Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

Volume 1

Chapter 21 - Onshore Archaeology and Cultural Heritage

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Glossary of Acronyms

AD	Anno Domini
ADBA	Archaeological Desk Based Assessment
BC	Before Christ
BDC	Broadland District Council
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Survey
BP	Before Present
CIA	Cumulative Impact Assessment
CHIA	Cultural Heritage Impact Assessment
CTMP	Construction Traffic Management Plan
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEP	Dudgeon Offshore Wind Farm Extension Project
DMRB	Design Manual for Roads and Bridges
DOW	Dudgeon Offshore Wind Farm
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
GI	Ground Investigation
GIS	Geographical Information System
HER	Historic Environment Record
HLC	Historic Landscape Characterisation
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
IHBC	Institute of Historic Buildings Conservation
JCS	Joint Core Strategy
km	Kilometre
LiDAR	Light Detection and Ranging
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment

MHCLG	Ministry for Housing, Communities and Local Government
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MW	Megawatts
NCC HES	Norfolk County Council Historic Environment Service
NHER	Norfolk Historic Environment Record
NHLE	National Heritage List for England
NNDC	North Norfolk District Council
NMP	National Mapping Programme
NorCC	Norwich City Council
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
OWF	Offshore Wind Farm
oWSI	Outline Written Scheme of Investigation
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PLBCAA	Planning (Listed Buildings and Conservation Areas) Act 1990
PPG	Planning Practice Guidance
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
SNC	South Norfolk Council
SoS	Secretary of State
SVIA	Seascape and Visual Impact Assessment
UK	United Kingdom
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility

Glossary of Terms

Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substation. 220 – 230kV.
Onshore Substation	Compound containing electrical equipment to enable connection to the National Grid.
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.

SEP onshore site	The Sheringham Shoal Wind Farm Extension onshore area consisting of the SEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
SEP wind farm site	The offshore area of SEP within which wind turbines, infield cables and offshore substation platform/s will be located and the adjacent Offshore Temporary Works Area.
Study area	Area where potential impacts from the project could occur, as defined for each individual Environmental Impact Assessment (EIA) topic.
The Applicant	Equinor New Energy Limited

21 ONSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

21.1 Introduction

1. This chapter of the Environmental Statement (ES) describes the potential impacts of the proposed Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP) on Onshore Archaeology and Cultural Heritage. The chapter provides an overview of the existing environment for the proposed onshore development area, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of SEP and DEP.
2. This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary source is the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) are presented in ES **Chapter 5 EIA Methodology** and **Section 21.4**.
3. The existing baseline conditions for the onshore archaeological and cultural heritage environment as outlined in this chapter (**Section 21.5**) provide an account of the known archaeological resource (including designated and non-designated heritage assets) and a summary of the potential for currently unrecorded sites and finds to exist within the study area and within the Development Consent Order (DCO) application boundary.
4. The assessment should be read in conjunction with following linked chapters:
   - **Chapter 14 Offshore Archaeology and Cultural Heritage**;
   - **Chapter 18 Water Resources and Flood Risk**;
   - **Chapter 23 Noise and Vibration**;
   - **Chapter 24 Traffic and Transport**;
   - **Chapter 25 Seascape and Visual Impact Assessment**; and
   - **Chapter 26 Landscape and Visual Impact Assessment**.
5. Additional information to support the onshore archaeology and cultural heritage assessment includes:
   - Onshore Archaeological Desk-Based (Baseline) Assessment (**Appendix 21.1**);
   - Aerial Photographic, LiDAR Data and Historic Map Regression Analysis (**Appendix 21.2**);
   - Aerial Photography and Historic Map Regression Addendum (**Appendix 21.3**);
   - Onshore Infrastructure Setting Assessment (**Appendix 21.4**);
   - Offshore Infrastructure Setting Assessment (**Appendix 21.5**);
   - Priority Archaeological Geophysical Survey (**Appendix 21.6**); and
   - Archaeological and Geoarchaeological Monitoring Assessment (**Appendix 21.7**).

21.2 Consultation

6. Consultation with regard to onshore archaeology and cultural heritage has been undertaken in line with the general process described in **Chapter 5 EIA Methodology** and the **Consultation Report** (document reference 5.1). The key elements to date have included scoping, Preliminary Environmental Information Report (PEIR), and the ongoing Evidence Plan Process (EPP) via the Archaeology and Cultural Heritage Expert Topic Group (ETG) (onshore and offshore).

7. The feedback received throughout this process has been considered in preparing the ES. This chapter has been updated following consultation in order to produce the final assessment submitted within the DCO application. **Table 21-1** provides a summary of the consultation responses received to date relevant to this topic, and details of how the Applicant has had regard to the comment and how these have been addressed within this chapter.

8. The consultation process is described further in **Chapter 5 EIA Methodology**. Full details of the consultation process is presented in the **Consultation Report** (document reference 5.1), which has been submitted as part of the DCO application.

Table 21-1: Consultation Responses

Consultee	Date/ Document	Comment	Project Response
Scoping Responses - The following comments were received prior to consultation on the PEIR and were in response to the Scoping Report or direct consultation with stakeholders. These comments were taken into account in the production of the PEIR.			
The Planning Inspectorate (PINS)	Scoping Opinion, 2019	Any likely significant effects associated with the potential for breakout of bentonite drilling fluid should be assessed in the ES.	Assessment of potential impacts from any breakout of bentonite is presented in **Section 21.6.1**.
The Planning Inspectorate (PINS)	Scoping Opinion, 2019	Paragraph 697 of the Scoping Report states there are potential cumulative impacts from the original Dudgeon and Sheringham Shoal Offshore Wind Farm Extension Projects. The Inspectorate notes that these windfarms are operational and therefore considers that they should be considered in the environmental baseline, rather than the cumulative effects assessment.	These projects have been considered as part of the baseline environment (**Section 21.5**).
The Planning Inspectorate (PINS)	Scoping Opinion, 2019	Table 3-16 of the Scoping Report states that proposed baseline surveys will be undertaken on targeted areas of the application site and that any targeted trial trenching would be dependent on landowner access permissions being agreed. The Applicant should ensure that the baseline survey coverage is sufficient to inform the assessment of effects. The ES should explain and justify how the 'targeted areas' are selected. The Inspectorate recommends that areas critical for the delivery of the Proposed Development are included within the surveys e.g. the landfall site. The Inspectorate recommends that the Applicant seeks to agree the scope of surveys with relevant consultation bodies including Historic England and the relevant local planning authorities.	The scope of baseline surveys was agreed in consultation with Historic England and NCC HES and are presented in **Section 21.4.2**. A summary of the results is presented in **Section 21.5**.
The Planning Inspectorate (PINS)	Scoping Opinion, 2019	The Inspectorate welcomes references to the preparation of an outline WSI (Written Scheme of Investigation) to be submitted as part of the ES to outline mitigation commitments. The Inspectorate recommends the Applicant prepare the WSI in	An **Outline WSI (Onshore)** (document reference 9.21) is included as part of this DCO application and has been prepared in consultation with Historic England and NCC HES.

Consultee	Date/ Document	Comment	Project Response
		conjunction with Historic England and the relevant local planning authorities and that agreements as to spatial and temporal coverage (as well as it's delivery through DCO requirements) will be sought as part of the EPP.	
The Planning Inspectorate (SoS)	Scoping Opinion, 2019	Appropriate cross reference should be made to the Landscape and Visual Impact Assessment (LVIA) and Seascape and Visual Impact Assessment (SVIA) section of the ES particularly in terms of viewpoint selection within the LVIA which should incorporate views from cultural heritage assets.	Heritage specific viewpoints have been identified in collaboration with the LVIA and SVIA specialists and consulted upon with Historic England and NCC HES. The viewpoints and photomontages are presented in **Appendix 21.4** and **21.5**.
ETG Meetings			
Historic England/NCC HES	ETG Meeting 1 and Evidence Plan Agreement Log, 2020	With respect to the proposed onshore substation, and potential impacts associated with changes to the setting of heritage assets, it was confirmed that LVIA and SVIA tool kits, including e.g. zones of theoretical visibility and photomontages, would be used to inform assessment.	The results of the LVIA and SVIA ZTVs and photomontages are presented in two separate Setting Assessment reports. The Setting Assessment for the onshore substation is presented in **Appendix 21.4**, and the Setting Assessment for the coastal infrastructure is presented in **Appendix 21.5**. A summary of both is provided in **Section 21.5.**
Historic England/NCC HES	ETG Meeting 1 and Evidence Plan Agreement Log, 2020	It was agreed that if any Engineering-led Ground Investigation (GI) works are planned for the project, NCC HES and HE should review the methodology and provision for associated archaeological watching brief and/or geoarchaeological monitoring.	NCC HES approved the WSI for archaeological and geoarchaeological monitoring of GI works on 16th August 2021. The findings are reported on in **Appendix 21.7**.
Historic England/NCC HES	ETG Meeting 1 and Evidence Plan Agreement Log, 2020	It was agreed that analysis of Lidar and aerial photographic data will primarily be undertaken within the 200m onshore cable corridor and will also include a suitable small buffer out with the PEIR boundary. Following this, locations for priority archaeological geophysical surveys would be agreed with NCC HES.	Full details of the Aerial Photographic, LiDAR and Map Regression Analysis are presented in **Appendix 21.2** and **21.3**, and the results of the Priority Archaeological Geophysical Survey are presented in **Appendix 21.6**. A summary of the results from both baseline surveys is presented in **Section 21.5**.

Consultee	Date/ Document	Comment	Project Response
Historic England/NCC HES	ETG Meeting 1 and Evidence Plan Agreement Log, 2020	It was agreed that possible targeted archaeological trial trenching should also be considered in the areas identified as 'critical', or at particular pinch-points, for DEP and SEP. However, it was acknowledged that this is heavily dependent on land access in the pre-consent stage.	No targeted archaeological trial trenching has been carried out pre-application. A commitment to including archaeological trial trenching post-consent is presented in the **outline WSI (Onshore)** (document reference 9.21) submitted with the DCO application. Also see responses to comments at ETG 3 and 4, below.
Historic England/NCC HES	ETG Meeting 1 and Evidence Plan Agreement Log, 2020	Agreed that neither an offshore or onshore Evidence Plan Process specific archaeology and cultural heritage Method Statement document is required, as this would simply be repeating much of the Scoping Report and Scoping Opinion, as well as discussion as already documented within the minutes of the first and future ETG meetings.	Approach to assessment established through EPP and established industry practice for offshore renewables as set out in **Section 21.4**
Historic England/NCC HES	ETG 2 Meeting Minutes, 2020	It is important to consider all desk-based and non-intrusive survey results when positioning trial trenches.	All baseline information collected to date (January 2022) has been considered and has informed the evaluation and mitigation strategy presented in the **outline WSI (Onshore)** (document reference 9.21).
NCC HES	ETG 2 Meeting Minutes, 2020	Extant earthworks are a rare resource within the county and as such have a higher level of heritage importance and should be avoided wherever possible.	All baseline information collected to date has informed the route refinement process and extant earthworks have been avoided where possible.
NCC HES	ETG Meeting 3 Minutes, 2021	The number of similar projects in the area, which due to certain geographical constraints across Norfolk (e.g. the Broads), all follow relatively similar routes, as they aim for defined grid connection points; meaning that proportionately there is less room on a macro and a micro scale to avoid archaeological interests.	All baseline information collected to date has informed the route refinement process.
NCC HES	ETG Meeting 3 Minutes, 2021	HER records of Early Saxon metal work finds should be reviewed and used as evidence to gage the likelihood of sites of historic interest being present, which perhaps haven't shown in AP/LiDAR reviews or in the geophysical survey data gathered to date.	Details of the potential for Early Saxon archaeology is presented in the ADBA (**Appendix 21.1**) and summarised in **Section 21.5**.

Consultee	Date/ Document	Comment	Project Response
NCC HES	ETG Meeting 3 Minutes, 2021	The range of survey techniques proposed for the Projects (i.e. aerial photos, LIDAR, geophysical surveys (currently magnetometry), metal detecting and later intrusive surveys) is consistent with other projects in the area. Trial trenching for these projects was ultimately considered an 'initial informative stage of mitigation' to be undertaken in the post-consent stages of the Projects.	The initial informative stage of mitigation and further mitigation stage is presented in the **outline WSI (Onshore)** (document reference 9.21).
NCC HES	ETG Meeting 3 Minutes, 2021	Archaeological information gathering would be on the back of the GI works, and this is an initial stage of the investigation only. If areas of particular sensitivity are identified through this, they will need to be taken forward for further survey.	The results of the archaeological and geoarchaeological monitoring of GI works are presented in **Appendix 21.7**. A summary is provided in **Section 21.5** and potential impacts are considered in **Section 21.6**.
NCC HES	ETG Meeting 3 Minutes, 2021	It is important that the programme of trial trenching post-consent must allow for sufficient time within the delivery schedule to achieve any requirements of mitigation.	The initial informative stage of mitigation (to include trial trenching) and further mitigation stage is presented in the **outline WSI (Onshore)** (document reference 9.21) along with details of timing/programme of archaeological works to be undertaken post-consent and prior to construction works commencing.
Historic England	ETG Meeting 4 Minutes, 2021	It is important to clearly understand and acknowledge the risk of undertaking trial trenching post-submission/consent.	The initial informative stage of mitigation (to include trial trenching) and further mitigation stage is presented in the **outline WSI (Onshore)** (document reference 9.21) along with details of timing/programme of archaeological works to be undertaken post-consent and prior to construction works commencing.
Historic England	ETG Meeting 4 Minutes, 2021	Agreed with heritage viewpoints and photomontages presented.	These are presented in the Setting Assessment for the onshore substation is presented in **Appendix 21.4**, and the Setting Assessment for the coastal infrastructure is presented in **Appendix 21.5**.
Section 42 Responses - The following comments were made in response to the PEIR and were taken into account in the production of this ES.			

Consultee	Date/ Document	Comment	Project Response
Historic England	Section 42 Response Letter, 2021	Route refinement and micro-siting of the cable within the corridor should also be adopted as the preferred mitigation measure for non-designated heritage assets.	All baseline surveys have informed the route refinement process. Known and potential heritage assets (both designated and non-designated) have been avoided where possible. Approach adopted as set out in **Section 21.3.3**.
Historic England	Section 42 Response Letter, 2021	We recommend that consideration is given to alternative techniques, such as electromagnetism and/or geoarchaeological approaches for parts of the scheme that cross wetlands, where magnetometry is less successful.	Approaches to alternative geophysical techniques and geoarchaeological approaches are considered in the **outline WSI (Onshore)** (document reference 9.21).
Historic England	Section 42 Response Letter, 2021	The assessment of historic cartography presented in Appendix 23.2 is limited to nineteenth century enclosure and tithe maps and Ordnance Survey maps. However, eighteenth century and earlier maps are available for some parts of the study areas.	The Aerial Photographic, LiDAR and Map Regression Analysis includes a review of available eighteenth century and earlier maps. This is presented in **Appendix 21.2**.
Historic England	Section 42 Response Letter, 2021	We cannot see any further discussion of the coastal designated heritage assets in the main part of Appendix 23.3. The setting assessment needs to be used to inform the siting of any above ground infrastructure such as the substation at the options appraisal stage. We would also suggest an additional viewpoint from Mangreen Lane looking south towards the Grade II* listed Gowthorpe Manor and the proposed substation site.	The offshore infrastructure setting assessment is presented in **Appendix 21.5**, with the onshore substation setting assessment presented in **Appendix 21.4**. The findings of the setting assessment informed the siting of the onshore substation. Additional viewpoint discussed with Historic England at ETG Meeting 4 (August 2021), and agreed it wasn't required.

Consultee	Date/ Document	Comment	Project Response
Historic England	Section 42 Response Letter, 2021	Given the high archaeological potential of the PEIR boundary, Historic England has concerns about the proposal to carry out all trial trenching investigations at the post-consent stage. We consider that this approach presents significant risks to both the historic environment and the delivery of the Project.	The Applicant understands and acknowledges the potential risks to the historic environment and delivery of SEP and DEP. A commitment to undertaking trial trenching in a timely manner is set out in the **outline WSI (Onshore)** (document reference 9.21). Also see responses to comments at ETG 3 and 4, above.
Historic England	Section 42 Response Letter, 2021	It is worth highlighting that not all types of below ground archaeological heritage assets are conducive to detection through geophysical survey and aerial photographic and LiDAR analysis. We recommend that the archaeological finds data within the PEIR boundary is further reviewed to identify the potential for associated buried archaeological remains, and that potentially important locations are subject to pre-application intrusive surveys so that the results can inform the route refinement process.	Full details of the historic environment baseline are presented in the ADBA (**Appendix 21.1**) and potentially important locations requiring evaluation and further mitigation is presented in the **outline WSI (Onshore)** (document reference 9.21).
Historic England	Section 42 Response Letter, 2021	Assessment of which landscape zones different types and periods of heritage assets are, and are not, currently known to be located is likely to provide a more detailed understanding of the archaeological potential of the study area and inform the design of further investigations and mitigation measures.	A detailed baseline is presented within the ADBA (**Appendix 21.1**) and summarised in **Section 21.5**.
Historic England	Section 42 Response Letter, 2021	We recommend that the Historic England document 'Preserving Archaeological Remains' (2016) is referred to as this document sets out how impacts such as changes to groundwater levels and the preservation of archaeological sites can be investigated. We consider that the proximity of this medieval moated site (List Entry Number 1013097) to the cable corridor means that there may be potential for adverse impact on any waterlogged deposits and preserved organic remains.	Potential hydrological changes to heritage assets have been reviewed and further assessed; details of which are presented in **Section 21.6**.

Consultee	Date/ Document	Comment	Project Response
		We recommend that this is given further consideration and that the statement in Section 23.6.1.3 (paragraph 200) that 'Indirect impacts to designated heritage assets are not anticipated to occur' is reviewed and amended.	
Historic England	Section 42 Response Letter, 2021	In terms of potential indirect (physical) impacts we wish to highlight that the potential for the buried cables to emit heat needs to be considered, particularly for wetland areas where waterlogged deposits/organic archaeological remains may be preserved. Heat could dry out these deposits which in turn could damage or destroy vulnerable buried archaeological remains.	Archaeological and geoarchaeological monitoring undertaken on GI works to date have highlighted areas of archaeological and geoarchaeological potential. The details of which are presented in **Appendix 21.7** and assessed in **Section 21.6**.
Historic England	Section 42 Response Letter, 2021	Historic parish boundaries and hundred boundaries should be identified, in conjunction with the historic map regression work and considered for further investigation and mitigation measures. Where linear earthworks such as hedgerow banks are present on historic parish and hundred boundaries direct physical impact on these should be identified and avoided. Where impact will occur, mitigation should include recording the profile of any earthwork and sub-surface features with appropriate reinstatement of earthworks following construction activities.	Identification of historic parish boundaries and hundred boundaries are presented in **Appendix 21.2**. Details of mitigation are presented in the **outline WSI (Onshore)** (document reference 9.21).
Historic England	Section 42 Response Letter, 2021	We recommend that the potential for buried archaeological remains at the landfall location is subject to intrusive investigations (including geotechnical/geoarchaeological assessment) prior to DCO submission to assess the impact of HDD works as well as the surface/shallow depth impacts.	The archaeological and geoarchaeological monitoring of GI works is presented in **Appendix 21.7**.

Consultee	Date/ Document	Comment	Project Response
Historic England	Section 42 Response Letter, 2021	With regards to the potential impacts of the HDD works, both at the landfall location and any inland river/road crossings, we wish to highlight the potential for direct impact on buried archaeological remains through bentonite slurry break-out. We request that this potential impact is given appropriate consideration.	Potential direct impacts from bentonite slurry break-out has been considered further and is discussed in **Section 21.6.1**.
NCC HES	Section 42 Response Letter, 2021	A number of the priority areas for geophysical survey were not surveyed due to crop conditions and other access issues. We strongly advise the applicants to extend the geophysical survey into these areas, and indeed the rest of application corridor at the earliest possible opportunity regardless of what stage the EIA/NSIP application has reached.	Where possible, further geophysical survey has been undertaken; the results of which are presented in full in **Appendix 21.6**. These results have further informed **Section 21.6** and the **outline WSI (Onshore)** (document reference 9.21).
NCC HES	Section 42 Response Letter, 2021	We note that Geoarchaeological desk-based review, including assessment of potential for Palaeolithic archaeology is yet to be undertaken. We appreciate there may be good reasons for this, for instance waiting for the results of GI works. We seek to gently remind the applicants about this aspect of the onshore archaeology.	Details of the archaeological and geoarchaeological monitoring of GI works is presented in **Appendix 21.7**. This has informed the initial informative stage of mitigation and further mitigation stage presented in the **outline WSI (Onshore)** (document reference 9.21).

21.3 Scope

21.3.1 Study Area

9. The study area for onshore archaeology and cultural heritage is based on the DCO application boundary landward from Mean High Water Springs, with an appropriate buffer applied defined on the basis of:
   - Non-designated Heritage Assets study area: defined by a 500m boundary around (either side of) the DCO application boundary; and
   - Designated Heritage Assets study area: defined by a 1km boundary around the DCO application boundary.
10. The setting assessment considers potential setting impacts arising from the above ground infrastructure over a wider area using LVIA and SVIA processes and tools such as Zones of Theoretical Visibility (ZTVs), photomontages and wireframes where necessary.
11. For the purposes of the Aerial Photographic, LiDAR and Map Regression Analysis a separate study area comprising a 100m buffer around the DCO application boundary was utilised.

21.3.2 Realistic Worst-Case Scenario

21.3.2.1 General Approach

12. The final design of SEP and DEP would be confirmed through detailed engineering design studies that would be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine: Rochdale Envelope (v3, 2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 5 EIA Methodology**.
13. The realistic worst-case scenarios for the onshore archaeology and cultural heritage assessment are summarised in **Table 21-2**. These are based on the project parameters described in **Chapter 4 Project Description**, which provides further details regarding specific activities and their durations.
14. In addition to the design parameters set out in **Table 21-2**, consideration is also given to how SEP and DEP would be built out as described in **Section 21.3.2.2** to **Section 21.3.2.4** below. This accounts for the fact that whilst SEP and DEP are the subject of one DCO application, it is possible that either one or both of the projects could be developed, and if both are developed, that construction may be undertaken either concurrently or sequentially. Further details are provided in **Chapter 4 Project Description**.

21.3.2.2 Construction Scenarios

15. In the event that both SEP and DEP are built, the following principles set out the framework for how SEP and DEP may be constructed:
    - SEP and DEP may be constructed at the same time, or at different times;
    - If built at the same time both SEP and DEP could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times, each Project would require a four year period of construction;
    - If built at different times, the offset between the start of construction of the first Project, and the start of construction of the second Project may vary from two to four years;
    - Taking the above into account, the total maximum period during which construction could take place is eight years for both Projects; and
    - The earliest construction start date is 2025.
16. The impact assessment for onshore archaeology and cultural heritage considers the following development scenarios in determining the worst-case scenario for each topic:
    - Build SEP or build DEP in isolation;
    - Build SEP and DEP sequentially with a gap of up to four years between the start of construction of each Project - reflecting the maximum duration of effects; and
    - Build SEP and DEP concurrently – reflecting the maximum peak effects. .
17. Any differences between SEP and DEP, or differences that could result from the manner in which the first and the second projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in the impact assessment section of this chapter (**Section 21.6**). For each potential impact only the worst-case construction scenario for two Projects is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst-case is provided, where necessary, in **Section 21.6**.

21.3.2.3 Operation Scenarios

18. Operation scenarios are described in detail in **Chapter 4 Project Description**. Where necessary, the assessment considers the following three scenarios:
    - Only SEP in operation;
    - Only DEP in operation; and
    - The two Projects operating at the same time, with a gap of up to four years between each Project commencing operation.
19. The operational lifetime of each Project is expected to be 40-years.

21.3.2.4 Decommissioning Scenarios

20. Decommissioning scenarios are described in detail in **Chapter 4 Project Description**. Decommissioning arrangements for the onshore elements of SEP and DEP will be agreed through the submission of an onshore decommissioning plan to the relevant planning authority for approval within six months of the permanent cessation of commercial operation (unless otherwise agreed in writing by the relevant planning authority), however for the purpose of this assessment it is assumed that decommissioning of SEP and DEP could be conducted separately, or at the same time.

21.

Table 21-2: Realistic Worst-Case Scenarios

Impact	SEP or DEP in Isolation	SEP and DEP Concurrently	SEP and DEP Sequentially	Notes and Rationale
Construction				
Impact 1: Direct Physical Impact on (permanent change to) Designated Heritage Assets **Impact 2**: Direct Physical Impact on (permanent change to) Non-designated Heritage Assets	**Landfall:** • HDD drills: Number: 2, Length: 1,150m. • Transition joint bays: Number: 1, Dimensions: 26m (L) x 10m (W) x 3m (D). • Transition joint bay link box: Number: 1, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D). • HDD compound area: 75m x 75m. • Total works area: 48955.1m^2	**Landfall**: • HDD drills: Number: 4, Length: 1,150m. • Transition joint bays: Number: 2 (adjacent to each other), Dimensions: 26m (L) x 12m (W) x 3m (D). • Transition joint bay link box: Number: 2, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D). • HDD compound area: 75m x 75m. • Total works area: 48955.1m^2	**Landfall**: • HDD drills: Number: 4, Length: 1,150m. • Transition joint bays: Number: 2 (adjacent to each other), Dimensions: 26m (L) x 10m (W) x 3m (D). • Transition joint bay link box: Number: 2, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D). • HDD compound area: 75m x 75m (per project and overlapping). • Total works area: 48955.1m^2	These parameters represent the maximum footprint of disturbance within the DCO order limits, in which the potential disturbance to designated and non-designated heritage assets (buried archaeology) could occur. SEP and DEP constructed sequentially is considered as the worst-case of the three-project scenarios due to the larger works footprint and requirement for two transition joint bays at the landfall. It is also considered as the worst-case scenario due to the requirement for a wider working easement along the cable corridor and larger operational footprint at the onshore substation.

Impact	SEP or DEP in Isolation	SEP and DEP Concurrently	SEP and DEP Sequentially	Notes and Rationale
	Onshore Cable Corridor: • Construction corridor: Length: 60km, Width: 45m. • Working easement: Width: 27m. • Main construction compound: Number: 1, Area: 30,000m^2. • Secondary construction compounds: Number: 6, Area 2,500m^2 – 7,500m^2. • Trenchless crossing compounds: Area: 1,500m^2 – 4,500m^2. • Total works area (incl. compounds and accesses): 4566250.6m^2 • Cable trench: Number: 1, Width at base: 0.85m, Width at surface: 3m, Depth: 2m. • Jointing bays: Typical frequency: Every 1000m, Approximate number: 60, Dimensions: 16m (L) x 3.5m (W) x 2m (D). • Link boxes: Typical frequency: Every 1000m, Approximate number: 60, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D). • Hedgerow removal: Width: 12m – 20m.	**Onshore Cable Corridor:** • Construction corridor: Length: 60km, Width: 60m. • Working easement: Width: 38m. • Main construction compound: Number: 1, Area: 30,000m^2. • Secondary construction compounds: Number: 6, Area 2,500m^2 – 7,500m^2. • Trenchless crossing compounds: Area: 1,500m^2 – 4,500m^2. • Total works area (incl. compounds and accesses): 4566250.6m^2 • Cable trench: Number: 2, Width at base: 0.85m, Width at surface: 3m, Depth: 2m. • Jointing bays: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 16m (L) x 3.5m (W) x 2m (D) (per circuit). • Link boxes: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D) (per circuit). • Hedgerow removal: Width: 12m – 20m.	**Onshore Cable Corridor:** • Construction corridor: Length: 60km, Width: 60m. • Working easement: Width: 45m. • Main construction compound: Number: 1, Area: 30,000m^2. • Secondary construction compounds: Number: 6, Area 2,500m^2 – 7,500m^2. • Trenchless crossing compounds: Area: 1,500m^2 – 4,500m^2. • Total works area (incl. compounds and accesses): 4566250.6m^2 • Cable trench: Number: 2, Width at base: 0.85m, Width at surface: 3m, Depth: 2m. • Jointing bays: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 16m (L) x 3.5m (W) x 2m (D) (per circuit). • Link boxes: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D) (per circuit). • Hedgerow removal: Width: 12m – 20m.	
	Onshore Substation: • Total works area (including Norwich Main connection): 445653.3m^2 • Substation platform: Area: 3.25ha, Depth of topsoil strip: 300mm. • Substation compounds: Number: 2, Total area: 12,500m^2. • Permanent access road: Number: 1, Length: 850m: Width: 6m, Area: 5,100m^2. • Landscape planting area: 13.25Ha	**Onshore Substation:** • Total works area (including Norwich Main connection): 445653.3m^2 • Substation platform: Area: 6.0ha, Depth of topsoil strip: 300mm. • Substation compounds: Number: 2, Total area: 12,500m^2. • Permanent access road: Number: 1, Length: 850m: Width: 6m, Area: 5,100m^2. • Landscape planting area: 13.25Ha	**Onshore Substation:** • Total works area (including Norwich Main connection): 445653.3m^2 • Substation platform: Area: 6.0ha, Depth of topsoil strip: 300mm. • Substation compounds: Number: 2, Total area: 12,500m^2. • Permanent access road: Number: 1, Length: 850m: Width: 6m, Area: 5,100m^2. • Landscape planting area: 13.25Ha.	
	400kv connection: • Cable trench: Number: 1, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 27m.	**400kv connection:** • Cable trench: Number: 2, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 38m.	**400kv connection:** • Cable trench: Number: 2, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 45m.	
Impact 3: Indirect Physical Impact on (permanent change to) Designated Heritage Assets **Impact 4**: Indirect Physical Impact on (permanent change to) Non-designated Heritage Assets	**Landfall:** • HDD drills: Number: 2, Length: 1,150m. • Transition joint bays: Number: 1, Dimensions: 26m (L) x 10m (W) x 1.5m (D).	**Landfall**: • HDD drills: Number: 4, Length: 1,150m. • Transition joint bays: Number: 2, Dimensions: 26m (L) x 12m (W) x 1.5m (D).	**Landfall**: • HDD drills: Number: 4, Length: 1,150m. • Transition joint bays: Number: 2 (adjacent to each other), Dimensions: 26m (L) x 12m (W) x 1.5m (D).	These parameters represent the maximum potential of indirect disturbance (change in ground conditions) within the DCO order limits, in which the potential disturbance to designated and non-designated heritage assets (buried archaeology) could occur. SEP and DEP constructed sequentially is considered as the worst-case of the three-
	Onshore Cable Corridor: • Cable trench: Number: 1, Width at base: 0.85m, Width at surface: 3m, Depth: 2m.	**Onshore Cable Corridor:** • Cable trench: Number: 2, Width at base: 0.85m, Width at surface: 3m, Depth: 2m.	**Onshore Cable Corridor:** • Cable trench: Number: 2, Width at base: 0.85m, Width at surface: 3m, Depth: 2m.	

Impact	SEP or DEP in Isolation	SEP and DEP Concurrently	SEP and DEP Sequentially	Notes and Rationale
	• Jointing bays: Typical frequency: Every 1000m, Approximate number: 60, Dimensions: 16m (L) x 3.5m (W) x 2m (D). • Link boxes: Typical frequency: Every 1000m, Approximate number: 60, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D). • HDD: 'Route width': up to 100m.	• Jointing bays: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 16m (L) x 3.5m (W) x 2m (D) (per circuit). • Link boxes: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D) (per circuit). • HDD: 'Route width': up to 100m.	• Jointing bays: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 16m (L) x 3.5m (W) x 2m (D) (per circuit). • Link boxes: Typical frequency: Every 1000m, Approximate number: 120, Dimensions: 2.6m (L) x 2m (W) x 1.5m (D) (per circuit). • HDD: 'Route width': up to 100m.	project scenarios due to the requirement for two transition joint bays at the landfall and the larger impermeable footprint at the onshore substation.
	Onshore Substation: • Combined impermeable area: 1.625ha.	**Onshore Substation:** • Combined impermeable area: 3.0ha.	**Onshore Substation:** • Combined impermeable area: 3.125ha.	
	400kv connection: • Cable trench: Number: 1, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 27m.	**400kv connection:** • Cable trench: Number: 2, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 38m.	**400kv connection:** • Cable trench: Number: 2, Dimensions: Length: 600m, Width at base: 0.85m, Width at surface: 2m, Depth: 2m. • Construction easement: Width: 45m.	
Impact 5: Temporary Change to the Setting of Designated Heritage Assets which could affect their Heritage Significance **Impact 6**: Temporary Change to the Setting of Non-designated Heritage Assets which could affect their Heritage Significance	**Offshore Wind Turbines:** • Duration of offshore construction: 2 years.	**Offshore Wind Turbines:** • Duration of offshore construction: 2 years.	**Offshore Wind Turbines:** • Duration of offshore construction: 4 years.	These parameters represent the maximum potential of disturbance within the DCO order limits, in which the potential change to the setting of designated and non-designated heritage assets (buried archaeology) could occur. SEP and DEP constructed sequentially is considered as the worst-case of the three-project scenarios due to the maximum intrusive effect of construction activities for the longest duration.
	Landfall: • Duration: Landfall HDD: 4 months, Landfall cable pull: 2 months.	**Landfall**: • Duration: Landfall HDD: 5 months, Landfall cable pull: 5 months.	**Landfall**: • Duration: Landfall HDD: 4 months, Landfall cable pull: 2 months (per project).	
	Onshore Cable Corridor: • Main construction compound: Duration: 48 months. • Secondary construction compounds: Duration: 12 - 24 months • Trenchless crossing compounds: Duration: 7 weeks. • Duration: Onshore cable ducting and installation (incl. reinstatement): 26 months.	**Onshore Cable Corridor:** • Main construction compound: Duration: 48 months. • Secondary construction compounds: Duration: 12 - 24 months. • Trenchless crossing compounds: Area: Duration: 7 weeks • Duration: Onshore cable ducting and installation (incl. reinstatement): 28 months.	**Onshore Cable Corridor:** • Main construction compound: Duration: 48 months. • Secondary construction compounds: Duration: 12 - 24 months. • Trenchless crossing compounds: Area: Duration: 7 weeks • Duration: Onshore cable ducting and installation (incl. reinstatement): 28 months.	
	Onshore Substation and 400kv connection: • Duration: 32 months.	**Onshore Substation and 400kv connection:** • Duration: 36 months.	**Onshore Substation and 400kv connection:** • Duration: 36 months.	
Operation				
Impact 1: Permanent Change to the Setting of Designated Heritage Assets which could affect their Heritage Significance **Impact 2**: Permanent Change to the Setting of Non-designated Heritage Assets which could affect their Heritage Significance	**Offshore Wind Turbines:** • Maximum number of wind turbines: 23 (SEP); 30 (DEP). • Maximum blade tip height above LAT: 330m.	**Offshore Wind Turbines:** • Maximum number of wind turbines: 53. • Maximum blade tip height above LAT: 330m.	**Offshore Wind Turbines:** • Maximum number of wind turbines: 53. • Maximum blade tip height above LAT: 330m.	These parameters represent the maximum potential of disturbance within the DCO order limits, in which the potential change to the setting of designated and non-designated heritage assets (buried archaeology) could occur. SEP and DEP constructed sequentially is considered as the worst-case of the three-project scenarios due to the maximum intrusive effect of the permanent infrastructure.
	Onshore Substation: • Operational area: 3.25ha. • Substation control building: Length: 30m; Width: 14m; Height: 15m. • Lightning protection masts: Height: 30m. • Building fabric: Steel framed building with cladding. • Duration: 35 years.	**Onshore Substation:** • Operational area: 6.0ha. • Substation control building: Length: 50m; Width: 25m; Height: 15m. • Lightning protection masts: Height: 30m. • Building fabric: Steel framed building with cladding. • Duration: 35 years.	**Onshore Substation:** • Operational area: 6.25ha. • Substation control building: Length: 30m; Width: 14m; Height: 15m for each project. • Lightning protection masts: Height: 30m. • Building fabric: Steel framed building with cladding. • Duration: 35 years.	

Impact	SEP or DEP in Isolation	SEP and DEP Concurrently	SEP and DEP Sequentially	Notes and Rationale
Decommissioning				
No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable corridor and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, would be removed, reused or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and would be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts would be no greater than those identified for the construction phase. Assuming that provision is made for methods of removal which minimise further impact to the wider area, it is reasonable to assume that any potential damage upon designated and non-designated heritage assets would have already occurred as part of construction activities. However, it is noted 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. As such, the worst-case scenario with regard to decommissioning cannot be ascertained until the decommissioning plan is finalised. Changes to setting may be present as a result of visual and audible impacts associated with decommissioning activities. Changes to the setting of heritage assets are considered to be temporary in duration, occurring in association with the decommissioning phase. As such, the worst-case scenario as outlined for the construction phase in relation to temporary changes to the setting of heritage assets is unlikely to be exceeded as a result of decommissioning activities.				

21.3.3 Summary of Mitigation Embedded in the Design

22. This section outlines the embedded mitigation relevant to the onshore archaeology and cultural heritage assessment, which has been incorporated into the design of SEP and DEP (**Table 21-3**). Where other mitigation measures are proposed, these are detailed in the impact assessment (**Section 21.6**).

23. Avoidance, micro-siting and route refinement has been carried out throughout the development of the DCO application boundary. This strategy ensured that baseline data collection inputted directly into the iterative design process so that designated heritage assets and known locations of non-designated heritage assets and areas of high archaeological potential were avoided, wherever possible within the confines of engineering and other environmental constraints.

Table 21-3: Embedded Mitigation Measures

Parameter	Mitigation Measures Embedded into the Project Design
Direct, physical impacts to designated heritage assets	Route refinement process undertaken to avoid all designated heritage assets, wherever possible.
Direct, physical impacts to non-designated heritage assets	Route refinement process undertaken to avoid all non-designated heritage assets, wherever possible.

21.4 Impact Assessment Methodology

21.4.1 Policy, Legislation and Guidance

24. The following sections detail information on the key pieces of UK legislation, policy and guidance relevant to the assessment within this chapter. Further detail where relevant is provided in **Chapter 2 Policy and Legislative Context**.

21.4.1.1 National Policy

21.4.1.1.1 National Policy Statements

25. The assessment of potential impacts upon onshore archaeology and cultural heritage assessment has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision-making policy documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to SEP and DEP 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).

26. The specific assessment requirements for onshore archaeology and cultural heritage, as detailed in the NPS, are summarised in **Table 21-4** together with an indication of the section of the ES chapter where each is addressed.

27. It is noted that the NPS for Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for Electricity Networks Infrastructure (EN-5) are in the process of being revised. A draft version of each NPS was published for consultation in September 2021 (Department for Business Energy and Industrial Strategy (BEIS), (2021a), BEIS, (2021b) and BEIS (2021c) respectively). A review of these draft versions has been undertaken in the context of this ES chapter.

28. **Table 21-4** includes a section for the draft version of NPS (EN-1, EN-3 and EN-5) in which relevant additional NPS requirements not presented within the current NPS (EN-1, EN-3 and EN-5) have been included. A reference to the particular requirement's location within the draft NPS and to where within this ES chapter or wider ES it has been addressed has also been provided.

29. Minor wording changes within the draft version which do not materially influence the NPS (EN-1, EN-3, EN-5) requirements have not been reflected in **Table 21-4**.

Table 21-4: NPS Assessment Requirements

NPS Requirement	NPS Reference	Section Reference
NPS for Energy (EN-1)		
'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.'	Paragraph 5.8.8	The significance and value of the heritage assets considered in this chapter have been detailed in **Section 21.5**. A setting assessment has been undertaken for the onshore substation (**Appendix 21.4**) and offshore infrastructure (**Appendix 21.5**), the results of which have informed **Section 21.5** Issues relating to the setting of offshore and intertidal heritage assets have been considered as part of **Chapter 14 Offshore and Intertidal Archaeology and Cultural Heritage**.
'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.'	Paragraph 5.8.9	**Section 21.5** of this chapter has been informed by an Archaeological Desk Based Assessment (ADBA) (**Appendix 21.1**), an Aerial Photographic, LiDAR and Map Regression Analysis (**Appendix 21.2** and **Appendix 21.3**), a Setting Assessment for the onshore substation (**Appendix 21.4**) and offshore infrastructure (**Appendix 21.5**), a Priority Archaeological Geophysical Surveys (**Appendix 21.6**) and an Archaeological and Geoarchaeological Monitoring Assessment (**Appendix 21.7**).
'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.'	Paragraph 5.8.10	This chapter provides an account of the potential impacts of SEP and DEP upon heritage assets and their significance (**Section 21.6**).
NPS for Renewable Energy Infrastructure (EN-3)		

NPS Requirement	NPS Reference	Section Reference
'Consultation with the relevant statutory consultees should be undertaken by the applicants at an early stage of the development.'	Paragraph 2.6.140	Consultation has been undertaken with relevant statutory consultees, as outlined in **Section 21.2** Consultation would be on going throughout the development 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 windfarm design.'	Paragraph 2.6.141	The assessment has been undertaken in accordance with section 5.8 of EN-1, as detailed above. This assessment has been informed by the Priority Archaeological Geophysical Surveys (**Section 21.5** and **Appendix 21.6**) and an Archaeological and Geoarchaeological Monitoring Assessment (**Appendix 21.7**).
NPS for Electricity Networks Infrastructure (EN-5)		
…developers will be influenced by Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to "have regard to the desirability… of protecting sites, buildings and objects of architectural, historic or archaeological interest; and … do what [they] reasonably can to mitigate any effect which the proposals would have on the… sites, buildings or objects."	Paragraph 2.2.6	Potential impacts upon sites and objects of archaeological interest onshore are set out in **Section 21.6** along with a proposed approach to mitigation which is further detailed in the **outline WSI (Onshore)** (document reference: 9.21).
Draft Overarching NPS for Energy (EN-1) (BEIS, 2021a)		
The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where possible: • enhancing, through a range of measures such a sensitive design, the significance of heritage assets or setting affected • considering measures that address those heritage assets which are at risk or which may become at risk, as a result of the scheme	Paragraph 5.9.14	Where potential opportunities arise for enhancement these are described within **Section 21.12**.

NPS Requirement	NPS Reference	Section Reference
• considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of, the heritage assets affected by the scheme		

21.4.1.1.2 National Planning Policy Framework

30. This assessment has also been undertaken in a manner consistent with the National Planning Policy Framework (NPPF), a revised version of which was published by the Ministry of Housing, Communities and Local Government (MHCLG) in July 2021, replacing the original policy from March 2012. Provision for the historic environment is principally given in section 16: 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". Local planning authorities should recognise that heritage assets are "an irreplaceable resource and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations" (MHCLG, 2021).

31. The aim of NPPF section 16 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.

32. To summarise, UK government guidance provides a framework which:

- Recognises that heritage assets are an irreplaceable resource;
- Requires applicants to provide a level of detail that is proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance;
- Takes into account the desirability of sustaining and enhancing the significance of heritage assets, including any contribution made by their setting, and putting them to viable uses consistent with their conservation;
- 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), with any anticipated substantial harm weighed against the public benefits of the proposal;
- Requires applicants to include a consideration of the effect of an application on the significance of non-designated heritage assets, giving regard to the scale of any harm or loss and the significance of the heritage asset;

- Regard proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) favourably; 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.

33. The NPPF's associated Planning Policy Guidance (PPG) 'Conserving and enhancing the historic environment', published in 2014 and updated 2019, (MHCLG, 2019) 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 with respect to this project, EN-1 (the Overarching NPS for Energy) is the key decision-making document.

21.4.1.1.3 Local Policy

34. The regional policy relevant to the study area comprises the Planning Guidance Note 6: Regional Planning Guidance for East Anglia to 2016 (Department of the Environment, Transport and the Regions, 2000), which includes:

- Policy 37: General management principles for conserving and enhancing the natural, built and historic environment;
  - To conserve and enhance the important aspects of East Anglia's natural, built and historic environment;
- Policy 38: Protection of designated areas;
  - Priority should be given to protecting and enhancing areas designated at international or national level for their intrinsic importance in terms of nature conservation or landscape quality;
- Policy 40: Conservation of East Anglia's built and historic environment;
  - Development plans should contain policies to protect the built and historic heritage and manage change in a way that respects local character and distinctiveness, by conserving and maintaining historic and archaeological resources, and by ensuring that new development respects and enhances local character.

35. 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 Broadland Development Management Development Plan Document (Broadland District Council, 2015); and

- Breckland District Council Local Plan Document (Breckland District Council, 2019).

36. 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 21.1**.

21.4.1.1.4 Legislation and Guidance

37. Works affecting Listed Buildings and Conservation Areas are subject to the Planning (Listed Buildings and Conservation Areas) Act 1990, 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.

38. 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".

39. 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:

- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021);
- The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Historic England 2017a);
- Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-Based Assessments (updated 2017b) and Code of Conduct (2014);
- Conservation Principles: For the Sustainable Management of the Historic Environment (Consultation Draft 10th November 2017, Historic England 2017c);
- Preserving Archaeological Remains: Decision-taking for Sites under Development (Historic England 2016);
- The Historic Environment in Local Plans: Historic Environment Good Practice Advice in Planning Note 1 (Historic England 2015a); and
- Managing Significance in Decision-Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning Note 2 (Historic England 2015b).

21.4.2 Data and Information Sources

21.4.2.1 Site Specific Surveys

40. In order to provide site specific and up to date information on which to base the impact assessment, a historic environment walkover survey, priority archaeological geophysical survey and monitoring of geotechnical works was undertaken.

41. The historic environment walkover survey was undertaken to confirm the presence/absence of heritage assets identified on the Norfolk Historic Environment Record (NHER) and through desk-based review of aerial imagery and historic maps, to assess their preservation, extent and setting, and to identify any previously unrecorded heritage assets. A total of 67 locations containing known heritage assets were visited between 5th-8th October 2020, the results from which are presented within **Appendix 21.1**.

42. The aims of the historic environment walkover survey were to:

- Assess the condition of upstanding/above ground archaeological remains within identified sites (i.e. earthworks or structures);
- identify any currently unrecorded heritage assets (i.e. earthworks or structures);
- establish the potential for currently unknown heritage assets (e.g. buried archaeology) to be present within SEP and DEP boundary;
- assess the potential impact from other modern developments within the study areas which may have reduced the significance/preservation of known heritage assets; and
- undertake initial setting assessment site visits of and in the vicinity of identified designated heritage assets.

43. A detailed setting assessment has been conducted for SEP and DEP to assess any potential impacts on the significance of heritage assets through a change in their setting as a result of the onshore and offshore infrastructure. The details of the setting assessment for the onshore infrastructure is presented in **Appendix 21.4** and for the offshore infrastructure in **Appendix 21.5**. The results from both assessments have informed the ES Chapter.

44. The aim of the priority archaeological geophysical survey was to locate, record and characterise any surviving sub-surface archaeological remains that would enhance current understanding of the archaeological resource at targeted locations within the DCO application boundary.

45. A total of 37 areas, covering approximately 546ha, were identified as requiring a priority archaeological geophysical survey. These areas were targeted based on known locations of recorded heritage assets relating to buried archaeology within the NHER and as identified from aerial photographic data.

46. Two phases of priority archaeological geophysical survey have been undertaken between September 7th, 2020, and December 15th, 2021. 28 survey areas were complete or partially complete (due to constraints such as crop cover or land access restrictions), covering approximately 426ha, including areas previously surveyed for other projects. Details of the results for the survey areas completed are provided in **Appendix 21.6**, and have been incorporated into **Section 21.5**.

47. A scheme of archaeological and geoarchaeological monitoring and recording during ground investigations, comprising boreholes and test pits, was undertaken in September 2021.

48. 31 locations were archeologically monitored during the ground investigations whilst a further 15 were monitored for geoarchaeological and palaeoenvironmental potential. The works were undertaken to enable an informed decision to be made in relation to the presence or absence of archaeological and geoarchaeological remains along the proposed route; their significance; and to guide the design of appropriate further mitigation measures. Full details of the archaeological and geoarchaeological monitoring assessment are presented in **Appendix 21.7**.

21.4.2.2 Other Available Sources

49. Other sources that have been used to inform the assessment are listed in **Table 21-5**.

Table 21-5: Other Available Data and Information Sources

Data set	Spatial coverage	Notes
National Heritage List for England (NHLE)	England	Official, up to date, register of all nationally protected historic buildings and sites in England - listed buildings, scheduled monuments, registered parks and gardens, and battlefields.
Norfolk Historic Environment Record (NHER)	Norfolk County	HERs are information services that provide access to comprehensive and dynamic resources relating to the archaeology and historic built environment of a defined geographic area. HERs contain details on local archaeological sites and finds, historic buildings and historic landscapes and are regularly updated.
Conservation Areas	Norfolk County	North Norfolk District Council (NNDC), Broadland District Council (BDC) and Breckland District Council hold information on Conservation Areas including locally listed buildings.
Relevant Regional, Local and Period Archaeological Studies and Journals	UK	Historic and archaeological data consulted to inform the wider baseline context. The studies/journals consulted do not constitute an exhaustive account of all historical/archaeological data identified within the study area.
The Archaeology Data Service	UK	A non-exhaustive directory of archaeological research consulted to inform the wider baseline context and previous archaeological investigations in the study area.
Cartographic sources (the NHER, Norfolk Record Office,	Norfolk County	Historic mapping for the study area including 19th century Enclosure and Tithe maps, and 1st, 2nd and

Data set	Spatial coverage	Notes
NCC's Historic Map Explorer and Envirocheck Report)		later edition Ordnance Survey maps. Some cartographic data is fragmentary for the study area. This chapter integrates the results of the Map Regression analysis undertaken by Air Photo Services, inclusive of 2021 addendum. The full report is included as **Appendix 21.2**.
Aerial Photographic Data (Historic England Archive and the NHER, and ortho-rectified mosaics of vertical aerial photographs at Google Earth)	Norfolk County	Aerial photographic data for the study area. This chapter integrates the results of the Aerial Photographic assessment undertaken by Air Photo Services, inclusive of 2021 addendum. The full report is included as **Appendix 21.2**.
Light Detection and Ranging (LiDAR) survey data	Norfolk County	Available LiDAR data for the study area. This chapter integrates the results of the LiDAR assessment undertaken by Air Photo Services. The full report is included as **Appendix 21.2**.
British Geological Survey (BGS) data (surface geology)	UK	Historic borehole logs and wider geological background for the study area.
Zone of Theoretical Visibility (ZTV), wireframes and photomontages	Study Area	ZTVs for the permanent above ground infrastructure required by SEP and DEP to inform the setting assessments – details of the ZTVs are provided in **Chapter 25 Seascape, Landscape and Visual (SLVIA)** and **Chapter 26 Landscape and Visual (LVIA)**.

21.4.3 Impact Assessment Methodology

50. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied to SEP and DEP. The following sections confirm the methodology used to assess the potential impacts on Onshore Archaeology and Cultural Heritage.

51. The impact assessment methodology adopted for Onshore Archaeology and Cultural Heritage defines heritage assets and their settings, likely to be impacted by SEP and DEP and assesses the level of any resulting benefit, harm or loss to their significance. The assessment is not limited to direct (physical) impacts, but also assesses possible indirect (physical) impacts upon heritage assets which may arise as a result of changes to hydrological processes and changes to the setting of heritage assets, whether visually, or in the form of noise, dust and vibration, spatial associations and a consideration of historic relationships between places which may impact their significance.

52. As set out in Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021), Cultural Heritage Impact Assessment (CHIA) is concerned with "understanding the consequences of change to cultural significance". The principles of assessment are:

- understanding cultural heritage assets; and
- evaluating the consequences of change.

53. Understanding cultural heritage assets distinguishes between:

- describing the asset (what it is and what is known about it);

- ascribing cultural significance (a description of what is valued about it); and
- attributing importance (a scaled measure of the degree to which the cultural significance of that asset should be protected).

54. Evaluating the consequences of change also distinguishes between three separate analytical stages:

- understanding change (a factual statement of how a proposal would change a cultural heritage asset or its setting, including how it is experienced);
- assessing impact (a scaled measure of the degree to which any change would impact on cultural significance);
- and weighting the effect (the measure that brings together the magnitude of the impact and the cultural heritage asset's importance).

55. The relationship between these principles and the general approach to EIA **Chapter 5 EIA Methodology** is described below.

21.4.3.1 Understanding Cultural Heritage Assets

56. A description of the assets, and their cultural significance, relevant to the assessment of Onshore Archaeology and Cultural Heritage is provided in **Section 21.5**. At this initial stage of the project, many of these assets are not yet fully understood. However, as set out in the Principles, as well as in national planning guidance including the NPSs (see **Table 21-4**) and NPPF (see **Section 21.4.1.1.2** above), proportionality is key and applicants must provide a level of detail that is proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. The level of detail provided in **Section 21.5**, therefore, sufficiently characterises these assets so that potential impacts upon their significance can be understood for the purposes of EIA.

57. As discussed in consultation with heritage stakeholders (see **Table 21-1**), further investigation and data gathering would be progressed post-consent, including further geophysical surveys and trial trenching, alongside additional mitigation requirements as set out in the **outline WSI (Onshore)** (document reference: 9.21). This is in line with the Principles (IEMA, IHBC and CIfA, 2021) which describe how, "an understanding of the cultural heritage asset is likely to be an iterative process which regularly reappraises the consequential impact on cultural significance as a proposal evolves or as more evidence emerges from research and investigations". **Section 21.5**, therefore, also highlights where there is a need to acquire additional information, and when this would be progressed, as part of an ongoing iterative design process.

58. As defined in the NPPF (MHCLG, 2021, Annex 2) cultural (or heritage) significance is the sum of the heritage values or interests that we, as a society, recognise in a heritage asset and seek to protect or enhance for future generations. A statement of significance should explain why we value a heritage asset. Understanding the significance of an asset should not be confused with a description of that asset which does not articulate 'what matters and why'. Historic England's 'Conservation Principles' (Historic England, 2017c) defines the term significance as encompassed by four headings: archaeological interest, architectural interest, artistic interest and historic interest. These terms are used in articulating the cultural significance of heritage assets for the purposes of this impact assessment.

59. As defined in the Principles (IEMA, IHBC and CIfA, 2021), cultural significance does not have a scale associated with it and it is therefore not appropriate to refer to 'high' or 'low' significance. This scaling is addressed through the separate consideration of a heritage asset's importance. Cultural significance is not directly related to designation status, nor is it defined in law. However, the reasons for designation may articulate aspects of heritage significance.

60. In describing the cultural significance of heritage assets, reference will also be made to the contribution of setting to that significance. The setting of a heritage asset is described as the surroundings in which a heritage asset is experienced (Historic England, 2017a). Elements of an asset's setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.

61. The importance of a heritage asset is a measure of the degree to which we seek to protect and preserve the cultural significance of that asset through, for example, legislation and planning policy. Determining the importance of an asset is a key decision in impact assessment as it will affect judgements regarding the relative weight to be given to protecting different assets during the design of a proposal.

62. Importance is scaled (unlike cultural significance) and requires the assessor to make a judgement regarding the merits of different heritage assets. It is therefore appropriate to refer to 'high' or 'low' importance for example. The statutory designation of heritage assets provides examples of how assets can be assigned a level of importance against explicit criteria. Some designated assets are judged to be of national importance, for example Scheduled Monuments, and World Heritage Sites are, again by definition, sites of international importance.

63. In determining the significance of effect for the purposes of EIA, this last analytical stage (attributing importance) broadly equates to 'sensitivity' as described in **Section 21.4.3.3** below.

21.4.3.2 Evaluating the Consequences of Change

64. The Principles (IEMA, IHBC and CIfA, 2021) describe change as, "both the act and the result of making something different from how it was before, whether directly or indirectly, temporarily or permanently, reversibly or irreversibly". It is also important to note that change may or may not lead to an impact on cultural significance. Before a scaled measure of this change can be determined it is necessary to describe the potential change to a heritage asset or its setting. To this end, a narrative approach describing the nature of potential changes is provided for each impact assessed in **Section 21.6**.

65. This is followed by the determination of a scaled measure of the degree to which any change would impact cultural significance, which broadly equates to the 'magnitude of impact' as described in **Section 21.4.3.3** below. This change could have a positive (beneficial) or negative (adverse) outcome. It is not a measure of the reach or extent of the proposal but rather the change to 'what matters' about a heritage asset.

66. The final stage is weighting the effect (the measure that brings together the magnitude of the impact and the cultural heritage asset's importance). For SEP and DEP this is articulated through the significance of effect matrix presented in **Table 21-8**. Following on from the previous stages of the assessment, which draw out the narrative regarding the importance of a cultural heritage asset, its cultural significance, and how the proposal will impact this significance, this measure is indicative of the weight that should be given to the matter in influencing the design of the proposal or, ultimately, in influencing whether the proposal would be acceptable and permitted.

67. Definitions for this weighted measure of significance of effect (in EIA terms) are provided in **Table 21-9**.

21.4.3.3 Definitions of Sensitivity and Magnitude

68. The sensitivity of a receptor 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 an asset cannot recover. On this basis, the assessment of the significance of effect of any identified impact is largely a product of the importance of an asset (rather than its sensitivity) and the degree to which any change would impact on cultural significance.

69. For the purposes of this EIA, the criteria for determining the heritage importance of any relevant heritage assets are described in **Table 21-6**.

70. The categories and definitions of heritage importance do not necessarily reflect a definitive level of importance of an asset. They are intended to provide a provisional guide to the assessment of perceived heritage importance, which is to be based upon professional judgement incorporating the evidential, archaeological, historical, aesthetic, architectural and communal heritage values of the asset or assets. It is important to note that the importance and cultural significance of an asset can be amended or revised as more information comes to light (i.e. as part of further investigations planned post-consent).

71. **Table 21-6** includes heritage assets of uncertain heritage importance i.e. where the importance, existence and/or level of survival of an asset has not been ascertained (or fully understood) from available evidence. Although **Table 21-6** provides a definition for assets of an uncertain heritage importance, where uncertainty occurs, the precautionary approach is to assign the highest likely level of importance. This precautionary approach represents good practice in cultural heritage impact assessment and reduces the potential for impacts to be under-estimated.

Table 21-6: Criteria for Determining Heritage Importance

Importance	Definition
High (perceived International/National Importance)	• World Heritage Sites • Scheduled Monuments • Grade I and II* Listed Buildings or structures • Protected wrecks • Designated historic landscapes of outstanding interest • Conservation Areas containing buildings or structures with high heritage importance, or high concentrations of listed buildings • Assets of acknowledged international/national importance • Assets that can contribute significantly to acknowledged international/national research objectives
Medium (perceived Regional Importance)	• Grade II Listed Buildings or structures • Designated special historic landscapes • Other types and character of Conservation Areas • Assets that contribute to regional research objectives • Assets with regional value, educational interest or cultural appreciation
Low (perceived Local importance)	• 'Locally Listed' buildings or structures • Assets that contribute to local research objectives • Assets with local value, educational interest or cultural appreciation • Assets 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

72. Magnitude broadly equates as the degree to which cultural significance is positively or negatively changed by the proposal.

73. Direct physical impacts, indirect physical impacts and impacts from a change in setting on the significance of 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.

74. The finite nature of archaeological remains means that physical impacts are almost always permanent and irreversible as the 'fabric' of the asset and, hence, its potential to inform our historical understanding, would be removed. By contrast, impacts resulting from the change in the setting of heritage assets will depend upon the longevity of construction and operation of SEP and DEP and the sensitivity with which the landscape/seascape is re-instated subsequent to decommissioning/demolition, if applicable

75. The magnitude of adverse impact with respect to Onshore Archaeology and Cultural Heritage directly relates to the extent of harm to, or loss of, key elements of the assets cultural significance, which may include its setting.

76. The magnitude of beneficial impact with respect to Onshore Archaeology and Cultural Heritage directly relates to the level of public benefit associated with an individual impact. 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).

77. 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 information and data). The measure of beneficial impact (high/medium/low) is, therefore, necessarily situational and specific to a given site, area or subject. One such example of a positive magnitude of impact could be relevant to, for example, new survey data being acquired, which will ultimately be made publicly accessible.

78. The criteria used for assessing the magnitude of impact with regard to archaeology and cultural heritage are presented in **Table 21-7**.

Table 21-7: Definition of Magnitude of Impact to Heritage Assets

Magnitude	Definition
High Adverse	Key elements of the asset's fabric and/or setting are lost or fundamentally altered, such that the asset's cultural significance is lost or severely compromised.
Medium Adverse	Elements of the asset's fabric and/or setting which contribute to its significance are affected, but to a more limited extent, resulting in an appreciable but partial loss of the asset's cultural significance.
Low Adverse	Elements of the asset's fabric and/or setting which contribute to its cultural significance are affected, resulting in a slight loss of cultural significance.
Negligible	The asset's fabric and/or setting is changed in ways which do not materially affect its cultural significance.

Magnitude	Definition
Low Beneficial	Elements of the asset's physical fabric which would otherwise be lost, leading to a slight loss of cultural significance, are preserved *in situ*; or Elements of the asset's setting are improved, slightly enhancing its cultural significance; or Research and recording leads to a slight enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss.
Medium Beneficial	Elements of the asset's physical fabric which would otherwise be lost, leading to an appreciable but partial loss of cultural significance, are preserved *in situ*; or Elements of the asset's setting are considerably improved, appreciably enhancing its cultural significance; or Research and recording leads to a considerable enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss.
High Beneficial	Elements of the asset's physical fabric which would otherwise be lost, severely compromising its cultural significance, are preserved *in situ*; or Elements of the asset's setting, which were previously lost or unintelligible, are restored, greatly enhancing its cultural significance.
No impact	No change to the assets fabric or setting which affects its cultural significance.

21.4.3.4 Significance of Effect

79. In accordance with the Principles for cultural heritage landscape (IEMA, IHBC and CIfA, 2021), for the purposes of this chapter the assessment refers to magnitude of impact and significance of effect. This is a departure from the language used in other chapters which refers to magnitude of effect and impact significance.

80. In basic terms, the potential significance of effect is a function of the sensitivity of the receptor and the magnitude of the impact (see **Chapter 5 EIA Methodology** for further details). As described above, for Onshore Archaeology and Cultural Heritage this equates to the importance of a heritage asset weighed against the magnitude of change to its cultural significance. The determination of significance is guided by the use of a significance of effect matrix, as shown in **Table 21-8**. Definitions of each level of significance are provided in **Table 21-9**.

81. Potential impacts identified within the assessment as major or moderate are regarded as significant in terms of the EIA regulations. Potential impacts should be described using significance of effect, followed by a statement of whether this is significant in terms of the EIA regulations, e.g. "*minor adverse effect, not significant in EIA terms/moderate adverse effect, significant in EIA terms"*. Appropriate mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall impact in order to determine a residual impact upon a given receptor.

Table 21-8: Significance of Effect Matrix

		Adverse Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Importance	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 21-9: Definition of Significance of Effect

Significance	Definition
Major	Change in cultural significance, both adverse or beneficial, which are likely to be important considerations at a national or regional level because they contribute to achieving national or regional objectives. Effective/acceptable mitigation options may still be possible, to offset and/or reduce residual impacts to satisfactory levels.
Moderate	Change in cultural significance, both adverse or beneficial, which are likely to be important considerations at a local level. Effective/acceptable mitigation options may still be possible, to offset and/or reduce residual impacts to satisfactory levels.
Minor	Change in cultural significance, both adverse or beneficial, which may be raised as local issues but are unlikely to be material considerations in the decision-making process. Industry standard mitigation measures may still apply.
Negligible	No material change to cultural significance.
No change	No impact, therefore, no change to cultural significance.

21.4.4 Historic Landscape Character

82. The approach to the assessment of historic landscape character (HLC) differs to that outlined above for heritage assets. The historic character of the landscape is described in terms of ability to accommodate change. For this reason, an approach is required which recognises the dynamic nature of the landscape and how all aspects of the landscape, no matter how modern or fragmentary, are treated as part of the HLC. It is not meaningful, therefore, to assign a level of heritage importance to these aspects of landscape character. Individual elements which contribute towards the HLC of an area (e.g. hedgerows, field boundaries) may, however, be assigned a heritage importance based on the criteria outlined in **Table 21-6** (where relevant).

83. As the HLC is described in terms of ability to accommodate change, it is also not meaningful to assign a measure of magnitude in order to understand the nature of the potential changes. Rather, this change is expressed as a narrative description of the landscape character and how it might be affected by SEP and DEP.

84. With regard to HLC, in terms of assessing impact, it is the alteration arising as a result of SEP and DEP to the baseline HLC as assessed in this chapter (see **Section 21.5.3.7** and **Appendix 21.1**) that is the key focus. In the absence of attributing heritage importance, impact upon HLC cannot be assessed using the significance matrix presented in **Table 21-8**, but is rather expressed in terms of the ability of the HLC to accommodate any change arising as a result of a project. In this respect, while damage to, or destruction of, a heritage asset is considered permanent and irreversible, impacts to HLC are dynamic, and may be temporary and reversible. Certain elements/features that may be considered to contribute to the HLC of an area (e.g. hedgerows, field/parish boundaries) may nonetheless be considered in relation to the process outlined above, as and where relevant.

21.4.5 Cumulative Impact Assessment Methodology

85. The cumulative impact assessment (CIA) considers other plans, projects and activities that may impact cumulatively with SEP and DEP. As part of this process, the assessment considers which of the residual impacts assessed for SEP and/or DEP on their own have the potential to contribute to a cumulative impact, the data and information available to inform the cumulative assessment and the resulting confidence in any assessment that is undertaken. **Chapter 5 EIA Methodology** provides further details of the general framework and approach to the CIA.

86. For onshore archaeology and cultural heritage, cumulative impacts may occur where developments acting in combination can have a cumulative impact on an archaeological resource which overlaps or intersects more than one development as well as affecting the nature of the wider archaeological landscape. In combination effects of a development's construction and/or operation phases could result in a cumulative impact through a change in heritage setting to both designated and non-designated heritage assets.

87. Cumulative impacts are considered in **Section 21.7**.

21.4.6 Transboundary Impact Assessment Methodology

88. No transboundary impacts are anticipated as a result of SEP and DEP with respect to onshore archaeology and cultural heritage.

21.4.7 Assumptions and Limitations

89. Data used to compile this ES chapter primarily consist of 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 reasonably accurate.

90. 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.

91. In support of the DCO application, an aerial photographic, LiDAR and map regression analysis, 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. The potential for additional buried remains not indicated by the survey results must therefore not be discounted.

92. In addition, the priority geophysical survey data acquired to date has also been subject to access restrictions. Where warranted, and still relevant to the onshore project area, a number of these areas would be subject to survey post-consent, to be agreed in consultation with NCC HES and HE (see **outline WSI (Onshore)** (document reference 9.21)), the results of which will inform upon additional mitigation strategies, as and where required.

21.5 Existing Environment

21.5.1 Introduction

93. The following section provides a summary of the known and potential onshore archaeological and cultural heritage resource within the defined study areas.

94. The baseline environment as presented below has been, to date, informed by the baseline data and information gathering exercise and assessment undertaken as part of the ADBA (**Appendix 21.1**), the Aerial Photographic, LiDAR and Map Regression Analysis (**Appendix 21.2** and **21.3**) and site visits to inform the setting assessments (**Appendix 21.4** and **21.5**), as well as the results from the Priority Archaeological Geophysical Survey (**Appendix 21.6**) and archaeological monitoring of ground investigation work (**Appendix 21.7**).

95. The archaeological periods referred to in this chapter are broadly defined by the following date ranges:

- 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.

21.5.2 Designated Heritage Assets

96. There are 276 designated heritage assets within the 1km study area, comprising:
    - 13 Scheduled Monuments;
    - Five Registered Parks and Gardens;
    - 246 Listed Buildings; and
    - 12 Conservation Areas.

97. Details of the designated assets are presented in a gazetteer (**Appendix 21.1; Annex 21.1.1**).

98. At present, one designated heritage asset is located partly within the DCO order limits; Mannington and Wolterton Conservation Area (**275**). The onshore cable corridor will have direct interaction with the cable installation works intersecting the far-western edge of the Conservation Area.

99. At the time of writing, there is no character appraisal available for the Mannington and Wolterton Conservation Area. However, it is known that the Conservation Area covers an area of 2238 hectares (being the largest within the study area) and includes the Registered Park and Garden of Mannington Hall (Grade II Listed, **15**). A number of Listed Buildings are interspersed throughout the Conservation Area, primarily centred around the rural villages located within it, ranging from Grade I, II* and II. The landscape is mostly agricultural in nature with some villages, such as Mannington, Wolterton and Calthorpe, being set within the River Bure valley landscape. The subsequent assessment of potential impacts of SEP and DEP upon this designated heritage asset is discussed in **Section 21.6.**

21.5.2.1 Heritage Setting Assessment

100. 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 importance. 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.

101. The heritage settings assessment has been carried out for the onshore substation (see **Appendix 21.4**) and the offshore infrastructure (see **Appendix 21.5**) which details the methodology, heritage viewpoint locations, and the assets which have been screened out. A summary of the results is provided below.

21.5.2.1.1 Onshore Substation

102. For the onshore substation setting assessment, three heritage assets were identified for further assessment on the basis of being potentially vulnerable to the onshore substation and associated infrastructure with respect to their setting:

- Church of St Peter (1169726, Grade II*)
- Church of the Holy Cross (1050437, Grade II*)
- Church of St Mary Magdalen (1172267, Grade II*)

21.5.2.1.2 Onshore Cable Corridor

103. The following assets have been considered separately in **Section 21.6** in regard to the effects to changes in setting due to their proximity to the DCO order limits:

- Moated site 380m SSW of Rosedale Farm (SM, **13**);
- Barningham Hall (RPG Grade II, **14**);
- Mannington Hall (RPG Grade II, **15**);
- Heydon Hall (RPG Grade II*, **16**);
- Two round barrows near Norwich Lodge (SM, **6**);
- Monument at TG 1735 0342 (LB Grade II, **249**);
- Norwich Lodge (LB Grade II, **239**);
- Heydon and Salle (CA, **276**);
- Mannington and Wolterton (CA, **275**);
- Baconsthorpe (CA, **267**);
- Weybourne (CA, **271**);
- Mere Farmhouse (LB Grade II, **76**);
- Dix's Farmhouse (LB Grade II, **119**); and
- The Lodge (LB Grade II, **213**).

104. Any changes in setting due to construction activities would be temporary and of sufficiently short duration that they would not give rise to material harm. There are, however, no identified or relevant heritage setting impacts on these assets associated with the onshore substation (and related) construction, based predominantly on the distance of the assets from the onshore substation and associated infrastructure.

21.5.2.1.3 Offshore Infrastructure

105. For the offshore infrastructure setting assessment, twenty-nine heritage assets were identified for further assessment on the basis of being potentially vulnerable to the offshore infrastructure with respect to changes in their setting:

- Blakeney Chapel, site of (1003622, Scheduled Monument) – Blakeney;
- Roman fort (Branodunum) (1003983, Scheduled Monument) – Brancaster;
- Church of All Saints (1049521, Grade I) – Beeston Regis;

- Church of St Mary (1169843, Grade I) – Happisburgh;
- Parish Church of St Peter and St Paul (1049032, Grade I) – Cromer;
- The Pleasaunce (1049817, Grade II*) – Overstrand;
- Remains of Blakeney Chapel at TG 043 452 (1172376, Grade II) – Blakeney;
- Cromer Pier (1049005, Grade II) – Cromer;
- Cromer Lighthouse (1171781, Grade II) – Cromer;
- Sea View (1231563, Grade II) – Wells;
- Lifeboat House (1277330, Grade II) – Wells;
- Happisburgh Lighthouse, Lighthouse Cottages (1306338, Grade II) – Happisburgh;
- Sea Wall Defences including Promenade and cliff retaining walls from opposite the bottom of Melbourne slope to the gangway (1350361, Grade II) – Cromer;
- Jetty Cliff and Bastion including sloping pedestrian pathways (1350362, Grade II) – Cromer;
- The Watch House (1373910, Grade II) – Cromer;
- Terraced Beach Chalets, The Promenade, Cromer (1408235, Grade II) – Cromer;
- The Pleasaunce, Overstrand (1001013, Grade II Registered Park and Garden) – Overstrand;
- Burnham Overy Staithe (Conservation Area);
- Wells (Conservation Area);
- Blakeney (Conservation Area);
- Cley-next-the-Sea (Conservation Area);
- Salthouse (Conservation Area);
- Sheringham (Conservation Area);
- West Runton (Conservation Area);
- Cromer (Conservation Area);
- Overstrand (Conservation Area);
- Mundesley (Conservation Area); and
- Happisburgh (Conservation Area).

21.5.2.1.4 Conclusion

106. **Appendix 21.4** and **21.5** details and describes the assets identified above in more detail, including their heritage importance and setting. It also includes the outcome of the setting assessment process in each case (taking primarily intervisibility into account with the onshore substation and associated infrastructure which is considered to represent the worst-case scenario 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.

107. The assets identified above were found to either not share intervisibility or had limited intervisibility with the onshore substation and associated infrastructure and the offshore infrastructure. This was considered to have little to limited change on their setting, and due to their distance from the above ground onshore and offshore project infrastructure, no significant impacts to heritage setting (and associated importance) were identified and no further action is considered to be required. This is further evidenced in **Section 21.6** and **Appendix 21.4** and **21.5**.

21.5.2.2 Heritage Importance

108. Based on the criteria shown in **Table 21-6**, the designated heritage assets outlined in **Section 21.5.2** (and **Appendix 21.1**) are considered to be assets of medium or high heritage importance with perceived regional or national importance.

21.5.3 Non-designated Heritage Assets

21.5.3.1 Summary of Non-designated Heritage Assets within the Study Area

109. There are 1,370 non-designated heritage assets within the 500m study area (**Appendix 21.1, Annex 21.1.2** and **Annex 21.1.3**), of which 237 fall within SEP and DEP DCO application boundary. This comprises 216 previously recorded non-designated heritage assets and 21 previously unrecorded potential non-designated heritage assets (as indicated by Aerial Photographs, LiDAR and historic mapping data).

110. Non-designated heritage assets potentially subject to direct physical impacts are confined to the DCO order limits and may comprise potential subsurface archaeological remains and above ground heritage assets (e.g. earthworks or structures).

111. Non-designated heritage assets which may be subject to indirect physical or non-physical impacts (associated with change in setting) as a result of SEP and DEP may be either within or beyond the parameters of the DCO order limits.

21.5.3.2 Potential Sub-surface Archaeological Remains

112. Heritage assets located within or partly within the DCO application boundary that are considered to potentially represent surviving below ground archaeological remains have not yet been fully evaluated through intrusive (e.g. trial trenching) evaluation approaches.

113. Features indicative of sub-surface archaeological remains, as indicated by data available and archaeologically assessed as part of the ADBA (see **Appendix 21.1**) and aerial photographic, LiDAR and historic map analysis (**Appendix 21.2** and **21.3**), variously include cropmarks, soil/parch marks, depressions and ditches.

114. Sub-surface archaeological remains may also be indicated by features identified in aerial photographs or historic map data as former buildings, structures or sites, which may no longer be extant as above ground remains but for which below ground remains may still be present (see **Appendix 21.2** and **21.3**).

115. A programme of priority archaeological geophysical survey (detailed magnetometry) has also been undertaken at targeted locations and further helps inform an understanding of the sub-surface archaeological potential of the DCO application boundary (see **Appendix 21.6**). The types of buried archaeological remains identified range from extensive areas of settlement and enclosure to single clearly defined features.

116. A summary of the sub-surface archaeological remains identified within the DCO order limits from the desk-based and non-intrusive surveys are presented in **Table 21-10**. The relevant figures to the identified sub-surface archaeological remains are available to view in **Appendix 21.1**, **Appendix 21.2**, **Appendix 21.3**, and **Appendix 21.6**.

Table 21-10: Summary of Potential Archaeological Remains Identified to Date

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
Onshore Substation					
328, 586	37649, 52135	N/A	N/A	Small enclosed Roman inhumation cemetery: prehistoric, post-medieval and undated features and multi-period finds, alongside cropmarks of fragmentary undated ditches	Medium - High
327, 1489	37650	APS_027	N/A	Late Bronze Age flint scatters, post medieval building material	Medium
570	37651	N/A	N/A	Late Bronze Age flint concentrations, post medieval finds	Medium
1463	N/A	APS_001	N/A	Eroded bank which may have been a headland to Medieval ploughing	Low
544, 1464	52082	APS_002	N/A	Cropmarked eroded linear ditches, likely boundaries and tracks of possible Roman date, and a curvilinear ditched enclosure which may be a Bronze Age funerary feature.	Medium - High
703, 1465	52076	APS_003	PA1	Cropmarks of ditches, intersects Roman pits and possible field system south of Mangreen Farm. No coherent pattern of anomalies but cluster of anomalies in the south-west corner. Also, other linear and discrete anomalies, particularly in the western half of the field which may have archaeological potential.	Medium
1466	N/A	APS_004	N/A	Cropmarked ditch with a terminal defined gap, which could be part of an undated enclosure	Low
1376, 1147, 1467	52079, 52080	APS_005	Completed as part of Hornsea 3	Cropmarks of fragmentary ditches of unknown date and post-medieval field boundaries. Carried out by SUMO in 2017: two former field boundaries were recorded along with a geological feature (possible buried channel) running on a NW/SE alignment across the northern part of field.	Low

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
547	57922	N/A	PA2	Linear settlement clearly identified along the western edge of the survey area, which comprises a series of sub-rectangular enclosures with divisions and multiple discrete anomalies. Low magnitude linear anomalies suggest a field system extending to the east of the settlement.	Medium
Onshore Cable Corridor					
1405	9751	N/A	N/A	Undated and unidentified cropmark	Low
707	55197	N/A	N/A	Roman coin	Low
1323,1479, 1480	52077	APS_017, APS_018	N/A	Site of a probable World War Two searchlight battery	Medium - High
436, 1486	22652	APS_024	N/A	Extraction site of unknown date and multi-period finds.	Low
1167	9742	N/A	N/A	Site of part of 18th century Turnpike road	Low
1484	N/A	APS_022	N/A	Bank or bund which may be associated with quarrying to the north	Low
762, 393. 280	38161, 25513, 9477	N/A	N/A	Multi period finds area, with evidence of Anglo-Saxon finds and prehistoric flints	Low
611, 1487	58937	APS_025	N/A	Very eroded bank likely to be headland created by medieval ploughing which is now fully eroded.	Low
641, 952, 482, 1491	30575, 49971, 50006	APS_029	N/A	Eroded banks and ditches where field boundaries have been removed to facilitate modern farming.	Low
1059	44333	N/A	N/A	Ketteringham Park	Medium
1492	N/A	APS_030	N/A	Extraction site of unknown date.	Low
766, 1335, 1093, 466, 836, 937, 871, 872, 1483, 1490	28710, 54604, 54616, 28163, 28164, 28165, 28157, 28158	APS_021 & APS_028	PA4	Former WWII military site / accommodation. Area of magnetic disturbance locates accommodation building. Linear anomalies to south and east of the building locate likely services associated with the building.	Low - Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
1225	13571	N/A	N/A	Norfolk Railway (Yarmouth, Norwich and Brandon)	Low
723, 973, 1100, 1495, 1496, 1498	59846, 19725, 19725	APS_033 to 034 & APS_036	PA5	Cropmarks over Roman road between Caistor St Edmund and Crownthorpe. Former boundaries of unknown date are identified in all three fields in the PA. No clear response from the road. Clusters of discrete anomalies located at the southern end of the survey area which may be small quarry pits from which material was excavated for use in the road's construction.	Medium - High
675	22643	N/A	N/A	Roman Brooch findspot	Medium
1125	64622	N/A	N/A	Site where geophysical survey identified no evidence for archaeologically significant remains	Low
1500	N/A	APS_038	N/A	Post-inclosure boundaries which have been removed to facilitate modern farming	Low
298	20669	N/A	N/A	Prehistoric worked flints and Iron Age to post-medieval finds, with evidence of Anglo-Saxon period finds	Low - Medium
661, 663	17476, 23853	N/A	N/A	Mesolithic flint scatter and later prehistoric worked flints	Medium
672, 288, 464, 1379, 415, 1355, 430, 459, 1501, 1502, 416	22038, 18294, 19752, 53602, 19744, 53603, 15277, 19751, 19748	APS_039 to 040	PA6	Cropmarks of rectilinear enclosure, ditches and large infilled pits. Large rectilinear enclosure identified to the west of the survey area. Linear anomalies within the main enclosure indicate partition/sub-division. Other smaller enclosures extend to the east of the main enclosure.	Low - Medium
969, 1358, 1504, 1505	53601, 17345	APS_042 & APS_043	N/A	Post-medieval field system and possible trackway and additional parallel ditch of unknown date.	Low
465	19973	N/A	N/A	Multi-period objects	Low - Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
1357, 564, 338, 379, 483, 1508	115763, 53488, 17924, 17925, 60942	APS_046	PA7	Multi-period cropmarks; former field boundaries, enclosures and possible settlement. Unsurveyable – planted with Christmas trees.	Medium - High
680	25237	N/A	N/A	Roman Pottery Finds	Medium
460, 1509	25236	APS_047	N/A	Buried linear ditches of uncertain origin.	Low
921	64017	N/A	N/A	Medieval coin.	Low
418, 705, 431, 509, 867, 422, 1124, 1513, 1514	19755, 53628, 15898, 53679, 25701, 20011, 65215	APS_051 & APS_052	PA10	Cropmarks of a possible ring ditch of Bronze Age date and enclosures of Roman date. Linear anomalies possibly forming part of field system/enclosures; however none are of possible or probable archaeological origin.	High
867, 705, 1513	25701, 53628	APS_051	PA11	Northern extent of cropmarks of Roman date. No anomalies of probable archaeological potential have been identified during the geophysical survey. Discrete anomalies of possible archaeological origin have been identified in the southern part of the access track.	Medium
877, 1515	28552	APS_053	PA12	Extant platforms and ditched enclosures relating to former medieval tofts. Anomalies possibly indicative of the medieval tofts visible to the western side of the field. North-eastern section of survey data characterised by responses due to deposition of alluvium adjacent to a stream course.	Medium
444, 1243, 368	16390, 17163, 23429	N/A	N/A	Probable Early Neolithic flint-working site, multi-period finds and undated mounds	Low to Medium
1380, 1058, 632, 1520, 1521, 487	53678, 44183, 23773, 12807	APS_058 & APS_059	PA14	Cropmarks of probable Bronze Age barrow and undated fragmentary field boundaries and trackways. A single ring ditch indicative of a barrow has been identified, corresponding with the cropmarks of a	High

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
				Bronze Age round barrow. Two discrete anomalies of possible archaeological origin are identified towards the southern end of the survey area.	
1372, 1058, 1522	50617, 44183	APS_060	N/A	Cropmarks over a series of undated linear ditches, probably the remains of former field boundaries	Low - Medium
306	33261	N/A	N/A	Prehistoric flint artefacts and post medieval coin, water pipeline at Blackbreck Plantation	Low - Medium
585, 1239, 1058, 1523	50615, 50618, 44183	APS_061	PA15	Cropmarks of possible enclosures and associated field boundaries of possible Iron Age to Roman date. Possible rectangular enclosure at western end of survey area. No anomalies of likely or possible archaeological potential identified on geophysical data and no correlation with the cropmark data.	Medium - High
584, 956, 1524, 1525	50610, 50614	APS_062 & APS_063	N/A	Cropmarks of possible Iron Age to Roman date enclosures and probable former field boundaries.	Medium - High
1072, 1527	50609	APS_065	N/A	Cropmarks over a series of undated linear ditches, probably the remains of former field boundaries of post medieval date	Low
1400	7736	N/A	N/A	Possible course of old road	Low
1529	N/A	APS_067	N/A	Very slight light toned linear marks in crops which may indicate either buried foundations or possibly natural features	Low
1374, 1530	50673	APS_068	PA17	Cropmarks of field boundaries of unknown date. No anomalies of likely or possible archaeological potential identified on geophysical data. A former field boundary has been recorded in the data, along with parallel and oblique linear anomalies which are indicative of ploughing.	Low

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
946, 469, 909, 912, 1532	35933, 29962, 7741, 50676	APS_ 070	PA18	Cropmarks of medieval building platforms. Although no clear pattern, except in northernmost field possible enclosures visible in data. Elsewhere pattern of linear and curvilinear anomalies. No evidence of cropmark ring ditch and oval enclosure.	High
790	51714	N/A	N/A	Roman, medieval and post-medieval finds	Medium
1386, 750, 506, 840, 569, 862, 1537, 1538, 1539	54355, 34326, 50657, 50677	APS_075, APS_076 & APS_077	PA20	Medieval enclosures and field boundaries, and cropmarks of fragmentary ditches, former field boundaries and a possible ring ditch. Linear anomalies indicative of ditches forming fields and enclosures are identified in southern and central fields. Linear trends in northern field are more likely to be agricultural in origin.	Medium - High
1385, 971, 706, 363, 1542	54354, 54353, 53700, 22887	APS_080	PA21	Undated ditches and a former road/trackway and field boundaries of medieval to post-medieval date. No anomalies of obvious archaeological interest.	Low
806, 1384, 706, 1543, 1544	51115, 53699, 53700	APS_081 & APS_082	PA22	Cropmarks of fragmentary ditches and soilmarks of buried walls of uncertain date. Fragmentary linear anomalies of uncertain origin. Possible round barrow on north-eastern edge of survey area.	Low
1383, 823, 753, 1545	53698, 62266, 7712	APS_083	N/A	Cropmarks of possible ditches and a possible ring ditch.	Medium – High
822, 1546	62267	APS_084	N/A	Very eroded bank which may be a headland to an area of totally medieval ploughing	Low
914, 1547	53481	APS_085	N/A	Earthworks of probable medieval building platforms	Medium - High
563, 558	51590, 51591	N/A	N/A	Multi-period findspot, inclusive of Anglo-Saxon finds	Low – Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
587, 1548	53482	APS_086	N/A	Cropmarks over ditches, probable former field boundaries & trackway, some of which may be Iron Age to Roman in date	Medium – High
848	42549	N/A	N/A	Late Saxon, medieval and post-medieval metal objects	Medium
1382, 1128, 1549	53697, 60169	APS_087	N/A	Cropmarks of undated ditches and a possible ring ditch.	Medium - High
1342, 983, 1550, 1551, 1552, 974	7465, 60170, 55014	APS_088 to APS_090, APS_001A	N/A	Cropmarks of a trackway and circular feature possibly associated with the former military airfield (Swannington WWII Airfield – NHER 7465).	Low - Medium
1553	N/A	APS_091	N/A	Eroded mound of unknown type and origin.	Low
684	2796	N/A	N/A	Fen Causeway Roman Road	Medium
944, 945, 1554	35096, 35098	APS_092	N/A	Likely trackway and focus of ditches and possible enclosures	Low
652, 772, 473, 1555	58227, 33889, 39903	APS_093	N/A	A complex of likely multi-phased rectilinear ditched enclosures and pits, with an outlying D-shaped ditched enclosure to the immediate east of the DCO order limits.	Medium - High
844, 1556	32599	APS_094	N/A	Likely post inclosure field system which has been removed	Low
847, 752	37543, 32042	N/A	N/A	Late Saxon to post-medieval finds	Medium
796, 1558	61327	APS_096	PA23	Cropmarks of ditches and possible enclosures. Southern end of 'ladder' settlement extending north/south and continuing into and through PA24 and PA25, approximately 1km in length and at least 200m wide. Comprises a series of rectangular enclosures. Numerous discrete anomalies within the enclosures suggests settlement activity.	Medium - High
671, 370, 405, 560, 3013, 1559	21849, 58762, 7343, 29841	APS_097	PA24	Cropmarks of enclosures, boundaries and pits. NCC HER records a probable Roman fort.	Medium - High

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
				Central part of 'ladder' settlement extending north into PA25 and south into PA23, approximately 1km in length and at least 200m wide. Comprises a series of rectangular enclosures. Numerous discrete anomalies within the enclosures suggests settlement activity.	
1638	N/A	APS_004A	N/A	Cropmarked ditches of uncertain origin.	Low - Medium
1412	14397	N/A	N/A	Undated Cropmark	Low
713	7322	N/A	N/A	Roman Stew Pans	Low - Medium
1412, 1637	14397	APS_003A	N/A	Undated Cropmark	Low
953, 1562	50073	APS_100	N/A	Ditches which may be former boundaries or earlier features	Low
1216	13581	N/A	N/A	Route of Midland and Great Northern Joint Railway (Great Yarmouth to Sutton Bridge)	Low
1217	13581	N/A	N/A	Route of East Norfolk Railway, Aylsham Branch, including Bure Valley Railway	Low
1563	N/A	APS_101	N/A	Cropmarks of pits and ditches	Medium
1421, 1640	36408	APS_006A	N/A	Cropmarks of undated enclosures, west of Flag Meadow Plantation	Medium
788, 1564	51461	APS_102	PA26 (linked)	Cropmarks possible trackways or roadway. Geophysical survey within study area confirms linear trend of cropmark.	Medium – High
1566	N/A	APS_104	N/A	Buried ditches of unknown date and origin.	Low - Medium
577, 513, 1567	12987, 6672	APS_105	N/A	Rectilinear enclosure and Iron Age chariot fitting, and cropmarks of ditches of a possible former field system.	Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
1079, 787, 1567	51456, 51457	APS_106	N/A	Buried linear ditches which may be boundaries and some fragmentary ditches and pits which may indicate an area of past settlement	Low -Medium
315, 333, 596, 1569	51455, 63420, 11339	APS_107, APS_008A, APS_007A	PA28	Settlement enclosures with a central trackway and outlying enclosures and boundaries. Southern half unsurveyed due to crop cover, however northern half contains settlement enclosures and trackway very similar to ladder settlement located in PA23-25 in south of study area. Possible field system extends east into PA29.	Medium - High
608	28973	N/A	N/A	Iron Age Coin	Low - Medium
749, 759, 1570, 1643, 1642, 491, 1641	28024, 28026, 18099	APS_108, APS_009A, APS_008A	PA29	Cropmarks of enclosures and former field system. Possible single large square enclosure straddling the boundary between the northern and southern fields. Other fragmentary linear anomalies possibly locate parts of an associated field system.	Medium
477, 951, 789, 783, 1644, 1465, 1572, 1573, 942	28025, 40482, 51479, 44076, 34281	APS_110, APS_111, APS_010A, and APS_011A	N/A	Continuation of a former ditched field system with an integral trackway.	Low - Medium
1366, 1575	36779	APS_113	PA30	Ditches, pits and boundaries indicative of field and settlement features in this area, possible prehistoric site. Two overlapping L-shaped anomalies located west of DCO may indicate parts of single large enclosure in centre of area.	Medium
1576	N/A	APS_114	N/A	Cropmarks of pits and possible buried ditches of unknown date.	Low - Medium
1020, 1577	51446	APS_115	N/A	Cropmarks of pits and ditches	Low - Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
1418, 959, 1578, 1645	30317, 51442	APS_116, APS_011A	N/A	Cropmarks of buried ditches and a possible ditched trackway.	Low - Medium
1579	N/A	APS_117	N/A	Buried ditches	Low
1580	N/A	APS_118	N/A	NMP records a ring ditch and enclosures.	Medium - High
1362, 390, 476, 1424, 1583, 1584, 1585, 1586	27993, 22883, 53757, 51434	APS_121, APS_122, APS_123 & APS_124	PA32	Cropmarks of elongated mortuary enclosure, ring ditch, linear ditches and possible mounds. Two parallel linear trends correlate with the cropmark data, alongside a small barrow and small square enclosure, alongside fragmentary linear and discrete anomalies, however all anomalies are extremely weak and tentative.	Medium - High
1250, 1589	30708	APS_127	N/A	Large adapted type 20V pillbox, no longer extant	Medium
1391, 837, 1304, 1390, 1593	6282, 38640, 38642, 6281	APS_131	N/A	Group of earthwork iron procurement pits, likely Medieval.	Low
1052, 1594	38638	APS_132	N/A	Possible slight earthworks of an embanked rectilinear enclosure with sunken interior.	Low
332, 903, 1604, 1606, 497	32047, 51432, 62305, 32048	APS_142 & APS_144	PA34	Probable Bronze Age round barrow, and part of medieval moated complex. No anomalies of probable archaeological potential identified on geophysical data. Discrete anomalies of possible archaeological origin are identified in the east of survey area. Former field boundary has been recorded.	High
687	30046	N/A	N/A	Roman pottery finds	Medium
1263, 603, 1603, 1605	34181, 31088	APS_141 & APS_143	N/A	WWII Searchlight batter and associated fences and structures, and post-inclosure boundaries which have been removed to facilitate modern farming.	Medium

SEP/DEP ID	NHER PrefRef	APS ID	Geophysical Survey Area	Summary of Findings	Perceived Heritage Importance
784, 322, 1607, 334	51430, 60330, 63388	APS_145	PA35	Medieval moated complex with enclosures, fishponds, old road and field system. Adjacent to Scheduled moated site – NHLE 1013097. Access denied at time of writing.	High
1609, 949	38272	APS_147	N/A	Cropmarks over linear features of unknown date and type	Low
Landfall					
1228, 694, 335, 610, 1625, 1300, 1423	11335, 39345, 51724, 56090, 38626, 51157	APS_163	PA36	Site of Weybourne Camp (NHER MNF11335). No anomalies of likely archaeological origin have been identified.	Low - Medium
1233, 1228, 694, 1051, 335, 610, 810, 667, 708, 1620, 1621, 1624, 1625, 1628, 1300, 1423	32502, 11335, 39345, 38634, 51724, 56090, 63210, 17649, 3274, 38626, 51157	APS_158, APS_159, APS_162, APS_163, APS_166	N/A	WWI and WWII slit trenches and associated coastal defences, and possible part of airfield. Multi-period findspots.	Low - High

117. Those archaeological sites/features/assets/anomalies (based on the data presented in **Appendices 21.1** to **21.3** and **21.6**) considered to be potentially vulnerable to direct physical impact as a result of SEP and DEP (i.e. those within the DCO application boundary) are directly addressed within the impact assessment and discussed, where relevant, in **Section 21.6**.

21.5.3.3 Above Ground Archaeological Remains and Heritage Assets

118. Features considered to represent above ground heritage assets within SEP and DEP DCO order limits are summarised in **Table 21-11**.

Table 21-11: Possible above Ground Heritage Assets within DCO Order Limits

DEP/SEP ID	NHER PrefRef	APS ID	Description	Perceived Heritage Importance
877	28552	APS_053	Extant platforms and ditched enclosures relating to former medieval tofts.	Medium
1259	32516		World War Two pillbox	Low

119. These heritage assets represent only those within the DCO order limits which are considered to represent above ground remains as indicated by descriptive information held by the NHER and assessed as a result of the aerial photographic, LiDAR and historic map analysis. Access restrictions, thick vegetation and unharvested crops variously prevented access to some areas during the walkover survey. As such, the potential for heritage assets to survive as above ground remains in addition to those summarised in **Table 21-11** cannot be discounted.

117. It is also acknowledged that examples of above ground historic earthworks are a rare resource within Norfolk as a result of agricultural activity and as such are considered valuable where they do survive as above ground features.

21.5.3.4 Heritage Importance

120. The non-designated heritage assets within the DCO order limits (identified to date as part of this assessment) are examples of locally common features representing post-medieval agriculture, and modern military activity. Based on information available to date, these assets may contain evidence that would contribute to understanding the archaeological resource of the local area. They are therefore anticipated to be of low heritage importance.

121. The previously recorded non-designated heritage assets also, however, include possible prehistoric and/or Roman features represented by cropmarks. Given the uncertainty regarding the origin of potential sub-surface archaeological remains of this nature (based on available data), this chapter has been prepared in line with the precautionary principle whereby the highest likely level of importance may be assigned and assessed within **Section 21.6**, as necessary. This precautionary approach represents good practice in archaeological impact assessment and reduces the potential for impacts to be under-estimated.

122. For the previously unrecorded non-designated heritage assets, identified as a result of the analysis of aerial photography, LiDAR data and historic mapping (**Appendix 21.2** and **21.3**) and the priority archaeological geophysical survey (**Appendix 21.6**), it has not yet been possible to determine the precise nature, extent or date of these features. It may also be the case that some (or many) of the features prove to be non-archaeological. Given this uncertainty, these potential heritage assets have also been assigned a precautionary heritage importance, where appropriate, depending on the nature of the asset in question, against which potential impacts have been assessed in **Section 21.6**.

21.5.3.5 Geoarchaeological and Palaeoenvironmental Potential

123. The archaeological monitoring of geotechnical works identified deposits of palaeoenvironmental and geoarchaeological interest at three separate locations; River Bure, north of Oulton (BH6-15), Swannington Beck (BH9-25) and River Wensum, south of Attlebridge (BH10-31). A summary of the findings and potential is presented below with full details provided in **Appendix 21.7**.

124. The deposits identified within BH6-15 and BH10-31 represent alluvium and organic alluvium associated with the Rivers Bure and Wensum respectively and have high to moderate palaeoenvironmental and moderate geoarchaeological potential.

125. The organic deposits identified within BH9-25 have high palaeoenvironmental and geoarchaeological potential. These are interpretated as the fills of a buried tunnel valley of Anglian age. If this origin is accepted then the fills must post-date MIS 12 and, due to the absence of Devensian gravels within this area, must predate the deposition of the Briton's Lane Formation (possibly MIS 6/191 – 130ka) and therefore a provisional, mid-Pleistocene date of between c. 424,000 – 191,000 years ago is proposed.

126. All other deposits are considered to have no to low palaeoenvironmental or geoarchaeological potential due to the generally shallow sequences, dominated by coarse, gravelly sediments of mid-Pleistocene origin.

127. These areas of moderate to high palaeoenvironmental and geoarchaeological potential could be physically impacted by construction activities both directly and indirectly. This is directly addressed within the impact assessment and discussed, where relevant, in **Section 21.6**.

21.5.3.6 Heritage Importance

128. These deposits of moderate to high geoarchaeological and palaeoenvironmental potential have been assigned a precautionary heritage importance of medium as there is uncertainty as to their precise nature, extent and date.

21.5.3.7 Historic Landscape Characterisation

129. The HLC has been considered in detail in **Appendix 21.1**.

130. The HLC data identifies a distinctly rural landscape within the study area, the history of which is mostly related to the period of Enclosure during the 18th to 19th century (piecemeal and parliamentary) mostly as a result of parliamentary planned enclosure. There are some links to the earlier history of the landscape, with two areas of historic earthworks associated with Venta Icenorum at Caistor St Edmund (**8**) and the medieval moated site south-west of Weybourne (**13**), as well as a number of surviving historic structures relating to religious buildings.

131. The route of the onshore cable corridor passes through fields of distinctly modern agricultural character, with large fields that have developed since the period of Enclosure, most often amalgamated from smaller fields from the mid-20th century onwards. This predominantly arable landscape has provided an optimal environment for recording buried archaeological features in the form of cropmarks and for retrieving artefacts as evidence of potential buried archaeology.

132. These predominant HLC types are anticipated to be able to accommodate a temporary level of change to HLC during construction with fields/areas being returned to their pre-construction 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/during the construction process and enhanced provisions during backfilling and reinstatement.

21.5.4 Climate Change and Natural Trends

133. The historic environment is vulnerable to the effects of climate change. Changes to environmental conditions have the potential to alter the range of flora and fauna within the environment, thereby potentially changing the inherent character of historic and designed landscapes and affecting historic building materials (e.g. fungal/plant growth and insect infestation due to the effects of global warming). Extremes in temperature and cycles of wetting and drying as a result of climate change can also damage historic buildings, landscapes and buried archaeological remains, variously as a result of soil saturation and shrinkage and changes to soil chemistry. Waterlogged archaeological and palaeoenvironmental remains are particularly vulnerable in this regard, with the desiccation of soils and lowered groundwater levels potentially increasing the risk of decay to such remains, if and where present. These damaging cycles create stressful environments for buried archaeology, with preservation in situ becoming increasingly difficult. Given that heritage assets, and the contexts in which they survive vary, it follows that multiple factors may affect their survival, stabilisation or decay. On this basis, broad-scale strategies to safeguard the historic environment from the effects of climate change are therefore difficult to determine, with no one single solution available.

134. Elements of climate change considered to be a particular relevance to the order limits include those associated with sea level changes and erosion, which have the potential to damage and de-stabilise coastal heritage assets. To the west of the landfall, the North Norfolk Heritage Coast (from Old Hunstanton to Weybourne) is described as a very dynamic coastline subject to continuous change, both erosion and accretion varying over time and in rate along the coast. However, the soft cliffs from Weybourne to Bacton, which characterise the landfall study area, are being affected by sea level rise causing increased erosion and increasing difficulty in maintaining sea defences. In particular, increased frequency and severity of storms, coupled with sea level rise, will likely impact coastal heritage assets and in the medium to long-term, sea-level rise is likely to drive a very significant change. 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, and certainly preferable to assets and remains being lost altogether.

21.6 Potential Impacts

135. This section outlines potential impacts as a result of SEP and DEP, their likely magnitude and the resulting significance of any effects when compared against the heritage importance of assets assessed, using the assessment methodology described in **Section 21.4**.

136. A range of potential impacts may occur to onshore archaeology and cultural heritage assets as a result of changes during the construction, operation and decommissioning of SEP and DEP. SEP and DEP have the potential to impact upon the historic environment resource in a number of ways, through direct (physical) changes, indirect (physical) changes, and indirect (non-physical) changes to the setting of heritage assets. Some impacts and changes would be temporary and others permanent, some confined to the construction stages and others more permanent during operation and the lifespan of SEP and DEP, and subsequent decommissioning. A summary of all potential impacts identified for onshore archaeology and cultural heritage is provided in **Section 21.12**.

137. Direct (physical) impacts, as stated in the NPS EN-3 (DECC 2011b: 49), encompass direct effects from the physical siting of the DCO order limits. 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 SEP and DEP which involve intrusive groundworks have the potential to affect heritage assets with archaeological interest (e.g. buried archaeological remains) through direct physical change.

138. SEP and DEP also have the potential to interact with local hydrological processes which in turn may result in impacts of an in-direct (physical) nature occurring upon buried archaeological deposits through either desiccation or waterlogging.

139. Indirect (non-physical) impacts on the historic environment, as stated in NPS EN3 (DECC 2011b: 67), include heritage assets being affected by change in their setting. Indirect (non-physical) impacts upon significance as a result of change in the setting of heritage assets have the potential to occur throughout the lifetime of SEP and DEP, thus encompassing all phases, from construction, into operation and subsequent decommissioning. Indirect non-physical impacts upon the setting of heritage assets are most relevant as a result of the presence of above ground infrastructure for the SEP and DEP during the operational phase, effects of which may be long-term or 'permanent' in nature. Indirect non-physical impacts upon the setting of heritage assets may also arise as a result of construction and decommissioning works, although effects would be, by comparison, shorter in duration and of a temporary nature.

140. The impact assessment as presented in this chapter assumes that activities associated with construction may theoretically occur anywhere within the DCO application boundary.

141. As such heritage assets will not be considered as single, individual receptors as part of an asset-by-asset approach. Instead, for the purposes of this ES, heritage assets have been grouped. The following broad groups will apply and be taken forward into the impact assessment:

- Below ground archaeology:
  - Areas of possible archaeological interest (including non-designated buried archaeological heritage assets) (ranging between anticipated low and high, as a worst-case, heritage importance);
  - Unknown potential buried archaeological remains (precautionary high heritage importance until evidenced otherwise); and
  - Geoarchaeological and palaeoenvironmental deposits (precautionary medium heritage importance until evidenced otherwise).
- Above ground archaeology/built heritage assets:
  - Designated heritage assets (high heritage importance); and
  - Areas of possible archaeological/cultural heritage interest (including non-designated above ground archaeology and cultural heritage assets, e.g. earthworks and standing structures) (ranging between anticipated low and medium, as a worst-case, heritage importance).

21.6.1 Potential Impacts During Construction

21.6.1.1 Impact 1: Direct Physical Impact on (permanent change to) Designated Heritage Assets

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

- The removal of topsoil anywhere across the DCO application boundary;
- Open cut trenching as part of the onshore cable installation works;
- The excavation of jointing bays and link boxes along the onshore cable corridor;

- Groundworks associated with the onshore cable corridor easement and associated access trackways;
- Vibration from HDD drilling and other intrusive groundworks; and
- Accidental damage from plant movement and other construction traffic.

143. For all construction scenarios, the impacts associated with construction works within the DCO application boundary are considered to be the same. The worst-case scenario for direct physical impacts on designated heritage assets is based upon the general assumption that the greatest potential footprint for SEP and DEP represents the greatest potential for direct physical impacts (e.g. damage/destruction). The combined footprint of both SEP and DEP constructed sequentially, therefore, represents a greater potential for direct impacts than if, for example, SEP and DEP were constructed concurrently or if only SEP or DEP was to be built in isolation. However, the magnitude of impact and significance of effect would be the same if SEP or DEP were constructed in isolation.

144. The application of embedded mitigation would be the same for the construction of both SEP and DEP, as for either SEP or DEP built in isolation.

145. Any direct (physical) impact to designated heritage assets (and their associated heritage significance) 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 would be needed for any loss (EN-1, paragraph 5.8.15). Any direct (physical) impact would likely be permanent and irreversible. If disturbed or removed without an appropriate record having been made, their context and relationship to other heritage assets is partially or completely lost and their heritage significance is as such likely to be reduced.

146. The DCO application boundary will avoid all known (e.g. Conservation Areas, Scheduled Monuments, Listed Buildings, etc.) designated heritage assets and as such, **no direct physical impacts** are anticipated to occur to designated heritage assets (**Section 21.5.2**).

147. This is with the exception of the Mannington and Wolterton Conservation Area (**275**) through which cable installation works will take place. Although the occurrence of such works constitutes a direct physical impact on the landscape character of the Conservation Area (see **Section 21.5.2**), 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 cultivation.

21.6.1.1.1 Magnitude of Impact – all scenarios

148. As detailed above, Mannington and Wolterton Conservation Area (**275**) is located partly within the DCO application boundary which is considered to have a medium heritage importance. The onshore cable corridor partially crosses the edge of this heritage asset and as such, the magnitude of impact is considered to be medium (see **Appendix 21.1**).

21.6.1.1.2 Significance of Effect – all scenarios

149. In the absence of mitigation, direct physical impacts on Mannington and Wolterton Conservation Area (**275**) are considered to represent a medium magnitude of impact on an asset of medium heritage importance, representing an effect of **moderate adverse** significance.

21.6.1.1.3 Mitigation – all scenarios

150.

151. In respect of the Mannington and Wolterton Conservation Area (275),the landscape through which the onshore cable corridor is constructed will be sensitively backfilled and reinstated following construction, with field boundaries and hedgerows returned to their pre-construction condition. As such no significant adverse effects are anticipated to occur following the implementation of proposed mitigation work. This will include sensitive management of the cable installation works through the Conservation Area followed by controlled backfilling and reinstatement, and the returning of field boundaries and hedgerows to their pre-construction condition. All backfilling and reinstatement works of archaeologically sensitive areas will be carried out in accordance with the **Outline WSI (Onshore)** (document reference: 9.21)).

21.6.1.1.4 Residual Impacts – all scenarios

152. Whilst the highlighted impact to Mannington and Wolterton Conservation Area (**275**) will be a direct physical impact, it is temporary in nature and confined to the construction period. Following the completion of sensitive and controlled backfilling and reinstatement of landscape features, the magnitude of impact is considered to reduce from medium to low, resulting in a residual impact of **minor adverse**. This is not considered to constitute harm to the significance of the Conservation Area.

21.6.1.2 Impact 2: Direct Physical Impact on (permanent change to) Non-designated Heritage Assets (including Buried Archaeological Remains, Geoarchaeological and Palaeoenvironmental Remains, Historic Earthworks and Structures)

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

- The removal of topsoil anywhere across SEP and DEP;
- The excavation of transition pits at the landfall;
- The application of HDD at the landfall and crossing locations along the onshore cable;
- Open cut trenching as part of the onshore cable installation works;
- The excavation of jointing bays and link boxes along the onshore cable corridor;
- Groundworks associated with the onshore cable corridor easement and associated access trackways; and
- Groundworks associated with the onshore substation.

154. For all construction scenarios, the impacts associated with construction works for the DCO application boundary is considered to be the same. The worst-case scenario for direct physical impacts on non-designated heritage assets would be based upon the general assumption that the greatest potential footprint for SEP and DEP represents the greatest potential for direct physical impacts (e.g. damage/destruction) to surviving buried archaeological remains (including geoarchaeological and palaeoenvironmental remains) and above ground heritage assets. The combined footprint of both SEP and DEP constructed sequentially, therefore, represents a greater potential for direct impacts than if, for example, SEP and DEP were constructed concurrently or if only SEP or DEP was built in isolation. However, whilst there is a greater potential for direct physical impacts, the increased footprint of SEP and DEP together would not lead to an increase to the magnitude of impact for any of the heritage assets or potential heritage assets discussed above (**Section 21.5.3**). Similarly, the significance of the effects will remain the same regardless of which construction scenario is adopted.

155. The application of mitigation (as detailed below) would be the same for the construction of both SEP and DEP, as for either SEP or DEP built in isolation.

156. Any adverse impacts (and associated effects) upon sub-surface archaeological remains, geoarchaeological and palaeoenvironmental remains, and above ground heritage assets due to construction-related works would likely be permanent and irreversible in nature. 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 physical impacts to an asset's fabric (where elements lost contribute to heritage significance) can represent a total loss of an asset's heritage significance, or parts of it, and the character, composition or attributes of the asset may be fundamentally changed or lost from the site altogether.

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. This approach has identified a number of areas of possible archaeological interest, which have been assigned initial predicted heritage importance levels between low and high. 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 (**Section 21.5.4**) have the potential to verify previously known/anticipated buried archaeological 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 importance of assets encountered as indicated by current available data.

158. It should also be emphasised that the potential for buried archaeological remains and above ground heritage assets not currently represented by available data to be impacted as a result of construction works should not be discounted. In the absence of further data regarding the 'potential' archaeological resource, such assets must be considered as potentially having a high perceived heritage importance.

159. Extant earthworks and field boundaries are an integral part of the HLC. Any loss of such features arising as a result of construction-related activities therefore has the potential to impact upon the HLC of the DCO application boundary and wider surrounds. This change to the HLC arising from the potential loss of above ground features is also discussed below.

Landfall location

160. Construction activities within the landfall location that have the potential to directly (physically) impact buried archaeological remains, and above ground heritage assets, are those associated with HDD works, cable trenching, installation of the landfall HDD compound, and groundworks associated with transition bay installation.

161. Data available and assessed to date (as part of this assessment) within the landfall location indicates a predominance of features associated with the coastal defence network of the two World Wars (particularly those of the WWII) and military training areas (see **Table 21-10**). It is possible that sub-surface remains relating to these features exist within the landfall location. Below ground features associated with the two World Wars are likely to be of low to medium heritage importance.

162. One WWII pillbox (**1259**), which is recorded as an above ground heritage asset, has been identified within the landfall location (see **Table 21-11**). Based on information available to date, this heritage asset is assigned a low heritage importance.

163. The landfall location also contains numerous records of multi-period findspots which could potentially indicate the presence of buried archaeological remains of earlier date (SEP/DEP IDs **667, 708, 910, 694, 335, 610 and 810**). Due to the uncertainty of the heritage significance of these findspots in the absence of further assessment and survey, these assets are assigned a precautionary medium heritage importance.

164. With regard to the HLC (see **Appendix 21.1**), the areas mapped as commons, wastes, heaths and 20th century agriculture at the landfall location will experience a temporary level of change to HLC during construction. The level of heritage importance is likely to be low.

Onshore Cable Corridor

165. Construction activities in the DCO order limits that have the potential to directly (physically) impact buried archaeological remains and above ground heritage assets are those associated with cable trenching, potential trenchless techniques at crossing points and groundworks associated with compound footprints, jointing bay and link box installation and the cable easement.

166. Areas of notable features within the DCO order limits are presented in **Table 21-10**. These areas have been variously assigned a low to high heritage importance based on information available to date.

167. In addition to areas of potential buried archaeological remains, two areas representative of above ground archaeological remains have been identified within the DCO order limits (see **Table 21-11**). Based on information available to date, these heritage assets are assigned a low to medium heritage importance.

168. Based on existing data, the potential to encounter geoarchaeological and/or palaeoenvironmental remains are located within three locations along the onshore cable corridor: River Bure, north of Oulton (BH6-15), Swannington Beck (BH9-25) and River Wensum, south of Attlebridge (BH10-31). These deposits are considered to be of medium heritage importance.

169. The predominant HLC types of 18th to 19th century enclosure and 20th century agriculture within the majority of the DCO order limits will experience a temporary level of change to HLC during construction, as will the more discrete HLC types represented variously across DCO order limits (pre-18th century enclosure, woodland, inland managed wetland, parks, gardens, recreation water features, mineral and marginal). The level of heritage importance is considered to be low.

Onshore Substation

170. Construction activities at the onshore substation that have the potential to directly (physically) impact buried archaeological remains are those associated with groundworks and landscape planting.

171. Data available and assessed to date for the onshore substation site includes cropmarks of fragmentary ditches of unknown date and post-medieval field boundaries. This area has been assigned a low perceived heritage importance based on information available to date.

21.6.1.2.1 Magnitude of impact – all scenarios

172. Any direct physical impacts on the significance of buried archaeological remains, geoarchaeological and palaeoenvironmental remains, and above ground heritage assets are often considered to be of high magnitude. However, the extent of any impact will often depend on the presence, nature and depth of any such remains, in association with the depth of construction-related groundworks, as well as the specific elements, aspects or areas of the asset subject to impact (including the level to which these may or may not contribute to heritage significance). As such, a reduced magnitude of effect may be relevant where the anticipated interaction between the proposed groundworks and the potential sub-surface archaeological remains (as indicated by available data) is considered to be unlikely or limited in terms of impact upon the asset's heritage significance. The magnitude of direct physical impacts on buried archaeological remains during the construction phase could therefore range from negligible to high.

Landfall location

173. Direct physical impacts to potential below ground archaeological remains as part of construction works at the landfall could represent up to a medium magnitude of impact.

174. Direct physical impacts to above ground heritage assets as part of construction works within the landfall location have the potential to result in a high magnitude of impact.

Onshore Cable Corridor

175. Direct physical impacts to potential below ground archaeological remains and geoarchaeological and palaeoenvironmental as part of construction works within the onshore cable corridor could result in a low to high magnitude of impact.

176. Direct physical impacts to above ground archaeological remains as part of construction works within the DCO order limits have the potential to result in impacts of medium to high magnitude.

Onshore Substation

177. It could be possible that direct physical impacts to potential below ground archaeological remains as part of construction works within the onshore substation site could result in a high magnitude of impact.

21.6.1.2.2 Significance of Effect – all scenarios

Landfall location

178. Construction works within the landfall location which could impact known and potential buried archaeological remains represent a medium magnitude of impact on heritage assets of medium heritage importance (as a precautionary highest level of heritage importance), resulting in effects of **moderate adverse** significance (in certain instances and prior to site specific mitigation), based upon the realistic worst-case.

179. Construction works within the landfall location which could impact extant above-ground heritage assets represent a high magnitude of impact on heritage assets of low heritage importance (as a precautionary highest level of heritage importance), resulting in effects of **moderate adverse** significance, based upon a realistic worst-case scenario.

Onshore Cable Corridor

180. In the absence of mitigation, direct impacts from the construction works have the potential to result in a high magnitude of impact upon areas of known and potential buried archaeological remains of high heritage importance (as a precautionary highest level of heritage importance) resulting in an effect of **major adverse** significance, based upon a realistic worst-case scenario.

181. Construction works along the onshore cable corridor which could impact extant above-ground heritage assets represent a high magnitude of impact on heritage assets of medium heritage importance (as a precautionary highest level of heritage importance), resulting in effects of **major adverse** significance, based upon a realistic worst-case scenario.

182. The onshore cable corridor crosses 34 parish boundaries. Any hedgerows associated with these boundaries are classed as “Important Hedgerows” and are therefore considered to be heritage assets of medium heritage importance (as a likely highest level of heritage importance). Prior to mitigation, groundworks have the potential to result in a low magnitude of impact upon any such hedgerows (where present, given the limited interaction between the boundaries and the onshore cable corridor), resulting in an effect of **minor adverse** significance, as a likely worst-case scenario.

Onshore Substation

183. In the absence of mitigation, all direct physical impacts from the construction works within the onshore substation are considered to have a high magnitude of impact upon known and potential buried archaeological remains assigned a low heritage importance, resulting in an effect of **moderate adverse** significance, based upon a realistic worst-case scenario.

184. No above ground archaeological remains or heritage assets are currently recorded or identified within the onshore substation based on data available to date. As such, there would be **no change** arising from construction works within the onshore substation upon above ground archaeological remains.

185. The onshore substation will represent a permanent/long-term change to the HLC which is mapped as 18th to 19th century enclosure and 20th century agriculture, and is considered of low heritage importance. This permanent change is considered to have a medium magnitude of impact resulting in a **minor adverse** significance of effect, based on a receptor of low heritage importance.

186. Two parish boundaries are located within the onshore substation, any hedgerows associated with these boundaries which fall within the DCO order limits would be classed as “Important Hedgerows” and are therefore considered to be heritage assets of medium heritage importance (as a likely highest level of heritage importance). Prior to mitigation, groundworks have the potential to result in a medium magnitude of impact upon any such hedgerows (where present), resulting in an effect of **moderate adverse** significance, as a likely worst-case scenario.

21.6.1.2.3 Mitigation – all scenarios

187. Avoidance, micro-siting and route refinement are embedded into the design of SEP and DEP, where possible. This strategy ensures that, when and where available, geophysical survey data has been input directly into the iterative design process so that potential sub-surface archaeological remains (in particular suspected features of likely medium or high heritage importance or concentrated areas of known complex archaeological features) and above ground heritage assets have been avoided, wherever possible within the confines of engineering and other environmental constraints.

188. SEP and DEP would undertake additional programmes of post-consent survey and evaluation (to be referred to as post-consent initial informative stages of mitigation work and as discussed in **Section 21.11**) which, of relevance to sub-surface archaeological remains, may include any outstanding geophysical survey, a scheme wide programme of trial trenching, and targeted metal detecting. This strategy is presented in the **Outline WSI (Onshore)** (document reference 9.24). The initial informative stages of mitigation work may indicate the presence of previously unknown buried archaeology (and further verify previously known/anticipated buried remains as indicated by the previous non-intrusive survey methods), enabling the resource to be appropriately addressed by means of mitigating any impacts in a manner that is proportionate to the significance of the remains present.

189. Additional mitigation beyond the initial informative stages is envisaged to comprise a combination of the following recognised standard approaches:

- Further advance and enacting of preservation in situ options and requirements (e.g. avoidance/micro-siting/HDD etc. where possible);
- Set-piece (open-area) Excavation: including subsequent post-excavation assessment, and analysis, publication and archiving;
- Strip, Map and Record (or Sample) Excavation: including subsequent post-excavation assessment, and analysis, publication and archiving;
- Watching Brief (targeted and general archaeological monitoring and recording): including subsequent post-excavation assessment, and analysis, publication and archiving (where appropriate);
- Earthwork Condition Surveys: including subsequent reporting and archiving (followed by backfilling and reinstatement, where required on a case-by-case basis); and
- Geoarchaeological/Palaeoenvironmental Surveys: including subsequent reporting, deposit model and archiving.

190. Impact to the HLC (including hedgerows and parish boundaries) would be minimised by returning field boundaries/areas/hedgerows to their pre-construction 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.

191. The site-specific measures adopted by SEP and DEP would be determined post-consent as SEP and DEP progress in a specific and bespoke manner, tailored on a case-by-case/area-by-area basis (as required) accordingly and in response to the combination of onshore archaeological and cultural heritage assessment. Opportunities to optimise the programme, including expedient commencement of archaeological work in the immediate post-consent stages will also be sought in ongoing discussion and agreement with NCC HES and Historic England.

192. The preferred and optimum mitigation measure is preservation in situ, wherever possible. By avoiding sub-surface archaeological remains (sites/features), either largely or in their entirety (as indicated by existing and available data), the magnitude of impact may be reduced depending on the extent of the site/feature in question (with reference to change or impact upon heritage significance) and the degree to which preservation in situ has been applied. Where avoidance is not possible, significant impacts upon sub-surface archaeological remains may potentially to a degree be off-set by the application of appropriate alternative mitigation measures which serve to preserve archaeological remains, where present, by record (e.g. following intrusive evaluation and subsequent excavation, where required). Although preservation by record cannot be considered to reduce the magnitude of impact (and associated significance of effect) per se, given the physical loss of a given site/feature, the acquisition of a robust archaeological record of a site/feature may be considered to adequately compensate identified, recognised and acceptable harm to a heritage asset in line with industry standard good practice mitigation measures and compatible with the definitions outlined in **Section 21.4.3**.

21.6.1.2.4 Residual Impact – all scenarios

Landfall location

193. With the application of mitigation, the magnitude of impact upon known and potential buried archaeological remains of at most medium heritage importance is considered to reduce or offset from medium to negligible, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

194. With the application of mitigation, the magnitude of impact upon extant above-ground heritage assets of at most low heritage importance is considered to reduce or offset from high to negligible, resulting in a residual impact of **negligible** significance.

Onshore Cable Corridor

195. With the application of mitigation, the magnitude of impact upon known and potential buried archaeological remains of at most high heritage importance is considered to reduce or offset from high to negligible, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

196. With the application of mitigation, the magnitude of impact upon extant above-ground heritage assets of at most medium heritage importance is considered to reduce or offset from high to negligible, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

197. With the application of mitigation, the magnitude of impact upon the HLC (including important hedgerows) of at most medium heritage importance is considered to reduce or offset from low to negligible, resulting in a residual impact of **negligible** significance.

Onshore Substation

198. With the application of mitigation, the magnitude of impact upon known and potential buried archaeological remains of at most low heritage importance is considered to reduce or offset from high to low, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

199. With the application of mitigation, the magnitude of impact upon the HLC (including important hedgerows) of at most medium heritage importance is considered to reduce or offset from medium to low, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

21.6.1.3 Impacts 3 and 4: Indirect Physical Impact on (permanent change to) Designated and Non-designated Heritage Assets

21.6.1.3.1 SEP and DEP - all scenarios

Changes in ground conditions

200. For all construction scenarios, the impacts associated with construction works for the DCO application boundary is considered to be the same. The worst-case scenario for indirect physical impacts on heritage assets as a result of changes to ground conditions beyond the onshore DCO order limits would be based upon the general assumption that the greatest potential footprint for SEP and DEP represents the greatest potential for indirect physical impacts (e.g. damage/destruction) to surviving buried archaeological remains (including geoarchaeological and palaeoenvironmental remains). The combined footprint of both SEP and DEP constructed sequentially, therefore, represents a greater potential for indirect impacts than if, for example, SEP and DEP were constructed concurrently or if only SEP or DEP was built in isolation. However, whilst there is a greater potential for indirect impacts, the increased footprint of SEP and DEP together would not lead to an increase to the magnitude of impact for any potential buried archaeological remains. Similarly, the significance of the effects will remain the same regardless of construction scenario.

201. Construction activities undertaken as part of SEP and DEP which have the potential to effect below ground heritage assets through hydrological changes that may cause desiccation and drying out of wetland deposits and associated preserved waterlogged archaeological or geoarchaeological remains, or waterlogging of predominantly drier remains is assessed with reference to **Section 18.6** (Potential Impact during Construction) of **Chapter 18 Water Resources and Flood Risk**.

202. It is considered that the depth of excavation work is one that could result in localised changes to groundwater. Deeper groundwater is not considered to be affected. As such, hydrological changes are expected within the direct locality of the cable trenches (which are 2 m deep), with any potentially deeper geoarchaeological deposits not affected by hydrological changes.

203. As assessed above, geoarchaeological deposits are considered to be of medium heritage importance.

204. In the absence of mitigation, the effects of localised changes to ground conditions have the potential to result in a medium magnitude of impacts upon geoarchaeological deposits of medium importance, resulting in an effect of **moderate adverse** significance, based on a worst-case scenario.

205. A staged approach to mitigation would be applied as detailed above in **Section 21.6.1.2.3**.

206. Following mitigation, any geoarchaeological deposits present will have been considered as vulnerable to the effects of cable trenching and HDD drilling, and therefore any assets identified will have been subject to initial informative stages of mitigation work, where necessary, and subsequent and additional mitigation measures, where required. On this basis, the magnitude of impact would reduce or offset from medium to low, resulting in a residual impact of **minor adverse** significance, which is not significant in EIA terms.

Traffic and Transport, Noise and Vibration

207. The worst-case scenario for indirect physical impact on heritage assets as a result of traffic movements, noise levels and vibrations would be based on the general assumption that the longest duration for SEP and DEP represents the maximum intrusive effect of construction activities. The longest construction duration of both SEP and DEP constructed sequentially therefore represents a greater potential for indirect impacts than if for example SEP and DEP were constructed concurrently or if only SEP or DEP was built in isolation. However, whilst there is a greater potential for indirect impacts, the longer construction period of SEP and DEP constructed sequentially would not lead to an increase to the magnitude of impact for the heritage assets. Similarly, the significance of the effects will remain the same regardless of construction scenario.

208. Potential indirect impacts to designated and non-designated heritage assets as a result of vibration from groundworks and construction traffic affecting the fabric of a heritage asset is assessed with reference to **Section 24.6** (Potential Impact during Construction) of **Chapter 24 Traffic and Transport**, and **Section 23.6** (Potential Impact During Construction) of **Chapter 23 Noise and Vibration**. The traffic and transport assessment considers the peak construction traffic against the 2025 baseline. This is considered the worst-case year for assessment purposes as it represents the earliest realistic year for peak construction traffic. Later years would have higher baseline traffic flows and therefore the introduction of SEP and DEP construction traffic would represent a lesser impact magnitude.

209. Potential for vibration from groundworks and construction traffic affecting the fabric of a heritage asset would likely occur through the presence of machinery, traffic and general activities taking place within the onshore areas. The sight, noise and smell as well as any dust and vibration created during the construction, operation and decommissioning phase could have an indirect (non-physical) impact upon heritage assets and their settings. The operation of the HDD and ancillary equipment would produce the greatest vibration impacts along the onshore cable corridor. The vibration effects from the onshore cable corridor construction activities would be no greater than negligible magnitude; representing an effect of no greater than **minor adverse** significance of effect on assets of medium heritage importance.

Bentonite Break out

210. Potential for drilling fluid to break out and spread into archaeological deposits, features and materials thereby causing an adverse effect upon the site preservation has also been subject to consideration.

211. As part of the HDD works, a drilling fluid (comprising a combination of water and natural clays such as bentonite) would be employed to lubricate the drilling process and cool the drilling 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% of solids by volume and weight to water ratio.

212. Fluid pressures would be monitored throughout the drilling process to minimise the potential for break out of the drilling fluid and an action plan would be developed alongside procedures adopted during the drilling activity to respond to any drilling fluid break out.

213. Geoarchaeological monitoring of geotechnical works have recorded organic deposits of geoarchaeological and palaeoenvironmental potential at three locations along the onshore cable corridor. Should these deposits exist within the HDD drilling zone further mitigation, such as a geoarchaeological survey, would be required. This is addressed in the **Outline WSI (Onshore)** (document reference 9.24).

214. The potential for drilling fluid to break out and spread into/'coat' archaeological deposits, features and materials thereby causing an adverse effect upon site preservation has as such been assessed as being of negligible magnitude of impact on assets of medium heritage importance (as a precautionary highest level of heritage importance), resulting in an effect of **minor adverse** significance for Impact 3 and 4, as a realistic worst-case scenario.

21.6.1.4 Impacts 5 and 6: Temporary Change to the Setting of Heritage Assets (both Designated and Non-Designated) which could affect their Heritage Significance

215. The worst-case scenario for temporary change to the setting of these heritage assets is based upon the general assumption that the longest duration for SEP and DEP represents the maximum intrusive effect of construction activities. The longest construction duration of both SEP and DEP constructed sequentially therefore represents a greater potential for changes to setting than if for example SEP and DEP were constructed concurrently or if only SEP or DEP was built in isolation. However, whilst there is a greater potential for changes to setting, the longer construction period of SEP and DEP together would not lead to an increase to the magnitude of impact for the heritage assets. Similarly, the significance of the effects will remain the same regardless of construction scenario.

216. Activities undertaken as part of construction works for SEP and DEP have the potential to impact designated and non-designated heritage assets through a temporary change in their setting which may affect their heritage significance. Temporary changes in the setting of heritage assets, should they occur, may do so through the presence of machinery, construction traffic and general construction activities taking place within the DCO application boundary. The sight, sound, any dust created, and even smell, during the construction phase has the potential to temporarily change the setting of heritage assets and their associated heritage significance.

217. The heritage setting assessment has been undertaken and has informed the understanding of how SEP and DEP would potentially change the setting of each asset and whether these changes would impact on the heritage significance of the asset.

218. The following assets have been considered separately in regard to the effects to changes in setting due to their proximity to the DCO order limits:

- Moated site 380m SSW of Rosedale Farm (SM, **13**);
- Barningham Hall (RPG Grade II, **14**);
- Mannington Hall (RPG Grade II, **15**);
- Heydon Hall (RPG Grade II*, **16**);
- Two round barrows near Norwich Lodge (SM, **6**);
- Monument at TG 1735 0342 (LB Grade II, **249**);
- Norwich Lodge (LB Grade II, **239**);
- Heydon and Salle (CA, **276**);
- Mannington and Wolterton (CA, **275**);
- Baconsthorpe (CA, **267**);
- Weybourne (CA, **271**);
- Mere Farmhouse (LB Grade II, **76**);
- Dix's Farmhouse (LB Grade II, **119**); and
- The Lodge (LB Grade II, **213**).

219. Any changes in setting due to construction activities would be temporary and of sufficiently short duration that they would not give rise to material harm. There are, however, no identified or relevant heritage setting impacts on these assets associated with the onshore substation (and related) construction, based predominantly on the distance of the assets from the onshore substation and associated infrastructure.

21.6.1.4.1 Magnitude of Impact – all scenarios

220. Any change to the setting of the heritage assets identified above effecting their heritage significance is considered to be of negligible magnitude due to the temporary nature of the works.

221. The presence and undertaking of construction works across a relatively small proportion of Mannington and Wolterton Conservation Area (**275**) would also have a short term, temporary, negligible magnitude of effect on the setting of the Conservation Area., which is of high heritage importance. This will, as a worst-case scenario, represent an effect of **minor adverse** significance and again will not constitute any ongoing harm to the heritage significance of the Conservation Area post-construction.

21.6.1.4.2 Significance of Effect – all scenarios

222. Any temporary change to the settings of these heritage assets from the construction works of SEP and DEP will be short term and temporary in nature, and therefore represents a negligible magnitude of impact on heritage assets of high importance, resulting in a **minor adverse** significance of effect, as a worst-case scenario, which is not significant in EIA terms.

21.6.2 Potential Impacts During Operation

223. During operation, it is expected that there would be no further requirement for land to be disturbed or excavated, except in the event that onshore cables require repair or maintenance. However, these activities would not extend beyond the construction footprint, and would be relatively rare and localised in occurrence. As such, direct physical impacts to both designated and non-designated heritage assets during operation have been scoped out of further assessment.

224. The presence of above ground onshore and offshore infrastructure could, however, have an impact on heritage significance as a result of change in the setting of heritage assets due to the presence of new above ground onshore and offshore infrastructure associated with SEP and DEP being introduced to and present within the landscape/seascape.

21.6.2.1 Impacts 1 and 2: Permanent Change to the Setting of Heritage Assets (both Designated and Non-Designated) which could affect their Heritage Significance

225. The impacts associated with the operation of SEP and DEP sequentially is considered greater than SEP and DEP concurrently and SEP or DEP in isolation due to a greater footprint and number of buildings required at the onshore substation.

226. The presence of permanent visible infrastructure could have an ongoing impact on the setting of heritage assets for the duration of the operation phase as a result of the onshore substation and offshore wind turbines.

227. The landfall location and the onshore cable corridor requires no significant above ground infrastructure. The transition joint bay(s) at the landfall location would be buried below ground. Jointing bays and link boxes would be required along the cable corridor at a frequency of one every 1000m and would be buried below ground level and would not result in any significant visibility. As a result, no changes to the setting of heritage assets with regard to these elements of SEP and DEP are anticipated for all scenarios.

Onshore Substation

228. The following designated heritage assets may be subject to a change in setting affecting their heritage significance as a result of the presence of the onshore substation and were identified as requiring further assessment (see **Appendix 21.4**):

- Church of St Peter (1169726, Grade II*)
- Church of the Holy Cross (1050437, Grade II*)
- Church of St Mary Magdalen (1172267, Grade II*)

229. A summary of the onshore infrastructure setting assessment outcomes is shown in **Table 21-12** below:

Table 21-12: Onshore Substation Summary of Settings Assessment Outcomes

Name	Settings Outcome
Church of St Peter (1169726, Grade II*)	Changes to the setting of the Church of St Peter are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
Church of the Holy Cross (1050437, Grade II*)	No change to the setting of the Church of the Holy Cross, there would be no change to the significance of the church. No further action and no mitigation required. **No Impact**.
Church of St Mary Magdalen (1172267, Grade II*)	No change to the setting of the Church of St Mary Magdalen, there would be no change to the significance of the church. No further action and no mitigation required. **No Impact**.

Offshore Infrastructure

230. The following designated heritage assets may be subject to a change in setting affecting their heritage significance as a result of the presence of the offshore infrastructure and were identified as requiring further assessment (see **Appendix 21.5**):

- Blakeney Chapel, site of (1003622, Scheduled Monument) – Blakeney;
- Roman fort (Branodunum) (1003983, Scheduled Monument) – Brancaster;
- Church of All Saints (1049521, Grade I) – Beeston Regis;
- Church of St Mary (1169843, Grade I) – Happisburgh;
- Parish Church of St Peter and St Paul (1049032, Grade I) – Cromer;
- The Pleasaunce (1049817, Grade II*) – Overstrand;
- Remains of Blakeney Chapel at TG 043 452 (1172376, Grade II) – Blakeney;
- Cromer Pier (1049005, Grade II) – Cromer;
- Cromer Lighthouse (1171781, Grade II) – Cromer;
- Sea View (1231563, Grade II) – Wells;
- Lifeboat House (1277330, Grade II) – Wells;
- Happisburgh Lighthouse, Lighthouse Cottages (1306338, Grade II) – Happisburgh;

- Sea Wall Defences including Promenade and cliff retaining walls from opposite the bottom of Melbourne slope to the gangway (1350361, Grade II) – Cromer;
- Jetty Cliff and Bastion including sloping pedestrian pathways (1350362, Grade II) – Cromer;
- The Watch House (1373910, Grade II) – Cromer;
- Terraced Beach Chalets, The Promenade, Cromer (1408235, Grade II) – Cromer;
- The Pleasaunce, Overstrand (1001013, Grade II Registered Park and Garden) – Overstrand;
- Burnham Overy Staithe (Conservation Area);
- Wells (Conservation Area);
- Blakeney (Conservation Area);
- Cley-next-the-Sea (Conservation Area);
- Salthouse (Conservation Area);
- Sheringham (Conservation Area);
- West Runton (Conservation Area);
- Cromer (Conservation Area);
- Overstrand (Conservation Area);
- Mundesley (Conservation Area); and
- Happisburgh (Conservation Area).

231. A summary of the offshore infrastructure setting assessment outcomes is shown in **Table 21-13** below:

Table 21-13: Offshore Infrastructure Summary of Settings Assessment Outcomes

Name	Settings Outcome
Blakeney Chapel, site of (1003622, Scheduled Monument) – Blakeney;	No change to the setting of the Scheduled Monument, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Roman fort (Branodunum) (1003983, Scheduled Monument) – Brancaster;	No change to the setting of Branodunum, there would be no change to the significance of the monument. No further action and no mitigation required. **No Impact**.
Church of All Saints (1049521, Grade I) – Beeston Regis;	No change to the setting of the Church of All Saints, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Church of St Mary (1169843, Grade I) – Happisburgh;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
Parish Church of St Peter and St Paul (1049032, Grade I) – Cromer;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
The Pleasaunce (1049817, Grade II*) – Overstrand;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.

Name	Settings Outcome
Remains of Blakeney Chapel at TG 043 452 (1172376, Grade II) – Blakeney;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Cromer Pier (1049005, Grade II) – Cromer;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Cromer Lighthouse (1171781, Grade II) – Cromer;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Sea View (1231563, Grade II) – Wells;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Lifeboat House (1277330, Grade II) – Wells;	No change to the setting of the Listed Building, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Happisburgh Lighthouse, Lighthouse Cottages (1306338, Grade II) – Happisburgh;	Changes to the setting of the lighthouse and cottages would be **negligible**, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Sea Wall Defences including Promenade and cliff retaining walls from opposite the bottom of Melbourne slope to the gangway (1350361, Grade II) – Cromer;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
Jetty Cliff and Bastion including sloping pedestrian pathways (1350362, Grade II) – Cromer;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
The Watch House (1373910, Grade II) – Cromer;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
Terraced Beach Chalets, The Promenade, Cromer (1408235, Grade II) – Cromer;	Changes to the setting of the Listed Building are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
The Pleasaunce, Overstrand (1001013, Grade II Registered Park and Garden) – Overstrand;	No change to the setting of the Registered Park and Garden, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Burnham Overy Staithe (Conservation Area);	No change to the setting of Burnham Overy Staithe Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Wells (Conservation Area);	No change to the setting of Wells Conservation Area, there would be no change to their significance. No further action and no mitigation required. **No Impact**.

Name	Settings Outcome
Blakeney (Conservation Area);	No change to the setting of Blakeney Conservation Area, there would be no change to their significance. No further action and no mitigation required. **No Impact**.
Cley-next-the-Sea (Conservation Area);	No change to the setting of Cley Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Salthouse (Conservation Area);	No change to the setting of the Salthouse Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Sheringham (Conservation Area);	Changes to the setting of the Conservation Area are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
West Runton (Conservation Area);	No change to the setting of West Runton Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Cromer (Conservation Area);	Changes to the setting of the Conservation Area are considered to be **negligible**, resulting in no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.
Overstrand (Conservation Area);	No change to the setting of the Overstrand Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Mundesley (Conservation Area); and	No change to the setting of Mundesley Conservation Area, there would be no change to its significance. No further action and no mitigation required. **No Impact**.
Happisburgh (Conservation Area).	Changes to the setting of the Conservation Area are considered to be **negligible**, resulting in be no significant change to its heritage significance. No further action and no mitigation required. **No Impact**.

21.6.2.1.1 Magnitude of Impact – all scenarios

Onshore Substation

232. In general, the heritage assets presented in **Table 21-12** were not found to share visibility or intervisibility with the onshore substation apart from the Church of St Peter, however, this will not detract from its appreciation or setting, and due to its distance from these above ground elements of SEP and DEP and the intervening vegetation, trees, hedgerows, landform and built form, there would be limited change to its setting, at most a **negligible** magnitude of impact is anticipated.

233. There is considered to be **no change** to the setting (and associated heritage significance) of the other heritage assets assessed.

Offshore Infrastructure

234. In general, the heritage assets presented in **Table 21-13** were not found to share visibility or intervisibility with the offshore infrastructure. Whilst the offshore wind turbines would be visible from some of the assets along the coastline, they will not detract from their appreciation or setting, and due to their distance from the offshore elements of SEP and DEP and the intervening vegetation, trees, hedgerows, landform and built form, there would be no change to the setting of the heritage assets identified, or at most a **negligible** magnitude of impact.

21.6.2.1.2 Significance of Effect – all scenarios

Onshore Substation

235. As discussed above, there would be limited change to the setting of the Church of St Peter; representing a negligible magnitude of impact upon an asset of high heritage importance resulting in an effect of **minor adverse** significance, which is not significant in EIA terms.

Offshore Infrastructure

236. As discussed above, there would be limited change to the setting of a small number of heritage assets, as presented in **Table 21.13**; which represents a negligible magnitude of impact upon assets of at most high heritage importance resulting in an effect of **minor adverse** significance, which is not significant in EIA terms.

21.6.2.1.3 Mitigation – all scenarios

237. In general, and as part of best practice, the design of the onshore substation and permanent infrastructure would be sympathetic to the surrounding landscape to mitigate the visual elements of the infrastructure further. This in turn will help to further minimise the effect upon the setting of the heritage assets (and associated heritage significance) than the low levels of change already identified.

21.6.2.1.4 Residual Impact – all scenarios

238. Following mitigation, the residual impact would be no greater than **negligible**.

21.6.2.2 Impacts 3 and 4: Indirect Physical Impact on (permanent change to) Designated and Non-designated Heritage Assets

Cable Heat Loss

239. Consideration has also been given to heat loss from electrical cables having the potential to have an adverse effect on any waterlogged archaeological remains that may be present, such as palaeoenvironmental/geoarchaeological remains, other organic material and waterlogged wood.

240. 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 would be localised to areas immediately around the cables and ducts, and reduced further by the use of a cement bound sand which has a low thermal resistance to conduct the heat produced during electricity transmission.

241. The soil surrounding the immediate locality of a large portion of the cables will have been subject to disturbance as a results 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, and subsequent and additional mitigation measures, where required. On this basis, there would be no further impact during operation associated with the heat loss from cables.

242. Sections of the cable installed by means of trenchless techniques will occur at such a depth that the anticipated impacts upon sub-surface archaeological remains are limited and would be mitigated. As such, it is considered that there would be no further impact to sub-surface archaeological remains associated with the heat loss from cables during the operational phase.

243. Data assessed indicated that there is potential for interaction between the HDD works and the potential palaeoenvironmental/geoarchaeological deposits recorded at three locations along the onshore cable corridor. As these deposits will have been subject to mitigation prior to construction (see **Outline WSI (Onshore)** (document reference 9.24)), it is considered that there would be **no impact** during operation associated with the heat loss from cables.

21.6.3 Potential Impacts during Decommissioning

244. No decision has been made regarding the final decommissioning policy for SEP and DEP as it is recognised that industry best practice, rules and legislation change over time. The detailed decommissioning activities and methodology would be determined later within SEP and DEP lifetime so as to be in line with latest and current guidance, policy and legislation at that point. At that juncture, the decommissioning methodology would be agreed with the relevant authorities and statutory consultees. Onshore, decommissioning is likely to include removal or reuse of the onshore substation with the cables and jointing bays left in situ or removed.

245. Assuming that provision is made for methods of removal which minimise further impact to the wider area, it is reasonable to assume that any potential damage upon designated and non-designated heritage assets would have already occurred as part of construction activities. However, it is noted 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. As such, the worst-case scenario with regard to decommissioning cannot be ascertained until the decommissioning plan is finalised.

246. Changes to setting may be present as a result of visual and audible impacts associated with decommissioning activities. Any changes to the setting of heritage assets are considered to be temporary in duration, occurring in association with the decommissioning phase. As such, the worst-case scenario as outlined for the construction phase in relation to temporary changes to the setting of heritage assets is unlikely to be exceeded as a result of decommissioning activities.

247. In the absence of further information at this stage of enquiry, a precautionary **major adverse** significance of effect is predicted (as a worst-case scenario, 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. 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 the significance of effect to levels representing an effect of **minor adverse** significance, which is considered not significant in EIA terms.

21.7 Cumulative Impacts

21.7.1 Identification of Potential Cumulative Impacts

248. The first step in the cumulative assessment is the identification of which residual impacts assessed for SEP and/or DEP on their own have the potential for a cumulative impact with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 21-14** below. Only potential impacts assessed in **Section 21.6** as negligible or above are included in the CIA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

249. **Table 21-14** concludes that in relation to onshore archaeology and cultural heritage, potential cumulative impacts are likely to arise where the construction phase for two or more projects overlap or where the extent of the archaeological resource intersects two or more projects, or where intervisibility is shared between a heritage asset and two or more developments, should construction and operation run simultaneously.

Table 21-14: Potential Cumulative Impacts (Impact Screening)

Impact	Potential for Cumulative Impact	Rationale
Construction		
Impact 1: Direct Physical Impact on (permanent change to) Designated Heritage Assets	Yes	Cumulative direct impacts arising from two or more projects are possible in an area of over-lap or those with an extent which intersects two or more proposed project boundaries (where groundworks are anticipated). Impacts may also occur which affect the nature of the heritage resource on a wider scale.

Impact	Potential for Cumulative Impact	Rationale
Impact 2: Direct Physical Impact on (permanent change to) Non-designated Heritage Assets	Yes	Cumulative direct impacts arising from two or more 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 (buried or above ground) in an area of over-lap or those with an extent which intersects two or more proposed project boundaries (where groundworks are anticipated). Impacts may occur which affect the nature of the archaeological resource on a wider scale. Such impacts also have the potential to affect the HLC of the study area (e.g. loss of earthworks as a result of one project could affect the HLC as summarised for the purposes of another project).
Impacts 3 and 4: Indirect Physical Impact on (permanent change to) Designated and Non-designated Heritage Assets	Yes	Cumulative direct impacts arising from two or more projects are possible in an area of over-lap or those with an extent which intersects two or more proposed project boundaries (where groundworks are anticipated).
Operational		
Impacts 1 and 2: Permanent change in the Setting of Heritage Assets (both designated and non-designated) which may affect their Heritage Significance	Yes	Cumulative changes in heritage setting 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, although additional factors affecting setting may also occur.
Decommissioning		
The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan would be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.		

21.7.2 Other Plans, Projects and Activities

250. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CIA (described as 'project screening'). This information is set out in **Table 21-15** below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to SEP and DEP, status of available data and rationale for including or excluding from the assessment.

251. The project screening has been informed by the development of a CIA Project List which forms an exhaustive list of plans, projects and activities in a very large study area relevant to SEP and DEP. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

252. Those projects located more than 1km from the onshore cable corridor and more than 5km from the onshore substation are not included in **Table 21-15**.

Table 21-15: Summary of Projects Considered for the CIA in Relation to Onshore Archaeology and Cultural Heritage (Project Screening)

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Norfolk Vanguard and Norfolk Boreas Offshore Wind Farm	DCO Consented	2023 – 2029	0km – SEP and DEP onshore cable corridor crosses the Norfolk Vanguard onshore cable corridor. 30km between onshore substation location.	High	Y	The Norfolk Vanguard onshore cable corridor crosses the SEP and DEP DCO application boundary and may result in impacts of a direct and/or indirect nature upon non-designated heritage assets. There is also the possibility of cumulative impacts on heritage setting should the construction periods overlap.
Hornsea Project Three Offshore Wind Farm	DCO Consented	2023-2025 (single phase) 2023-2031 (two phase)2021 -2027 (single phase)	0km – SEP and DEP onshore cable corridor crosses the proposed Hornsea Three onshore cable corridor. 1.4km from onshore substation	High	Y	The Hornsea Three onshore cable corridor crosses the SEP and DEP DCO application boundary and may result in impacts of a direct and/or indirect nature upon non-designated heritage assets. There is also the possibility of cumulative impacts on heritage setting should the construction periods overlap and also during operation due to the location of the substation.
A47 North Tuddenham to Easton	DCO examination	2022/23-2024/25	0km – A47 crosses the onshore cable corridor of SEP and DEP.	High	Y	The proposed road scheme overlaps with the SEP and DEP DCO application boundary and may result in impacts of a direct and/or indirect nature upon non-designated heritage assets. There is also the possibility of cumulative impacts on heritage setting should the construction periods overlap.

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Norwich Western Link	Scoping Opinion Provided / Pre-Application	2023	0km – Preferred route intersects SEP and DEP.	High	Y	The proposed road scheme overlaps with the SEP and DEP DCO application boundary and may result in impacts of a direct and/or indirect nature upon non-designated heritage assets. There is also the possibility of cumulative impacts on heritage setting should the construction periods overlap.
East Anglia GREEN	Site selection / pre-scoping	2027-2031	-	Low	N	Screened out as insufficient details available about this proposal to undertake any meaningful cumulative impact assessment.

21.7.3 Assessment of Cumulative Impacts

253. Having established the residual impacts from SEP and/or DEP with the potential for a cumulative impact, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of impact that may arise.

21.7.3.1 Cumulative Impact 1: Direct Physical Impact on (permanent change to) Non-designated Heritage Assets arising as a result of construction works

254. Due to the geographical overlap between SEP and DEP DCO order limits and the projects listed in **Table 21-15**, there is the potential for direct cumulative impacts upon above ground and buried archaeological remains.

255. Impacts resulting in these potential effects as part of construction work are those associated with intrusive groundworks associated with the various projects, should they occur. The extent of any impact will depend on the presence and nature of any such remains. Any adverse effects 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, direct cumulative impact on buried and above ground archaeological remains would be considered to be high, resulting in a significance of effect ranging between **moderate** to **major adverse**, as a worst-case scenario.

256. The Norfolk Vanguard and Norfolk Boreas projects share the same application footprint, as many of the groundworks and construction activities for the Norfolk Vanguard project also serve to facilitate the Norfolk Boreas project, such as cable duct installation, trenchless crossings, onshore substation, etc. As such, they are considered as one project for the CIA.

257. Whilst it is not possible to avoid unknown heritage assets that have not yet been discovered (potential heritage assets), unavoidable direct physical impacts may occur if archaeological material is present within the footprint of any plans, projects and activities, and these impacts have the potential to be of high adverse magnitude. The Norfolk Boreas, Norfolk Vanguard, Hornsea Project Three, A47 North Tuddenham to Easton, and Norwich Western Link projects all adopt mitigation strategies which 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 representing an effect of **minor adverse** significance (as a worst-case scenario), which is not significant in EIA terms. Furthermore, the consideration of phasing and careful design (especially throughout the route refinement process that has been undertaken) associated with SEP and DEP will ensure impacts are minimised as much as possible. However, if multiple unavoidable impacts occur during the construction, operation or decommissioning of multiple projects, then cumulative impacts may be considered of greater significance. For example, it is possible that unique aspects of former landscapes, or of the *in situ* archaeological resource, may be lost as a result. In addition, if a site is damaged or destroyed, comparable sites elsewhere may increase in importance as a result of greater rarity and any future direct physical impacts would be of greater significance.

21.7.3.2 Cumulative Impact 2: Temporary and Permanent Change to the Setting of Designated and Non-designated Heritage Assets arising as a result of construction and operational works

Construction

258. 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 concurrent.

259. A setting assessment following Historic England guidance was undertaken (**Appendix 21.4** and **21.5**). The assessment utilised LVIA and SVIA tools such as ZTVs, photomontages and wireframes, particularly in relation to the onshore substation and offshore infrastructure.

260. At this stage, the cumulative impact considerations with respect to the setting of heritage assets is expected to be limited to the potential intervisibility of SEP and DEP onshore substation with the Hornsea Project Three onshore substation and any potential to cumulatively effect the setting of heritage assets in proximity to these. The expected construction date of the Hornsea Project Three Offshore Windfarm is 2021 – 2027.

261. No heritage assets have been considered likely to be vulnerable in this regard as a result of the setting assessment (**Appendix 21.4** and **21.5**). However, any cumulative impacts upon the setting of any of the heritage assets associated with construction works would be temporary in nature only (if concurrent or sequential construction takes place at all) and are therefore considered not significant in EIA terms.

Operational

262. For the operational phase of the projects, 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 arising as a result of other projects or activities. Projects scoped into this assessment comprise the Hornsea Project Three substation which will be located approximately 1.4km away from the SEP and DEP substation.

263. The setting assessment as presented in this chapter has concluded that significant changes to setting and associated heritage significance are not considered to occur due to the presence of the onshore substation. This is largely due to the natural screening surrounding the onshore substation area, which has resulted in little to no visibility or intervisibility from the surrounding heritage assets towards the above ground infrastructure at this location. It is considered therefore that the potential for changes to setting affecting heritage significance to occur cumulatively as a result of Hornsea Project Three is also considered unlikely, and therefore resulting in **no impact**.

21.8 Transboundary Impacts

264. There are no transboundary impacts with regard to onshore archaeology and cultural heritage as the onshore project area would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and are not considered further.

21.9 Inter-relationships

265. Inter-relationships exist between onshore archaeology and cultural heritage and the assessments undertaken for Offshore Archaeology and Cultural Heritage, Water Resources and Flood Risk, Noise and Vibration, Traffic and Transport, and Seascape, Landscape and Visual Impact Assessment (see **Table 21-16**). Upon their completion, information from these chapters would be used to help establish any further potential impacts on the onshore archaeology and cultural heritage and inform the impact assessment presented in the final DCO application.

Table 21-16: Onshore Archaeology and Cultural Heritage Inter-Relationships

Impact / receptor	Related Chapter	Where Addressed in this Chapter	Rationale
Construction			
Impact 1 and **2**: The WWII coastal defences and associated buried remains, and a change to the setting of heritage assets.	**Chapter 14 Offshore Archaeology and Cultural Heritage**	**Sections 21.6.1.2**and **21.6.1.4**	Potential impacts on nearshore, intertidal and coastal archaeology and cultural heritage.
Impact 3 and **4**: Indirect (physical) impacts on designated and non-designated heritage assets.	**Chapter 18 Water Resources and Flood Risk**	**Section 21.6.1.3**	Potential impacts as a result of changes to ground conditions affecting buried archaeological deposits.
	Chapter 24 Traffic and Transport	**Section 21.6.1.3**	Potential for vibration from groundworks/construction traffic affecting the fabric of a heritage asset.
Impact 5 and **6**: A change to the setting of heritage assets.	**Chapter 23 Noise and Vibration**	**Section 21.6.1.4**	Potential impacts related to noise and vibration could impact on the setting of heritage assets.
	Chapter 25 Seascape and Visual Impact Assessment	**Section 21.6.1.4**	There could be potential impacts with respect to visual receptors along the coast which could also represent potential impacts to the setting of heritage assets.
	Chapter 26 Landscape and	**Section 21.6.1.4**	There could be potential impacts with respect to

Impact / receptor	Related Chapter	Where Addressed in this Chapter	Rationale
	Visual Impact Assessment		landscape and visual receptors which could also represent potential impacts to the setting of heritage assets.
Operation			
Impact 1 and **2**: A change to the setting of heritage assets.	**Chapter 23 Noise and Vibration**	**Section 21.6.2.1**	Potential impacts related to noise and vibration could impact on the setting of heritage assets.
	Chapter 25 Seascape and Visual Impact Assessment	**Section 21.6.2.1**	There could be potential impacts with respect to visual receptors along the coast which could also represent potential impacts to the setting of heritage assets.
	Chapter 26 Landscape and Visual Impact Assessment	**Section 21.6.2.1**	There could be potential impacts with respect to landscape and visual receptors which could also represent potential impacts to the setting of heritage assets.
Decommissioning			
Inter-relationships and the identified impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.			

21.10 Interactions

266. The impacts identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between impacts are presented in **Table 21.17.** This provides a screening tool for which impacts have the potential to interact. **Table 21.18** provides an assessment for each receptor (or receptor group) as related to these impacts.

267. Within **Table 21.18** the impacts are assessed relative to each development phase (Phase assessment, i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

Table 21-17: Interaction Between Impacts - Screening

Potential Interaction between Impacts						
Construction						
	Impact 1: Direct Physical Impact on Designated Heritage Assets	**Impact 2:** Direct Impact on Non-designated Heritage Assets	**Impact 3:** Indirect Physical Impact on Designated Heritage Assets	**Impact 4**: Indirect Physical Impact on Non-designated Heritage Assets	**Impact 5:** Temporary Change to the Setting of Designated Heritage Assets	**Impact 6**: Temporary Change to the Setting of Non-designated Heritage Assets
Impact 1: Direct Physical Impact on Designated Heritage Assets	-	No	Yes	No	Yes	No
Impact 2: Direct Impact on Non-designated Heritage Assets	No	-	No	Yes	No	Yes
Impact 3: Indirect Physical Impact on Designated Heritage Assets	Yes	No	-	No	No	No
Impact 4: Indirect Physical Impact on Non-designated Heritage Assets	No	Yes	No		No	No
Impact 5: Temporary Change to the Setting of Designated Heritage Assets	Yes	No	Yes	No		No
Impact 6: Temporary Change	No	Yes	No	Yes	No	

Potential Interaction between Impacts						
to the Setting of Non-designated Heritage Assets						
Operation						
	Impact 1: Permanent Change to the Setting of Designated Heritage Assets		**Impact 2**: Permanent Change to the Setting of Non-designated Heritage Assets	**Impact 3**: Indirect Physical Impact on Designated Heritage Assets	**Impact 4**: Indirect Physical Impact on Non-designated Heritage Assets	
Impact 1: Permanent Change to the Setting of Designated Heritage Assets	-		No	Yes	No	
Impact 2: Permanent Change to the Setting of Non-designated Heritage Assets	No		-	No	Yes	
Impact 3: Indirect Physical Impact on Designated Heritage Assets	Yes		No	-	No	
Impact 4: Indirect Physical Impact on Non-designated Heritage Assets	No		Yes	No	-	
Decommissioning						
It is anticipated that the decommissioning impacts would be similar in nature to those of construction.						

Table 21-18: Interaction Between Impacts - Phase and Lifetime Assessment

	Highest significance level				
Receptor	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
Designated Heritage Assets	**Minor adverse**	**Minor adverse**	**Minor adverse**	No greater than individually assessed impact. Mitigation (avoidance, micro-siting and route refinement) will minimise or remove the potential for direct physical and indirect physical impacts on designated heritage assets during construction. There would be no direct or indirect physical disturbance during operation. Setting is not relevant to the construction and decommissioning phases. It is therefore considered that there will be no pathway for interaction to exacerbate the potential impacts associated with these activities during or between any of the project phases.	No greater than individually assessed impact. Infrastructure is only installed during construction, therefore there is no greater footprint taken as part of the operational or decommissioning phases. Setting is not relevant to the construction and decommissioning phases. It is therefore considered that over the project lifetime these impacts would not combine to increase the significance level of any impacts identified in this assessment.
Non-designated Heritage Assets	**Minor adverse**	**Minor adverse**	**Minor adverse**	No greater than individually assessed impact. Mitigation will minimise or offset the potential for direct physical and indirect physical impacts on non-designated heritage assets during construction. There would be no direct or indirect physical disturbance during operation. Setting is not relevant to the construction and decommissioning phases. It is therefore considered that there will be no pathway for interaction to exacerbate the potential impacts	No greater than individually assessed impact. Infrastructure is only installed during construction, therefore there is no greater footprint taken as part of the operational or decommissioning phases. Setting is not relevant to the construction and decommissioning phases. It is therefore considered that over the project lifetime these impacts would not combine to increase the significance level of any impacts identified in this assessment.

	Highest significance level				
				associated with these activities during or between any of the project phases.	

21.11 Potential Monitoring Requirements

268. Monitoring requirements for onshore archaeology would be described in the **outline WSI (Onshore)** (document reference 9.21) submitted alongside the DCO application and further developed and agreed with stakeholders prior to construction taking account of the final detailed design of SEP and DEP.

269. Direct (physical) impacts would be offset or reduced through either preservation in situ or archaeological fieldwork and reporting, undertaken by professional archaeologists and monitored by NCC HES and Historic England.

21.12 Assessment Summary

270. This chapter provides a characterisation of the existing environment for onshore archaeology and cultural heritage based on both existing and site-specific survey data, which has established that there would be some minor adverse residual impacts on heritage assets during construction, operation and decommissioning phases of SEP and DEP.

271. A summary of the findings of this chapter for onshore archaeology and cultural heritage is presented in **Table 21-19**.

272. In accordance with the assessment methodology presented in **Section 21.4**, this table should also be used in conjunction with the additional narrative explanations provided in **Section 21.6**.

273. The impact assessment as presented in this chapter assumes that activities associated with construction may theoretically occur anywhere within SEP and DEP DCO application boundary.

274. With respect to direct physical impacts upon designated and non-designated heritage assets, SEP and DEP has sought opportunities to minimise harm to the archaeological and cultural heritage resource (e.g. by means of siting the onshore substation and onshore cable corridor to avoid known heritage assets, where possible within the confines of other environmental and engineering constraints). Following the implementation and completion of the initial informative stages of mitigation work and additional mitigation measures, it is not anticipated that there will be predicted residual impacts on the heritage significance of heritage assets with archaeological interest of greater than a **minor adverse** significance of effect.

275. The predicted residual impacts on the heritage significance of heritage assets as a result of changes to their setting due to the onshore substation and offshore infrastructure will range from no impact to a **minor adverse** significance of effect, which is not significant in EIA terms. It is acknowledged, also, that those heritage assets within closest proximity to the onshore construction works may be subject to short term / temporary impacts, albeit that these are not significant in EIA terms.

276. 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 **outline WSI (Onshore)** (document reference 9.21)).

277. The landscape character elements of the Mannington and Wolterton Conservation Area (**275**), through which the cable corridor 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 the 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 the **outline WSI (Onshore)** (document reference 9.21).

278. 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 SEP and DEP, as well as the mitigation strategies anticipated, outlined and adopted for the existing and future projects reviewed as part of this chapter.

279. 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).

280. 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 (Onshore)** (document reference 9.21).

281. Other potential opportunities for SEP and DEP to deliver broader heritage benefits include the restoration of historic landscape features and field boundaries, and provision of publicly-facing interpretation of key heritage sites and/or public engagement and outreach events.

Table 21-19: Summary of Potential Impacts on Onshore archaeology and Cultural Heritage

Potential impact	Project	Receptor	Importance	Magnitude	Pre-mitigation impact	Mitigation measures proposed	Residual impact	Cumulative Residual Impact
Construction								
Impact 1: Direct Physical Impact on Designated Heritage Assets	SEP DEP SEP & DEP	Known Designated Heritage Assets	Medium	Medium	**Moderate Adverse**	Avoidance, micro-siting and route refinement	Predicted to be **minor adverse**, which is not significant in EIA terms following the application of mitigation (sensitive backfilling and reinstatement)	No Impact
Impact 2: Direct Physical Impact on Non-designated Heritage Assets	SEP DEP SEP & DEP	Known and potential buried archaeological remains and above ground heritage assets	Low - High	Low - High	**Minor - Major Adverse**	Further programmes of survey and evaluation to inform a mitigation strategy for either preservation *in situ*, archaeological excavation or watching brief.	Following the application of appropriate and proportionate evaluation and mitigation approaches, to be agreed in consultation with NCC HES and Historic England, the residual impact is anticipated to be reduced (or offset) to **negligible** to **minor adverse**, which is not significant in EIA terms.	Following the application of appropriate and proportionate evaluation and mitigation approaches, to be agreed in consultation with NCC HES and Historic England, the residual impact is anticipated to be reduced (or offset) to an impact significance level considered non-significant in EIA terms.
Impact 3: Indirect Physical Impact on Designated Heritage Assets	SEP DEP SEP & DEP	Deposits associated with Designated Heritage Assets	Medium - High	Medium	**Minor - Moderate Adverse**	Further programmes of Geoarchaeological/Palaeoenvironmental surveys and mitigation. No mitigation measure proposed for Traffic and Transport, Noise and Vibration.	Following the application of appropriate and proportionate mitigation approaches, to be agreed in consultation with NCC HES and Historic England, the residual impact is anticipated to be reduced (or offset) to **negligible** to **minor adverse**, which is not significant in EIA terms.	No Impact
Impact 4: Indirect Physical Impact on Non-designated Heritage Assets	SEP DEP SEP & DEP	Known palaeoenvironmental and geoarchaeological deposits	Medium	Medium	**Moderate Adverse**	Further programmes of Geoarchaeological/Palaeoenvironmental surveys and mitigation. No mitigation measure proposed for Traffic and Transport, Noise and Vibration.	Following the application of appropriate and proportionate evaluation and mitigation approaches, to be agreed in consultation with NCC HES and Historic England, the residual impact is anticipated to be reduced (or offset) to **minor adverse**, which is not significant in EIA terms.	No Impact
Impact 5: Temporary Change to the Setting of Designated Heritage Assets	SEP DEP SEP & DEP	Known designated heritage assets	Medium - High	Negligible	**Minor Adverse**	None required. Other than due care, attention and diligence to the presence and proximity of the designated heritage assets identified in **Section 21.6.1.4** throughout the duration of construction.	Predicted to be **no impact**, following the application of mitigation.	No Impact

Potential impact	Project	Receptor	Importance	Magnitude	Pre-mitigation impact	Mitigation measures proposed	Residual impact	Cumulative Residual Impact
Impact 6: Temporary Change to the Setting of Non-designated Heritage Assets	SEP	Known non-designated above ground heritage assets and historic landscape character	Low - Medium	Negligible	**Negligible - Minor Adverse**	None required. Other than due care, attention and diligence to the presence and proximity of the non-designated heritage assets identified in **Section 21.6.1.4** throughout the duration of construction..	Predicted to be **no impact**, following the application of mitigation.	No Impact
	DEP							
	SEP & DEP							
Operation								
Impact 1: Permanent Change to the Setting of Designated Heritage Assets	SEP	Known designated heritage assets	Medium - High	Negligible	**Minor Adverse**	The application of sensitive design and landscaping.	Following the application of mitigation, the predicted residual impact is considered to be **negligible** which is not significant in EIA terms.	No Impact
	DEP							
	SEP & DEP							
Impact 2: Permanent Change to the Setting of Non-Designated Heritage Assets	SEP	Non-designated heritage assets including historic landscape character	Low - Medium	Negligible	**Negligible -Minor Adverse**	The application of sensitive design and landscaping.	Predicted to be **no impact**, following the application of mitigation.	No Impact
	DEP							
	SEP & DEP							
Impact 3: Indirect Physical Impact on (permanent change to) Designated Heritage Assets	SEP	Deposits associated with designated heritage assets	Medium - High	N/A	**No Impact**	None required.	**No Impact**	No Impact
	DEP							
	SEP & DEP							
Impact 4: Indirect Physical Impact on (permanent change to) Non-Designated Heritage Assets	SEP	Known and potential buried archaeological remains and above ground heritage assets	Medium	N/A	**No Impact**	None required.	**No Impact**	No Impact
	DEP							
	SEP & DEP							
Decommissioning								
No decision has been made regarding the final decommissioning policy, as it is recognised that industry best practice, rules and legislation change over time. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of SEP and DEP 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. It is anticipated that the decommissioning impacts could be similar in nature to those of construction, depending on the extent and depths to which any further intrusive sub-surface decommissioning groundworks may occur.								

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