a former field boundary may be intersected by the cable route at this location.	Low	**Minor**
	Cable route	AP 56 (F99 and F100)	Low	**Yes**: the cable route intersects a number of linear features (former field boundaries, trackways and ditches) identified and captured as AP 56 and observed in F99 and F100.	Medium	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	AP 55 RHDHV 435 / 762 NHER 12821 / 37987 F101	Medium – High (as a WCS)	**Yes**: the cable route intersects a possible enclosure / ditch identified and captured as AP 55. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate - Major** (as a WCS)
MA 9 to MA 10 (Figures 28.2, 28.4 and 28.6, map 6)	Trenchless Crossing Zone: TC12 / TC13	AP 57 RHDHV 435 NHER 12821 F103	Medium - High (as a WCS)	**Yes** (slight): The trenchless crossing zone between the East Norfolk Railway and the A149 intersects a number of cropmark features identified and captured as AP 57. There is currently (pre-consent) no geophysical survey data for this area. Despite this interaction, just one linear feature (ditch) intersects an indicative trenchless crossing compound in this area (to the immediate east of the A149). Requires geophysical survey and subsequent ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate**
	Trenchless Crossing Zone: TC12 / TC13	RHDHV 1494 NHER 13586	Low	**No:** Interaction between this asset (the East Norfolk Railway, later great Eastern, Cromer Line) and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
	Cable route	AP 260	Low	**Yes**: The cable route intersects linear features (ditches) identified and captured as AP 260.	Medium	**Minor**
MA 10 to MA 10a (Figures 28.2, 28.4 and 28.6, maps 4-6)	MA 10	AP 270 RHDHV 1609 NHER 36505 (F107)	Medium - High (as a WCS)	**Yes** (slight): Mobilisation zone MA 10 interacts with a small number of former field boundary features observed in geophysical survey data acquired in F107. Only a fraction of a single field boundary intersects the indicative mobilisation footprint in this area.	Low	**Minor**
	Trenchless Crossing Zone: TC14a/b			**Yes**: To the west of the B1145, linear features and a possible ring-ditch identified and captured as AP 270 intersect the trenchless crossing zone. These features are only partially corroborated by	Medium - High	**Moderate - Major** (as a WCS)

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
				geophysical data acquired in F107. The possible ring-ditch feature is within the indicative trenchless crossing compound at this location. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.		
	Trenchless Crossing Zone: TC14a/b	RHDHV 1501 NHER 13585	Low	**No**: Interaction between this asset (the Norfolk and Suffolk Joint Railway (Northern Section) and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
	Trenchless Crossing Zone: TC14a	AP 262 RHDHV 1608 RHDHV 36504 (F108)	Medium - High (as a WCS)	**No:** Interaction between these features and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
	Trenchless Crossing Zone: TC15	(F109 and F110)	Low	**Yes** (slight): The indicative trenchless crossing footprint intersects a former field boundary at this location.	Low	**Minor**
	Cable route	AP 261 (F113)	Low	**Yes**: the cable route interacts with linear features (boundary ditches) captured in AP 261 and extending into F113.	Medium	**Minor**
	Cable route	AP 163 RHDHV 1586 NHER 39000	Low - Medium	**Yes**: the cable route partly interacts with linear features captured in AP 163 (former site of WWII barbed wire entanglement).	Medium	**Minor - Moderate**
	Side access: Extending south-west and south-east from Paston Road (north-west of Bacton Wood)			**Yes:** Interaction with former extant features identified and captured as AP 163.	Medium	**Minor - Moderate**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	AP 164 RHDHV 1152 NHER 39007	Low	**Yes**: the cable route interacts in part with a linear feature captured in AP 164 (ditches, field boundaries).	Medium	**Minor**
	Cable route	RHDHV 1604 NHER 32172 and RHDHV 1675 / NHER 52898	Medium - High	**No:** There is no interaction with RHDHV 1675 (undated pits). RHDHV 1604 (possible prehistoric hearths) intersects the cable route, however, these features have been previously excavated under an earlier unrelated project.	Negligible	**Minor**
	Cable route	(F115 and F116)	Low	**No:** the cable route intersects linear features observed in F115 which have been identified as being of agricultural origin. Former field boundaries lie beyond the cable route.	Negligible	**Negligible**
	Cable route	AP 227 RHDHV 1290 NHER 39031 (F117 and F118)	Low	**Yes**: the cable route intersects linear features (ditches and field boundaries) identified and captured as AP 227 (F117).	Medium	**Minor**
MA 10a to 11 (Figures 28.2, 28.4 and 28.6, maps 3-4)	Trenchless crossing location: TC16	AP 239 RHDHV 1635 NHER 39026 (F118)	Low	**No**: Interaction between this feature and the construction works is negligible due to the adoption of trenchless crossing techniques at this location.	Negligible	**Negligible**
	Side access: Parallel and adjacent to Plantation Road (north of Bacton Wood)			**Yes** (slight): Slight interaction with northern extent of boundary ditch features identified and captured as AP 239.	Low	**Minor**
	Trenchless	AP 240	Medium -	**No**: based on information available to date, the cropmark features	Low	**Minor –**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	crossing location: TC16	RHDHV 791 NHER 39032 (F119)	High	recorded at this location are not visible within the trenchless crossing zone or within the indicative trenchless crossing compound, although the possibility that they do extend into these areas should not be discounted.		**Moderate** (as a WCS)
	Trenchless crossing location: TC16	AP 237 RHDHV 1018 NHER 39111 (F119 and F120)	Low	**Yes**: a number of cropmark features (ditches / field boundaries) intersect the trenchless crossing zone and indicative trenchless crossing compound at this location.	Medium	**Minor**
	Cable route			**Yes** (slight): a limited number of cropmark features are intersected by the cable route.	Medium	**Minor**
	Side access: Two accesses extending northwards from Mill Common Road (east of Plantation Road)			**Yes** (slight): Very slight interaction with field boundary feature (ditch) identified and captured as AP 237.	Medium	**Minor**
	Cable route	AP 234 RHDHV 795 / NHER 7014 F120 and F121	Medium - High	**Yes**: the cable route intersects a small number of linear features captured in AP 234 (ditches, field boundaries, trackways). Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate**
	Side access: Two accesses extending northwards from Mill			**Yes** (slight): Very slight interaction with cropmark feature (linear) identified and captured as AP 234.	Low	**Minor - Moderate**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Common Road (east of Plantation Road)					
	Cable route	AP 231 RHDHV 822 NHER 27237 F122 and F123	Medium - High	**Yes**: the cable route intersects a small number of linear features captured in AP 231 and possible archaeology (linear features) visible in the geophysical survey data acquired in F122.	Low	**Minor - Moderate**
	Cable route	AP 225 RHDHV 854 NHER 27242 (F122)	Medium	**Yes**: the cable route intersects a small number of linear features captured in AP 225 and possible archaeology (linear features) visible in the geophysical survey data acquired in F122.	Low	**Minor**
	Cable route	AP 223 RHDHV 1149 NHER 38864 AAA11 (F123)	Low - Medium	**Yes**: the cable route intersects this recorded medieval / post-medieval road / Holloway visible as cropmarks.	Medium	**Minor - Moderate**
	Cable route	AP 220 RHDHV 1166 NHER 27241 AAA12 (F123)	Low - Medium	**Yes**: the cable route intersects a number of cropmark features (enclosures, ditches and trackways) recorded at this location.	Medium	**Minor - Moderate**
	Cable route	AP 226 RHDHV 747 NHER 27243	High	**Yes**: the cable route intersects a number of cropmark features (ditches, enclosures and field systems) recorded at this location.	Low	**Moderate**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
		AAA12 (F122 and F123)		Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.		
	Cable route	AP 157 RHDHV 1632 NHER 38860 (F125)	Medium - High (as a WCS)	**Yes**: The cable route intersects cropmark (boundary) features which are visible as being more extensive in the geophysical survey data for F125, which shows additional boundary features and enclosures. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium - High (as a WCS)	**Moderate - Major** (as a WCS)
	Cable route	(F125 and F126)	Medium - High (as a WCS)	**Yes**: the cable route intersects features of archaeological interest identified in the geophysical survey data acquired in F125, including a rectangular double-ditched enclosure (F125) and linear features of possible archaeological interest (F126). Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium - High (as a WCS)	**Moderate - Major** (as a WCS)
	Cable route	AP 153 RHDHV 1631 NHER 38853 AAA13 and AAA14 (F128 to F134)	Medium	**Yes**: the cable route intersects cropmark (ditch / field boundary) features as well as features of archaeological interest identified in the geophysical survey data acquired in F130. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate**
	Side access: South-east of North Walsham / Happisburgh			**Yes** (slight): Interaction with field boundary features identified and captured as AP 153.	Low	**Minor**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Road (south-west of Ridlington)					
	Cable route	AP 136 RHDHV 1146 NHER 38842 (F135 and F136)	Low - Medium	**No**: only the northernmost boundary of this AP feature intersects the cable route (by some 5m) with the cropmark features recorded within it avoided by the cable route.	Negligible	**Negligible**
	Cable route	AP 137 RHDHV 807 NHER 21835 AAA15 and AAA16 (F136 to F138)	Medium - High	**Yes**: The cable route interacts with a dense concentration of features at the northern extent of F137 as shown in the geophysical survey data. In the area of AP 137 itself, the highest concentration of archaeological features has been avoided by means of deliberate and proactive routeing of the cable route to the north-west. There is nonetheless an interaction between the cable route and some of the more peripheral looking features of archaeological interest visible in F137 and captured as AP 137. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium-High	**Moderate - Major** (as a WCS)
MA 11 to Landfall (Figures 28.2, 28.4 and 28.6, maps 1-3)	MA 11			**Yes**: Mobilisation zone MA 11 interacts with a number of linear features observed in F137, including a dense concentration of features at the northern extent, just south of the Happisburgh Road. The indicative mobilisation area footprint is proposed in a location adjacent to the cable route, just to the south of this concentration of features. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
	Cable route	AP 250 RHDHV 784 NHER 38730 AAA17 (F147 to F152)	Medium - High	**Yes**: the cable route intersects a small number of cropmark features (trackways, field boundaries, ditches) or linear features of possible archaeological interest identified in the geophysical survey data acquired in F149 and F151. Despite this interaction, the cable has been deliberately and proactively routed to the east to avoid the densest concentration of archaeological features in this area. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)
	Side Access: Running north-south, parallel and adjacent to Grub Street (south-west of Happisburgh)			**Yes:** Interaction with features visible on geophysical data acquired in the east of F149 (possible archaeology).	Low	**Minor - Moderate**
	Cable route	AP 128 RHDHV 1133 NHER 38738 AAA18 (F157 and F158)	Low	**Yes** (slight): there is a slight / minimal interaction between the northern-most crop features captured in AP 128 and the cable route.	Low	**Minor**
	Cable route	AP 120 RHDHV 915 NHER 38769 AAA19 (F159 and	Medium - High	**Yes**: the cable route intersects a number of cropmark features (trackways, ditches, field boundaries and coaxial field system) captured in AP 120. Requires ground truthing (as part of the programme of	Low	**Minor - Moderate**

Route Section	Project Element	ID (AP, RHDHV, NHER) + (Headland AAAs / Field Number)	Anticipated heritage significance (importance)	Interaction (WCS)	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
		F160)		archaeological trial trenching) post-consent.		
	Cable route	(F161 and F162 (west))	Medium	**Yes**: there is an interaction between the cable route and a number of features of archaeological or possible archaeological interest identified in geophysical survey data acquired for F161. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Medium	**Moderate**
Landfall (Figures 28.2, 28.4 and 28.6, map 1)	Cable route	AP 80 RHDHV 814 NHER 36495 AAA19 and AAA20 (F162 and F164 to F166)	Medium	**Yes**: the cable route extending from the landfall intersects a small number of cropmark features captured as AP 80. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low - Medium	**Minor - Moderate**
	Cable route	AP 91 RHDHV 828 NHER 16015 AAA19 (F165 and F166)	Medium - High (as a WCS)	**Yes**: the cable route extending from the landfall intersects a small number of cropmark features captured as AP 91. Requires ground truthing (as part of the programme of archaeological trial trenching) post-consent.	Low	**Minor - Moderate** (as a WCS)

166. In the absence of mitigation, all direct impacts to areas in which sub-surface archaeological remains may be present within the onshore cable route could represent adverse impact significance levels ranging between **negligible** and **major adverse** (depending on the significance of the heritage asset in question and the likely magnitude of effect on the asset), based upon a WCS. Of those identified, 45 features have been assigned an impact significance considered significant in EIA terms, prior to the application of mitigation.

167. As part of the iterative project design process, where possible, many known and suspected features of likely high heritage significance or concentrated areas of complex archaeological features have been avoided (see section 28.7.2). However, due to engineering and other environmental constraints, it has not been possible to avoid all features indicative of sub-surface archaeological remains within the onshore cable route. Where significant interactions remain, these often occur in the form of direct impacts upon potential sub-surface archaeological remains on the periphery of larger and / or more complex sites or features, as indicated by available data.

168. With the application of initial informative stages of mitigation and additional mitigation measures (where required) it is anticipated that impacts arising as a result of these effects can be reduced or offset to levels considered **non-significant** in EIA terms. The proposed mitigation measures and other commitments are summarised below and set out in greater detail in the Outline WSI (document reference 8.5).

169. Further geophysical survey will be undertaken post-consent in areas of the onshore project area not previously covered by the priority programme (October 2017 to March 2018). This, alongside other data sets (including aerial photographic cropmark data and cartographic sources), will inform the placement of archaeological trial-trenches as part of a comprehensive project-wide programme of archaeological trial trenching. Should archaeological remains of notable heritage significance be encountered during the trial trenching programme, they are to be considered on a case-by-case basis, in consultation with NCC HES and HE, and will be subject to recognised standard and bespoke approaches to archaeological mitigation (as set-out in the Outline WSI, document reference 8.5) in a manner that is directly proportionate to the nature, level of survival and extent of the remains identified as being present. In addition, as part of the post-consent detailed design phase, further consideration will be given, where possible, to minor route and design refinement (within the confines of the DCO boundary) which will seek to avoid / microsite around and / or minimise impact upon those areas of highest sub-surface archaeological potential, again within the confines of engineering and other environmental constraints.

170. The most pronounced outstanding interactions, including areas of uncertainty on the edge of more substantial remains, between the cable route (and associated compounds and trenchless crossing zones) and potential sub-surface remains, as indicated primarily by the results of the non-intrusive archaeological surveys are listed below in relation to where they appear along the cable route with reference to mobilisation areas and trenchless crossing compounds (where necessary). These sites / areas / features are likely to be priority locations (post-consent) for site-specific initial informative stages of mitigation and additional mitigation measures, as required. The application of which will ensure that archaeological information from these sites will be gathered and retained, and informed decisions made around any further opportunities for preservation *in situ* and where necessary preservation by record, ensuring that the residual impact significance will be offset to levels considered non-significant in EIA terms.

Table 28.17 Notable interactions between the onshore cable route and sub-surface archaeological remains

Cable route Section	Heritage Asset
MA 4 to MA 5a	**AP 6 (F33)**: Extensive area of likely multi period eroded field boundaries, tracks, ditches and possible enclosures, only partly corroborated by the geophysical survey data.
MA 6 to MA 7	**F54** (adjacent to MA6): Archaeological features visible in geophysical survey data in the form of possible enclosures and other linear features (e.g. possible boundaries, trackways).
	AP 30 / RHDHV 1597 / NHER 22903 (F60 and F61): Geophysical survey data shows a continuation of the features observed in AP30 to the west, with two possible enclosures (one of which directly intersects the cable route) and a trackway also visible.
MA 7 to MA 8 (National Trust Land)	**AP 39** / RHDHV 1588 / NHER 12974 (F67 and F68): Geophysical survey appears to show a lesser density and complexity of remains compared to cropmark data, which records an extensive field system with a rectangular enclosure with trackways. Ditches may run further than mapped extent.
	AP 40 / RHDHV 1589 / NHER 12975 (F70 to F74): Geophysical survey appears to show a lesser density and complexity of remains compared to cropmark data, which records former field boundaries possibly relating to post-medieval agriculture. But there are also a large number of ditched features, which are most likely earlier in date.
MA 8 to MA 9	**AP 46** / RHDHV 531 + 1614 / NHER 60062 + 3370 (F80 to F83): A number of cropmark features (ditches / trackways) located within the indicative trenchless crossing footprint (TC 9a/b and TC10). Geophysics appears to show a lesser density and complexity of remains. The most significant looking feature (the Henge Monument) has been deliberately and proactively avoided, but is still in close proximity.
	AP 50 (F87, F88, F91): a number of linear features (former field boundaries, ditches, trackways and enclosures), and a large linear archaeological feature is also identified in the geophysical survey data for F91.

Cable route Section	Heritage Asset
	AP 51 / RHDHV 1607 / NHER 36499 (F93): Area of large ditches which may be part of a field system. There is also a possible large enclosure in the south-east of the area and also a large possible ring ditch in the centre. Geophysical data acquired in the location of AP 51 (F93) indicates the presence of a more complex and concentrated area of features of archaeological interest than indicated by the cropmark data alone.
	AP 53 / RHDHV 1612 / NHER 35549 (F95 and F96): the cable route intersects a number of linear features (ditches / possible enclosure) identified and captured as AP 53 (not obviously shown on geophysical survey data for F95 and F96).
	AP 55 / RHDHV 435 + 762 / NHER 12821 + 37987 (F101): the cable route intersects a possible enclosure / ditch identified and captured as AP 55. Not subject to geophysical survey, due to access constraints.
	AP 57 / RHDHV 435 / NHER 12821 (F103): Trenchless crossings TC12 and TC 13 intersect a number of cropmark features identified and captured as AP 57. Area was identified for, but not subject to, priority archaeological geophysical survey, due to access constraints.
MA 10 to MA 10a	**AP 270** / RHDHV 1609 / NHER 36505 (F107): To the west of the B1145, linear features and a possible ring-ditch have been identified and captured as AP 270. These intersect the trenchless crossing zone (TC14a/b). The NHER identifies an oval enclosure and square enclosure. These features may, however, be formed by natural deposits affecting the crop and producing an irregular pattern of cropmarks. An old windmill is also recorded in this general location on the 1st Edition OS mapping, which may have left a circular surface impression similar to that of an earlier ring ditch at this location.
MA 10a to MA 11	**AP 234** / RHDHV 795 / NHER 7014 / (F120 and F121): Cropmarks of Iron Age to Roman rectilinear enclosure complex and field system. The cable route intersects a small number of linear features only.
	AP 226 / RHDHV 747 / NHER 27243 (F122 and F123): Cropmarks of possible Bronze Age or Iron Age boundary ditch and multi-period enclosures. The cable route intersects a number of cropmark features (ditches, enclosures and field systems) recorded at this location. Although it has been routed to avoid the densest concentration of remains.
	F125 and **F126**: Complex enclosure / boundary features are visible in this field, and may relate to both AP 157 and / or AP 154.
	AP 153 / RHDHV 1631 / NHER 38853 (F128 to F134): Multi-period field boundaries. Many of the cropmark features are corroborated by the geophysical survey data at this location. A number of additional archaeological features are also visible, which may indicate a potentially more dense and complex arrangement and indicate higher potential for subsurface remains than that indicated by the cropmark data alone.
	AP 137 / RHDHV 807 / NHER 21835 (F136 to F138): Cropmarks of probable Iron Age to Roman and medieval to post-medieval features. Many of the cropmark features are corroborated by the geophysical survey data at this location. A number of additional archaeological features are also visible, indicating a potentially more dense and complex arrangement and higher potential for subsurface remains than that indicated by the cropmark data alone. Albeit that the highest concentration of archaeological features as indicated by cropmark data has been avoided by means of deliberate and proactive routeing of the cable route to the north-west.

Cable route Section	Heritage Asset
MA 11 to Landfall	**AP 250** / RHDHV 784 / NHER 38730 (F147 to F152): the cable route intersects a small number of cropmark features (trackways, field boundaries, ditches) or linear features of possible archaeological interest identified in the geophysical survey data acquired in F149 and F151. Despite this interaction, the cable has been deliberately and proactively routed to the east to avoid the densest concentration of archaeological features in this area.
	AP 120 / RHDHV 915 / NHER 38769 (F159 and F161): the cable route intersects a number of cropmark features (trackways, ditches, field boundaries and coaxial field system) captured in AP 120. There is an interaction between the cable route and a number of features of archaeological or possible archaeological interest identified in geophysical survey data acquired for F161. Particularly on the east side of The Street (Whimpwell Street), Happisburgh.

28.7.6.1.3 Onshore Project Substation

171. Construction activities in the onshore substation area that have the potential to directly impact buried archaeological remains are those associated with groundworks relating to onshore project substation construction.

172. There are no known / recorded heritage assets or AP / cropmark features identified within the footprint of the onshore project substation or the associated onshore project substation temporary construction compound, with the exception of a former field boundary (no longer extant) recorded on the 1st Edition OS mapping at the substation location, which is considered to be of low or negligible heritage significance. Due to the former field boundary no longer being extant, even if low-level traces currently survive subsurface, the magnitude of effect is considered to be negligible. As such, direct impacts upon sub-surface archaeological remains (as indicated by available data) as a result of these elements of work are considered to be of **negligible** adverse impact significance.

173. However, the potential for currently unrecorded buried archaeological remains to exist in this area should not be discounted altogether, and will be investigated further as part of post-consent general and site-specific initial informative stages of mitigation and additional mitigation measures, as required. The onshore project substation was outlined for, but not subject to, priority archaeological geophysical survey pre-consent due to access constraints (see section 28.5.3). It is anticipated that this area will be subject to geophysical survey post-consent in order to identify further anomalies which may represent archaeological sites and features and to further inform trial-trench placement (see Outline WSI, document reference 8.5).

28.7.6.1.4 National Grid Substation Extension and Overhead Line Modification

174. Construction activities in the National Grid substation extension zone that have the potential to directly impact buried archaeological remains are those associated with groundworks relating to National Grid substation extension construction, particularly

the installation of 400kV cables, and groundworks associated with temporary works areas (for the substation extension and the overhead line modification) and the installation of AIS bays, landing gantries and new / replacement towers.

175. The above work elements have the potential to result in direct impacts upon **AP 1 (RHDHV 1015)** (Figure 28.4, map 23 and Figure 28.2, map 23) or sub-surface remains currently unrecorded that may be associated with this site. The site represents the likely sub-surface remains of a moated site of possible medieval date and associated ditches, boundaries and enclosures and has been assigned a perceived medium - high heritage significance as a WCS. In order to minimise the interaction between the works and AP 1, the potential presence and survival of this site was taken into direct consideration as part of the iterative design process, which sought to avoid it to the greatest degree possible. As such, interaction between the works in this area and the recorded extent of the site is minimal, and limited to the more peripheral looking ditches to the south of the main moated site area (with the 400kV cable route intersecting only the southern-most cropmark features associated with the site) and to the north-west of the site in the National Grid temporary works area. However, given the uncertainty regarding the exact extent of the potential sub-surface remains at this location (and associated magnitude of effect, anticipated to be low), in the absence of mitigation, direct impacts arising from the 400kV and National Grid temporary works construction and associated works to areas of possible archaeological interest could result in a **moderate adverse** impact significance, based upon a WCS. However, with the application of site-specific mitigation (see section 28.7.2.2), it is anticipated that such impacts can be reduced to levels considered **non-significant** in EIA terms.

28.7.6.1.5 Summary

176. The assessment above indicates that there is the potential for construction works to directly impact buried archaeological remains, resulting in a broad range of **negligible** - **major adverse** impact significance levels, prior to the implementation of mitigation and based upon a WCS.

177. If / when a DCO is granted, initial informative stages of mitigation work (see section 28.7.2 and the Outline WSI, document reference 8.5) will be planned and undertaken in agreement with NCC HES and HE in order to further establish specific and bespoke additional mitigation requirements on a case-by-case / area-by-area basis, as/where required. It is anticipated that the application of appropriate and proportionate initial informative stages of mitigation and subsequent mitigation measures / commitments will help reduce (or offset) impact significance to levels considered **non-significant** in EIA terms.

28.7.6.2 (2) Direct Impact on (permanent change to) Above Ground Archaeological Remains e.g. historic earthworks (including Historic Landscape Character)

178. Impacts resulting in potential effects as part of construction works are those associated with intrusive groundworks, outlined above in section 28.7.6.1.

179. The extent of any impact will depend on the presence and nature of any such remains. Any adverse impacts may as a WCS be permanent and irreversible in nature. In the absence of mitigation, the magnitude of effect of direct impacts on above ground archaeological remains during the construction phase could range from low - high.

180. Extant earthworks and field boundaries are an integral part of the HLC of the wider area, and any loss of such features therefore has the potential to impact upon the HLC of the study area. This change to the HLC arising from the potential loss of above ground features is discussed below.

28.7.6.2.1 Landfall

181. Construction activities in the landfall area that have the potential to directly impact above ground archaeological / built heritage remains (extant structures / features, buildings and earthworks) are those associated with the excavation of the transition pit (to be sited within the landfall compound zone), groundworks at HDD entry pit / exit point locations, groundworks associated with the HDD compound area and associated access routes.

182. One feature representative of above ground archaeological remains has been identified within the landfall, comprising a Type 26 pill box dating to WWII (RHDHV 1529). This asset is likely to have a low heritage significance.

183. This heritage asset is not, however, located within the landfall compound (the compound at the landfall within which HDD drilling would take place) and as such, is not considered vulnerable to direct impacts associated with construction works. No direct impacts (**no impact**) are therefore anticipated to arise as a result of landfall works on above ground archaeological remains.

28.7.6.2.2 Onshore Cable Route

184. Construction activities for the onshore cable route that have the potential to directly impact above ground archaeological remains are those associated with top-soil stripping, cable trenching, groundworks at HDD entry pit / exit point locations, excavation for jointing pits and link boxes and groundworks associated with construction work areas (e.g. MAs and TC compounds), the central storage facility and the cable easement.

185. Nine assets / features considered as possibly being representative of (previously recorded and documented) above ground archaeological remains have been

identified within the onshore cable route and may be subject to impact as a result of construction works. The potential for further heritage assets representative of above ground remains to exist within the onshore project area should not be discounted on the basis that it is not always possible to ascertain whether or not features are still extant based on available records (see section 28.6.3.3).

186. Of those heritage assets identified based on available data, five refer to the presence of earthworks. The heritage significance of these earthworks, alongside the magnitude of effect and pre-mitigation impact significance with respect to construction works within the onshore cable route are summarised in Table 28.18.

Table 28.18 Interaction between earthworks and the onshore cable route

RHDHV ID / NHER / AP ID	Name	Anticipated Heritage Significance	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
RHDHV 1101 NHER 29500 Figure 28.2 (map 8)	Undated earthworks and post-medieval bank.	Low - Medium	Medium	**Minor - Moderate**
RHDHV 1673 NHER 50412 Figure 28.2 (map 3)	Series of low banks in Witton.	Low	Medium	**Minor**
RHDHV 1682 NHER 7295 Figure 28.2 (map 22)	Smugglers' Lane.	Medium	Medium	**Moderate**
AP 6 RHDHV 811 NHER 2999 Figure 28.4 (map 16)	Extensive area of likely multi period eroded field boundaries, tracks, ditches and possible enclosures.	Medium	Low	**Minor**
AP 48 RHDHV 1615 NHER 36454 Figure 28.4 (map 8)	A series of former field boundaries and trackways of unknown date. These features are likely to be more widespread than their visible extent.	Low	Medium	**Minor**

187. The remaining four heritage assets relate to above ground structures, buildings or features, some aspects of which may still be extant within the onshore project area. The heritage significance of these heritage assets, alongside the magnitude of effect and pre-mitigation impact significance with respect to construction works within the onshore cable route are summarised in Table 28.19.

Table 28.19 Interaction between above ground heritage assets and the onshore cable route

RHDHV ID / NHER / AP ID	Name	Anticipated Heritage Significance	Magnitude of Effect	Adverse Impact Significance (pre-mitigation)
RHDHV 1379 NHER 7361 Figure 28.2 (map 16)	Sparham Limekiln (partially demolished, recorded on a side operation access route to the cable route).	Low	Low	**Minor**
RHDHV 1456 NHER 55475 Figure 28.2 (map 4)	Witton Park (the historically mapped extent of which is now in arable use with many landscaped features recorded as being partially destroyed by ploughing)	Low	Low	**Minor**
RHDHV 1559 NHER 40950 Figure 28.2 (map 18)	World War Two buildings and the site of a World War Two antenna array.	Low - Medium	Low	**Minor**
RHDHV 1816 NHER 7364 Figure 28.2 (map 11)	Oulton Airfield (which intersects the proposes storage area).	Low - Medium	Low	**Minor**

188. With the application of site-specific mitigation measures (see section 28.7.2.2), it is anticipated that all such impacts can be reduced to levels considered **non-significant** in EIA terms.

189. Earthwork condition surveys and built heritage / historic building surveys and recording are two approaches that are likely to be implemented at targeted locations as part of post-consent initial informative stages of mitigation. This may be followed by additional backfilling, reinstatement and conservation / restoration requirements, where required on a case-by-case basis (see Outline WSI, document reference 8.5).

190. Trenchless crossing techniques (e.g. HDD) will be used during construction with regards to the canal (RHDHV 1479) and the majority of former / extant railway crossings (RHDHV 1499, 1501, 1494, 1498, 1486 and 1487) and as such, the low heritage significance of these assets when set against a magnitude of effect of no

more than negligible would result in a **negligible** adverse impact significance. One exception to this is RHDHV 1490, the former Route of Midland and Great Northern Joint Railway (Great Yarmouth to Sutton Bridge). This linear heritage asset crosses the cable route in the location of MA7 and is not within a trenchless crossing zone. The NHER records a number of stations, signal boxes, goods sheds and concrete mileposts that remain associated with this wider heritage asset, the presence / absence of which within the onshore project area would need to be further verified as part of post-consent initial informative stages of mitigation. The anticipated magnitude of effect upon this heritage asset (which has been assigned a low heritage significance) is also considered to be low, however, and therefore having the potential to result in an impact significance of **minor adverse.**

191. It is estimated that the onshore cable route will cross in the region of 165[5] hedgerows of low heritage significance. The magnitude of effect on these hedgerows is also considered to be low, resulting in an impact significance of **minor adverse.** Provision will be made to restore any important hedgerows to their pre-construction condition and character where possible. Additional recording and enhanced provisions may also be required during reinstatement at certain locations. It is expected that the implementation of these mitigation measures will help reduce (or offset) the significance of impact upon hedgerows (including county and parish boundaries).

192. The Blickling Conservation Area (356) will also be subject to a degree of temporary direct impact (to landscape character, as discussed in section 28.6.2.1, and not any associated built heritage) on the basis that it contains a proposed Trenchless Crossing (e.g. HDD) Zone (TC9a/b), on the west side of the River Bure, and a *c.* 3.8km length of the 45m wide onshore cable route. At this location the areas associated with the onshore project area and onshore works are owned predominantly by the National Trust (Figure 28.1 – map 4 of 9), and are subject to tenant farming. Although the construction of the onshore cable route through the Blickling Conservation Area represents a direct physical impact on the landscape character of the Conservation Area, the areas through which the onshore cable route passes are considered to have been largely subject to certain levels of alteration and 'recent' change already, through the former historic removal of hedgerows in order to create larger more open fields suitable for agricultural cultivation. The impact highlighted here will be temporary in nature and confined to the construction period and is not considered to constitute harm to the significance of the Conservation Area following the completion of construction through into the operation stage.

[5] Estimated based on 110 hedgerows surveyed within the onshore project area plus a further 55 identified from the Norfolk Living Map and aerial photography taken in 2017. The final number of hedgerows to be removed will be determined during ecological surveys of the unsurveyed areas post-consent when access becomes available (see Chapter 22 Onshore Ecology for further information).

193. The landscape through which the cable route is constructed will be sensitively backfilled and reinstated following construction and field boundaries and hedgerows returned to their pre-construction condition and as such no significant adverse impacts are anticipated to occur following the implementation of proposed mitigation work. This will include an initial informative stage of mitigation in the form of earthwork condition (GPS / topographic) survey prior to construction, and the subsequent sensitive management of cable installation works through the Conservation Area and later the strictly controlled backfilling and reinstatement returning field boundaries and hedgerows to their pre-construction condition, as referred to above, and highlighted within DCO documents (see Outline WSI document reference 8.5 and OLEMS document reference 8.7). A comprehensive programme of post-consent archaeological survey work is also anticipated to take place across the relevant parts of the wider National Trust's Blickling Estate, in consultation with the Trust and NCC HES. For further information and explanation, see the Outline WSI (document reference 8.5).

28.7.6.2.3 Onshore Project Substation

194. No above ground archaeology / built heritage remains are currently recorded within the onshore project substation area and associated onshore project substation temporary construction compound footprint based on data available to date. As such, impacts arising from construction works within the onshore project substation area upon above ground archaeological remains are anticipated to result in **No Impact**.

28.7.6.2.4 National Grid Substation Extension and Overhead Line Modification

195. As part of this initial assessment, no above ground archaeology is currently recorded or identified within the National Grid substation extension, National Grid temporary works area and 400kV cable route based on data available to date. As such, impacts arising from construction works within the National Grid substation extension and overhead line modification area upon above-ground archaeological remains are considered to result in **No Impact**.

28.7.6.2.5 Summary

196. The assessment above indicates that there is the potential for significant impacts upon above-ground archaeological / built heritage remains (extant structures / features, buildings and earthworks) as a result of construction works within the onshore cable route, with a **minor - moderate** adverse impact significance (as a WCS), prior to mitigation. However, as part of a staged approach to post-consent specific surveys (initially informative stages of mitigation), and the application of subsequent mitigation measures / commitments (see section 28.7.2), as required, considering both preservation *in situ* by means of further micrositing and route refinement (with the confines of the DCO limits) or preservation by record options, it

is considered that this will reduce (or offset) impact significance to levels considered **non-significant** in EIA terms.

197. As noted above under section 28.6.4, within the onshore project area, the predominant HLC types of 20th century agriculture and to a lesser degree post-medieval enclosures of an 18th and 19th century date, as well as the rare occurrence of pre-18th century enclosure (Figure 28.3, maps 1 - 9), are anticipated to be able to accommodate a temporary level of change to HLC during construction with fields / plots / areas being returned to their pre-construction condition and character post-construction, as part of a controlled and sensitive programme of backfilling and reinstatement / landscaping. Certain hedgerows and field boundaries (e.g. county and parish boundaries) may require a more formal approach to recording prior to / during the construction process and enhanced provisions during backfilling and reinstatement.

28.7.6.3 (3) Indirect Impact on the Setting of Heritage Assets (both Designated and Non-Designated)

198. Activities undertaken as part of construction works for the project have the potential to impact designated and non-designated heritage assets in an indirect (non-physical) manner, related to the setting of heritage assets. Indirect impacts are likely to arise through the temporary presence of machinery, construction traffic and general construction activities taking place within the onshore development areas. Predominantly the sight and noise and dust, created during the construction phase could have a temporary impact upon heritage assets and their settings.

28.7.6.3.1 Landfall

199. The designated assets shown in Table 28.20 have been identified and assessed as possibly being subject to a temporary, short-term, low or negligible level of adverse magnitude of effect, as a result of their relative proximity to the landfall (Figure 28.1, map 1):

Table 28.20 Heritage assets screened into settings assessment (landfall construction works)

Construction Element	Name (RHDHV ID)
Landfall	Happisburgh Manor RPG (8)
	The Church of St. Mary (11)
	The Encircling Wall to St. Mary's (37)
	St. Mary's including 2 Summerhouses (38)
	Happisburgh Lighthouse / Lighthouse Cottages (61)
	Happisburgh Conservation Area (352)

200. All the designated heritage assets outlined above have been subject to site visits from publicly accessible areas between PEIR and ES submission.

201. Landfall construction works are anticipated to result in indirect impacts of a negligible adverse magnitude of effect, which are temporary and short-term in nature. In light of these low-level findings, Happisburgh Lighthouse (61), as a tall and prominent asset in closest proximity to the landfall, was the only subsequent heritage asset from the list above taken forward and prioritised for further consideration.

202. Happisburgh Lighthouse and Lighthouse Cottages (61) are Grade II Listed Buildings, first listed in May 1987. The Lighthouse is located immediately south-east / south of the main historic core of the village of Happisburgh. The Lighthouse is located *c.* 250m from the cliff edge (to the east) within a large arable field, with further fields to the south, Lighthouse Lane to the west and Beach Road to the north. The setting of the Lighthouse contributes to its heritage significance being located as it is in a prominent (increasingly) coastal position, and was obviously designed to be seen from offshore, by ships, boats and vessels passing out at sea.

203. The Lighthouse can also be seen widely from the surrounding inland and coastal areas. It is one of the tallest, most prominent buildings / structures within the immediate area, along with the Church of St. Mary, Happisburgh (11). The Lighthouse is open to the public on occasional Sundays and Bank Holidays throughout the summer, or by requested appointment. It is a 112 step climb to the lantern with views from the top afforded both seaward, up and down the coast and inland. The Lighthouse is an iconic structure and local landmark, which is also appreciated for its distinctive and traditional colourings.

204. In summary, although the setting of Happisburgh Lighthouse evidently contributes to its heritage significance with its elevated position looking out to sea, the temporary presence of the landfall and specifically the landfall compound to the south / south-east will only have a short term, temporary, low or negligible adverse magnitude of effect on the setting the Lighthouse, which will as a WCS represent a **minor adverse** impact significance and will not constitute harm to the Lighthouse's heritage significance.

205. The other designated heritage assets identified above, located further to the north / north-west of the landfall compound zone, were subject to site visits between PEIR and ES. Any indirect impacts upon the setting of these heritage assets associated with construction works at the landfall compound will only be short term and temporary in nature (and therefore of negligible magnitude of effect), which will as a WCS represent **minor adverse** impact significance. No harm to heritage setting and associated heritage significance will occur.

206. The same conclusions have been reached with respect to construction works immediately offshore associated with bringing the offshore cables ashore and connecting the onshore and offshore elements of the project at this location. Under a long HDD approach these works are anticipated to be located *c.* 1km from the coastline north-east of the landfall compound within the nearshore area of the wider landfall (Figure 28.1, map 1). There will be no construction works on the beach at Happisburgh.

28.7.6.3.2 Onshore Cable Route (e.g. trenchless crossings and mobilisation areas)

207. The heritage assets identified and assessed as possibly being subject to an adverse magnitude of effect as a result of their relative proximity to onshore cable route construction works, TC Zones and / or MAs (Figure 28.1, maps 1-9 and Figure 28.2, maps 3-5, 13 and 16-17) are shown in Table 28.21. Although there may be temporary, short-term, negligible levels of adverse magnitude of effect upon their heritage setting as a result of their proximity to the trenchless crossing zones (e.g. HDDs) and / or mobilisation areas, these are only considered to represent **minor adverse** impact significance as a WCS for the duration of construction activities at these specific locations.

Table 28.21 Heritage assets screened into settings assessment (onshore cable route construction)

Reason for assessment / Construction Element	Name (RHDHV ID)
Proximity to MA 11	The Church of St. Peter, Ridlington (13) (Grade I LB)
	Barn (non-designated) now converted private residence (1423) opposite the east wall of Ridlington churchyard
Proximity to MA 10 and TC 14 a/b	The Friends Meeting House, North Walsham (43) (Grade II* LB)
	The Thatched Cottage (117) (Grade II LB)
	The (non-designated) Old Quaker Burial Ground (1408)
Proximity to 10a and TC16, which overlaps with the very south-west corner only of the recorded extent of the Park (the relevant field is now under arable)	The (non-designated) Witton Park (1456)
Proximity to TC 11 (King's Beck)	Keepers Cottage (145) (Grade II LB)
Proximity to cable route, MA 8 and TC 10	Church of St. Botolph, Colby (20) (Grade I LB)
Proximity to TC9a/b associated with the River Bure	Aylsham Conservation Area (355)
Proximity to TC9a/b associated with the River Bure	Abbots Hall Farmhouse (156) (Grade II LB)
With respect to an c.3.8km stretch of the cable route and TC9a/b associated with the River Bure	Blickling Conservation Area (356)

Reason for assessment / Construction Element	Name (RHDHV ID)
Proximity to MA 6	Salle Park (9) (Grade II RPG) / Salle Park (52) (Grade II* LB)
Proximity to TC7 (*c.* 100m away at its closest point) to the west of Reepham	The (non-designated) Kerdiston Cross (1041)
TC6 associated with The Marriott's Way	Pettywell Farm and associated buildings (307, 308, 309 and 310) (Grade II LBs)
MA 1b and 2 and associated trenchless crossing zones	Scarning Dale (346) (Grade II LB)
Proximity to construction accesses	Colby Hall Farm House (148) (within 50m of a proposed access route)
	Blickling Hall Registered Park and Garden (10) (within 50m of a proposed access route)
	Blickling Conservation Area (356) (within 50m of, and containing, proposed access routes)
	Flashpit Farmhouse (206) (beyond 50m of a proposed access route)
	Old Hall Farmhouse (325) (beyond 50m of a proposed access route)
	The (non-designated) cottages associated with Old Hall Farm House (1394) (beyond 50m of a proposed access route)
	The (non-designated) Park Farm (1449) (within 50m of a proposed access route)

208. On the basis that no ongoing or longer term harm to heritage setting and associated heritage significance is considered likely to occur, the majority of heritage assets listed in Table 28.21 are not considered further as part of this assessment. However, two areas have been considered further as follows:

- Heritage assets with proximity to MA 10 and TC 14 a/b (see Table 28.21); and
- Blickling Conservation Area (356).

209. Heritage assets with proximity to MA 10 and TC 14 a/b and screened into the settings assessment comprise the Friends Meeting House, North Walsham (43), the Thatched Cottage (117) and the Old Quaker Burial Ground (1408) (Figure 28.1, map 2 and Figure 28.2, map 5). The cable route is highly constrained in this area and represents a significant pinch point at the crossings of Little London Road, the Paston Way and the B1145. Construction works at this location will likely have a short term, temporary, negligible adverse magnitude of effect on the setting of the Friends Meeting House (43) and the Thatched Cottage (117) (each regarded as assets of high heritage significance). This will as a WCS represent **minor** adverse impact significance and will not constitute any ongoing harm to the buildings' heritage significance post-construction at this location.

210. The Old Quaker Burial Ground (1408) is beyond the parameters of the onshore project area and will not be subject to direct impact. Nonetheless, construction work around the Old Quaker Burial Ground (1408) will need to be conducted in a sensitive and controlled manner, with associated signage and temporary barriers in order to avoid any accidental damage or physical interactions occurring. This is noted in the Outline WSI (document reference 8.5) and will ultimately need to be included and detailed in a Construction Stage Plan(s), Contractor Environmental Action Plan(s), or similar. In terms of indirect setting impacts, the temporary and short term presence and undertaking of construction works at this location would again only represent a **minor** adverse impact significance as a WCS, and will not constitute any ongoing harm to the Burial Ground's heritage significance post-construction.

211. The presence and undertaking of construction works across a relative small proportion of Blickling Conservation Area (356) will also likely have a short term, temporary, negligible magnitude of effect on the setting of the Conservation Area. This will as a WCS represent a **minor** adverse impact significance and again will not constitute any ongoing harm to the heritage significance of the Conservation Area post-construction. As well as temporary, short-term indirect setting impacts, Blickling Conservation Area will be subject to a degree of temporary direct impact (to landscape character, as set out in section 28.6.2.1, and not any associated built heritage), which is discussed in greater detail in section 28.7.6.2.2. For further information and explanation, see the Outline WSI (document reference 8.5).

28.7.6.3.3 Onshore Project Substation and the National Grid Substation Extension and Overhead Line Modification

212. As the only 'permanent' new above ground infrastructure associated with the project, the onshore project substation has formed the main focus of the heritage settings assessment work undertaken for the EIA, particularly since the decision to adopt HVDC technology was made and as a result there is no longer a requirement for an HVAC associated CRS at the landfall end of the onshore cable route.

213. The settings assessment related to the onshore project substation is considered most relevant to the operational phase of the project (i.e. once the substation has been built and is present within the landscape) (see section 28.7.7 below).

214. The following heritage assets have been subject to consideration as part of any indirect heritage setting impacts associated with construction.

- Two moated sites at Huntingfield Hall (5) (Scheduled Monument);
- Moated site 430m south west of Bradenham Hall (6) (Scheduled Monument);
- Mona Hill (7) (Scheduled Monument);
- Church of St. Andrew, Bradenham (34) (Grade I LB);
- Church of St. Mary, Fransham (35) (Grade I LB);
- Church of All Saints, Necton (36) (Grade I LB);
- The Old Hall, Fransham (58) (Grade II* LB); and
- Bradenham Hall (347) (Grade II LB).

215. There are, however, no identified or relevant heritage setting impacts on these assets associated with the onshore project substation (and related) construction, based predominantly on the distance of the assets from the onshore project substation and associated infrastructure.

216. These assets alongside selected others as identified in association with LVIA tool-kits (e.g. ZTVs and photomontages) have, however, been considered in more detail under potential operational impacts as described in section 28.7.7 below.

28.7.6.3.4 Summary

217. No indirect impacts upon the setting of heritage assets are anticipated to be greater than a **minor** adverse level impact significance (as a WCS), as a result of onshore construction related activity. These would also be of a short term, temporary nature. The majority of impacts have been identified as **negligible** adverse significance, again due predominantly to their temporary and short term nature.

28.7.6.4 (4) Impact on potential Geoarchaeological / Palaeoenvironmental remains, potentially indicative of former land surfaces

218. Construction activities undertaken as part of the project have the potential to effect below ground deposits over a wider area than that of the footprint of the infrastructure. For example, through hydrological changes that may cause desiccation and drying out of wetland deposits and associated preserved waterlogged archaeological / geoarchaeological remains.

219. Impacts resulting in potential effects as part of construction works are those associated with intrusive groundworks, outlined above in section 28.7.6.1. Of particular interest in relation to geoarchaeological and palaeoenvironmental remains are those works requiring trenchless techniques (e.g. HDD), taking place within the landfall and at crossing locations where the onshore cable route intersects for example major transport routes or waterways.

220. The onshore project area at the landfall is part of an internationally important region for Lower Palaeolithic archaeology. Deposits identified as CFB Formation have been encountered at Happisburgh and Pakefield, within which the earliest evidence for

prehistoric hominin activity in the UK has been discovered (Parfitt *et al*., 2010; Parfitt *et al*., 2005). Potential palaeoenvironmental and geoarchaeological remains of this nature are regarded as having a high heritage significance, again under a WCS.

221. In order to ascertain the presence / absence of deposits of palaeoenvironmental potential such as the CFB Formation within the onshore project area, two geoarchaeological watching briefs (Phase 1 and Phase 2) of onshore engineering GI works have been undertaken within (and now immediately beyond) the onshore project area. The Phase 1 watching brief focussed on two landfall sites at the Happisburgh South landfall and at seven key crossing locations where trenchless methods (e.g. HDD) will be required. The Phase 2 watching brief focussed on four proposed trenchless crossing locations at Wooden Copse, North Walsham and Dilham Canal, Kings Beck and Wendling Beck.

222. No deposits resembling the CFB were encountered in boreholes assessed as part of the geoarchaeological watching brief (with depths down to approximately 20 metres below ground level recorded) (see Appendix 28.6). Sediments encountered at the landfall location were considered to be glacial in origin. These results align with suggestions from the AHOB team that a large doline-type geological feature in-filled with glacial deposits may be present within the landfall compound zone. Data assessed indicates that if CFB deposits do survive, they are likely to be found at significant depth.

223. The maximum target depth of drill for trenchless techniques is *c.* 20m (relative to mean sea level). On this basis, it has been concluded in consultation with HE and NCC HES (see Appendix 28.2) that impacts upon geoarchaeological / palaeoenvironmental remains are likely to be of a negligible magnitude of effect, resulting in a **negligible** to **minor adverse** impact significance, at this location, as an interaction ('pathway') between receptor and impact is not considered likely based on information available to date.

224. The potential for the project to encounter currently unrecorded geoarchaeological / palaeoenvironmental remains will be mitigated by means of implementing the additional mitigation measures and commitments as set-out in the Outline WSI (document reference 8.5), which will include reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey which will be established in the post-consent stages.

225. The opportunity to capture and geoarchaeologically assess sediments of possible palaeoenvironmental interest within this internationally important region can also be regarded as a beneficial effect arising as a result of the project. The accumulation of data pertaining to the wider stratigraphy of this region not only builds upon an understanding of the potential for geoarchaeological / palaeoenvironmental remains

to exist with the project area, but also feeds into the wider research framework regarding British Palaeolithic archaeology through engagement with the AHOB and PAB projects. Any beneficial effect, however, must be demonstrated by the completion of studies to professional archaeological standards, and the results produced must be made publicly available (see Outline WSI - document reference 8.5).

28.7.6.5 (5) Impacts to site preservation conditions from drilling fluid breakout

226. The potential for drilling fluid to breakout and spread into archaeological deposits, features and materials thereby causing an adverse effect upon site preservation has also been subject to consideration.

227. As part of the HDD works, a drilling fluid (comprising a combination of water a natural clays such as bentonite) will be employed to lubricate the drilling process and cool the drill head. Bentonite is a common drilling fluid for HDD and is a naturally occurring clay which, when mixed with water, provides a gel like lubricant known as 'drilling mud' for the drilling process. Bentonite typically has a neutral pH level of 7.0 – 9.5 (similar to that of water / seawater) and typically contains less than 3-6% solids by volume and weight to water ratio.

228. Fluid pressures will be monitored throughout the drilling process to minimise the potential for breakout of the drilling fluid and an action plan will be developed and procedures adopted during the drilling activity to respond to any drilling fluid breakout. High level studies have indicated that the total worst case drilling fluid losses to the sea could be up to 300m³ per duct (noting that ~95% of this fluid is water). Moreover, GIs and geoarchaeological assessments have shown that if the CFB deposits associated with potential Palaeolithic archaeology are still extant, they are expected to occur beneath the glacial tills at significant depth and likely beneath the HDD target depths (see Appendix 28.6).

229. The potential for drilling fluid to breakout and spread into / 'coat' archaeological deposits, features and materials thereby causing an adverse impact upon site preservation has as such been assessed as being of negligible magnitude of effect, resulting in a **negligible to minor** adverse significance as a WCS.

28.7.7 Potential Impacts During Operation

28.7.7.1 (1) Indirect Impact on the Setting of Heritage Assets (Designated and Non-Designated)

230. The presence of above ground infrastructure could have an impact on the setting of heritage assets as a result of above ground onshore infrastructure within the landscape.

28.7.7.1.1 Landfall

231. The landfall requires no above ground onshore infrastructure as part of operation. As a result, there are **no indirect impacts** upon the setting of heritage assets with regards to this element of the project.

28.7.7.1.2 Onshore Cable Route

232. The onshore cable route requires no above ground onshore infrastructure that is considered likely to have any implications with regards to the setting of heritage assets. The only above ground components in association with the onshore cable route are confined to a number of link boxes. The link boxes will be located close to field boundaries and in accessible locations (where possible) with the exact location to be determined during detailed design phases (post-consent) and are typically placed at 5km intervals along the cable route. The link boxes may be buried to ground level or may be installed as above ground cabinets. Where they are above ground, the link box cabinets are relatively small in stature (1.2m x 0.8m x 1.8m). On the basis of the size and anticipated siting (i.e. adjacent to field boundaries / roads, where possible) of the link boxes, no **indirect impacts** with respect to heritage setting are considered likely to occur in relation to the onshore cable route.

233. In addition, the Blickling Conservation Area (356) which contains a number of operation access routes may also be subject to temporary, short-term, negligible magnitude of effects upon its heritage setting as a result of its proximity to proposed access routes (Figure 28.1, map 4). However, there is no ongoing requirement to maintain the onshore cables following installation, with access to the onshore cable route only required to conduct emergency repairs if necessary. The use of these access routes by vehicles conducting repair works during the operation phases is therefore likely be infrequent and intermittent. As a result, indirect impacts upon the setting of heritage assets with regards to this element of the project during operation are considered to be of **minor adverse** significance (as a worst case scenario) given its high heritage significance.

28.7.7.1.3 Onshore Project Substation and the National Grid Substation Extension and Overhead Line Modification

234. The following designated heritage assets have been subject to further consideration with respect to indirect impacts as a result of the onshore project substation and the National Grid substation extension operation works (see section 28.6.2), as agreed (with NCC HES and HE) at the ETG meeting held on 24th January 2018:

- Two moated sites at Huntingfield Hall (5);
- Moated site 430m SW of Bradenham Hall (6);
- Mona Hill (7);
- Church of St. Andrew, Bradenham (34);
- Church of St. Mary, Fransham (35);
- Church of All Saints, Necton (36);
- The Old Hall, Fransham (58); and
- Bradenham Hall (347).

235. In addition, the following heritage assets were also given further consideration following discussion with the LVIA consultant project team in March 2018 (see section 28.6.2):

- Church of St. Mary, Bradenham (1825);
- Holme Hale Hall (and associated assets) (1828);
- The Church of St. Andrew, Holme Hale (1826);
- Wendling Abbey, Scheduled Monument (4); and
- The Church of All Saints, Fransham (1827).

236. The above heritage assets are shown in Figure 28.1, map 9 and Figure 28.5. Appendix 28.7 tabulates and details these assets further, with reference to supporting visuals. A summary of the settings assessment outcomes is shown in Table 28.22.

Table 28.22 Onshore project substation summary of settings assessment outcomes

Name	Settings assessment summary
Two moated sites at Huntingfield Hall (5)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) shows no intervisibility between the Monument(s) and the onshore project substation located approx. 3.2 km to the west. A site visit (December 2017) also confirmed this to be the case, with much existing screening (and intervening woodland, vegetation and topography) noted. The moated sites are tree covered and/or surrounded by trees and located to the east side of New Lane. No further action and no mitigation required. **No Impact.**
Moated site 430m SW of Bradenham Hall (6)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) shows no or very low possibility of intervisibility between the Monument and the onshore project substation located approx. 1.6 km to the north-west. There is significant woodland screening (Great Wood) between the moated site and the substation location. The moated site is tree covered and located to east of Wood Lane. No further action and no mitigation required. **No Impact**.
Mona Hill (7)	The Monument is located within a dense woodland block on Necton Common, as shown on the LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) and is surrounded by trees on all sides. As such there is no intervisibility between the Monument and the onshore project substation located approx. 1.6 km to the north. No further action and no mitigation required. **No Impact**.
Church of St.	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and

Name	Settings assessment summary
Andrew, Bradenham (34)	Figures 29.5 and 29.6) suggests medium to low intervisibility between the Church and the onshore project substation located approx. 2 km to the north-west. However, during the site visit (December 2017) the Church was noted as being situated in a hollow and although views towards the onshore project substation may be afforded from the top of the Tower, there are no views from ground level, as these are well-screened by intervening topography, vegetation, trees and hedgerows. The Site was subsequently visited by the LVIA consultant project team in March 2018, at the request of the Heritage consultant project team, and as such is included as a representative heritage specific viewpoint location (BNG 591711, 309148). This has confirmed that there is no visibility from this location, as the Norfolk Vanguard development is concealed by landform and tree cover. No further action and no mitigation considered to be required. **No Impact**. It is worth noting, however, that Cultural Heritage Viewpoint No. 1 (CH1) (Appendix 28.7) does show a very small corner section of the proposed Norfolk Boreas substation as being visible in the photomontage view (seen at a distance of c. 1.6 km) from the grounds of the Church of St Andrew, Bradenham (34). This will be further assessed as part of the Norfolk Boreas project, PEIR and subsequent ES.
Church of St. Mary, Fransham (35)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) suggests low intervisibility between the Church and the onshore project substation located approx. 1.7 km to the south. The Tower does not survive and there are no views from ground level, as these are well-screened by intervening vegetation, trees and hedgerows and the A47. Other intervening features of note further to the south are the existing 400kV overhead powerlines and Necton Wood. No further action and no mitigation required. **No Impact**.
Church of All Saints, Necton (36)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) suggests medium to low intervisibility between the Church and the onshore project substation located approx. 2 km to the north-east. However, the Church is very well-screened by intervening vegetation, trees, hedgerows and built form. Whilst views towards the Substation site may be afforded from the top of the Tower, there are no views in that direction from ground level. Any such views would also encompass the existing Dudgeon and National Grid Substation sites at Necton and the 400kV overhead powerlines. The Tower is not believed to be publicly accessible. The Site was subsequently visited by the LVIA consultant project team in March 2018, at the request of the Heritage consultant project team, and as such is included as a representative heritage specific viewpoint location (BNG 587872, 309726). This has confirmed that there is no visibility from this location, as the development is concealed by landform and tree cover. No further action and no mitigation considered to be required. **No Impact**.
The Old Hall, Fransham (58)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) suggests medium to low intervisibility between the Building and the onshore project substation located approx. 1.3 km to the south. However, the Building is believed to be well-screened by intervening vegetation, trees, hedgerows and built form, including woodland blocks, not least Necton Wood. Although some isolated views towards the Substation site may be afforded from certain locations across the farm complex, this must be taken within the context of other existing large modern farm buildings (barns and silos) within the immediate setting of Old Hall Farm, as well as the large 400kV powerlines running east - west further to the south, adjacent to Necton Wood on its northern side.

Name	Settings assessment summary
	The Site was, however, still subsequently visited by the LVIA consultant project team in March 2018, at the request of the Heritage consultant project team, and as such is included as a representative heritage specific viewpoint location (BNG 590191, 311793). Cultural Heritage Viewpoint No. 3 (CH3) (Appendix 28.7) shows a corner section of the onshore project substation as being visible in the photomontage view (seen at a distance of c. 1.25 km), on the same level as the existing tree line. Viewpoint CH3 is located on the field boundary to the south-west of Old Hall (58), and (as above) visibility from the Hall itself is considered unlikely, as it is enclosed by outbuildings, farm sheds and a certain degree of tree cover. This view, as also noted above, should be seen in the context of the existing overhead powerlines featuring prominently within views in this direction. No further action and no mitigation considered to be required. **No Impact**.
Bradenham Hall (347)	The LVIA ZTV (Chapter 29 Landscape and Visual Impact Assessment, section 29.5.4.1 and Figures 29.5 and 29.6) suggests no intervisibility between the Building and the onshore project substation located approx. 1.9 km to the west / north-west. The Building is well screened by intervening woodland blocks on its west side and further afield by Great Wood, and other vegetation, trees and hedgerows. No further action and no mitigation required. **No Impact**.
Church of St. Mary, Bradenham (1825)	The Site was visited by the LVIA consultant project team in March 2018, at the request of the Heritage consultant project team, and as such is included as a representative heritage specific viewpoint location (BNG 593069, 308410). This has confirmed that there is no intervisibility from this location, as the development is concealed by landform and tree cover. No further action and no mitigation required. **No Impact**.
Holme Hale Hall (and associated assets) (1828)	There is no known intervisibility from these locations, as the development is concealed by landform and tree cover. No further action and no mitigation required. **No Impact**.
The Church of St. Andrew, Holme Hale (1826)	The Site was visited by the LVIA consultant project team in March 2018, at the request of the Heritage consultant project team, and as such is included as a representative heritage specific viewpoint location (BNG 588711, 307543). This has confirmed that there is no intervisibility from this location, as the development is concealed by landform and tree cover. No further action and no mitigation required. **No Impact**.
Wendling Abbey, Scheduled Monument (4)	There is no intervisibility from this location, as the development is concealed by landform and tree cover. No further action and no mitigation required. **No Impact**.
The Church of All Saints, Fransham (1827)	There is no intervisibility from this location, as the development is concealed by landform and tree cover. No further action and no mitigation required. **No Impact**.

28.7.7.1.4 Summary

237. In summary, in general the heritage assets above were not found to share visibility or intervisibility with the onshore project substation and associated infrastructure (if

any different this is stated in Table 28.22), and due to their distance from these above ground elements of the project and the intervening vegetation, trees, hedgerows, landform and built form, **no impacts** to heritage setting (and associated heritage significance) were identified and no further action and no further mitigation is considered to be required. The Blickling Conservation Area (356) may be subject to indirect impacts upon its setting due to infrequent and intermittent use of operation accesses for repair works, the impact significance of which is considered to be of **minor** adverse significance (as a worst case scenario) given its high heritage significance.

238. The noise assessment for the project concluded that the presence of the onshore project substation in isolation, with the application of noise mitigation measures, will result in no impact or negligible impact significance at the identified noise receptor locations. Two of the noise receptor locations were located in the vicinity of Bradenham Hall (**347**), but generally the noise receptors were in closer proximity to the onshore project substation than the designated heritage assets subject to further heritage setting consideration, including those which were taken forward as heritage specific viewpoints. As such noise impacts are not considered to represent a material consideration with respect to heritage setting and the onshore project substation.

239. The nature of the landscape surrounding the onshore substation, including topography, intervening built form, pockets of small, medium and larger woodland blocks and established hedgerows, all contribute to a partially enclosed landscape character. Views of the onshore project substation are therefore typically contained within the short range, with medium to distant range views limited in their occurrence and extent. Mature tree cover within settlements, especially surrounding the sites of heritage assets, provide enclosure and limit the visual association with the wider landscape. As such it is not believed, and has not been identified to date, that the onshore substation features within any important views (e.g. views of the assets from outside of their immediate settings) of the heritage assets identified for further heritage setting consideration. No harm to heritage significance in this respect has therefore been identified and no associated loss of appreciation of the heritage assets, as listed above in Table 28.22.

28.7.7.2 (2) Impacts to site preservation conditions from heat loss from installed cables

240. Heat loss from electrical cables has the potential to have a damaging effect on any waterlogged archaeological remains that may be present, such as palaeoenvironmental / geoarchaeological remains, other organic material and waterlogged wood.

241. The soil structure (thermal properties) and final engineering design will determine the maximum heat loss and subsequent dissipation of heat through the soil.

However, heat dissipation will be localised to areas immediately around the cables and ducts.

242. The soil surrounding the immediate locality of a large portion of the cables will have been subject to disturbance as a result of cable trenching. As any sub-surface archaeological remains present therein will have been considered as vulnerable to the effects of cable trenching, any assets identified will have been subject to initial informative stages of mitigation work, where necessary (see section 28.7.2), and subsequent and additional mitigation measures, where required. On this basis, there will be **no further impact** during operation associated with the heat loss from cables.

243. Sections of the cable installed by means of trenchless techniques will occur at such a depth that there are no anticipated impacts upon sub-surface archaeological remains. Moreover, data assessed indicates that the likely interaction between HDD works and palaeoenvironmental / geoarchaeological deposits are also negligible on the basis that if CFB do survive, they are likely to be found at significant depth (see section 28.7.6.4). As such, it is considered that there will be **no impact** to sub-surface archaeological remains or palaeoenvironmental / geoarchaeological deposits associated with the heat loss from cables during the operational phase.

28.7.8 Potential Impacts During Decommissioning

244. No decision has been made regarding the final decommissioning policy for the onshore cables, as it is recognised that industry best practice, rules and legislation change over time.

245. In relation to the onshore project substation, the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined later within the project lifetime, but are expected to include:

- Dismantling and removal of outside electrical equipment from site located outside of the onshore project substation buildings;
- Removal of cabling from site;
- Dismantling and removal of electrical equipment from within the onshore project substation buildings;
- Removal of main onshore project substation building and minor services equipment;
- Demolition of the support buildings and removal of fencing;
- Landscaping and reinstatement of the site (including land drainage); and
- Removal of areas of hard standing.

246. Whilst details regarding the decommissioning of the onshore project substation are currently unknown, considering the WCS which would be the removal and

reinstatement of the current land use at the site, it is anticipated that the impacts would be no worse than those during construction (see sections 28.7.8.1 and 28.7.8.2).

247. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with latest and current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing approach, which may require EIA.

28.7.8.1 1. Direct Impact on (Permanent Change to) Buried Archaeological Remains

248. Although no decision has been made regarding the final decommissioning plan for the onshore cables and other onshore elements of the project, it is likely that the onshore cables will be removed from the ducts and recycled, with the transition pits and ducts capped and sealed then left *in situ*. Direct impacts as part of decommissioning works may as such result from the removal of onshore cables and the onshore project substation. The extent of any impact will depend on the presence, nature and depth of any such remains, in association with the depth of the proposed decommissioning-related groundworks. Any adverse impacts would likely be permanent and irreversible in nature.

249. It was noted by HE in the Scoping Opinion (Planning Inspectorate, 2016) that the demolition of buildings and infrastructure can have an impact greater than that of construction e.g. if grubbing out of foundations or remediation of contaminants is required. Although a final decommissioning plan has not been established at this stage, it is not anticipated that the grubbing out of foundations will be undertaken. Foundations for the project will either exist in the form of concrete pad foundations (which would likely be broken out and removed) or piled foundations (which would likely be cut off sub-surface) (see Chapter 5 Project Description). Additionally, although there is the potential for small oil spills associated with transformer filling operations, the application of best practice measures would ensure that any leakage would be dealt with quickly and efficiently, thus ensuring that decommissioning activities will not give rise to a major transformer leak. On this basis, direct impacts on buried archaeological remains are assumed to be no worse than those identified during the construction stage. Given that direct impacts on buried archaeological remains are likely to have already occurred as part of the construction phase, impacts of this nature occurring as a result of decommissioning works are considered to be of negligible magnitude.

250. In the absence of further information at this stage of enquiry, a precautionary **minor adverse** impact significance is predicted (as a WCS, and in the absence of both embedded and site-specific / additional mitigation measures, as deemed to be required at the time). This would require substantiation following a more thorough

and detailed assessment at the decommissioning stage. As mentioned above, a full EIA may be carried out ahead of any decommissioning works to be undertaken, including any requisite archaeological and cultural heritage impact assessment. It is also anticipated, however, that appropriate and proportionate mitigation can be applied, as required at the time, which will reduce impact significance to levels considered **non-significant** in EIA terms.

28.7.8.2 2. Indirect Impact on the Setting of Heritage Assets (Designated and Non-Designated)

251. Low or negligible levels of magnitude of effect of a temporary / short-term nature could occur through the presence of machinery, decommissioning traffic and general decommissioning activities taking place within the onshore decommissioning areas. The sight, noise and smell, as well as any dust created during the decommissioning phase could have a temporary indirect (non-physical) impact upon heritage assets and their settings.

252. Impacts upon the setting of heritage assets are likely to be confined to the works associated with the removal of onshore infrastructure and related components. As noted above these works will be temporary in nature. A full EIA may be carried out ahead of any decommissioning works to be undertaken. However, indirect impacts associated with decommissioning and the setting of heritage assets are not considered likely to be any greater than those identified for the construction and operation and maintenance stages. As such no impacts would be greater than a temporary level of **minor adverse** impact significance, and at this stage of assessment most are anticipated to be **negligible** adverse or **no impact**.

28.8 Cumulative Impacts

253. As defined for the purposes of this impact assessment, cumulative impacts are those which arise from the interaction of the project with other known plans or projects. The projects identified for potential cumulative impacts with Norfolk Vanguard have been discussed during ETG meetings with stakeholders and the full list of projects for consideration has been updated following PEIR and agreed in consultation with local authorities.

254. Table 28.23 summarises the project-specific impacts identified in sections 28.7.6 – 28.7.8, alongside their potential to act cumulatively with other projects.

Table 28.23 Potential cumulative impacts

Impact	Potential for cumulative impact	Data confidence	Rationale
Construction			
Direct impact on	Yes	Low -	Cumulative direct impacts arising from two or more

Impact	Potential for cumulative impact	Data confidence	Rationale
buried archaeological remains		Medium	projects are possible given the level of uncertainty regarding the nature and extent of the potential archaeological resource. Impacts may occur to individual archaeological features in an area of over-lap or those with an extent which intersects two or more project boundaries (where groundworks are anticipated). Impacts may also occur which affect the nature of the buried archaeological resource on a wider scale.
Direct impact on above ground archaeological remains	Yes	Medium - High	Cumulative direct impacts arising from two or more projects are possible. Impacts may occur to non-designated heritage assets or individual archaeological features (e.g. earthworks). Such impacts have the potential to affect the HLC of the study area (e.g. loss of earthworks and / or historic field boundaries as a result of one project could affect the HLC as summarised for the purposes of another project).
Indirect impact on the setting of heritage assets	Yes	High	Cumulative indirect impacts arising from two or more projects are possible, particularly in the event that the construction of two or more projects is concurrent and within sight of an individual heritage asset or group of heritage assets, although additional (external) factors affecting setting may also occur.
Impact on potential geoarchaeological / palaeoenvironmental remains	Yes	Low - Medium	Cumulative direct impacts arising from two or more projects are possible. Impacts may occur to geo-archaeological / palaeoenvironmental remains where deposits of geoarchaeological importance present within two or more project boundaries are directly impacted as the result of groundworks.
Operation			
Indirect impact on the setting of heritage assets	Yes	High	Cumulative indirect impacts arising from two or more projects are possible, particularly in the event that the infrastructure of two or more projects occurs within sight of an individual heritage asset or group of heritage assets, although additional (external) factors affecting setting may also occur.
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.			

255. Table 28.24 summarises those projects which have been scoped in to the CIA due to their potential spatial overlap with the Norfolk Vanguard project or their potential to impact the same receptors (assets). The remainder of the section details the nature of the cumulative impacts against all those receptors (assets) scoped in for cumulative assessment.

Table 28.24 Summary of projects considered for the CIA in relation to onshore archaeology and cultural heritage

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
National Infrastructure Planning							
Norfolk Boreas Offshore Wind Farm	Pre-Application	Expected construction date 2026	0 – projects are co-located	Pre-application outline only	High	Yes	Overlapping project boundaries may result in impacts of a direct and / or indirect nature.
Hornsea Project Three Offshore Wind Farm	Pre-Application	Expected construction date 2021	0 – cable intersects project	Full PEIR available: http://hornseaproject3.co.uk/Documents-library/PEIR-Documents	High	Yes	Overlapping project boundaries may result in impacts of a direct and / or indirect nature.
A47 corridor improvement programme – North Tuddenham to Easton	Pre-application	Expected construction date 2021-23	2.5	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-north-tuddenham-to-easton/	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the North Tuddenham to Easton dualling

[6] Shortest distance between the considered project and Norfolk Vanguard – unless specified otherwise.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
A47 corridor improvement programme – A47 Blofield to North Burlingham	Pre-application	Expected construction date 2021-22	25	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-blofield-to-north-burlingham/	Medium	No	due to its proximity (2.5km at the closest point). Designated heritage assets identified in this Chapter which may have intervisibility associated with the con-current construction of the project and this project are the Grade I LB Elsing Hall (RHDHV 31) and the Grade II LB remains to the gatehouse of Elsing Hall (RHDHV 327). However, satellite imagery indicates that these heritage assets lie directly north of a wooded area and are unlikely to have any intervisibility with the A47 corridor improvement programme at this location. Indirect cumulative impacts are therefore considered to be negligible.
A47 corridor improvement programme – A47 / A11 Thickthorn	Pre-application	Expected construction date 2020-21	18	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47a11-thickthorn-junction/	Medium	No	
Norwich Western Link	Pre-application	2022	2.8	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/norwich/norwich-western-link/timeline	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the Norwich Western Link. However, no heritage assets have been identified within this Chapter that will likely share any intervisibility with the construction activities associated with both the project and the Norwich Western Link. Indirect cumulative impacts are therefore also considered to be negligible.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
Third River Crossing (Great Yarmouth)	Pre-application	Expected to start in 2020	28	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the Third River Crossing project. However, due to the distance between these projects, no heritage assets have been identified within this Chapter that will likely share any intervisibility with the construction activities associated with both the project and the Third River Crossing. Indirect cumulative impacts are therefore also considered to be negligible.
King's Lynn B Power Station amendments	Pre-application	Construction expected 2018-2021	28	https://www.kingslynnbccgt.co.uk/	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the King's Lynn B Power Station amendments. However, due to the distance between these projects, no heritage assets have been identified within this Chapter that will likely share any intervisibility with the construction activities associated with both the project and the King's Lynn B Power Station amendments. Indirect cumulative impacts are therefore also considered to be negligible.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
North Norfolk							
PF/17/1951 Erection of 43 dwellings and new access with associated landscaping, highways and external works, and amendments to substation.	Awaiting decision	Anticipated Q2 2018	0.7	Application available: https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_92323	High	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. There is no above ground infrastructure for the project in this section of the cable route (north of North Walsham). Indirect cumulative impacts, should they occur, would therefore only arise as a result of con-current construction works. No heritage assets have been identified within this Chapter that will likely share any intervisibility with the construction activities associated with both the project and the proposed dwellings at this location. Indirect cumulative impacts are therefore considered to be negligible.
Bacton Gas Terminal Extension	Approved	Approved 20/09/2016. Expires 20/09/2019	3.0	Approved PDS available https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_88	Medium	Yes	Proximity to Norfolk Vanguard project with potential impacts upon an area of high potential for geo-archaeological and / or palaeoenvironmental remains. Direct cumulative impacts may therefore occur to this resource, which is internationally renowned for its Lower Palaeolithic archaeological potential.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
				689			
Bacton Gas Terminal Coastal Protection	Approved	Approved 18/11/2016. Expires 18/11/2019	2.5	Approved PDS available	Medium	Yes	Proximity to Norfolk Vanguard project with potential impacts upon an area of high potential for geo-archaeological and / or palaeoenvironmental remains. Direct cumulative impacts may therefore occur to this resource, which is internationally renowned for its lower Palaeolithic archaeological potential.
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction date 2018	1.0	Public information leaflets available: https://www.north-norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Although there is no geographical overlap between the project boundaries, cumulative impacts of a direct or indirect nature may occur to deposits of geoarchaeological interest that are present and intersect both the onshore project area and the proposed Bacton and Walcott Coastal Management Scheme.
Breckland							

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
21-31 new dwellings in Necton (BLR/2017/0001 /PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0001/PIP&module=pl	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the Former Necton Diner proposal (Part 2 of the Brownfield Register) and also during the operational phase due to the presence of above ground infrastructure (e.g. onshore project substation and dwellings). The main heritage asset identified within this chapter that could potentially have combined intervisibility (of construction works and above ground infrastructure) arising from the project and the Former Necton Diner proposal is the Grade I LB Church of All Saints (RHDHV 36). This highly designated heritage asset is not, however, considered to be subject to significant indirect impacts with respect to its setting as a result of the project, on the basis that it is well screened by intervening vegetation, trees, hedgerows and built form. Indirect cumulative impacts are therefore considered to be negligible.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
4-8 new dwellings in Necton (BLR/2017/0002/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0002/PIP&module=pl	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the Former V A Infant School (Part 2 of the Brownfield Register) and also during the operational phase due to the presence of above ground infrastructure (e.g. onshore project substation and dwellings). The main heritage asset identified within this chapter that could potentially have combined intervisibility (of construction works and above ground infrastructure) arising from the project and the Former V A Infant School proposal is the Grade I LB Church of All Saints (RHDHV 36). This highly designated heritage asset is not, however, considered to be subject to significant indirect impacts with respect to its setting, as above. Indirect cumulative impacts are therefore also considered to be negligible.
70 dwellings (3PL/2016/0298/D) (Phase 2 of 3PL/2012/0576/O)	Approved (21/09/16)	Not known. Application submitted March 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0298/D&from=plan	Medium	No	No direct or indirect impacts are considered to arise cumulatively as a result of the project and this housing proposal.

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
				ningSearch			
98 dwellings at Swans Nest with access from Brandon Road (3PL/2017/1351/F) (Phase 3 of 3PL/2012/0576/O)	Awaiting decision (due 30/03/2018)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2017/1351/F&from=planningSearch	Medium	No	No direct or indirect impacts are considered to arise cumulatively as a result of the project and this housing proposal.
175 dwellings with access at land to west of Watton Road, Swaffham (3PL/2016/0068/O) (Swans Nest Phase B)	Awaiting decision (due 13/10/2017)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0068/O	Medium	No	No overlapping project boundaries and therefore direct cumulative impacts are negligible. Indirect cumulative impacts, should they occur, would only arise as a result of con-current construction works in relation to the project and the proposed dwellings, as well as any indirect impacts during the operational phase due to the presence of above ground infrastructure in relation to the project and the proposed dwellings. However, as the project onshore substation and associated works are not considered to result in any significant indirect impacts upon the setting of heritage

Project	Status	Development period	[6]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
							assets, indirect cumulative impacts are also considered to be negligible.

256. As identified in Table 28.24, through one of its subsidiaries, Vattenfall Wind Power Ltd is developing the Norfolk Boreas Offshore Wind Farm (herein the 'Norfolk Boreas project') to the north of Norfolk Vanguard East, with the DCO submission following approximately one year behind the Norfolk Vanguard DCO submission. The development of Norfolk Boreas will use the same onshore cable route as Norfolk Vanguard.

257. The Norfolk Boreas project uses the same landfall as Norfolk Vanguard, and if constructed, a total of four offshore cables and four ducts at the landfall would be required (two for each project, under the HVDC electrical solution). The landfall at Happisburgh South can accommodate all four ducts at one site.

258. The WCS for archaeology and cultural heritage is set out in section 28.7.4 and has assumed that the laying of ducts for the onshore cable route for the Norfolk Boreas project will be conducted as part of the Norfolk Vanguard project construction. Therefore, the elements of Norfolk Boreas that are considered in the CIA are the Norfolk Boreas cable pull and onshore project substation (including the National Grid substation extension, any landscaping or planting, and the onshore 400kV cable route (buried cables between onshore project substation and Necton National Grid substation)).

28.8.1 Potential Cumulative Impacts during Construction

28.8.1.1 (1) Cumulative Direct Impact on (permanent change to) Above Ground and / or Buried Archaeological Remains

259. Due to the geographical overlap between the project and the Norfolk Boreas and Hornsea Project Three projects, there is the potential for direct cumulative impacts upon both above ground and buried archaeological remains.

260. Effects resulting in these potential impacts as part of construction work are those associated with intrusive groundworks in relation to the various projects. The extent of any impact will depend on the presence and nature of any such remains. Any adverse impacts may be permanent and irreversible in nature and have the potential to affect individual heritage assets (or group of heritage assets), as well as the nature of the known archaeological resource as a whole. In the absence of mitigation (both embedded and site-specific / additional mitigation), the magnitude of effect on buried and above ground archaeological remains could be considered to be medium or high, resulting in an impact significance ranging between **moderate** - **major adverse**, as a WCS.

261. Although many of the groundworks and construction activities undertaken for the Norfolk Vanguard project will also serve to facilitate the Norfolk Boreas project (e.g. cable duct installation / trenchless crossings / onshore project substation enabling

works), groundworks specific to the Norfolk Boreas project will also be undertaken (including landfall compound areas, transition / jointing pits, link box installation, the Norfolk Boreas onshore project substation and associated construction area, 400kV interface cable installation and National Grid extension and associated construction compound). As such, although the area of land subject to groundworks as part of the Norfolk Boreas project is comparatively smaller than that for the Norfolk Vanguard project (assuming Norfolk Vanguard is consented and constructed prior to Norfolk Boreas), with many work areas already subject to soil stripping and / or groundworks under the Norfolk Vanguard project, there is still the potential for cumulative direct impacts to occur. Despite this potential (and again, assuming Norfolk Vanguard is consented and constructed prior to Norfolk Boreas), it should be noted that the land impacted by Norfolk Boreas will be more isolated and targeted in discrete locations than that impacted as part of the Norfolk Vanguard project which spans the length of the onshore project area. Moreover, areas subject to groundworks as part of the Norfolk Boreas project will also be in close proximity to the Norfolk Vanguard works and as such, any post-consent survey work undertaken for the Norfolk Vanguard project or construction learning will be able to further inform the Norfolk Boreas project and the application of appropriate mitigation measures therein.

262. In addition, both the Norfolk Boreas and Hornsea Project Three projects are subject to EIA, and are therefore anticipated to adopt mitigation strategies which will seek to avoid, reduce or offset direct impacts upon both buried and above ground archaeological remains. Such strategies if implemented effectively are considered highly likely to reduce (or offset) the impact significance to a level(s) considered **non-significant** in EIA terms. Furthermore, the consideration of phasing and careful design associated with both Norfolk Vanguard and Norfolk Boreas being undertaken by the same developer (Vattenfall Wind Power Ltd.) will help ensure impacts are minimised as much as possible. As outlined above, the survey, identification and recording of archaeological remains associated with Norfolk Vanguard will help inform assessment subsequently undertaken for Norfolk Boreas, thereby resulting in a beneficial effect through the accumulation of data which can be fed into the project design process and de-risk the project from an archaeological / cultural heritage perspective (e.g. route refinement, micrositing, input into the iterative design process), where possible, and within the confines of engineering and other environmental constraints.

28.8.1.2 (2) Cumulative Indirect Impact on the Setting of Heritage Assets (Designated and Non-Designated)

263. Cumulative indirect impacts have the potential to occur upon heritage assets which share intervisibility with both construction works associated with the project and

those undertaken for other projects and activities, where construction works are con-current.

264. The construction works for the Norfolk Vanguard and Norfolk Boreas projects have been designed in such a way that concurrent construction is not anticipated to take place. As such, cumulative indirect impacts on the setting of heritage with respect to construction works associated with these projects is considered to be of **negligible** adverse significance.

265. The expected construction date of the Hornsea Project Three Offshore Wind Farm is 2021, during which time pre-construction works for the Norfolk Vanguard project are anticipated to take place. There is therefore the potential for concurrent construction to occur with respect to these projects. However, cumulative indirect impacts are only likely to occur should construction works take place con-currently within the area in which the cable routes cross.

266. The heritage asset considered most likely to be vulnerable in this regard and identified in this assessment comprises Salle Park (Registered Park and Garden, RHDHV 9 and Grade II* LB, RHDHV 52). However, any cumulative indirect impacts upon the setting of these heritage assets associated with construction works will be temporary in nature only (if concurrent construction takes place at all) and are therefore considered **non-significant** in EIA terms.

28.8.1.3 (3) Cumulative Impact on potential Geoarchaeological / Palaeoenvironmental remains, potentially indicative of former land surfaces

267. The Happisburgh area is regarded as an internationally important region for Lower Palaeolithic archaeology, with recorded Palaeolithic deposits of significant archaeological / palaeoenvironmental potential along this section of the coast of high heritage significance. On the basis of this, it is considered that there is the potential for geoarchaeological deposits to span this section of the coast, thereby intersecting the onshore project area (e.g. landfall) and other coastal projects, including the Bacton Coastal Protection Scheme and Bacton Gas Terminal Extension and Coastal Protection projects.

268. Impacts resulting in potential effects as part of construction work are those associated with intrusive groundworks in relation to the various projects, should they occur. The extent of any impact will depend on the presence and nature of any such remains.

269. On the basis of two project-specific phases of geoarchaeological monitoring (watching briefs), this chapter has concluded in consultation with HE and NCC HES that the magnitude of effect upon geoarchaeological / palaeoenvironmental remains at the landfall arising as a result of the project is likely to be negligible as an

interaction ('pathway') between receptor and impact is not considered likely to occur based on the information available to date (see section 28.7.6.4). The cumulative impact significance is thus considered to be **negligible** adverse.

270. The potential for the project to encounter currently unrecorded geoarchaeological / palaeoenvironmental remains more widely across the onshore project area will be mitigated by means of implementing the embedded mitigation measures and commitments as set-out in the Outline WSI (document reference 8.5), which includes reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey, which will be established, planned and under-taken post-consent. The adoption of mitigation measures which take into account the potential for deposits of geoarchaeological / palaeoenvironmental interest to be present is anticipated to offset or reduce any identified impacts, should any such impacts arise as a result of these projects, and represents good practice in approaches to geoarchaeology with respect to large linear schemes.

271. A beneficial cumulative magnitude of effect is the accumulation of geoarchaeologically monitored and recorded geotechnical data. Such data may be considered to contribute significantly to a greater understanding of the palaeoenvironmental and geoarchaeological resource across a large area of the county.

28.8.2 Potential Cumulative Impacts During Operation

28.8.2.1 (1) Cumulative Indirect Impact on the Setting of Heritage Assets (designated and non-designated)

272. Cumulative indirect impacts upon the setting of heritage assets may occur during the operational phase due to the visibility and presence of above ground project infrastructure alongside above ground infrastructure arising as a result of other projects or activities. Projects scoped into this assessment comprise the Norfolk Boreas onshore project substation and National Grid substation extension works.

273. The settings assessment as presented in this chapter has concluded that significant indirect impacts upon the setting of heritage assets are not considered to occur due to the presence of the onshore project substation. This is largely due to the natural screening surrounding the onshore project substation area, which has resulted in little or no visibility or intervisibility from the surrounding heritage assets towards the above ground infrastructure at this location. It therefore follows that the potential for this impact to occur cumulatively as a result of the Norfolk Boreas project is also considered unlikely, and therefore resulting in **no impact**.

274. It is worth noting that Cultural Heritage Viewpoint No. 1 (CH1) (Appendix 28.7) does show a very small corner section of the proposed Norfolk Boreas substation as being

visible in the photomontage view (seen at a distance of c. 1.6 km) from the grounds of the Church of St Andrew, Bradenham (34). However, this does not give rise to a cumulative impact because the Norfolk Vanguard substation is not visible from this heritage asset. An assessment of the impact arising from the Norfolk Boreas substation alone will be conducted as part of the Norfolk Boreas application for development consent.

28.8.3 Potential Cumulative Impacts During Decommissioning

275. Decommissioning of the Norfolk Boreas and Hornsea Project Three projects may potentially take place at the same time as the Norfolk Vanguard project. The detail and scope of the decommissioning works for the Norfolk Vanguard project will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. Appropriate mitigation strategies for the decommissioning phase will be developed for both the Norfolk Vanguard and Norfolk Boreas projects in line with best practice at the time of decommissioning. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are predicted to be no worse than those identified during the construction stage.

28.9 Inter-relationships

276. Inter-relationships exist between onshore archaeology and cultural heritage and predominantly the assessments undertaken for offshore archaeology and cultural heritage, landscape and visual impact and onshore noise and vibration. Information from these chapters has been used to help establish any further potential impacts to the onshore archaeology and cultural heritage resource and help inform the impact assessment presented in this ES chapter.

Table 28.25 Onshore archaeology and cultural heritage inter-relationships

Topic and description	Related chapter	Where addressed in this chapter	Rationale
The setting of heritage assets (including indirect impacts).	Chapter 29 Landscape and Visual Impact Assessment.	Sections 28.5, 28.6 and 28.7.	There could be potential impacts with respect to landscape and visual receptors which could also represent potential impacts to the setting of heritage assets.
The setting of heritage assets (including indirect impacts).	Chapter 25 Onshore Noise and Vibration.	Sections 28.5, 28.6 and 28.7.	Potential impacts related to noise and vibration could impact on the setting of heritage assets.
CFB deposits and the setting of heritage assets (including direct and indirect impacts).	Chapter 17 Offshore and Intertidal Archaeology and	Sections 28.5, 28.6 and 28.7.	Potential impacts on nearshore, intertidal and coastal archaeology and cultural heritage, for example Cromer Forest Bed deposits could continue into

Topic and description	Related chapter	Where addressed in this chapter	Rationale
	Cultural Heritage		the onshore project area.

277. Cross-references, where relevant, have been made to the LVIA chapter (Chapter 29) throughout this ES chapter in relation to the assessment of heritage setting. In particular, this underlines the cross-correlation between the chapters through the incorporation of LVIA tool-kits (e.g. ZTVs and photomontages) into the onshore archaeology and cultural heritage assessment, alongside identification and review of heritage specific viewpoints, which have been captured in collaboration with the LVIA consultants and agreed with HE and NCC HES, as part of the pre-application EPP ETG consultation process.

278. The potential for an inter-relationship to occur between onshore archaeology (Chapter 28) (this chapter) and intertidal archaeology (Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) has also been considered, where activities in the intertidal zone / offshore and onshore have the potential to impact the same heritage asset or group of heritage assets, either directly or indirectly.

279. Norfolk Vanguard Limited have made the decision to adopt a long HDD approach at the landfall, which means that no works will take place on the beach or within the intertidal zone, with the HDD passing under the cliffs and exiting at an offshore location beyond 5.5m below Lowest Astronomical Tide (LAT) (up to 1000m in total drill length, minimum target depth 10m, maximum target depth 20m). As a result, there will be no impacts to archaeological remains within the upper beach sand deposits. Although HDD works may, in theory, impact the CFB deposits (corresponding to Yarmouth Roads Formation offshore, see Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage), the geoarchaeological monitoring (watching brief) undertaken on GI works conducted for the project to date has revealed no deposits resembling the CFB in boreholes monitored and assessed (Appendix 28.6). On this basis, it has been concluded in consultation with HE and NCC HES that impacts upon geoarchaeological / palaeoenvironmental remains are likely to be negligible at this location, as an interaction ('pathway') between receptor and impact is not considered likely based on information available to date (section 28.7.6.4).

280. The potential for the project to encounter currently unrecorded geoarchaeological / palaeoenvironmental remains will be mitigated by means of implementing the mitigation measures and commitments as set-out in the Outline WSI (document reference 8.5) (see sections 28.7.2 and 28.7.6.4) and addressed through ongoing consultation with members of the AHOB / PAB research team, HE and NCC HES.

281. Intertidal and / or offshore activities could have an impact upon the setting of heritage assets onshore, albeit temporary and limited to construction activities only. However, due to the decision to adopt a long HDD approach, there will be no construction works on the beach at Happisburgh. Any indirect impacts upon the setting of onshore / coastal heritage assets associated with bringing the offshore cables ashore and connecting the onshore and offshore elements of the project will only be of negligible levels of adverse magnitude of effect, short term and temporary in nature, which will as a WCS represent **minor adverse** impact significance (see section 28.7.6). No harm to heritage setting and associated heritage significance will occur. Additionally, as discussed in Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage, the setting of intertidal heritage assets is not considered to contribute to their significance and there is, therefore, no potential for impact from onshore activities upon the setting of intertidal heritage assets.

282. No impacts are anticipated to occur upon the setting of heritage assets onshore during the operational phase as a result of the presence of offshore infrastructure. It was proposed within the Scoping Report prepared for the project that landscape, visual and cumulative impacts of the offshore components for all phases of the development were scoped out of the EIA given the distance from onshore landscape and visual receptors (47km) document reference: PB4476-102-001 (Royal HaskoningDHV, 2016); an approach which was agreed with the SoS in the Scoping Opinion (The Planning Inspectorate, 2016). To this end, significant impacts are also considered highly unlikely to occur upon the setting of onshore (coastal) heritage assets as a result of offshore infrastructure. As a result no impact is considered to arise in relation to this potential inter-relationship, as further explained and evidenced below.

283. The vast majority of onshore heritage assets do not derive any primary heritage significance from long ranging (e.g. 47km) seaward views, towards where the offshore infrastructure is to be located. Examples of heritage assets where seaward views may contribute in part to their heritage significance include lighthouses, lifeboat lookout stations, coastal forts, batteries and other defences. However, the presence of the offshore turbines, potentially perceptible and visible on the distant horizon in certain clear weather conditions, is not considered to impact the heritage significance of such coastal heritage assets within the context of other coastal, nearshore and offshore activities, which take place within the southern North Sea.

284. Taking the Happisburgh Lighthouse (61) as an example. The Lighthouse is the oldest working light in East Anglia, and the only independently run lighthouse in Great Britain, which contributes historic value to its heritage significance. The setting of the Lighthouse is also considered to contribute to its heritage significance being located as it is in a prominent (increasingly coastal) position, and designed to be seen from

offshore, by ships, boats and vessels passing out to sea. The Lighthouse can also be seen widely from the surrounding inland and coastal areas. It is one of the tallest, most prominent buildings / structures within the immediate area, along with the Church of St. Mary, Happisburgh (11).

285. Although the setting of Happisburgh Lighthouse evidently contributes to its heritage significance with its elevated position looking out to sea and also affording views inland, the presence of the offshore infrastructure is not considered to feature within the lighthouse's immediate setting or adversely impact upon the heritage significance of the Lighthouse. The presence of the offshore infrastructure would not constitute harm to the Lighthouse's heritage significance or the ability of members of the public to appreciate its heritage significance. The Lighthouse is open to the public on occasional Sundays and Bank Holidays throughout the summer, or by requested appointment. It is a 112 step climb to the lantern with views both seaward, up and down the coast and inland. On a clear day the offshore turbines may be visible on the distant horizon, however, as per views from the top of St. Mary's Tower, views from the Lighthouse's lantern viewing platform would also likely include numerous churches, water towers, corn and drainage mills, existing wind farms, Trimingham RAF radar installation, Bacton gas terminal and possibly the Cathedral spire in Norwich (Happisburgh Village Website - www.happisburgh.org) The offshore wind turbines may simply be seen (if / when visible) as another aspect of an ever developing and evolving view from this location.

286. This conclusion is further evidenced by the landscape, visual and cumulative impacts of the offshore components for all phases of the development being scoped out of the EIA given the distance from onshore landscape and visual receptors (47km). As such no wire-frame analysis, ZTV (in regard to the offshore infrastructure) or photomontages were considered necessary.

28.10 Interactions

287. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within the chapter take these interactions into account and for the impact assessments are considered both conservative and robust. For clarity the areas of interaction between impacts are presented in Table 28.26, along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 28.26 Interaction between impacts

Potential interaction between impacts Construction	1 Direct impact on buried archaeological remains	2 Direct impact on above ground archaeological remains	3 Indirect impact on the setting of heritage assets	4 Impact on potential geoarchaeological / palaeoenvironmental remains	5 Impacts to site preservation conditions from drilling fluid breakout
1 Direct impact on buried archaeological remains	-	Yes	Yes	Yes	Yes
2 Direct impact on above ground archaeological remains	Yes	-	Yes	No	No
3 Indirect impact on the setting of heritage assets	Yes	Yes	-	Yes	No
4 Impact on potential geoarchaeological / palaeoenvironmental remains	Yes	No	Yes	-	Yes
5 Impacts to site preservation conditions from drilling fluid breakout	Yes	No	No	Yes	-

Operation	1 Indirect Impact on the Setting of Heritage Assets	2 Impacts to site preservation conditions from heat loss from installed cables
1 Indirect Impact on the Setting of Heritage Assets	-	No
2 Impacts to site preservation conditions from heat loss from installed cables	No	-

Decommissioning
It is anticipated that the decommissioning impacts will be no worse than those of construction.

28.11 Summary

288. The construction, operation and decommissioning phases of the project have the potential to result in a range of impacts upon the onshore archaeological and cultural heritage resource. The significance of these impacts has been assessed based on best practice, consultation and professional judgement.

289. Prior to the implementation of additional site-specific mitigation requirements, impacts are predicted to occur ranging between **no impact** and **major adverse** impact significance levels. However, it is anticipated that, following the application of the initial informative stages of mitigation and additional site-specific mitigation measures (as and where required, to be agreed in consultation with NCC HES and HE) (see section 28.7.2), to be undertaken post-consent, the significance of any impacts, where relevant, will be reduced or offset to levels considered **non-significant** in EIA terms.

290. As part of the additional mitigation, a project-specific draft (outline) WSI (document reference 8.5) has been submitted as part of the DCO application, prepared in agreement with NCC HES and HE, which outlines a commitment to undertake the initial informative stages of mitigation post-consent. The information attained from these additional programmes of survey and evaluation (Note: for consistency of reference and terminology these are always to be referred to as initial informative stages of mitigation) will inform further decisions regarding the subsequent archaeological mitigation strategy for the project so that the historic environment resource can be safe-guarded in a manner that is both appropriate and proportionate to the significance of the archaeological remains identified and present.

291. Further mitigation approaches and measures will be determined as the project progresses into and through the post-consent stages and are expected to comprise a combination of the following recognised standard approaches both in advance of and / or during construction.

292. Initial informative stages:

- Additional project-wide archaeological geophysical survey;
- Targeted archaeological metal detecting and field walking;
- Archaeological trial-trenching;
- Earthwork condition (Global Positioning System (GPS) / topographic) survey; and
- Geoarchaeological assessment / palaeoenvironmental survey.

293. Additional (subsequent) site-specific measures:

- Set-piece (open-area) Excavation. Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate);
- Preservation *in situ* (further avoidance / micrositing);
- Strip, Map and Sample Excavation. Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate); and
- Archaeological Monitoring / Watching Brief (targeted and general). Including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate).

294. Through the application of an appropriate and proportionate mitigation strategy, applying a range of techniques, significant direct adverse impacts to known heritage assets post-mitigation are considered unlikely to occur, or to be satisfactorily reduced or offset. This is based on:

- The avoidance of physical impacts to all designated heritage assets, wherever possible, reasonable and practicable (e.g. this does not apply to physical impacts to landscape character elements of the Blickling Conservation Area, as previously discussed with NCC HES and HE, which will be subject to the implementation of additional mitigation work as discussed below);
- The avoidance of non-designated heritage assets / potential sub-surface archaeological remains by means of micrositing (where possible within the confines of engineering and other project-related constraints); and
- The preservation either *in situ* or by record of all non-designated heritage assets where avoidance has not been possible.

295. The presence, exact nature and extent of all potential heritage assets is at present often uncertain or unknown, and as such direct impacts cannot be entirely avoided. However, the staged programme of assessment and survey undertaken to date has been designed to identify the presence of hitherto unsubstantiated, unknown and unrecorded heritage assets within and across the onshore project area. The avoidance, where possible, of any areas in which potential sub-surface archaeological remains may be present (as indicated by available data) has enabled individual features and areas considered to be of heightened archaeological sensitivity to be avoided where possible by means of micrositing as part of the iterative design process and reviewed throughout a series of pre-application

workshops. It is anticipated that this approach, alongside the initial informative stages of mitigation post-consent, which will help further elucidate the potential for buried archaeological remains whilst also corroborating the heritage significance of previously known / identified or suspected assets, will enable direct impacts upon heritage assets to be minimised through good practice approaches to mitigation, thus reducing (or offsetting) the impact significance upon the potential resource to levels considered non-significant in EIA terms.

296. Following a robust assessment supported by a desk-based review, site visits, the incorporation and use of LVIA tool-kits (photomontages, ZTVs) and the consideration and capturing of a number of heritage-specific viewpoints, it has been demonstrated in this chapter that impacts upon the setting of heritage assets arising as a result of the project are likely to be non-significant in EIA terms. This assessment has revealed that none of the heritage assets identified within the study area (and certain assets considered over a wider area) were found to share visibility or intervisibility with the onshore project substation and associated infrastructure, which represents the only 'permanent' (the indicative design life is 30 years) new above ground onshore infrastructure associated with the project with the potential to result in an indirect impact upon the setting of heritage assets. It is acknowledged, however, that those heritage assets within closest proximity to onshore construction works may be subject to short term / temporary impacts, albeit it that these are determined as non-significant in EIA terms.

297. Impact to the HLC will, in part, be off-set by returning field boundaries / hedgerows to their preconstruction condition and character post-construction, wherever possible, as part of a sensitive programme of backfilling and reinstatement / landscaping (where appropriate). Certain hedgerows and field boundaries (e.g. parish and county boundaries) may require recording prior to / during the construction process and enhanced provisions made during backfilling and reinstatement (see document references 8.5 and 8.7).

298. The landscape character elements of the Blickling Conservation Area, through which the cable route is constructed, will be sensitively backfilled and reinstated following construction and field boundaries and hedgerows returned to their pre-construction condition and as such no significant adverse impacts are anticipated to occur following the implementation of proposed mitigation work. This will include an initial informative stage of mitigation in the form of earthwork condition (GPS/topographic) survey prior to construction, and the subsequent sensitive management of cable installation works through the Conservation Area and later the strictly controlled backfilling and reinstatement returning field boundaries and hedgerows to their pre-construction condition, as referred to above, and highlighted

within DCO documents (see Outline WSI document reference 8.5 and OLEMS document reference 8.7).

299. This chapter has also concluded that whilst cumulative impacts may occur to heritage assets, this potential and the significance of any such impacts is also considered to be reduced (or offset) on the basis of the application of industry standard initial informative stages of mitigation and subsequent mitigation measures to be implemented as part of the project, as well as the mitigation strategies anticipated, outlined and adopted for the existing and future projects reviewed as part of this chapter.

300. Whilst the impacts anticipated and assessed as part of this chapter are generally of an adverse nature, the benefits associated with the application of appropriate initial informative stages of mitigation and subsequent site-specific mitigation measures that contribute overall to a greater understanding of the onshore archaeological and cultural heritage resource could be considered to represent a beneficial cumulative magnitude of effect that cannot be discounted, especially where archaeological sites are under threat from other non-project related impacts, for example as a result of arable farming (e.g. deep ploughing). The accumulation of data for the Norfolk Vanguard project has the additional benefit of feeding into the Norfolk Boreas project design process, which will reduce potential impacts of the project from an archaeological / cultural heritage perspective (e.g. through route refinement, micrositing), where possible, and within the confines of engineering, environmental and other constraints.

301. The beneficial cumulative magnitude of effect of data accumulation described above is obviously dependent, however, on the demonstration that the archaeological works to be undertaken (following a logical and heritage stakeholder approved staged approach) are completed to high professional archaeological standards and on the basis that any results produced and important findings made will ultimately be made publicly available. Compliance to industry best practice standard and guidance documents is set out in the Outline WSI (document reference 8.5).

Table 28.27 Potential impacts identified for onshore archaeology and cultural heritage

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
Construction						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Low to High	Negligible to High (as a WCS)	Negligible to Major adverse (as a WCS)	1) Additional project-wide geophysical survey to further ascertain presence / absence and likely extent of buried archaeological remains, *where not undertaken as part of the priority programme*. 2) Targeted metal detecting and field walking. 3) Trial trenching (i.e. ground truthing). Followed by the most appropriate subsequent mitigation approaches agreed with NCC HES / HE: • Preservation *in situ*; • Set-piece excavation; • Strip, map and sample excavation; and • Monitoring / watching brief. See Outline WSI for further details (DCO Doc 8.5).	Predicted to be **non-significant** in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE). This further information regarding potential sub-surface remains will be gathered post-consent, and will directly inform decisions made around any further opportunities for preservation *in situ* and where required and necessary preservation by record, ensuring that the residual impact significance is offset to levels considered non-significant in EIA terms.

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
(2) Direct impact on (permanent change to) above ground archaeological remains e.g. historic earthworks (including the Historic Landscape Character)	Above ground archaeological remains (e.g. extant structures / features, buildings and earthworks)	Low to Medium	Low to Medium	Minor to Moderate adverse (as a WCS)	Targeted earthwork condition or built heritage / historic building survey and recording, where necessary, followed by the most appropriate subsequent mitigation approaches (e.g. additional backfilling, reinstatement and sensitive conservation/ restoration requirements), where required on an area by area, site by site and case by case basis. Cable installation works through Blickling Conservation Area are to be sensitively managed and subject to full, thorough and strictly controlled backfilling, and reinstatement of landscape character elements of the Conservation Area. See Outline WSI for further details (DCO doc. 8.5).	Predicted to be **non-significant** in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE). As such it is anticipated that such impacts can be reduced or offset to levels considered non-significant in EIA terms.

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
(3) Indirect impact on the setting of heritage assets (both designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	None required. Other than due care, attention and diligence to the presence and proximity of the designated and non-designated heritage assets identified in section 28.7.6 throughout the duration of construction. Certain assets (e.g. the Old Quaker Burial Ground at North Walsham - 1408) may require associated signage and temporary barriers in order to avoid any accidental damage or physical interactions occurring. This has been noted in the Outline WSI (DCO doc. 8.5) and will ultimately need including and detailing in a Construction Stage Plan(s), Contractor Environmental Action Plan(s), or similar.	**Minor adverse** **(as a WCS)**
(4) Impact on potential geoarchaeological /	Palaeoenvironmental and geoarchaeological	High (as a WCS)	Negligible	Negligible to Minor adverse (as	Potential / currently unrecorded	**Negligible** (**non-significant** in EIA terms): Following the

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
palaeoenvironmental remains, potentially indicative of former land surfaces	deposits / remains			a WCS)	geoarchaeological / palaeoenvironmental remains will be mitigated by means of implementing the embedded mitigation measures and commitments as set-out in the Outline WSI (DCO doc. 8.5), which includes reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey, which will be planned and undertaken in the post-consent stages, in agreement and ongoing consultation with NCC HES and HE.	application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures (to be agreed in consultation with NCC HES and HE), as required.
(5) Impacts to site preservation conditions from drilling fluid breakout	Palaeoenvironmental and geoarchaeological deposits / buried archaeological remains	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	Fluid pressures are to be monitored throughout the drilling process to minimise the potential for breakout of the drilling fluid and an action plan will be developed and procedures adopted during the drilling	**Negligible**

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
					activity to respond appropriately to any drilling fluid breakout.	
Operation						
(1) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	High	Negligible	Minor adverse (as a WCS), but generally No Impact	None required.	**Minor adverse (as a WCS), but generally No impact**
(2) Impacts to site preservation conditions from heat loss from installed cables	Palaeoenvironmental and geoarchaeological deposits / buried archaeological remains	Negligible to High	N/A	No Impact	None required.	**No impact**
Decommissioning						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Negligible to High	Negligible	Minor adverse (as a WCS)	The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with latest and current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The	It is anticipated that appropriate and proportionate mitigation can be applied, as required at the time, which will reduce / off-set impact significance to levels considered **non-significant** in EIA terms.

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
					decommissioning works could be subject to a separate licencing approach, which may require EIA, including any requisite archaeological and cultural heritage impact assessment.	
(2) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible to Low	Negligible to Minor adverse (as a WCS)	None required. Indirect impacts associated with decommissioning and the setting of heritage assets are not considered likely to be any worse than those identified for the construction and operation and maintenance stages.	**Minor adverse (as a WCS)** Although a full EIA may be carried out ahead of any decommissioning works to be undertaken.
Cumulative: Construction						
(1) Cumulative direct impact on (permanent change to) above ground and / or buried archaeological remains	Above ground archaeological remains (e.g. extant structures / features, buildings and earthworks) and buried (sub-surface) archaeological remains	Negligible to High	Medium to High (as a WCS)	Negligible to Major adverse (as a WCS)	Norfolk Boreas and Hornsea Project Three are subject to EIA, and are therefore anticipated to adopt mitigation strategies which will seek to avoid, reduce or offset direct impacts upon both above ground and buried archaeological remains.	Predicted to be **non-significant** in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE).

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
					The survey, identification and recording of archaeological remains associated with Norfolk Vanguard will help inform assessment subsequently undertaken for Norfolk Boreas, thereby resulting in a beneficial effect through the accumulation of data which can be fed into the project design process from an archaeological and cultural heritage perspective.	
(2) Cumulative Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	None required.	**Negligible to Minor adverse (as a WCS)**
(3) Cumulative Impact on potential geoarchaeological / palaeoenvironmental remains, potentially indicative of former land surfaces	Palaeoenvironmental and geoarchaeological deposits / remains	High (as a WCS)	Negligible (adverse)	Minor adverse (as a WCS)	Potential / currently unrecorded geoarchaeological / palaeoenvironmental remains will be mitigated by means of implementing the embedded mitigation measures and commitments as set-out in the Outline WSI	**Negligible** (**non-significant** in EIA terms): Following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures (to be agreed in consultation with NCC HES and HE), as

Potential impact	Heritage asset type	Heritage significance (importance)	Magnitude of effect (change)	Impact significance (significance of impact)	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
					(DCO doc. 8.5), which includes reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey, which will be planned and undertaken in the post-consent stages, in agreement and ongoing consultation with NCC HES and HE.	required. A beneficial cumulative magnitude of effect is the accumulation of geoarchaeologically monitored and recorded geotechnical data which may contribute significantly to a greater understanding of the palaeoenvironmental and geoarchaeological resource across a large area of the county.
Cumulative: Operation						
(1) Cumulative Indirect Impact on the Setting of Heritage Assets (designated and non-designated)	Designated and certain non-designated heritage assets	High	N/A	No Impact	None required.	**No impact**
Cumulative: Decommissioning						
Cumulative decommissioning	The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. A full EIA may be carried out ahead of any decommissioning works being undertaken, including any requisite archaeological and cultural heritage cumulative impact assessment.					

28.12 References

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