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NeuConnect

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NeuConnect: Great Britain to Germany Interconnector

GB Onshore Scheme

Environmental Statement
Main Report

NeuConnect Britain Ltd

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Prepared for:

NeuConnect Britain Ltd
105 Piccadilly
London, W1J 7NJ
United Kingdom

Prepared by:

AECOM Infrastructure & Environment UK Limited
1 Tanfield
Edinburgh EH3 5DA
United Kingdom

T: +44 131 301 8600
aecom.com

Table of Contents

Figures

Tables

Glossary & Abbreviations

Glossary

Term	Meaning
NeuConnect	Also referred to as the Project, which includes all components of the interconnector between the Isle of Grain, UK and Wilhelmshaven, Germany.
GB Onshore Scheme	Includes all components of the interconnector from the connection to the existing overhead line at Perry's Farm, Grain, to Mean Low Water Spring.
the proposed substation	This is the substation that will be built and operated by National Grid Electricity Transmission to connect the interconnector to the National Electricity Transmission System.
the proposed converter station	This is the converter station proposed to be operated by NeuConnect Britain Limited on land at Perry's Farm, Grain.
GB Offshore Scheme	The subsea Direct Current cable, extending between Mean High Water Spring and the point of transition between Dutch and UK waters.
landfall	The area where offshore cables come ashore.
proposed landfall site	Also referred to as the proposed landfall, located to the north/ northwest of the settlement of Grain.
Transition Joint Pit	Buried concrete pad with joint connecting subsea and underground Direct Current cables at the proposed landfall site.
proposed DC cable route	Also referred to as the Direct Current (DC) cable route (from Mean Low Water Spring to the proposed converter station).
proposed DC cable working width	Typically 30 metre wide works corridor in which Direct Current cable installation will occur. This corridor increases in width at the West Lane crossing and at the proposed landfall.
joint bays	Buried concrete pad where adjacent sections of onshore cable are connected.
temporary construction area	Any area to be disturbed during construction. This will include working areas (i.e. Alternating Current and Direct Current cable troughs, converter station and substation footprints) in addition to the working width, temporary access tracks and the temporary construction compound.
temporary construction compound	Compound for site offices, storage, welfare facilities etc.
converter station	Specialist facility to convert electricity Alternating Current to Direct Current or vice versa.
proposed converter station site	The complete converter station site including temporary working areas.
the permanent converter station area	The permanent converter station area (approx. 5 hectares).
proposed permanent access road	The permanent access to the converter station and substation from the B2001/ Grain Road.
proposed substation site	The complete substation site including temporary working areas.
permanent substation area	The permanent substation area (approx. 0.72 hectares).
Rochdale Envelope	The maximum parameters in which the converter station and substation will be designed.
the Applicant	The proponent of the Project, NeuConnect Britain Limited.

Term	Meaning
the Contractor	Party or parties responsible for the detailed design and construction.

Abbreviations

Abbreviation	Definition
AADT	Annual Average Daily Traffic
AC	Alternating Current
AIL	Abnormal Indivisible Loads
AOD	Above Ordnance Datum
BAP	Biodiversity Action Plan
BGS	British Geological Society
BNL	Basic Noise Level
BPM	Best Practicable Means
BS	British Standard
CBS	Cement Bound Sand
CEMP	Construction Environmental Management Plan
CKD	Cement Kiln Dust
CoCP	Code of Construction Practice
CO_2	Carbon Dioxide
COPC	Chemicals of Potential Concern
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
dB	Decibel
DC	Direct Current
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
GB	Great Britain
GI	Ground Investigation
GW	Gigawatt
ha	Hectare
HDD	Horizontal Directional Drilling
HE	Historic England
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HRA	Habitat Regulations Assessment
HVDC	High Voltage Direct Current
JNCC	Joint Nature Conservation Committee

Abbreviation	Definition
km	Kilometre
kV	Kilovolt
LCA	Landscape Character Area
LCT	Landscape Character Type
LGV	Light Goods Vehicle
LNG	Liquefied Natural Gas
LOAEL	Lowest Observable Adverse Effect Level
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
m	Metres
m^2	Square metre
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatt
NCA	National Character Assessment
NE	Natural England
NETS	National Electricity Transmission System
NGET	National Grid Electricity Transmission
NNR	National Nature Reserve
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSR	Noise Sensitive Receptor
Ofgem	Office of Gas and Electricity Markets
OHL	Overhead Line
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbons
PPV	Peak Particle Velocity
PRA	Preliminary Risk Assessment
SAC	Special Areas of Conservation
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
TCC	Temporary Construction Compound
TJP	Transition Joint Pit
TMP	Traffic Management Plan
UAEL	Unacceptable Adverse Effect Level
UK	United Kingdom
UKPN	UK Power Networks
VSC	Voltage Source Converter

1. Introduction

Introduction

1.1 NeuConnect Britain Limited (hereafter also referred to as the 'Applicant') is seeking outline planning permission from Medway Council under the Town and Country Planning Act 1990 for the construction, operation and maintenance of an electricity converter station and underground Direct Current (DC) and Alternating Current (AC) cables as part of the development of an electricity link (interconnector) between Great Britain and Germany. In addition, the Applicant is seeking outline planning permission for a substation and cable sealing end compound which will enable connection of the interconnector to the GB transmission system. The construction and operation of the substation will be the responsibility of National Grid Electricity Transmission (NGET), who is the licensed Transmission Operator.

1.2 This Environmental Statement has been prepared by AECOM Infrastructure & Environment UK Limited (AECOM) on behalf of the Applicant. The Environmental Impact Assessment (EIA) process and production of the Environmental Statement has been coordinated and managed by Tom Cramond, who has over seven years' experience as an environmental consultant. AECOM are members of the Institute of Environmental Assessment and Management (IEMA) EIA Quality Mark as a commitment to excellence in EIA activities.

About NeuConnect

Overview of the Project

1.3 NeuConnect (the 'Project'), is a 1400 megawatt (MW) interconnector between Great Britain and Germany. The Project will create the first direct electricity link between Great Britain and German energy networks; two of the largest electricity markets in Europe. The new link will create a connection for electricity to be transmitted in either direction between Great Britain and Germany. The Project comprises approximately 700 kilometres (km) of subsea and underground High Voltage Direct Current (HDVC) cables, with onshore converter stations linking into the existing electricity grids at Grain in Great Britain and at Wilhelmshaven in Germany. The subsea cables will traverse through British, Dutch and German waters. An overview of the components of the Project is illustrated in Figure 1.1

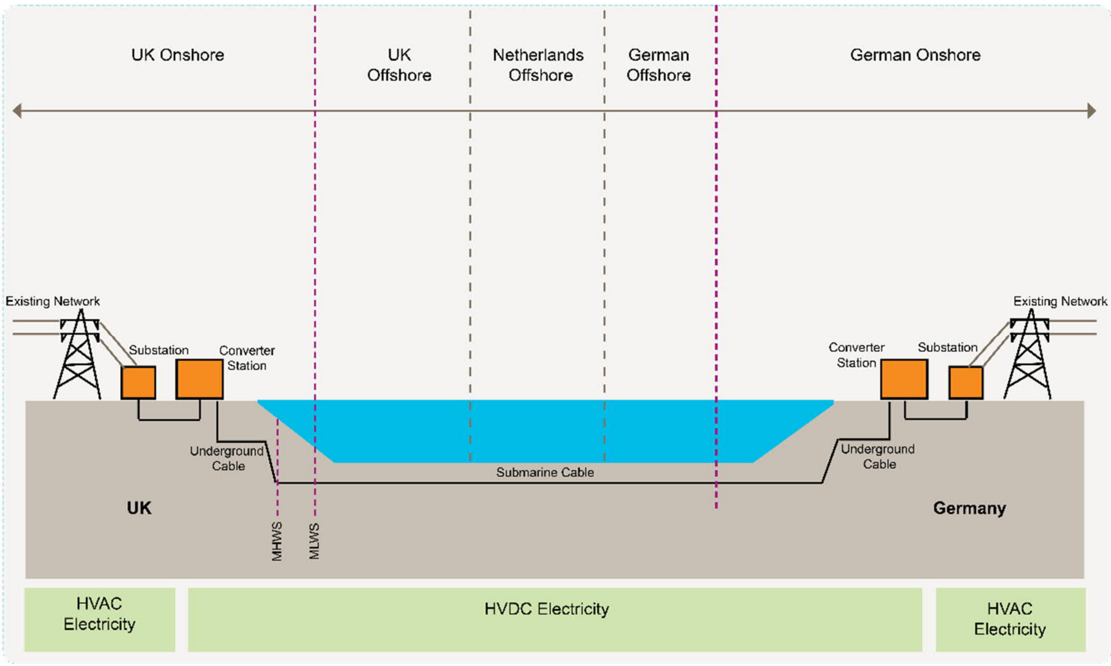

Figure 1-1: Overview of NeuConnect Project

The GB Onshore Scheme

1.4 In Great Britain the onshore components of the Project (the ‘GB Onshore Scheme’) extend as far as Mean Low Water Springs (MLWS). This Environmental Statement assesses the likely significant environmental effects of the GB Onshore Scheme only. A separate Environmental Statement assesses the likely significant environmental effects of the GB Offshore Scheme. Environmental reports will also accompany permit applications within Dutch and German jurisdictions.

1.5 The GB Onshore Scheme will comprise the following main elements extending as far as MLWS:

- Cable sealing end compound within a fenced compound occupying an area of approximately 1,600 square metres (m^2) or 0.16 hectares (ha).
- Substation within a fenced compound occupying an area of approx. 6,400 m^2 or 0.64 ha. The substation will comprise a single building and some outdoor electrical equipment, and an internal road will allow access to equipment within the compound.
- Approximately 50 metre (m) long AC cable route from the substation to the converter station. The AC cable may be either underground or above ground.
- Converter station within a fenced compound occupying an area of approximately 62,500 m^2 or 6.25 ha. The converter station will comprise buildings and some outdoor electrical equipment, as well as internal roads around the buildings/ equipment.
- An approximate 1,550 m long underground DC cable route from the converter station to the landfall point.
- At the point of landfall, there will be a Transition Joint Pit (TJP), where underground and subsea DC cables are joined together (subsea cable are slightly larger than underground cables due to additional protective armouring).
- From the TJP and across the intertidal zone subsea DC cables will be installed in buried ducts for a distance of approximately 1,700 m.
- Access to the GB Onshore Scheme will be taken from the existing junction on the B2001/ Grain Road. The existing junction will be improved and a new approximately 850 m long permanent access road will be constructed. This will provide access to the proposed converter station and substation compounds and the cable sealing end compound.

- On the southern and western boundaries of the GB Onshore Scheme, boundary planting is proposed to better integrate the proposed converter station and substation buildings in to the existing landscape. These boundaries are comprised of native species which will also increase biodiversity and help screen or soften some views of the GB Onshore Scheme from viewpoints in the vicinity.

1.6 To connect the Project to the electricity transmission system there will be modifications required to the existing overhead line (OHL) which runs roughly east to west across the Isle of Grain. These works will be the responsibility of NGET and are not the subject of this application. The works are not yet confirmed and will be subject to detailed design, however they are likely to include:

- A new 50 m tall lattice tower immediately north of the proposed substation;
- Down leads from the new tower to the proposed substation;
- Down leads from the new tower to the proposed cable sealing end compound;
- Approximately 200 m long underground AC cable route between the proposed cable sealing end compound and the proposed substation (together the “Substation to New OHL Tower Connection”); and
- A temporary diversion of the existing OHL may also be required to accommodate the construction of a new tower on the existing route (the “Temporary OHL Diversion”) (together the “OHL Works”).

1.7 These works do not form part of the GB Onshore Scheme, but are subject to cumulative assessment as part of this environmental assessment.

Need for the Project

1.8 Electricity interconnectors play a key role in supporting Great Britain and Europe’s transition away from existing fossil fuel-driven power generation by allowing additional generation capacity to be imported overseas and exported according to supply and demand.

1.9 By connecting two of Europe’s largest energy markets for the first time, the Project will offer a more diverse and sustainable electricity supply, offering much needed resilience, security and flexibility in Great Britain and Germany. Increased competition in Great Britain’s market could also lead to lower costs for consumers and businesses, while in Germany the new link will help reduce ‘bottlenecks’ by opening up an important new market for excess renewable energy to be exported to.

1.10 The development of the Project provides benefits for both Great Britain and Germany helping to meet national and European objectives:

- Affordability: NeuConnect will connect electricity networks in Great Britain and Germany and in turn connect both countries to the wider European electricity market. This should stimulate competition in electricity markets through cross border trade in electricity and shared use of the cheapest or optimal generation sources and help put pressure on wholesale electricity prices in both Britain and Germany. NeuConnect will benefit both countries by increasing the market for electricity generators (i.e. providing access to larger pool of consumers) and by providing consumers with more affordable electricity (i.e. providing access to a larger pool of suppliers).
- Security of supply: Interconnection provides access to a wide range of electricity generation sources. It is a means to import or bring in extra electricity when not enough is being generated to meet demand at that time or when there is a surplus it is a means to export electricity to where demand is greater. This increases energy continuity and security if demand rises or electricity generation falls suddenly in one country. It can also act as an important balancing tool helping to improve the stability of the British and German electricity transmission systems.
- Sustainability: Interconnectors are an important means to help manage the fact that electricity cannot be stored efficiently at a large scale and not all electricity sources can generate consistently and predictably. With the increasing utilisation of renewable energy

such as wind, generation often outweighs demand, and likewise does not always generate regionally when required. Interconnectors are therefore used to provide a means to transfer surplus energy between countries when too much is generated at once to be used domestically. This helps to balance out the intermittency of renewable generation. This should make a significant contribution in the continuing transition to a net zero carbon economy in Great Britain, Germany and Europe by helping with the challenge of integrating low carbon and renewable sources of electricity and retiring fossil fuel and nuclear plants.

1.11 It is noted that within the draft UK National Energy and Climate Plan the UK Government confirmed its commitment to the support and utilisation of interconnectors for their benefit in the "diversification of energy sources" and "increasing the resilience if regional and national energy systems".

The Applicant

1.12 The Project is being developed by NeuConnect Britain Limited (the Applicant). The Applicant is an international consortium comprised of Meridiam Infrastructure SAS, Allianz Capital Partners on behalf of Allianz Group and Kansai Electric Power, with the Project also supported by Greenage Power and Frontier Power. In August 2018 the Applicant was granted a UK Interconnector Licence by regulators the Office of Gas and Electricity Markets (OFGEM).

Consents Required for NeuConnect

1.13 As noted previously, the works required for the GB Onshore Scheme extend from the connection point at the proposed substation to MLWS and therefore are located entirely within Medway Council's administrative area. The Applicant will be seeking planning permission from Medway Council under the Town and Country Planning Act 1990 for the entire GB Onshore Scheme. It is noted that for the subsea DC cable, the Applicant will be seeking a marine licence from the Marine Management Organisation (MMO) to lay the DC cables between Mean High Water Springs (MHWS) and the boundary between Great British and Dutch territorial waters.

Table 1.1: Consents Required for NeuConnect

Scheme	Component	Consent(s) required
GB Onshore Scheme	Converter station, substation (inc. AC cable), cable sealing end compound, and DC cable to MLWS, new permanent access track and landscaping.	Town and Country Planning Act 1990
GB Offshore Scheme	Cables (DC cable MHWS to median line)	Marine and Coastal Access Act 2009 (as amended in 2011)
Netherlands (NL) Offshore Scheme	Cables (DC cable median line to median line)	Water Act
		Nature Conservation Act
Germany (DE) Offshore Scheme	Cables (DC cable from median line to coastal sea)	Federal Mining Law Bundesbergbaugesetz (BBerG)
		State Office for Mining, Energy and Geology (LBEG)
Germany (DE) Onshore Scheme	Cables (DC cable from coastal sea to converter station and	Energy Economy Law Energiewirtschaftsgesetz (EnWG)
		Federal Immission Control Act

Scheme	Component	Consent(s) required
	AC cable to substation) and converter station	Bundesimmissionsschutzgesetz (BImSchG)

Requirement for EIA

Underground AC and DC Cables, Converter Station, Substation and Cable Sealing End Compound

1.14 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (EIA Regulations) apply to applications for planning permission made under the Town and Country Planning Act 1990. It sets out two schedules of development (which are derived from Annex I and II of the amended EU 2011/92/EU (the 'Directive') on the assessment of the effects of certain public and private projects on the environment):

- Schedule 1 Development: EIA is mandatory for developments of a type referred to in Schedule 1. Such developments are considered to be "EIA development".
- Schedule 2 Development: EIA is not mandatory for developments of a type referred to in Schedule 2. Such developments may be "EIA development" only where they are considered likely to have significant effects on the environment by virtue of factors such as their nature, size or location.

1.15 There is no reference to interconnector projects or the components they comprise (e.g. converter stations, underground or submarine cables) in Schedule 1 of the EIA Regulations. Therefore EIA is not mandatory for the GB Onshore Scheme as per the EIA Regulations. Similarly there is no reference to interconnector projects or the components that they comprise (e.g. converter stations, underground or submarine cables) in Schedule 2 of the EIA Regulations.

1.16 A request for an EIA Screening Opinion (MC/18/3363) was submitted to Medway Council on the 20th November 2018 which provided an outline assessment of the likely significant environmental effects of the GB Onshore Scheme, and a proposed scope of assessment. In Medway Council's response dated the 20th December 2018 it was stated that an EIA would be required for any subsequent planning application on account of the proposal to install the DC cable within the ecologically-sensitive intertidal zone. A copy of Medway Council's opinion is contained in Appendix 3.1. Simultaneous scoping of technical assessments was also undertaken during consultation with Medway Council and responsible authorities, summaries of consultation are provided within the specialist technical assessment chapters where relevant.

OHL Works

1.17 To facilitate the connection of the interconnector to the electricity transmission system, modifications to the existing OHL will be required. Whilst the exact modification works are not yet confirmed and will be subject to detailed design, they are likely to include:

- A new 50 m tall lattice tower immediately north of the proposed substation;
- Down leads from the new tower to the proposed substation;
- Down leads from the new tower to the proposed cable sealing end compound;
- Approximately 200 m long underground AC cable route between the proposed cable sealing end compound and the proposed substation (together the Substation to New OHL Tower Connection Works); and
- A temporary diversion of the existing OHL may also be required to accommodate the construction of a new tower on the existing route (the Temporary OHL Diversion) (together the OHL Works).

1.18 These works do not form part of the GB Onshore Scheme but are subject to cumulative assessment as part of this environmental assessment.

The Environmental Statement

Scope of the Environmental Impact Assessment

1.19 As part of the screening opinion request and subsequent discussions with Medway Council, the proposed scope of the EIA was discussed. The specialist's assessments included within the EIA are those relevant to the existing environment, sensitive receptors within the vicinity of the GB Onshore Scheme and the potential for the GB Onshore Scheme to result in likely significant environmental effects.

1.20 A detailed assessment of potential impacts to air quality have been scoped out of the EIA from the Scoping process, on account of the negligible emissions from the GB Onshore Scheme during operation. Other assessments that are not directly covered in individual assessments include human health and climate change, as the pertinent aspects of these assessments are covered elsewhere in the EIA.

1.21 Potential impacts to human health as a result of the GB Onshore Scheme are considered to be assessed in the noise assessment (Chapter 7), and the generation of electric and magnetic fields (EMF) from the Project are outlined in Chapter 3. Potential impacts to the GB Onshore Scheme from the effects of climate change, and the GB Onshore Scheme's potential to contribute to factors causing climate change are determined to be highly limited. The control and management of increased runoff and higher intensity runoff from greater precipitation, as well as the GB Onshore Scheme's potential contribution to extending existing areas of potential flood risk are all assessed in the flood risk assessment.

This Environmental Statement

1.22 The structure of the ES is set out below in Table 1.2. It comprises four volumes:

- Volume 1 - Non-Technical Summary. This is intended to be readily accessible to the general public. It is concise and written in non-technical language providing a description of NeuConnect, in particular the GB Onshore Scheme and a summary of the assessment of likely significant environmental effects and proposed mitigation measures.
- Volume 2 - Main Report. This comprises the main text including a description of the Scheme (including the alternatives considered), the baseline conditions, an assessment of the likely significant environmental effects resulting from the GB Onshore Scheme, and proposed measures to mitigate those effects.
- Volume 3 - Figures. This comprises supporting figures, plans and other illustrations or visualisations which are cross referenced throughout Volume 2.
- Volume 4 - Technical Appendices. This comprises the supporting technical information such as baseline surveys which are cross referenced throughout Volume 2.

Table 1.2: Environmental Statement Structure

Volume	Chapter No.	Chapter Title
Volume 1.	**Non Technical Summary**	
Volume 2.	**Main Report**	
	01	Introduction
	02	Alternatives and Design Evolution
	03	Proposed GB Onshore Scheme
	04	Approach to Assessment
	05	Landscape & Visual Amenity

Volume	Chapter No.	Chapter Title
	06	Ecology & Nature Conservation
	07	Noise & Vibration
	08	Archaeology & Cultural Heritage
	09	Water Resources & Flood Risk
	10	Transport & Access
	11	Ground Conditions
	12	Cumulative Assessment
	13	Schedule of Mitigation
Volume 3.	**Figures**	
Volume 4.	**Technical Appendices**	

Other Supporting Documents

1.23 Further to the ES, other documents have been prepared and submitted to Medway Council in respect of the Applicant's planning application including:

- Planning application drawings
- Planning Statement
- Design and Access Statement
- Habitat Regulation Assessment Report

Availability of the Environmental Statement

1.24 Hard copies of the ES are available to the public for viewing in the offices of Medway Council. Copies of the ES can also be downloaded from the project website: https://neuconnect.eu/

1.25 Further information about the Project can be requested by email (neuconnect@communityfeedback.co.uk) or by telephone (0800 298 7040).

2. Alternatives and Design Evolution

Introduction

2.1 This chapter describes the evolution of the Great Britain (GB) Onshore Scheme design, including the selection of the proposed technology, alternatives that have been considered and rationale for selection of the proposed site. Details of subsea cable route selection within British, Dutch and German waters as well as the identification of the onshore components in Germany are described within the reports which accompany consent applications in those jurisdictions.

Strategic Alternatives

The Do-Nothing Scenario

2.2 The 'do nothing' option considers a scenario in which NeuConnect is not developed. There would be no interconnection between the British and German electricity transmission systems and therefore no export and / or import of electricity between the two countries. In this scenario the contribution that NeuConnect makes to the European Union's (EU) interconnection targets of 10% by 2020 and 15% by 2030 as set out in the 2030 climate and energy framework would not be realised. Further to this the wider benefits of increased interconnection as means for addressing energy security, sustainability and affordability would also not be realised.

The Do-Something Scenario

2.3 A range of specialist studies have been undertaken by NeuConnect Britain Limited which confirm the feasibility of the 'do something' option. Following this consideration has been given to the identification of the Project and alternatives including:

- Selection of the most appropriate electricity transmission technology,
- Identification of connection points to British and German electricity transmission systems,
- Selection of the proposed converter station sites in Britain and Germany,
- Selection of the proposed underground cable routes in Britain and Germany, and
- Selection of the proposed subsea cable route through British, Dutch and German waters.

2.4 The following sections of this chapter describe the selection of the proposed electricity transmission technology and selection of the proposed converter station site and underground cable route in GB. As noted above information on alternatives in relation to other jurisdictions is set out in the relevant consent applications.

Selection of the Proposed Technology

Transmission Technology

2.5 In order to connect the British and German electricity transmission systems, a subsea cable approximately 700 km long is required. It is more efficient to use High Voltage Direct Current (HVDC) technology to transmit electricity between the two countries, rather than High Voltage Alternating Current (HVAC) due to the physical distance involved.

2.6 At longer distances HVDC technology is more efficient as it can transmit larger volumes of electricity with less losses than an equivalent HVAC system. In addition to this, the existing electricity transmission systems in both countries are not synchronised. This means that they operate at different frequencies which would prevent direct HVAC interconnection.

2.7 HVDC systems also only require two cables whereas equivalent HVAC systems need multiples of three cables (i.e. one cable per phase) to accommodate the volume of electricity being transmitted. The physical footprint of a HVDC system in the is therefore smaller than an equivalent HVAC system.

2.8 Further for high voltage AC submarine cables exceeding 70 km in length, the associated reactive power created would reduce the capability of the system to transmit power efficiently. This can be overcome in the terrestrial environment by the use of intermediate shunt compensation reactors (SCRs), however, it would be impractical to install and operate these in the marine environment. Consequently, the Applicant considers that HVDC technology is the most efficient choice for the Project.

HVDC Conversion Technology

2.9 As the existing high voltage electricity networks in Great Britain and Germany predominantly use HVAC technology, converter stations are required at each 'end' of the interconnector in order to convert electricity from HVDC into HVAC or HVAC into HVDC. There are two conversion technologies currently available that could meet the requirements of NeuConnect. These are self-commutated voltage source conversion (VSC) and line-commutated current source conversion (CSC) technologies.

2.10 The Applicant has selected VSC technology for the Project. The main benefits of this technology are its ability to control reactive and active power independently of each other, and as a result keep both the voltage and frequency stable. In addition, VSC technology would allow for a more compact converter station design and layout thereby reducing the operational land take required compared to a converter station using CSC technology.

Selection of the Connection Point

2.11 The selection of a connection point, the point on the electricity transmission system in Great Britain where the Project is connected (e.g. where electricity is either imported to or exported from), was a key early consideration. The selection of the connection point was undertaken by the Applicant in conjunction with the National Grid Electricity System Operator (ESO) and National Grid Electricity Transmission (NGET) as part of the ESO's Connection Infrastructure Options Note (CION) process. The Applicant, the ESO and NGET have a number of statutory obligations under the terms of their interconnector and electricity transmission licences respectively. This means that the parties must balance technical, economic and environmental considerations in identifying the most appropriate connection point. This section provides a high-level summary of how the proposed connection point was identified.

2.12 The feasibility of connecting to the existing Grain 400 kV Substation was considered. NGET identified that this would trigger a six-bay extension of the existing substation requiring additional land as well as a diversion of the existing Medway Power Station overhead line. It was also noted that connection of further interconnectors to Grain Substation could impact the operation of the network. On that basis it was concluded that the use of the existing Grain Substation was neither economic nor efficient.

2.13 Whilst the existing Grain Substation was not considered feasible, the electricity transmission network at Grain has sufficient capacity to accommodate the import or export of power via the Project. NGET and the ESO therefore considered the development of a new 400 kV substation on the Isle of Grain which would enable connection to the existing electricity network. By co-locating the substation and the converter station it would provide a more economic and efficient solution by:

- Reducing the length of underground cable or overhead line which could be required to connect the converter station and the substation, and
- Minimising the footprint of the converter station as far as possible; at greater distances from the connection point additional specialist equipment would be required to make up for power losses.

2.14 On that basis, the development of a new substation was identified as the most feasible solution.

Approach to Site Selection and Design

Site Selection

2.15 Selection of a site requires consideration of a number of environmental, technical and economic factors and attempting to balance these. The Applicant's objective in identifying the proposed site has been to select a site which best balances these; that is one which is technically feasible, economically efficient and reduces environmental impacts as far as possible. Key factors which have influenced site selection include:

- Land availability: the availability of land to accommodate the footprint of the development.
- Electricity network: the proximity of the site to the existing electricity transmission system.
- Accessibility: the proximity of the site to the road network.
- Existing land use: the current use of the site and adjacent areas.
- Settlement: the proximity of the site to residents and potential for noise and visual effects.
- Landscape character: the character of Grain and ability to accommodate the development.
- Ecological impact: the proximity to ecological sites and potential to affect these.
- Archaeological impact: the proximity to archaeological sites and potential to affect these.
- Ground conditions: the underlying ground and risk of encountering contamination.
- Flood risk: the location of the site with respect to areas of known flood risk.
- Underground and subsea cable routes: the feasibility of routes to or from the site.
- Planning policy: the presence of any relevant planning policy allocations.

2.16 For the purposes of site selection there are a number of constraints or features (see Figure 2.1) that help to establish the extent of a search area in which to consider potential site options. In particular, this includes:

- Thames Estuary and Marshes and Medway Estuary and Marshes Special Protection Areas (SPAs): These sites occupy significant sections of the coastline of Isle of Grain but also extend across the peninsula. The parts of the SPAs which extend across the peninsula define the western extent of the search area for potential sites. It was concluded that sites should not be located within the SPAs in order to prevent permanent habitat loss but noted that underground cable routes would require to cross them resulting in some temporary impacts.
- The existing 400 kV overhead line (OHL): This crosses the Isle of Grain in a broadly east-west direction. Land to the north mainly comprises undeveloped coastal land as well as settlement such as Grain Village and individual properties. As a result it was concluded that land to the north of the OHL was not suitable for potential sites. Land to the south of the overhead line mainly comprises large scale industrial development such as Grain Liquified Natural Gas (LNG) Terminal or brownfield land such as the former Grain Power Station site. This does provide opportunities for siting the development and in general terms is likely to be less environmentally impacting.
- The River Medway: this forms the boundary eastern and southern extent of the Isle of Grain. The River Medway is a key shipping channel for vessels accessing the Grain LNG Terminal as well as London Thamesport Container Facilities. The volume of shipping traffic transiting the River Medway adjacent to the Isle of Grain, as well as existing and planned cables in this area are key considerations in the routeing of subsea HVDC cables. This exerts an influence on site selection as it is preferable to minimise the distance between where the subsea cable route reaches land and where the development is sited.

2.17 The potential for a site within or adjacent to the former Grain Power Station site was considered but discounted due to a combination of onshore and offshore issues. Whilst it would benefit from being within an area characterised by industrial development and which is well served by the existing road network, it is constrained by the feasibility of HVDC and HVAC routes to and from the site. The HVDC route would be required to enter the River Medway in order to make landfall on the east side of the Isle of Grain. As noted above the River Medway is a key navigation channel. In combination with the potential impact on shipping the proximity to a number of other existing and planned subsea cables a landfall on the eastern side of the peninsula was discounted.

2.18 Based on an initial review of the environmental and planning related constraints it is recommended that the converter station and substation are located to the west of the Project Area as illustrated on Figure 2.2. In this area they would be outside of the land which has been used for landfill reducing the risk of encountering contaminated land and it also maximises the distance from Grain. Land to the east could be used to extend existing woodland planting on the western boundary of Grain and provide further screening of the converter station and substation. Dependent on technical requirements it would be preferable to locate both the converter station and substation to the south of the OHL as this defines a boundary for the extent of industrial development.

Site Design

2.19 The layout of the GB Onshore Scheme within the Project Area has been developed as part of an iterative process with the EIA, specifically in regards to the potential adverse impacts on landscape and visual amenity and noise.

2.20 The proposed converter station and substation have been collocated south of the existing OHL, to best ‘fit’ the GB Onshore Scheme within the existing land use, with the heavy industry located to the south. This also presents benefits technically, and limits the potential extent of impacts by reducing the need for further disturbance from longer AC cable connections between the proposed converter station and the substation.

2.21 The existing landform in this location slopes towards the northwest, and the development of a level platform for the proposed converter station will allow for the built form to be ‘sunk’ in to the existing landscape, and the development of the landscape mitigation further phases the proposed converter station in to the landscape whilst screening potential views from the east.

2.22 The permanent access track will include a new junction to the B2001/ Grain Road at the south-eastern corner of the Project Area. This location was selected to avoid the need for the majority of the construction vehicles to pass residences on the B2001 on the edge of Grain village. This will also prevent any additional vehicles required for operations and maintenance of the proposed converter station and substation needing to enter Grain. The point of access is also on the outside of a bend in the existing network allowing for clear line of sight in both directions for vehicles exiting the Project Area.

2.23 Further information on the design of the site layout is contained in the Design and Access Statement which accompanies the planning application.

Underground Cable Route Selection

2.24 With regard to the DC underground cable route the majority of constraints are north of West Lane and include residential properties to the east and west, historic landfills (extent of contamination) and the ecological designations in the intertidal area. It is preferable for the route to broadly follow the unnamed track from West Lane to the coast. This provides a separation distance from Rose Court Farm and keeps the route to the west of Grain using existing woodland/ scrub as a screen. A number of alternative routes were considered in the identification of the preferred route, as illustrated in Figure 2.3. these predominantly varied between West Lane and the proposed converter station.

2.25 In order to avoid the capped landfill to the northeast of the proposed converter station site, the preferred DC cable route crosses West Lane at the existing culvert and then follows the existing hardstanding track on the eastern boundary of the capped landfill site. The use of the existing culvert will also minimise the disruption to West Lane during installation.

2.26 The precise route is subject to detailed design and should be informed by Ground Investigation (GI) in order to ensure care is taken to avoid/ minimise contact with areas of contamination associated with the historic landfills. In the intertidal area it is not possible to avoid the designated sites, however, these are designated for their bird interests (breeding and wintering) and not habitat features.

Conclusion

2.27 The Applicant has given consideration to a range of alternatives in identifying the proposed site of the GB Onshore Scheme. This has included consideration of a range of technical, economic and environmental factors in line with their interconnector licence. As a result of this analysis it was concluded that the development of a converter station and substation on land to the south west of Grain Village (see Figure 2.2) adjacent to the existing 400 kV OHL best balances the Applicant's obligations under the terms of their interconnector licence whilst also taking account of the ESO's and NGET's obligations under the terms of their electricity transmission licence. That is, the proposed site is technically feasible, economically efficient and prevents or reduces adverse environmental effects as far as possible.

3. Project Description

Introduction

3.1 This chapter describes the GB Onshore Scheme comprising all elements above Mean Low Water Springs (MLWS). This includes a proposed substation and cable sealing end compound to connect to the existing electricity network, a proposed converter station including the proposed Direct Current (DC) cable route, which runs from the converter station to the landfall point, and through the intertidal area to MLWS (overlapping with the subsea DC cable between Mean High Water Springs (MHWS) and MLWS), and a new access track from the B2001/ Grain Road to access both the converter station and substation.

3.2 This chapter provides details of:

- Construction: Provides details of the construction of the proposed converter station and substation including an indicative construction programme, description of the main construction works and indicative details of the site office, storage and laydown areas.
- Operation: Describes the main components of the proposed converter station and substation including information about its design and appearance, operation and maintenance as well as details of the permanent site access arrangements.
- Decommissioning: provides details of the likely activities which would be undertaken at the end of NeuConnect's (the Project's) operational life should the Applicant decommission the GB Onshore Scheme.

The GB Onshore Scheme

General Overview

3.3 The GB Onshore Scheme will be entirely within the Project Area (the application boundary, as illustrated on Figure 3.1) which will be under the ownership or control of the Applicant prior to the commencement of construction.

3.4 The GB Onshore Scheme will comprise the following main elements extending as far as MLWS:

- Cable sealing end compound within a fenced compound occupying an area of approximately 1,600 square metres (m^2) or 0.16 hectares (ha).
- Substation within a fenced compound occupying an area of approx. 6,400 m^2 or 0.64 ha. The substation will comprise a single building and some outdoor electrical equipment, and an internal road will allow access to equipment within the compound.
- Approximately 50 metre (m) long AC cable route from the substation to the converter station. The AC cable may be either underground or above ground.
- Converter station within a fenced compound occupying an area of approximately 62,500 m^2 or 6.25 ha. The converter station will comprise buildings and some outdoor electrical equipment, as well as internal roads around the buildings/ equipment.
- Access to the GB Onshore Scheme will be taken from the existing junction on the B2001/ Grain Road. The existing junction will be improved and a new approximately 850 m long permanent access road will be constructed. This provide access to the proposed converter station and substation compounds and to the cable sealing end compound.
- An approximate 1,550 m long underground DC cable route from the converter station to the landfall point.
- At the point of landfall, there will be a Transition Joint Pit (TJP), where underground and subsea DC cables are joined together (subsea cable are slightly larger than underground cables due to additional protective armouring).

- From the TJP and across the intertidal zone subsea DC cables will be installed in buried ducts for a distance of approximately 1,700 m.

Site Description

3.5 The study area is entirely within the boundary of Medway Council and is centred on the Isle of Grain located at the tip of the Hoo Peninsula between the Thames Estuary to the north and the Medway Estuary to the south. The study area is located to the west of the settlement of Grain, as illustrated on Figure 3.1. Land use comprises a mix of industrial development to the south, the small settlement of Grain to the southeast and undeveloped land, much of which is designated for ecological interests, to the north (along the coastline) and to the west. There are also some small areas of brownfield or derelict land and some small areas of agricultural land (some of these coincide with brownfield land). The existing 400 kilovolt (kV) overhead line (OHL) which is broadly routed east to west generally marks the boundary between the extent of industrial or brownfield land and settlement or undeveloped coastal land. The only road access to the peninsula is from the B2001/ Grain Road.

3.6 The GB Onshore Scheme, as shown on Figure 3.2, is located on the fringes of industrial land (this is based on the existing 400 kV OHL defining the extent of industrial land) and extends north/ northeast to the coast. Land within the Project Area and in the immediate vicinity is either in agricultural use or is brownfield land which has no current discernible use. The Project Area is located approximately 0.5 km to the west of Grain, the main settlement, however, there are individual unnamed properties in the centre of and to the west (Rose Court Farm) of the Project Area. An existing access track is located within Project Area between Grain Road and centre of the Project Area (west of the proposed substation). West Lane also crosses the proposed DC cable route in a broadly east-west direction which is a private road to properties to the west of the Project Area and is also part of Natural England's proposed England Coast Path: Grain to Woolwich.

3.7 Land within the Project Area and in the immediate vicinity has historically been used for the extraction of gravel and sand and the resultant voids used for landfill. Historic landfills have been capped however an existing permitted leachate monitoring system still operates from the historic landfill (to the east of Perry's Farm) to the pond (to the northeast of Rose Court Farm).

Consents Required

3.8 Outline planning permission is being sought from Medway Council under the Town and Country Planning Act 1990 (TCPA) for the following components:

- The proposed cable sealing end compound,
- Proposed AC cables,
- Proposed substation,
- Proposed converter station,
- Proposed underground DC cables, and
- Proposed new permanent access track.

3.9 The detailed design of the GB Onshore Scheme is subject to the Applicant's selection of a Contractor, following a competitive tender process. The outline design as described within this Chapter has been developed for the purposes of seeking outline planning permission. This outline design establishes the maximum parameters and principals of the GB Onshore Scheme within which the Contractor's detailed design will be developed and constructed. It is therefore intended that details on the layout and appearance of the GB Onshore Scheme will be agreed with Medway Council post-application as part of reserved matters application.

3.10 The proposed modifications to the existing overhead line, the down leads from the tower to the proposed substation and cable sealing end compound, and the proposed underground cables between the proposed cable sealing end compound and the proposed substation will be undertaken by National Grid Electricity Transmission (NGET, hereafter referred to as 'National Grid'). It is hoped that these works are to be undertaken under National Grid's permitted development rights under Class B(a) or Part 15 of Schedule 2 of The Town and Country Planning (General Permitted Development) (England) Order 2019 (the 'GPDO'). However if subject to detailed design, consent is required for the OHL works under Section 37 of the Electricity Act 1989 such permitted development rights may not be relevant.

The Proposed Converter Station and Substation

General Overview

3.11 The application boundary, or Project Area, is illustrated on Figure 3.1. The Project Area includes all land necessary to accommodate all of the proposed components of the GB Onshore Scheme as well as the land required to facilitate construction, and the proposed mitigation and landscaping. The Project Area covers an area of approximately 68 ha.

3.12 From the point of connection to the NETS via the existing OHL, is the proposed substation located adjacent to the previous landfill site (to the east) and south of the existing OHL. The proposed substation compound will occupy an area of approximately 0.64 ha. The proposed substation will connect directly to the proposed converter station via up to six proposed AC cables across the boundary between the two components. To the north of the proposed substation will be a cable sealing end compound, which will facilitate the connection of one of two circuits from the existing OHL to the proposed substation.

3.13 The proposed converter station will convert electricity from DC to AC (or vice versa depending on the direction of operation of the interconnector) and will therefore be connected to both the AC and DC cables. Immediately adjacent to the proposed converter station and substation platforms are two construction laydown areas which will be utilised by the Contractor on site for offices, welfare facilities, and material and plant storage.

3.14 Along the southern boundary of the Project Area is the proposed access track, which will allow access to the proposed converter station, proposed substation and proposed cable sealing end compound. The existing junction to the B2001/ Grain Road will be widened and improved to allow safe access to and from the Project Area.

3.15 To the north of the proposed cable sealing end compound, is the proposed attenuation basin which is incorporated within the wider landscaping plan of the Project Area. The attenuation basin will provide storage of surface water from the new platforms of the converter station and substation which require the reprofiling of the area to accommodate the GB Onshore Scheme. The attenuation basin is connected to the drainage of the platforms via a swale that extends down the western side of the Project Area. The swale also offers a boundary between the infrastructure of the GB Onshore Scheme and the landscaping to the west and south of the Project Area. The landscaping has been designed to help phase the perceived scale of the proposed converter station and substation buildings and also soften the boundary between the open marshes and the GB Onshore Scheme, whilst also providing greater biodiversity to the area from the inclusion of a variety of native plant species.

Proposed Converter Station - Outline Design

3.16 Converter stations are key parts of DC electricity systems. They convert electricity from AC to DC, or vice versa, depending on the direction of operation of the interconnector.

3.17 The footprint of the proposed converter station at Grain is expected to be up to approximately 250 m by 250 m (to the perimeter security fence). This area will comprise specialist electrical equipment, most of which will be located indoors in one or two building units in order to provide protection from the increased levels of salinity of the air. The building units will range in height according to the electrical equipment they contain including required safety clearances up to a maximum building height of up to 26 m. There will be a 2 m exclusion zone around the perimeter fencing.

3.18 The building units which make up the proposed converter station will be constructed to a similar specification to one another. Whilst their exact appearance is subject to detailed design the cladding of the building units will utilise similar colours and materials to those used on developments in the immediate vicinity as this will help to effectively integrate the converter station with its surroundings.

A description of the main components of the proposed converter station is provided in Table 3.1.

Table 3.1: Proposed Converter Station – Key Components

Component	Description
Converter station	The converter station will include specialist electrical equipment to convert DC electricity to AC electricity, and vice versa. The converter station will be located on a hardstanding platform measuring 250 m by 250 m.
DC switch hall	This contains the termination of the DC onshore underground cables together with HVDC switchgear (specialist DC electrical equipment) to connect these to the power electronics. This equipment will be enclosed in a building up to 26 m high.
Valve halls and AC ancillary equipment	This contains high voltage power electronics equipment that converts electricity from DC to AC and vice-versa. This is located indoors in buildings up to 26 m high. It also contains specialist equipment to control the environmental conditions within the building.
Control building	This contains control panels and associated operator stations for operating the converter station as well as protection and communication equipment. Offices, welfare facilities and other auxiliary systems are also located within the control building. Indicative dimensions – 40 m wide; 60 m long; 16 m high.
Cooling fans	This comprises external fan units located outside of the Valve Halls. The fans are used to cool down the valves. Power electronic valves may be cooled by water or glycol. Coolant is pumped through the fan units.
Transformers	These are normally located outdoors and change the AC voltage electricity between the voltage needed for transmission via the AC transmission system (the NETS) and the voltage needed to connect to the power electronic equipment for conversion from AC to DC within the Valve Halls. The transformers are separated by valve halls. The transformers will be approximately 16 m in height.
AC switchyard	This connects the proposed converter station to the NETS. It includes a range of electrical equipment which is likely to be located indoors including harmonic filtration and reactive power compensation equipment, circuit breakers, transformers, busbars, insulators and subject to detailed design shunt reactors. This building will be a maximum height of 26 m.
Diesel backup Generator	This would be used in the event of a failure of the low voltage electricity supply provided by the Distribution Network Operator (DNO).
Spare parts building	This building will house spare parts and components. Adjacent hardstanding areas provide storage for a spare transformer and spare cable drums. Indicative dimensions: 15 m wide; 40 m long; 14 m high.
Substation	The substation will include specialist electrical equipment that facilitates the transformation of electricity voltages, from high voltages (from the interconnector) to lower voltages as used on the electricity transmission network. This transformation can also work in the opposite direction as needed. The substation will be located on a hardstanding platform measuring 80 m by 80 m.
GIS Building	The gas insulated substation (GIS) building will be up to 14 m tall.

Component	Description
Gantry	A gantry will be required to facilitate the connection of the downleads between the new lattice tower and the substation and maintain safety separation distances. The gantry will be a simple structure which will be up to 14 m tall.

3.19 The layout of the buildings is subject to detailed design, however an indicative layout of a typical converter station is illustrated in Figure 3.3.

Proposed Gas Insulated Substation and Cable Sealing End Compound - Outline Design

3.20 Substations contain equipment which is necessary to connect high voltage transmission systems to electricity distribution systems which then distribute electricity across the network in typically lower voltages. This system can also be operated in reverse, to increase the voltage from domestic supply networks to a voltage more readily used by long distance, high voltage, links.

3.21 The footprint of the proposed substation is expected to be approximately 80 m by 80 m (to the perimeter security fence, and the boundary of the proposed converter station), as illustrated on Figure 3.2. The substation will comprise specialist electrical equipment which will be located within a single building unit. To accommodate the equipment and required safety clearances the building will have a maximum height of approximately 14 m. The electrical equipment will likely be enclosed for protection against corrosion from salinity in the air. The area will be surrounded by palisade security fencing.

3.22 As per the proposed converter station, the design and layout of the substation is subject to further design but will be done so in that the appearance will be in keeping with the existing industrial units in the area. The exact location of the substation within the identified substation platform (as per Figure 3.2) is subject to further design by National Grid who will operate the substation and will be agreed with Medway Council post application.

3.23 The substation will be connected to the existing OHL via a new tower immediately north of the proposed substation in the centre of the Project Area, and also via the proposed cable sealing end compound. A temporary diversion of the existing OHL may be required to facilitate the connection, and/ or modifications to the existing tower structure. The requirements for modification and/ or a temporary diversion is subject to further investigation by National Grid.

3.24 The proposed cable sealing end compound footprint will be approximately 40 m by 40 m and will also be enclosed within a security fence. The cable sealing end compound will include an approximately 14 m high gantry which will facilitate the safety separation for the electrical connection from the new tower. The downleads from the tower will connect onto the gantry and then the downdroppers will be connected to cable sealing ends within the compound. From here the AC cables will be undergrounded to connect to the proposed substation. As noted in Chapter 1 the cabling works from the new tower will be consented by NGET.

Design Mitigation Measures

3.25 The location of the proposed converter station and substation has been chosen so that they are located as far as reasonably practicable from surrounding residents and the settlement of Grain. This location also allowed the point of access for the site to be located prior to any residential properties in Grain limiting disruption from construction traffic.

3.26 The technology selection for both the proposed converter station, voltage source conversion (VSC), and the proposed substation, gas insulated substation (GIS), has allowed for a minimal footprint compared to the alternative options available (current source conversion (CSC) and air insulated substation (AIS), respectively).

3.27 The orientation of the site has been determined from review of the potential impact to surrounding residents from noise and visual amenity.

3.28 The design of the GB Onshore Scheme has been developed in parallel with the EIA providing opportunities to embed mitigation measures within the design. Mitigation measures have been incorporated into the design of the proposed converter station and substation and therefore form part of the planning application. These measures include:

- Landscape planting;
- Noise mitigation;
- A drainage strategy;
- Pollution prevention measures; and
- Ecological mitigation and enhancement.

3.29 The landscaping strategy included within the design is outlined in Figure 3.4.

3.30 Due consideration has been given to electric and magnetic fields (EMFs) produced by the proposed converter station and onshore high voltage DC. It is acknowledged that all equipment that generates, distributes or uses electricity produces EMFs. There is some scientific evidence of possible effects at lower levels, and the electricity industry takes this evidence seriously and recognises that it can generate public concern however the evidence has been extensively reviewed, and the UK Government have not considered it appropriate to implement any restrictions or guidelines on the basis of this evidence.

3.31 The GB Onshore Scheme uses both AC and DC technology, and will produce both static (DC) and alternating (AC) electric and magnetic fields will be produced. The GB Onshore Scheme will therefore be designed to ensure that it is compliant with International Commission on Non-Ionising Radiation Protection (ICNIRP) public exposure guidelines for EMFs outside the boundary fence, to avoid all established effects on the human population.

Construction of the Proposed Converter Station & Substation

Overview

3.32 Subject to outline planning permission being granted it is anticipated that construction will start in early 2021 and will take approximately three years to complete. An additional area, beyond the required area to accommodate the permanent footprint of the GB Onshore Scheme, of approximately 1.5 ha will be required for the converter station construction compound, laydown and storage areas, and 0.64 ha will be required for the substation construction compound and laydown area.

Construction Programme

3.33 Construction of the proposed converter station and substation is planned to begin in 2021 and is anticipated to last approximately three years. Construction of the proposed substation will take approximately one year, and will likely be programmed to be completed at the same time as the proposed converter station.

3.34 Construction works across this period will include following activities:

- Preparatory works including access road construction and site establishment;
- Civil construction works including earthworks, foundations and erection of buildings;
- Mechanical and electrical works including installation of AC and DC cables;
- Testing, commissioning and site reinstatement including landscape planting.

Construction Activities

3.35 Construction of the proposed converter station and proposed substation will be undertaken by the appointed Contractors. As the converter station and the substation will be owned and operated by different organisations (the Applicant, and NGET respectively), separate Contractors will be appointed for each.

3.36 Construction of the proposed converter station and the proposed substation will largely comprise similar outline activities as set out below:

- Preliminary works: This will include further site investigation and preconstruction surveys required to be undertaken in advance of construction. This will also include utilities diversions as necessary.
- Site establishment: This includes vegetation clearance, soil removal and establishment of all temporary facilities including site offices, lay down and storage areas and welfare facilities, development of electricity and water supplies, erection of security fencing or hoarding and implementation of external lighting for security.
- Earthworks: This will include land re-profiling in order to establish the level platforms on which the proposed converter station and proposed substation will be constructed.
- Civil engineering works: This will include construction of building foundations, development of the platforms' permanent drainage system and construction of internal roads and car parking arrangements.
- Building works: This will include the construction of building units including erection of steel frames and cladding.
- Cable installation: This will include the installation of the proposed DC cables entering the proposed converter station as well as proposed AC cables between the proposed converter station and the proposed substation.
- Provision/ installation of permanent services: This will include water supplies, foul drainage, low voltage electricity supply and telecommunications.
- Mechanical and electrical works: This will include installation of high voltage AC and DC electrical equipment and transformers within the proposed converter station.
- Commissioning: Following completion of all construction works there will be a period of commissioning and testing.
- Site Reinstatement & Landscape Works: This will include removal of site offices and temporary facilities, land reinstatement and landscape works

Construction Site Layout

3.37 The exact layout of the site will depend on the Contractors appointed to design and construct the proposed converter station and proposed substation.

3.38 There will be temporary construction areas; 1.5 ha for the converter laydown and 0.64 ha for the substation laydown. These temporary construction compounds will accommodate temporary construction facilities and include provision for:

- Site offices including offices and meeting rooms;
- Staff welfare facilities including portable chemical toilets, kitchen and mess room;
- Storage areas for construction vehicles, plant, equipment and other materials;
- Appropriately bunded areas to be used for the storage of oils and other fuels;
- Wheel washing to be used by construction vehicles and plant;
- Segregated waste management and storage areas;
- Car parking for construction staff and site visitors; and
- Rock crushing and concrete batching facilities.

Access Arrangements

3.39 The A228/ B2001 Grain Road is the only road access to the Isle of Grain. Access to the proposed converter station will be via the B2001 Grain Road from the development of a new access point and internal road, this will be the primary point of access during construction and operation of the GB Onshore Scheme. Temporary access for construction of the proposed DC cable route will also be taken from Grain Road from the Perry's Farm access track, as well as from West Lane further to the north which provides access to Rose Court Farm and Peat Way which may also be used for temporary and/ or permanent access.

Hours of Working

3.40 For the purposes of EIA it has been assumed that construction activities will in general be undertaken during daytime periods, Monday to Friday, with limited hours and restricted activities on Saturday morning. There may be some working activities which require out of hours working and/ or 24 hour working such as delivery of abnormal loads, during concrete pouring activities or works within buildings once they've been erected.

Staffing and Employment

3.41 The number of staff present on site will vary according to the construction phase and activities being undertaken. Due to the nature of the construction works it is likely that staff levels will be at their highest during the earthworks and civil engineering works, likely to be between 12 and 18 months from the start of construction, with up to 150 personnel on site at any one time. Staffing levels will generally decrease as construction is progressed through to the commissioning phase.

Site Environmental Management

3.42 During construction, the Contractor will be required to undertake all works in accordance with a Construction Environmental Management Plan (CEMP). As a minimum, the CEMP will implement the mitigation measures identified within this Environmental Statement. The CEMP will set out a variety of control measures for mitigating the potential environmental effects of construction works including control and management of noise, dust, surface water runoff, waste and pollution control.

3.43 The Contractor will employ an Environmental Clerk of Works (ECoW) who will be responsible for the implementation of the CEMP. The ECoW will be supported by environmental specialists such as ecologists or archaeologists as required.

Operation of the Proposed Converter Station & Substation

Overview

3.44 Following a period of commissioning and testing the proposed converter station will operate continuously throughout the year. Typically it will import electricity from Germany to Great Britain (e.g. convert electricity from DC (from the interconnector) to AC for onwards transmission), however, as noted above the interconnector is bi-directional and will export electricity when required. Whether it is importing electricity (converting DC to AC) or exporting electricity (converting AC to DC) will depend on supply and demand of and for electricity in Great Britain and Germany.

3.45 During ordinary operation the proposed converter station will be staffed by a small team on site. During regular maintenance and/ or repairs the number of personnel present on site would increase with the number of staff proportionate to the nature of the maintenance or repair works being undertaken.

3.46 The proposed converter station will be operated by the Applicant. The proposed substation will be operated by NGET. Each site will be fully enclosed by palisade security fencing, and access to the sites will be restricted to authorised personnel throughout operation.

Regular Maintenance

3.47 Maintenance works and inspections will be undertaken periodically during operation. Typically, this will require staff to access the site in cars and/ or vans. The frequency and duration of maintenance activities and safety checks will be dependent on the Contractor's recommendations for the equipment installed.

Unplanned Maintenance

3.48 In the event of a breakdown, corrective repairs would be required. These repairs could occur at any time and for this reason 24/7 access to the proposed site would be required for all vehicle types including HGVs and AILs. Dependent on the nature of the breakdown, temporary accommodation such as site offices may be required on site.

Staffing and Employment

3.49 The proposed converter station will be operated by a small team based on site with a minimum of two operators present at all times. During normal operation there will be approximately six personnel on site, divided between three shifts over a 24-hour period.

Emissions to Air, Water and Land

3.50 During general operation the proposed converter station will not generate significant emissions to air, water or land. Rainfall within the site will be collected, treated and drained via a drainage system.

3.51 Backup diesel generators will be present on the proposed site. These will only be operated in the event of a fault with the converter station's power supply, however, they will require to be regularly tested. Whilst operation of diesel backup generators will result in some emissions of Sulphur Oxide (SOx), Nitrogen Oxide (NOx) and Particulate Matter (PM) to air, these are considered to be negligible given the short-term duration they would be in operation.

3.52 Sulphur hexaflouride (SF6) will be utilised in the proposed converter station and the proposed substation for electrical insulation purposes. It is an extremely effective electrical insulator that has significant advantages over alternative materials. It is non-flammable, a critical requirement in the high-voltage applications for which it is used, and because of its effectiveness, takes up less volume than an equivalent insulating volume of an oil alternative. All SF6 insulated switchgear is fully tested in the factory by a gas leakage detector to ensure that as far as reasonably practicable there is no leakage from any of the components, however, during operation some minor leakage of trace amounts may occur.

Decommissioning of the Proposed Converter Station & Substation

3.53 The anticipated operational life of the proposed converter station is approximately 40 years. It is likely that during this period refurbishment and plant replacement will extend the life of the converter station rather than decommissioning taking place. In the event that NeuConnect ceases operation at the end of its operational life, the proposed converter station would be decommissioned.

3.54 The scale and nature of activities undertaken would be similar to those described previously for construction. The main components would be dismantled and removed for recycling wherever possible. Where this is not possible, disposal would be undertaken in accordance with the relevant waste disposal regulations at the time of decommissioning. Site foundations would be removed to a level agreed with Medway Council and reinstated to agricultural land.

3.55 The requirement to decommission the substation would depend on NGET's operational requirements, however, should this be decommissioned it would follow a similar approach to that outlined for the converter station.

The Proposed DC Cables

Overview of the Proposed DC Cable

3.56 From the proposed converter station, the proposed DC cable route extends east towards B2001/ Grain Road, it then extends north along the field boundary to West Lane, and after crossing West Lane follows the existing track (previously used for mineral extraction activities) to the point of landfall at the coast. There will be two DC cables installed within a single trench, as well as up to four fibre cables for monitoring of the cables. The total length of the DC cable route between the proposed converter station and the landfall location is approximately 1.6 km. The Project Area accounts for space to facilitate the installation of the proposed DC cables, as well as allowing construction vehicles passage along the DC cable route. There is also allowance for potential variations in the DC cable route should there be technical issues or constraints during installation.

3.57 At the landfall location there will be a buried TJP, which will allow connection of the underground and subsea DC cables. From the TJP the subsea cables will be installed under the seabed out to MLWS.

3.58 The total length of the proposed DC cable route between the proposed converter station and MLWS is approximately 3.2 km.

Proposed DC Cables Outline Design

3.59 There will be two DC cables which will be approximately 20 cm in diameter, and both DC cables will be laid within a single trench between the proposed converter station and the TJP at the landfall location. The cable trench will be approximately 1 m wide by 1.5 m deep. The DC cables may either be laid directly within the trench, or ducts will be laid and the cables pulled through the duct.

3.60 Whilst there are only two DC cables, within the DC cable trench there may be up to four DC ducts installed within the trench. The spare ducts allow for repair or replacement works to be undertaken in the event of a cable failure. Alongside the DC cables there will also be up to four fibre cables, a temperature sensor and an optic cable. A working corridor of up to 30 m, as illustrated on Figure 3.2, will be required for the installation of the DC underground cables. This corridor allows for the cable trench, excavated spoil storage and plant operation, as well as allowing for some deviation of the proposed DC cable route should there be any unfavourable ground conditions or environmental sensitivities encountered during detailed investigation and/ or construction.

3.61 At the landfall location where the onshore underground cable transitions to the subsea cable a TJP will be installed. The TJP is a buried concrete pad where the underground and subsea cables are connected and will have an indicative footprint of up to 75 m^2 as a worst case (dimensions approximately 15 m by 5 m). The exact location of the TJP is subject to detailed ground investigation.

3.62 From the TJP, the proposed DC cables will be installed underneath the seabed in ducts. Each of the four DC cable ducts from the TJP will be installed using horizontal directionally drilling (HDD) methods as far as technically feasible through the intertidal area. It is assumed for this assessment that the maximum distance achievable for HDD is 800 m. As each duct is drilled individually, there will be up to four breakout points within the intertidal area. From these breakout points in the mid-intertidal area out to MLWS the proposed DC cables will be installed in three separate trenches – one for each of the DC cables and a separate trench for the fibre optic cable. These trenches will extend approximately 800 m to MLWS and the boundary of the GB Onshore Scheme application.

Proposed DC Cable Route

3.63 As illustrated on Figure 3.2, from the proposed converter station the DC cable route extends to the east towards B2001/ Grain Road across the former mineral extraction site. Prior to the B2001/ Grain Road the DC cable route extends to the north along the boundary of the capped landfill site utilising an existing track to West Lane. The DC cable route will pass underneath

West Lane via an existing culvert, and continue north towards the point of landfall following the existing access track previously used for mineral extraction activities. Between the proposed converter station and the landfall location, the proposed DC cable route will be approximately 1.6 km to the landfall location.

3.64 At the landfall location the proposed DC cable route will connect to the TJP. From the TJP the proposed DC cables will then extend another approximately 1.6 km, directly across the intertidal area to MLWS (where the scheme continues as the GB Offshore Scheme).

Design Mitigation

3.65 The route of the proposed DC cable has been chosen so that the new infrastructure is located in areas of previously disturbed land as far as reasonably practicable, including the use of the existing culvert at West Lane to limit the requirement to disturb vegetation and ecological receptors in the area. The use of the culvert at West Lane also minimises disruption to vehicle and pedestrian users of the road.

3.66 The proposed DC cable route also avoids the potential disturbance of the existing landfill site and contaminated land, therefore minimising the risk of creating new pathways of the contaminated material to impact the surrounding environment and also construction staff.

3.67 The proposed DC cable route and the installation methods have been identified and developed in parallel with the EIA providing opportunities to embed mitigation measures within the design, namely for the avoidance of impacts during installation.

Installation of the Proposed DC Cables

3.68 The preferred method for installation of the proposed underground DC cables will be by buried, open cut trenches with thermal stable backfill (subject to the ground conditions and cable specifications). The cable trench will be approximately 1 m wide by 1.5 m deep. There will be approximately 0.6 m of stabilised backfill material, along with concrete slabs (plus warning tape) and approximately 0.9 m of top soil.

3.69 Alternative methods of installation are available, such as laying the cable in surface troughs and covering or capping these, which has the benefit of not disturbing any areas of potentially contaminated ground, such as the historic landfills. The installation method will be confirmed following detailed ground investigations. Whilst there are only two DC cables, within the DC cable trench there may be up to four DC ducts installed within the trench. The spare ducts allow for repair or replacement works to be undertaken in the event of a cable failure with minimal impact to the surrounding area.

3.70 A working corridor of up to 30 m will be required for the installation of the DC underground cables. This corridor allows for the cable trench, excavated spoil storage and plant operation. Access to the working corridor will be achieved via the main Project Area access location from the B2001/ Grain, and also from West Lane. The arrangements and requirement for construction compounds and site laydown areas will be determined following the appointment of the DC cable Contractor, however it is likely that offices and welfare facilities will be located at the construction laydown area adjacent to the proposed converter station, as well as a smaller compound and storage area located at the landfall location (see Figure 3.2).

3.71 The proposed DC cable from the TJP through the intertidal area will be installed in lengths of approximately 800 m. In between each length a joint bay will be required to join the lengths together. The joint bays will be similar in scale to the TJP, approximately 15 m by 5 m, and consist of a concrete slab for physically joining two lengths of cable together. The location of these and the number required is subject to detailed design, but for the purpose of the EIA it is assumed they are required every 800 m and therefore up to four will be required between the proposed converter station and MLWS as a worst case scenario. The joint bays will be accommodated within the working width.

Installation of the Proposed DC Cable Route from MHWS to the Mid-Shore Intertidal Area

3.72 Installation of the DC cable from the landfall will be by Horizontal Directional Drilling (HDD) techniques and installing ducts through which the subsea cable is pulled. The maximum length of HDD possible is approximately 800 m, and therefore will not extend beyond the MLWS (located approximately 1.6 km from the landfall location). The remaining length of subsea DC cable required to be installed through the intertidal area to MLWS will likely be undertaken using open cut or trenching techniques.

3.73 HDD is a technique commonly used to install ducts underneath sensitive features such as rivers, highways, sea defences, and dune systems whereby a hole is typically drilled under the sensitive features, to a point a suitable distance away. A duct is inserted into the drilled hole which is then used as the duct into which the cables are installed.

3.74 Depending on the size of the duct and the ground conditions encountered the drilling operations will take place in a series of stages:

- Drill initial pilot hole (approximately 250 mm in diameter).
- Increase the pilot hole to a larger diameter (up to approximately 750 mm) in stages using "reaming/ hole opening" techniques (an operation that may be repeated a number of times to suit the diameter of the duct).
- Install the duct into the hole produced for cable installations, a messenger (draw) wire is installed within the duct (for subsequent cable pull in operations) or may be blown in afterwards using compressed air.

3.75 HDD operations utilise drilling fluids and additives such as bentonite, to assist in maintaining the integrity of the drilled hole and to transport the cutting materials out of the hole as drilling progresses. The choice of drilling mud required will be selected by the Contractor on the basis of drilling performance and environmental constraints. The majority of drilling fluids are biodegradable and have no harmful effect on the surrounding environment. It is extremely unlikely that any drilling fluids will be discharged into the marine environment.

3.76 Drilling fluid and cuttings are tested during drilling for contamination and possible reuse or disposal after the work has been completed. The drilling mud and cuttings will be transported to an appropriate licensed waste disposal site. Only licensed waste carriers will be used for the transportation of any drilling fluids.

3.77 Drilling fluid breakouts that may occur from the end of the duct will be dealt with by containing the flow within a small bunded pit, likely to be adjacent to the TJP. The drilling mud is then either pumped via a mud return line to the holding pits/ tanks located onshore, or collected by a vacuum tanker. Any residual mud can then be cleaned up. The normal practice of having a supply of filled sandbags on site to contain any such breakouts will be followed.

Installation of the Proposed DC Cable Route from the Mid-Shore Intertidal Area to MLWS

3.78 From the mid-shore breakout points (from the end of the HDD) to MLWS a further approximately 800 m of cables will be laid via open cut/ trench and burial activities. Three separate trenches will be required to accommodate each of the two HVDC cables and the fibre-option cable.

3.79 Although installation details are not known at this stage, it is expected that the cable installation technique will be determined by sediment conditions. For the purposes of this assessment, cable installations which may be considered include:

- Boat based installation where the cable is ploughed, trenched or jetted using installation methods while the tide is high. A jack-up barge or anchored barge would likely be required in the low intertidal to facilitate cable installation activities. Small jack-up barges use legs with spudcans (approx. 2 m diameter). Anchor barges can utilise up to eight anchors to keep position, the anchors for this type of vessels can be large; between 1.5 m and 3 m in length. The placing and removal of anchors may result in anchor scars and seabed mounds.

Designated (and as minimal as possible) anchoring areas and protocols shall be employed during marine operations. At low tide the barge/ vessel will ground and wait until next high tide to be able to move again.

- Shore based installation with trenches installed from using open cut techniques with a conventional excavator and rollers, while the tide is low. This would seek to achieve cable trenching of up to 3 m wide and between 1 and 1.5 m deep, subject to sediment conditions. Access to the installation site would be gained across the upper shore.

Operation of the Proposed DC Cables

3.80 Once operational, activity along the proposed DC cable route will be limited to non-intrusive inspections and cable repairs. Intrusive inspections would only be required in the unlikely event of a cable fault. Where a fault does occur, the location of the fault would be identified and the faulty section of the cable replaced. The activities involved in cable repair would be similar to those outlined above for installation albeit over a much smaller section.

Decommissioning of the Proposed DC Cable

3.81 In the event that the project ceases operation, the proposed underground DC cable would be decommissioned. Dependent on the prevailing requirements, the redundant cables would either be left in-situ or all parts of the cables could be removed for recycling. Where this is not possible, removed cables would be disposed of in accordance with the relevant waste disposal requirements at the time of decommissioning.

The Proposed AC Cables

Proposed AC Cables Outline Design

3.82 The specification of the proposed AC cables is subject to detailed design, and they may either be underground or above ground. If above ground these will likely be gas-insulated transmission line (GIL) tubes.

3.83 There will be up to six AC cables installed, which will be approximately 20 cm in diameter. The proposed AC cables will be installed directly between the proposed converter station and the proposed substation. They will be approximately 20 m long, with the route of the proposed AC cables dependant on the detailed design of both the proposed converter station and the proposed substation.

3.84 Should the proposed AC cables be installed in GIL tubes, these will be gas insulated with SF_6, as per the proposed converter station and the proposed substation as it is an extremely effective electrical insulator and is non-flammable.

Design Mitigation

3.85 Through the co-siting of the proposed converter station and proposed substation, there are no further areas of disturbance required for the installation of the proposed AC cables. These will be installed within the footprint of the proposed converter station and the proposed substation, therefore reducing the overall footprint of the GB Onshore Scheme and the potential for disturbance of additional receptors within the area.

Installation of the Proposed AC Cables

3.86 If installed underground, the proposed AC cables will be installed in a similar way to the proposed DC cables – with all six cables either being installed in one or two trenches, or pulled through pre-installed ducts where necessary. Should the proposed AC cables be installed above ground these will be installed as six individual GIL tubes, which may be installed alongside one-another, or on top of one-another to best fit the technical layout of the proposed converter station and proposed substation.

Operation of the Proposed AC Cables

3.87 Similar to the proposed DC cable route operational activity for the proposed AC cables would generally be limited to non-intrusive inspections and cable repairs. The latter would only be required in the unlikely event of a cable fault. Where a fault does occur the location of the fault would be identified and the faulty section of cable replaced. The activities involved in cable repair would be similar to those outlined above for installation albeit over a much smaller section.

Decommissioning of the Proposed AC Cables

3.88 In the event that the project ceases operation, the proposed AC cable would be decommissioned. Dependent on the prevailing requirements, the redundant cables would either be left in-situ or all parts of the cables could be removed for recycling. Where this is not possible, removed cables would be disposed of in accordance with the relevant waste disposal requirements at the time of decommissioning.

4. Approach to EIA

Introduction

4.1 This chapter describes the method which has been used to undertake the assessment of likely significant environmental effects resulting from the GB Onshore Scheme. It outlines the key stages of the assessment process and the approach undertaken to identify and evaluate the potential environmental effects resulting from the GB Onshore Scheme.

4.2 The GB Onshore Scheme has three distinct phases: construction/installation, operation (including maintenance and repair) and decommissioning. This Environmental Impact Assessment (EIA) considers the impacts of the GB Onshore Scheme during construction/ installation and operation.

4.3 Due to the proposed operational lifespan of 40 years for the GB Onshore Scheme, it is recognised that the future baseline and therefore surrounding receptors are likely to change, and the works associated with the decommissioning of the GB Onshore Scheme will be subject to the relevant planning and legislative requirements adopted at that time.

About EIA

4.4 EIA is the process of identifying, evaluating and mitigating the likely significant environmental effects of a proposed development such as those potentially occurring as a result of the construction and operation of the proposed GB Onshore Scheme. Through the early identification and evaluation of the likely significant environmental effects of a proposed development EIA enables appropriate mitigation (that is measures to avoid, reduce or offset significant adverse effects) to be identified and incorporated into the proposed development's design, or commitments to be made to environmentally sensitive construction methods and practices.

4.5 The EIA of the proposed GB Onshore Scheme has been undertaken in parallel with the development of the design thereby maximising opportunities to mitigate likely significant effects as they have been identified. This approach ensures mitigation is embedded in the design and forms an integral component of it.

4.6 The results of the EIA also ensure that decision makers, such as Local Planning Authority (LPA) and statutory consultees as well as other interested parties including local communities, are aware of a proposed development's potential environmental impacts and whether these may be significant or not so that they may be considered in the determination of an application for planning permission.

4.7 As described in Chapter 01 Introduction, in the case of the proposed GB Onshore Scheme the results of the EIA have been described within this Environmental Statement which accompanies an application for outline planning permission to Medway Council. The results of the EIA have been reported such that Medway Council are aware of the likely significant effects of the proposed GB Onshore Scheme.

The Need for EIA of the GB Onshore Scheme

Underground AC and DC Cables, Converter Station and Substation

4.8 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (EIA Regulations) apply to applications for planning permission made under the Town and Country Planning Act 1990. It sets out two schedules of development (which are derived from Annex I and II of the amended EU 2011/92/EU (the 'Directive') on the assessment of the effects of certain public and private projects on the environment):

- Schedule 1 Development: EIA is mandatory for developments of a type referred to in Schedule 1. Such developments are considered to be "EIA development".
- Schedule 2 Development: EIA is not mandatory for developments of a type referred to in Schedule 2. Such developments may be "EIA development" only where they are considered likely to have significant effects on the environment by virtue of factors such as their nature, size or location.

4.9 There is no reference to interconnector projects or the components they comprise (e.g. converter stations, underground or submarine cables) in Schedule 1 of the EIA Regulations. Whilst the OHL works will be undertaken by NGET, for completeness consideration has also been given to whether or not these works would constitute EIA development. The construction of "overhead electrical power lines" is referenced within Schedule 1 of the EIA Regulations however the temporary diversion of the existing 400 kV OHL, and the proposed new connection between the substation and the adjacent lattice tower are below the 15 km length criteria. Therefore EIA is not mandatory for the GB Onshore Scheme as per the EIA Regulations.

4.10 Similarly there is no reference to interconnector projects or the components that they comprise (e.g. converter stations, underground or submarine cables) in Schedule 2 of the EIA Regulations.

4.11 A request for an EIA Screening Opinion (MC/18/3363) was submitted to Medway Council the 20th November 2018 which provided an outline assessment of the likely significant environmental effects of the GB Onshore Scheme. In Medway Council's response dated the 20th December 2018 it was stated that an EIA would be required for any subsequent planning application on account of the proposal to install the DC cable within the ecologically-sensitive intertidal zone. A copy Medway Council's opinion is contained in Appendix 3.A.

OHL Works

4.12 To facilitate the connection of the interconnector to the existing NETS, modifications to the existing OHL will be required. The modification works are not confirmed yet and will be subject to detailed design, however, they are likely to include:

- a new 50 m tall lattice tower immediately north of the proposed substation;
- down leads from the new tower to the proposed substation;
- down leads from the new tower to the proposed cable sealing end compound; and
- approx. 200 m long underground AC cable route between the proposed cable sealing end compound and the proposed substation.

4.13 For the purpose of this EIA the OHL works will be included within the assessment of cumulative effects as part of this EIA as assumed development.

Temporary Diversion

4.14 A temporary diversion to the existing overhead line may be required to accommodate the GB Onshore Scheme. The temporary diversion works will be undertaken by NGET and, subject to detailed design, it is hoped that these works will be undertaken in accordance with the exemptions to the requirement for section 37 consent under Regulation 3 of the Overhead Lines (Exemption) (England and Wales) Regulations 2009 (the 'Exemption Regulations'). The distance between the towers is 772 m, where the exemption is subject to a maximum distance of 850 m, and therefore the exemption applies if the diversion is not in place for more than six months.

4.15 For the purpose of this EIA the temporary diversion will be included within the assessment of cumulative effects as part of this EIA as assumed development.

Substation to New OHL Tower Connection

4.16 In respect of the new connection between the substation and new OHL tower (likely to be down leads connecting the cable sealing end compound to the tower), these will also likely be delivered by NGET. A section 37 consent would not be required provided that the electric line will be on premises which is (or will be) in the Applicant's or NGET's occupation or control (as provided for by section 37(2) of the Electricity Act 1989). The Applicant has an option over the land, and the Applicant or NGET will have occupation or control of the land.

4.17 As per the OHL works and the temporary diversion, for the purposes of the EIA of the GB Onshore Scheme these works are included within the cumulative assessment as assumed development.

Consultation & Stakeholder Engagement

Determination of EIA Scope

4.18 As noted above in November 2018 a Screening Opinion request was submitted to Medway Council as to whether or not an EIA was required and to comment on the proposed technical or specialist assessments that would inform the design and accompany the subsequent planning application. The Screening Opinion request identified those aspects of the environment which were considered likely to be significantly affected by the proposed GB Onshore Scheme and the approach to the identification and assessment of those effects. It also scoped out those aspects of the environment which were considered unlikely to be significantly affected. A copy of the opinions provided is contained in Appendix 3.A. Simultaneous scoping of technical assessments was also undertaken during consultation with Medway Council and responsible authorities, summaries of consultation are provided within the specialist technical assessment chapters where relevant.

4.19 Additional consultation has been undertaken throughout the development of the proposed GB Onshore Scheme and throughout the EIA informing the approaches to both baseline studies and assessment methods.

4.20 The potential impacts from climate change have been assessed where directly applicable to the specialist assessments in the proceeding Chapters, such as the consideration of flood risk within the water resources and flood risk assessment (Chapter 9).

Consultation and Community Engagement

4.21 A public information event was held on 21st November 2018 during the development of the GB Onshore Scheme, with feedback helping to inform the design, such as the proposed DC cable route and the siting of the proposed converter station. Statutory and non-statutory consultees as well as members of the public provided feedback which helped to inform the selection of the proposed DC cable route and confirm the siting of the proposed converter station.

4.22 A further two pre-application consultation events were undertaken on the 20th and 22nd June 2019 to provide the local community and statutory and non-statutory consultees further information on the proposed GB Onshore Scheme initial design. Attendees provided feedback which helped to inform the design and appearance of the main structures. The approach to consultation with the community and a summary of the feedback that was received is provided in Appendix 3.B Statement of Community Involvement.

4.23 Technical specialists have also consulted with statutory and non-statutory authorities throughout the EIA process to inform approaches to specialist assessments including data requests, the scope of and approach to field surveys, assessment methods and details of other projects to be considered as part of cumulative assessments. The relevant technical chapters in the Environmental Statement summarise the topic-specific consultation which was undertaken and how it informed the scope of and/or approach to the EIA.

Approach to Environmental Impact Assessment

Overview

4.24 The assessment methodology follows a systematic approach in order to assess the potential impacts and subsequent effects of the GB Onshore Scheme on physical, biological and human receptors in a robust and transparent manner.

4.25 The GB Onshore Scheme aims to integrate environmental considerations into the design. Alternatives have been considered and assessed through desk studies and field surveys that have sought to avoid or reduce disturbance of known environmental constraints, where ever possible. The consideration of alternatives is discussed in further detail in Chapter 4.

4.26 This ES aims to identify potentially significant adverse environmental effects and, if any, propose GB Onshore Scheme specific mitigation measures to avoid, reduce or offset adverse environmental effects or maximise environmental benefits. These can be incorporated into the configuration of the components of the GB Onshore Scheme.

Method of Environmental Impact Assessment

4.27 The EIA process involves the following main steps as presented in Figure 4.1.

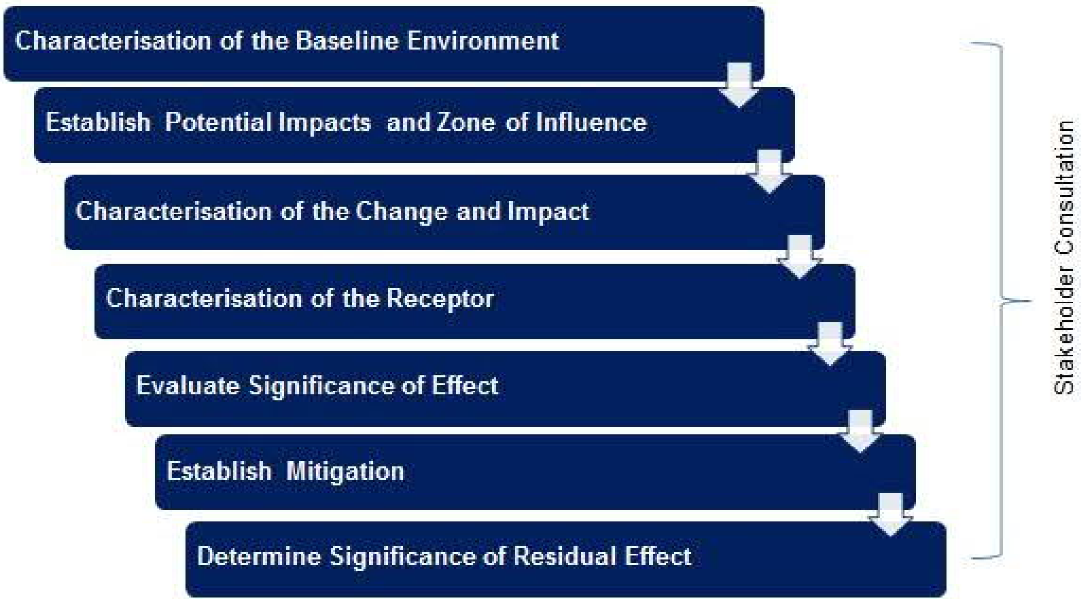

Figure 4-1: Steps of an EIA

4.28 The steps are described in more detail below and are followed and presented within the receptor topic chapters of this report.

Characterisation of the Baseline Environment

4.29 In order to assess the potential impacts resulting from the GB Onshore Scheme, it is necessary to first establish the physical, biological and human conditions that currently exist along and within the vicinity of the proposed converter station and substation sites and DC cable corridors.

4.30 Appropriate understanding of the baseline for each environmental receptor has been achieved through some or all of the following:

- Review of primary baseline studies (field);
- Review of additional specialist baseline studies (desk-based);
- Detailed review of all secondary sources (i.e. existing documentation and literature);
- Stakeholder consultation.

4.31 The key data sources used to establish the baseline are described in each technical assessment chapter. The following limitations or assumptions should be noted:

- Third party and publicly available information is correct at the time of publication.
- Baseline conditions are accurate at the time of physical surveys but due to the dynamic nature of the environment, conditions may change before or during the construction/installation and operation phases of the GB Onshore Scheme (although the effects of the natural variation are included in the assessment).

4.32 For each receptor topic, the baseline has been described at an extent relevant for their assessment between the cable sealing end compound location and Mean Low Water Spring (MLWS).

Establish Potential Impacts and Zone of Influence

4.33 The IEMA (2004) guidelines state:

"*The assessment stage of the EIA should follow a clear progression; from the characterisation of 'impact' to the assessment of the significance if the effects taking into account the evaluation of the sensitivity and value of the receptors*." (p11/2).

4.34 The prediction of potential impacts has been undertaken to determine what could happen to each environmental receptor as a consequence of the GB Onshore Scheme and its associated activities. The diverse range of potential impacts considered in the assessment process has resulted in a large range of prediction methods being used, including quantitative, semi-qualitative and qualitative. Potential impacts to be assessed are provided in each topic chapter. The definitions used to describe impacts are presented in Table 4.1 below.

Table 4.1: Impact definitions

Term	Definition
Direct impact	Impacts that result from a direct interaction between the GB Onshore Scheme / GB Onshore Scheme activities and the receiving environment.
Indirect impact	Impacts on the environment, which are not a direct result of the GB Onshore Scheme / GB Onshore Scheme activities, often produced away from the activity or as a result of a complex pathway. For example, loss of existing screening vegetation resulting in the loss of visual amenity.
Cumulative impact	Impacts that result from incremental changes caused by other present or reasonably foreseeable actions together with the GB Onshore Scheme. Generally considered to be the same impact by from different projects e.g. construction traffic from two separate projects combining to affect the same network.
Beneficial impact	An impact that is considered to represent an improvement on the baseline condition or introduces a new desirable factor.
Adverse impact	An impact that is considered to represent an adverse change from the baseline condition or introduces a new undesirable factor.

4.35 For each potential impact, the 'Zone of Influence' (ZOI) – the spatial extent over which the activities are predicted to have an impact on the receiving environment – is established. This will vary for different activities and for the different stages of the GB Onshore Scheme (construction/installation, operation and decommissioning).

4.36 Establishing the ZOI for different activities and receptors has been undertaken quantitively where possible. Where necessary, it has been undertaken based on the GB Onshore Scheme description, project experience and literature reviews.

4.37 Potential for impacts on receptors which occur outside the ZOI and which cannot or are unlikely to travel into the zone can be screened out. Conversely, mobile species and other mobile receptors can travel into the ZOI, and may therefore be impacted by the GB Onshore Scheme.

4.38 The ZOI used in the assessment are described in the individual receptor topic chapters of this report. In some cases the ZOI only covers the GB Onshore Scheme site, in other cases, it extends further from project activities.

4.39 ZOIs have been considered for each potential impact on the receptor. Where a number of GB Onshore Scheme activities have the same impact, or the installation technique has not been determined, the largest ZoI has been applied.

Characterisation of the Change and Impact

4.40 In order to fully characterise an impact or level of change from baseline conditions, the parameters shown in Table 4.2 and Table 4.3 have been used to define the magnitude of change.

Table 4.2 Factors which determine the magnitude of an impact

Term	Definition
Scale of change	The scale of change refers to the degree of change to or from the baseline environment caused by the impact being described
Spatial extent	The extent of an impact is the full area over which the impact occurs
Duration and frequency	The duration is the period within which the impact is expected to last prior to recovery or replacement of the feature. Frequency refers to how often the impact will occur

Table 4.3 Criteria for characterising the magnitude of an impact

Term	Definition
High	Long term (> 5 years) and/ or regional level loss; or major alteration to key elements/ features of the baseline condition such that post development character/ composition of the baseline will be fundamentally changed.
Medium	Medium term (1-5 years) loss and/ or local level change (greater than the GB Onshore Scheme footprint) or alteration to one or more key elements/ features of the baseline conditions such that post development character/ composition of the baseline condition will be materially changed.
Low	Short term (<1 year), site specific and/ or a minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/ composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation.

Value of the Receptor

4.41 The value of a receptor or feature is characterised by the sensitivity, recoverability and importance of the receptor or feature (see Table 4.4). Characterisation of the receptor is achieved by balancing out these three considerations to determine the receptor’s value.

Table 4.4 Factors which determine the value of the receptor

Term	Definition
Sensitivity	The sensitivity of the receptor relates to its vulnerability to change (including its capacity to accommodate change i.e. the tolerance/intolerance of the receptor to change).
Recoverability	The ability of the receptor to return to the baseline state before the GB Onshore Scheme impact caused the change.
Importance	The importance of the receptor or feature is a measure of the value assigned to that receptor based on biodiversity and ecosystem services, social value and economic value. Importance of the receptor is also defined within a geographical context, whether it is important internationally, nationally or locally.

Evaluate Significance of Effect

4.42 Having established the magnitude of change and the value of the receptor, the significance of the effect can be assessed using the significance matrix presented in Table 4.5.

Table 4.5 Significance matrix

		Magnitude of Change			
		Negligible	**Low**	**Medium**	**High**
Value of Receptor	**High**	Negligible	Moderate	Major	Major
	Medium	Negligible	Minor	Moderate	Major
	Low	Negligible	Negligible	Minor	Moderate
	Negligible	Negligible	Negligible	Negligible	Minor

4.43 The result of using this matrix approach is the assignment of the level of significance of the effect for all GB Onshore Scheme potential impacts. This is done prior to any mitigation.

4.44 Negligible or minor impacts are not considered to be significant.

Establish Mitigation

4.45 A standard hierarchical approach to identifying mitigation requirements has been used:

- Avoid or Prevent: in the first instance, mitigation should seek to avoid or prevent the adverse effect at source.
- Reduce: if the effect is unavoidable, mitigation measures should be implemented which seek to reduce the significance of the effect.
- Offset: If the effect can neither be avoided nor reduced, mitigation should seek to offset the effect through the implementation of compensatory mitigation.

4.46 Mitigation measures fall into two categories: mitigation by design which forms part of the GB Onshore Scheme design; and mitigation by practice which is part of the installation, operation and decommissioning of the GB Onshore Scheme.

Mitigation by Design

4.47 The GB Onshore Scheme has been developed through an iterative process which involved seeking to avoid or reduce potential environmental effects through location of the proposed converter station and substation and routeing of the marine cables. This was the first GB Onshore Scheme-specific step in mitigation potential effects by seeking to avoid or reduce environmental disturbance. Mitigation measures which form part of the initial design are an inherent part of the GB Onshore Scheme and are considered the 'base case' therefore they have not been included within the assessment. Following selection of the final site/ route to be considered for assessment, further mitigation measures by design have been identified and where applicable have been proposed within each of the topic chapters. GB Onshore Scheme specific mitigation by design may include, for example, micro routeing to avoid sensitive features identified during the assessment process.

Mitigation by Practice (Best or Good Practice)

4.48 Mitigation which helps reduce the likelihood or severity of potentially adverse environmental effects through measures implemented during installation, operation and decommissioning are referred to as 'mitigation by practice'. Such measures are often followed as a course of Best Practice or to comply with international statute. Within the topic chapters all proposed mitigation by practice measures have been recorded and referenced where applicable.

Determine Significance of Residual Effects

4.49 The significance assessment is repeated taking into consideration the application of Best Practice and GB Onshore Scheme specific mitigation measures. This determines whether there is likely to be a residual impact. When applied after mitigation, the resulting significance level is referred to as the residual significant effect. Tables within the topic chapters present the results of both assessments.

4.50 Residual effects as moderate or major after consideration of proposed mitigation measures will normally require additional analysis and consultation in order to discuss and possible further mitigate impacts where possible. Where further mitigation is not possible, a residual effect may remain.

Approach to Cumulative Effects Assessment

4.51 The term cumulative effects refer to effects upon receptors arising from the GB Onshore Scheme when considered alongside other plans and projects that result in an additive impact with any element of the project. Cumulative effects can be described as the net effect of both direct and indirect cumulative pressures, from different activities. An individual effect alone may be considered insignificant, but the additive effects of more than one effect, from any number of sources, could result in a significant cumulative effect, either beneficial or adverse.

4.52 Cumulative effect assessment identifies for each receptor, areas where the predicted effects of the GB Onshore Scheme could interact with effects arising from other projects, plans on the same receptor based on a spatial and/or temporal basis.

4.53 The cumulative effects assessment for the receptors is presented within each topic chapter of this report.

4.54 The convention on Environmental Impact Assessment in a Transboundary Context (UN, 1991) sets out the obligations of parties to assess the transboundary environmental effect of certain activities at an early stage of planning. It also lays down the general obligations of states to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental effect across boundaries.

4.55 It is anticipated that transboundary effects associated with the GB Onshore Scheme will be limited.

5. Landscape & Visual Amenity

Introduction

5.1 This chapter provides an assessment of the likely Landscape and Visual effects arising from the construction and operation of the proposed GB Onshore Scheme. A detailed description of the GB Onshore Scheme and the Project Area is provided in Chapter 03 Proposed GB Onshore Scheme. The scope of the landscape and visual assessment and methodology has been informed by and agreed through consultation with the statutory stakeholders.

5.2 This chapter is supported by the following Figures:

- Figure 5.1 Zone of Theoretical Visibility
- Figure 5.2 Site Topography
- Figure 5.3 Landscape Designations
- Figure 5.4 Landscape Character Areas
- Figure 5.5 Recreational Routes and Public Rights of Way
- Figure 5.6 Representative Viewpoints
- Figure 5.7a Landscape Mitigation Design Plan
- Figure 5.7b Landscape Mitigation Design Sections
- Figure 5.8 Viewpoint 1: Grain Coastal Park
- Figure 5.9a Viewpoint 2: Existing view
- Figure 5.9b Viewpoint 2: Photomontage year 1
- Figure 5.9c Viewpoint 2: Photomontage year 15
- Figure 5.10a Viewpoint 3: Existing view
- Figure 5.10b Viewpoint 3: Photomontage year 1
- Figure 5.10c Viewpoint 3: Photomontage year 15
- Figure 5.11a Viewpoint 4: Existing view
- Figure 5.11b Viewpoint 4: Photomontage year 1
- Figure 5.11c Viewpoint 5: Photomontage year 15
- Figure 5.12a Viewpoint 5: Existing view
- Figure 5.12b Viewpoint 5: Photomontage year 1
- Figure 5.12c Viewpoint 5: Photomontage year 15
- Figure 5.13a Viewpoint 6: Existing view
- Figure 5.13b Viewpoint 6: Photomontage year 1
- Figure 5.14a Viewpoint 7: Existing view
- Figure 5.14b Viewpoint 7: Photomontage year 1
- Figure 5.15a Viewpoint 8: Existing view
- Figure 5.15b Viewpoint 8: Photomontage year 1
- Figure 5.16a Viewpoint 9: Existing view
- Figure 5.16b Viewpoint 9: Photomontage year 1

5.3 This Chapter is also supported by the following technical appendices presented in:

- Appendix 05.A- Landscape Assessment, and
- Appendix 05.B- Visual Assessment.

Approach to Assessment

Overview

5.4 This section presents the following:

- details of consultation undertaken with respects to the landscape and visual resource;
- identification of the information sources that have been consulted throughout the preparation of this Chapter;
- the methodology behind the assessment of landscape and visual effects, including the criteria for the determination of the significance of the receptor and the magnitude of change from the baseline conditions;
- an explanation as to how the identification and assessment of potential landscape and visual effects has been reached; and
- the significance criteria and terminology for assessment of the residual effects to the landscape and visual resource.

Study Area

5.5 The extent of the study area is determined by the potential visibility of the proposed GB Onshore Scheme in the surrounding landscape and is proportionate to its size and scale and the nature of the surrounding landscape. For the purposes of this assessment the study area has been defined by a combination of Zone of Theoretical Visibility (ZTV) analysis and professional judgement. The ZTV is shown on Figure 5.1.

5.6 Based upon the extent of visibility and professional judgement it is considered that it is highly unlikely that significant long term residual landscape effects will be possible from further than 5 km from the Project Area boundary. Three viewpoints beyond the 5 km study area have been included in the assessment. Each of these viewpoints is representative of potential visual effects from recreational receptors in elevated locations with long distance views across the landscape and have been informed by consultation with Medway Council. Whilst the visual assessment considers representative viewpoints beyond 5 km, it is not considered proportionate to extend the study area, as fieldwork has demonstrated that significant adverse effects on visual amenity would be limited to within 5 km of the Project Area.

Consultation

5.7 Consultation relevant to the landscape and visual assessment has been undertaken with relevant stakeholders and has informed the scope of the assessment. A summary of the comments raised, and responses are detailed in Table 5.1 Summary of Consultation.

Table 5.1 Summary of Consultation

Consultee	Key Issue	Consultee Response	Action Taken
Medway Council	AECOM sent a letter of consultation to Medway Council (23/01/2019) that outlined the scope of the Landscape and Visual Assessment. Key issues included: Extent of study area Landscape Character areas; Proposed Viewpoint Locations and preparation of visualisations.	Medway Council Response (22/02/2019): In agreement of scope and guidance, with the following additions: Proposed 15 no. additional viewpoints; Proposed that the study area for the visual assessment should be considered beyond 5 km.	AECOM undertook field surveys and visited each of the additional viewpoints proposed by Medway Council within Medway and Swale authority areas and other locations representative of visual receptors up to 10 km from the Project Area boundary. AECOM's Landscape Architects proposed that 2 of the15 additional viewpoints proposed by Medway Council would be added to the scope of the visual assessment as they were representative of visual

Consultee	Key Issue	Consultee Response	Action Taken
			receptors where the view has the potential to be significantly affected. These were: Furze Hill PRoW; and The Riverside Country Park, (viewing platform) Set out in email sent from AECOM to Medway Council dated 7/3/2019.
Medway Council	In response to AECOM's email of 7/3/19 following the site survey the Landscape Officer maintained the request for additional viewpoint locations along the south Essex coastline and Southend (12/03/2019).	Medway Council Landscape Officer stated that: '*The reasoning behind the exclusion of a number of viewpoints put forward is understandable with selected viewpoints being representative of different visual receptors*.' Medway Council Landscape officer also requested that views from the south Essex coastline and Southend be taken into consideration, even if this means that the resulting views can be discounted as a result of visual evidence.	AECOM have prepared visualisations from viewpoints 5, 7 and 9 which are of similar distance and background context to those on the South Essex coastline where the proposals are not likely to result in significant visual effects. AECOM have excluded viewpoints from the Essex coastline and Southend from the visual assessment to focus the assessment on the likelihood of significant effects in line with best practice (27/06/2019)

Assessment Method

Guidance

5.8 The approach to the Landscape and Visual Impact Assessment (LVIA) has been devised to address the specific effects likely to result from developments of this scale and nature. The methodology draws upon the following established best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) (Ref. 5.1); and
- Photographs from representative viewpoints have been produced in compliance with Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment (Landscape Institute, 2011) (Ref. 5.2).

Scope of Assessment

5.9 GLVIA3 requires that a clear distinction is drawn between landscape and visual effects:

- Landscape effects relate to the degree of change to characteristics or physical components of a rural area, which together form the character of that landscape, e.g. topography, land use, vegetation and open space.
- Visual effects relate to the degree of change to an individual receptor or a receptor group's view of that landscape, e.g. local residents, users of public open space, footpaths or motorists passing through the area.

5.10 By assessing the construction, operation and maintenance and decommissioning stages of the GB Onshore Scheme separately, distinctions may be drawn between temporary and permanent effects, with permanent effects typically being of greater importance. Residual effects are those likely to arise from the GB Onshore Scheme taking into account all additional mitigation measures.

5.11 In understanding that the GB Onshore Scheme is subject to detailed design, and that the layout of the converter station and substation is still to be determined, the LVIA has considered the worst case scenario. In consideration of the proposed layout of the converter station as identified in Figure 3.3, the LVIA has assessed the converter station layout to be rotated 180 degrees with the DC hall located to the north of the converter station platform. In this layout the greatest massing of buildings would be closest to the residential area to the north and would be closer to the Perry's Farm property to the east of the GB Onshore Scheme.

Temporal Scope

5.12 Landscape and visual effects change over time as the existing landscape external to the Project Area evolves and the embedded mitigation planting establishes and matures. The assessments therefore report on potential effects during the construction phase and at operation both during winter (Year 1 of opening) and summer (Year 15 once the embedded mitigation is expected to be established). The assessments have been carried out, as is best practice, by assuming the worst case scenario, i.e. on a clear bright day, when haze would not interfere with the clarity of the view obtained.

5.13 The following provides details of the process and classification criteria employed in undertaking the landscape and visual assessments. The criteria detailed in Table 5.2 to Table 5.11 are not intended to be prescriptive. Rather these examples are used to illustrate potential combinations of judgements which relate to the scales for value, susceptibility, sensitivity to change, magnitude of change and significance of effect as described subsequently.

Professional Judgement

5.14 GLVIA3 places a strong emphasis on the importance of professional judgement in identifying and defining the significance of landscape effects. This LVIA has been undertaken by two Chartered Landscape Architects and professional judgement has been used in combination with structured methods and criteria to evaluate landscape value, sensitivity, magnitude and significance of effect.

Sensitivity of Landscape Receptors

5.15 Landscape receptors are described as components of the landscape that are likely to be affected by the GB Onshore Scheme. These can include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects. It is the interaction between the different components of the GB Onshore Scheme and these landscape receptors which has potential to result in landscape effects (both adverse and beneficial).

5.16 The sensitivity of the landscape receptor is a combination of the value of the landscape (undertaken as part of the baseline study) and the susceptibility to change of the receptor to the specific type of development being assessed.

5.17 Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory bodies and planning agencies. Absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource.

5.18 Factors that can help in identifying the value of a landscape include:

- landscape quality/ condition – the measure of the physical state of the landscape including the intactness of the landscape and the condition of individual elements;
- scenic quality – the extent that the landscape receptor is recognised for its perceptual qualities (e.g. remoteness or tranquillity);
- perceptual aspects – the extent that the landscape receptor is recognised for its perceptual qualities (e.g. remoteness or tranquillity);
- rarity – the presence of unusual elements or features;
- representativeness – the presence of particularly characteristic features;
- recreation – the extent that recreational activities contribute to the landscape receptor; and
- association – the extent that cultural or historical associations contribute to the landscape receptor.

5.19 The evaluation of landscape value has been undertaken with reference to a three-point scale, as outlined in Table 5.2 Landscape Value Criteria below.

Table 5.2 Landscape Value Criteria

Classification	Criteria
High	Protected by a statutory landscape designation, a landscape contributing strongly to a sense of place, or an unspoilt landscape containing unique or scarce elements/ features with few, if any, detracting elements/ features
Medium	Locally designated landscape or an undesignated landscape with locally important, but more commonplace, features and containing some detracting elements/ features.
Low	Undesignated landscape with few, if any, notable elements/ features, or containing several detracting elements/ features.

5.20 The susceptibility to change is a measure of the ability of a landscape to "*accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*" (Ref. 5.3, para 5.40).

5.21 Landscape susceptibility has been appraised through consideration of the baseline characteristics of the landscape, and in particular, the scale or complexity of a given landscape.

The evaluation of landscape susceptibility has been undertaken with reference to a three-point scale, as outlined in Table 5.3 Landscape Susceptibility Criteria.

Table 5.3 Landscape Susceptibility Criteria

Classification	Criteria
High	Attributes that contribute to a landscape which is considered to be intolerant of even minor change of the type proposed without fundamentally altering key characteristics.
Medium	Attributes that contribute to a landscape which offers some opportunities to accommodate change of the type proposed without fundamentally altering the key characteristics.
Low	Attributes that contribute to a landscape which is considered to be tolerant of a large degree of change of the type proposed without fundamentally altering the key characteristics.

5.22 Landscape sensitivity to change has been determined by employing professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three-point scale outlined in Table 5.4 Sensitivity of Landscape Receptors.

5.23 Combining susceptibility and value GLVIA3 indicates that this can be achieved in a number of ways and needs to include professional judgement. However, it is generally accepted that a combination of high susceptibility and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to result in the lowest level of sensitivity.

Table 5.4 Sensitivity of Landscape Receptors

Classification	Criteria
High	Landscape of national or regional value with distinctive elements and characteristics, considered to have a limited ability to absorb the type of change proposed without fundamentally altering the key characteristics.
Medium	Landscape of regional or local value, or rarity, exhibiting some distinct elements/ features, considered tolerant of some degree of the type of change proposed without fundamentally altering the key characteristics.
Low	Landscape with few distinctive elements/ features or valued characteristics and considered tolerant of a large degree of the type of change proposed without fundamentally altering the key characteristics.

Sensitivity of Visual Receptors

5.24 Sensitivity of visual receptors has been defined through appraisal of the viewing expectation, or value placed on the view as identified in the baseline study, and its susceptibility to change.

5.25 Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey or tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. Value of the view has been determined with reference to the three-point scale and criteria outlined in Table 5.5 Value of the View.

Table 5.5 Value of the View

Classification	Criteria
High	Nationally recognised view, a view with cultural associations (recognised in art, literature, or other medium), or a recognised high quality view of the landscape with very few, if any detracting elements.
Medium	Locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.

Classification	Criteria
Low	Typical or poorly composed view, often with numerous detracting elements.

5.26 Visual susceptibility relates to the importance of views to receptors at a certain location and is informed by the type of receptor and the activity with which they are engaged. This considers the extent to which receptors' attention or interest is focused on the view or visual amenity. For example, residents in their home, walkers whose interest may tend to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience, may indicate a higher level of susceptibility. Whereas, receptors occupied in outdoor sport where views are not important or at their place of work could be considered less susceptible to change. Visual susceptibility has been determined with reference to the three-point scale and criteria outlined in Table 5.6 Visual Susceptibility Criteria.

Table 5.6 Visual Susceptibility Criteria

Classification	Criteria
High	Locations where the view is of primary importance and receptors are likely to notice even minor change.
Medium	Locations where the view is important but not necessarily the primary focus and receptors are tolerant of some change.
Low	Locations where the view is incidental or unimportant to receptors and tolerant of a high degree of change.

5.27 Visual sensitivity to change has been determined by employing professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three-point scale outlined in Table 5.7 Sensitivity of Visual Receptors below. In combining susceptibility and value it is generally accepted that a combination of high susceptibility and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to result in the lowest level of sensitivity.

Table 5.7 Sensitivity of Visual Receptors

Classification	Criteria
High	Locations where receptors experience an impressive or well composed view containing few detracting elements, with limited ability to absorb change.
Medium	Locations where receptors experience a valued view which generally represents a pleasing composition but may include some detracting features and is tolerant of a degree of change.
Low	Locations where the view is incidental or not important to the receptors and the nature of the view is of limited value or poorly composed with numerous detracting features and is tolerant of a large degree of change.

Landscape Magnitude of Change

5.28 The magnitude of landscape change refers to the extent to which the GB Onshore Scheme would alter the existing characteristics of the landscape. Changes to landscape characteristics can be both direct and indirect.

5.29 Magnitude of landscape change refers to the extent to which the GB Onshore Scheme would alter the existing characteristics of the landscape. It is an expression of the size or scale of change to the landscape, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The extent of existing landscape elements that would be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape.

- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones.
- Whether the change alters the key characteristics of the landscape, which are integral to its distinctive character.
- The geographic area over which the change will be felt (within the application boundary itself, the immediate setting, at the scale of the landscape character area, on a larger scale influencing several landscape character areas).
- The duration of the change short term, medium term or long term and its reversibility (whether it is permanent, temporary or partially reversible).

5.30 The magnitude of landscape change has been evaluated with reference to Table 5.8 Magnitude of Landscape Change below ranging from higher to lower levels of magnitude described using a four-point scale (high, medium, low, very low).

Table 5.8 Magnitude of Landscape Change

Size or Scale of Change	Geographical Extent	Duration	Reversibility
Highly noticeable change, affecting many key characteristics and dominating the experience of the landscape; and Introduction of highly incongruous GB Onshore Scheme.	Very extensive affecting several landscape types or character areas.	Long-term (10 years +)	Irreversible
Noticeable change, affecting some key characteristics and the experience of the landscape; and Introduction of some uncharacteristic elements.	Affecting a substantial proportion of the landscape character area.	Medium-term (5-10 years)	Partially reversible
Minor change, affecting some characteristics and the experience of the landscape to an extent; and Introduction of elements that are not uncharacteristic.	Affecting the immediate setting of the Project Area.	Short-term (0-5 years)	Reversible
Little perceptible change.	Limited to within the GB Onshore Scheme application boundary.	Short-term (0-5 years)	Reversible

Visual Magnitude of Change

5.31 Visual magnitude of change relates to the extent to which the GB Onshore Scheme would alter the existing view and is an expression of the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the GB Onshore Scheme.
- The degree of contrast or integration of any new features or changes in the form, scale, composition and focal points of the view.
- The nature of the view of the GB Onshore Scheme in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpsed.
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the GB Onshore Scheme and the extent of the area over which the changes would be visible.

- The duration of the change short term, medium term or long term and its reversibility (whether it is permanent, temporary or partially reversible).

5.32 Visual magnitude of change has been evaluated with reference to Table 5.9 Magnitude of Visual Change, ranging from higher to lower levels of magnitude described using a four-point scale (high, medium, low, very low).

Table 5.9 Magnitude of Visual Change

Size or Scale of Change	Geographical Extent	Duration	Reversibility
Extensive change to the existing view including the loss of existing characteristic features, and/ or introduction of new discordant features. A change to an extensive proportion of the view. Views where the GB Onshore Scheme would become the dominant landscape feature or contrast heavily with the current view.	The GB Onshore Scheme is located in the main focus of the view; and or at close range over a large area.	Long-term (10 years +)	Irreversible
The GB Onshore Scheme will result in a change to the view but not fundamentally change its characteristics. Changes that would be immediately visible but not the key feature of the view.	Changes where the GB Onshore Scheme is located obliquely to the main focus of the view; and/ or at medium range; and/ or over a narrow area.	Medium-term (5-10 years)	Partially reversible
The GB Onshore Scheme would result in a small change to the composition of the view. Changes that would only affect a small portion of the view or introduce new features that were partially screened.	Changes where the GB Onshore Scheme is located on the periphery to the main focus of the view; and/or long range; and/ or over a small area.	Short-term (0-5 years)	Reversible
Little perceptible change in the existing view.	Changes where the GB Onshore Scheme is peripheral to the overall view.	Short-term (0-5 years)	Reversible

Significance of Landscape Effect

5.33 Determination of the significance of landscape effects has been undertaken by employing professional judgement and experience to combine and analyse the magnitude of change, against the identified sensitivity of the receptor. The assessment takes account of direct and indirect change on existing landscape elements, features and key characteristics and evaluates the extent to which these would be lost or modified, in the context of their importance in determining the existing baseline character.

The levels of landscape effects are described with reference to the four-point scale outlined in Table 5.10 Significance of Landscape Effect, below.

Table 5.10 Significance of Landscape Effect

Classification	Criteria
Major	Considerable change over an extensive area of a more sensitive landscape, fundamentally affecting the key characteristics and the overall impression of its character.
Moderate	Small or noticeable change to a more sensitive landscape or more intensive change to a less sensitive landscape, affecting some key characteristics and the overall impression of its character.
Minor	Small change to a limited area of more sensitive landscape or a more widespread area of a less sensitive landscape, affecting few characteristics and not altering the overall impression of its character.
Negligible	Scarcely any perceptible change to the existing landscape.

5.34 Following the classification of an effect as detailed in Table 5.10 Significance of Landscape Effect, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Significance of Visual Effect

5.35 Determination of the significance of visual effects has been undertaken by employing professional judgement and experience to combine and analyse the magnitude of change against the sensitivity of the receptor. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

The levels of visual effects are described with reference to the four-point scale outlined in Table 5.11 Significance of Visual Effect below.

Table 5.11 Significance of Visual Effect

Classification	Criteria
Major	Substantial loss, alteration or replacement of existing components which causes a very noticeable change in the existing view.
Moderate	Whilst some existing characteristic components of the existing view remain, there is a noticeable change in the overall composition.
Minor	The GB Onshore Scheme would be visible in the view but would form a small component and the majority of the view would be unaffected.
Negligible	The GB Onshore Scheme would be scarcely perceptible in the existing view.

5.36 Following the classification of an effect as detailed in Table 5.11 Significance of Visual Effect, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Planning Policy & Applicable Legislation

National Planning Policy Framework

5.37 The revised National Planning Policy Framework (NPPF) was published in July 2018 which replaced the NPPF published back in March 2012. It sets out national planning policies that reflect priorities of the Government for England of the planning system and the economic, social and environmental aspects of the development. The NPPF has a strong emphasis on the achievement of sustainable development.

5.38 The NPPF outlines 12 core planning policies, one of which is conserving and enhancing the natural environment. This is of relevance to landscape and visual considerations as it sets out the requirement to protect and enhance natural and local environment.

Medway Local Plan 2003

5.39 The Medway Local Plan (Ref 5.3) was adopted in 2003 provides a framework for local planning policies that reflects priorities of Medway Council for guiding strategic development over the plan period. The policies which are relevant to the landscape and visual resource are outlined below:

- S4: Landscape and Urban Design: This general policy states that new development responds appropriately to its context specifically to the local character.
- BNE1: General Principles for Built Development: This policy outlines the requirement for careful consideration of site planning of new developments that respects existing features, landscape character and visual amenity of the surrounding area.
- BNE6: Landscape Design: states all major developments should include a structural landscape scheme to enhance the character of the locality including the retention of important existing landscape features such as trees and hedgerows.
- BNE22: Environmental Enhancement: This policy encourages development proposals that lead to the improvement of the appearance and environment of existing and proposed areas of development, transport corridor, open spaces and areas adjacent to the River Medway.
- BNE33: Special Landscape Areas: This policy states that development will only be permitted within the North Kent Marshes Special Landscape Area if it conserves and enhances the natural beauty of the area's landscape unless the economic and social benefits are so important to outweigh the county priority to conserve the natural beauty of the landscape.
- BNE43: Trees on Development Sites: This policy seeks to retain any trees, woodlands, hedgerows and other landscape features that provide valuable local character. It ensures that any tree loss is compensated on development sites.

5.40 Medway Local Plan (2018 to 2035) will set the future vision for Medway and replace the 2003 local plan. At the time of writing this assessment, the new local plan had not yet been adopted and as such the adopted policies contained in the 2003 local plan remain valid.

The Swale Borough Local Plan 2017

5.41 The Borough of Swale occupies a proportion of the study area to the east of the Project Area and as such the local planning policies related to the protection and enhancement of the landscape are relevant to this assessment. The relevant policies contained within the Swale Borough Local Plan 2017 (Ref 5.4) include:

- Policy DM 24 Conserving and Enhancing Valued Landscapes: This policy related to the value, character amenity and tranquillity of the Borough's landscapes. This policy outlines that development proposals to be considered in relation to the extent to which they would protect the local landscape character and enhance the future appearance of the designated landscape and, where relevant, its nature conservation interest.

Baseline Conditions

Project Area and Surrounding Context

Location and Site Context

5.42 The Project Area is located within Medway Council and is centred on the Isle of Grain located at the tip of the Hoo Peninsula between the Thames Estuary to the north and the Medway Estuary to the south. The Project Area is located to the west of the settlement of Grain. The only road access to the peninsula is from the B2001/ Grain Road. The Project Area is located on the fringes of industrial land and extends north/ northeast to the coast and is located approximately 0.5 km to the west of Grain.

Topography

5.43 Topography within the Project Area slopes from 14 m AOD in the east to 4 m AOD in the west. The marshland to the west of the Project Area extends to Allhallows is low lying at about 1-2 m AOD whilst the settlement of Grain sits on higher ground between 14-15 m AOD. Topography is shown on Figure 5.2.

Movement and Connectivity

5.44 The B2001/ Grain Road is the main road through the Project Area linking Grain to the A228. Access to the Project Area is via a small unnamed road which is connected to Grain Road. An alternative access is from West Lane which is routed along the northern boundary of the Project Area in a broadly east-west direction. There are also a number of private access roads to adjacent land. There are no Public Rights of Way (PRoW) within the Project Area, although there are several PRoW within the wider study area which are considered within the visual baseline.

Settlement and Land use

5.45 Land use within the Project Area and in the immediate vicinity is either in agricultural use or is brownfield land which has no current discernible use. The existing 400 kilovolt (kV) overhead line (OHL) which is broadly routed east to west generally marks the boundary between the extent of industrial or brownfield land and settlement or undeveloped coastal land. The small settlement of Grain is located to the southeast.

5.46 There are individual residential properties in the centre of and to the west (Rose Court Farm) of the Project Area. Land to the west of the Project Area is largely dominated by open marshland and grazing marsh extending to the arable farmland at Allhallows and Lower Stoke. The National Grid Liquefied Natural Gas (LNG) Terminal is located immediately south of the Project Area whilst to the south-east is a mix of vacant land and Grain Power Station.

Landscape Fabric of the Project Area

5.47 The landscape fabric of the Project Area consists of agricultural farmland and vacant land extending north to an area of woodland which continues to the coastline, to the west of Grain Coastal Park. The landscape fabric (physical character) of the Project Area is distinctly different and not representative of the key characteristics of the Allhallows to Stoke Marshes Landscape Character Area in which the Project Area is located.

5.48 The Project Area is largely contained by fragmented boundary vegetation (scrub and hedgerow) to the west and hedge with low post and wire fence to the south and east. The interface with the distinctive marshland to the west is somewhat diffuse and formed of; linear dykes, semi-natural scrub and wet pasture between the agricultural field and the core areas of marshland to the west where the tidal influence varies.

5.49 This interface between the two distinct areas is an important band of separation that helps to differentiate between the core character of the marshland landscape and the Project Area. There are two pylon towers within the Project Area, linked by the overhead line (OHL) that extends through the study area from Lower Stoke to Grain Power Station.

5.50 The combination of the OHL, pylons, Grain Power Station and the National Grid LNG Terminal and other industrial development form the backdrop to the south and south-east of the Project Area and have a strong bearing on the setting (refer to Figures 5.9a, 5.10a, 5.11a and 5.12a).

Landscape Designations

5.51 Landscapes can be given designations in recognition of their importance, natural beauty and distinct attractiveness. There are two landscape designations within the study area shown on Figure 5.3 and outlined below.

The North Kent Marshes Special Landscape Area

5.52 The North Kent Marshes Special Landscape Area (SLA) occupies the broad area of coastal marshlands extending over the northern and eastern coastline of the Isle of Grain, extending east across Swale estuary to the Sheppey Marshes and south across the Conyer, Luddenham, Graveny and Chetny Marshes.

5.53 The now archived Regional Planning Guidance (The South East Plan) removed the county-wide landscape protection designations of SLA. This designation was originally applied under the now archived Kent and Medway Structure Plan to a large proportion of Medway's North Kent Marshes as well as some tracts of adjacent farmland situated on the Hoo Peninsula. This designation recognised the special quality of this landscape in terms of its natural beauty.

5.54 The Medway Landscape Character Assessment 2011 recognises the 'special qualities of the North Kent Marshes SLA within relevant character areas and ensures that the high landscape value and distinctive quality of these areas continue to be recognised'. (Ref 5.5) The SLA designation is saved within the current Local Plan.

Areas of High Landscape Value (Swale level) - The Sheppey Court and Diggs Marshes

5.55 The Sheppey Court and Diggs Marshes is an area of landscape value recognised under the Swale Local Plan (Ref 5.4). The key characteristics and special qualities of this local designation are covered in the landscape character description of the Sheppey Court and Diggs Marshes Landscape Character Area.

National Landscape Character

5.56 The Project Area and the majority of the study area are located within the Greater Thames Estuary National Character Area (NCA Profile: 81). This national character area is 'predominantly a remote and tranquil landscape of shallow creeks, drowned estuaries, lowlying islands, mudflats and broad tracts of tidal salt marsh and reclaimed grazing marsh that lies between the North Sea and the rising ground inland. It forms the eastern edge of the London Basin and encompasses the coastlines of South Essex and North Kent, along with a narrow strip of land following the path of the Thames into East London.' There is a marked contrast between the wild and remote coastal marshes and the industrial and urban developments which are highly visible in the low-lying landscape. (Ref 5.6).

Local Landscape Character

5.57 The Isle of Grain and surrounding landscape fall within the Kent Landscape Assessment 2004 (Ref 5.7) which draws together all the existing character assessments of the county. The Project Area and surrounding context fall within the Medway Marshes Character Area.

5.58 The Medway Marshes are typically low lying and flat, with huge open skies and extensive views. To the north of the river, the marshes are dominated by the massive industrial complexes of Grain and Kingsnorth which sit in grand isolation amidst open marshland. This contrasts markedly with the more confined and industrial marshland landscapes of parts of the Thames Marshes and the more tranquil, pastoral landscape of the Swale Marshes. The southern Medway Marshes are much smaller and fragmented with a much less coherent character.

5.59 The majority of marshland is reclaimed and the traditional landcover is coastal grazing marsh, large areas of typically flat low-lying pasture with characteristic network of creeks and dykes to the west of the Isle of Grain. The landscape of the Medway Marshes has long been associated with industrial use. Large areas of the north Medway Marshes are now occupied by extensive industrial complexes, with their associated jetties, roads and rail links, while to the south of the river smaller-scale urban and industrial development has occurred in a piecemeal fashion along the immediate coastline where marshes now barely exist.

5.60 The saltmarshes, mudflats and grazing marshes of the Medway form an integral part of the North Kent estuarine and marshland habitat complex. The grazing marshes which separate Allhallows and the Isle of Grain and coastal mud flats in the north of the study area fall within the North Kent Marshes SLA.

5.61 The study area is covered by the Medway Landscape Character Assessment 2011 (Ref 5.5), and Swale Landscape Character and Biodiversity Appraisal 2011 (Ref 5.8). These documents identify the local Landscape Character Areas (LCA) which are considered as recognisable distinctions in landform, land use pattern, vegetation, historic and cultural features combined that lead to a unique sense of character. The key characteristics of each LCA have been refined within the study area to reflect the findings of the site surveys. The landscape character areas relevant to this assessment are shown on Figure 5.4, their key characteristics and judgements on landscape value are noted below.

Allhallows to Stoke Marshes

5.62 This LCA covers the majority of the central and western proportion of the study area and is predominantly comprised of marshland with large pockets of saltmarsh between Allhallows, Grain and Kingsnorth. This landscape has a strong historical influence. The relevant key characteristics are as follows:

- open, flat and expansive marshland landscape with open and expansive panoramic views across the Thames Estuary and to Southend-On-Sea;
- industrial development and infrastructure has a strong influence on the setting and back-cloth to the south and south east (at Grain and Kingsnorth);
- strong industrial influence with the OHL and pylons extend from Middle Stoke to Grain Power Station which marks the boundary of this LCA and is a strong vertical feature that contrasts with the flat open marshland;
- there are a number of historic military features to the north of Grain, including the Grain Foreshore flood defence wall, former mineral workings and earthworks to site Grain Fort;
- range of natural features such streams, pools, marshland and regenerating scrub with protected wildlife zones which contribute to a strong sense of place and is particularly distinctive in relation to the adjacent landscapes;
- substantial areas of water along Yantlett Creek at Stoke Marshes form a particularly distinctive landscape feature marking historic boundary between Isle of Grain and the Hoo Peninsula;
- the presence of water meandering to the coastline contributes to the strong sense of place built up by the complex arrangement of creeks, fleets and pools interrupted by the rectilinear dykes and sea walls further emphasising the sense of place and contributes to the relative sense of tranquillity experienced within this LCA;
- characteristic vegetation consists of extensive tracts of grazing marsh with isolated trees and pockets of scrub and managed grassland;
- this LCA also offers some recreational routes including Circular Walks of the Hoo Peninsula but there are not local paths or PRoW that link the main communities of Allhallows and Grain; and
- large pockets of salt marsh with varied habitats of wetlands and scrub habitats. Wild birds and grazing animals contribute to the noticeable overall biodiversity value.

5.63 The majority of this LCA is located within the North Kent Marshes SLA. This LCA demonstrates a number of high quality landscape elements that contribute to a strong sense of place, relative sense of tranquillity that is particularly representative of the special qualities of the SLA. Landscape value is therefore considered to be Medium.

Hoo Peninsula Farmland

5.64 This LCA occupies an area to the west of Allhallows and is generally characterised as a flat to undulating open farmland that extends beyond the study area and occupies the central part of the Hoo Peninsula. The relevant key characteristics are as follows:

- undulating, predominantly arable farmland with large open fields and little sense of enclosure. There are extensive views from elevated areas towards the Thames and Medway estuaries;
- weak landscape structure, lack of distinctive elements and overall coherence;
- mixed field boundaries consisting of fences, hedges, isolated trees and sparse hedgerows most of which are not particularly intact; and
- some detracting and discordant features including poor quality edges to farms and settlements, the influence of the road networks, OHL and pylons with prominent views to industrial areas at Grain and Kingsnorth.

5.65 This LCA does not lie within any designation and consists of a weak landscape structure therefore value is considered to be Low.

Lower Stoke Farmland

5.66 This LCA covers a small area at the western extent of the study area. This LCA is comprised of arable farmland to the south and east of Lower Stoke. Beyond the study area this character area runs east/ west between St Werhbugh to Middle Stoke. The relevant key characteristics are as follows:

- consists of open and undulating, arable farmland with medium scale fields;
- varied field boundaries range from hedgerows, isolated trees and fences and although more enclosed than the Hoo Peninsula farmland LCA, the field boundaries within the study area are noticeably fragmented; and
- strong industrial influence surrounding the southern edge of the LCA with large infrastructure and largescale complexes at Grain and Kingsnorth form a strong industrial backcloth to the south.

5.67 Although part of this LCA falls within the North Kent SLA it is not particularly representative of any of the special qualities. The landscape elements within the study area are relatively discordant therefore landscape value is considered to be Low.

St Mary's Farmland

5.68 This LCA covers a small portion at the north western extent of the study area. This landscape is comprised of mixed farmland from upper slopes with open elevated views north across the Thames Estuary. The medium to large scale rectilinear field patterns, with upper slopes form a contrast against the adjacent flat marshland fringe.

5.69 As shown on Figure 5.1, there would be no intervisibility between this LCA and the GB Onshore Scheme and as such would result in no change to the character of this LCA. Therefore the St Mary's Farmland LCA has been excluded from further assessment.

Urban/ Industrial Area

5.70 Although this area has no specific character classification or published characteristics, it occupies a noticeable portion of the study area and is strongly influenced by the presence of industry and infrastructure. This area is comprised of largescale industrial development associated with the energy infrastructure network as well as the residential settlement of Grain. The industrial developments including the National Grid LNG Terminal and Grain Power Station dominate the urban fabric of this area. There are however, remains of military defences along the western coastline of grain which are of historical and cultural importance. To the east of Grain the urban fabric is dominated by the industrial expanse within Sheerness extending south to Queenborough where large areas of hardstanding, wind turbines and dockyard prevail.

5.71 The Urban/ Industrial area is not designated, is dominated by industrial complexes, and the landscape value is considered to be Low.

Chetney and Greenborough Marshes

5.72 This LCA covers the south eastern extent of the study area. This landscape is an area of extensive coastal marshland comprised of grazing marsh, mudflats and broad skylines. The relevant key characteristics are as follows:

- extensive flat coastal marsh comprised of grazing marsh, saltmarsh, mudflats and including features of ditches and fleets;
- isolated and remote landscape with high degree of intervisibility between marshland and surrounding landscape which influence a sense of place;
- scattered trees with patches of vegetation cover;
- detracting features of overhead lines and major transportation routes across the landscape; and
- interrupted distant views by adjacent industrial complexes.

5.73 This LCA is predominantly located within the North Kent SLA. The LCA demonstrates a strong sense of place and the quality of the coastal marshland is kept isolated from human influence contributing to a relative sense of tranquillity and is particularly representative of the special qualities of the SLA. Therefore landscape value is considered to be Medium.

Elmley Marshes

5.74 The Elmley Marshes is a flat open expanse comprised of coastal grazing marsh with sinuous reed filled ditches. This landscape is a relatively unspoilt, natural and tranquil landscape, epitomised by open flat land with broad skies, few landscape features and an overriding sense of remoteness. This LCA occupies only a very small area at the edge of the study area adjacent to the Chetney and Greenborough Marshes. The proportion of this LCA within the study area is so peripheral to the overall character and impression of this LCA which extends south-east across the central part of the Isle of Sheppey. The qualities of this LCA within the study area are reflected in the characterisation and assessment of the Chetney and Greenborough Marshes LCA as such the Elmeny Marshes LCA is not considered further within this assessment.

Sheppey Court and Diggs Marshes

5.75 This LCA covers a small area to the south of Mile Town and east of Queenborough at the eastern periphery of the study area. This landscape is characterised by flat, low lying, open alluvial marshland with urban fringe and industrial complexes at its boundary. There are expansive views interrupted by industrial developments, major transportation routes and overhead lines that contain this LCA to the east, south and west.

5.76 This LCA is located within an area designated as of 'high landscape value (Swale level)' identified within the Swale Local Plan. However the GB Onshore Scheme would have little bearing on the character of this LCA due to the scale and mass of intervening industrial development and infrastructure. Therefore the GB Onshore Scheme would not result in significant effects as such this LCA is not considered for further assessment.

Minster Marshes

5.77 This is a rural landscape to the north west of the Isle of Sheppey characterised by the low-lying alluvial marshlands. This landscape is generally flat but gently rises to the south-east with long interrupted views. This LCA occupies a very small proportion of the eastern extent of the study area adjacent to the Sheppey Court and Diggs LCA. As is the case for the Sheppey Court and Diggs LCA the GB Onshore Scheme would have little bearing on the character of the Minster Marshes LCA due the scale and mass of intervening industrial development within Grain and Sheerness. Therefore this LCA is not considered for further assessment.

Summary of Landscape Baseline

5.78 The landscape baseline analysis has identified a number of landscape receptors that have the potential to be significantly affected by the GB Onshore Scheme. The special qualities relevant to the North Kent Marshes SLA are embedded within the key characteristics of each of the relevant local LCAs. Some of the local LCAs and the Sheppey Court Area of High Landscape Value are highly unlikely to be significantly affected and have therefore have been excluded from further assessment.

5.79 The landscape character areas considered for more detailed assessment include:

- Allhallows to Stoke Marshes;
- Hoo Peninsula Farmland;

- Lower Stoke Marshland;
- Industrial/Urban Area; and
- Chetney and Greenborough Marshes

5.80 The extent of impact on landscape character and significance is considered in subsequent sections of this chapter and Appendix 05.A.

Visual Baseline

Zone of Theoretical Visibility (ZTV)

5.81 In order to identify visual receptors and locations with the potential to have views of the GB Onshore Scheme, a ZTV has been produced as described below. The ZTV identifies those areas that have the potential to experience views of the GB Onshore Scheme and is illustrated on Figure 5.1. This has been used to inform the selection of representative viewpoints and to illustrate the potential influence of the GB Onshore Scheme in the wider landscape.

5.82 The ZTV map indicates areas from where it may be possible to view part of or the entire GB Onshore Scheme. However, the use of the map needs to be qualified by the following considerations:

- the ZTV is based on a bare ground model - Ordnance Survey (OS) Terrain 5 data based on a 5 m grid terrain model across the study area;
- screening from buildings taken from OS MasterMap has been included within first 2 km of the project area however, beyond 2 km the bare ground ZTV mapping is limited by the detail of the digital terrain model data used and does not take account screening from built form or vegetation;
- some areas of theoretical visibility may comprise woodland, or agricultural land, where there is effectively no public access and the likelihood of views being experienced is consequently low; and
- the ZTV does not take account of the likely orientation of a viewer, such as the direction of travel and there is no allowance for reduction of visibility with distance, weather or light.

5.83 These limitations mean that the ZTV map tends to overestimate the extent of the visibility, both in terms of the area from which the GB Onshore Scheme is visible and the extent of the GB Onshore Scheme which is visible. It should be considered as a tool to assist in assessing the theoretical visibility of the GB Onshore Scheme and not a measure of the visual effect.

5.84 The ZTV illustrates that the theoretical visibility of the GB Onshore Scheme would be widespread across the study area. However actual visibility is partially constrained by the presence of other industrial scale complexes particularly to the south and east. Nonetheless upper portions of the proposed 26 m high converter station would be widely visible but less distinguishable when viewed alongside larger industrial complexes. The extent of impact on visual amenity and significance is considered in detail in section 7 and Appendix 05.B.

Visual Receptors

5.85 Visual receptors within the scope of this assessment are described in the following section and are grouped into the following visual receptor categories:

- views from residential areas;
- views from recreational routes; and
- views from roads.

Views from Residential Areas

5.86 Grain is the main settlement within the study area and is adjacent to the Project Area. Views towards the Project Area are limited to those properties at the western and south-western extent of the settlement most notably those residential properties on West Lane and Grain Road. Views towards the Project Area from the majority of the settlement are contained by the immediate context of the buildings.

5.87 Allhallows, Lower Stoke and Middle Stoke are located to the west of the Project Area. Properties at the eastern edge of these settlements experience open long distance views east across farmland and marshland towards Grain, and the industrial complexes that extend across the backdrop of views to the east and south-east.

5.88 In addition to the main settlements on the Hoo Peninsula there are a number of properties typically grouped in linear clusters and isolated farmsteads located either along or connecting to Ratcliffe Highway. Many of these residential properties experience open and long distance views east, south-east and south across the undulating farmland landscape against a backcloth of industrial complexes at Grain and Kingsnorth.

5.89 Residential areas in Swale, on the Isle of Sheppey include Sheerness, Mile Town, Queenborough, Halfway Houses and Minster on Sea. Views towards the Project Area from these settlements are heavily filtered by the presence of industrial infrastructure that stretches along the western coastline of the Isle of Sheppey.

5.90 Views experienced from residential settlements are represented by Viewpoints 2, 4 and 5.

Views from Recreational Routes

5.91 The Saxon Shore Way is a 262 km historic long distance route from Gravesend to Hastings that offers a diversity of scenery. People using the section of this route within the study area experience wide angle views dominated by expanses of marshland bordering the Medway Estuary.

5.92 Walk 3-Allhallows Marshes is one of the Circular Walks of the Hoo Peninsula (Ref 5.9) and is a 7 km circular route accessed from the eastern edge of Allhallows. This route is comprised of flat unmade paths and tracks. Points of interest include Allhallows-on-Sea, Yantlett Creek and the London Stone. Views are typically expansive and panoramic across the North Kent Marshes SLA and extend north towards the Thames Estuary and Southend on Sea. Part of this route also follows the proposed coastal path between Grain and Woolwich (England Coast Path Stretch Grain to Woolwich GWO 1) which extends across the study area to Grain.

5.93 There are a number of PRoW concentrated in three principal areas within the study area. A few PRoW in the west of the area typically follow some farmland fields and link small clusters of residential areas to Allhallows where views are typical open and expansive across the Hoo Peninsula. In the central portion of the study area a number of PRoW provide access from Grain to a small section of the coastline and extend south to a jetty to the south of Grain Power Station where views are focused east along the coastline and towards Sheerness. There is no PRoW or recreational route across the marshlands that connect Allhallows to Grain. The PRoW within the eastern portion of the study area is largely concentrated within the urban context of Sheerness with occasional routes across farmland such as Furze Hill where there are more elevated views across the Isle of Sheppey.

5.94 All of the recreational Routes and PRoWs are shown on Figure 5.5.

5.95 Views experienced from recreational routes are represented by Viewpoints 1, 3, 6, 7, 8 and 9.

Views from Roads

5.96 The B2001/ Grain Road is the main route within the study area linking the settlement of Grain to the rest of the Hoo Peninsula. Views experienced from this road vary from long distance and open views across the marshland landscape to views dominated by the scale and mass of industrial complexes in close proximity. Views towards the Project Area are partially interrupted by intervening development and fragmented road corridor vegetation.

5.97 Views from West Lane and other local roads are low level and typically interrupted by either sporadic patches of vegetation to the west or by intervening buildings. There are occasional longer distance views from West Lane across the vacant land within the Project Area. Stoke Road connects the residential settlement of Allhallows, Lower Stoke and Middle Stoke. Sections of this road experience open views across arable farmland and marshland towards the Project Area. The industrial complexes that occupy large swathes of the Isle of Grain coast are prominent across the backdrop of easterly views.

Representative Viewpoints

5.98 A total of nine representative viewpoints have been selected by ZTV and site based analysis to represent the visual receptors detailed above. These viewpoints have been agreed with the statutory consultees and are shown on Figure 5.6 and are identified in Table 5.12 Representative Viewpoints below.

Table 5.12 Representative Viewpoints

Viewpoint	Receptor Type	Easting	Northing
1 - Grain Coastal Park	Recreational	589078	176926
2 - West Lane	Residential	588328	176613
3 - Circular Walk 3-Allhallows Marshes	Recreational	585870	177537
4 - Stoke Road	Residential	583442	177143
5 - Ratcliffe Highway	Residential	582861	177572
6 - Saxon Shore Way	Recreational	584986	169149
7 - Queenborough Coastal Path	Recreational	590321	172726
8 - Riverside Country Park	Recreational	580806	168446
9 - Furze Hill	Recreational	592762	172062

Viewpoint 1: Grain Coastal Park

5.99 This viewpoint is representative of recreational users of Grain Coastal Park. This is a popular area used by the local community for coastal walks where the primary focus of views is along the coastline and north towards Southend-On-Sea. Foreground views north and north-west extend from the coastal defences along the coastline extending across the Thames Estuary. The taller buildings within Southend-On-Sea and the south Essex coastline form the backdrop of the view. This is a dynamic view strongly influenced by the changing tides where the extent of mudflats is more obvious at low tide and the movement of large container ships are a frequent occurrence in views. This is a well composed view across the North Kent Coastline, offers a mix of scenic elements typical of the North Kent SLA as well as some detracting features. On balance value is considered to be Medium.

Viewpoint 2: West Lane

5.100 This viewpoint is representative of residential receptors at the western extent of Grain along West Lane and the B2001/ Grain Road. Residents experience long range expansive views across the landscape towards Allhallows. Foreground views of the adjacent vacant land are partially interrupted by sporadic vegetation. The gently rising foreground obscures the lower lying marshland landscape before the land gently rises again to the farmland and built form within Allhallows that forms the backdrop of the view. The height and contrasting scale of the electrical pylons and OHL alongside the Tanks at the National Grid LNG Terminal tend to dominate the focus of views and as such value is considered to be Low.

Viewpoint 3: Circular Walk 3-Allhallows Marshes

5.101 This viewpoint is representative of recreational users of the Allhallows Marshes Circular Walk (Walk 3 of the Hoo Peninsula Walks) (Ref 5.9). This viewpoint offers long distance and panoramic views across a distinctive part of the North Kent Marshes SLA comprised of dykes, grazing marsh, creeks and grasslands that occupy the foreground in all directions. Mid-ground views north extend across the mouth of the Thames Estuary with views of Southend-On-Sea. Views south-east towards the Project Area are dominated by the presence of the pylons and OHL and storage tanks at the National Grid LNG Terminal that extend across a noticeable horizontal extent of the mid-ground. Other tall industrial infrastructure including stacks at Grain Power Station, wind turbines at Queenborough and the distinctive container gantry cranes at London Thamesport form the south-eastern and southern backdrop of the view. The appearance of such infrastructure only appears beyond the pylons and OHL which appear to contain the extent of the industrial development whereas views to the east experience big skies and a largely uninterrupted skyline. This viewpoint demonstrates many of the scenic aspects of the North Kent

Marshes SLA and views north are particularly well composed. However a noticeable proportion of the mid-to-background view is dominated by the scale and mass of industrial complexes. On balance value is considered to be Medium.

Viewpoint 4: Stoke Road

5.102 This viewpoint is representative of residential receptors at the southern extent of Allhallows along Stoke Road. Views are typically open and expansive. Foreground views extend east across the arable farmland and gently fall to the low lying marshland. Mid-ground views across the marshland area are punctuated by pockets of scrub vegetation and occasional trees that extend across the horizontal extent of views. The background is comprised of large scale industrial development including the pylons and OHL, large cylindrical storage tanks at the National Grid LNG Terminal, the series of stacks at Gain Power Station and gantry cranes at London Thamesport that extend across half of the horizontal extent of the view to the south. Background views to the north of the pylons and OHL remain uninterrupted and extend seaward where cargo ships sailing to and from ports is a distinguishable feature on the skyline. Mid to long distance views north demonstrate some of the more scenic aspects of the North Kent Marshes SLA. However the scale and mass of the storage tanks at the National Grid LNG Terminal and industrial backcloth is prominent therefore value is considered to be Low.

Viewpoint 5: Ratcliffe Highway

5.103 This viewpoint is representative of residential receptors located on and adjacent to Ratcliffe Highway. Views from this location are slightly elevated and offer open and expansive vistas towards the coastline and the industrial complexes that extend across the Isle of Grain. The primary focus of views is north to north-east across the mouth of the Thames Estuary where the Southend-On-Sea coastline forms the backdrop of the view. Views south-east towards the Project Area extend across the arable fields that occupies the foreground before the land falls away into the mid-distant low level marshland. The expanse of industrial complexes including pylons and OHL, storage tanks at the National Grid LNG Terminal, stacks at Grain Power Station, container gantry cranes at London Thamesport and other structures extend across half of the horizontal extent of the background view. The storage tanks and other industrial structures are seen alongside the residential properties at Grain and provide an indication of the contrast in scale. The expansive relatively undisturbed skyline to the north is representative of the more scenic quality experienced within the North Kent Marshes SLA. However this is seen alongside the large scale industrial development that strongly influences the background to the east and south. Taking this into account value is considered to be Medium.

Viewpoint 6: Saxon Shore Way

5.104 This viewpoint is representative of the open and long distance views experienced by people using the Saxon Shore Way. This section of this long distance route offers open and long distance views north across the Greenborough Marshes towards the Hoo Peninsula. Foreground views extend north across the marshlands to the Medway Estuary which then terminate at the Isle of Grain where a backcloth of industrial development extends across the background of the view. Industrial scale development at Grain Power Station, BP terminal and London Thamesport where the four blue container gantry cranes are particularly distinctive tall structures on the skyline. Large scale industrial developments on the Isle Sheppey including wind turbines at Queenborough are also visible in the background to the north-east. Extensive views of the open distinctive marshland demonstrate many of the more scenic elements of the North Kent Marshes SLA and are the main focus of views whilst the presence of the industrial backcloth reduces the overall quality and composition. Taking this into account value is considered to be Medium.

Viewpoint 7: Queenborough Coastal Path

5.105 This viewpoint is representative of recreational users using the local coastal path and waterfront at Queenborough. This location is a well-used PRoW at the edge of the sea defence wall and offers wide angle, long distance views west across the mudflats of the Medway Estuary at the edge of Queenborough. The flood wall itself contains views east and north-east. The immediate focus of views is of the dynamic mudflats of the estuary with boats and other watercraft that extend from fore-to-mid ground. The large structures at the industrial complexes on the Isle of Grain including the blue container gantry cranes at London Thamesport, stacks at Grain Power Station and the storage tanks at the National Grid LNG terminal extend across the full horizontal extent of the background view. Given the scale and close proximity of the industrial complexes that extend across the view, value is considered to be Low.

Viewpoint 8: Riverside Country Park

5.106 This viewpoint is located at the viewpoint platform at the Riverside Country Park, Rainham and is representative of people visiting the park and users of this section of the Saxon Shore Way. This location offers panoramic views of the park and beyond, however the primary focus of the view is north across the Medway Estuary. Foreground views north extend from the path network to the saltmarsh islands and meandering creeks across the mid-ground and beyond to Darnet Fort, Nor Marsh and the wider Medway Estuary. The tall structures at the industrial complexes Kingsnorth on the Isle of Grain and Queenborough including power station stacks, container gantry cranes at London Thamesport and wind turbines form the backdrop of views and punctuate the skyline. Elements in the view are of historical importance and the fore-to mid-ground is relatively well composed however the scale and horizontal extent of industrial complexes are prominent features across the background. On balance value is considered to be Medium.

Viewpoint 9: Furze Hill

5.107 This viewpoint is representative of recreational users of this PRoW and is located at the top of Furze Hill where views are relatively elevated and panoramic across the Isle of Sheppey. Agricultural fields occupy the immediate foreground in every direction and views north towards the Project Area slope down towards the residential area of Halfway Houses. The Sheppey Court and Diggs Marshes occupy the area between the Halfway Houses and Sheerness where the comparatively larger scale industrial developments extend south from Garrison Point to Queenborough where the four wind turbines punctuate the skyline. Beyond the Isle of Sheppey the industrial complexes on the Isle of Grain extend across the backdrop of the view. Largescale industrial development occupies almost all of the background view in every direction. Elevated views from this location are not particularly well composed and large industrial complexes are prominent in all directions therefore value is considered to be Low.

Future Baseline

5.108 The future baseline considers future conditions of the Project Area and study area should the GB Onshore Scheme not come forward in the context of the surrounding landscape. Overall there would be very limited change to the future landscape and visual baseline. It is anticipated that there would be no discernible change within the majority of the landscape immediately west of the site given the presence and proximity of the North Kent Marshes SLA which is protected under the Local Plan. The potential for future change to the landscape and visual receptors within the study area would likely be limited to the expansion of other industrial development within the existing complexes to the south and south-east of the Project Area which would further reinforce the existing character. Taking this into account there would be no substantial change to the sensitivity of the landscape and visual receptors between the existing and future baseline.

Potential Impacts

Sources of Potential Construction Effects

5.109 Potential effects at the construction phase of the proposed converter station, substation and DC cable route would be most noticeable within the Allhallows to Stoke Marshes LCA which includes potential effects on the landscape fabric of the Project Area.

5.110 Construction activities would introduce a number of new elements into the landscape and the greatest potential for significant effects would primarily arise from the loss of existing landscape features and the visibility of construction activities associated with the proposed converter station and substation. Construction activities related to the DC cable route could also directly affect the existing fabric of the North Kent SLA including the coastal mudflats and marshland habitats.

5.111 The potential for temporary impacts on the landscape and visual resource of the study area may arise from the activities detailed in Chapter 03. Temporary impacts associated with the installation of the DC cable route would be experienced over 1 year whereas construction of the converter station and substation would be experienced within a 3 year construction period. The main construction activities are summarised below:

- preliminary works;
- site establishment;
- earthworks;
- civil engineering works;
- building works;
- cable installation;
- provision/ installation of permanent services;
- mechanical and electrical works;
- commissioning;
- access and traffic within the site and to the site and
- site reinstatement and landscape works.

Sources of Potential Effects at Operation (Year 1) and Operation (Year 15)

5.112 The potential for long-term, operational and permanent impacts on the landscape and visual resource of the study area may arise from the introduction of the converter station and substation. These are considered to be permanent features within the landscape and in views which would be apparent for the long-term.

5.113 The operational elements with the potential to affect the landscape and visual receptors within the study area include the permanent buildings, outdoor equipment and associated infrastructure as detailed in Chapter 03: Proposed GB Onshore Scheme, Table 3.1.

5.114 The greatest potential for significant effects on landscape and visual receptors would primarily arise from:

- Physical effects within the Project Area and direct effects on the landscape fabric of the Project Area and the Allhallows to Stoke Marshes LCA including the loss of characteristic landscape elements and the introduction of uncharacteristic elements;
- Effects on the character and setting of the North Kent Marshes SLA;
- The combination of all the project components could also affect the setting of the neighbouring character areas by appreciably extending the influence of the industrial complexes within the Hoo Peninsula and fragmenting the more scenic elements of the marshland landscape; and

- Visibility of the proposed converter station and substation which are likely to be prominent features on the skyline within the open flat and expansive marshland landscape from residential settlements and recreational routes.

5.115 Following installation of the proposed DC cables all areas of the DC cable will be reinstated. There would be no perceptible change to the landscape and visual receptors during operation and maintenance of the DC cables.

Sources of Potential Effects at Decommissioning

5.116 The scale and nature of activities undertaken during decommissioning would be similar to those described previously for construction, however they would be temporary during the period of decommissioning activities on site. Following the removal of the structures and the reinstatement of the land there would be no further potential effects to the landscape and visual amenity.

Mitigation

Overview

5.117 Chapter 02 describes the alternatives that have been considered as part of the initial design process which led to the siting of the proposed GB Onshore Scheme. The siting will be further refined as part of the detailed design stage. Integral to the evolution of the design has been the iterative process to design and assessment which the LVIA has been embedded from feasibility through consultation to design refinement and the submitted design. From the outset, landscape and visual considerations have informed the siting and design of the various components of the GB Onshore Scheme to ensure that the submitted design proposals respond as sensitively as possible to the landscape and visual resource. Landscape Design Mitigation is shown on Figure 5.7a and 5.7b.

Medway Landscape Character Assessment – Allhallows to Stoke Marshes LCA Guidelines

5.118 The approach to embedded mitigation takes account of the guidelines set out in the Landscape Character Assessment - Allhallows to Stoke Marshes LCA (Ref 5.5. Page 96).

5.119 In response to these guidelines the landscape mitigation design:

- takes into account wetland creation linked to storage capacity through the Sustainable Drainage System (SUDS), including an attenuation pond, swale and dry attenuation basins;
- respects the open remote character of the marshland landscape and seeks to reduce the visual intrusiveness through careful siting of the larger buildings and the introduction of water tolerant planting that suits the character of the open marshland;
- reinforces the interface with the coastal grazing marshes; and
- vegetation and ditches (proposed swale) improves the strength of the boundary features along the western boundary of the Project Area.

5.120 Specific aspects of the design evolution and landscape mitigation design considerations are summarised below.

Siting, Orientation and Massing

5.121 The siting of the converter station and substation within the Project Area has been informed by the design development and assessment process. The location of the proposed converter station and substation has been located as close as possible alongside the existing industrial development at the National Grid LNG terminal and away from the majority of residential properties in Grain. The proposed siting and massing of converter station and substation alongside the existing industrial complexes and the proposed landscape reinstatement would improve the landscape fit and therefore reduce potential impacts on the setting of the North Kent Marshes SLA and Allhallows to Stoke Marshes LCA.

Boundary Vegetation and Landform

5.122 Appropriate boundary vegetation within the Project Area has been developed to improve the interface between the built edge of the converter station and substation and the transition to the adjacent marshland landscape. The combination of boundary vegetation on a slightly raised earth mound would also help to reduce the overall scale and mass of the proposed building façades. The proposed selection of scrub and wetland species has been developed in conjunction with ecologists and makes reference to the landscape character guidelines set out to improve and restore the characteristic feature of the Allhallows to Stoke Marshes LCA.

Access

5.123 The proposed location and working width of the primary access road has been selected in part to minimise physical impacts on the Project Area and the immediate context. The proposed route and 5.5 m working width would be in keeping with the existing landscape pattern and layout with a simple connection to the B2001/ Grain Road.

Drainage and Habitat Creation

5.124 The outline Landscape Plan has been developed to enhance the biodiversity found within the Project Area. The introduction of a SUDS detention basin, attenuation pond and swale each planted with marginal wetland species will create a green corridor and more complex vegetation structure and improve the biodiversity value within the Project Area.

Residual Impacts

5.125 This section presents the findings of the landscape and visual effects assessment for the construction and operational phases of the GB Onshore Scheme. A detailed assessment of landscape and visual effects is provided in Appendix 05.A Landscape Assessment and Appendix 05.B Visual Assessment. The following section therefore, provides a summary of the likely significant effects during construction, operation and maintenance and decommission on the landscape and visual resource. The sensitivity of the landscape and visual receptors between the existing and future baseline is not considered to change as explained in section 5.108 and therefore not considered further in the assessment of effects.

5.126 This section should be read in conjunction with the following appendices, figures and visualisations:

- Appendix 05.A –Landscape Assessment;
- Appendix 05.B – Visual Assessment; and
- Figures 5.1 – 5.16.

Effects on the Landscape Fabric

5.127 Effects on the landscape fabric relate to the physical effects on the fabric of the Project Area such as changes to the land cover and use. Physical effects are found only on the Project Area where existing landscape elements may be removed or altered by the introduction of the proposed converter station and substation and the DC cable route corridor including the landfall. The detailed assessment of effects on the landscape fabric is inherent within the assessment of the local character area and is therefore contained within the assessment of effects on the Allhallows to Stoke Marshes LCA.

Effects on Landscape Designations during Construction

North Kent SLA

5.128 As described in section 5.54 the Medway Landscape Character Assessment recognises the special qualities of the North Kent Marshes SLA through the key characteristics of the relevant LCAs. Construction activities within the SLA are limited to those associated with the DC cable route and subsea cable (to MLWS) across a narrow corridor of the coastal mudflats leading to the landfall site. The increased sense of activity in the estuary would result in a very limited change to the special qualities and overall impression of the character of the North Kent SLA and would not result in significant effects on the natural beauty of the landscape of this designated area.

Landscape Effects during Construction

5.129 Significant landscape effects are predicted at one of the five LCAs assessed; Allhallows to Stoke Marshes LCA. The other four LCAs would not result in significant landscape effects during construction. The detailed assessment of landscape effects is contained within Appendix 05.A.

Allhallows to Stoke Marshes LCA

5.130 Overall sensitivity of this LCA is considered to be Medium. Construction activity related to the proposed converter station and substation would be located within this LCA at the eastern edge resulting in effects on both the landscape fabric and character.

5.131 Construction activities would be concentrated at the eastern edge, adjacent to the National Grid LNG terminal complex where extensive earthworks to create the platform, storage of materials, lay down areas, movement of plant and operation of cranes would be more apparent. However the area of land occupied by construction activities is somewhat physically detached from the majority of this LCA due to pockets of boundary vegetation, land use and most notably higher topography with very limited access. Therefore construction activities would be confined to a small portion of this LCA and concentrated away from the core area of the marshland where there would be no change to the most distinctive elements of the landscape fabric.

5.132 The presence and scale of activity would have a noticeable bearing on the setting and perceptual quality of this LCA. In particular the scale and intensity of activity would reduce the existing level of tranquillity experienced and is more prevalent in eastern areas.

5.133 Construction activities related to the DC cable route corridor would result in temporary physical changes to the fabric of the landscape and character within a very small footprint to the north-east of this LCA. Construction of the intertidal section of the subsea cable route (to MLWS) would extend across the distinctive mudflats which are a characteristic feature of the North Kent Marshes SLA. Construction activities would extend from the intertidal mudflats leading to the landfall site and within the corridor for the proposed DC cable route leading to the proposed converter station and would further increase the scale and extent of activity within the landscape and North Kent Marshes SLA.

5.134 Activities associated with the onshore length of the DC cable route would include the movement of plant and earthworks required for open cut trenches within a 30 m wide corridor between the proposed converter station and the landfall at the eastern extent of this LCA.

5.135 Overall construction activities would affect some of the key characteristics and special qualities across a noticeable portion of the landscape. However there would be no physical change to the distinctive core landscape elements of the marshland landscape. On balance the magnitude of change is considered to be Medium.

5.136 The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Visual Effects during Construction

5.137 Three of the nine viewpoints assessed would result in significant construction effects on visual amenity of residential and recreational receptors represented by:

- Viewpoint 2- West Lane;
- Viewpoint 3- Circular Walk 3-Allhallows Marshes; and
- Viewpoint 4- Stoke Road.

5.138 The main source of significant effects would result from the contrasting nature and scale of construction activity and its prominence within relatively close proximity of the views. Significant visual effects are experienced within 4 km of the construction of the proposed converter station and substation.

5.139 The predicted influence of construction activity at the other six viewpoints is less distinguishable largely due to a combination of more distant locations (beyond 4 km) where the extent of view occupied by construction activity was contained by and seen alongside existing industrial complexes. Visual effects from these six viewpoints were predicted to be Minor adverse or Negligible and therefore not significant. The detailed assessment of visual effects is contained within Appendix 05.B.

Significant Visual Effects from Residential Areas

5.140 Residential receptors at the western edge of Grain and along the B2001/ Grain Road are represented by Viewpoint 2- West Lane where overall visual sensitivity is considered to be Medium.

5.141 Construction activity at the proposed converter station and substation site would be prominent in mid-range views across half of the horizontal extent of views. The majority of the tallest building works associated with the converter station and substation would be contained between the National Grid LNG Terminal and the OHL however lay down areas and civil engineering works associated with the proposed cable sealing end compound would extend north of the OHL.

5.142 Construction activity associated with the DC cable route corridor would occur in incremental lengths of 800 m with a 30 m wide construction corridor in close proximity and adjacent to West Lane and a number of properties along the B2001/ Grain Road and would temporarily dominate the focus of close range views.

5.143 The overall magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

5.144 Residential receptors on Stoke Road are represented by Viewpoint 4- Stoke Road where overall visual sensitivity is considered to be Medium. Construction activities at the converter station and substation would be noticeable in distant views across a small section of the background mostly between the OHL and the National Grid LNG Terminal.

5.145 Construction activities related to the proposed DC cable route would be barely perceptible across the distant background of the view.

5.146 Overall, the open expansive nature of the marshland landscape and the seaward views would remain undisturbed key features and the magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Significant Visual Effects from Recreational Routes

5.147 Significant effects on views from recreational routes are predicted along sections of a local recreational route through Allhallows Marshes, represented by Viewpoint 3- Circular Walk 3- Allhallows Marshes where sensitivity is considered to be Medium.

5.148 Construction activity at the converter station and substation would appear in mid-range views between the OHL and the National Grid LNG Terminal against the backdrop of more distant industrial complexes. Construction activities would also appear to the north of the OHL at the proposed cable sealing end compound. The extent of construction activities visible would be more prominent in closer proximity sections of this walk. Construction activities would be highly noticeable and would distract from the visual amenity across a noticeable horizontal extent of the view.

5.149 Construction activities related to the proposed DC cable route including movement of plant along incremental lengths of 800 m across a 30 m wide corridor would be perceptible in the background extending from the coast to the substation against the backdrop of the distinctive marshland landscape.

5.150 Overall the magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Effects on Landscape Designations at Operation (Year 1)

North Kent SLA

5.151 As described in section 5.54 the Medway Landscape Character Assessment recognises the special qualities of the North Kent Marshes SLA through the key characteristics of the relevant LCAs. At year 1 of operation the GB Onshore Scheme would result in little perceptible change to the special qualities and overall impression of the character of the North Kent SLA and would not result in significant effects on the natural beauty of the landscape of this designated area.

Landscape Effects at Operation (Year 1)

5.152 There would be no significant landscape effects predicted at any of the five LCAs assessed. Significant landscape effects during the construction phase at the Allhallows to Stoke Marshes LCA would have reduced. The detailed assessment of landscape effects is contained within Appendix 05.A.

Allhallows to Stoke Marshes LCA

5.153 The operational converter station and substation would occupy an area within this LCA but outside of the North Kent Marshes SLA. Therefore the proposed converter station and substation would result in physical changes to the landscape fabric however changes to the special qualities of the SLA would be limited to the setting and perceptual aspects. The strong sense of place, open and panoramic views of the coastline and distinctive landscape elements would all remain intact.

5.154 The operational DC cable route corridor would be reinstated and no permanent structures would remain in the landscape. Therefore the completed DC cable route would have no bearing on this LCA. The overall magnitude of change is considered to be Low. The magnitude of change, assessed alongside the sensitivity would result in a Minor Adverse effect, which is not considered significant.

Visual Effects at Operation (Year 1)

5.155 At year 1 of operation three of the nine viewpoints assessed would result in significant effects on visual amenity of residential and recreational receptors represented by:

- Viewpoint 2- West Lane;
- Viewpoint 3- Circular Walk 3-Allhallows Marshes; and
- Viewpoint 4- Stoke Road.

5.156 The main source of significant effects would result from the contrasting scale and mass of the converter satiation and substation and its prominence within relatively close proximity of the views. Significant visual effects are only experienced within 4 km of the converter station and substation.

5.157 The predicted influence of the proposed converter station and substation at the other six viewpoints is less distinguishable largely due to a combination of more distant locations (beyond 4 km) where the extent of view occupied by the proposed converter station and substation was contained by and seen alongside existing industrial complexes.

5.158 The proposed DC cable route would be reinstated and would have no bearing on views.

5.159 Visual effects from these six viewpoints were predicted to be Minor adverse or Negligible and therefore not significant. The detailed assessment of visual effects is contained within Appendix 05.B.

Significant Visual Effects from Residential Areas

5.160 Residential receptors at the western edge of Grain and along the B2001/ Grain Road are represented by Viewpoint 2- West Lane where overall visual sensitivity is considered to be Medium. At year 1 of operation the proposed converter station and substation would occupy a noticeable proportion of mid-range views but contained between the taller National Grid LNG Terminal storage tanks and the OHL. The substation would be noticeable against the façade of the converter station alongside outdoor electrical equipment. The proposed converter station and substation would be immediately visible in mid-range views strongly associated with the existing industrial facilities but would be prominent albeit oblique to the main focus. Taking all of this into account, the magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

5.161 Residential receptors on Stoke Road are represented by Viewpoint 4- Stoke Road where visual sensitivity is considered to be Medium. At year 1 of operation the proposed converter station and substation would occupy a noticeable horizontal extent of the background view between the OHL and National Grid LNG Terminal storage tanks. However the height of the proposed converter station and substation would appear smaller than the adjacent National Grid LNG Terminal storage containers. The open marshland landscape that fills the majority of the background view north would remain unaffected. The magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Significant Visual Effects from Recreational Routes

5.162 Significant effects on views from recreational routes are predicted along sections of a local recreational route through Allhallows Marshes, represented by Viewpoint 3- Circular Walk 3-Allhallows Marshes where sensitivity is considered to be Medium. At year 1 of operation the scale and mass of the proposed converter station and substation would be noticeable across a horizontal extent between the taller OHL and National Grid LNG Terminal storage tanks which is associated with lower quality elements within the view. Overall the proposed converter station and substation would not compromise the more scenic and attractive quality of marshland and seaward views. The magnitude of change is considered to be Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Effects on Landscape Designations at Operation (Year 15)

North Kent SLA

5.163 At year 15 of operation the GB Onshore Scheme would result in little perceptible change to the special qualities and overall impression of the character of the North Kent SLA and would not result in significant effects on the natural beauty of the landscape of this designated area.

Landscape Effects at Operation (Year 15)

Landscape Effects at Operation (Year 15)

5.164 There would be no significant landscape effects predicted at any of the five LCAs assessed. The Allhallows to Stoke Marshes LCA, the landscape in which the proposed converter station and substation is located would not result in significant landscape effects. The detailed assessment of landscape effects is contained within Appendix 05.A.

Allhallows to Stoke Marshes

5.165 Physical changes to the landscape fabric of the Allhallows to Stoke Marshes LCA would be the same at year 1 of operation. However the establishment of vegetation would help to reduce the scale and mass of proposed buildings and subsequently reduce the influence of the proposed converter station and substation would have on this LCA. The boundary vegetation would provide a transitional interface between the marshland landscape and the proposed converter station and substation. The resulting impression would be that the proposed converter station and substation would no longer be associated within the character of this LCA. The establishment of native scrub and wetland vegetation would improve the strength of the boundary vegetation and biodiversity at the interface between proposed converter station and substation site and the core of the marshland landscape. The most integral characteristics and high quality elements of the landscape would remain intact. The magnitude of change is considered to be Low. The magnitude of change, assessed alongside the sensitivity would result in a Minor Adverse effect, which is not considered significant.

Visual Effects at Operation (Year 15)

5.166 At year 15 of operation only one of the nine viewpoints assessed would result in significant effects on visual amenity of residential receptors represented by Viewpoint 2- West Lane.

5.167 The magnitude of change and significance of visual effects predicated at year 1 of operation at Viewpoints 3 and 4 would have reduced from Moderate Adverse to Minor Adverse due to the establishment of mitigation planting. Scrub and woodland edge vegetation would partially screen lower level buildings which would help to assimilate the proposed converter station and substation into the landscape and subsequently the view. Established vegetation would also break up the built façade, reduce the sense of scale and mass of the taller buildings within the converter station platform and reinforce the delineation between the open marshland landscape and the industrial complexes.

5.168 At the other six Viewpoints the proposed converter station and substation would remain less distinguishable due to a combination of more distant locations (beyond 4 km) where the extent of the view occupied by the proposed converter station and substation was seen alongside existing industrial complexes. The proposed DC cable route would be reinstated and would have no bearing on views. Visual effects from these six Viewpoints were predicted to be Minor Adverse or Negligible and therefore not significant. The detailed assessment of visual effects is contained within Appendix 05.B.

Significant Visual Effects from Residential Areas

5.169 Residential receptors at the western edge of Grain and along the B2001/ Grain Road are represented by Viewpoint 2- West Lane where overall visual sensitivity is considered to be Medium. At year 15 of operation once vegetation has established there would be a linear belt of low level scrub and woodland edge that would extend across part of the horizontal extent of the view to the north-west the proposed converter station and substation. However the scale and extent of change would remain same as at year 1 and the magnitude of change would remain Medium. The magnitude of change, assessed alongside the sensitivity would result in a Moderate Adverse effect, which is considered significant.

Landscape and Visual Effects during Decommissioning

5.170 The scale and nature of activities undertaken during decommissioning would be similar to those described previously for construction. It is anticipated that below ground cables would remain in situ which would further limit the duration and extent of decommissioning activities. Following the removal of the structures and the reinstatement of the land there would be no long-term effects to the landscape and visual receptors.

Cumulative Effects

5.171 This section considers the potential for cumulative landscape and visual effects to occur as a result of the GB Onshore Scheme. Not all of the proposed cumulative developments contained within the long list set out in Chapter 12, Table 12.2 would result in significant landscape and visual cumulative effects. These developments have been excluded on the basis that they are not of the same type or similar scale or nature to the GB Onshore Scheme and do not have the potential to result in significant cumulative effects.

5.172 The following cumulative schemes are shown on Figure 12.1 and have been included in the assessment of inter-project cumulative landscape and visual effects:

- A new lattice tower (50 m tall) north of the proposed substation;
- Down leads from the tower direct to the substation;
- Down leads to the proposed cable sealing end compound (25 m x 25 m) via the proposed gantry (14 m tall); and
- Phase 1 of an outline planning application for the development of a business park management centre, Grain Road Rochester Kent ME3 0AE,

5.173 Potential cumulative effects during construction have been scoped out of the assessment as it is considered that there would be very little discernible difference between impacts associated with construction of the GB Onshore Scheme on its own and those associated with construction of the GB Onshore Scheme and the cumulative schemes together. The following inter-project cumulative assessment therefore focuses on potential inter-project cumulative landscape and visual effects at the operational stage only.

Cumulative Landscape Effects

5.174 The potential for significant cumulative landscape effects would be limited to the landscape fabric of the Project Area and the Allhallows to Stoke Marshes LCA. Overall the GB Onshore Scheme in combination with the cumulative schemes would result no distinguishable difference in intervisibility with the adjacent LCAs. The inclusion of the Phase 1 development of the business park management centre within this cumulative scenario in particular would reinforce the industrial setting of the Project Area. Given the existing context and the non-cumulative assessment, there would be no perceptible change to the key characteristics and would not result in significant cumulative effects. Therefore the cumulative landscape assessment has been limited to the Allhallows to Stoke Marshes LCA as detailed below.

Allhallows to Stoke Marshes LCA

5.175 This LCA is considered to be of Medium sensitivity as detailed in the non-cumulative assessment set out in Appendix 05.A Table 1.

5.176 The operational GB Onshore Scheme in combination with the cumulative schemes would very slightly increase the industrial influence within this LCA. The Phase 1 business park and management centre would further reinforce the industrial nature of the backdrop and setting of this LCA whereas the lattice tower and down leads would physically link the cumulative schemes to components of the GB Onshore Scheme, in particular the substation and cable sealing end compound. However, the majority of the more valued landscape elements of this LCA, in particular the balance of marshland features and creeks would remain unchanged. Overall the sense of place and distinctive qualities would remain largely intact. Therefore the cumulative magnitude of change is considered to be Very Low.

5.177 The magnitude of cumulative change, assessed alongside the sensitivity would result in a Negligible cumulative effect, which is not considered significant.

North Kent SLA

5.178 The cumulative developments are outside of the North Kent SLA and as such there would be no change to the fabric of the SLA or the majority of its setting and therefore no cumulative effects are predicted.

Cumulative Visual Effects

5.179 The cumulative schemes would be barely perceptible from more distant visual receptors where residual effects are predicted to be minor adverse and negligible as illustrated by viewpoints 1,5,6,7, and 9. These visual receptors (representative viewpoints) are unlikely to result in cumulative significant effects and are not considered for detailed cumulative assessment.

5.180 The potential for significant cumulative visual effects is limited to the visual receptors represented by:

- Viewpoint 2-West Lane;
- Viewpoint 3-Circular Walk 3-Allhallows Marshes; and
- Viewpoint 4-Stoke Road.

Viewpoint 2: West Lane

5.181 This viewpoint is representative of views experienced by residents at the western edge of Grain where overall visual sensitivity is considered to be Medium.

5.182 The introduction of the operational GB Onshore Scheme in combination with the cumulative schemes, in particular the 50m lattice tower and down leads would result in a very slightly greater influence of industrial development north beyond the existing OHL, physically linking the substation and cable sealing end compound. Together this cumulative scenario would appear as one development albeit oblique to the main focus of views. The upper portions of Phase 1 of the business park management centre may also be perceptible within a small proportion of the background of the view which is already occupied by existing industrial development. Overall the addition to the Proposed Development into this cumulative scenario would result in a slight change not dissimilar to the existing composition and balance of features within the view. Overall the cumulative magnitude of change is considered to be Low.

5.183 The cumulative magnitude of change, assessed alongside the sensitivity would result in a Minor Adverse cumulative effect, which is not considered significant.

Viewpoint 3-Circular Walk 3-Allhallows Marshes

5.184 This viewpoint is representative of views experienced by recreational receptors on this part of the circular walk and overall visual sensitivity is considered to be Medium.

5.185 The introduction of the GB Onshore Scheme in combination with the cumulative schemes, in particular Phase 1 of the business park and management centre would slightly extend the influence of industrial complexes across the backcloth of view north beyond the OHL. The lattice tower and down leads would physically link the substation and cable sealing end compound and would read as one development within the extent of the view occupied by the GB Onshore Scheme.

5.186 However this cumulative scenario would not detract from the overall composition and more scenic elements across the marshland and seaward views north. The cumulative magnitude of change is considered to be Low. The cumulative magnitude of change, assessed alongside the sensitivity would result in a Minor Adverse effect, which is not considered significant.

Viewpoint 4-Stoke Road

5.187 This viewpoint is representative of residential receptors and overall visual sensitivity is considered to be Medium.

5.188 The introduction of the operational GB Onshore Scheme in combination with the cumulative schemes would be perceptible where the lattice tower and down leads connect to the proposed substation and cable sealing end compound within a small part of the background view and would read as one development. The inclusion of the Phase 1 business park and management centre would further reinforce the industrial backdrop of the view. Overall the cumulative magnitude of change is considered to be Low. The cumulative magnitude of change, assessed alongside the sensitivity would result in a Minor Adverse effect, which is not considered significant.

Summary of Assessment

5.189 This LVIA was undertaken in accordance with current professional standards namely GLVIA 3 and has been informed by consultation with Medway Council. The LVIA considers the potential effects of the landscape and visual receptors at the construction phase, year 1 of operation and year 15 of operation of the GB Onshore Scheme. The LVIA also assesses the likely significant cumulative effects of the GB Onshore Scheme when considered in combination with the cumulative schemes.

5.190 The findings of the assessment are presented in Table 5.13 Assessment Summary Table.

5.191 In respect of effects on the landscape fabric and landscape character, the assessment found that significant effects during construction would be limited to the eastern edge of the Allhallows to Stoke Marshes LCA. Significant effects would arise from the loss of agricultural land as a result of construction activity at the proposed converter station and substation site as well as the DC cable route corridor. These effects would be short term during construction and there would be no physical change to the most distinctive landscape elements of the marshland. The landscape assessment concludes that there would be no significant effects at years 1 and 15 of operation. The assessment also concludes that the North Kent SLA would not be significantly affected.

5.192 In respect of visual amenity, of the nine viewpoints assessed during construction, visual receptors at three of the viewpoints would be significantly affected over the short term, with the furthest viewpoint located 3.9 km from the Project Area. The source of significant effects was due to receptors of medium sensitivity where the scale and extent of construction activity would be a prominent addition within the overall composition of the view. At year 1 of operation of the GB Onshore Scheme, the number of viewpoints significantly affected would be the same due to the scale and prominence of the proposed converter station and substation within close proximity views. At year 15 of operation of the GB Onshore Scheme, the number of viewpoints significantly affected would be reduced to one, at West lane. This finding relates to the establishment of landscape planting at the western edge of the Project Area which would reduce the prominence of the proposed converter station and substation over time.

5.193 The cumulative assessment concludes that there would be no significant cumulative effects on the landscape and visual receptors.

Table 5.13 Assessment Summary Table of Residual Effects

Landscape/ Visual Receptor	Sensitivity	Construction		Operation Year 1		Operation Year 15		Cumulative Assessment	
		Magnitude of Change	Significance of residual effect	Magnitude of Change	Significance of residual effect	Magnitude of Change	Significance of residual effect	Cumulative Magnitude of Change	Significance of residual effect
Allhallows to Stoke Marshes	Medium	Medium	**Moderate Adverse (significant)**	Low	Minor Adverse	Low	Minor Adverse	Very Low	Negligible
Hoo Peninsula Farmland	Low	Low	Minor Adverse	Very Low	Negligible	Very Low	Negligible	NA	NA
Lower Stoke Farmland	Low	Low	Minor Adverse	Very Low	Negligible	Very Low	Negligible	NA	NA
Industrial/ Urban Area	Low	Very Low	Negligible	Low	Negligible	Low	Negligible	NA	NA
Chetney and Greenborough Marshes	Medium	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	NA	NA
VP1 - Grain Coastal Park	Medium	Low	Minor Adverse	Very Low	Negligible	Very Low	Negligible	NA	NA
VP2 - West Lane	Medium	Medium	**Moderate Adverse (significant)**	Medium	**Moderate Adverse (significant)**	Medium	**Moderate Adverse (significant)**	Low	Minor Adverse
VP3 - Circular Walk 3-Allhallows Marshes	Medium	Medium	**Moderate Adverse (significant)**	Medium	**Moderate Adverse (significant)**	Low	Minor Adverse	Low	Minor Adverse
VP4 - Stoke Road	Medium	Medium	**Moderate Adverse (significant)**	Medium	**Moderate Adverse (significant)**	Low	Minor Adverse	Low	Minor Adverse
VP5 - Ratcliffe Highway	Medium	Low	Minor Adverse	Low	Minor Adverse	Low	Minor Adverse	NA	NA
VP6 - Saxon Shore Way	Medium	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	NA	NA
VP7 - Queenborough Coastal Path	Medium	Low	Minor Adverse	Low	Minor Adverse	Low	Minor Adverse	NA	NA
VP8 - Riverside Country Park	Medium	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	NA	NA
VP9 - Furze Hill	Low	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	NA	NA

References

Ref 5.1 Landscape Institute and Instituted of Environmental Management and Assessment, (2013). Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Oxon.

Ref 5.2 Landscape Institute, (2011). Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment.

Ref 5.3 Medway Council, (2003). Medway Local Plan.

Ref 5.4 Swale Borough Council, (2017). Bearing Fruits, The Swale Borough Local Plan.

Ref 5.5 Medway Council, (2011). Medway Landscape Character Assessment.

Ref 5.6 Natural England, (2013). National Character Area Profile: 81. Greater Thames Estuary.

Ref 5.7 Jacobs Babtie on behalf of Kent County Council, (2004). The Landscape Assessment of Kent.

Ref 5.8 Jacobs on behalf of Swale Borough Council, (2011). Swale Landscape Character and Biodiversity Appraisal, Supplementary Planning Document.

Ref 5.9 Medway Swale Estuary Partnership and Medway Council, (2008). Circular Walks on The Hoo Peninsula.

6. Ecology & Nature Conservation

Introduction

6.1 This chapter of the Environmental Impact Assessment (EIA) addresses potential effects associated with the NeuConnect GB Onshore Scheme on Ecology and Nature Conservation. It evaluates relevant ecological receptors (including nature conservation designations, priority habitats, protected species and invasive non-native species (INNS)) associated with the GB Onshore Scheme, with each being assigned a nature conservation value (sensitivity). Thereafter, the GB Onshore Scheme's potential impacts and effects on ecological receptor conservation status, inter-relationships, and their contribution to local (and if appropriate regional and national) biodiversity have been identified. The assessment takes into account impact avoidance design measures and management activities when determining the significance of potential effects. The requirement for any further mitigation measures is then described and mitigation measures are taken into account in the assessment of potential residual effects.

6.2 Consultation responses and scoping opinions have been taken into account during the preparation of this chapter. Consideration is also given, where appropriate to third-party projects and activities and specifically to the potential for interaction between the NeuConnect Scheme and other projects resulting in cumulative effects.

Study Areas

6.3 The Proposed Development area (the Site) (see Figure 6-1) is entirely within the boundary of Medway Council and is centred on the Isle of Grain located at the tip of the Hoo Peninsula between the Thames Estuary to the north and the Medway Estuary to the south.

6.4 The study areas used in this assessment were defined with reference to the likely zones of influence (ZoIs) and relevant nature conservation features in relation to which the GB Onshore Scheme may have potential to result in significant effects, but also with regard to the precautionary principle to ensure sufficient data were gathered to meet any design iterations which may change the likely ZoI used to undertake the impact assessment.

6.5 It is important to recognise that the likely ZoI of the GB Onshore Scheme may vary over time (e.g. the construction zone of influence may differ from the operational zone of influence) and/ or depending on the individual sensitivities of different ecological features and this has been factored into the assessment, where relevant.

6.6 For the purpose of this assessment the following study areas have been used:

- up to 10 kilometres (km) from the Site boundary for all European statutory designated sites;
- up to 2 km from the Site boundary for all National statutory designated sites
- up to 2 km from the Site boundary for all non-statutory designated sites;
- up to 2 km from the Site boundary for records (within the last ten years) of protected/ notable species and, or habitats;
- up to 50 metres (m) from the Site boundary for notable habitats;
- up to 50 m from the Site boundary for terrestrial and aquatic invertebrates;
- up to 50 m from the Site boundary for Badger Meles meles;
- up to 500 m from the Site boundary for Great Crested Newt Triturus cristatus;
- up to 100 m from the Site boundary for reptiles, Water Vole Arvicola amphibius and Otter Lutra lutra;
- up to 100 m from the Site boundary for bat roosts and notable foraging and, or commuting habitat;
- up to 100 m from the Site boundary for breeding and wintering birds and their habitats (although habitats within the Site boundary are given greater emphasis); and
- up to 500 m from the Site boundary for waterbirds using the intertidal areas.

6.7 The study area for the intertidal benthic ecology baseline has been defined as the area encompassing the wider Thames Estuary. ZoIs for specific receptors are discussed in further detail throughout this assessment. This spatial extent was selected on the basis that it provides geographic context and encompasses the relevant functional habitats and range of movement for mobile benthic species found within the area of interest for the Project.

Planning Policy & Applicable Legislation

6.8 Legislation and policies relevant to the assessment of the impacts of the GB Onshore Scheme on ecology and nature conservation include:

International Legislation

6.9 European Union and global biodiversity targets are partly delivered through a range of legislative measures, which place obligations on Member States to protect biodiversity and the natural environment. In relation to wildlife and nature conservation, six key Directives have been adopted by the European Union, namely:

- Marine Strategy Framework Directive (2008/56/EC);
- Directive 2009/147/EC on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended) (Birds Directive);
- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
- The Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') 1998; and
- Regulation (EU) 1143/2014 on the introduction and spread of invasive alien species (IAS).

6.10 These Directives provide for the protection of animal and plant species of European importance and the habitats which support them, particularly through the establishment of a network of protected sites, called Natura 2000.

6.11 Further relevant legislation includes Directive 2000/60/EC (Water Framework Directive), under which Member States are required to protect and improve their inland and coastal waters.

National Legislation

6.12 The main relevant legislative instruments relating to nature conservation in England are:

- Conservation of Habitats and Species Regulations 2017;
- Conservation of Habitats and Species and Planning (Various Amendments) (England and Wales) Regulations 2018;
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD);
- The Marine Strategy Regulations 2010;
- Wildlife and Countryside Act (WCA), 1981 (as amended);
- Marine and Coastal Access Act 2009;
- Countryside and Rights of Way (CRoW) Act, 2000 (as amended);
- Natural Environment and Rural Communities (NERC) Act, 2006 (as amended);
- Protection of Badgers Act, 1992 (as amended);
- Hedgerow Regulations 1997 (as amended);
- Animal Welfare Act 2006; and
- Aquatic Animal Health (England and Wales) Regulations 2009 (as amended).

6.13 Key national and local plans and policy relevant to the assessment of the impacts of the GB Onshore Scheme on ecology and nature conservation include:

- UK Marine Policy Statement – Specific policies set out in the East Inshore Coast Marine Plan (Marine Management Organisation (MMO), 2014);

- Kent Biodiversity Action Plan - The Kent Biodiversity Action Plan (1997)[1] sets out Habitat Action Plans for 20 habitat types and 13 Species Action Plans within the county;
- Kent Biodiversity 2020 and beyond - A strategy for biodiversity in Kent and Medway, focussed on 33 priority habitats;
- Biodiversity 2020 - A strategy for England's Wildlife and Ecosystem Services with regards to marine habitats, ecosystems, and fisheries (Defra, 2011); and
- UK Post 2010 Biodiversity Framework: Revised Implementation Plan (2018 2020) - Succeeds the UK Biodiversity Action Plan (UK BAP) (Joint Nature Conservation Committee (JNCC) and Defra, 2018) (the UK BAP list of priority species and habitats remains an important reference material which has been considered within this EIA Report).

[1] The Kent Biodiversity Action Plan: A framework for the future of Kent's wildlife. Kent Biodiversity Action Plan Steering Group (1997)

Approach to Assessment

6.14 The Ecological Impact Assessment (EcIA) detailed in this chapter has been undertaken in accordance with best practice guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM) entitled ‘Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Costal and Marine’ (CIEEM, 2018) as summarised below. The aims of the ecology assessment are to:

- identify relevant ecological features (i.e. designated sites, habitats, species or ecosystems) which may be impacted;
- provide a scientifically rigorous and transparent assessment of the likely ecological impacts and resultant effects of the GB Onshore Scheme. Impacts and effects may be beneficial (i.e. positive) or adverse (i.e. negative);
- facilitate scientifically rigorous and transparent determination of the consequences of the GB Onshore Scheme in terms of national, regional and local policies relevant to nature conservation and biodiversity, where the level of detail provided is proportionate to the scale of the development and the complexity of its potential impacts; and
- set out what steps will be taken to adhere to legal requirements relating to the relevant ecological features concerned.

6.15 The principal steps involved in the CIEEM approach can be summarised as:

- ecological features that are both present and might be affected by the GB Onshore Scheme are identified (both those likely to be present at the time works begin and those predicted to be present at a set time in the future) through a combination of targeted desk-based study and field survey work to determine the relevant baseline conditions;
- the importance of the identified ecological features are evaluated, placing their relative biodiversity and nature conservation value into geographic context, which is then used to define the relevant ecological features that need to be considered further within the EcIA process;
- the changes or perturbations predicted to result as a consequence of the Proposed Development (i.e. the potential impacts) and which could potentially affect relevant ecological features that are identified and their nature described. Established best-practice, legislative requirements or other incorporated design measures to minimise or avoid impacts are also described and are taken into account;
- the likely effects (beneficial or adverse) on relevant ecological features are then assessed, and where possible quantified;
- measures to avoid or reduce any predicted significant effects, if possible, are then developed in conjunction with other elements of the design (including mitigation for other environmental disciplines) and if necessary, measures to compensate for effects on features of nature conservation importance are also included;
- any residual effects of the GB Onshore Scheme are reported; and
- scope for ecological enhancement is considered.

6.16 It is not necessary in the assessment to address all habitats and species with potential to occur in the study area and instead the focus should be on those that are “relevant” i.e. ecological features that are considered to be important and potentially affected by the Proposed Development. CIEEM (2018) makes clear that there is no need to “carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable”. This does not mean that efforts should not be made to safeguard wider biodiversity and requirements for this have been considered. National policy documents emphasise the need to achieve net gains for nature and that a core principle for planning is that it should contribute to conserving and enhancing the natural environment and reducing pollution.

6.17 To support focussed EcIA, there is a need to determine the scale at which the relevant ecological features identified through the desk studies and field surveys undertaken for the GB Onshore

Scheme are of value. The value of each relevant ecological feature has been defined with reference to the geographical level at which it matters.

6.18 The frames of reference used for this assessment, based on CIEEM guidance are:

- international (generally this is within a European context, reflecting the general availability of good data to allow cross-comparison);
- national (Great Britain, but considering the potential for certain ecological features to be more notable (of higher value) in England, with context relative to Great Britain as a whole);
- regional (south-east England);
- county (Kent);
- district (Medway);
- local (biodiversity or geological features that do not meet criteria for valuation at a district or higher level, but that have sufficient value to merit retention or mitigation e.g. for purposes of ensuring no net loss of biodiversity); and
- negligible (common and widespread biodiversity or geological features of such low priority that they do not require retention or mitigation at the relevant location to otherwise maintain a favourable nature conservation status as defined in the Habitats Directive/ Regulations).

6.19 Species populations are valued on the basis of their size, recognised status (such as recognised through published lists of species of conservation concern and designation of Biodiversity Action Plan (BAP) status) and legal protection. For example, bird populations exceeding 1% of published information on biogeographic populations are considered to be of international importance, those exceeding 1% of published data for national populations are considered to be of national importance and so on.

6.20 In assigning values to species populations, it is important to take into account the status of the species in terms of any legal protection. However, it is also important to consider other factors such as its distribution, rarity, population trends and the size of the population which would be affected. For example, whilst the Great Crested Newt is protected under European law and therefore conservation of the species is of significance at the international level, this does not mean that every population of Great Crested Newt is internationally important. It is important to consider the particular population in its context. Therefore, in assigning values to species the geographic scale at which they are important has been considered. The assessments of value rely on the professional opinion and judgment of experienced ecologists.

6.21 Plant communities are assessed both in terms of their intrinsic value and as habitat for protected species whose habitat is also specifically protected and for species of nature conservation concern which are particularly associated with them.

6.22 Due regard will also be paid to the legal protection afforded to species during the development of mitigation and compensation measures to be implemented during the Proposed Scheme. For European protected species there is a requirement that the Proposed Scheme should not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

6.23 Assessing the value of features requires consideration of both existing and future predicted baseline conditions. Therefore, the description and valuation of ecological features takes account of any likely changes, such as trends in the population size or distribution of species, likely changes to the extent of habitats and the effects of other proposed developments or land use changes.

6.24 In line with the CIEEM guidelines, the terminology used within the EcIA draws a clear distinction between the terms ‘impact’ and ‘effect’. For the purposes of this EcIA these terms are defined as follows:

- impact – actions resulting in changes to an ecological feature. For example, construction activities of a development removing a hedgerow; and

- effect – outcome resulting from impact acting upon the conservation status or structure and function of an ecological feature, e.g. the effects on a population of bats as a result of the loss of a bat roost.

6.25 When describing potential impacts (and where relevant the resultant effects) consideration is given to the following characteristics likely to influence this:

- Positive or negative - i.e. is the change likely to be in accordance with nature conservation objectives and policy?:
  - positive - a change that improves the quality of the environment, or halts or slows an existing decline in quality e.g. increasing the extent of a habitat of conservation value; or
  - negative - a change that reduces the quality of the environment e.g. destruction of habitat.
- spatial extent - the spatial or geographical area or distance over which the impact or effect occurs;
- magnitude - the ‘size’, ‘amount’ or ‘intensity’ and ‘volume’ of an impact - this is described on a quantitative basis where possible;
- duration - the time over which an impact is expected to last prior to recovery or replacement of the resource or feature. Consideration has been given to how this duration relates to relevant ecological characteristics such as a species’ lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;
- timing and frequency - i.e. consideration of the point at which the impact occurs in relation to critical life-stages or seasons; and
- reversibility - i.e. is the impact temporary or permanent. A temporary impact is one from which recovery is possible or for which effective mitigation is both possible and enforceable. A permanent effect is one from which recovery is either not possible, or cannot be achieved within a reasonable timescale (in the context of the feature being assessed).

6.26 Cumulative effects are those occurring from several sources (also known as inter-relationships) and, or the combined effects of other developments in the area.

6.27 For each ecological feature only those characteristics relevant to understanding the ecological effect and determining the significance are described. The determination of the significance of effects has been made based on the predicted effect on the structure and function, or conservation status, of relevant ecological features, as follows:

- not significant - no effect on structure and function, or conservation status; and
- significant - structure and function, or conservation status is affected.

6.28 CIEEM guidance states that effects should be determined as being significant when

> *“an effect either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national / local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local. A significant effect is an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. In broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)”.*

6.29 Using this information and judgment, it is determined whether the effects will be significant or not on the structure and integrity (of site or ecosystems) or conservation status (of habitats and, or species) of each ecological feature and the impact significance is determined at the appropriate geographical scale.

6.30 In order to provide consistency of terminology, the findings of the CIEEM assessment have been translated into the classification of effects scale, as outlined in Table 6.1.

Table 6.1 Relating CIEEM Assessment Terms

Effect classification terminology		Equivalent CIEEM assessment
High	Major beneficial	Beneficial effect on structure/ function or conservation status at regional, national or international level.
Medium	Moderate beneficial	Beneficial effect on structure and, or function or conservation status at county level.
Low	Minor beneficial	Beneficial effect on structure/ function or conservation status at local and, or site level.
Negligible	Neutral	No effect on structure/ function or conservation status.
Low	Minor adverse	Adverse effect on structure/ function or conservation status at local and, or site level
Medium	Moderate adverse	Adverse effect on structure/ function or conservation status at county level.
High	Major adverse	Adverse effect on structure and, or function or conservation status at regional, national or international level.

Sources of Information/ Data

Desk Study

6.31 A desk study was carried out to identify ecological designations and protected and, or notable habitats and species and scheduled invasive non-native species potentially relevant to the GB Onshore Scheme.

6.32 The approach taken to defining the desk study areas was based on the likely ZoI of the GB Onshore Scheme on different ecological receptors and an understanding of the maximum distances that are typically expected to be considered by statutory consultees.

6.33 The desk study included a search for:

- European Sites within 10 km of the Site;
- statutorily designated sites of national nature conservation value, e.g. Sites of Special Scientific Interest (SSSIs) and Local Nature Reserves (LNRs) within 2 km of the Site; and
- non-statutorily designated sites of nature conservation value, e.g. Local Wildlife Sites (LWSs), within 2 km of the Site.

6.34 The Kent and Medway Biological Records Centre (KMBRC) was contacted in July 2018 to gain information on pre-existing ecological information (i.e. records of protected and notable species and habitats within 2 km of the Site as well as any invasive non-native species). The results of this desk study are reported in detail in the Preliminary Ecological Appraisal (PEA) report (AECOM, 2019) and included in Appendix 06.A.

6.35 In addition, online data resources were reviewed including:

- Multi-Agency Geographic Information Centre (MAGIC);
- The Joint Nature Conservation Committee (JNCC) website for details of Special Protection Areas (SPAs) including site information and designation details;
- The British Trust for Ornithology (BTO) website for site specific data from the Wetland Bird Survey (WeBS), a partnership between the BTO, the Royal Society for the Protection of Birds (RSPB) and JNCC (the last on behalf of Natural England (NE), Natural Resources

Wales (NRW), Scottish Natural Heritage (SNH) and the Department of the Environment Northern Ireland (DENI)) in association with the Wildfowl and Wetlands Trust (WWT); and

- National Biodiversity Network (NBN) Gateway.

6.36 Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA; Schedules 2, 4 and 5 of the Habitat Regulations; and species and habitats of principal importance for nature conservation in England listed under Section 41 (S41) of the NERC Act. Other habitats and species have also been considered and assessed on a case by case basis, e.g. those included in national, regional or local Red Data Books and Lists but not protected by legislation. This is consistent with the requirements of relevant planning policy.

6.37 Records of invasive non-native species, as listed under Schedule 9 of the WCA and as species of EU concern (EU IAS Regulation, 2014), were also collated and have been taken into account when assessing the potential ecological effects of the GB Onshore Scheme. It would not be appropriate to attribute the same weight to these invasive non-native species as has been applied to relevant ecological features when determining the likely significant effects of the GB Onshore Scheme, as the presence of such species is generally detrimental for ecology and the spread of such species may contravene legislation and the removal of such species may be desirable and beneficial for ecology. Requirements for control are also driven by the WCA and related legislation. Therefore, while the weed species concerned are not relevant ecological features for the purposes of EcIA, there is still a need to consider them in terms of their potential relevance to delivery of legislative compliance, for their potential to contribute to the amplification of any adverse effects arising from the GB Onshore Scheme, or their potential to conflict with objectives for ecological mitigation, compensation and enhancement.

6.38 The benthic ecology baseline has been described using a combination of information from a desk study and project-specific survey data to provide a robust and up to date characterisation of the benthic environment within the study area.

Field Survey

6.39 The requirement for ecological field surveys was determined following a review of the desk based study data and a PEA undertaken by AECOM in April and August 2018 (see Appendix 06.A).

6.40 The PEA from 2018 consisted of two components: a Phase 1 Habitat survey; and a scoping survey for protected species and other species of conservation concern.

6.41 The Phase 1 Habitat survey followed the standard methodology ‘Handbook for Phase 1 habitat survey: A technique for environmental audit’ (JNCC, 2010). In summary, this comprised walking over the Site and recording the habitat types and boundary features present. A protected species scoping survey was carried out in conjunction with the Phase 1 Habitat survey.

6.42 Subsequently, field surveys for protected or notable species were then undertaken, as identified in the PEA.

6.43 The field survey data obtained are reported in the following survey reports (included as technical appendices):

- Appendix 06. A. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Preliminary Ecological Appraisal Report;
- Appendix 06. B. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Breeding Birds;
- Appendix 06. C. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Wintering Birds;
- Appendix 06. D. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Intertidal Waterbirds;
- Appendix 06. E. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Reptiles;
- Appendix 06. F. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Great Crested Newt;

- Appendix 06. G. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Surveys for Water Vole;
- Appendix 06. H. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on Aquatic Ecology;
- Appendix 06.I. AECOM (2019) NeuConnect, Great Britain to Germany Interconnector, GB Onshore Scheme: Report on surveys for bats; and
- Appendix 06. J. AECOM (2019) NeuConnect Interconnector: Benthic Characterisation and Habitat Assessment Survey (UK), Technical Report.

6.44 No further surveys were necessary in order to define the ecological baseline relevant to the GB Onshore Scheme. Information and rationale for surveys scoped out are provided in the PEA report included as Appendix 06.A.

6.45 Details of the survey methodologies, survey dates and guidance used for each survey are available in the reports as detailed above (and included as technical appendices (06.A to 06.J)) – a summary of survey findings is provided further on in this chapter.

Consultation

6.46 Consultation was undertaken with statutory and non-statutory consultees in 2018 as part of the EIA Scoping process. Stakeholder responses from Kent County Council and Natural England, relevant to Ecology, are included in Chapter 3.

6.47 The following stakeholders were consulted during the ecological impact assessment:

- Kent County Council (KCC);
- Environment Agency;
- Centre for Environment, Fisheries and Aquaculture Science (Cefas);
- Marine Management Organisation (MMO); and
- Natural England.

6.48 The key issues relating to ecology and nature conservation raised during consultation are outlined in Table 6.2 below, together with how these issues have been considered in the production of this assessment.

Table 6.2 Key issues raised in relation to ecology and nature conservation during consultation

Key issue raised	Response to issue raised and action taken where appropriate
KCC raised the following issues in relation to terrestrial ecology: *The Thames Estuary and Marshes SPA and Ramsar and the South Thames Estuary and Marshes SSSI is within 150m of the project area (where the substation will be located) and the cables will run directly through the designated sites. Therefore we advise that the proposed development is likely to have a significant impact on biodiversity (both direct and indirect) and based on the above conclusion we advise that for this development an EIA for Ecology is required. The submitted information has detailed that a range of ecological surveys are currently on going and the results of these surveys must inform the Environmental Statement. We highlight that there has been a number of projects within Kent which have resulted in direct impacts to the mud flats through the installation of cables – we recommend that the results of the ongoing monitoring from these projects are gathered to help inform the impact assessments and mitigation strategies.*	Consideration has been given to the impacts of the GB Onshore Scheme on designated sites and sensitive ecological receptors.

Key issue raised	Response to issue raised and action taken where appropriate
Cefas and the MMO raised concerns about the Screening Report conclusion of no expected significant impact on the Thames Estuary and Marshes SPA and advised that this hinges on whether 0.25% is considered a significant impact.	The GB Onshore Scheme will be installed by HDD cable conduits through the upper and mid-shore, therefore avoiding direct impact to upper and mid intertidal sediments and supported benthic communities. The cable will be installed through three separate trenches through the lower shore. At initial screening stage the quoted value of 0.25% assumed that the open cut trench and burial will be carried out using shore-based installation techniques. The preferred construction method would use a boat based technique which would further reduce the area of impact within the Thames Estuary and Marshes SPA.
The MMO disagreed with the conclusion to screen out intertidal impacts from boat or barge-based installation and cable burial.	Consideration has been given to this potential activity and, or receptor interactions within the impact assessment.
The MMO recommended that intertidal ecology should be included as a receptor with respect to the potential release of drilling fluids in the intertidal zone.	Consideration has been given to the potential effects of drilling fluids on benthic habitats and species within the impact assessment.

Baseline Conditions

6.49 The ecological baseline conditions for the Site are summarised below.

Statutory Sites

6.50 The Site, above the Mean High Water Spring (MHWS), is not located within any site statutorily designated for nature conservation. The intertidal area of the GB Onshore Scheme between MHWS and MLWS lies within the Thames Estuary and Marshes Ramsar/ SPA and South Thames Estuary and Marshes SSSI and Medway Estuary Marine Conservation Zone (MCZ). There are seven statutorily designated sites of international importance (Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar) designated for ecological reasons within 10 km of the Site and three sites of national importance (two SSSIs and one MCZ) designated for ecological reasons within 2 km of the Site. More information on these statutory sites is presented in Table 6.3 and Table 6.4 (see Figure 6-2).

Table 6.3: International Statutory Nature Conservation Designated sites within 10 km of the Site

Site Name and Designation	Reason(s) for Designation	Area (ha)	Approximate distance from the Site (km)	Connectivity to the Site
Thames Estuary and Marshes SPA and Ramsar	The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates and supports populations and an assemblage of waterbirds occurring at levels of international importance.	5,588.6	0.0	Ecological connections between interest features of the Ramsar / SPA and the Site.
Medway Estuary and Marshes SPA and Ramsar	The site holds several nationally scarce plants and a total of at least twelve British Red Data Book species of wetland invertebrates. The site also holds a significant number of non-wetland British Red Data Book species and supports populations and an assemblage of waterbirds occurring at levels of international importance.	4,696.7	1.1	Potential for ecological connections between interest features of the Ramsar and, or SPA and the Site.
Outer Thames Estuary SPA	The site qualifies for supporting breeding Common Tern *Sterna hirundo*, Little Tern *Sternula albifrons* and non-breeding Red-throated Diver *Gavia stellata*	392451.6	2.2	No connectivity between the SPA and the Site, although birds associated with the SPA may forage offshore from the Site.
Benfleet and Southend Marshes Ramsar / SPA	The site supports populations and an assemblage of waterbirds occurring at levels of international importance.	2,251.3	4.2	No connectivity between the Site and the Ramsar and, or SPA, although it is acknowledged that there is likely to be interchange of waterbirds between designated wetland sites in the region.
Essex Estuaries SAC	The site comprises of mainly Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*),	46,111.4	4.8	No connectivity between the Site and the SAC.

Site Name and Designation	Reason(s) for Designation	Area (ha)	Approximate distance from the Site (km)	Connectivity to the Site
	representing over 10% of the UK resource. The site also includes intertidal and subtidal sediment, mud, rock, sand and seagrass beds.			
Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar	The site contains extensive saltmarsh habitat, with areas supporting full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. The site also supports a number of nationally-rare and nationally-scarce plants species and British Red Data Book invertebrates. Furthermore, Foulness supports populations of waterbirds occurring at levels of international importance	10,932.9	4.9	No connectivity between the Site and the Ramsar and, or SPA, although it is acknowledged that there is likely to be interchange of waterbirds between designated wetland sites in the region.
The Swale SPA and Ramsar	The site supports nationally scarce plants and at least seven British Red Data book invertebrates. The site also supports populations of waterfowl occurring at levels of international importance.	6,514.7	7.1	No connectivity between the Site and the Ramsar and, or SPA, although it is acknowledged that there is likely to be interchange of waterbirds between designated wetland sites in the region.

Table 6.4: National Statutory Nature Conservation Designated sites within 10 km of the Site

Site Name and Designation	Reason(s) for Designation	Area (ha)	Approximate distance from the Site (km)	Connectivity to the Site
South Thames Estuary and Marshes SSSI	The site supports outstanding numbers of waterfowl with total counts regularly exceeding 20,000. Many species regularly occur in nationally important numbers and some species regularly use the site in internationally important numbers. The breeding bird community is also of particular interest and the diverse habitats support a number of nationally rare and scarce invertebrate species and an assemblage of nationally scarce plants.	5,449.1	0.0	Ecological connections between interest features of the SSSI and the Site.
Medway Estuary and Marshes SSSI	The site forms the largest area of intertidal habitats which have been identified as value for nature conservation in Kent. The area holds internationally important populations of wintering and passage birds and is also important for its breeding birds. An outstanding	6,840.1	0.5	Potential for ecological connections between interest features of the SSSI and the Site.

Site Name and Designation	Reason(s) for Designation	Area (ha)	Approximate distance from the Site (km)	Connectivity to the Site
	assemblage of plant species also occurs on site.			
Medway Estuary MCZ	An inshore site located on the Kent coast. It encompasses the Medway Estuary from Rochester down to its mouth, and extends seaward to include an area between Sheerness and the Isle of Grain. One species and eight different habitats and their associated wildlife are protected by the Medway Estuary MCZ. Such a range of habitats creates an environment that is capable of supporting some of the most diverse communities of animals in the South-East region.	6,000.0	0.0	Ecological connections between interest features of the MCA and the Site.

Non-Statutory Sites

6.51 The GB Onshore Scheme is immediately adjacent to the western boundary of a non-statutory site designated for nature conservation (ME16 Grain Pit LWS). More details of this non-statutory designated site are presented in Table 6.5 (see Figure 6.2).

Table 6.5: Site with Non-statutory Designation for Nature Conservation

Site Name and Designation	Reason(s) for Designation	Area (ha)	Approximate Distance from the Site (km)	Connectivity to the Site
ME16 Grain Pit LWS	Mosaic of habitats including neutral grassland and reedbed of local importance. Marsh Harrier breeds in the reedbed.	29.56	0.01	Immediately adjacent to the east of the Proposed DC cable corridor.

Species Records

6.52 Records of protected species were obtained in July 2018 from KMBRC using a 2 km search radius from the Site boundary and from the preceding 10 years. A number of notable species, including species of conservation importance, were recorded and these are presented in the PEA report provided as Appendix 06.A and summarised in Table 6.9.

Terrestrial Habitats

6.53 The habitats associated with the Site are summarised below and habitat descriptions are defined by broad habitat types (JNCC, 2010). Results from the Phase 1 Habitat survey, undertaken by AECOM in 2018, are provided in Appendix 06.A and shown on Figure 6-3 in this chapter.

6.54 The Site is 21.44 ha in area and the broad habitat types on the Site, together with area calculations (taken from digitised maps of the Site) and whether they are a priority habitat are presented in Table 6.6.

Table 6.6: Broad habitat types present on Site

Habitat	Area (ha)	% of Site Area	Priority Habitat
Scrub, Scattered	0.22	1.0	No
Scrub, Dense/continuous	1.76	8.1	No
Neutral grassland, Semi-improved	0.06	0.3	No
Improved Grassland	0.48	2.2	No
Maritime Cliffs and Slopes (Hard Cliff)	0.01	0.0	Maritime Cliffs are a priority habitat in the UK and Kent
Swamp / Reedbed	0.11	0.5	Swamps are a priority habitat in the UK, Reedbeds are a priority habitat in Kent
Cultivated/disturbed land, Arable	16.59	76.2	No
Cultivated/disturbed land, Ephemeral/short perennial	0.11	0.5	No
Other, Tall ruderal	1.37	6.3	No
Hardstanding	0.73	3.3	No

Intertidal Habitats and Communities

6.55 Table 6.7 outlines the intertidal broadscale habitats and biotope complexes identified during surveys of the cable corridor. The key characteristics of these habitats are outlined below.

Table 6.7 Summary of intertidal broad-scale habitats and biotope complexes identified during the surveys of the cable corridor.

Broad Scale Habitat	Biotope Complex
Littoral sand and muddy sand (A2.2)	Polychaetes in littoral fine sand (A2.231)
	Cerastoderma edule and polychaetes in littoral muddy sand (A2.242)
Littoral mud (A2.3)	*Nephtys hombergii* and *Streblospio shrubsolii* in littoral mud (A2.321)

Littoral sand and muddy sand (A2.2)

6.56 Habitats belonging to this broadscale habitat typically comprise of clean sands (no more than 25% silt and clay content) and can be found in areas of wave exposure ranging from 'exposed' to 'very sheltered'. Biological diversity is dependent upon the stability of substrates with mobile sands typically exhibiting lower biological diversity in comparison to stable sands.

6.57 Sediment associated with the biotope complex 'polychaetes in littoral fine sand' (A2.231) is known to be relatively stable. This biotope complex was only recorded within the GB Onshore Scheme Route Corridor at a single intertidal sampling station located in the mid shore region. The biotope complex 'Cerastoderma edule and polychaetes in littoral muddy sand' (A2.242) was recorded at four intertidal sampling stations located in the mid to upper shore region.

Littoral mud (A2.3)

6.58 Habitats belonging to this broadscale habitat are generally characterised by fine particulate sediment, mostly silt and clay, although sandy mud may contain up to 40% sand content. Wave exposure is normally very low in areas characterised by this habitat. Biotopes typically form extensive mudflats that support productive biological communities, consisting of predominately infaunal bivalves, polychaetes, and oligochaetes. The biotope complex 'Nephtys hombergii and

Streblospio shrubsolii in littoral mud' (A2.321) was recorded at the remaining two intertidal sampling stations located in the lower shore region.

Intertidal macrofauna

6.59 Intertidal macrofauna was found to be relatively homogenous across all sampling stations, being generally characterised by a dominance of polychaetes (e.g. marine catworms (Nephtys species) and to a lesser extent gastropod mollusc (e.g. Laver spire shell or mudsnail (Peringia ulvae)). A notable distinction was the abundance of the commercial Common Cockle (Cerastoderma edule) found within the mid shore region. Infaunal communities in the low shore region were found to be much less diverse, being dominated by the presence of polychaetes.

6.60 The Tentacled Lagoon-worm (Alkmaria romijni), which is a protected feature of the Medway Estuary MCZ, was not recorded at intertidal stations sampled within the Project Route Corridor.

Intertidal habitats and species of conservation importance

6.61 The two broadscale habitats identified within the intertidal area of the GB Onshore Scheme Route Corridor are representative of Annex I habitat 'mudflats and sandflats not covered by water at low tide'. Furthermore, intertidal sand and muddy sand is a designated feature of the Medway Estuary MCZ. These habitats are known to represent important feeding grounds for wildfowl and waders as a result of the macrofaunal communities and flora which they support.

6.62 No intertidal species of conservation importance were recorded from surveys of the GB Onshore Scheme Route Corridor.

Protected/ Notable Species

6.63 Protected or notable animal species have been identified as present, or potentially present within the surveyed areas (as defined in section 6.2.4) and are summarised in Table 6.8.

Table 6.8: Summary of Baseline Details for Protected/ Notable species on Site

Species	Baseline Detail
Plants	Desk study: The data search returned records of 34 protected or notable plant species recorded within the last ten years and within 2 km from the Site. Field survey: No legally protected plant species recorded on the Site. Divided Sedge *Carex divisa* and Sea Buckthorn *Hippophae rhamnoides,* both Kent Rare Plant Register (RPR) species, were recorded outside of the Site boundary, but were not noted within the Site boundary and habitats with the potential to support either species are restricted.
Terrestrial invertebrates	Desk study: A large number of notable terrestrial invertebrate species, including moths, butterflies, beetles and bees recorded within the last ten years and within 2 km from the Site. Field survey: The habitats on site were assessed during the PEA to have limited potential to support a diverse community of terrestrial invertebrates, including notable species. Although, better quality habitats were identified outside of the Site boundary.
Freshwater invertebrates	Desk study: Records of protected/ notable aquatic invertebrates recorded within the last ten years and within 2 km from the Site. Field survey: No aquatic macroinvertebrate species were recorded that receive specific legal protection via Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), or that are listed on Section 41 of the NERC Act as being of principal importance for nature conservation in England. A number of notable beetle taxa recorded in the Ditch adjacent to the proposed DC cable, including the diving beetles, *Hygrotus parallelogrammus,* Wasp Diving Water Beetle (*Dytiscus circumflexus*)*, Agabus conspersus* and the water scavenger beetles *Helophorus alternans, Limnoxenus niger, Berosus affinis, Berosus signaticollis* and the Great Silver Water Beetle, *Hydrophilus piceus.* The River Habitat Survey classed the ditch adjacent to the proposed DC cable corridor as severely modified which is a consequence of being an artificial drainage channel. Despite its artificial nature, the watercourse provided habitat for a variety of notable and protected species including the near threatened Great Silver Diving Water Beetle and aquatic invertebrate assemblage of very high conservation value.
Marine invertebrates	Desk study: Tentacled Lagoon worm is found in the Medway Estuary. This species is likely to be found in narrow upstream channels which are absent from the GB Onshore Scheme. No records of any other protected or notable species. Field survey: Intertidal macrofauna characterised by a dominance of *polychaetes* and to a lesser extent gastropod molluscs, the exception being the abundance of the Common Cockle (*Cerastoderma edule*) in the mid-shore region in the low-shore region infaunal communities were found to be much less diverse, being dominated by *polychaetes*. No occurrence of Tentacled Lagoon worm.

Species	Baseline Detail
Breeding birds	Desk study: The data search returned records of 148 notable species recorded within the last ten years and within 2 km of the Site. Field survey: 61 bird species were recorded within the survey area during surveys for breeding birds with 44 species representing confirmed, probable or possible breeding within the survey area. Single territories of two WCA Schedule 1 species (Marsh Harrier *Circus aeruginosus* and Cetti's Warbler *Cettia cetti*) confirmed breeding within the survey area. Cetti's Warbler also confirmed breeding outside of the Site boundary, within 100 m.
Non-breeding (wintering and passage) birds	Desk study: The data search returned records of 148 notable species recorded within the last ten years and within 2 km of the Site. Field survey: 43 bird species were recorded within the terrestrial survey area during surveys for wintering birds, with 18 notable species recorded. A total of 24 waterbird species were recorded using the intertidal survey area between January 2018 and December 2018. Of these 24 species, 17 species of waterbird were recorded using the survey area in winter; 9 species of waterbirds were recorded using the survey area in spring and 14 species were recorded using the survey area in autumn. No waterbird species recorded within the intertidal survey area in 2018 represented 1% or more of the international or national population estimates used for assessing populations. A significant proportion (>5%) of the wintering population of Black-tailed Godwit (*Limosa limosa*), cited on The Thames Estuary and Marshes Ramsar/ SPA was recorded within the survey area in 2018. However, when evaluating the peak count of Black-tailed Godwit recorded in the survey area in 2018 against the recent five-year peak mean for the whole estuary, taken from the Wetland Bird Survey (WeBS) data, the peak count represents just over 1% of the population using the estuary. The peak count of three species (Dark-bellied Brent Goose *Branta bernicla*, Oystercatcher (*Haematopus ostralegus*) and Black-tailed Godwit) recorded during the Site surveys represented over 5% of the cited SPA populations for the Medway Estuary and Marshes Ramsar/ SPA.
Reptiles	Desk study: The data search returned records of three species of reptile (Adder (*Vipera berus*), Grass Snake (*Natrix helvetica*) and Common Lizard (*Zootoca vivipara*)) recorded within 2 km of the Site and within the last ten years. Field survey: Habitats on site identified during the PEA as being potentially suitable for reptiles were surveyed in September - October 2018 using refugia felt mats, following techniques detailed in Gent and Gibson (2003) and JNCC (2014). These mats were surveyed in suitable weather conditions for reptiles to be basking to establish reptile presence. The reptile surveys in 2018 identified three species of reptile present on Site: Common Lizard, Slow-worm (*Anguis fragilis*) and Grass Snake. The maximum counts, recorded on the Site in a single survey were 17 Common Lizard, three Slow-worm and one Grass Snake were of 17, 3. Estimating population sizes of these species using guidance within Froglife's Advice Sheet Number 10 (Froglife, 1999), places the population of Common Lizard at 'good' and the populations of Slow-worm and Grass Snake at 'low'.

Species	Baseline Detail
Badger *Meles meles*	Desk study No recent records (within the last ten years) of Badger were identified during the data search from within 2 km of the Site. Field survey Badger latrines and snuffle holes were recorded on the Site during the PEA but no Badger setts were found on the Site.
Amphibians	Desk study: The desk study identified eight waterbodies (not including rivers and, or swamps) within 500 m of the Site, using aerial mapping. The data search returned three records of Great Crested Newts from within 2 km of the Site in 2009. Great Crested Newt is also known to be widespread across much of the Isle of Grain (Max Wade, personal communication). Field survey: No Great Crested Newt recorded during surveys of five accessible waterbodies outside of the Site boundary in 2018. No Great Crested Newt recorded within terrestrial habitat within the Site boundary. The terrestrial habitat on Site has the potential to support foraging and commuting Great Crested Newt and Common Toad (*Bufo bufo*).
Water Vole	Desk study: The data search returned 12 records of Water Vole within 2 km of the Site, with five records located within 1 km from the Site in 2012 and 2014. Water Vole is known to be widespread across much of the Isle of Grain (Max Wade, personal communication). Field survey: Water Vole was recorded in three lagoons outside of the Site boundary. Water Vole was recorded within the ditch adjacent to the proposed DC cable corridor. Based on presence and quality of habitat on site, Water Vole is likely to be present in low numbers in all un-surveyed waterbodies within the vicinity of the Site.
Bats	Desk study: A data search undertaken through Kent Bat Group returned three records of flying, grounded or dead bat from within 2 km of the Site and within the last ten years. These records were: a dead Pipistrelle species in 2015,1.5 km to the south-south-west of the proposed converter station; a grounded Nathusius's Pipistrelle (*Pipistrellus nathusii*) in 2016, 1.5 km to the south-south-west of the proposed converter station; and an unidentified bat, in 2014, approximately 500 m to the east of the proposed DC cable corridor. Field survey: There were no features of interest such as mature trees and buildings to support roosting bats within the Site boundary. The mosaic of scrub and wetland habitats around and across the Site provides foraging resources for bats. Seasonal transect surveys to record bat activity (based on the habitat quality of the Site being 'low' suitability for commuting and foraging bats) recorded very low numbers of three bat species (Common Pipistrelle (*Pipistrellus pipistrellus*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*)) and a single Nathusius' Pipistrelle (*Pipistrellus nathusii*) using the Site for foraging and commuting. One species group (*Myotis* sp.) was also recorded during transect surveys.

Species	Baseline Detail
	Seasonal static monitoring surveys from two locations along the proposed DC cable corridor recorded three species of bat (Common Pipistrelle, Soprano Pipistrelle and Noctule (*Nyctalus noctula*)) using the Site for foraging and commuting. Soprano Pipistrelle was the most numerously recorded bat species. Overall, a small (<100) number of contacts (calls) of Common Pipistrelle and Soprano Pipistrelle were recorded each night during the monitoring periods, but for one night when 367 Soprano Pipistrelle contacts were recorded. A very small (<6) number of Noctule contacts were recorded, but not recorded every night.
Invasive non-native species	Desk study: The data search returned six records of invasive non-native plant species within 2 km of the Site and within the last ten years. These (along with their distances from the Site) were: hybrid Bluebell-Spanish Bluebell cross (*Hyacinthoides non-scripta* x *hispanica = H.* x *massartiana*) (1.9 km), Curly Waterweed (*Lagarosiphon major*) (0.2 km), New Zealand Pigmyweed (*Crassula helmsii*) (0.3 km), Japanese Rose (*Rosa rugosa*) (1.2 km), American Slipper Limpet (*Crepidula fornicate*) (0.5 km) and Portuguese Oyster (*Crassostrea gigas*) (0.5 km). Field survey: No invasive non-native species were recorded on the terrestrial areas of the Site. Marsh Frog (*Pelophylax ridibundus*) was recorded within all off-site waterbodies, including the ditch running adjacent to the proposed DC cable corridor. Marsh Frog is listed on Schedule 9 of the Wildlife and Countryside Act, which makes it illegal to distribute or allow the release of Marsh Frog into the wild. Two individuals of the non-native barnacle species (*Austrominius modestus)* which competes with British species, in particular, (*Semibalanus balanoides*) were identified during surveys at a single intertidal station. *A. modestus* occurs naturally in Australasia and is now widespread throughout Britain and the North West coasts of Europe (Avant, 2007). It is most common from mid shore to shallow subtidal areas of estuarine and sheltered marine habitats. A number of other INNS have been identified by other surveys undertaken within the study area in recent years (Limpenny *et al.,* 2011). These include the American slipper limpet, amphipod (*Monocorophium sextonae*) and the cryptogenic amphipod species (*Photis pollex*). Whilst these INNS have not been confirmed to be present within the Project Route Corridor, it remains a possibility that they may be present in areas outwith the survey sampling stations.
West European Hedgehog *Erinaceus europaeus*	Desk study: The data search did not return any recent (within the last ten years) records of Hedgehog from within 2 km from the Site. Field survey: An assessment of the habitat present on the Site and likelihood for Hedgehog to occur on Site concluded that Hedgehog is likely to be present on Site.
Brown Hare *Lepus europaeus*	Desk study: The data search did not return any recent (within the last ten years) records of Brown Hare from within 2 km from the Site. Field survey: An assessment of the habitat present on the Site and likelihood for Brown Hare to occur on the Site concluded that this species is likely to be present.

Future Baseline

6.64 This section considers changes to the baseline conditions as described above, which might occur in the future in the absence of the GB Onshore Scheme being constructed.

6.65 If the GB Onshore Scheme did not proceed, the majority of existing habitats are likely to continue being present. For the intertidal area, whilst the proportion of habitats may alter due to changes in currents and sedimentation, they will remain unchanged. For the terrestrial habitats there will be some changes in habitat extent, composition and structure. These will occur as a result of ecological succession e.g. the gradual establishment of tree and shrub seedlings increasing the amount of scrub habitat and its progression to woodland.

6.66 The Site is largely undisturbed and the habitats present are suitable for a wide range of biodiversity present within the ZoI. In the short to medium term, in the absence of the GB Onshore Scheme, the terrestrial habitat has and will continue to provide a number of species with potential to be colonised from the wider ZoI, such as Great Crested Newt and Badger. In the long term, in the absence of the GB Onshore Scheme, habitats on site, the terrestrial habitat will mature and develop, which will change the distribution and assemblage of some species.

Important Ecological Features

6.67 For each ecological feature identified within a respective ZoI, a biodiversity value has been assigned according to the geographical scale at which it is important in accordance with Section 6.4. This value is the result of professional judgement, taking into account the intrinsic value of the receptor type in the UK and the actual area of a habitat or population of a species present within or in the vicinity of the Site. The rationale for assigning value to each ecological receptor is discussed in this section.

6.68 In addition, some ecological features are protected by legislation, such that their presence on or near the Site must be taken into account when assessing the likely effects of the GB Onshore Scheme, regardless of the biodiversity value assigned to these. For these features, a discussion of legal considerations is also provided.

6.69 Table 6.9 summarises the sensitive ecological receptors identified in the relevant study areas (as identified in Section 6.4) and the nature conservation value assigned to each receptor.

6.70 No protected or notable plant, terrestrial invertebrates or marine invertebrates, were recorded on site and neither were Great Crested Newt or Badger. These are not included as ecological receptors in Table 6.9. However, given the presence of these species, or species groups in the wider area, the potential for these species or species groups to occur on site should be considered in relation to the legal status of any given species.

6.71 There are considered to be no ecological connections between the Site and other designated sites, beyond 2 km from the Site (as listed in Table 6.3) and therefore these have been coped out of further assessment and are not included in Table 6.9.

Table 6.9: Nature Conservation Value of Each Ecological Receptor

Designated/ Non-Designated Site/ Habitat/ Species	Nature Conservation Receptor	Driver	Biodiversity Value	Rationale
Statutorily Designated Site	Thames Estuary and Marshes SPA	Habitats and Birds Directives	International	Statutory site of nature conservation importance
	Thames Estuary and Marshes Ramsar	Designated under the Convention on Wetlands of International Importance	International	Statutory site of nature conservation importance
	Medway Estuary and Marshes SPA	Habitats and Birds Directives	International	Statutory site of nature conservation importance
	Medway Estuary and Marshes Ramsar	Designated under the Convention on Wetlands of International Importance	International	Statutory site of nature conservation importance
	South Thames Estuary and Marshes SSSI	WCA 1981	National	Statutory site of nature conservation importance
	Medway Estuary and Marshes SSSI	WCA 1981	National	Statutory site of nature conservation importance
Non-statutory Designated Site	ME16 Grain Pit LWS	Local authority declaration	County	Site of nature conservation importance in Kent
Habitats	Maritime Cliffs and Slopes (Hard Cliff) Swamp / Reedbed	NERC Act (2006) UK BAP, LBAP NERC Act (2006) UK BAP, LBAP	Local	Both Maritime Cliffs and Slopes (Hard Cliff) and Swamp/reedbed are priority habitats, however neither of the habitat areas recorded within the Site were of either sufficient quality or extent to qualify under the relevant national or county criteria for priority habitats. All other habitats found within the survey area were common and widespread.
	Intertidal Habitats	Habitats Directive Annex I, UK BAP.	County	All intertidal habitats identified within the Project Route Corridor were representative of the Annex I habitat 'mudflats and sandflats not covered by seawater at low tide' and UK BAP Priority Habitat 'intertidal mudflats'. Intertidal sand and muddy sands which approximate to the broadscale habitat 'littoral sand and muddy sand' (A2.2) is a qualifying feature of the Medway Estuary MCZ although is known to be widespread throughout the study area.
Legally Protected and Notable Species				

Designated/ Non-Designated Site/ Habitat/ Species	Nature Conservation Receptor	Driver	Biodiversity Value	Rationale
Freshwater invertebrates	A range of notable and uncommon species were recorded within the ditch. The most notable was the Great Silver Water Beetle *Hydrophilus piceus*, which is Near Threatened. However none of the species recorded are rare, threatened or legally protected.	Red Data Book 3, Rare	District	Many of the notable species recorded are species of coastal wetlands and as such they can reasonably be expected to occur wherever there are comparable habitats, which are fairly common in the wider landscape, most notably in the nearby statutorily designated sites. Therefore, there are no individual species present that are of any more than Local value. The criteria established to allow the identification of habitats and sites of county nature conservation value does not define specific thresholds for the identification of Local Wildlife Sites on the basis of invertebrate communities. However, given the diverse assemblage and the large number of notable species, it is possible that the ditch adjacent to the proposed DC cable may be of District value, especially given its close proximity to statutorily designated sites of similar habitats and the likely dispersal of species between the ditch and those sites. The ditch is assessed as being of District value.
Breeding birds	A single Marsh Harrier territory within the survey area	All birds, their nests and eggs are afforded protection under the WCA 1981, as amended.	District	Single Marsh Harrier territory represents 1% of the Kent breeding population (based on population reported in the Kent Breeding Bird Atlas 2008-2011).
Breeding birds	A small assemblage of notable birds breeding on Site.	All birds, their nests and eggs are afforded protection under the WCA 1981, as amended. Species of principal importance within Section 41 of the NERC Act (2006).	Local	The habitat on the Site supports a very low number of notable bird species during the breeding season. Breeding assemblage common and widespread nationally, regionally and locally. A single territory of Cetti's Warbler (a Schedule 1 breeding species on the WCA), overlapped with the DC cable corridor. This does not represent >1% of the population in Kent and the nesting location is likely to be outside of the DC cable corridor. This species was also recorded breeding outside of the Site boundary.
	Common nesting bird species throughout the Site.	All nesting birds are protected under the Wildlife and Countryside Act 1981 (as amended).	Local	Habitat present across the extent of the Site supports a very low assemblage of common nesting birds.
Non-breeding (wintering) birds (terrestrial)	A small assemblage of wintering birds present on Site	NERC, 2006, LBAP	Local	Habitat present across the Site supports a low assemblage of notable wintering birds.

Designated/ Non-Designated Site/ Habitat/ Species	Nature Conservation Receptor	Driver	Biodiversity Value	Rationale
Non-breeding Birds (intertidal)	Assemblage of waterbirds present with the intertidal area, adjacent to the DC cable landfall.	Natura 2000	International	A significant proportion (>5%) of the wintering population of Black-tailed Godwit, cited on The Thames Estuary and Marshes Ramsar / SPA was recorded within the survey area in 2018.
Reptiles	Good population of Common Lizard and low populations of Grass Snake and Slow-worm	Protected from injury or killing under the Wildlife and Countryside Act 1981 (as amended). Species of principal importance within Section 41 of the NERC Act (2006).	Local	Common Lizard, Grass Snake and Slow-worm are nationally widespread in abundance and can be found in suitable habitat across the county. Relatively low numbers of reptiles recorded and an abundance of available habitat for reptiles in the wider area. Reptile population and assemblage scores do not meet criteria for selection of County Wildlife Sites in Kent.
Water Vole	Population of Water Vole recorded within the ditch, adjacent to the DC cable corridor and in three waterbodies within 100 m of the Site.	Protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and is afforded protection under Section 9 parts 9 (1), (2), (4) and (5) of the Act. Priority Species under Section 41 of the NERC Act 2006 and is also included as a UK and Local Biodiversity Action Plan (LBAP) priority species.	Local	Low population size recorded in the ditch immediately adjacent to the proposed DC cable corridor and likely (based on habitat quality and presence in the wider area) to be present within Lagoon 5, within the proposed DC cable corridor. Impacts on these wetland habitats will be avoided, or minimised. Species is declining in a national and county context, but the criteria for selection of a County Wildlife Site in Kent, for Water Vole, are not met.
Bats	Foraging and commuting bats – records of Noctule, Nathusius' Pipistrelle and the *Myotis* genus – all are uncommon / rarer species in the UK.	Wildlife and Countryside Act 1981 (as amended). Noctule is a species of principal importance in the UK. Noctule is classed as a rarer species nationally (Wray, 2010).	Local	Low levels of Noctule, Nathusius' Pipistrelle and the *Myotis* genus activity were recorded on the Site. Low numbers (1-2 bats) of all three species on site are unlikely to represent a significant (*i.e.* >1%) proportion of the county population.
	Foraging and commuting bats – populations of 'common' species (Common Pipistrelle Soprano Pipistrelle) on site.	Wildlife and Countryside Act 1981 (as amended). Soprano Pipistrelle is a species of principal importance in the UK.	Local	On average, low levels of commuting and foraging activity of Common Pipistrelle and Soprano Pipistrelle recorded during transect and static monitoring surveys in 2018 / 2019. Both species are common and widespread in Kent.
West European Hedgehog	Likely to be present on the Site, on the basis of local records in the wider area and habitat on site.	Priority species in England	Local	On the basis of suitable available habitat, this species is likely to occur on Site. Hedgehog is widespread and abundant in the UK and Kent.

Designated/ Non-Designated Site/ Habitat/ Species	Nature Conservation Receptor	Driver	Biodiversity Value	Rationale
Brown Hare	Likely to be present on Site, on the basis of local records in the wider area and habitat on Site.	Priority species in England	Local	On the basis of suitable available habitat, this species is likely to occur on the Site. Hedgehog is widespread and abundant in the UK and Kent.
Invasive non-native species	No records of any terrestrial invasive non-native species from within the Site. Two individuals of the non-native barnacle species *Austrominius modestus* were identified during surveys at a single intertidal station. Further terrestrial and inter-tidal invasive non-native species have been recorded within the 2 km search area. Marsh Frog recorded in waterbodies outside the Site boundary.	Wildlife and Countryside Act 1981 (as amended) Schedule 9	Marine INNS – National All terrestrial INNS – Local	The non-native barnacle *Austrominius modestus* recorded within the intertidal area of the Cable Route. Marsh Frog was recorded outside of the Site. No invasive non-native species on the Site.

6.72 Features of less than district importance are not considered further in the assessment process due to the scale and type of the GB Onshore Scheme, potential impacts and context of the wider area, unless legislation requires their consideration.

Avoidance Measures/ Mitigation by Design

6.73 The design process for the GB Onshore Scheme includes consideration of ecological constraints and has incorporated, where possible, measures to reduce the potential for adverse ecological effects in accordance with the mitigation hierarchy and relevant planning policy. The measures identified and adopted include those that can realistically be expected to be applied as part of construction environmental best practice, or as a result of legislative requirements. The expectation is that the Proposed Scheme will be constructed and will operate in accordance with the plans detailed on the consent, incorporating the measures identified below.

6.74 The development design, impact avoidance and reduction measures that have been, or will be, adopted are:

- the design of the GB Onshore Scheme will deliver compliance with industry good practice and environmental protection legislation during both construction and operation e.g. prevention of surface and ground water pollution, fugitive dust management, noise prevention or amelioration;
- the use of an HDD cable installation method to minimise habitat loss and disturbance within the intertidal zone. HDD conduits will be drilled at sufficient depth to ensure disturbance to surface habitats and species as a result of drilling vibrations will not occur.
- drilling fluids required for HDD operations will be carefully managed to minimise the risk of breakouts into the marine environment. Specific avoidance measures would include:
  - The use of biodegradable drilling fluids that Pose little or no risk (PLONOR substances) where practicable;
  - Drilling fluids will be tested for contamination to determine possible reuse or disposal; and
  - If disposal is required, drilling fluids would be transported by a licensed courier to a licensed waste disposal site; and
  - The end of the ducts would be bundled in order to capture discharges from the breakout points.
- the preparation and implementation of a Construction and Environmental Management Plan (CEMP) to manage the environmental effects of the GB Onshore Scheme and to demonstrate compliance with environmental legislation, which will then be implemented by the selected construction contractor. The CEMP, Emergency Spill Response Plan and a Waste Management Plan shall be developed and implemented for the installation phase of the Project in accordance with in the coastal and marine environmental site guide (John et al., 2015);
- the latest guidance from the GB non-native species secretariat (2015) will be followed and a Biosecurity Plan produced to cover cable installation and any maintenance or cable repair works;
- all project vessels shall adhere to the International Convention for the Control and Management of Ships' Ballast Water and Sediments with the aim of preventing the spread of INNS;
- all Project vessels will be required to comply with the International Regulations for Preventing Collisions at Sea (1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) with the aim of preventing and minimising pollution from ships. Most critically, all vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan);
- where practicable, the cable route will be micro routed around sensitive benthic ecology receptors as identified from surveys of the Project Route Corridor.

- dredge spoil will be deposited adjacent to the cable route to minimise the footprint of disturbance effects;
- cable installation will be carried out on a 24-hour basis in order to reduce the overall installation time and associated disturbance of benthic ecological receptors;
- an outline landscape design as detailed in Chapter 5: Landscape and Visual Amenity which includes boundary planting incorporating tree and shrub planting;
- a Sustainable Drainage System (SUDS) detention basin, attenuation pond and swale each planted with marginal wetland species;
- further development of the landscape design to support the application and detailed design, in particular any ecological mitigation requirements as detailed herein;
- implementation of standard environmental best practice and mitigation to ensure construction and operation of the GB Onshore Scheme complies with legislation relating to protected species and does not compromise the local conservation status of ecological receptors present within or in the vicinity of the GB Onshore Scheme;
- obtaining, where required, protected species licences from Natural England sufficiently in advance of the works to meet with the optimum time for mitigation and to minimise any changes to the construction programme;
- production of mitigation strategies for protected species and application for species licences for translocation of animals away from construction areas where required;
- site vegetation clearance undertaken in advance of construction and at an appropriate time of year so as to avoid incidental injuring or killing of reptiles;
- avoidance where possible of lagoons and ditch with potential to support Water Vole (a legally protected species) and where avoidance is not possible, mitigation measures will be implemented in consideration of the legal status of the species.;
- post-construction restoration of any habitat removed from within the DC cable corridor;
- retention of the lagoons outside of the Site boundary;
- soft landscaping on site to create diverse habitats for locally important species, using trees and shrubs of local provenance; and
- avoidance of the nesting bird period i.e. March to August (inclusive) for site vegetation clearance and for any vegetation clearance proposed outside of this time to be checked for the presence of any nest by a suitably qualified ornithologist, prior to removal, and if active nests are found, then appropriate buffer zones would be put in place and the area monitored until the young birds have fledged.

Potential Impacts

6.75 This section describes the impacts and potential effects of the GB Onshore Scheme on relevant ecological features in the absence of any mitigation over and above that which is inherent to the design (as described above).

6.76 Relevant ecological features are those that are considered to be important and have the potential to be affected by the GB Onshore Scheme.

6.77 Decommissioning and demolition impacts have been scoped out of detailed assessment but are likely to be similar to those during construction. It is anticipated that the existing protected species legislation would remain in place.

Converter Station and Substation

6.78 An initial screening of potential impacts and effects arising from the construction and operation phases of the proposed converter station and substation is provided in Table 6.10.

Table 6.10: Determination of Relevant Ecological Features for the Proposed Converter Station and Substation

Ecological feature	Value	Screening for Potential impacts / effects	Scoped into EcIA?
Thames Estuary and Marshes SPA / Ramsar	International	**Construction**: The construction of the proposed converter station and substation will not impact on habitat within the SPA and Ramsar sites. Preparation of the Site and the construction of the proposed converter station and substation will result in dust generation, along with noise and visual disturbance. Noise and visual disturbance will not impact on the integrity or the functioning of the SPA and Ramsar sites owing to the distance between the SPA and Ramsar and the construction of the proposed converter station and substation. Furthermore, the construction of the proposed converter station and substation will be screened by existing vegetation and the topography. The implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, will be adopted and these measures will be formalised into a CEMP. Consequently, dust generation during construction is unlikely to affect the integrity of the SPA and Ramsar, providing the environmental protection measures are implemented and owing to the distance between the SPA and Ramsar and the proposed converter station and substation.	No
		Operation: There are no pathways (*e.g.* habitat loss, disturbance to SPA and Ramsar features such as noise, lighting or visual, due to distance to qualifying receptors and visual screening from existing vegetation and topography) which could affect the SPA and Ramsar sites during operation of the proposed converter station and substation.	No
Medway Estuary and Marshes SPA / Ramsar	International	**Construction**: The construction of the proposed converter station and substation will not impact on habitat within the SPA and Ramsar sites, which is >1 km from the Site. Preparation of the Site and the construction of the proposed converter station and substation will result in dust generation, along with noise and visual disturbance. The SPA and Ramsar sites are more than 1 km from the Site and therefore there will be no impacts on the SPA and Ramsar sites from dust, noise or visual disturbance as pollution controls will be in place to supress dust and vectors for noise and visual disturbance will be both a sufficient distance and sufficiently screened by existing urban/landscape features.	No
		Operation: The SPA and Ramsar are more than 1 km from the Site and therefore, there are no pathways (*e.g.* disturbance to SPA and Ramsar features such as noise, lighting or visual) which could affect the SPA and Ramsar sites during operation of the proposed converter station and substation.	No
South Thames Estuary and Marshes SSSI	National	**Construction**: The construction of the proposed converter station and substation will not impact on habitat within the SSSI. Preparation of the Site and the construction of the proposed converter station and substation will result in dust generation, along with noise and visual disturbance. Noise and visual disturbance will not impact on the integrity or the	No

Ecological feature	Value	Screening for Potential impacts / effects	Scoped into EcIA?
		functioning of the SSSI due to distance to qualifying receptors and visual screening from existing vegetation and topography. The implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, will be adopted and these measures will be formalised into a CEMP. Consequently, dust generation during construction is unlikely to affect the integrity of the SSSI, providing the environmental protection measures are implemented.	
		Operation: There are no pathways (e.g. habitat loss, disturbance to SPA and Ramsar features such as noise, lighting or visual, due to distance to qualifying receptors and visual screening from existing vegetation and topography) which could affect the SSSI during operation of the proposed converter station and substation.	No
Medway Estuary and Marshes SSSI	National	**Construction**: The construction of the proposed converter station and substation will not impact on habitat within the SSSI, which is more than 1 km from the Site. Preparation of the Site and the construction of the proposed converter station and substation will result in dust generation, along with noise and visual disturbance. The SSSI is more than 1 km from the Site and therefore there will be no impacts on the SSSI from dust, noise or visual disturbance as pollution controls will be in place to supress dust and vectors for noise and visual disturbance will be both a sufficient distance and sufficiently screened by existing urban/landscape features.	No
		Operation: The SSSI is more than 1 km from the Site and therefore, there are no pathways (*e.g.* disturbance to SSSI features such as through noise, lighting or visual) which could affect the SSSI during operation of the proposed converter station and substation.	No
ME16 Grain Pit LWS	County	**Construction**: The construction of the proposed converter station and substation will not impact on habitat within the LWS. With the implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, there are no likely pathways by which the construction of the proposed converter station and substation could adversely affect the LWS. Therefore, there is no reasonable likelihood of impacts during construction.	No
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect the LWS during operation of the proposed converter station and substation.	No
Aquatic Invertebrates	District	**Construction**: The construction of the proposed converter station and substation will not directly impact on any waterbodies or watercourses. The implementation of standard environmental protection measures during construction, such as dust	No

Ecological feature	Value	Screening for Potential impacts / effects	Scoped into EcIA?
		suppression and pollution prevention measures such as temporary silt fencing, Sustainable Drainage System features, will be adopted to prevent any indirect impacts and these measures will be formalised into a CEMP.	
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect aquatic invertebrates during operation of the proposed converter station and substation.	No
Breeding Birds (Marsh Harrier)	District	**Construction**: The construction of the proposed converter station and substation will be a sufficient (>500 m) distance from Marsh Harrier breeding locations to ensure that there will be no disturbance from noise or visual disturbance which would affect breeding Marsh Harrier. There will be no loss of habitat used by breeding Marsh Harrier during construction of the proposed converter station and substation.	No
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect breeding birds during operation of the proposed converter station and substation.	No
Non-breeding (intertidal) birds	International	**Construction**: The construction of the proposed converter station and substation will generate noise, dust and will create visual disturbance. However, the converter station and substation are >500 m from the intertidal areas used by waterbirds. It is unlikely that there will be any effects on waterbirds using the intertidal areas at this distance and therefore there are no pathways for effects on intertidal waterbirds during construction of the proposed converter station and substation.	No
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect intertidal waterbirds during operation of the proposed converter station and substation, given the distance between the converter station and substation and the intertidal areas used by waterbirds (>500 m distance).	No

Proposed DC Cable Route

6.79 An initial screening of potential impacts and effects arising from the construction and operation phases of the proposed DC cable is provided in Table 6.11.

Table 6.11: Determination of Relevant Ecological Features for the Proposed DC Cable Route

Ecological feature	Value	Screening for Potential impacts/ effects	Scoped into EcIA ?
Thames Estuary and Marshes SPA and Ramsar	International	**Construction**: The construction of the proposed DC cable corridor, above the MHWS, will not directly impact on habitat within the SPA and Ramsar sites. Preparation of the Site and the installation of the proposed DC cable corridor will result in dust generation, along with noise and visual disturbance. The implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, will be adopted and these measures will be formalised into a CEMP. Consequently, dust generation during construction is unlikely to affect the integrity of the SPA and Ramsar sites, providing the environmental protection measures are implemented. The effects of noise and visual disturbance on the interest features of the SPA and Ramsar sites are considered further on in this Table.	No
		Operation: There are no pathways which could affect the SPA and Ramsar sites during operation of the proposed DC cables.	No
Medway Estuary and Marshes SPA and Ramsar	International	**Construction**: The construction of the proposed DC cable corridor, above the MHWS, will not impact on habitat within the SPA and Ramsar sites, which are more than 1 km from the Site. Preparation of the Site and the installation of the proposed DC cables will result in dust generation, along with noise and visual disturbance. The SPA and Ramsar sites are more than 1 km from the Site and therefore there will be no impacts on the SPA and Ramsar sites from dust, noise or visual disturbance as pollution controls will be in place to supress dust and vectors for noise and visual disturbance will be both a sufficient distance and sufficiently screened by existing urban/landscape features.	No
		Operation: The SPA and Ramsar are more than 1 km from the Site and therefore, there are no pathways (*e.g.* disturbance to SPA and Ramsar features such as noise, lighting or visual) which could affect the SPA and Ramsar sites during operation of the proposed DC cables.	No
South Thames Estuary and Marshes SSSI	National	**Construction**: The construction of the proposed DC cable corridor, above the MHWS, will not impact on habitat within the SSSI. Preparation of the Site and the installation of the proposed DC cables will result in dust generation, along with noise and visual disturbance. The implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, will be adopted and these measures will be formalised into a CEMP. Consequently, dust generation during construction is unlikely to affect the integrity of the SSSI, providing the environmental protection measures are implemented. The effects of noise and visual disturbance on the interest features of the SSSI are considered further on in this Table.	No

Ecological feature	Value	Screening for Potential impacts/ effects	Scoped into EcIA ?
		Operation: There are no pathways which could affect the SSSI during operation of the proposed DC cables.	No
Medway Estuary and Marshes SSSI	National	**Construction**: The construction of the proposed DC cable corridor, above the MHWS, will not impact on habitat within the SSSI, which is more than 1 km from the Site. Preparation of the Site and the installation of the proposed DC cables will result in dust generation, along with noise and visual disturbance. The SSSI is more than 1 km from the Site and therefore there will be no impacts on the SSSI from dust, noise or visual disturbance as these pollutants are unlikely to travel that far.	No
		Operation: The SSSI is more than 1 km from the Site and therefore, there are no pathways (*e.g.* disturbance to SSSI features such as through noise, lighting or visual) which could affect the SSSI during operation of the proposed DC cables.	No
ME16 Grain Pit LWS	County	**Construction**: The construction of the proposed DC cable corridor will not impact on habitat within the LWS, which is adjacent (on the eastern side) to the DC cable corridor. With the implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, there are no likely pathways by which the construction of the proposed DC cable corridor could adversely affect the LWS. Therefore, there is no reasonable likelihood of impacts during construction. The CEMP for the Site will include measures to avoid the temporary effects of artificial lighting pollution on fauna and habitats associated with the LWS and to avoid accidental ingress (through fencing) of plant machinery and personnel into the LWS.	No
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect the LWS during operation of the proposed DC cables.	No
Intertidal Habitats	County	**Construction:** Construction activities associated with route preparation and cable installation can lead to direct physical disturbance (*i.e*. reworking) of substrate which may lead to disturbance and/or loss of benthic habitats and species within the footprint and immediate vicinity of the intertidal works. The construction activities can also lead to a temporary increase in suspended sediment concentrations (SSC), sediment deposition and re-deposition leading to turbidity and smothering effects. Changes to marine water quality from the use of drilling fluids and accidental leaks and spills from vessels, including loss of fuel oils during installation.	Yes
Aquatic Invertebrates	District	**Construction:**	No

Ecological feature	Value	Screening for Potential impacts/ effects	Scoped into EcIA ?
		Providing the construction of the DC cable avoids the direct loss of habitat within the ditch at crossing points, or along the length of the ditch, there will be no direct impacts (through habitat loss) on aquatic invertebrates during construction. The implementation of standard environmental protection measures during construction, such as dust suppression and pollution prevention, will be adopted to prevent any indirect impacts and these measures will be formalised into a CEMP. If possible, works should be limited to the western side of the Ditch and access track, including excavation, spoil storage, vehicle movements etc., and thereby direct and indirect impacts to the Ditch avoided. Due to the high biological water quality and value of the Ditch, pollution prevention measures such as temporary silt fencing, Sustainable Drainage System features and attenuation ponds (as detailed in Chapter 5) are recommended for construction works.	
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect aquatic invertebrates during operation of the proposed DC cables.	No
Invasive Non-native Species (Marine)	National	**Construction:** Introduction and spread of INNS from biofouling on marine vessels - In light of the avoidance measures outlined in Section 6.10, the risk of INNS being introduced and spread by biofouling on marine vessels and subsequently effecting benthic habitats and species is considered to be negligible. Thus, this environmental issue has been scoped from further consideration within the impact assessment.	No
Breeding Birds (Marsh Harrier)	District	**Construction**: The construction of the proposed DC cable corridor, if undertaken within the bird breeding season (March to August inclusive) has the potential to affect Marsh Harrier breeding in off-site habitats within 100 m of the proposed DC cable corridor, through noise and visual disturbance. There will be no loss of habitat used by breeding Marsh Harrier during construction of the proposed DC cable corridor.	Yes
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect breeding birds during operation of the proposed DC cables.	No
Non-breeding (intertidal) birds	International	**Construction**: There will be no permanent loss of intertidal habitat used by waterbirds to the MHWS. The movement of people and plant during the construction phase of the proposed DC cable route, at the MHWS mark, may be visible to a small proportion of the SPA cited bird species using the intertidal areas of the SPA and Ramsar during low tide and recorded during intertidal waterbird surveys. However, at low tide, from the MHWS landwards there is limited potential for temporary disturbance of birds using the intertidal areas caused by visual disturbance and that there is sufficient exposed intertidal habitat that any temporary disturbance to waterbirds during installation of the proposed DC cables at low tide is mitigated for through the abundance of available habitat elsewhere.	No

Ecological feature	Value	Screening for Potential impacts/ effects	Scoped into EcIA ?
		At high tide, the majority of waterbirds congregate at high tide roosts >600 m from the landfall area. This is a sufficient distance from the landfall area at which any temporary disturbance from installation of the proposed DC cables at landfall, generated through noise, should not affect the integrity of the high tide roost. The curvature of the coastline will screen the construction areas at landfall from the high tide roost >600 m from the landfall area. Therefore, there will be no temporary affects from visual disturbance during installation of the DC cable corridor at landfall.	
		Operation: There are no pathways (*e.g.* habitat loss, disturbance from noise, lighting or visual) which could affect waterbirds using the intertidal areas during operation of the proposed DC cables.	No

Significance of effects

6.80 Taking into account the committed avoidance and mitigation measures as detailed in section 6.10, the potential for the GB Onshore Scheme to generate effects on ecological receptors was evaluated using the methodology as detailed in section 6.5. The aim of the evaluation was to identify potentially significant effects and determine the need for bespoke mitigation measures additional to those detailed in section 6.10.

Intertidal Benthic Habitats

6.81 The evaluation highlighted that the GB Onshore Scheme has the potential to generate a negative effect on intertidal habitats during construction and operation of the DC cable (refer to Table 6.11 for details) and this is discussed further.

Construction - Temporary physical disturbance to and/or loss of intertidal benthic habitats

6.82 Various activities associated with the route preparation and cable installation phases of the Project may result in temporary physical disturbance to and/or loss of intertidal benthic habitats and species. These include:

- Horizontal direction drilling (HDD);
- Cable burial by ploughing, trenching or excavating; and
- Vessel anchors.

6.83 Effects would occur at the four breakout points for the HDD conduits in the mid shore area (i.e. approximately 800 m from the MHWS mark) and would continue down to MLWS where the cable would be installed within an open cut trench created using either a plough, mechanical trencher or excavator.

6.84 It is highly likely that a boat-based method (i.e. anchored barge) would be used to carry out the cable installation works within the low intertidal zone. Consequently, marine vessels would be required; the associated anchorage is estimated to have a ZoI of 500 m from the marine vessel whilst the cable barge would also have a footprint on the foreshore. Should cable installation works be completed using small jack up barges, the ZoI would be limited to the legs and spudcans which would have an approximate diameter of 2 m.

6.85 In the event that the intertidal trench is installed using shore based open cut techniques, it is anticipated to have a footprint measuring approximately 800 m long, 3 m wide and 1 – 1.5 m deep. Including a cable access corridor of 10 m, the total ZoI for this activity equates to an area of approximately 0.06 km2. This area would include the area which may be impacted should there be a requirement for a temporary cofferdam and/or for the cable to be pulled along the beach for installation within the HDD ducts.

6.86 All intertidal habitats identified within the Project Route Corridor are representative of Annex I habitat (‘mudflats and sandflats not covered by seawater at low tide’) and the UK BAP Priority Habitat ‘intertidal mudflats’. ‘Intertidal sand and muddy sands’ which approximates to the broadscale habitat ‘littoral sand and muddy sand’ (A2.2) is also a qualifying feature of the Medway Estuary MCZ. The Project Route Corridor overlaps with this designated site covering an area of 0.08 km2.

6.87 Physical disturbance and loss of intertidal habitats and species due to the cable installation works would be temporary, with excavated substrates being returned to the trench following cable laying. Intertidal environments are highly dynamic and therefore habitats and species have adapted to variable conditions; for example, natural community changes are often observed between summer and winter due to sediment erosion from storm events (Connor et al., 2004). As a result, the sensitivity of intertidal habitats and species to temporary physical disturbance to and/or loss is considered to be low. More sensitive nearshore habitats such as saltmarshes have demonstrated recovery to pre burial condition after five years, with some recovery within two years (Linders et al., 2003). The recovery rate for mudflats would be expected to be more rapid than this with sediment reworking and natural recruitment or migration of species from similar habitats adjacent to the ZoI. Considering the sensitivity, recoverability and conservation importance of intertidal benthic habitats, the overall value of this receptor is considered to be of county value.

6.88 Overall, effects to intertidal habitats and species from temporary physical disturbance to and/or loss of substrates during the cable installation phase of the Project is predicted to be of low magnitude. Combined with the county value of this receptor, the effect is predicted to be **minor adverse** and **not significant**.

Construction - Temporary increase in suspended sediment concentrations (SSC), sediment deposition and re-deposition leading to turbidity and smothering effects

6.89 Within the intertidal zone, activities likely to cause disturbance to sediment, and therefore increased suspended sediment and depositional loads, would be limited to the lower 800 m of the foreshore, as HDD will be used for cable installation across the upper 800 m of the intertidal zone. Trenching, barge anchor points and foreshore-based works may cause increased SSC and deposition however, the duration of these effects would be short-term.

6.90 Owing to the prevalence of fine sediments within the intertidal zone, the ZoI for increased SSC is likely to extend across the intertidal area through which the Project Route Corridor passes and may extend into the surrounding Thames and Medway estuaries, depending on prevailing currents at the time of sediment disturbance.

6.91 Sediment chemistry analysis has shown there to be some low level and localised contamination of intertidal substrates with concentrations of several Polycyclic Aromatic Hydrocarbons (PAHs) exceeding the Cefas Action Level 1 (AL1). This is not unexpected given the heavily industrialised nature and history of the area. Despite this, all concentrations of heavy and trace metals, polychlorinated biphenyls (PCBs), organotins and organochlorines fell below AL1 and are therefore not considered to be of concern and are unlikely to influence any licensing decision for dredging.

6.92 Several PAHs are highly toxic to aquatic organisms and a number are known to be carcinogenic and mutagenic. Threshold Effect Levels (TEL) and Probable Effect Levels (PEL) are defined by the Canadian sediment quality guidelines (CCME, 2001). These are referred to in the absence of equivalent UK guidelines. The TEL of a substance is the concentration below which sediment associated chemicals are not considered to represent significant hazards to aquatic organisms. The PEL represents the lowest concentration of a substance that is known to have an adverse effect on aquatic organisms. Exceedances of the TEL for several PAHs were also prevalent where observed within the intertidal zone although no exceedance of the PEL was observed. Thus, there is considered to be no potential for effects to intertidal habitats and species from the release and re-deposition of sediment bound contaminants and thus, this effect has not been considered further.

6.93 Intertidal environments are highly dynamic and subject to constant physical disturbance and exposure to wave and tidal action which can lead to natural increases to SSC and deposition. Intertidal habitats known to be present within the Project Route Corridor are characterised by muddy substrates, which are likely to easily become suspended by natural current and wave action. In addition, these habitats occur at the mouth of the River Thames where discharges of suspended sediment are high (i.e. near-bed levels typically in the region of 100 mg/l (HR Wallingford, 2002)). Thus, it expected that the intertidal habitats and associated species within the ZoI of the route preparation and cable installation works would be relatively insensitive to increases in SCC and deposition related to the Project.

6.94 Increases in SSC and deposition associated with the intertidal installation activities are not predicted to greatly exceed natural variations. Furthermore, no significant alteration of water quality due to the mobilisation of sediment bound contaminants is anticipated.

6.95 Although temporary increases in SCC and deposition may occur within the intertidal zone as a result of the Project, in comparison to the high and variable background levels, any increase is unlikely to be detectable above natural variation. Owing to the short-term nature and small scale of change related to any increase in SSC and deposition, photosynthesis of marine flora is unlikely to be affected.

6.96 Given the conservation importance of intertidal habitats and species the value of this receptor has been assessed as county importance. However, due to the already high background levels of SSC and the low sensitivity of intertidal habitats and species to increases in SSC and deposition, the magnitude of impact is predicted to be negligible and turbidity and smothering effects is predicted to be negligible and not significant.

Construction - Changes to marine water quality from the use of drilling fluids and accidental leaks and spills from vessels, including loss of fuel oils

6.97 Changes to marine water quality arising from the use of drilling fluids and additives, accidental leaks and spills from vessels has the potential to harm benthic habitats and species through toxicity and bacteriological contamination.

6.98 Most drilling fluids and additives such as bentonite which would be required during the HDD operations are biodegradable and have no harmful effect on the marine environment. For example, bentonite which consists predominately of clay minerals and is generated frequently from the alteration of volcanic ash, is considered to be a clean, inert and non-polluting substance. As such it is included on the OSPAR List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment (Cefas, 2018). Furthermore, bentonite is not listed under the Environmental Quality Standards Directive (EQSD). As outlined in section 6.10 several mitigation measures shall be implemented to avoid and/or minimise the risk of drilling fluid breakouts from the end of the ducts.

6.99 Construction vessels produce the following types of wastes and discharges each requiring appropriate handling and disposal; these include:

- Black water (i.e. sewage) which can contain harmful microorganisms, organic material with a chemical and biological oxygen demand, nutrients etc.;
- Grey water (i.e. from sinks and showers); and
- Deck drainage and bilge water there is potential for contamination with oils and lubricants.

6.100 All effluent from construction vessels will be discharged in accordance with the applicable MARPOL Convention Regulations. The potential for accidental leaks or spills of fuel, oils and any other hazardous construction materials which would also be addressed through control and response measures in the project Environmental Management Plans.

6.101 Despite the prevalence of marine traffic in the outer Thames Estuary and southern North Sea, historically few pollution events have occurred in this area. Considering this and the mitigation measures outlined above, the likelihood of accidental release occurring in relation to this Project is thought to be extremely low. Should an accidental spill or leak occur, it would be subject to immediate dilution and rapid dispersal within the marine environment.

6.102 Overall, intertidal habitats and species could potentially be affected by the changes in water quality associated with the route preparation and cable installation works however, any effect would be temporary and largely restricted to the vicinity of the works. Furthermore, the mitigation measures outlined in Section 6.10 are considered to significantly reduce the likelihood of changes in water quality occurring as a result of accidental release of substances. Thus, the overall magnitude of impact is predicted to be negligible. Combined with the county value of intertidal benthic receptors, the overall effect is predicted to be **negligible** and **not significant**.

Operation - Disturbance to benthic habitats and species due to subsea cable thermal emissions

6.103 Operation of the subsea HVDC cables generates heat due to resistance in the conductor components which can warm the cable surface and adjacent environment (i.e. sediments). The rate of heat loss, and magnitude of environmental heating is dependent on several factors; most notably the amount of power passing through the cables; the design of the cables; and the thermal properties of the surrounding substrates which in turn is influenced by sediment grain size. Coarser sediments such as gravel and sand have lower thermal resistivity than clays and mud and can therefore lead to greater transfer of heat (OSPAR Commission, 2009).

6.104 Temperature increases near the cable can modify chemical and physical properties of the substratum, such as the oxygen concentration profile (redox interface depth) and, indirectly, the development of microorganism communities and/ or bacterial activity. Physiological changes in benthic organisms living at the water-sediment interface and in the top sediment layers can also potentially occur (OSPAR Commission, 2008; Rhoads and Boyer, 1982). Temperature radiation can also cause small spatial changes in benthic community structure by way of migratory behaviour modification with species which prefer lower temperature being excluded from the cable route in favour of other, more tolerant species.

6.105 Whilst sediments may be exposed to temperature increases, the cable has negligible capacity to heat the overlying water column due to the high heat capacity of water (OSPAR, 2008). Thus, there is considered to be no interaction between benthic organisms which live in contact with the water column with potential effects being limited to infaunal species.

6.106 Temperature emissions have been modelled for a range of different possible cable systems in order to identify systems that would meet the limit described (Fichtner, 2018). All assumptions used for modelling are believed to be conservative. Modelling assumes an ambient seabed temperature of no more than 15°C, a seabed thermal resistivity of 0.7 Km/W and an average burial depth of 1500 mm. Calculations also assume a steady-state electricity transmission, which would enable heating to achieve equilibrium. In reality electricity transmission will fluctuate, leading to lower heating effects, and so this assumption is considered to be very conservative.

6.107 Sediments within the intertidal zone experience extreme natural temperature variations due to immersion and emersion during tidal cycles. As such, many intertidal species are considered to have wide tolerances for temperature and can also alter metabolic activity or burrow deeper or migrate upwards in the sediment to adjust to temperature changes (Brown, 1982).

6.108 Based on the temperature emissions predicted for the HVDC cable design, it is unlikely that any increase in temperatures within intertidal sediments would lead to notable changes in benthic species richness and abundance, or microbial activity and microphytobenthic primary production (Blanchard and Guarini, 1996).

6.109 Whilst thermal emissions would represent a permanent effect lasting for the operational lifetime of the subsea cables, the scale of change and spatial extent of effects is expected to be small and limited to a very narrow region above the cables. Thus, the overall magnitude of impacts to intertidal benthic habitats and species is predicted to be negligible. Combined with the county value of this receptor, the effect is predicted to be **negligible** and **not significant**.

Marsh Harrier

6.110 This evaluation highlighted that the GB Onshore Scheme has the potential to generate a negative effect on breeding Marsh Harrier during construction of the DC cable (refer to Table 6.11 for details) and this is discussed further.

6.111 The potential effects of construction relating to breeding Marsh Harrier, which are subject to further assessment in this chapter, are summarised below:

- temporary loss of natural or semi-natural habitats; and
- temporary disturbance from noise or light pollution, human activity and vehicular movement.

6.112 As identified in Table 6.11 there are no pathways for effects on species or designated sites during operation of the proposed DC cables and therefore will not be further assessed within this EcIA.

Temporary loss of habitat for Marsh Harrier

6.113 There will be no loss of reedbed habitat used by breeding Marsh Harrier, during installation of the proposed DC cables. Therefore, there will be **no effects** of habitat loss on Marsh Harrier.

Temporary disturbance from noise or light pollution, human activity and vehicular movement

6.114 Construction lighting, if night working is required during construction of the DC cable corridor, has the potential to disrupt breeding Marsh Harrier through light spill and glare if this falls onto reedbed habitat outside of the Site boundary. However, construction lighting will be temporary. Task-specific lighting may be used during darkness hours that occur within regular working hours (i.e. in the winter months), or during periods of low levels of natural light, but these will be outside of the breeding season for Marsh Harrier (typically March to August inclusive).

6.115 Therefore, the effects from lighting associated with construction of the proposed DC cable corridor on breeding Marsh Harrier would be negligible.

6.116 A study from Dos Reinos Lake in Spain (Fernandez and Azkona, 1993) on the effects of human disturbance on parental care by Marsh Harrier and the nutritional condition of nestlings considered that whilst the effects of human disturbance limited Marsh Harrier parental care, the behaviour of male Marsh Harrier was only affected during the incubation stage. Overall, the breeding success of Marsh Harrier was unaffected between disturbed and undisturbed pairs.

6.117 This study would suggest that the effects of disturbance on Marsh Harrier, a receptor of district value, during construction are unlikely to be significant.

6.118 Human activity, through the movement of people and vehicles during the operational phase has potential to cause temporary visual disturbance to breeding Marsh Harrier. However, this is likely to be a significant impact only immediately adjacent to the main works areas, where these works are visible to the reedbed habitat. The majority of the reedbed habitat will be screened from construction activities by vegetation, including trees and scrub. The vegetation screening will reduce the visibility of movement of people and vehicles during the breeding season (March to August inclusive).

6.119 Therefore, the magnitude of the impacts of disturbance during construction on Marsh Harrier would be low, resulting in a short-term temporary minor adverse effect which is not significant.

6.120 No predictions for noise disturbance have been performed (see Chapter 7: Noise) and therefore the significance of any construction noise effects on Marsh Harrier, without mitigation, cannot be stated. Whilst the construction of the DC cable is likely to result in short-term temporary disturbance only (if undertaken during the breeding season), there is the potential for high construction noise levels to occur whilst works are undertaken in close (<200 m) proximity to the reedbed area, east of the DC cable.

6.121 Therefore, in the absence of mitigation, the magnitude of the impacts of disturbance during construction of the GB Onshore Scheme on Marsh Harrier could lead to a short-term temporary moderate adverse effect which is significant.

Mitigation

6.122 This section only includes mitigation that is not already accounted for within the upfront inherent scheme design, as detailed in section 6.10. Any measures identified here are where significant effects on ecology and nature conservation (i.e. major or moderate adverse effects) or otherwise are predicted and mitigation is required for specific protection afforded to relevant protected species.

6.123 Good practice precautionary mitigation measures are required on the grounds of animal welfare and to ensure works are undertaken in a manner that provides certainty of compliance with relevant legislation and these will be implemented as detailed within the relevant mitigation strategies. This will be adopted and implemented through the CEMP adopted prior to and throughout the construction phase of the GB Onshore Scheme.

6.124 Noise disturbance, during construction of the DC cable, has the potential to directly impact breeding Marsh Harrier, if such works are undertaken during the breeding season (typically March to August inclusive). Therefore, to avoid any such impacts, the mitigation will be adopted and formalised into the CEMP such that construction of the DC cable, within 200 m of the Marsh Harrier territory, will not be undertaken between March and August, inclusive.

6.125 The lighting for the GB Onshore Scheme, during construction and operation, would be appropriately designed to minimise impacts on bats and off-site habitats (details to be confirmed). Brightness would be as low as legally possible and the times during which the lighting is to be used limited to provide some dark periods, if possible subject to safety requirements. Lighting would be directed to where it is needed to avoid any horizontal light spillage. Any upward lighting would be minimal to avoid light pollution and disturbance to foraging and commuting bats. Limiting the height of lighting columns and directing light at a low level would reduce the ecological impact of lighting on bats and off-site habitats. An outline Lighting Strategy will be prepared. Any lighting that is required for the construction and operation of the GB Onshore Scheme will be directed away from surrounding habitat to minimise light disturbance to off Site habitats.

6.126 In addition to the avoidance measures and mitigation by design described in Section 6.10, the following project specific mitigation is proposed to address potential significant effects to intertidal benthic ecology:

- deployment of anchors/anchor chains on the seabed will be kept to a minimum in order to reduce disturbance to seabed within the intertidal zone; and
- the preferred method of cable installation in the intertidal would be boat-based, as whilst there is potential for small non-significant effects to intertidal habitats and species from beaching of the barge and vessel anchorage, the alternative shore based option would be associated with a much larger potential ZoI and magnitude of effect although the significance is predicted to remain as minor adverse.

6.127 No further mitigation is required for the construction of the proposed GB Onshore Scheme.

6.128 No other pathways to effects on ecology are predicted during operation of the GB Onshore Scheme.

Enhancement

6.129 An Indicative Landscape Design (see Chapter 5: Landscape and Visual Amenity) has been prepared to support this application. The design includes biodiversity mitigation measures, enhancement proposals and habitat management prescriptions. The proposed biodiversity enhancements are summarised below:

- management of retained areas of scrub and trees to enhance their landscape and biodiversity value, including infill tree planting, understorey scrub planting, ground flora planting, provision of dead wood habitat piles;
- provision of bat and bird boxes within retained areas of scrub and trees;

- biodiversity enhancements through the provision of species rich grassland and scrub in surrounding areas;
- retention and enhancement of existing boundary vegetation;
- hedgerow planting and diversification along the Site boundary;
- screen planting, with trees and scrub, around the proposed converter and substation;
- creation of an attenuation SUDS basin with standing water;
- creation of a dry attenuation area immediately west of the proposed converter station; and
- creation of a dry swale, leading to the attenuation pond.

Residual Impacts

6.130 The residual effects are those that will remain after the implementation of mitigation measures. Requirements for mitigation relating to potential significant effects are minimal and relate primarily to requirements to comply with good practice and relevant legislation. Accordingly, no significant residual effects on ecological features are predicted during construction or operation of the GB Onshore Scheme.

Cumulative Effects

6.131 This section presents the assessment of cumulative effects between the GB Onshore Scheme and other proposed and committed plans and projects including other developments.

6.132 This cumulative effect assessment identifies for each receptor those areas where the predicted effects of the GB Onshore Scheme could interact with effects arising from other plans and, or projects on the same receptor based on a spatial and, or temporal basis. The approach adopted within this report follows the principles and guidelines as set out by the Planning Inspectorate. This follows a four-stage approach to assessment, initially identifying a long list of other plans and projects (Stage 1) followed by a shortlisting exercise and information gathering (Stage 2), before any potential cumulative effects are assessed (Stage 3). Further information on this methodology can be found in Chapter 12: Cumulative Assessment.

6.133 Where relevant, transboundary effects have also been considered, as per the obligations set out in the Convention on Environmental Impact Assessment in a Transboundary Context' (United Nations 1991).

Stage 1: Long list of other plans and projects

6.134 A long list of plans and projects known for the survey area and the wider area was drawn up. This list is presented in Chapter 12 and the locations are shown in Figure 12.1.

Stage 2: Shortlist of cumulative assessment developments relevant to Ornithology

6.135 The shortlisting of projects involved taking into consideration spatial and temporal overlaps between the GB Onshore Scheme and the long list of developments as outlined in Chapter 12. Where potential spatial and, or temporal overlap was thought to occur, the area of overlap was reviewed to identify any specific ecological receptors. If the ecological receptors identified were considered to be sensitive, the overlapping development was taken forward into the cumulative assessment (Stages 3 and 4).

6.136 From review of the projects identified in Chapter 12, those which are regarded as having a temporal and/ or spatial overlap with the GB Onshore Scheme, that may result in cumulative impact(s) on ecological receptors are the proposed NGET OHL Works, and the GB Offshore Scheme. From review of these proposed projects and their overlap to the GB Onshore Scheme the only ecological receptors considered to be sensitive, thereby requiring assessment, are the Thames Estuary & Marshes SPA and Ramsar, and Lower Thames Estuary & Marshes SSSI, and the Marsh Harrier.

6.137 In reviewing the long-list of projects it has been assumed that any maintenance and repair work associated with the operation of the GB Onshore Scheme would be temporary and highly localised such that any disturbance (e.g. visual, noise and, or lighting) would not combine with similar effects during either the construction or maintenance works associated with any of the projects listed above to result in a cumulative effect. As such no cumulative effects are likely during operation.

6.138 Further to the projects identified in Chapter 12, the Britned development – located 1.5 km to the south-east of the Project Area – was also screened out as this development is operational and therefore there are unlikely to be any cumulative effects arising from any maintenance and repair to this development and the construction of the GB Onshore Scheme (where these are coincident).

6.139 The remaining plan and projects including developments have also been screened out on the basis of distance from the GB Onshore Scheme.

Stages 3 and 4: Information gathering and assessment

6.140 The works associated with the installation of the GB Offshore Scheme subsea cables, may result in the cumulative impact on the Thames and Lower Thames Estuary & Marshes SPA, Ramsar and SSSI sites. However the installation activities of the subsea cable on either side of MLWS would be undertaken as part of the same activity and not undertaken simultaneously. Therefore whilst the impacts may persist for slightly longer the GB Offshore Scheme, beyond the GB Onshore Scheme application boundary, installation will be out of the boundary of the protected areas. Any disturbance to bird populations would also be negligible as whether these activities are undertaken at high tide or low tide, there will either be no mudflats exposed for feeding, or maximum feeding grounds exposed.

6.141 From review of the location of the Marsh Harrier nesting site and the proposed projects there are no spatial overlaps. Due to the nature of the works associated with the NGET OHL Works and the GB Offshore subsea cable installation activities being minor and undertaken in line with the GB Onshore Scheme construction, it is concluded that in combination impacts on the Marsh Harrier would be negligible.

6.142 In terms of assessment, no plans or projects including other developments, as detailed in Chapter 12, have been identified which may result in cumulative effects on Ecology within the GB Onshore Scheme. Therefore, the main potential for ecological impacts during construction and operation of the GB Onshore Scheme is within the Site itself. Other schemes do not contribute to the effects on protected species identified in this chapter and therefore the effects are likely to be **not significant**.

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7. Noise & Vibration

Introduction

7.1 This chapter of the Environmental Statement reports the findings of an assessment of the effects associated with noise and vibration occurring as a result of the construction, operation and maintenance and decommissioning of the GB Onshore Scheme. Described within this chapter are:

- The methods used to assess the likely significant noise and vibration effects associated with the GB Onshore Scheme;
- The baseline sound environment at noise sensitive receptor (NSR) locations surrounding the Project Area (the area in which the GB Onshore Scheme is located) based upon a long-term sound survey;
- Mitigation measures required to prevent, reduce or offset any likely significant adverse noise and vibration effects arising as a result of the construction, operation and maintenance and decommissioning of the GB Onshore Scheme; and
- The likely residual noise and vibration effects of the GB Onshore Scheme after these mitigation measures have been adopted and a statement on the significance of the residual effects.

7.2 Effects are considered during the construction, operation and maintenance and decommissioning phases of the GB Onshore Scheme. The scope of this assessment is to identify the potential for effects to occur at NSRs due to the following:

- Noise and vibration impacts from construction and/or decommissioning works;
- Noise impacts from the operation of the converter station and substation; and
- Noise impacts associated with road traffic movements attributable to the construction activities.

7.3 No sources of significant vibration are associated with the operation and maintenance of the GB Onshore Scheme. DC cables do not typically emit high levels of sound and, according to Chapter 03 Proposed GB Onshore Scheme, the DC cable will be buried in a 1.5 m deep trench which would absorb any sound emissions. Any sound emissions from the buried DC cable are anticipated to be imperceptible. Therefore, assessments of operational vibration, operational noise from the proposed DC cables have been scoped out of the assessment.

7.4 Regular maintenance activities are not anticipated to generate perceptible levels of noise or vibration at nearby receptors. Unplanned maintenance activities may result in perceptible noise levels at NSRs, in particular due to the requirement for night-time access when NSRs are more sensitive. However, these would be extremely infrequent events. Therefore, noise and vibration impacts due to maintenance activities have been scoped out.

7.5 Road traffic flows due to the operation and maintenance of the GB Onshore Scheme are anticipated to have a negligible impact on baseline flows on the surrounding roads. Therefore, operational impacts due to road traffic noise have been scoped out. This Chapter is supported by the following Technical Appendices:

- Appendix 7.A: Baseline Sound Survey Report
- Appendix 7.B: Modelling Information

Approach to Assessment

Overview

7.6 This section of this ES Chapter presents the following:

- Information sources that have been consulted throughout the preparation of this chapter;
- Details of consultation undertaken with respect to noise and vibration;
- The methods used to assess magnitude of noise level change from the existing or 'baseline' condition and the potential future baseline; and
- The significance criteria and terminology for the assessment of noise and vibration effects.

7.7 The assessment has been based on the development description in Chapter 3: Proposed GB Onshore Scheme. The following sources of information that define the GB Onshore Scheme have been reviewed and form the basis of the assessment of potential noise and vibration effects:

- Site layout plans:
  - Figure 2.2: Proposed GB Onshore Scheme;
  - Figure 2.3: Indicative Converter Station Layout.
- Development traffic: 24-hour AADT base and development traffic flows provided as part of the Transport Assessment (refer to Chapter 5: Transport).

7.8 Operational plant and sound source levels: based on information from the Environmental Statement submitted in support of the planning application for the "NSN Link" project by National Grid dated July 2014. The proposed converter station is of a similar design and plant and sound source levels are therefore considered representative of the GB Onshore Scheme.

Study Area

7.9 The extent of the study area has been defined to include the nearest NSRs in each direction from the Project Area and alongside the transport corridors that may be affected by changes in road traffic flows during the construction of the GB Onshore Scheme.

Consultation

7.10 An EIA Screening Opinion request was submitted to Medway Council (MC) on 23rd November 2018. The MC Environmental Health department provided the following comment in relation to noise and vibration:

> *"I am happy with the proposed scope of the EIA with respect to air quality and noise.*
>
> *There are likely to be construction and operational phase noise. Due to the long duration of the project I recommend that a construction phase noise assessment is carried out, and this should inform the scope of a Construction Environmental Management Plan (CEMP) and so set construction noise limits at representative noise sensitive receptors. The most appropriate standard for assessing the construction phase noise, and setting suitable noise limits and best practice controls and mitigation measures for this phase is BS5228.*
>
> *The operational phase noise assessment should refer to applicable standards and guidelines (for example BS4142:2014) and particular attention needs to be taken to the consideration of low frequency sound. It may be beneficial to seek the advice of UK Power Networks on the suitable assessment of low frequency sound from these types of installations."*

7.11 MC have been further consulted by telephone call between Tim Britton (Principal Acoustic Consultant, AECOM) and Stuart Steed (Environmental Protection Officer, MC). During this phone call it was agreed that:

7.12 Due to the absence of available information on the construction activities, assessment of construction noise and vibration would be qualitative, focussing on determining suitable limits and potential best practice measures;

7.13 Predictions of operational sound levels at receptors will be based on similar alternative projects to determine likelihood of requiring additional mitigation measures. However impacts will be controlled via the detailed design process and conditions in planning consent; and

7.14 In terms of an operational noise assessment using BS 4142: 2014, MC have a general preference of applying a criterion that the rating level should be at least 10 dB below the background sound level, subject to a demonstration that the internal noise level criteria in BS 8233:2014 are met. However it was agreed that BS 8233:2014 is not applicable to this type of sound and that alternative internal noise level criterion should be identified, preferably by applying guidance from UK Power Networks (UKPN).

Assessment Method

Guidance

7.15 The following guidance has been applied in this assessment as required.

British Standard 7445-1:2003 and 7445-2:1991

7.16 BS 7445 'Description and measurement of environmental noise' (BSi 2003 & 1991) (Ref 7-1) defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 5228:2009+A1:2014

7.17 BS 5228-1 'Code of practice for noise and vibration control on construction and open sites. Noise' (BSi 2014a) (Ref 7-2) provides a 'best practice' guide for noise control, and includes Sound Power Level (Lw) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 'Code of practice for noise and vibration control on construction and open sites. Vibration' (BSi 2014b) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

British Standard 4142:2014

7.18 BS 4142 'Methods for rating and assessing industrial and commercial sound' (BSi 2014) (Ref 7-3) can be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise. The method compares the difference between the 'rating level' of the industrial noise with the 'background sound level' at the NSR position.

British Standard 8233:2014

7.19 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (Ref 7-4) provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties.

Department of Transport: Calculation of Road Traffic Noise

7.20 Department of Transport (DfT)/ Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN) (1998)' (Ref 7-5) describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

Highways Agency: Design Manual for Road and Bridges

7.21 The Highways England 'Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration' (DMRB) (Highways Agency, 2011) (Ref 7-6) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from all road projects, including new construction, improvements and maintenance. The guidance can also be used for assessing changes in traffic noise levels as a result of non-road projects such as this.

ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors

7.22 International Standards Organisation (ISO) 9613-2:1996 'Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation' (ISO 9613-2) (Ref 7-7) specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

Assessment Method

7.23 Applicable planning policy is discussed in the following section; however it is necessary at this stage to describe the requirements of the Noise Policy Statement for England (NPSE) (Ref 7-8) in relation to the proposed assessment method. The Explanatory Note to the NPSE refers to the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established.
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected.

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

7.24 It is recognised that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL may be different for different noise sources, for different NSRs and at different times.

7.25 The aims of the NPSE are interpreted to be as follows (within the context of Government policy on sustainable development):

- To avoid noise levels above the SOAEL.
- To consider situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur.

7.26 To demonstrate compliance with the NPSE, the adopted assessment methodology identifies the LOAEL and SOAEL for each potential impact under consideration.

Construction and Decommissioning Noise

7.27 Annex E of BS 5228-1 provides example criteria for the assessment of potential significance of construction noise effects. 'Example Method 1 – The ABC Method' has been adopted for the purposes of this assessment, as it takes into consideration the context of existing noise levels experienced at a NSR, and the method for defining construction noise limits is outlined in Table 7.1.

Table 7.1 BS 5228-1:2009+A1:2014 ABC Method

Assessment Category and Threshold Value Period	Threshold Value, in decibels (dB) ($L_{Aeq,\,T}$)		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (23.00−07.00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07.00−19.00) and Saturdays (07.00−13.00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq,\,T}$ noise level arising from the application site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,\,T}$ noise level for the period increases by more than 3dB due to site noise.

NOTE 3 Applied to residential receptors only.

[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

[B)] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

[C)] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

[D)] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

7.28 For the appropriate period (day, evening, night, weekend etc.), the ambient noise level is determined and rounded to the nearest 5 dB and the appropriate Threshold Value is then derived. The predicted construction noise level is then compared with this Threshold Value. The criterion adopted in this assessment for the onset of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be potentially equivalent to the SOAEL, although as stated in BS 5228, other project-specific factors are also considered by the assessor when determining if there is a potentially significant effect, such as the number of NSRs affected and the duration and character of the impact. The criterion for the LOAEL for this assessment is a predicted construction noise level equal to the existing ambient noise level at each NSR, *i.e.* resulting in a 3 dB increase in noise level when combined with the ambient noise level. Note that these criteria relate to residential NSRs only, in line with the ABC method.

7.29 With consideration of the above and the information presented in Table 7.1, Table 7.2 presents the construction noise magnitude of impact criteria for residential NSRs.

Table 7.2 Construction noise magnitude of impact criteria for residential NSRs

Magnitude of Impact	Construction Noise Level $L_{Aeq,T}$ (dB)
High	Exceedance of ABC Threshold Value by ≥5 dB
Medium	Exceedance of ABC Threshold Value by up to 5 dB
Low	Equal to or below the ABC Threshold Value by up to 5 dB
Very low	Below the ABC Threshold Value by ≥5 dB

7.30 As details of the proposed construction and decommissioning schedule and plant to be used are not available at this stage, a quantitative construction noise assessment has not been carried out. Instead a qualitative assessment focussing on best practicable means has been completed.

Construction Vibration

7.31 BS 5228 indicates that construction activities (particularly piling) usually only generate significant vibration effects when they are located within 20 metres (m) from sensitive locations. The effect depends on the construction activity, ground conditions and receptor distance.

7.32 Table 7.3 details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for description of demolition and construction vibration impacts on human receptors based on guidance contained in BS 5228-2.

Table 7.3 Guidance on the Impacts of Vibration (PPV) Levels

Peak Particle Velocity Level	Description	Magnitude of Impact
0.14 mm/s to <0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very Low
0.3 mm/s to <1.0 mm/s	Vibration might be just perceptible in residential environments.	Low
1.0mm/s to <10 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Medium
>=10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High

7.33 As with the construction noise assessment, a quantitative construction vibration assessment has not been carried out. Instead a qualitative assessment focussing on best practicable means has been completed.

Construction Traffic Noise

7.34 Construction traffic noise impacts due to increases in traffic flows on existing roads have been estimated based on the CRTN methodology for the calculation of the Basic Noise Level (BNL) at a reference distance of 10 m from the nearside carriageway. Predictions have been undertaken for both the “with” and “without” construction traffic scenarios.

7.35 The criteria for the assessment of traffic noise level changes have been taken from Table 3.1 of DMRB and are provided in Table 7.4 below.

Table 7.4 Road Traffic Noise Assessment Criteria (Temporary Changes)

Magnitude of Impact	Change in Road Traffic Noise Level $L_{A10,18h}$ (dB)
High	≥ 5
Medium	3 to <5
Low	1 to <3
Very low	<1

7.36 DMRB advises that an increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an increase in road traffic noise of 1 dB LA10,18h. A doubling in traffic flow would be required for an increase in 3 dB LA10.

7.37 It is generally accepted that changes in noise levels of 1 dB or less are imperceptible, and changes of 1 to 3 dB are not widely perceptible. The SOAEL is set at a change in traffic noise of +3 dB LA10 and the LOAEL at +1 dB LA10.

Operational Noise

7.38 The layout of the buildings in the converter station and substation are subject to detailed design approval; however the sites have been zoned to demonstrate where buildings will be located. It is understood that there will be no transformers or other external plant associated with the substation, therefore no significant impacts are anticipated due to operational noise from the substation. The assessment has been based on the worst-case scenario for converter station orientation in regards to predicted noise levels and surrounding NSR locations. The indicative layout identified in Figure 3.3 shows the layout assumed for the worst-case noise level with the transformers – the main noise source during operation – located to the north of the site.

7.39 Predicted operational sound levels from the converter station have been calculated using the SoundPLAN sound prediction software (version 8.0), which predicts the L_{Aeq} at NSR locations in accordance with the methodology in ISO 9613-2. The model includes sound breakout from buildings where internal levels are anticipated to be high and sound from external plant. Predictions have been performed in octave bands using individual frequency spectra for each sound source, allowing determination of the likely frequency spectra of operational sound levels at NSRs. The predictions have incorporated 15 m high blast walls separating each combined transformer and transformer cooler location and at either end of the transformer area. Further details are provided in Appendix 7.2.

7.40 BS 4142 provides a means of assessing the significance of industrial noise. A key aspect of the BS 4142 assessment procedure is a comparison between the background sound level in the vicinity of residential locations and the rating level of the sound source under consideration. The relevant parameters in this instance are as follows:

- Background Sound Level, $L_{A90,T}$, defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels';
- Specific Sound Level, $L_{Aeq,Tr}$,the 'equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr'; and
- Rating Level, $L_{Ar,Tr}$, the specific sound level plus any adjustment made for the characteristic features of the sound'.

7.41 BS 4142 allows for, as an absolute worst case, a cumulative +15 dB correction to be applied to the specific sound level based upon the presence or expected presence of the following:

- Tonality - up to +6 dB penalty;
- Impulsivity - up to +9 dB penalty (this can be summed with tonality penalty); and
- Other sound characteristics (neither tonal nor impulsive but still distinctive) - +3 dB penalty.

7.42 When considering the difference between the rating level and the background sound level, the following guidance is provided in the standard:

- "*Typically, the greater this difference, the greater the magnitude of the impact.*"
- *"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context."*
- *"Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

7.43 Any consideration of the significance of effect should also take into account other factors including:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the NSR.

7.44 The criteria for determining the magnitude of operational noise impacts at NSRs, based on guidance within BS 4142, are presented in Table 7.5.

Table 7.5 BS 4142:2014 Noise Ratings

Difference Between *Rating Level* and *Background Sound Level*	Magnitude of Impact
-10dB(A) or less	Very low
Between -10dB(A) and 0dB(A)	Low
Between 0 and +10 dB(A)	Medium
+10dB(A) or more	High

7.45 For indicative assessment purposes the LOAEL is set at a rating level equal to the background noise level and the SOAEL is set at a rating level of +10 dB above background, although it should be remembered that the context assessment can vary the overall significance of effects.

7.46 To provide further context to the assessment, the ingress of operational noise into residential properties has also been assessed. As proposed by MC in the Screening Opinion and subsequent consultation, these assessment criteria have been established based on the opinion of UK Power Networks (UKPN). UKPN have published a response to 'The London Plan' (The Spatial Development Strategy for Greater London) dated March 2018 , which stated the following in regard to noise which is relevant to this assessment:

"we note your reference to BS8223:2014 in respect of providing guidance on good acoustic design inside buildings. Whilst this is a widely used standard it is not always appropriate for low frequency noise associated with electricity transformer hum. When buildings are in close proximity to our substations consideration should also be given to…..:…

Considering the use of noise reduction curves within the planning conditions – the NR20 would be the appropriate curve to use. However, a robust process would need to be put in place to ensure that planning conditions are achieved post construction."

7.47 It is understood from the above that UKPN are satisfied that internal electricity transformer hum sound levels are likely to be considered acceptable as long as the criterion of NR20 is not exceeded.

7.48 There are no available significance of effect criteria allowing assessment of internal operational noise impacts for this type of low frequency hum sound in the context of Environmental Impact Assessment (EIA) or to identify a LOAEL or SOAEL. The calculated internal noise levels are therefore compared to the limit of NR20, the effect is classified as not significant or significant depending on whether the limit is exceeded.

7.49 It is assumed that occupants of surrounding NSRs will keep their windows partially open during both daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods; a partially open window provides up to 15 dB attenuation of external free-field to internal noise.

7.50 Backup diesel generators will be present on the proposed site. These will only be operated in the event of a fault with the converter station's power supply; however, they will require to be regularly tested during daytime hours only. Given the likely infrequency of the operational noise impacts, the effect of these generators is not significant and therefore has not been assessed further.

Significance Criteria

7.51 Sensitive NSRs have been classed depending on their use and subsequent sensitivity to noise and vibration. The sensitivity of NSRs to noise and vibration has been defined in Table 7.6.

Table 7.6 Criteria Used to Define Sensitivity of Receptors

Sensitivity	Description	Examples of Receptor Usage
High	Receptors where noise will significantly affect the function of a receptor	• Auditoria/ studios; • Specialist medical/ teaching centres; and • Libraries.
Medium	Receptors where people or operations are particularly susceptible to noise	• Residential and student accommodation; • Places of worship; • Conference facilities; • Schools in daytime; and • Hospitals/ residential care homes.
Low	Receptors of low sensitivity to noise, where it may cause some distraction or disturbance	• Offices; • Restaurants; and • Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Very low	Receptors where distraction or disturbance from noise is minimal	• Residences and other buildings not occupied during working hours; • Factories and working environments with existing high noise levels; and • Sports grounds when spectator or noise is a normal part of the event.

7.52 The following terminology has been used to define noise and vibration effects:

- **Adverse** – detrimental or negative effects to an environmental resource or receptor;

- **Negligible** – imperceptible effects to an environmental resource or receptor; or
- **Beneficial** – advantageous or positive effects to an environmental resource or receptor.

7.53 Where adverse or beneficial noise and vibration effects have been identified, these are described using the following scale:

- **Minor** – slight, very short or highly localised effect;
- **Moderate** – limited effect (by extent, duration or magnitude), which may be important at a local scale; or
- **Major** – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

7.54 The duration of noise and vibration effects is defined as follows:

- **Short term** – period lasting for no longer than 3 months;
- **Medium term** – period lasting for no longer than 2 years; or
- **Long term** – period lasting for longer than 2 year.

7.55 Table 7.7 provides a matrix showing the classification of effects depending on the sensitivity of receptors and magnitude of impact.

Table 7.7 Classification of Effects Matrix

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

7.56 Generally, effects classed from negligible to minor are considered to be not significant, whereas effects classed from moderate to major are considered to be significant. However, in line with best practice this initial decision on the significance of an effect is then combined with professional judgement which takes into account a range of other factors. Where relevant to specific potential impacts these have already been discussed however other potential generic factors include:

- the absolute sound levels e.g. if sound levels are already very high then small sound level changes may be considered significant. Conversely if sound levels are very low then a larger change may be required to be considered significant;
- where the predicted level lies relative to the boundaries between the bands, e.g. in some circumstances a change of road traffic noise level e.g. 2.9 dB, which just falls into the minor category, may be considered significant;
- the circumstances of the NSR, e.g. a NSR may contain areas which are more or less sensitive than others, e.g. office spaces or kitchens in a school, would be considered less sensitive than classrooms. Alternatively, if a receptor is particularly vulnerable, such as a school for hearing impaired children;
- the acoustic character of an area, e.g. if a scheme introduces a sound source into an area where that type of sound is not currently a major source; and
- the proportion of a designated site that is affected (e.g. comparing the proportion of a designated site within the noise study area, such as a Site of Special Scientific Interest (SSSI)), that is above the LOAEL or SOAEL.

Assumptions and Limitations

7.57 Predictions of sound levels have an associated degree of uncertainty. Modelling and measurement processes have been carried out in such a way to reduce such uncertainty; however, it is unavoidable that some degree of prediction uncertainty remains. In particular, the following sources of uncertainty have been noted:

- The layout of the converter station and construction materials to be used for the buildings are all subject to detailed design approval and have been based on other similar projects. The modelling has assumed a potential worst-case in terms of the building and plant layout which would generate highest operational sound levels at NSRs.
- Sound source levels of operational plant have been based on data from other similar projects. The precise methodology by which these data were gathered, and hence the uncertainty associated with these is not known, however the plant modelled is based on models currently adopted within the industry and regarded to be a reasonable prediction of chosen equipment. The plant that will be installed and thus the associated operational sound emissions are also subject to detailed design.
- Predictions of operational plant and activities sound pressure levels according to ISO 9613-2 are based on an assumption of moderate downwind propagation, and hence could be considered as a worst-case calculation. However, the standard also indicates an estimated accuracy of ±3 dB(A) in predicted levels.
- Sound insulation data, used to calculate the break-out of sound from within buildings have been estimated from the details of the construction from the North Sea Link project due to its similarity with the proposed GB Onshore Scheme, using industry standard methods and software, but a degree of uncertainty in sound breakout from the building will result from the use of these estimates.
- An external free-field to internal noise level difference of 15 dB has been assumed for residential properties with a partially open window (per BS 8233 guidance).

7.58 To assess the potential noise and vibration effects of the GB Onshore Scheme, it was necessary to determine the baseline conditions. It is considered that the baseline sound measurements, which were undertaken at locations surrounding the application site in March to April 2019, as agreed with MC Environmental Health, are representative of the baseline sound climate in the vicinity. The potential for changes in baseline sound levels over the project duration has been considered but this is limited to available information about potential future changes in the observed sources contributing to the baseline sound climate.

7.59 In addition, any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort was made to undertake measurements as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey.

7.60 It is the contractor's responsibility to ensure that the noise from the proposed converter station operating at full load will not exceed the required specification (noise limits at NSRs) achieved through mitigation by design. Therefore it is assumed that this will be the case.

Planning Policy & Applicable Legislation

National Legislation

7.61 Relevant national legislation to noise and vibration include:

- The Control of Pollution Act 1974 (CoPA)
- The Environmental Protection Act 1990 (EPA)

Control of Pollution Act 1974

7.62 Section 72 of CoPA requires that Best Practicable Means (BPM) are adopted to control demolition and construction noise on any given site. CoPA makes reference to BS 5228 Noise and Vibration Control on Construction and Open Sites as BPM.

7.63 Sections 60 and 61 of the CoPA provide the main legislation regarding enabling works and demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Authority with instructions to cease work until specific conditions to reduce noise have been adopted. Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during demolition and construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on- site.

Environmental Protection Act 1990

7.64 The EPA prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

7.65 Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served to the person responsible for the nuisance. It requires either the abatement of the nuisance, works to abate it, prohibition or restriction of the activity. Contravention of a notice without reasonable excuse is an offence. Right of appeal to the Magistrates Court is permitted within 21 days of a noise abatement notice being served.

7.66 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law as no statutory noise limits exist. Demonstrating the use of best practicable means to minimise noise levels is an accepted defence against a noise abatement notice.

National Planning Policy

7.67 Relevant national planning policy and related guidance include:

- National Planning Policy Framework (NPPF);
- Noise Policy Statement for England (NPSE);
- Planning Practice Guidance: Noise (PPGN);
- UK 25 Year Environment Plan ('A Green Future: Our 25 Year Plan to Improve the Environment').

National Planning Policy Framework (2018)

7.68 The NPPF was published in July 2018 and sets out the Government's planning policies for England how these are expected to be applied.

7.69 In respect of noise and vibration the NPPF states to the following:

- Paragraph 170. *“Planning policies and decisions should contribute to and enhance the natural and local environment by: […] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."*

- Paragraph 180. *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and the quality of life; b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

Noise Policy Statement for England (2010)

7.70 The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

7.71 The statement sets out the long-term vision of the government's noise policy, which is to "promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".

7.72 This long-term vision is supported by three aims:

- *"avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvements of health and quality of life."*

7.73 The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

Planning Practice Guidance: Noise (2014)

7.74 The PPGN is a web-based resource that was launched on 6 March 2014 and includes guidance which "*advises on how planning can manage potential noise impacts in new development*" in line with the 2012 NPPF. At the time of writing, the PPGN has not yet been updated to reflect the updated NPPF.

7.75 The PPGN states that local planning authorities should take account of the acoustic environment and in doing so consider:

- *"whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved."*

7.76 This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Further details are provided in Table 7.8. Factors to be considered in determining whether noise is of concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative effects.

Table 7.8 Planning Practice Guidance Noise Observed Effect Levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid through use of appropriate mitigation whilst taking into account the social and economic benefit
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent through use of appropriate mitigation

Green Future: Our 25 Year Plan to Improve the Environment

7.77 The 25 Year Environment Plan, published in January 2018, sets out the actions the UK Government will take to help the natural world regain and retain good health.

7.78 The Plan states that "over the next 25 years, we must significantly cut all forms of pollution and ease the pressure on the environment. We must ensure that noise and light pollution are managed effectively."

Local Planning Policy

Medway Local Plan

7.79 The 2003 Medway Local Plan (MLP) (Ref 7-14) is due to be replaced by the Medway Local Plan 2018 – 2035 in 2020, subject to the outcomes of an independent examination by a planning inspector. However at the time of writing the 2003 document is applicable.

7.80 The MLP contains the following relevant policies to noise and vibration in the context of the GB Onshore Scheme:

- Policy BNE2: Amenity Protection *"All development should secure the amenities of its future occupants, and protect those amenities enjoyed by nearby and adjacent properties. The design of development, should have regard to:*
  - *(i) privacy, daylight, and sunlight; and*
  - *(ii) noise, vibration, light, heat, smell and airborne emissions consisting of fumes, smoke, soot, ash, dust and grit; and*
  - *(iii) activity levels and traffic generation."*

- Policy BNE3: Noise Standards "*Noise-generating development should be located and designed so as not to have a significant adverse noise impact on any nearby noise sensitive uses (including offices, hospitals, schools and, in respect of noise emanating from non-transport related sources, housing).*"

Baseline Conditions

Site Location

7.81 The Project Area is situated within the centre of the Isle of Grain to the west of Grain, the main settlement in the vicinity. The land surrounding the Project Area is either in agricultural use or is brownfield. In addition to Grain there are a number of scattered residential properties to the north and east of the Project Area.

Baseline Monitoring Methodology

7.82 Long-term surveys were undertaken from 27th March 2019 to 3rd April 2019 at three locations (LT1 to LT3) to establish the baseline sound environment around the Project Area. Details of the monitoring methodology and equipment specifications are provided in Appendix 7.1 Baseline Sound Survey Report.

7.83 Sound monitoring locations were selected based on professional experience to provide suitability representative information on sound levels at the NSRs and in agreement with MC Environmental Health. The baseline sound surveys were undertaken in accordance with guidance specified in BS 7445. The sound level meters logged environmental sound measurement parameters including average ambient (L_{Aeq}), and background (L_{A90}) sound levels, and all measurements were undertaken in free-field conditions (i.e. greater than 3 m from a reflecting surface other than the ground.

7.84 BS 7445 and BS 4142 include requirements on suitable weather conditions for sound measurements, for example maximum wind speeds to avoid wind-induced noise on the microphone. Therefore, the weather conditions were recorded throughout the monitoring period to exclude data gathered during periods of adverse weather conditions.

Sensitive Receptors

7.85 The identified NSRs are those nearest the Project Area i.e. the NSRs that will experience the highest level of sound from the GB Onshore Scheme. Although sound may be perceivable at other NSRs in the area, effects will not be significant if they are suitability controlled at the identified NSRs. The nearest NSRs to the Project Area have been selected for assessment, where the intention is to apply appropriate sound level data at each NSR location for assessment purposes. Sensitive NSRs that have been considered in the assessment are illustrated in Figure 7.1 (ES Volume III) and described in Table 7.9. Monitoring locations are shown in Figure 7.2 (ES Volume III).

Table 7.9 Noise Sensitive Receptor Locations

Receptor	Receptor Address	Corresponding Monitoring Location	Receptor Type	Distance to redline boundary (m)
R1	Dallekko, Grain Road	LT3	Residential	18
R2	Perry's Farm	N/a	Residential	89
R3	Police Cottages	LT2	Residential	546
R4	Rosecourt Farm	LT1	Residential	189
R5	Westbere	LT3	Residential	34

7.86 Measurements were not performed at a representative location to R2 Perry's Farm it will not be inhabited during construction or operation of the GB Onshore Scheme. However the property is included within the assessment to illustrate all potential impacts representative to the existing baseline. In order to identify the potential worst-case impacts, baseline sound levels at this location have been assumed to be the lowest of those measured at the three monitoring locations.

Baseline Monitoring Results

7.87 The results of baseline sound monitoring undertaken are summarised in Table 7.10. No periods of adverse weather conditions occurred, therefore no data have been excluded from the analysis.

7.88 At LT1 during set up of the monitoring equipment, the dominant sound source was aircraft movements from a combination of helicopters and planes. Other sound sources included birds tweeting and intermittent vehicle's driving through West Lane. At the time of collection, another sound which could be heard was from a school playground to the south during their dinner hour.

7.89 At LT2, the dominant sound sources were noted as birds tweeting/ intermittent aircraft movements. Other sound sources included a constant low lying background hum from factories to the south west.

7.90 At LT3, the dominant sound source was noted as fairly constant traffic along Grain Road. Other sound sources included birds tweeting and upon collection a group of workers setting up a temporary mobile generator approximately 80 m to the north.

Table 7.10 Baseline Sound Survey Results Summary

Location	Daytime			Night-time		
	dB $L_{Aeq,16h}$	dB $L_{A90,15min}$ Mode	dB $L_{A90,15min}$ 10th Percentile	dB $L_{Aeq,8h}$	dB $L_{A90,15min}$ Mode	dB $L_{A90,15min}$ 10th Percentile
LT1	55	36	32	51	34	32
LT2	51	37	32	46	35	33
LT3	55	39	36	52	36	35

Future Baseline

7.91 At the majority of the measurement locations the dominant source contributing to the baseline sound climate is aircraft, potential changes to the baseline sound levels in the future will primarily depend on the changes in aircraft sound levels. There is insufficient information available to predict the potential changes in aircraft sound levels, or the changes in sound from birds or the factories to the south-west. The anticipated increase in baseline road traffic flows in the vicinity is included within the assessment of construction road traffic noise impacts.

Potential Impacts

Introduction

7.92 Mitigation measures which have been incorporated in the design and construction of the GB Onshore Scheme are set out in Chapter 3: Proposed GB Onshore Scheme. These measures are included within this assessment of potential noise effects. If additional mitigation measures are required beyond those incorporated into the design, these are discussed in the Mitigation section of this Chapter.

7.93 The prediction of noise and vibration impacts associated with the construction and operation of the GB Onshore Scheme reflects the description presented in Chapter 3: Proposed GB Onshore Scheme**.**

Construction

7.94 The construction activities have the potential to result in temporary noise and vibration impacts at the closest NSRs to the works. The main construction activities are:

- Preliminary works;
- Site establishment;
- Earthworks;
- Civil engineering works;
- Building works;
- Cable installation;
- Provision/installation of permanent services;
- Mechanical and electrical works;
- Commissioning; and
- Site reinstatement and landscape works.

Construction Noise

7.95 Based upon the analysis and summary of the results of the baseline sound survey, the relevant LOAELs and SOAELs (SOAEL is equal to the BS 5228 'ABC' noise threshold category) at each NSR are provided in Table 7.11, along with the relevant ambient sound level. Note that the ambient sound levels presented below have been calculated based on the measurements during the relevant time period defined in BS 5228 which differs from those presented in Table 7.9.

Table 7.11 Measured free-field $L_{Aeq,T}$ noise levels and associated 'ABC' assessment category.

Receptor	Ambient Sound Level dB $L_{Aeq,T}$			LOAEL dB $L_{Aeq,T}$			SOAEL dB $L_{Aeq,T}$		
	Daytime	Evening	Night time	Daytime	Evening	Night time	Daytime	Evening	Night time
R1	56	53	52	56	53	52	65	60	55
R2	52	42	46	52	42	46	65	55	50
R3	52	42	46	52	42	46	65	55	50
R4	55	48	51	55	48	51	65	55	55
R5	56	53	52	56	53	52	65	60	50

7.96 As no predictions have been performed, the significance of the construction noise effect on NSRs without mitigation cannot be conclusively stated. Typically, earthworks cause the greatest noise impacts at NSRs due to the requirement for large numbers of noisy plant for a relatively long duration. The earthworks associated with the construction of the proposed substation and converter station are likely to have the greatest impacts on the residential property at Perry's Farm due to its proximity to these locations.

7.97 Given the proximity of the proposed DC cable route to residential properties on Grain Road (18 m to the site boundary) there is the potential for high construction noise levels to occur at these properties whilst works are undertaken in close proximity; however these works are likely to be of relatively short duration.

7.98 Prior to mitigation, the noise of the construction works has the potential to result in significant effects at NSRs.

Construction Vibration

7.99 The potential for temporary construction vibration impacts is dependent on the need for construction activities which are a potentially significant source of vibration, such as piling, ground improvement or compaction works.

7.100 Mobile plant is unlikely to give rise to high levels of ground borne vibration. Typically the levels of ground borne vibration from tracked earth moving equipment (such as a bulldozer or excavator) are imperceptible to humans at a distance of approximately 20 m, and those generated by vehicles with rubber tyres (e.g. a heavy lorry or dump truck) would be imperceptible at more than 10 m from the haul road[2]. Mobile plant may occasionally come within 10 or 20 m of an identified sensitive NSR; hence vibration may be perceptible but is highly unlikely to be of a magnitude that would cause complaint. Worst-case effects from vibration caused by mobile plant are therefore anticipated to be not significant.

Construction Traffic Noise

7.101 Construction traffic can have a temporary noise impact on sensitive NSRs located along existing roads used by these vehicles. The potential for such impacts is dependent on the volume and route of construction traffic.

7.102 During the construction phase there would be additional vehicle movements from staff and delivery HGVs accessing the site from the surrounding road network. These vehicles have the potential to increase noise levels at nearby NSRs. The routes these vehicles would take will be included within the outline CEMP and will be restricted to the major roads in the vicinity, which would help minimise the potential for significant adverse effects at NSRs. Implementation of a CEMP will be secured by planning condition.

7.103 Construction is anticipated to be undertaken between 2021 and 2023. Chapter 10 Traffic presents the 24-hour AADT for the road links which construction traffic are anticipated to use both 'with' and 'without' the construction traffic, for each of these years. The 18-hour AAWT was not available for majority of the identified links, therefore the 24-hour AADT has been assumed to be equal to the 18-hour AAWT and this information has been used to calculate the BNL for each of these scenarios. Based on this information, the additional construction traffic would result in a predicted increase in noise levels of up to 0.3 dB $L_{A10,18h}$, which is a negligible increase. The 18-hour AAWT flow is typically slightly lower than the 24-hour AADT but the construction traffic is the same whichever parameter is used. Therefore the construction traffic will result in slightly larger changes in the 18-hour AAWT baseline flow and therefore slightly higher increases in noise levels than calculated. However, given the small increases in noise levels that are anticipated due to the construction traffic, use of the actual 18-hour AAWT in the calculations would not result in changes greater than 1 dB $L_{A10,18h}$. Therefore, the magnitude of the worst-case construction traffic noise impacts is anticipated to be very low hence effects will be not significant.

[2] D.J.Martin (1977). Ground Vibrations Caused by Road Construction Operations. Transport and Road Research Laboratory.

Operation

7.104 Table 7.12 presents the BS4142 assessment of predicted operational noise levels from the converter station at NSRs. A +6 dB acoustic feature correction has been applied for the highly tonal nature of the operational sound emissions. The predicted operational sound level is the same irrespective of the time period being assessed.

Table 7.12 Operational Noise - BS4142 Assessment

Receptor	Predicted Free-Field *Specific Sound Level* $L_{Aeq,T}$ dB	Predicted *Rating Level* $L_{Ar,Tr}$ dB	Daytime *Background Sound Level* $L_{A90,T}$ dB	Daytime Difference, dB	Night-time *Background Sound Level* $L_{A90,T}$ dB	Night-time Difference, dB
R1	28	34	36	-2	35	-1
R2	32	38	32	6	29	9
R3	30	36	32	4	29	7
R4	26	32	32	0	32	0
R5	28	34	36	-2	35	-1

7.105 Predicted *rating levels* at R1 and R5 are 2 dB and 1 dB below the day and night-time *background sound levels* respectively (below the LOAEL threshold level), equivalent to an impact of low magnitude. For receptors of medium sensitivity this is an effect of minor significance and therefore not significant, depending on the context.

7.106 Predicted *rating levels* at R2 are 6 and 9 dB above the day and night-time *background sound levels* respectively (between the LOAEL and SOAEL), equivalent to an impact of medium magnitude. For receptors of medium sensitivity, this is an effect of moderate significance and therefore significant, depending on the context.

7.107 Predicted *rating levels* at R3 are 4 and 7 dB above the day and night-time *background sound levels* respectively (between the LOAEL and SOAEL), equivalent to impacts of low (daytime) and medium (night-time) magnitude. For receptors of medium sensitivity this effect is minor during the day and moderate during the night and therefore significant, depending on the context.

7.108 Predicted *rating levels* at R4 are equal to the day and night-time *background sound levels* (equal to the LOAEL), equivalent to an impact of low magnitude. For receptors of medium sensitivity this is an effect of minor significance and therefore not significant, depending on the context.

7.109 To add further context to the operational noise assessment, the impact of the internal operational sound levels in residential properties has been assessed. The worst-affected property is R2 Perry's Farm; internal operational sound levels in this property are anticipated to be around 17 dB L_{Aeq} with the windows partially open. Using the predicted operational sound frequency spectrum at this receptor, the internal operational sound level is expected to be around NR 11 which is below the criterion of NR20; therefore the effect is not significant.

7.110 In line with the guidance in BS 4142: 2014, it is considered that the contextual assessment has shown that the effect of the operational noise impacts will be not significant irrespective of the initial conclusion of the BS 4142 assessment.

Decommissioning

7.111 Decommissioning noise and vibration effects are anticipated to be similar to those during construction. These should be assessed at the time when the works are proposed.

Mitigation

Construction

7.112 A CEMP will be prepared and implemented by the construction contractors. The final CEMP will include the relevant noise and vibration criteria, giving regard to the criteria presented in Table 7.11 (noise) and Table 7.3 (vibration), proposed surveys and a range of BPM which are likely to include the following:

- Implementing processes to minimise noise before works begin and ensuring that BPM are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities where appropriate;
- Ensuring that modern plant is used, complying with the latest European noise emission requirements. Selection of inherently quiet plant where possible;
- Use of lower noise piling (such as rotary bored or hydraulic jacking) rather than driven piling techniques if any piling is required, where possible;
- Off-site pre-fabrication, where practical;
- All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;
- Ensuring contractors are made familiar with current legislation and the guidance in BS 5228 which should form a prerequisite of their appointment;
- Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials around the Project Area to be conducted in such a manner as to minimise noise generation;
- Consultation with MC and local residents as appropriate to advise of potential noisy works that are due to take place; and
- Monitoring of any noise complaints, and reporting to the contractor for immediate investigation.

7.113 Consultation and communication with the local community throughout construction periods will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed.

7.114 A detailed construction noise and vibration assessment may be required once the contractor is appointed and further details of construction methods are known, in order to identify specific mitigation measures (including construction traffic).

7.115 In addition, it is anticipated that the appointed contractor would be a member of the 'Considerate Constructors Scheme' which is an initiative open to all contractors undertaking building work.

7.116 A Construction Traffic Management Plan (CTMP) will be implemented, which will present the haul routes and road management procedures used to manage traffic movements within the works areas, the construction compound and on the local road network in the vicinity of the closest NSRs.

7.117 Preparation and implementation of the CEMP will be a secured by planning condition. Specific BPM can be further secured if required by an agreement under Section 60 or Section 61 of CoPA between the contractor and the Local Authority.

Operation

7.118 The best available operational methods should be employed at all times, having regard to the principles of BPM to minimise noise and vibration from the development.

7.119 The assessment has shown that pre-mitigation noise impacts due to operation of the converter station are not anticipated to be significant; therefore no further mitigation is required. However at the time of the assessment, the detailed acoustic specification of the equipment to be installed within the converter station is not known and has been assumed as described in the approach to assessment section.

7.120 Operational noise impacts will be controlled by detailed design and mitigation measures, if required, will be determined by the appointed contractor. The specification of the detailed design will require that internal operational sound levels in nearby residential properties do not exceed NR 20. This limit applies to the cumulative operational sound of the converter station and the substation.

7.121 Although the noise of the proposed backup generator is not anticipated to be significant, it may be a requirement of the Local Authority that this is assessed. Such an assessment would be performed at detailed design stage when the actual generator has been selected. If required, potential options may include:

- Minimising the running of the generator i.e. keeping testing times as short as possible;
- Positioning the generator such that line of sight to nearby receptors is blocked as much as possible to provide the maximum acoustic screening thereby minimising potential operational noise impacts; and
- Providing an acoustic enclosure to the generator if required.

7.122 Inclusion and implementation of noise limits within the project specification will be secured by planning condition.

Decommissioning

7.123 Any measures required to mitigate the impacts of decommissioning noise will be identified at the time. These are anticipated to be similar to those required for the construction activities.

Residual Impacts

Construction

7.124 Implementation of the final CEMP will ensure that construction noise and vibration impacts on NSRs are controlled to acceptable levels. High noise levels may occur whilst works are undertaken close to residential properties however these would be of short duration, therefore residual effects will be not significant.

7.125 Implementation of a CTMP will minimise potential adverse effects of construction traffic noise on NSRs. Residual effects are anticipated to be not significant.

7.126 The noise effects during decommissioning are anticipated to be no worse than during construction, they will also be temporary and no specific mitigation is required with regard to decommissioning noise. These effects are therefore predicted to be not significant.

Operation

7.127 With appropriate consideration of the airborne sound emissions during the detailed design phase the operational sound levels are anticipated to comply with the limit of an internal level not exceeding NR 20. Hence residual operational noise effects will be not significant.

Decommissioning

7.128 These are anticipated to be similar to the residual impacts during construction.

Cumulative Effects

7.129 No developments have been identified which may result in cumulative noise effects with the GB Onshore Scheme are as follows:

- The GB Offshore Scheme – the construction period will overlap with the onshore DC cable as it is laid through the intertidal area. However there are no receptors in the vicinity of the intertidal area that would experience cumulative construction noise impacts. These works will all be boat-based so there would be no construction traffic.
- The OHL works will likely directly overlap with the GB Onshore Scheme construction programme but will be a lot shorter in duration. The potential for cumulative impacts will be considered within the CEMPs for each development and mitigation measures to avoid significant cumulative effects will be identified if required.

7.130 Therefore cumulative effects are anticipated to be not significant.

7.131 Noise is an amenity issue and other impacts, such as air quality and landscape and visual, can also affect residential amenity. As the GB Onshore Scheme will inevitably result in impacts in a variety of areas which can influence residential amenity inter-relationship effects may occur. Cumulative impacts are further assessed in Chapter 12.

Summary of Assessment

7.132 A summary of residual effects due to noise and vibration and their significance is provided in Table 7.13.

Table 7.13 Summary of Residual Effects

Description of Effect	Description of Receptor (Sensitivity)	Summary of Mitigation	Residual Effect (Adverse or Beneficial)	Duration	Significant/ Not Significant
Construction and Decommissioning					
Construction works noise	Existing residential properties (medium)	Mitigation measures advised to employ 'best practicable means' to control noise, measures to be documented within CEMP.	Negligible to Minor (adverse)	Short to long term	Not significant (temporary)
Construction works vibration	Existing residential properties (medium)	Mitigation measures advised to employ 'best practicable means' to control vibration.	Negligible to Minor (adverse)	Short to long term	Not Significant (temporary)
Construction traffic noise	Existing residential properties (medium)	Contractors will issue project route map and delivery schedule to control construction traffic. Onsite management of access points.	Negligible (adverse)	Short to long term	Not Significant (temporary)
Operation					
Noise from the converter station	Existing residential properties (medium)	Noise emissions from operational activities will be considered during the detailed design in order to achieve appropriate operational noise limits.	Negligible to Minor (adverse)	Long term	Not Significant (permanent)

References

Ref 7-1 British Standards Institute (2003); BS 7445 – Description and measurement of environmental noise. Part 1: Guide to quantities and procedures, BSi, London.

Ref 7-2 British Standards Institute (2014) BS 5228:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Noise, BSi, London.

Ref 7-3 British Standards Institute (2014); BS 4142 – Methods for rating and assessing industrial and commercial sound, BSi, London.

Ref 7-4 British Standards Institute, (2014); BS 8233 – Guidance on sound insulation and noise reduction for buildings, BSI, London.

Ref 7-5 Department of Transport/Welsh Office (1988); Calculation of Road Traffic Noise.

Ref 7-6 Highways Agency (2011) Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration

Ref 7-7 International Standards Organisation (1996) ISO 9613 Acoustics - Attenuation of sound during propagation outdoors

Ref 7-8 Department for Environment Food and Rural Affairs (Defra) (2010); Noise Policy Statement for England.

Ref 7-9 Her Majesty's Stationery Office (1974); Control of Pollution Act.

Ref 7-10 Her Majesty’s Stationary Office (1990); Environmental Protection Act 1990.

Ref 7-11 Ministry of Housing, Communities & Local Government (MHCLG) (2018) National Planning Policy Framework.

Ref 7-12 Department for Communities and Local Government; Planning Practice Guidance.

Ref 7-13 Department for Environment, Food and Rural Affairs (2018). 'A Green Future: Our 25 Year Plan to Improve the Environment

Ref 7-14 Medway Council (2003). Medway Local Plan

8. Archaeology & Cultural Heritage

Introduction

8.1 This chapter of the Environmental Statement (ES) reports the findings of an assessment of the likely significant effects on Cultural Heritage as a result of the components of NeuConnect proposed on the Isle of Grain, Kent, (hereafter referred to as the 'GB Onshore Scheme') described in Chapter 2, Proposed GB Onshore Scheme, of this ES.

8.2 This chapter describes the cultural heritage assets within the GB Onshore Scheme application boundary (hereafter referred to as 'the Site') and the Study Area defined in the 'Approach to assessment' section below, including their heritage value, and assesses the potential impacts of the GB Onshore Scheme on those assets.

8.3 The potential for combined effect interactions (Type 1 effects) is discussed in Chapter 12: Cumulative Assessment. The potential for combined cumulative cultural heritage effects (Type 2 effects) of the GB Onshore Scheme with other development schemes is discussed at the end of this chapter.

8.4 Baseline information is provided in the Cultural Heritage Desk-based Assessment (DBA) produced by AECOM which appears in Volume II, Appendix 8-1 of this ES. This chapter is supported by Figures 8-1: Location of archaeological assets and 8-2: Location of built heritage assets.

Approach to Assessment

Introduction

8.5 This section presents the following:

- identification of the information sources that have been consulted throughout the preparation of this chapter;
- the methodology behind the baseline assessment including the definition of an appropriate Study Area;
- the methodology and terminology used in the assessment of effects; and
- details of the consultation undertaken during the preparation of this chapter.

Sources of information/ data

8.6 The following sources of information have been reviewed in order to establish the baseline conditions for the Cultural Heritage resource:

- Kent Historic Environment Record (KHER);
- National Heritage List for England (NHLE);
- Historic mapping data;
- Local Authority data;
- Kent archives at the Kent History & Library Centre;
- Geotechnical data; and,
- online sources.

Extent of Study Areas

8.7 For designated assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens, Registered Battlefields), a 1 km Study Area around the Site has been applied. This size of study area has been chosen using professional judgement and with reference to experience of working on comparable developments in comparable landscapes. The Study Area ensures that designated heritage assets are identified to a sufficient distance to anticipate or identify any likely changes to their setting. Given the low lying location of the Site, the Study Area was extended to the west to take in the villages of Allhallows and Lower Stoke, which are located on higher ground.

8.8 For non-designated assets (archaeological sites, findspots, locally Listed Buildings and other non-designated buildings) a search of 3 km was used to obtain data from the KHER and the Kent Archives. This distance has been agreed with Kent County Council as appropriate to provide the context of, and potential for, surviving archaeological remains within the Site. The 3 km Study Area is specifically targeted to include key Palaeolithic sites on the peninsula, a number of archaeological interventions that have been carried out in the southeast of the Isle of Grain, and the high ground on which the village of Grain is located (known as the Head and River Terrace Gravels geological deposits and margins). Kent County Council were concerned that a smaller Study Area would not adequately reflect the potential for archaeological remains of the Site due to the low number of archaeological studies undertaken in its immediate vicinity.

8.9 Intertidal heritage assets located within the application boundary between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS) have been identified in a cultural heritage DBA intended for the offshore aspect of the Scheme (GB Offshore Scheme ES Chapter 16)). These assets are referred to and cross referenced in this chapter where relevant but are assessed as part of the GB Offshore Scheme.

8.10 Assets identified within the Site and Study Area have been given unique reference numbers. These are pre-fixed with [A] for archaeological assets and [BH] for built heritage assets. Each asset can be cross-referenced to the gazetteers appended to the cultural heritage DBA (Appendix

8-1) and located on Figures 8-1, archaeological assets and 8-2, built heritage assets within this ES chapter.

Methodology for Determining Baseline Conditions

8.11 The cultural heritage baseline conditions have been set out in the accompanying DBA (Appendix 8-1). This assessment established the existing conditions of the cultural heritage resource within the Site and Study Area. The baseline section of this ES chapter draws on the results of the DBA.

8.12 The methodology for establishing the baseline followed guidelines of the Chartered Institute for Archaeologists (CIfA), the Standard and Guidance for Historic Environment Desk-based Assessment (CIfA 2017) and the Code of Conduct (CIfA 2014), and is set out in Section 3 of Appendix 8-1.

Methodology for Determining Construction Effects

8.13 The construction phase impacts will be permanent for archaeological remains within the Site and temporary (medium term) in nature for built heritage assets and Scheduled Monuments within the Study Area across the three year indicative construction programme (as defined in Chapter 2: Project Description and Chapter 3: Approach to Assessment of this ES), and will cease when the GB Onshore Scheme becomes fully operational.

8.14 Once the baseline conditions for the Site and surrounding Study Area were characterised, the following method was used to assess the likely significant effects of the GB Onshore Scheme upon cultural heritage:

- The significance (heritage value) of cultural heritage assets affected by the GB Onshore Scheme was first determined. This assessment draws on existing designations and for non-designated assets professional judgment guided by policy and research agendas set out in the DBA (Volume II, Appendix 8-1 of this ES) and the criteria set out in Table 8.1;
- The impacts (magnitude of change) arising from the GB Onshore Scheme upon the significance (heritage value) of known or potential cultural heritage assets were then assessed using the criteria set out in Table 8.2, which takes into account any environmental design and management measures (i.e. measures that offer mitigation but are inherent in the design and construction of the GB Onshore Scheme). This determines the significance of effect as set out in Table 8.3;
- Once the significance of the effect has been established, appropriate additional mitigation measures were proposed to compensate for any unavoidable significant effects;
- The final stage of the assessment established any residual effects that may remain following the implementation of the additional mitigation measures.

8.15 The construction effects of the GB Onshore Scheme on cultural heritage resources are presented in three sections covering three distinct locations of the GB Onshore Scheme which would be subject to distinct development works. All aspects of the construction phase will be assessed for all three areas. The three areas are:

- the proposed converter station and access track;
- the proposed substation and cable sealing end compound; and
- the proposed DC cable route.

8.16 The archaeological and built heritage assets presented below will be assessed slightly differently due to the nature of the potential impacts of the GB Onshore Scheme.

8.17 The effects of the construction phase on the archaeological resource have been assessed as resulting from each intrusive activity separately in order to design appropriate mitigation strategies in line with the individual construction effects.

8.18 The effects on the built heritage resource have been assessed separately for each individual asset. This is because each asset has the potential to be uniquely impacted by the GB Onshore

Scheme's construction phase based on its location and setting and may require a tailored mitigation strategy.

Methodology for Determining Operational Effects

8.19 Effects during operation are those effects associated with the GB Onshore Scheme once construction has been completed and the GB Onshore Scheme is fully operational.

8.20 The impacts on archaeological assets within the Site will occur during construction only; the operation of the GB Onshore Scheme will not have any additional impact on archaeological assets within the Site as any required maintenance or upkeep will likely be limited to the areas evaluated and mitigated prior to the construction phase.

8.21 With regard to built heritage assets and Scheduled Monuments within the Study Area, construction phase impacts are generally temporary in nature and will cease when the buildings become operational. Impacts during the operational phase of the GB Onshore Scheme are likely to result from changes to setting and are considered to be permanent.

8.22 Similarly to the methodology used for the construction phase, the assessment of operational effects is presented according to the three areas of the GB Onshore Scheme discussed above. All impacts resulting from the operational phase will be assessed in each section.

8.23 The operational effects of the GB Onshore scheme on archaeological and built heritage resources will be assessed following the same method as outlined for the construction phase. While the archaeological assessment is carried out for each intrusive activity, the built heritage assessment is undertaken for each asset individually.

Methodology for Determining Decommissioning Effects

8.24 The scale and nature of activities undertaken during decommissioning would be similar to those described previously for the construction phase, however they would only be temporary over the period of activities on site and would not extend beyond the footprint and depth of the existing structures. This would result in no additional impacts on the archaeological resource beyond those assessed and mitigated against for the construction phase, but may result in some changes to the settings of built heritage assets.

Value of Heritage Assets (Heritage Significance)

8.25 The value (heritage significance) of a heritage asset is derived from its heritage interest which may be archaeological, architectural, artistic or historic (NPPF Annex 2). The value of an asset is defined by the sum of its heritage interests. Taking these criteria into account, each identified heritage asset can be assigned a level of value in accordance with a four-point scale as set out in Table 8.1.

Table 8.1: Criteria for determining the value of heritage assets

Value (significance)	Asset categories
High	• World Heritage Sites • Scheduled Monuments • Grade I and II* Listed Buildings • Registered battlefields • Grade I and II* Registered Parks and Gardens • Conservation Areas of demonstrable high value • Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens or landscapes) that can be shown to have demonstrable national or international importance • Well preserved historic landscape character areas, exhibiting considerable coherence, time-depth or other critical factor(s)
Medium	• Grade II Listed Buildings • Conservation areas

Value (significance)	Asset categories
	• Grade II Registered Parks and Gardens • Conservation Areas • Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens or landscapes) that can be shown to have demonstrable regional importance • Averagely preserved historic landscape character areas, exhibiting reasonable coherence, time-depth or other critical factor(s) • Historic townscapes with historic integrity in that the assets that constitute their make-up are clearly legible
Low	• Locally Listed Buildings • Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens or landscapes) that can be shown to have demonstrable local importance • Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade • Historic landscape character areas whose value is limited by poor preservation and/ or poor survival of contextual associations
Negligible	• Assets identified on national or regional databases, but which have no archaeological, architectural, artistic or historic value • Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade • Landscape with no or little significant historical merit

8.26 When professional judgement is taken into account, some assets may not fit into the specified category in Table 8.1. Each heritage asset was therefore assessed on an individual basis and the assessment takes into account regional variations and individual qualities of these assets.

8.27 Having identified the value of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising as a result of the GB Onshore Scheme. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

8.28 The level and degree of impact (impact rating) is assigned with reference to a four-point scale as set out within Table 8.2. In respect of cultural heritage, an assessment of the level and degree of impact was made in consideration of any design mitigation (environmental design and management measures) within the GB Onshore Scheme.

Table 8.2: Criteria for determining the magnitude of impact on heritage assets

Magnitude of Impact	Description of Impact
High	Change such that the value of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the value of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the value of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Very Low	Changes to the asset that hardly affect value. Minimal change to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

8.29 An assessment of the level of effect, having taken into consideration any environmental design and management measures, was determined by cross-referencing the value of the asset (Table 8.1) and the magnitude of impact (Table 8.2). The resultant level of effect (Table 8.3) can be neutral, adverse or beneficial.

Table 8.3: Classification of effects

Heritage Value	Magnitude of Impact			
	High	**Medium**	**Low**	**Very Low**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

8.30 In accordance with the methodology set out within Chapter 3 – Approach to Assessment, of this ES, the following criteria is applied for determining the significance of effect:

- 'Moderate' or 'major' are deemed to be 'significant'.
- 'Minor' are considered to be 'not significant', although they may be a matter of local concern; and
- 'Negligible' effects are considered to be 'not significant'.

8.31 Within the NPPF, impacts affecting the value of heritage assets are considered in terms of harm and there is a requirement to determine whether the level of harm amounts to 'substantial harm' or 'less than substantial harm'. There is no direct correlation between the significance of effect as reported in this ES and the level of harm caused to heritage significance. A major (significant) effect on a heritage asset would, however, more often be the basis by which to determine that the level of harm to the significance of the asset would be substantial. A moderate (significant) effect is unlikely to meet the test of substantial harm and would therefore more often be the basis by which to determine that the level of harm to the significance of the asset would be less than substantial. A minor or negligible (not significant) effect would still amount to a less than substantial harm, which triggers the statutory presumptions against development within s.66 of the Listed Buildings Act 1990; however, a neutral effect is classified as no harm. In all cases determining the level of harm to the significance of the asset arising from development impact is one of professional judgement.

Consultation

8.32 Direct consultation with statutory bodies of Kent County Council and Historic England was carried out by AECOM's heritage team in February 2019. A response from Kent County Council's Archaeological Officer's was received on 12th February 2019 and a response from Historic England's Inspector of Ancient Monuments for Kent and Sussex was received on 1st March 2019, both of which are provided in Appendix 8-1.

8.33 Comments raised as part of this statutory consultation are set out in Table 8.4 below including a statement identifying how these comments have been addressed as part of this chapter and assessment.

Table 8.4: Comments raised by statutory and further consultation

Comments Raised	Response Provided in the ES / Planning Application
Kent County Council (KCC): The archaeology officer for KCC advised that the study area take in the higher ground, i.e. the area of Head and River Terrace Gravels and margins, so that the character of the archaeological resource could be better understood.	Following further discussion with the Kent Historic Environment Record prior to conducting the search, it was decided that a 3km on-shore buffer from the centre of the proposed development would adequately encompass the geomorphological landform of the terrace gravels as well as include relevant investigations on the south and south-east coast of the Isle of Grain.
KCC: It was advised that although major excavations were undertaken by the Kent Archaeological Rescue Unit (KARU) from the late 1970s over a period of some 16+years around Rose Court Farm (J. Clubb Ltd site), this information had not been published and would form a significant gap in our understanding of the archaeology of the area.	This has been considered in the Desk-based Assessment appended and the possible presence of significant Iron Age and Roman remains within the GB Onshore Scheme footprint has been considered for this Environmental Impact Assessment. Furthermore, contact was made with former staff of KARU in an effort to obtain some of the missing data. However, despite repeated attempts, no further information was obtained.
KCC: Requested that the assessment consider Historic England's study of the Hoo Peninsula and its landscapes.	This research project has been considered and is referenced within the appended cultural heritage desk-based assessment.
KCC: The officer requested that should borehole logs produced during ground investigation works, they should be assessed and appended to the DBA. Furthermore, it was requested that future test pitting be archaeologically monitored with potential inputs from a Palaeolithic/Pleistocene specialist.	Borehole logs of initial GI works are discussed and the data incorporated in the appended Desk-Based Assessment. All ongoing and future trial pits are to be archaeologically monitored.
HE: It was requested that the DBA consider the potential for the remains of the Second World War heavy anti-aircraft batteries, a Roman cemetery and an Iron Age settlement north of Rose Court farm.	These have been considered and impacts of the GB Onshore Scheme on these assets is included in this chapter.
HE: It was requested that information regarding intertidal cultural heritage assets be integrated between onshore and offshore EIAs. HE also advised that KCC should be consulted with regard to these intertidal assets and that project design for the cable route should take the location of cultural heritage assets into consideration.	The offshore aspect of the GB Onshore Scheme has produced a desk-based assessment which will have identified heritage assets within the intertidal zone. These assets will be considered as part of this ES chapter following KCC's directions. Impacts of the cable route on cultural heritage will be considered and the route may be micro-sited to avoid known assets.

Limitations and Assumptions

8.34 This assessment has been produced within the limitations of the data available at the time of writing. As this is an outline planning application, detailed construction methodology as well as detailed piling design was not available at the time of writing this ES chapter.

8.35 For the purpose of this assessment a worst-case scenario of topsoil removal across the entirety of the GB Onshore Scheme has been assumed. Furthermore, since the location of the Direct Current DC cable trench has not yet been determined, it has been assumed that it will be located in areas with the highest archaeological potential.

8.36 It is further assumed that topsoil stripping will extend to a depth of approximately 0.4 m below ground surface based experience and discussions with engineers familiar with the project.

Planning Policy & Applicable Legislation

Introduction

8.37 This assessment has been undertaken taking into account relevant legislation and guidance set out in national, regional and local planning policy. A detailed review of legislation and policy is set out in Section 2 of the cultural heritage DBA (ES Vol II, Appendix 8-1), with a summary presented in the sections below. The legislation and policy requirements have informed the preparation of this ES chapter.

Legislation

The Ancient Monuments and Archaeological Areas Act 1979

8.38 The Ancient Monuments and Archaeological Areas Act (Ref 8-2) imposes a requirement for Scheduled Monument consent for any works of demolition, removal, repair, and alteration that might affect a Scheduled Monument and any flooding or tipping operations on land in, on or under which there is a Scheduled Monument. For non-designated archaeological assets, protection is afforded through the development management process as established both by the Town and Country Planning Act 1990 (Ref 8-3) and the NPPF (Ref 8-1).

The Planning (Listed Buildings and Conservations Areas) Act 1990

8.39 The Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 8-3) sets out the principal statutory provisions which must be considered in the determination of any planning application affecting Listed Buildings or Conservation Areas.

8.40 Section 66 of the Act states that in considering whether to grant planning permission for development which affects a Listed Building or its setting, the LPA or, as the case may be, the Secretary of State, shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses. By virtue of Section 1(5) of the Act a Listed Building includes any object or structure within its curtilage. Section 72 of The Act establishes a general duty for planning authorities with respect to buildings and land within a Conservation Area that special attention shall also be paid to the desirability of preserving or enhancing the character or appearance of a Conservation Area. Control of development that may be considered to be within the setting of a Conservation Area is afforded through policy within the NPPF.

8.41 Recent case law makes it clear that the duty imposed in the Act means that in considering whether to grant permission for development that may cause harm (substantial or less than substantial) to a designated asset (Listed Building or Conservation Area) or its setting, the decision maker should give considerable importance and weight to the desirability of avoiding that harm. There is still a requirement to seek a planning balance, but it must be informed by the need to give appropriate weight to the desirability of preserving the asset and its setting.

National Planning Policy and Guidance

National Planning Policy Framework (2019)

8.42 The National Planning Policy Framework (NPPF) (Ref 8-1) outlines the Government's environmental, economic and social policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 8 and 15). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

8.43 The NPPF requires plans, both strategic and non-strategic to make provision for the conservation and enhancement of the built and historic environment (Paragraphs 20d and 28). Section 16 of the NPPF sets out a series of policies that are a material consideration to be taken into account in development management decisions in relation to the heritage consent regimes established in the Ancient Monuments and Archaeological Areas Act 1979 (Ref 8-2) and the Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 8-3).

8.44 The NPPF sets out the importance of being able to assess the significance of heritage assets that may be affected by a development proposal. Significance is defined in Annex 2 as the value of an asset because of its heritage interest. This interest may be archaeological, architectural, artistic or historic and can extend to its setting. The setting of a heritage asset is defined in Annex 2 as "the surroundings in which a heritage asset is experienced". In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the asset's importance and no more than is sufficient to understand the potential impact of the proposal on their significance (paragraph 189). Similarly, there is a requirement on local planning authorities to identify and assess the particular significance of any heritage asset that may be affected by a proposal; and that they should take this assessment into account when considering the impact of a proposal on a heritage asset (paragraph 190).

8.45 In determining planning applications, local planning authorities should take account of the following three points:

- “The desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- The positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- The desirability of new development making a positive contribution to local character and distinctiveness” (paragraph 192).

8.46 Paragraphs 193 to 196 of the NPPF introduce the concept that heritage assets can be harmed or lost through alteration or destruction or development within their setting. This harm ranges from less than substantial through to substantial. With regard to designated assets, paragraph 193 states that great weight should be given to an asset's conservation and the more important the asset, the greater the weight should be. Distinction is drawn between those assets of exceptional interest (e.g. grade I and grade II* Listed Buildings), and those of special interest (e.g. grade II Listed Buildings). Any harm or loss of heritage significance requires clear and convincing justification, and substantial harm or loss should be wholly exceptional with regard to those assets of greatest interest (paragraph 194).

8.47 In instances where development would cause substantial harm to or total loss of significance of a designated asset consent should be refused unless that harm or loss is 'necessary to achieve substantial public benefits that outweigh that harm or loss' (paragraph 195). In instances where development would cause less than substantial harm to the significance of a designated asset the harm should be weighed against the public benefits of the proposal including its optimum viable use (paragraph 196). In relation to non-designated assets a balanced judgment is required taking into account the scale of harm or loss and the significance of the asset (paragraph 197). Distinction is made between those non-designated assets of archaeological interest which are demonstrably of equivalent significance to Scheduled Monuments they should be considered against polices for designated heritage assets, as it outline within footnote 63.

8.48 Paragraph 199 states that the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted. Accordingly, whilst it is noted that there is potential to uncover remains of our past and generate records through proposed development, the benefit or otherwise of this would not been considered as a factor that either mitigates or reduces any identified harm. Similarly, it would not be treated as a benefit of the proposed development.

8.49 Guidance on the application of heritage policy within the NPPF is provided by on-line Planning Practice Guidance (Ref 8-4) and in a series of Good Practice Advice notes published by Historic England, as discussed below.

National Planning Policy Guidance (2019)

8.50 The Planning Practice Guidance (PPG; MCHLG 2019; Ref 8.4) is a government produced interactive on-line document that provides further advice and guidance that expands the policy outlined in the NPPF. It expands on terms such as ‘significance’ and its importance in decision making. The PPG clarifies that being able to properly assess the nature, extent and the importance of the significance of the heritage asset and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals (paragraph 009).

8.51 The PPG states that in relation to setting a thorough assessment of the impact on setting needs to take in to account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it (paragraph 013).

8.52 The PPG discusses how to assess if there is substantial harm. It states that what matters in assessing if a proposal causes substantial harm is the impact on the significance of the asset. It is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed (paragraph 017). Generally, harm to heritage assets can be avoided or minimised if proposals are based on a clear understanding of the heritage asset and its setting (paragraph 019).

8.53 The NPPF indicates that the degree of harm should be considered alongside any public benefits that can be delivered by development. The PPG states that these benefits should flow from the proposed development and should be of a nature and scale to be of benefit to the public and not just a private benefit and would include securing the optimum viable use of an asset in support of its long term conservation (paragraph 020).

Historic England Good Practice Advice Notes (2015 and 2017)

8.54 Historic England has published a series of Good Practice Advice (GPA) of which those of most relevance to this appraisal are GPA2 Managing Significance in Decision-taking (Ref 8.5) and GPA3 The Setting of Heritage Assets (Ref 8.6).

8.55 GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by the development and that the 'first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance' (para 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (paragraph 7).

8.56 GPA3 (Second Edition) provides detail on the setting of heritage assets provides general advice on understanding setting, and how it may contribute to the significance of heritage assets and allow that significance to be appreciated. The document also provides advice on how views contribute to setting.

8.57 Paragraph 8 of the advice note confirms that the extent of the setting, as defined in the NPPF, is not fixed and may change as the asset and its surroundings evolve.

8.58 Paragraph 9 states that although the setting is not itself a heritage asset, nor a heritage designation, land comprising a setting may itself be designated. The concept of a 'core', 'wider' and 'extended' setting is introduced in the same paragraph (under the section on Designated Views); however, it is acknowledged that there is no formal meaning for these terms and they will only apply in certain cases.

Local Planning Policy and Guidance

Medway Local Plan

8.59 Local policy is defined by the Medway Local Plan (Ref 8.7) adopted by Medway Council on 14th May 2003. Medway Council is currently working on an emerging Local Plan, Future Medway, which will cover the period up to 2035.

8.60 The Medway Local Plan makes several provisions for the protection and enhancement of the heritage environment. Relevant to this study are the following policies:

8.61 Policy BNE18: Setting of Listed Buildings. 'Development which would adversely affect the setting of a Listed Building will not be permitted.'

8.62 Policy BNE21: Development affecting potentially important archaeological sites will not be permitted, unless:

- the developer, after consultation with the archaeological officer, has arranged for an archaeological field evaluation to be carried out by an approved archaeological body before any decision on the planning application is made; and

- it would not lead to the damage or destruction of important archaeological remains. There will be a preference for the preservation of important archaeological remains in situ.
- where development would be damaging to archaeological remains, sufficient time and resources are made available for an appropriate archaeological investigation undertaken by an approved archaeological body. Such investigations should be in advance of development and in accordance with a specification and programme of work approved by the council. Resources should also be made available for the publication of the results of the investigation.

8.63 The emerging Local Plan is will use two heritage documents as their evidence base, the Medway Heritage Asset Review 2017 and the Medway Heritage Strategy 2018.

8.64 The Medway Heritage Asset Review 2017 highlights the designated and non-designated heritage assets considered to be of particular value, significance, or considered at risk. It also reinforces the historic and heritage character of the Medway's landscapes and various localities.

8.65 The Medway Heritage Strategy 2018 sets out the future approach to preserving and enhancing the historic environment. It's three objective are:

- Conserve and enhance the Medway's heritage assets;
- Work with Medway's heritage assets to help deliver sustainable development;
- Increase the understanding and community involvement with Medway's heritage assets.

8.66 The current draft of the emerging Local Plan's Development Strategy includes several policies aimed at fulfilling the objectives set out by the Medway Heritage Strategy which are relevant to the proposed development:

- BE1: Promoting High Quality Design
- BE2: Sustainable Design
- BE5: Historic Environment
- BE6: Managing Development in the Historic Environment

8.67 Together, these policies are largely in-line with the NPPF, specifying the need for sustainable development and for minimising impacts to cultural heritage assets, both designated and non-designated. The emerging plan is not expected to result in any significant changes to the LPA's approach to cultural heritage.

Baseline Conditions

Introduction

8.68 In order to assess the potential effects of the GB Onshore Scheme, it is necessary to determine the environmental conditions, resources and sensitive receptors that currently exist on the Site and in the surrounding area. These are known as 'baseline conditions' and should be considered in the context of each assessment.

8.69 A baseline summary is provided below. A full and detailed description of the baseline conditions within the Site and surrounding Study Area is provided in the cultural heritage DBA (Appendix 8-1). The baseline assets considered:

- the topography and geology of the Site (Cultural Heritage DBA section 4.1);
- the designated and non-designated heritage assets within the Site and Study Area (Cultural Heritage DBA sections 4.2, 4.3, and 4.4);
- the historic development of the Site and Study Area (Cultural Heritage DBA section 4.4);
- the historic landscape character within the wider area and features of the historic landscape within the Site (Cultural Heritage DBA section 4.5);
- the significance of the known designated and non-designated heritage assets within the Site and Study Area (Cultural Heritage DBA section 5.1 and 5.2);
- the potential for the survival of previously unknown archaeological remains within the Site and their heritage significance (value) (Cultural Heritage DBA section 5.3); and
- the character of the historic landscape and its sensitivity to change within the Site (Cultural Heritage DBA section 5.4).

8.70 There are no World Heritage Sites, Scheduled Monuments, Registered Battlefield or Registered Parks and Gardens within the Site. Two Scheduled Monuments, one grade I listed and two grade II Listed Buildings (Figure 8-2) are located in the Study Area. A further two Listed Buildings, one grade I and one grade II, are located within the village of Allhallows approximately 4 km to the west of the Site.

8.71 Five non-designated archaeological assets have been identified within the application boundary, in addition to two Areas of Archaeological Potential (AAP) as shown on Figure 8-1. These non-designated assets are archaeological in nature and date from the Iron Age to the post-medieval periods. The AAPs date to the Palaeolithic and the Iron Age and Roman periods respectively.

8.72 A further 143 non-designated assets lie within the Study Area, eleven of which are built heritage assets, while the remainder are archaeological (Figures 8-1 and 8-2).

Heritage Baseline

Scheduled Monuments

8.73 Coastal artillery Defences on the Isle of Grain, Immediately East and South East of Grain Village – BH5 (Scheduled Monument, NHLE 1019955)

8.74 The scheduled coastal defences commence to the southeast of the Church of St James [**BH2**] and continue south, with a break for the road to Grain Tower, for approximately 1.25 km in six separate areas of protection. The monument includes a gun tower (Grain Tower, outside the study area), a fort and three batteries together with later, 20th century additions including two searchlight emplacements. Grain Tower was built in response to the perceived threat from French invasion in the mid-19th century and was supported from the 1860s by Grain Fort which was built on the recommendation of the 1859 Royal Commission into the Defences of the United Kingdom Fortifications. The fort was formed of a semi-circular keep with a central parade and accommodation for 250 men, the whole being surrounded by inner and outer ditches and defended by bastions and caponiers. The fort's armaments were upgraded up until the Second World War and the fort was decommissioned in 1956.The keep and caponiers were demolished and the ditch partially filled in in the 1960s. Visible remains today comprise earth banks and platforms but the subterranean passages that linked the keep, caponiers and magazines remain.

8.75 A series of open batteries were built to the south of the fort. The first, Grain Battery (renamed Dummy Battery in 1901) was built approximately 1 km south of the fort in the 1860s and was linked to it by a communications road on an earthen bank. In 1895 Wing Battery was built immediately to the south of Grain Fort and in 1900 Grain Battery was built to the west of Wing Battery. Finally, two searchlight emplacements were built on the esplanade to the east of Grain Fort. The upstanding parts of these fortifications were similarly demolished in the 1960s.

8.76 The asset has historic interest as part of Britain's coastal defences for almost 100 years after the middle of the 19th century and archaeological interest in its surface and subterranean features which have the ability to provide information on construction, use and adaptation of the defences. The asset's setting is the estuary of the River Thames and River Medway and the coastal strip behind. Despite the development of the petro-chemical plant to the east of the southern end of the asset the setting has not changed substantially and contributes to the asset's significance.

Second World War QF P-Series Oil Bombing Decoy – BH13 (Scheduled Monument, NHLE 1425319)

8.77 The asset is located in two areas of protection approximately 1.78 km west-northwest of the application boundary at its nearest point in a wide bend of Yantlet Creek. The asset is one of eleven QF (diversionary fire) P (petroleum division) oil bombing decoy sites developed in Britain in the early years of the Second World War. This example was designed to draw enemy bombing away from the oil storage depot to the south. Aerial photographs and archaeological surveys have found that the asset retains all its above and below ground features. The decoy was designed to burn fuel oil in brick or clay-lined pools to simulate burning oil storage tanks, ignition being controlled from a control building and associated generator building approximately 200 m to the west of the pools.

8.78 The asset has considerable historic interest as one of only 11 such sites to be built and only two remaining. It has archaeological interest in the complete survival of its original above and below ground features.

8.79 The asset's setting is the flat floodplain of Yantlet Creek situated between the higher ground on which Allhallows is located to the west and Grain is located to the east. This extends to the site of the oil depots the asset was designed to protect on the south coast of the island. The post-war development of the petro-chemical site approximately 1 km south-east of the asset is within the asset's setting and can be seen as an expansion of the earlier oil depot. The asset's setting therefore continues to contribute to its significance.

Listed Buildings

World War II Anti-Tank Obstacles on the Foreshore – BH1 (Grade II, NHLE 1393145)

8.80 The asset comprises a line of concrete anti-tank obstacles erected c. 1940 and running for approximately 570 m from north-west to south-east along the north coast of the Isle of Grain. The main type of obstacle is formed by truncated square pyramids known as dragons teeth attached to a concrete grid. The teeth are arranged in rows four deep but every other row is offset so in effect the rows are eight deep. At the north-west end of the line is s double row of anti-tank concrete cubes while at the south-eastern end of the line is a pile of concrete caltrops, designed like medieval caltrops with four arms so that however they are placed one arm will always point upwards.

8.81 The asset has historic interest as part of Britain's coastal defences during the Second World War and archaeological interest for its strategic positioning.

8.82 Historic aerial photographs show that the obstacles were originally deployed inland some 50 m from the beach but coastal erosion means that the dragon's teeth are now on the beach and are being undermined by the tides, uncovering the concrete grids below. The asset's setting is now the coastline rather than the coastal strip but the setting still contributes to the significance of the asset by demonstrating its purpose of defending the land from seaborne attack.

Church of St James – BH2 (Grade I, NHLE 1085755)

8.83 The church has its origins in the 12th century with additions in the 13th and 15th centuries and a southwest tower added in 1903-05. Construction is ragstone rubble and the plan is simple with a nave, chancel, south-west tower, northeast sacristy and south porch. The chancel retains 13th century windows in the Early English style. The aisles have been removed but the remains of the arcade can still be seen with the early 20th century replacement windows inside the blocked-up spaces. Brick buttresses were added after the aisles were taken away.

8.84 The asset's setting is the village of Grain but is not extensive, being restricted to the less developed part of the village to the north. Due to the flatness of the topography and the asset's short, squat tower the asset cannot be seen from a wide area. The asset retains a relationship with the school to the south-west (although its 19th century buildings have been removed) and, to a lesser degree with the old rectory to the west of the school. The presence of the modern school buildings does nothing to enhance the church's setting and the chimney of the power station is a presence as it is in most parts of the village and the island. Apart from these incursions modernity has not encroached unduly and the open nature of the setting around the church contributes to its significance.

The Hogarth Inn – BH3 (Grade II, NHLE 1336496)

8.85 The Hogarth Inn is a rendered, timber-framed public house dating to the late 16th century. The two-storey building has a hipped, tiled roof and sliding sash windows to the first floor. The canted bay windows on the ground floor are a 20th century addition. The asset was built as a house and was later the Cock Inn and then the Post Office and stores before being reinstated as a public house in 1975. The Hogarth name is a reference to William Hogarth who visited the Cock Inn in 1732 during a visit to the Hoo peninsula. The brick outbuilding to the north-west of the asset is shown on the First Edition Ordnance Survey map of 1870 while a further building between the two shown on subsequent Ordnance Survey maps and labelled PO is no longer in place.

8.86 The asset has historic interest as the oldest domestic building on the island and historical interest and community value as the village's pub, Post Office and store since at least the early 18th century. The asset's setting is the centre of the village of Grain but has changed considerably in the last century. In the early 20th century the pub was the first building encountered on entering the village from the west. Over time the asset has become surrounded by modern development and now stands roughly in the centre of the developed part of High Street. The provision of a large area of hard standing immediately to the north-west of the asset has also been detrimental to the asset. In common with many parts of the village the chimney of Grain Power Station is visible to the south of the village as are examples of the electricity pylons that carry the overhead power lines from the power station to the south and west of the village and west across the Hoo peninsula. This combination of changes to the asset's setting means that it no longer contributes to its significance.

White House Farmhouse – BH4 (Grade II, NHLE 1204482)

8.87 White House Farmhouse is a two-storey, three-bay 18th century weatherboarded farmhouse with timber sash windows with glazing bars and a panelled front door with a fanlight above. The hipped roof is tiled, with brick stacks to the rear elevation. There is a triple-pile back addition to the rear of the main range.

8.88 The asset has historic interest as the last remaining example of what was a number of farmhouses present on the Isle of Grain in the 18th century. Although a small outbuilding shown on the 1898 Ordnance Survey map is extant, all the farm's other buildings have been removed and the surrounding land has been developed on all sides. Although much of the asset's former land remains in agricultural use to the south and west these considerable changes to the asset's setting mean it contributes only slightly to its significance.

Church of All Saints – BH14 (Grade I, NHLE 1085758)

8.89 The Church of All Saints is the parish church of Allhallows and dates from the 12th to 15th centuries with restoration in the late 19th century. Construction is of uncoursed rubble and slate roof. The plan of the building is of aisled nave with cupola, chancel and south porch. The asset has historic and architectural interest as Allhallows' parish church. The asset is located in a raised churchyard surrounded by a brick wall. It retains a village setting but, with the exception of the former Rose & Crown public house to the west with which the asset forms a group the majority of the historic buildings that once stood around the churchyard, including two farms, are no longer extant. The predominantly modern buildings within the setting have weakened the sense of place and the setting only contributes moderately to its significance.

Rose and Crown Public House – BH15 (Grade II, NHLE 1086504)

8.90 The asset is an 18th century house, formerly the Rose and Crown public house and now a dwelling house again. The two storey building is in painted brick with a hipped, tiled roof with two dormers to the front elevation. Both the roof and timber framed windows are said (list description) to have been replaced in the 20th century. The asset retains a village setting but one that has been largely changed, with only the Church of All Saints remaining from the 19th century and earlier. While the asset retains its important relationship with the church the setting only contributes moderately to its significance.

Archaeological and Historical Development

Early Prehistoric

8.91 Although only a single flint artefact [**A1**] and environmental remains [**A2**] of Palaeolithic date have been uncovered within the Study Area, the superficial Thames terrace gravel deposits on which the Site is located have been dated to Marine Isotope Stage (MIS) 6, roughly 200,000 years ago. These gravel deposits, on which the Site is located and which are the target of an Area of Archaeological Potential, may contain further unknown Lower Palaeolithic remains.

8.92 No Mesolithic remains have been identified within the Study Area.

Late prehistoric

8.93 Areas of peat recorded off the south-east coast of the Isle of Grain and alluvium deposits on the Isle itself have all been dated to the Holocene period and as such have the potential to contain remains from any period since the last glaciation. These deposits are, however, restricted to the low-lying areas and as such they are unlikely to be present within the GB Onshore Scheme.

8.94 The only Neolithic material recorded within the study area consists of a single Neolithic handaxe [**A3**] of insecure provenance.

8.95 No Bronze Age remains have been identified within the Study Area, although some evidence of Bronze Age salt production and occupation has been recorded on the Hoo Peninsula west of the Isle of Grain.

8.96 A large Iron Age settlement complex [**A6**] has been excavated somewhere north of Rose Court Farm. These extensive remains included a number of ditched enclosures and post-hole structures extending over an area of well over 10 ha dating to the first centuries BC and AD. The excavations reports have not been published and the exact location and extent of the settlement remains unknown. While it is highly likely that these deposits have been largely removed by gravel extraction, features may have survived within the access road on which the proposed cable route is situated. Iron Age remains, consisting of burnt material [**A7**] that may indicate the presence of kiln, have been recorded at Wallend 700 m south-east of the Site. Lastly, two Iron Age gold coins [**A4** and **A5**] have been recorded by the Portable Antiquities Scheme in the area of Grain, although their exact provenance is not known.

Roman

8.97 The most significant Roman remains within the Study Area consist of an enclosure, field ditches, and cemetery containing at least two cremation and 47 inhumation burials uncovered during salvage excavations in 1978-81 [**A11**] north of Rose Court Farm. The presence of a dense cluster of funerary remains suggests that a significant Roman settlement was present on the Isle of Grain, although it has yet to be identified. The exact location and extent of these features is not currently known as the results of the excavations have not been published. This site may extend to the GB Onshore Scheme's cable route north of West Lane, and although gravel extraction is likely to have destroyed much of the archaeology, there is a possibility that Roman remains have survived within the access road on which the cable route is centred.

8.98 A possible Roman pottery kiln [**A10**] is reported 1.2 km south of the Site, and Roman burnt material [**A7**] is reported 700 m south of the Site. Lastly, two isolated Roman cordoned flasks [**A8** and **A9**] have also been recorded within the Study Area south of the Site.

Medieval

8.99 Archaeological remains dating to the early medieval period identified within the Study Area are limited to four isolated findspots. These consist of two copper alloy fittings [**A12** and **A13**] and two Anglo-Saxon silver pennies (sceats) [**A14** and **A15**].

8.100 The parish church of St James [**BH2**] is the only building on the Isle of Grain with extant features dating to the medieval period. Archaeological remains within the Study Area dating to this period include a midden [**A16**], and a scatter of medieval pottery [**A10**]. Within the Site itself, a large area of ridge and furrow [**A70**], suggestive of medieval agricultural practices, have been identified through aerial photographs.

Post-medieval

8.101 The natural and built-up landscape of the Isle of Grain underwent significant changes throughout the post-medieval period, largely driven first by efforts to reclaim land lost to periodic saltwater inundation in the low-lying tidal marshes and then by the strategic military position of the Isle to the defence of both the Medway and Thames estuaries.

8.102 The village of Grain itself is first shown on 18th century historical maps as a dispersed settlement centred on the largely post-medieval parish church of St James [**BH2**] and the Cock Inn [**BH3**], surrounded by the dispersed farmsteads of Red House Farm [**A36**], Wallend [**A40** to **A43**], Perry's and Wilford's farms [**A48** and **BH11**], West Bear [**A49**], White House Farm [**A51** and **BH4**], St James' Farm [**A52**], a farm located on the later Lee's Cottages [**A56**], and first labelled as Brick House but likely to be White Hall Farm [**A47**].

8.103 Nineteenth century maps show the gradual expansion of the village of Grain, including Bethel Chapel [**A61**], the Grain United Reformed Church [**BH7**], the National School [A59], church Rectory [**A60** and **BH6**], Parsonage Barn [**A53**] and a row plan farm [**A54**]. The maps also show the construction of several new farms on the high ground surrounding Grain such as Baytree Farm [**A58**] and Rose Court Farm [**A44**, **A45**, and **BH10**]. Developments in the low-lying areas include the erection of Grain Bridge [**A67**], saltpans with associated windmills [**A17** to **A20**], Redhouse Farm [**A36**], and eight unnamed farms [**A35, A37, A38, A39, A46, A50, A55**, and **A57**].

8.104 Military remains dating to the 19th century include a number of batteries associated with the Scheduled Monument of Grain defences [**BH5**].

8.105 Industrial developments around the Isle of Grain include the Hoo Railway [**A63, A65**, and **A66**] linking the late 19th century pleasure port of Port Victoria [**A64**] to the rest of the Hoo Peninsula.

8.106 The post-medieval maritime heritage of the Isle of Grain is well attested archaeologically both onshore and offshore. They comprise a wide range of features, including buried features such as jetties and sea wall defences along former channels in the marshes [**A23** to **A27**], former wharves [**A28** and **A29**], a coastguard station [**A30**], and the sites of former signal beacons [**A31** to **A34**]. In addition, a place called 'Blackstakes' [**A62**] on the southern coast of the Isle of Grain is shown on a 17th century chart and on Ordnance Survey maps, but no information is available on the origins of the name.

8.107 Features of lesser importance are also recorded in the KHER throughout the Study Area. These include two post-medieval enclosures of unknown purpose [**A69** and **A70**] near the Yantlet Creek, a burial mound or ground [**A71**] marked on 19th century Ordnance Survey maps, a circular embanked feature [**A72**], flint foundations and scatters of red brick [**A73**], and water management features or pounds [**A74**], and a sewer outfall [**A68**]. Isolated finds dating to the post-medieval period include a rudder [**A75**] likely forming part of a wrecked vessel in the Yantlet, and a post-medieval silver coin [**A76**] registered by the portable antiquities scheme.

Modern

8.108 The Isle of Grain underwent drastic changes in the 20th century, in part due to the strategic importance of the area to the defence of the Thames and Medway estuaries during the First and Second World Wars, and in part due to the shift from a coal powered to an oil powered navy. These government-led military and industrial developments largely dictated the evolution of the Isle of Grain until the end of the Second World War, after which the military complex quickly declined while the petroleum industry and port facilities established on the southern half of the peninsula during the Second World War continued to thrive, developing into a power station complex and culminating in the landscape present there today.

8.109 The earliest modern military development within the Study Area is the Coastguard Station [**BH9**] built in 1900 for the Admiralty and comprising of a row of terraced cottages and watch room to the northeast of Whitehouse Farm. Soon afterwards, the Royal Navy began to use the Isle of Grain as a storage and resupply point for its oil powered ships, as evidenced by rows of oil tanks [**A94**] shown on early 20th century Ordnance Survey maps.

8.110 In 1912, a naval seaplane base was established at Port Victoria and in 1915 a Marine Experimental Aircraft Depot was added, the two being known collectively as RNAS Grain [**A96**]. This effectively converted the original pleasure port into a military asset. The earlier 19th century defences of Grain [**BH5**] were enhanced during the First World War and included several new anti-aircraft, batteries, and other features.

8.111 During the interwar period, the Admiralty built firing point buildings and structures on the Grain Range Line (also known as Yantlet Battery) on Yantlet Creek [**A86** and **BH12**]. The site was used as a firing point for the velocity testing of artillery from the 1920s to the 1950s. The remains consist of a number of structures [**A87**] including concrete bases and platforms; a workshop complex; powerhouse; mess building; guardhouse and cottages. Artillery was brought on and off-site via a wharf [**A88**] and slipway [**A89**] from Yantlet Creek and a purpose built railway [**A90**].

8.112 Aside from these military developments and the continued growth of the village of Grain, the only noteworthy change affecting the Site during the interwar period was the construction of a cluster of farm buildings [**A131**] south of White Hall Farm. Although this was destroyed in the latter half of the 20th century, remains of these buildings may survive within the Site.

8.113 Further enhancements were made to the Grain defences [**BH4**] and new defences were erected during the Second World War. Remains from this period that lie within the GB Onshore Scheme include dragon’s teeth anti-tank defences on the northern coast of the Isle of Grain [**BH1**] as well as military barracks [**A91**] and batteries [**A97**] immediately west of White Hall Farm. Within the Study Area, Second World War military remains comprise bombing decoys [**BH13**], oil storage tanks [**A92** and **A93**], pillboxes [**A95**], radio masts [**A98** and **A99**], and the sites of three German airplane crashes [**A101**, **A102**, and **A103**].

8.114 Gravel extraction was a significant factor in the changing modern landscape of the Isle of Grain. Although mostly reinstated, large scale quarrying was carried out north of West Lane, and east of Perry’s Farm. The earliest phases of extraction took place northwest of the village of Grain and included a tramway [**A104**] linking the extraction pit to a pier off the north coast of the Isle, both of which had been removed by the 1930s. By the 1990s roughly 46 hectares (ha) had been removed around White Hall Farm and Rose Court Farm and a small complex of farm buildings south of White Hall Farm had been demolished. While Rose Court Farm was left intact following the land reinstatement, the remaining buildings of White Hall Farm were ultimately demolished between 2007 and 2010. A mound [**A105**] to the east of the village of Grain may relate to small-scale extraction activities.

8.115 The extent of 20th century development on the Isle of Grain is reflected in the large number of modern assets reported in the KHER. Although maritime remains were not included in the study area, 11 archaeological assets have been recorded along the shore above the MHW, consisting of wharves, beacons, groynes, and hards [**A77** to **A87**].

8.116 The remaining KHER archaeological asset within the study dating to the modern period consists of a former sewage outfall [**A106**] south-east of Grain marked on 20th century Ordnance Survey maps.

8.117 A single non-designated archaeological asset [**7134**] of unknown date has been identified by the marine survey of the GB Offshore Scheme within the intertidal zone of the application site. This consists of a small dipole anomaly that is interpreted as a possible buried ferrous object.

Archaeological Potential

8.118 A full assessment of the archaeological potential within the Site is presented in section 5.3 of the cultural heritage DBA (Appendix 8-1). In summary the archaeological potential within the Site is considered to be:

- Palaeoenvironmental – Low potential given the lack of alluvial or peat deposits likely to contain such environmental remains within the Site.
- Early Prehistoric – Moderate potential for Lower Palaeolithic remains situated within the Grain Gravel deposits of Pleistocene origins which are known to contain such material. An AAP covers the geological deposits of relevance and highlights this potential.
- Late Prehistoric – High potential for Iron Age occupation and agricultural remains associated with a large settlement excavated north of Rose Court Farm. This potential is targeted by an AAP which overlies the northern part of the proposed cable route.
- Roman – High potential for settlement, funerary, or agricultural remains relating to the Roman era enclosures and cemetery uncovered north of Rose Court Farm. This potential is targeted by an AAP which overlies the northern part of the proposed cable route. There is also a possibility of industrial remains relating to salt production to exist on the edge of the low-lying marshland in the south-west section of the GB Onshore Scheme application site.
- Early medieval – Low potential given the general scarcity of such sites on the Isle of Grain;
- Medieval – Moderate potential given the medieval origins of an area of ridge and furrow agriculture beneath the proposed converter station. Remains are likely to relate to agricultural activities;
- Post-medieval – High potential based on the identification of several assets dating to the post-medieval period through HER and map analysis including several scattered farmsteads, military remains, and industrial activities.
- Modern – High potential due to the presence of extensive military remains dating to the First and Second World Wars throughout the Isle of Grain, and due to the presence of several dispersed farmsteads within and in close proximity to the GB Onshore Scheme Site.

Historic Landscape

8.119 The Cultural Heritage DBA (Appendix 8-1) sets out the Historic Landscape Character of the Site, drawing on the Natural England National Character, the Kent Historic Landscape Character, the results of the Hoo Peninsula Project, as well as the results of a site walkover and map regression. The landscape within the Site can be broadly categorised as formed of disused gravel workings and reinstated farmland in use by Rose Court Farm and Perry's Farm, and by 19th century medium fields with straight boundaries. These are set within a patchwork of industrial, military, urban, and agricultural landscapes that define the character of the Study Area and the Isle of Grain as a whole.

8.120 The disused gravel extraction workings are common throughout the country and considered of no historical or aesthetic interest.

8.121 Despite the abundance of 19th century field systems in England as a whole, this landscape is currently at risk of disappearing on the Isle of Grain. This landscape has lost much of its 19th century and earlier relationship to the rural village of Grain and the saltmarshes to the south due to 20th century urban and industrial developments. Nevertheless, this landscape is rapidly disappearing and as such our ability to understand the historical landscape of the Isle of Grain is at risk. On measure, it has been assessed as being of low sensitivity to change based on its local historical interest.

Summary of Receptors and Associated Value

8.122 Based on a review of the baseline conditions, the following assets have been identified in Table 8.5 as potentially affected by the GB Onshore Scheme, taking into consideration the location of the receptor and its relationship with the Site. These receptors have been attributed with a value based on the significance of each receptor in accordance with the criteria set out in Table 8.1.

Table 8.5: Resource / Receptor value

Asset/Receptor	Value of Asset / Receptor
World War II Anti-Tank Obstacles on the Foreshore (Scheduled Monument) [**BH1**]	Medium
Church of St James (Grade I Listed Building) [**BH2**]	High
The Hogarth Inn (Grade II Listed Building) [**BH3**]	Medium
White House Farm (Grade II Listed Building) [**BH4**]	Medium
Coastal artillery Defences on the Isle of Grain, Immediately East and South East of Grain Village (Scheduled Monument) [**BH5**]	High
The Old Vicarage, High Street, Grain Village (non-designated building) [**BH6**]	Low
Grain United Reformed Church (non-designated building) [**BH7**]	Low
Grain Village Hall (non-designated building) [**BH8**]	Low
Former Coastguard Station (Medtha House and Coastguard Cottages) (non-designated building) [**BH9**]	Low
Rose Court Farm (non-designated building) [**BH10**]	Low
Perry's Farm and Wilford's Farm (non-designated building) [**BH11**]	Low
Grain Range Line on Yantlet Creek (non-designated building) [**BH12**]	Low
Second World War QF P-Series Oil Bombing Decoy (Scheduled Monument) [**BH13**]	High
Church of All Saints (Grade I Listed Building) [**BH14**]	High
Rose and Crown Public House (Grade II Listed Building) [**BH15**]	Medium
Site of White Hall Farm [**A47**]	Low
Area of Ridge and Furrow [**A70**] and potential associated medieval agricultural remains	Low
Site of Second World War Camp west of White Hall Farm [**A91**]	Medium
Site of 20th Century Outfarm South of White Hall Farm [**A132**]	Negligible
Potential Palaeolithic remains	High
Potential Iron Age settlement remains	High
Potential Roman settlement and/or funerary remains	Medium
Potential post-medieval field systems or farmstead remains	Negligible
Potential post-medieval military remains	Medium
Potential modern field systems or farmstead remains	Negligible
Potential modern military remains	Medium
Landscape of 19th century fields	Low

Future Baseline

8.123 This section considers changes to the baseline conditions, described above, which might occur during the time period over which the GB Onshore Scheme will be in place. It considers changes that might occur in the absence of the GB Onshore Scheme being constructed.

8.124 Changes to the archaeological baseline which might occur during the lifespan of the GB Onshore Scheme and which might occur in the absence of the GB Onshore Scheme are virtually identical. They would be limited to typical taphonomic processes on buried archaeological assemblages, which may be very slightly altered by changes to the land drainage. Aside from issues of preservation, the future baseline would evolve according to new discoveries and the removal of archaeological assets through unrelated developments in the area. However these would occur regardless of the presence of the GB Onshore Scheme.

8.125 The Built Heritage baseline is unlikely to undergo significant change given the presence or absence of the GB Onshore Scheme other than through gradual industrial and rural development of the Isle of Grain. Of note, however, is that the World War II Anti-Tank Obstacles on the Foreshore [**BH1**] are being systematically lost to the gradual erosion of the northern shoreline of the Isle of Grain. Based on historical aerial photographs, the rate of erosion is significant and much of the current extent structures are likely to absent following the 40 year lifespan of the GB Onshore Scheme. However, the DC cable is expected to be directionally drilled beneath the asset and buried below MHWS, and as such the rate of erosion would not be materially altered by the GB Onshore Scheme.

Potential Impacts

Archaeological Effects during Construction

Proposed Converter Station & Access Track

8.126 Construction of the converter station will entail the following activities which may impact the cultural heritage resource outlined above:

- the construction of access roads, which are expected to be topsoil stripped to a depth of 0.4 m below surface;
- the establishment of temporary facilities including site offices, lay down and storage areas and welfare facilities, development of electricity and water supplies, erection of security fencing or hoarding and implementation of external lighting for security. Approximately 1.5 ha will be required for the construction compound, laydown, and storage areas, which are expected to be stripped of topsoil to a depth of approximately 0.4 m below surface;
- the levelling and land re-profiling in order to establish a level platform on which the proposed converter station will be constructed. The areas are expected to be levelled to a depth of approximately 5.8 m above Ordnance Datum (AOD);
- the construction of a converter station approximately 250 m by 250 m (or up to 5 ha) with a maximum height of approximately 26 m. The layout of this zone is still in the design stages but is expected to include a DC switch hall, valve halls, a control building, cooling fans, transformers, Alternating Current (AC) switchyard, diesel backup generator, and a spare parts building. Some of these structures will be placed on piled foundations;
- the installation of an AC cable route from the substation to the converter station, which may be either above or below ground. For this assessment it is assumed to be underground and laid within a trench 1 m wide and 1.5 m deep; and
- the excavation of an attenuation pond approximately 1.1 ha in size and a smaller overflow pond approximately 0.3 ha in size connected by a swale/ channel. The larger pond is expected to extend to a depth of approximately 2 m below surface.

8.127 Archaeological assets that may be affected by these works include an area of medieval ridge and furrow [**A70**], and previously unrecorded remains dating to the Palaeolithic, Iron Age, Roman, medieval, post-medieval, and modern periods ranging in value from low to high.

8.128 Topsoil stripping relating to the construction of compounds, lay down areas, and access road could result in the disturbance and/ or removal of archaeological deposits that may immediately underlie the topsoil.

8.129 This would result in the value of medieval ridge and furrow [**A70**] in this section of the Site, being totally altered or destroyed and as such is assessed to represent a high magnitude of impact in accordance with the criteria set out in Table 8.2. The asset is considered to be of low value, and as such topsoil stripping would result in a moderate adverse effect, which is significant. Planned levelling works to 5.8 m AOD would be limited to the footprints of the proposed converter station and substation. Due to the natural topography sloping down towards the south-west, soil removal of up to 4 m is anticipated in the eastern half of the converter station site and the addition of up to approximately 1.5 m of soil is anticipated in the south-west corner.

8.130 This would result in the value of the area of ridge and furrow [A70] being totally altered or destroyed and as such is assessed to represent a high magnitude of impact in accordance with the criteria set out in Table 8.2. Levelling activities would therefore result in a moderate adverse effect, which is significant, on this asset considered of low value.

8.131 Gravel deposits that may contain Palaeolithic remains, considered to be of high value, have been recorded in two boreholes within the converter station footprint at depths of between 6.95 m AOD and 8.35 m AOD. Consequently, levelling works would result in the complete removal of the asset resulting in its value being totally altered or destroyed. The magnitude of the impact is assessed to be high, resulting in a major adverse effect.

8.132 Construction of the proposed converter station will require the driving of piled foundations. However, previously unknown archaeological remains will have been entirely removed by earlier topsoil removal and levelling works and will therefore not cause further impacts to the archaeological resource.

8.133 The installation of attenuation ponds and swale, down to a maximum depth of 2 m below surface, would result in the removal of portions of medieval ridge and furrow [A70] which is of low value. This would result in the value of the asset in this part of the site being totally altered or destroyed and is therefore assessed to be a high magnitude of impact. The significance of effect is assessed to be moderate adverse.

8.134 Construction of the AC cable linking the converter station to the substation would take place within the area of proposed levelling, which would have already removed any archaeological remains present. As such, any open-cut trench required for the AC cable will result in no additional impacts to the archaeological resource.

8.135 There is a potential for previously unrecorded archaeological remains to be present within this section of the Site. These remains are likely to be associated with medieval, post-medieval, and modern farming practices and are assessed as being of low to negligible value. The construction of the proposed converter station would entail the removal of topsoil and superficial deposits through topsoil stripping and levelling works which would completely remove any such archaeological remains present, resulting in the value of any such asset being totally altered or destroyed. These works are therefore assessed to represent a high magnitude of impact in accordance with the criteria set out in Table 8.2, resulting in a moderate adverse effect.

8.136 This section of the GB Onshore Scheme would result in the loss of approximately a fifth of a landscape composed of 19th century field systems considered to be of low value. This would result in change in both to the asset itself and changes to its setting resulting in erosion in our ability to understand and appreciate the asset. The magnitude of change is therefore considered to be medium, resulting in minor adverse effect.

Proposed Substation and Cable Sealing End Compound

8.137 Construction of the substation would entail the following activities which may impact the cultural heritage resource outlined above:

- preliminary works, which would include utilities diversions as necessary;
- the establishment of a lay down and storage areas of approximately 0.64 ha would be required, which is expected to be stripped of topsoil to a depth of approximately 0.4 m below surface;
- the levelling and land re-profiling in order to establish a level platform on which the proposed substation would be constructed. The areas are expected to be levelled to a depth of approximately 5.8 m AOD;
- the construction of a new substation approximately 80 metres (m) by 80 m (or up to 0.64 ha) with a maximum height of approximately 14 m and which may be placed on piled foundations.

8.138 Receptors that may be affected by these works include previously unrecorded archaeological remains from the surficial deposits with the potential to contain archaeological remains dating to the Palaeolithic, medieval, post-medieval, and modern periods ranging in value from negligible to high.

8.139 Topsoil stripping relating to the establishment of the lay down area would result in the disturbance and/ or removal of archaeological deposits that may immediately underlie the topsoil. As a result, impact will be limited to previously unrecorded archaeological remains of medieval, post-medieval, and modern date.

8.140 Planned levelling works, which would level the ground to approximately 5.8 m AOD, would only occur within the footprint of the substation in this area of the GB Onshore Scheme. Based on the present ground surface being approximately 7.2 m AOD, it is anticipated that the levelling works would remove as much as 1.4 m of topsoil and subsoil deposits. No ground investigation works have been carried out in this area, but a single borehole sited 60 m south suggests that there are no Pleistocene gravel deposits of archaeological interest within the substation footprint. Impacts from levelling works would be limited to previously unrecorded assets of medieval, post-medieval, and modern date.

8.141 Although there are no known archaeological assets within the proposed substation section of the Site, there is a potential for previously unrecorded archaeological remains to be present. These remains are likely to be associated with medieval, post-medieval, and modern farming practices and are assessed as being of low to negligible value. The construction of the proposed substation would entail the removal of topsoil and superficial deposits which would completely remove any such archaeological remains present. The impact is therefore assessed to be high, resulting in a moderate adverse effect.

Proposed DC Cable Route

8.142 Construction of the proposed DC cable route would entail the following activities which may impact the cultural heritage resource outlined above:

- an underground DC cable route from the converter station to the landfall point, and through the intertidal area to MLWS (overlapping with the subsea DC cable between MHWS and MLWS). The 30 m easement is expected to be topsoil stripped to approximately 0.4 m depth and the cable is expected to be placed in an open cut trench 1 m wide and 1.5 m deep;
- the construction of a concrete pad (TJP) of 15 m by 5 m where the subsea cable and onshore underground cables meet, which will be excavated to a depth yet to be determined;
- the laying of buried concrete pads 15 m by 5 m placed every 800 m to connect the cables. These areas will be excavated to a depth of 1.5 m;
- three open-cut trenches approximately 800 m in length to carry the subsea DC cables and optic cable from the last breakout point in the mid-intertidal area to MHWS.

8.143 Despite the extensive mineral extraction that has taken place in Clubb Pit north of West Lane throughout the 20th century, which is likely to have removed most of the archaeological evidence, the access road present today and the area surrounding the former White Hall Farm appear to have been left largely intact. The 30 m easement and indicative trench location are sited over the former quarry access road and quarry working area, where there is the potential for survival of archaeological remains dating to the Palaeolithic, Iron Age, Roman, post-medieval and modern periods.

8.144 Topsoil stripping across the 30 m easement would result in the disturbance and/ or removal of archaeological deposits that may immediately underlie the topsoil. This would result in the value of the remains of the 20th century outfarm south of White Hall Farm [**A132**], the remains of White Hall Farm [**A91**], and the remains of the Second World War camp [**A91**], Iron Age settlement remains near Rose Court Farm and Roman funerary remains near Rose Court Farm being totally altered or destroyed and as such is assessed to represent a high magnitude of impact in accordance with the criteria set out in Table 8.2. As a result, there is anticipated to be a high impact on archaeological remains ranging from negligible to high value.

8.145 For the site of the 20th century outfarm south of White Hall Farm [**A132**], considered to be of negligible value, this would result in a minor adverse effect.

8.146 For the site of the post-medieval White Hall Farm [**A47**], considered to be of low value, this would result in a moderate adverse effect.

8.147 For assets of medium value, which includes potential Roman settlement and/ or funerary remains and the site of a Second World War camp [**A91**], this would result in a major adverse effect.

8.148 The significance of effect on possible Iron Age settlement remains of high value that may be located within the easement would be major adverse.

8.149 The open-cut trench for the proposed DC cable route, which is expected to be excavated to a depth of 1.5 m, would result in the localised removal or truncation of archaeological deposits below the topsoil. Given that the impact will be limited to a narrow trench within the easement and would therefore likely only affect a small proportion of the archaeological resource means that the open-cut trench would result in an impact of low magnitude on the remains of the 20th century outfarm south of White Hall Farm [**A132**], the remains of White Hall Farm [**A91**], the remains of the Second World War camp [**A91**], Iron Age settlement remains near Rose Court Farm and Roman funerary remains near Rose Court Farm.

8.150 For the site of the 20th century outfarm south of White Hall Farm [**A132**], considered to be of negligible value, and for the site of the post-medieval white Hall Farm [**A47**], considered of low value, the open-cut trench would result in a negligible effect.

8.151 For assets of medium value, which includes potential Roman settlement and/ or funerary remains and the site of a Second World War camp [**A91**], this would result in a major adverse effect.

8.152 The significance of effect on possible Iron Age settlement remains of high value that may be located within the easement would be minor adverse.

8.153 Similarly, the excavation of open areas in order to lay 15 m by 5 m concrete pads at cable joints is expected to be excavated to a depth of 1.5 m, and would result in the removal or truncation of archaeological deposits below the topsoil. Consequently, this would result in an impact of medium magnitude on archaeological remains of the 20th century outfarm south of White Hall Farm [**A132**], the remains of White Hall Farm [**A91**], the remains of the Second World War camp [**A91**], Iron Age settlement remains near Rose Court Farm and Roman funerary remains near Rose Court Farm.

8.154 For the site of the 20th century outfarm south of White Hall Farm [**A132**], considered to be of negligible value, this would result in a negligible effect.

8.155 For the site of the post-medieval White Hall Farm [**A47**], considered to be of low value, this would result in a minor adverse effect.

8.156 For assets of medium value, which includes potential Roman settlement and/or funerary remains and the site of a Second World War camp [**A91**], this would result in a moderate adverse effect.

8.157 The significance of effect on possible Iron Age settlement remains of high value that may be located within the easement would be major adverse.

8.158 The DC Cable is planned to be directionally drilled beneath much of the intertidal zone, which is expected to result in no impacts to the buried archaeological resource. However, the installation of four breakout points at unknown locations every 800 m within the intertidal zone to facilitate the directional drilling, and the excavation of open-cut trenches in the last 800 m to the MLWS have the potential to impact on archaeological remains within their footprints. A single geophysical anomaly [**7134**] has been identified within the intertidal zone and is assessed as a possible feature of anthropogenic origin (A2) within the GB Offshore Scheme (Chapter 16). There is a potential for previously unrecorded archaeological remains to be present within this section of the scheme. These remains are likely to be associated with post-medieval and modern farming practices and are assessed as being of negligible value, or to relate to post-medieval and modern military defences, considered of medium value. The construction of the proposed DC cable route would entail the removal of topsoil deposits across the 30 m easement and removal of subsoil deposits within the open cut trench and concrete pads, which would completely remove any previously unrecorded archaeological remains present. The impact is therefore assessed to be high, resulting in a minor adverse impact on assets of negligible value and moderate adverse on assets of medium value.

8.159 This section of the GB Onshore Scheme would result in the loss of approximately a tenth of a landscape composed of 19th century field systems considered to be of low value. This would result in change in both to the asset itself and changes to its setting resulting in erosion in our ability to understand and appreciate the asset. The magnitude of change is therefore considered to be medium, resulting in minor adverse effect.

Archaeological Effects During Operation

8.160 Effects once the GB Onshore Scheme is complete and occupied comprise operational effects arising from the presence of permanent structures, enclosing security palisade, maintenance activities, road traffic, and lighting. The Site is expected to be in operation for approximately 40 years prior to decommissioning.

8.161 All physical impacts on the archaeological resource will occur during the construction stage of the GB Onshore Scheme. The nature and extent of archaeological assets within the Site will have been established during evaluation works that would form part of the mitigation strategy outlined below. All identified archaeological remains will therefore have been recorded to a level commensurate with their significance. Any archaeological resource that may be impacted during the operational phase, through maintenance work or emergency intrusive excavations, will therefore have been previously evaluated and recorded. As such, it is considered that there would be no additional impacts to the archaeological resource once the GB Onshore Scheme is operational.

Potential Built Heritage Impacts During Construction and Operation

*World War II Anti-Tank Obstacles on the Foreshore [**BH1**]*

Construction

8.162 The Grade II listed World War II Anti-Tank Obstacles are assessed to be of medium value. The proposed DC cable route would pass underneath the asset via Horizontal Directional Drilling within a 30 m corridor centred approximately at NGR 588552, 177354. Construction of the cable route beneath the asset would be to a design by the appointed contractor and would represent a temporary change to the setting of the asset which will cease when the land is returned to its previous state. The temporary impact is assessed to be low, resulting in a minor adverse effect.

Operation

8.163 There will be no impact on the asset as a result of the operation of the GB Onshore Scheme and no change to its setting. When viewed from the beach the proposed converter station and other elements of the GB Onshore Scheme will not be visible above the cliff that runs immediately behind the asset. The effect from the operational Development is neutral.

*Church of St James [**BH2**]*

Construction

8.164 The Church of St. James is a Grade 1 Listed Building and is of high value. The setting of the church does not extend into the GB Onshore Scheme application site, therefore there will be no impact on the asset during the construction phase of the GB Onshore Scheme. No element of the GB Onshore Scheme Site would be visible from the asset or elsewhere in its setting including Grain Fort.

Operation

8.165 While the GB Onshore Scheme will not be visible from the asset or the churchyard surrounding it, it would be visible in views to the west from the ramparts of Grain Fort which include the asset to the right hand side of the view. The convertor station will be visible in these views above the roofs of the houses to the west of Green Lane and to the north of High Street. The converter station building will form a low backdrop to these buildings, taking up a very small proportion of the view and not providing a distraction from the asset within the view. The asset's setting is the historic core of the village and it is not considered that this slight visibility of the GB Onshore Scheme within the same view as the asset will change its setting sufficiently to be assessed as an impact. The effect from the operational Development is assessed to be neutral.

*The Hogarth Inn [**BH3**]*

8.166 There will be no impact on the asset during either the construction or operation phases of the GB Onshore Scheme. No element of the site would be visible from the asset or anywhere within its setting. The effect arising from the construction and operation of the GB Onshore Scheme is assessed to be neutral.

*White House Farm [**BH4**]*

Construction

8.167 There will be no impact on the asset during the construction phase of the GB Onshore Scheme. No element of the Site will be visible from the asset or elsewhere in its setting and the effect is assessed to be neutral.

Operation

8.168 The asset is screened from the Site by houses on the north side of Rivendell Close and the south and east sides of Lapwing Road so that there is no view of the Site from the asset itself. However, the flat landscape between the asset and the Site means that the GB Onshore Scheme would be visible from some parts of the asset's setting to the east, albeit at a distance of over 1 km from the eastern corner of the proposed convertor station. At this distance the GB Onshore Scheme would not be as great an influence on the asset's setting as the superstructure (as opposed to the chimney) of Grain Power Station. It would however be apparent within the asset's setting, adding to the already significant changes it has undergone throughout the 20th century. The effect of the scheme would be minor adverse, derived from a low magnitude of impact on a medium value asset.

*Coastal artillery Defences on the Isle of Grain, Immediately East and South East of Grain Village [**BH5**]*

Construction

8.169 Construction activity within the Site will not change the asset's setting and would not impact upon the asset. The effect is assessed to be neutral.

Operation

8.170 The GB Onshore Scheme would be visible in the view to the west from the ramparts of Grain Fort, the northernmost part of the group of coastal artillery defences. The asset is approx. 1.2 km distant from the eastern corner of the proposed convertor station at this point and the GB Onshore Scheme would be visible from the asset above the roofs of the houses to the west of Green Lane and to the north of High Street. The GB Onshore Scheme would form a low backdrop to these buildings, taking up a very small proportion of the view. The asset's setting is the coastal strip on the east of the Isle of Grain and it is not considered that this slight visibility of the GB Onshore Scheme from the asset would change this setting sufficiently to be assessed as an impact. It is assessed therefore that there would be no impact arising from the operational Development and the effect is assessed to be neutral.

The Old Vicarage, High Street, Grain Village [BH6]

Construction

8.171 There would be no impact on the asset during the construction phase of the GB Onshore Scheme. No element of the site would be visible from the asset or elsewhere in its setting including Grain Fort. The effect is assessed to be neutral.

Operation

8.172 While the GB Onshore Scheme would not be visible from the asset it would be visible in views looking west from the ramparts of Grain Fort which include the asset to the right of the centre of the view. The convertor station would be visible in these views above the roofs of the houses to the west of Green Lane and to the north of High Street. The building would form a low backdrop to these buildings, taking up a very small proportion of the view and not providing a distraction from the asset within the view. The asset's setting is the Church of St James [**BH2**] and the historic core of the village and it is not considered that this slight visibility of the GB Onshore Scheme within the same view as the asset will change its setting sufficiently to be assessed as an impact. It is assessed therefore that there would be no impact arising from the operational Development and the effect is assessed to be neutral.

*Grain United Reformed Church [**BH7**]*

Construction

8.173 There would be no impact on the asset during the construction phase of the GB Onshore Scheme. No element of the site would be visible from the asset or elsewhere in its setting.

Operation

8.174 The view from the asset to the north is terminated by the cottages on the northwest side of Grain Road. The electricity pylon to the north of Perry's Farm and Wilford's Farm [**BH11**] is visible behind the cottages but only the upper two pairs of arms can be seen meaning that the convertor station would not be visible from this location or from anywhere else in the asset's setting. There would therefore be no impact on the asset as a result of the operation phase of the GB Onshore Scheme and the effect is assessed to be neutral.

*Grain Village Hall [**BH8**]*

8.175 There would be no impact on the asset during either the construction or operation phases of the GB Onshore Scheme. No element of the site would be visible from the asset or anywhere within its setting. The effect of the construction and operation of the GB Onshore Scheme is assessed to be neutral.

*Former Coastguard Station (Medtha House and Coastguard Cottages) [**BH9**]*

8.176 There would will be no impact on the asset during either the construction or operation phases of the GB Onshore Scheme. No element of the site would be visible from the asset or anywhere within its setting. The effect of the construction and operation of the GB Onshore Scheme is assessed to be neutral.

*Rosecourt Farm [**BH10**]*

Construction

8.177 Given the proximity of the asset to the GB Onshore Scheme, approx. 200 m at its closest point, there would be impact on the asset during the construction phase. The asset is screened from the Site by a strip of scrub on the south side of West Lane. The scrub extends south along the southeast edge of the pond to the south of the road and continues around the southwest side of the pond. This screening is however sparse and construction activity including preparatory works and civil construction works would be visible and audible from the asset and from various locations within the setting of the asset. These changes will be temporary and would not result in a change in our ability to understand and appreciate the asset as a late 19th century farmstead. The impact is assessed to be very low on an asset of low value, resulting in a negligible effect.

Operation

8.178 The asset is located approx. 490 m from the proposed substation (80 m x 80 m x 14 m high) and approx. 570 m from the proposed convertor station (250 m x 250 m x 26 m high). Although there is some screening in place between the asset and the GB Onshore Scheme it is sparse and will not function efficiently as screening during the winter months. Some mitigation in the form of scrub and woodland edge planting is embedded in the scheme design to the north of the proposed attenuation pond but the GB Onshore Scheme would be visible above this when viewed from the asset. The GB Onshore Scheme would also be visible when approaching the asset from the northwest and southeast along West Lane. The asset's setting would change as a result of the GB Onshore Scheme, resulting in some change in our ability to understand and appreciate the asset. This change is assessed to represent a low magnitude of impact on an asset of low heritage value. The effect is assessed to be negligible.

*Perry's Farm and Wilford's Farm [**BH11**]*

Construction

8.179 The asset is located very close to the application boundary of the GB Onshore Scheme and would experience impact from activity during the construction phase including preparatory works and civil construction works. The majority of the asset's setting would experience change as a result of construction activity resulting in a change in our ability to understand and appreciate the asset. This change is assessed to represent a low magnitude of impact on an asset of low heritage value. The effect is assessed to be negligible.

Operation

8.180 The asset is located approx. 40 m from both the proposed substation (80 m x 80 m x 14 m high) and approx. 570 m from the proposed convertor station (250 m x 250 m x 26 m high) at its closest point. The proposed buildings would dominate the asset's setting, bringing the existing industrial landscape very much closer to it than the existing approx. 850 m. All parts of the asset's setting would be changed by the GB Onshore Scheme, resulting in an erosion of our ability to understand

and appreciate the asset. This change is assessed to represent a medium magnitude of impact on an asset of low heritage value. The effect is assessed to be minor adverse.

*Second World War QF P-Series Oil Bombing Decoy [**BH13**]*

Construction

8.181 The asset is located in two areas of protection approximately 1.6 km west-northwest of the application boundary at its nearest point, in a wide bend of Yantlet Creek. At this distance, although construction activity may be apparent from the asset and from locations within its setting it would not change that setting. There would therefore be no impact as a result of construction activity and the effect is assessed as neutral.

Operation

8.182 The GB Onshore Scheme would be visible from the asset and from locations within the asset's setting as a continuation of the existing industrial landscape to the southeast of the asset and southwest of the GB Onshore Scheme. However, the presence of the GB Onshore Scheme in the landscape would not change the asset's setting, the flat floodplain of Yantlet Creek, and would not alter the asset's relationship with the petro-chemical development to the south which is the successor to the oil storage facility the asset was built to protect. There would therefore be no impact on the asset and no loss of significance as a result of the proposed Development. The effect is assessed as neutral.

*Church of All Saints [**BH14**]*

Construction

8.183 At just under 4 km distant to the west, construction activity on the Site would not have any impact on the asset. The effect is assessed as neutral.

Operation

8.184 The GB Onshore Scheme would not be visible from the asset or its immediate context but would be visible in views to the east when entering the village on Stoke Road from the south or on Ratcliffe Highway from the west. In these views the GB Onshore Scheme would be seen as an extension of the existing industrial landscape to the south. The change in setting would be minimal and would not alter appreciation of the asset. This change represents a very low magnitude of impact on an asset of high heritage value and would result in a minor adverse effect.

*Rose and Crown Public House [**BH15**]*

8.185 The asset is located to the west of the Church of All Saints [**BH14**] and the GB Onshore Scheme would not have an impact on it or change its setting during either the construction or operation phases. The effect is assessed as neutral.

Archaeological and Built Heritage Effects during Decommissioning

8.186 The decommissioning of the Development would likely be limited to the removal of existing structures and the reinstatement of land to agricultural use. Impacts to the archaeological resource would likely be limited to the footprints and depths of existing structures within the GB Onshore Scheme, and as such would not result in any additional effects on the archaeological resource.

8.187 Impacts on built heritage assets at decommissioning would be at a similar scale and nature as for construction and would be similarly temporary. Impacts on built heritage assets during refurbishment would be at a smaller scale and would be temporary.

8.188 Following the removal of the structures and the reinstatement of the land to agricultural use, there would be no further potential effects to the historic landscape or built heritage resource.

Mitigation

8.189 Archaeological assessment is unlike most other EIA topics in so far as the presence of an asset is frequently not known with certainty. Unless records are extensive or archaeological investigation has been undertaken as part of the EIA, it remains the function of pre-construction investigation to ascertain whether any detailed mitigation measures may be required.

8.190 Archaeological fieldwork does not reduce the overall effect to an asset. Fieldwork is designed to offset an impact and inform the planning balance. Furthermore, it is not considered as a 'benefit' of the scheme given that the loss of an asset remains. The NPPF is clear on this point, stating that 'the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted' (paragraph 199).

8.191 The results of the Archaeological DBA (Appendix 8-1) has identified that there is the potential for archaeological remains to survive within the Site. Mitigation measures, in the form of a staged programme of archaeological investigation, recording and dissemination, if deemed appropriate by Kent County Council, could be employed to establish the presence and significance of archaeological remains within the Site.

8.192 Typical appropriate measures that may be employed to achieve preservation by record of any surviving archaeological remains are summarised in Table 8.6 below. An outline programme of initial investigations is detailed below based on the results of the desk-based assessment and impact assessment and in consultation with Kent County Council. It is anticipated that the requirements for archaeological mitigation will be secured by a planning condition post-determination.

Table 8.6: Possible archaeological investigation measures

Mitigation Method	Description
Geoarchaeological Investigation	A programme of sample recovery and analysis undertaken to investigate palaeoenvironmental conditions and soil sediment development that may be relevant to the research of archaeological remains recovered within the vicinity. Achieved through trial pit excavations or other geotechnical soil sample retrieval methods (such as soil cores or boreholes).
Targeted Watching Brief	A programme of observation, investigation and recording of archaeological remains during or alongside construction activities in which the contractor's preferred method of working would be controlled as necessary to allow archaeological recording to take place to the required standard. Targeted watching briefs can be undertaken in specific cases where the presence of potential remains has been demonstrated, but where detailed investigation prior to the main construction programme is unjustified, unfeasible due to safety or logistical considerations, or undesirable due to environmental or engineering constraints.
General Watching Brief	A programme of observation, investigation and recording of archaeological remains during or alongside construction activities in which the contractor's preferred method of working would be controlled as necessary to allow archaeological recording to take place to the required standard.
Strip Map and Sample Investigation	A flexible programme of fieldwork, which is of particular value where the presence of archaeological remains is known but the extent of areas requiring archaeological excavation, is unclear. Topsoil and overburden would be stripped under archaeological control, over a defined area, in order carefully to expose archaeological remains. This work will be undertaken prior to the main construction programme in order to allow sufficient time for archaeological recording. A scope of work appropriate to record any archaeological remains exposed would be agreed on site during consultation with KCC archaeological officer and implemented immediately.
Trial Trench Evaluation	Either targeted or sample-based investigation in which mechanical excavated trenches are excavated in order to establish the presence/absence, location, extent, and character of archaeological deposits or activity foci identified by non-intrusive baseline survey methods. Trial trenching would also inform the need for any further appropriate mitigation strategy. Trial trenching would also be applied to areas where

Mitigation Method	Description
	no significant archaeological remains have been identified to control the risk to the construction programme and the risk for disturbing 'unforeseeable' finds.
Detailed Excavation	Detailed Excavation would be undertaken where significant archaeological remains are either known previously or discovered during the course of the works. This may be targeted at specific area locations such as the sites of archaeological interest identified during the baseline assessment or identified as the result of a programme of trial trench evaluation or watching brief monitoring.

8.193 The first stage of investigation would be archaeological monitoring of any new geotechnical investigations in order to understand the nature of the made ground and magnitude of previous ground disturbance. This would be particularly relevant along the proposed DC cable route to clarify the extent of gravel extraction activities and determine whether there is any potential for undisturbed archaeological deposits to have survived. The result of this monitoring would be used to inform the need for further archaeological evaluation in the form of targeted trial trenching evaluation within the area of impact.

8.194 Archaeological trial trench evaluation would be targeted to investigate areas of proposed ground disturbance resulting from topsoil stripping and areas of intrusive excavation of the underlying surficial deposits. Areas of topsoil stripping would be investigated to determine the presence/ absence and extent of any surviving archaeological remains dating to the Iron Age, Roman, medieval, post-medieval, or modern periods cutting into the underlying superficial deposits, whereas areas of deeper excavation would be investigated to determine the presence/ absence of Palaeolithic material.

8.195 Any appropriate archaeological investigation or mitigation measures would be undertaken in accordance with an Archaeological Project Design and Written Scheme of Investigation (WSI) prepared and approved in advance with Kent County Council and Medway Council. All archaeological investigations will be undertaken by suitably qualified archaeologists who will be monitored as necessary by Kent County Council to ensure compliance with both the agreed project design and professional standards.

Residual Impacts

8.196 Table 8.7 below summarise the residual effects of the GB Onshore Scheme on the cultural heritage resource and any changes resulting from the implementation of the suggested additional mitigation measures.

8.197 Despite a comprehensive assessment of baseline archaeological conditions there remains the potential risk that construction works could reveal as yet unidentified or unexpected archaeological remains within the application site. This possibility is inherent in archaeological investigation and developments which require assessment against the guidance given in the NPPF. Any such remains would likely be revealed during the evaluation work secured by a post-determination planning condition.

Table 8.7: Summary of residual effects

Description of effect	Sensitivity of Receptor (heritage significance/ value)	Nature of Effect and Geographic Scale	Magnitude of Impact	Classification of Effect and Statement of Significance	Mitigation and monitoring	Residual effect
Effects during the construction phase of the converter station and substation						
Removal of remains of Ridge and Furrow [**A70**] and potential associated medieval agricultural remains from topsoil stripping, levelling works, and excavation of attenuation ponds.	Low	Permanent Local Negative	high	Moderate adverse	Programme of archaeological recording	Moderate adverse
Truncation of potential post-medieval field systems or farmstead remains from topsoil stripping, levelling works, and excavation of attenuation ponds.	Negligible	Permanent Local Negative	high	Minor adverse	Programme of archaeological recording	Minor adverse
Removal of potential post-medieval field systems or farmstead remains from topsoil stripping, levelling works and excavation of attenuation ponds.	Negligible	Permanent Local Negative	High	Minor adverse	Programme of archaeological recording	Minor adverse
Removal of potential Palaeolithic remains within gravel terrace deposits from levelling works.	High	Permanent Local Negative	High	Major adverse	Programme of archaeological recording	Major adverse
Rosecourt Farm [**BH10**]	Low	Temporary Local Negative	Very Low	Negligible	Additional mitigation is not required	Negligible
Perry's Farm and Wilford's Farm [**BH11**]	Low	Temporary Local Negative	Low	Negligible	Additional mitigation is not required	Negligible
Loss of 19th century landscape of straight field boundaries as a result of the construction of the converter and substation.	Low	Permanent Local Negative	Medium	Minor adverse	Embedded in scheme	Minor adverse

Description of effect	Sensitivity of Receptor (heritage significance/ value)	Nature of Effect and Geographic Scale	Magnitude of Impact	Classification of Effect and Statement of Significance	Mitigation and monitoring	Residual effect
Effects during the construction phase of the DC cable						
Truncation of remains of Site of White Hall Farm **[A47]** from topsoil stripping and DC cable route's open-cut trench.	Low	Permanent Local Negative	Low	Negligible	Programme of archaeological recording	Negligible
Truncation of remains of Site of White Hall Farm **[A47]** from excavations to place concrete pads at cable joints.	Low	Permanent Local Negative	Medium	Minor adverse	Programme of archaeological recording	Minor adverse
Truncation of remains of the Second World War Camp west of White Hall Farm [**A91**] from topsoil stripping and DC cable route's open-cut trench.	Medium	Permanent Local Negative	Low	Negligible	Programme of archaeological recording	Negligible
Truncation of remains of the Second World War Camp west of White Hall Farm [**A91**] from excavations to place concrete pads at cable joints.	Medium	Permanent Local Negative	Medium	Moderate adverse	Programme of archaeological recording	Moderate adverse
Truncation of remains of the 20th Century Outfarm South of White Hall Farm [**A132**] from topsoil stripping and DC cable route's open-cut trench.	Negligible	Permanent Local Negative	Low	Negligible	No mitigation required	Negligible
Localised truncation or removal of remains of the 20th Century Outfarm South of White Hall Farm [**A132**] from excavations to place concrete pads at cable joints.	Negligible	Permanent Local Negative	Medium	Negligible	No mitigation required	Negligible
Truncation of potential Palaeolithic remains from DC cable route's open cut trench.	High	Permanent Local Negative	Low	Moderate adverse	Programme of archaeological recording	Moderate adverse
Localised truncation or removal of potential Palaeolithic remains from	High	Permanent Local	Medium	Major adverse	Programme of archaeological recording	Major adverse

Description of effect	Sensitivity of Receptor (heritage significance/ value)	Nature of Effect and Geographic Scale	Magnitude of Impact	Classification of Effect and Statement of Significance	Mitigation and monitoring	Residual effect
excavations to place concrete pads at cable joints.		Negative				
Truncation of potential Iron Age settlement remains from topsoil stripping and DC cable route's open-cut trench.	High	Permanent Local Negative	Low	Moderate adverse	Programme of archaeological recording	Moderate adverse
Localised truncation or removal of potential Iron Age settlement remains from excavations to place concrete pads at cable joints.	High	Permanent Local Negative	Medium	Major adverse	Programme of archaeological recording	Major adverse
Truncation of potential Roman settlement and/or -funerary remains from topsoil stripping and DC cable route's open-cut trench.	Medium	Permanent Local Negative	Low	Minor adverse	Programme of archaeological recording	Minor adverse
Localised truncation or removal of potential Roman settlement and/or -funerary remains from excavations to place concrete pads at cable joints.	Medium	Permanent Local Negative	Medium	Moderate adverse	Programme of archaeological recording	Moderate adverse
Removal of potential post-medieval field systems or farmstead remains from topsoil stripping, DC cable route's open-cut trench, and concrete pads at cable joints.	Negligible	Permanent Local Negative	High	Minor adverse	Programme of archaeological recording	Minor Adverse
Removal of potential post-medieval military remains from topsoil stripping, DC cable route's open-cut trench, and concrete pads at cable joints.	Medium	Permanent Local Negative	High	Moderate adverse	Programme of archaeological recording	Moderate adverse
Removal of potential modern field systems or farmstead remains from topsoil stripping, DC cable route's open-cut trench, and concrete pads at cable joints.	Negligible	Permanent Local Negative	High	Minor adverse	Programme of archaeological recording	Minor adverse

Description of effect	Sensitivity of Receptor (heritage significance/ value)	Nature of Effect and Geographic Scale	Magnitude of Impact	Classification of Effect and Statement of Significance	Mitigation and monitoring	Residual effect
Removal of potential modern military remains from topsoil stripping, DC cable route's open-cut trench, and concrete pads at cable joints.	Medium	Permanent Local Negative	High	Major adverse	Programme of archaeological recording	Major adverse
World War II Anti-Tank Obstacles on the Foreshore [**BH1**]	Medium	Temporary Local	Medium	Minor adverse	Embedded in scheme	Minor adverse
Effects during the operational phase of the GB Onshore Scheme						
White House Farm [**BH4**]	Medium	Permanent Local Negative	Low	Minor adverse	Embedded in scheme	Minor adverse
Rosecourt Farm [**BH10**]	Low	Permanent Local Negative	Low	Negligible	Embedded in scheme	Negligible
Church of All Saints [**BH14**]	High	Permanent Local Negative	Very Low	Minor adverse	Embedded in scheme	Minor adverse

Cumulative Impacts

8.198 The wider archaeological resource of the Study Area comprises buried archaeological remains which have accumulated as a result of human activity since the prehistoric period and industrial and military development of the area since the late 19th century.

8.199 It is reasonably assumed that the determination of planning approval for each cumulative development will have been made in accordance with national, regional and local planning policy and guidance, within which archaeological assets would be a material consideration and would have included the provision of appropriate archaeological mitigation measures, including the requirement for investigation and recording.

8.200 The erection of the OHL north of the substation and the installation of the cable below MLWS have the potential to impact on archaeological assets that extend beneath both the GB Onshore Scheme and the respective developments. However, each scheme will be addressed separately and will therefore be subject to planning conditions that require archaeological investigation and recording. Nevertheless, the GB Onshore Scheme has been assessed as resulting in major adverse effects on potential archaeological resources of medium to high significance in both areas. As such, the additional impact of these schemes would not result in an increase in the effect for the GB Onshore Scheme, and as such the mitigation strategy remains suitable.

8.201 With regard to built heritage it is considered that the remaining four short listed development schemes are sufficiently distant from the Site so that any impact caused by them will not have a cumulative effect over and above the impacts caused by the propose development.

8.202 As a result, the likely cumulative effects of other development schemes in conjunction with the GB Onshore Scheme are considered to be negligible.

Summary of Assessment

8.203 The GB Onshore Scheme would not affect any World Heritage Sites, Registered Battlefields, Registered Parks and Gardens or Scheduled Monuments. It will cause change to the settings of two Listed Buildings, and two non-designated built heritage assets. Furthermore, the GB Onshore Scheme would directly impact on five non-designated archaeological assets located within Site, and may impact on potential archaeological remains dating to the Palaeolithic, Iron Age, Roman, medieval, post-medieval, and modern periods.

8.204 The construction phase of the GB Onshore Scheme would have a temporary Minor adverse effect on the grade II listed World War II Anti-Tank Obstacles on the foreshore [**BH1**]. The operational phase of the GB Onshore Scheme would have a Minor adverse effect on the Church of All Saints, Allhallows [**BH14**]. Convention and professional judgement dictate that neither effect is significant.

8.205 The construction and operational phases of the GB Onshore Scheme would have Negligible to Minor adverse effects on the non-designated built heritage assets of Rosecourt Farm [**BH10**] and Perry's Farm and Wilford's Farm [**BH11**]. Convention and professional judgement dictate that these effects are not significant.

8.206 Five archaeological assets have been identified within the Site consisting of the remains of the post-medieval White Hall Farm [**A47**], the remains of medieval ridge and furrow [**A70**], the remains of a Second World War camp [**A91**], and the remains of the a modern outfarm south of White Hall Farm [**A132**]. The fifth asset consists of a dipole anomaly of possible anthropogenic origin [**7134**] which is assessed in the GB Offshore Scheme ES Chapter 16. It has also been determined that the Site holds a potential to contain Palaeolithic, Iron Age, Roman, medieval, post-medieval and modern remains ranging in value from negligible to high.

8.207 It has been established that the GB Onshore Scheme would result in the truncation and/ or removal of archaeological assets, resulting in, at most, a permanent major adverse effect to the archaeological resource. It has been recommended that a staged program of archaeological investigations is undertaken to identify the extent and further assess the significance of known and potential archaeological remains within the Site and that a programme of excavation and recording of archaeological remains commensurate with their significance be carried out to mitigate the impacts of the GB Onshore Scheme.

References

Ref 8-1.MHCLG 2019 Revised National Planning Policy Framework (NPPF). Section 16: Conserving and enhancing the historic environment. Ministry of Housing, Communities and Local Government. https://www.gov.uk/government/publications/national-planning-policy-framework--2

Ref 8-2.The Ancient Monuments and Archaeological Areas Act 1979 and subsequent amendments http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf

Ref 8-3.Planning (Listed Buildings and Conservation Areas) Act 1990. The Stationery Office, London http://www.legislation.gov.uk/ukpga/1990/9/contents

Ref 8-4.MHCLG 2019 National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG). Conserving and enhancing the historic environment. Ministry of Housing, Communities and Local Government. https://www.gov.uk/guidance/conserving-and-enhancing-the-historic-environment

Ref 8-5.EH 2015 Historic Environment Good Practice Advice in Planning Note 2. Managing Significance in Decision Taking in the Historic Environment. English Heritage, Swindon http://historicengland.org.uk/images-books/publications/gpa2-managing-significance-in-decision-taking/

Ref 8-6.HE 2017 Historic Environment Good Practice Advice in Planning Note 3. 2nd edition. The Setting of Heritage Assets. English Heritage, Swindon http://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/

Ref 8-7.Medway Council (2003). Medway Local Plan

9. Water Resources & Flood Risk

Introduction

9.1 This Chapter describes the existing water environment and identifies and assesses the potential effects of the GB Onshore Scheme on water resources and flood risk. It identifies the likely impact risks and describes the mitigation measures and/ or best practice measures that will be incorporated into the construction and operational phases of the GB Onshore Scheme to avoid, reduce or offset potential adverse effects, or enhance potential beneficial effects. Following this, residual effects will then be assessed, and any necessary mitigation for these effects identified.

9.2 The potential impacts considered in this Chapter include those on hydrology and surface water resources that form part of the onshore environment to mean low water (MLW). Impacts on hydrogeology and groundwater are considered in Chapter 11: Ground Conditions. Impacts on receptors within the coastal and offshore waters are assessed within the GB Offshore Scheme Environmental Appraisal.

Approach to Assessment

Overview

9.3 Hydrology has been assessed in terms of natural drainage patterns, base flows and volumes, runoff rates, geomorphology and water quality. Potential effects resulting from the GB Onshore Scheme on water resources and flood risk both during construction and operation have been assessed having regard to the mitigation measures already integrated into the design.

9.4 In accordance with the NPPF (Ref 9.1) a Flood Risk Assessment (FRA) has been undertaken which establishes the risk of flooding to and from the GB Onshore Scheme and proposes suitable mitigation where required to avoid or reduce the risk to a more acceptable level. The FRA is included in Appendix 9A and is supported by the outline surface water Drainage Strategy included in Appendix 9B. Conclusions from the FRA and Drainage Strategy are summarised in this Chapter.

Consultation

9.5 Two key stakeholders were consulted during the preparation of this Chapter and the supporting FRA (Appendix 9A) and Drainage Strategy (Appendix 9B).

9.6 North Kent Marshes Internal Drainage Board (IDB) which is managed by Medway Council in their role as Lead Local Flood Authority (LLFA) was consulted on the approach for surface water management for the site. The IDB advised that sustainable drainage systems (SuDS) should be incorporated and should be designed in accordance with SuDS Management Train principles. This advice has been applied in the development of the Drainage Strategy (Appendix 9B).

9.7 The Environment Agency was consulted to obtain flood risk information and modelling datasets of relevance to the Project Area (shown in Figure 9.1). The Environment Agency were contacted to obtain agreement regarding the parameters for future site planning and design in this location. This information was used to determine the finished floor levels for the proposed converter station and substation, and the levels for a suitable place of safe refuge for occupants of the site, which are further described in the FRA (Appendix 9A).

Data and Information

9.8 The following sources of information that define the GB Onshore Scheme have been reviewed and form the basis of the assessment of likely significant effects on water resources and flood risk:

- LiDAR topographic survey of existing Project Area (Environment Agency);
- GB Onshore Scheme layout plan drawings (Chapter 3);
- AECOM Outline Surface Water Drainage Strategy (Appendix 9B); and
- GB Onshore Scheme operation and construction description (Chapter 3).

9.9 Water environment and flood risk baseline conditions have been established through a desk based review of data and correspondence with the Environment Agency and LLFA. Data has been collected from the following sources:

- Envirocheck Report (Ref 9.2);
- AECOM Flood Risk Assessment Report (Appendix 9A);
- AECOM Outline Surface Water Drainage Strategy (Appendix 9B);
- Environment Agency online flood risk mapping (Ref 9.3);
- Environment Agency ‘Product 4’ data request including outputs from the Kent Coastal Modelling Study (2015) (Ref 9.4);
- Medway Council Strategic Flood Risk Assessment (Ref 9.5); and,
- Medway Council Local Flood Risk Management Strategy (Ref 9.6).

9.10 Analysis of receptors was based on the source-pathway-receptor mode whereby a potential pathway for an impact sources to reach a receptor was analysed. Where a pathway to a receptor was identified, this receptor has been included in this Chapter, regardless of the distance from the Project Area boundary.

Assessment Method

Introduction

9.11 Tables 9.1, 9.2 and 9.3 provide details of the criteria that have been used within the assessment methodology to define the importance of a receptor or attribute, the magnitude of potential impacts, and the classification of significance of potential effects. These are based on the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 (Ref 9.7).

Importance of Receptors

9.12 The importance of receptors is identified from a review of Project Area and land uses within the surrounding area with respect to the vulnerability classifications as set out in the Planning Policy Guidance (PPG) (Ref 9.8). With respect to flood defence and flood storage features, the value of the receptor is based on the scale and type of development that is being protected.

Table 9.1 Importance of receptor/attribute

Value	Criteria	Examples
Very High	Attribute with a high quality and rarity, regional or national scale.	Watercourse having a Water Framework Directive (WFD) classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0 m^3/s; development defined within the PPG as Essential Infrastructure or Highly Vulnerable; Floodplain or defence protecting more than 100 residential properties from flooding
High	Attribute with a high quality and rarity, local scale.	Watercourse having a WFD classification as shown in a RBMP, and Q95 < 1.0m^3/s; development defined within the PPG as More Vulnerable; Water Resource Zone (WRZ) at serious stress; Floodplain or defence protecting between 1 and 100 residential properties from flooding.
Medium	Attribute with a medium quality and rarity, local scale.	Watercourse detailed in the Digital River Network[3] (DRN) but not having a WFD classification as shown in a RBMP; development defined within the PPG as Less Vulnerable; WRZ at moderate stress; Floodplain or defence protecting 10 or fewer industrial properties from flooding.
Low	Attribute with a low quality and rarity, local scale.	Surface water sewer, agricultural drainage ditch; development defined within the PPG as Water Compatible; WRZ at low stress; Floodplain with limited constraints and a low probability of flooding of residential and industrial properties.

Magnitude of Impacts

9.13 The magnitude of the potential impacts is estimated based on the likely effects and is independent of the importance of the feature. Table 2 provides examples of the potential impacts; it is intended to provide a guide rather than an exhaustive list.

[3] The Detailed River Network (DRN) is the only large-scale, accurate and fully attributed digital river centreline covering England and Wales. The DRN is captured from the water features theme of the OS MasterMap topographic layer and built into a network using automated rules. Other input datasets and extensive local Environment Agency staff knowledge has been used to augment the core geometry to incorporate critical spatial detail and attribution, such as flow direction and path, not available from the OS mapping and to verify the accuracy of the centreline itself.

Table 9.2 Magnitude of potential impacts

Magnitude	Criteria	Examples
Major Adverse	Results in loss of a feature.	Major loss of flood storage; increase in peak flood levels (>200 mm); major increase in surface water flood risk; decrease in surface water ecological or chemical WFD status.
Moderate Adverse	Results in adverse impact on integrity of feature or loss of part of feature.	Moderate loss of flood storage; increase in peak flood levels (>100 mm); moderate increase in surface water flood risk; measurable decrease in surface water ecological or chemical quality, or flow, such that existing users are affected, but not changing any WFD status.
Minor Adverse	Results in minor adverse impact of feature.	Minor loss of flood storage; increase in peak flood levels (>100 mm); minor increase in surface water flood risk; measurable decrease in surface water ecological or chemical quality, or flow, not affecting existing users or changing any WFD status.
Negligible	Results in an impact on feature but of insufficient magnitude to affect the use/integrity.	No change to flood storage, no increase in peak flood levels or surface water flood risk. Discharge to watercourse which does not lead to a change in the attribute's integrity.
Minor Beneficial	Results in minor beneficial impact on feature or a reduced risk of adverse effect occurring.	Measurable changes in feature, but of limited size and/or proportion; measurable increase in surface water ecological or chemical quality, or flow, not affecting existing users or changing any WFD status.
Moderate Beneficial	Results in moderate improvement of feature.	Moderate creation of flood storage; decrease in peak flood levels (>100 mm); moderate reduction in surface water flood risk; measurable increase in surface water ecological or chemical quality, or flow, such that existing users are affected, but not changing any WFD status.
Major Beneficial	Results in major improvement in feature.	Major creation of flood storage; decrease in peak flood levels (>200 mm); major reduction in surface water flood risk; increase in surface water ecological or chemical WFD status.

Significance of Potential Effects

9.14 The appraisal of the importance of the receptors (Table 9.1) is then combined with the appraisal of the magnitude of the potential impacts (Table 9.2) to establish the significance of these impacts, as detailed in Table 9.3. Both the DMRB and Environmental Statement terminology has been included.

9.15 Where a potential impact has a significance of Major or Moderate, this is considered Significant, and measures have been identified to mitigate the effect.

Table 9.3 Classification of significance of potential effects

Magnitude of potential effects	Important / sensitivity of receptor			
	Very High	High	Medium	Low
Major	Very Highly Significant (DRMB) Major (ES)	Highly Significant (DRMB) Major (ES)	Significant (DRMB) Major (ES)	Low Significance (DRMB) Moderate (ES)
Moderate	Highly Significant (DMRB) Major (ES)	Significant (DRMB) Moderate (ES)	Low Significance (DRMB) Moderate (ES)	Insignificant (DRMB) Minor (ES)

Magnitude of potential effects	Important / sensitivity of receptor			
	Very High	High	Medium	Low
Minor	Significant (DRMB) Moderate (ES)	Low Significance (DRMB) Moderate (ES)	Insignificant (DRMB) Minor (ES)	Insignificant (DRMB) Negligible (ES)
Negligible	Low Significance (DRMB) Moderate (ES)	Insignificant (DRMB) Minor (ES)	Insignificant (DRMB) Negligible (ES)	Insignificant (DRMB) Negligible (ES)

Planning Policy & Applicable Legislation

European Legislation

9.16 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) (Ref 9.9) is the primary European Directive setting the context for the requirements of this Chapter. The purpose of the Directive is to establish a framework for the protection and improvement of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater.

9.17 The Directive requires the UK to classify the current condition of key waterbodies (giving a 'Status' or 'Potential') and set objectives to either maintain the condition or improve it where a waterbody is failing minimum targets. Any activities or developments that could cause deterioration within a nearby waterbody or prevent the future ability of a waterbody to reach its target Status, must be mitigated so as to reduce the potential for harm and allow the aims of the WFD to be realised.

9.18 A water body is assessed for ecological status and chemical status as part of the WFD. The methodology for determining status has been set out by the United Kingdom Technical Advisory Group (UKTAG) on the WFD (Ref 9.10). The Environment Agency is responsible for monitoring and ensuring that the targets are met. Water bodies are classed as either: high, good, moderate, poor or bad status.

National Legislation

9.19 The Water Resources Act 1991 as amended (Ref 9.11) is the key element of national legislation setting out requirements specific to this Chapter, as it sets out the relevant regulatory controls that provide protection to waterbodies and water resources (from abstraction pressures and pollution), as well as drainage and flood risk management related to main rivers.

9.20 Other relevant national legislation setting out requirements related to control and protection of water resources and provision of flood risk management includes:

- The Water Act 2003 (Ref 9.12) and 2014 (Ref 9.13) governing the control of water abstraction, discharge to water bodies, water impoundment, conservation and drought provision.
- The Environment Act 1995 (Ref 9.14), which established the Environment Agency and its statutory role in water resource protection and flood risk management;
- The Environmental Protection Act 1990 (Ref 9.15), which provides for integrated pollution control;
- The Land Drainage Act (1991) (Ref 9.16), which provides for drainage and flood risk management related to non-main rivers; and,
- The Flood and Water Management Act 2010 (Ref 9.17), which introduces requirements for managing 'local' sources of flood risk such as groundwater and surface water flooding and introduces statutory roles for some tiers of local authority in managing local flood risk.

9.21 A number of specific regulations have been made to implement European legislation into national law and to implement details and practical measures into law under primary legislation. These regulations include:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Ref 9.18). The Regulations are key to the assessment within this Chapter as they set the WFD environment quality standards that need to be met and maintained in UK waterbodies;
- The Anti-Pollution Works Regulations 1999 (Ref 9.19);
- The Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 9.20);
- The Groundwater Regulations (England and Wales) (2009) (Ref 9.21) which transposed the EU Groundwater Directive 2006 (2006/118/EC) (Ref 9.22) into UK law;
- The Environmental Damage Regulations 2009 (Ref 9.23);

- The Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref 9.24),
- The Environmental Permitting (England and Wales) Regulations 2010 (Ref 9.25) which control discharge of water to surface water and groundwater; and,
- Water Supply (Water Quality) Regulations 2010 (Ref 9.26).

National Planning Policy

National Planning Policy Framework

9.22 The National Planning Policy Framework (NPPF) (Ref 9.1) and associated Planning Policy Guidance (PPG) (Ref 9.8) set out the national planning policy and guidance with respect to flood risk. Paragraph 103 of the NPPF requires local planning authorities to ensure when determining planning applications:

9.23 "that flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- *within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and*
- *development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems".*

9.24 The government published a ministerial statement (HCWS161) on sustainable drainage systems on 18th December 2014 (Ref 9.27) whereby decisions on planning applications relating to major development must ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate. The ministerial statement is currently referenced by Defra as Sustainable Drainage Systems Policy to be used in conjunction with the NPPF.

9.25 The PPG also contains guidance in relation to water supply, wastewater and water quality and provides advice and information on how planning can and should protect water quality and ensure the delivery of adequate water and wastewater infrastructure for new development.

Local Planning Policy & Guidance

Local Plan 'Future Medway' 2018-2037

9.26 Medway Council are currently working on a new Local Plan, Future Medway, which will cover the period up to 2037.

9.27 As part of the preparations of the new Local Plan the Council prepared a Development Strategy technical report along with the Medway 2035 document (Ref 9.28). The report set out the ambitions for the plan, options for how Medway could grow and draft policies for managing development, building on work carried out at previous stages of consultation on Medway's emerging Local Plan. These are described further below.

Consultation Development Strategy: Policy NE7: Flood and Water Management

9.28 The Local Plan will seek to reduce flood risk, promote water efficiency measures, and protect and enhance water quality through the following mechanisms:

Flood Risk Management

- Ensuring that development has a positive or nil impact on flood risk management interests
- Development that would harm the effectiveness of existing flood defences or prejudice their maintenance or management will not be permitted.
- Where development benefits from an existing or proposed flood infrastructure, the development should contribute towards the capital costs and/ or maintenance of these defences over the lifetime of the development.

Sustainable Urban Drainage

- Development should enable or replicate natural ground and surface water flows and decreased surface water runoff, via the use of Sustainable urban Drainage systems (SUDS), utilising green infrastructure where possible and as guided by relevant national (and/ or local standards) and guidance.
- Where SuDS are provided, arrangements must be put in place for their management and maintenance over their full lifetime.

Water Supply

- Development within groundwater Source Protection Zones[4] (SPZ) and principal aquifers will only be permitted provided that it has no adverse impact on the quality of the groundwater resource, and it does not put at risk the ability to maintain a public water supply.

Water Quality

- All new development should have regard to the actions and objectives of appropriate River Basin Management Plans (in Medway, this is the Thames River Basin District) in striving to protect and improve the quality of water bodies in and adjacent to the district, as well as ecology, geomorphology, and water quantity. Developers shall undertake thorough risk assessments of the impact of proposals on surface and groundwater systems and incorporate appropriate mitigation measures where necessary.

Adaptation to Climate Change

- Development will be required to be designed to be resilient to, and adapt to the future impacts of, climate change through the inclusion of adaptation measures. These include:
  - Incorporating water efficiency measures, such as the use of grey water and rainwater recycling, low water-use sanitary equipment.
  - Minimising vulnerability to flood risk by locating development in areas of low flood risk and including mitigation measures including SuDS in accordance with (SuDS policy above).
  - Optimising the use of multi-functional green infrastructure, including tree planting for urban cooling, local flood risk management and shading.
  - Seeking opportunities to make space for water and develop new blue infrastructure to accommodate climate change.
  - Where possible watercourses and wetland features will be adequately buffered from development commensurate with the designation and/or ecological value of those features so that they can be safeguarded and managed sustainably in perpetuity.
  - Provision for buffering, mitigating and extending habitats and green corridors to ensure that wildlife populations are more resilient for a changing climate.

Local Flood Risk Management Strategy for Medway

9.29 As the Lead Local Flood Authority (LLFA) Medway Council has developed the Local Flood Risk Management Strategy (LFRMS) (Ref 9.6) to increase the understanding of local flood risk posed to the area and take the lead in effectively implementing measures to manage the risk where appropriate. The following objectives from the LFRMS are of relevance to the proposed Scheme;

- 2b: Medway Council will promote the use of SuDS:
- 2c: Medway Council will take account of the cumulative effect of developments and climate change on the risk of flooding throughout Medway; and,
- 2d: Medway Council will seek to ensure that development has a positive or nil effect on the risk of flooding to and arising from proposed development.

[4] Defined by the Environment Agency for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk.

Thames Estuary 2100

9.30 The Thames Estuary 2100 Plan (Ref 9.29) is a long-term strategy for managing tidal flood risk in the Thames Estuary. The Plan divides the Estuary into policy units and sets out the policy for managing tidal flood risk in that area. The Isle of Grain forms one of the policy units within the Thames Estuary 2100 Plan. The selected policy for the Isle of Grain policy unit is P4: "*to maintain and improve the level of flood defences to keep up with climate change*".

9.31 The Plan states:

> *"The Isle of Grain forms one of the policy units within the Thames Estuary 2100 Plan. The Isle of Grain policy unit has two distinct parts: an area of freshwater marshes to the west (Allhallows and Grain Marshes) and an industrial area to the south and east. The village of Grain lies on higher ground at the north-eastern extremity of the policy unit.*
>
> *Large parts of the grazing marshes are designated (as a SPA), and the area also provides an open rural landscape. The adjacent intertidal areas to the north and south west of this policy unit are also designated (as a SPA). No new development should therefore be permitted in these areas. However, the marshes themselves do not justify the current level of tidal flood protection along the Thames and Yantlet Creek and this must be examined as part of the implementation of the TE2100 Plan – possibly as part of the TE2100 habitat creation strategy.*
>
> *The eastern part of the policy unit will continue to be developed for industry and commerce in the foreseeable future. This is an important industrial and port area with large installations, and flood risk management must continue to be provided, keeping pace with climate change."*

Other Relevant Standards and Guidance

Environment Agency Pollution Prevention Guidance Notes

9.32 The Environment Agency PPG Notes provide advice on statutory responsibilities and good environmental practice. The PPGs were withdrawn in December 2015 as the Environment Agency is no longer a provider of 'good practice' guidance. However, they are still relevant and a useful reference. The guidance notes of relevance to the Proposed Development include:

- PPG 1: General Guide to the Prevention of Pollution (Ref 9.30);
- PPG 2: Above Ground Oil Storage Tanks (Ref 9.31) which provides guidance to those responsible for the storage of oil on construction sites;
- PPG 3: Use and Design of Oil Separators in Surface Water Drainage Systems (Ref 9.32);
- PPG 5: Works and maintenance in or near water (Ref 9.33);
- PPG 6: Working at Construction or Demolition Sites (Ref 9.34) is a document that mirrors much of PPG 5 but with emphasis on the situations likely to occur at demolition and construction Sites;
- PPG 7: Refuelling Activities (Ref 9.35), which provides information on the correct delivery, storage and dispensing of fuel to help reduce the risk of pollution; and,
- PPG 21: Pollution Incident Response Planning (Ref 9.36) assists those developing Site-specific pollution incident response plans to prevent and mitigate damage to the environment caused by accidents such as spillages and fires.

Construction Industry Research and Information Association (CIRIA) Guidance

9.33 The CIRIA guidance of relevance to the Proposed Development includes:

- Guidance C532 – Control of Water Pollution from Construction Sites (Ref 9.37) brings together the Environment Agency guidance but goes into greater detail regarding sources of water on construction sites, pollutants and pathways. In addition, it provides guidance on planning for the type and location of suitable control measures; and
- Guidance C753 – The SuDS Manual (Ref 9.38) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their best effective implementation within developments.

Baseline Conditions

Water Resources

Surface Water Features

9.34 There are several land drains and unnamed ponds within the Project Area, and a number of tidal creeks, ponds and ordinary watercourse to the west of the site within the Grain Marsh, including the Hamshill Fleet (ordinary watercourse) and Millmarsh Fleet (Main River). These waterbodies are identified in Table 9.4 and 9.5.

9.35 These waterbodies are within the Medway Lower operational area. The Environment Agency Catchment Data Explorer[5] identifies that none of these waterbodies have a designated WFD status. The Grain Marsh is a designated Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and RAMSAR site.

9.36 The importance of these receptors is identified in Tables 9.4 and 9.5.

Table 9.4 Waterbodies within Project Area

Name	Classification	Importance of receptor*	Location
Unnamed pond	Pond	Low	TQ 87885 76850
Unnamed pond	Pond	Low	TQ 88292 77283
Unnamed pond	Pond	Low	TQ 87956 76465
Unnamed drain	Drain (appears to be land drain on OS mapping)	Low	TQ 87670 76245
Unnamed drain	Drain (appears to be land drain on OS mapping)	Low	TQ 88330 76935
Unnamed drain	Drain (appears to be land drain on OS mapping)	Low	TQ 88171 77003
Unnamed pond	Pond	Low	TQ 88511 77123
Unnamed watercourse system	Drain (appears to be land drain on OS mapping)	Low	TQ 88701 76933
Unnamed pond	Pond	Low	TQ 88606 76854

Table 9.5 Waterbodies close to the Project Area

Name	Classification	Importance of receptor*	Location
Thames Estuary	Tidal estuary	High	TQ 89353 78730
Hamshill Fleet	Ordinary Watercourse	Medium	TQ 87365 76998
Millmarsh Fleet	Main River	Medium	TQ 86937 76745
Unnamed tidal creeks (Grain Marsh)	Tidal Creeks	Medium	TQ 87622 77067
Unnamed tidal marsh/ ditches		Low	TQ 87557 76657
Unnamed pond	Pond	Low	TQ 87885 76850
Unnamed pond	Pond	Low	TQ 88292 77283
Unnamed pond	Pond	Low	TQ 87856 76110

* as defined in Table 9.1.

[5] The Catchment Data Explorer helps explore and download information about the water environment. It supports and builds upon the data in the river basin management plans. http://environment.data.gov.uk/catchment-planning/

Water Supply Source

9.37 The Project Area is located within Southern Water's Kent Medway WRZ. Within this WRZ 75% of the water supply comes from groundwater and 25% from rivers. Medway is an area of serious water stress as identified by the Environment Agency (Ref 9.39). In accordance with the criteria in Table 9.1. the water resources used to supply the Kent Medway WRZ are of **High** importance.

Flood Risk

Tidal Flooding

9.38 The Environment Agency's Flood Map for Planning (Rivers and Sea) (Figure 9.1) (Ref 9.3) shows that the western fringe of the Project Area is located within Flood Zone 3. Flood Zone 3 is defined as land assessed as having a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. This area is shown to benefit from flood defences, which are located along the frontage of the Thames Estuary. The risk of tidal flooding to this part of the Project Area is therefore **residual**, in the event of a breach or failure of these flood defences.

9.39 The majority of the Project Area, and the settlement of Grain itself, are located at a slightly higher elevation (7-12 m Above Ordnance Datum (AOD)) and are therefore within an area defined as Flood Zone 1 Low Probability of tidal flooding (less than 1 in 1000 annual probability, or 0.1% AEP).

Fluvial Flooding

9.40 The closest watercourses to the Project Area are the network of ditches adjacent to the south western edge of the Project Area which connect to the Hamshill Fleet, located approximately 0.5 km to the west of the Project Area. The LiDAR topographic survey identified that the Project Area is located above 3m AOD, and the marshland is below 2 m AOD. The risk of flooding from this watercourse is therefore considered to be **Low**.

Surface Water Flooding

9.41 The Environment Agency mapping 'Risk of Flooding from Surface Water' (Ref 9.3) identifies the main risks of surface water flooding close to the Project Area are associated with the drainage ditches in the lower lying areas to the west of the Project Area. The higher elevation of the Project Area itself means that it is not at risk of surface water flows from adjacent land. The risk of surface water flooding is therefore **Low**.

Groundwater Flooding

9.42 The Project Area is situated on superficial deposits of sand and gravel, which are classified as a 'Secondary A' aquifer. The bedrock is the London Clay Formation, which is typically impermeable and has no aquifer classification/ designation. Therefore, there is a significant risk of the groundwater level being close to the ground level in this area. Further ground investigation work will be required to determine more accurately the risk to the Project Area. The risk of groundwater flooding to the site is **Medium** prior to further investigation.

Sewer Flooding

9.43 No details regarding the sewer network local to the site have been provided. The risk of flooding on the site associated with surcharging sewers is therefore unknown.

Reservoir Flooding

9.44 The Environment Agency Flood Risk from Reservoirs mapping does not identify the Project Area to be at risk of flooding in the event of uncontrolled release of water associated with the failure of a reservoir. The risk is **Negligible**.

Flood Risk Receptor Value

9.45 The importance of receptors in the context of flood risk relates to the NPPF vulnerability classification for land uses potentially affected by changes in flood risk as a result of the GB Onshore Scheme. Potential receptors can therefore be the future users of the GB Onshore Scheme itself, as well as users or occupiers of land outside of the Project Area that could be affected by changes to flood risk resulting from the GB Onshore Scheme. The receptor importance is therefore defined independently of the sources of flood risk.

9.46 The GB Onshore Scheme includes a converter station and substation which are classified as 'Essential Infrastructure' in accordance with the NPPF (Ref 9.1) and PPG (Ref 9.8). The GB

Onshore Scheme is therefore defined as of **Very High** importance, in accordance with Table 1. However, it should be noted that much of the Project Area will be open land and therefore the vulnerability should not be considered uniform throughout the whole area.

9.47 The FRA for the GB Onshore Scheme identifies that the GB Onshore Scheme has the potential to influence surface water flow paths across the site, and discharge to the network of watercourses to the west of the Project Area. The importance of these receptors is defined as **Medium** and **Low,** as detailed in Tables 9.3 and 9.4.

Future Baseline

9.48 This section considers changes to the baseline conditions, described above, which might occur during the time period over which the GB Onshore Scheme will be in place. It considers changes that might occur in the absence of the GB Onshore Scheme being constructed.

9.49 Climate change over the coming decades is anticipated to result in hotter drier summers, milder wetter winters, rising sea levels and more extreme weather events including heavy rainfall events. This change in climate is anticipated to increase the likelihood of flooding.

9.50 The selected policy for the Isle of Grain under the Thames Estuary 2100 Plan (Ref 9.29) is Policy P4, whereby it is planned to maintain and improve the level of flood defences around the Isle of Grain to keep up with the anticipated changes in tidal flood levels that arise from the impact of climate change. The risk of tidal flooding to the area is therefore anticipated to remain a residual risk, in the event of a failure or breach of these flood defences.

9.51 The risk of surface water flooding is likely to increase in the future as a result of more extreme rainfall events.

Potential Impacts

Introduction

9.52 The potential impacts of the proposed converter station, substation and Direct Current (DC) cable are very similar and affect the same receptors. To avoid duplication and ensure a thorough assessment, the potential impacts from each elements of the development have been assessed collectively. For each potential impact, the significance of the effects has been assessed, based on the importance of the receptor or attribute and the likely magnitude of the potential impacts, as described in the 'Approach to assessment' section of this Chapter. These impacts are assessed prior to the consideration of the mitigation measures presented in the 'Mitigation' section of this Chapter.

Construction Phase

9.53 The following potential impacts on water resources and flood risk during the construction phase have been identified, based on the assessment approach above:

- The proposed works include the installation of a cable beneath the natural embankment that forms the existing tidal flood defence line. The works may have the potential to increase the risk of tidal flooding.
- Processes during the construction phase may require significant volumes of water supply.
- Processes during the construction phase may generate significant volumes of wastewater.
- There is potential for machinery and construction works on the site to cause a disturbance of the ground leading to an increase in sediment runoff to surrounding surface water resources.
- Leakages and spillages from machinery during construction have the potential to result in pollutant pathways that may impact surrounding groundwater and surface water resources.
- Increased areas of hard standing across the site may alter surface water runoff rates and patterns to the Project Area and receiving Grain Marsh during the construction phase.
- Uncontrolled surface water runoff may lead to surface water flooding on the Project Area and surrounding area.
- There is a risk of flooding to the Project Area should significant amounts of groundwater be encountered during construction.
- The Project Area is partially located within an area that is at residual risk of tidal flooding; there is residual risk of tidal flooding to the GB Onshore Scheme.

Table 9.6 Potential impacts during construction

Potential impact during construction	Importance of receptors	Magnitude of impacts	Significance of potential effects
Increase in tidal flood risk as a result of works under the tidal embankment	Residential areas on fringe of All Hallows – High Project Area – Medium Grain Marsh – Low	Major adverse Major adverse Major adverse	Highly significant (Major) Significant (Major) Low significance (Moderate)
Increase in water demand	Kent Medway WRZ – High	Moderate adverse	Significant (Moderate)
Increase in wastewater generation	Southern Water network - Low	Moderate adverse	Insignificant (Minor)
Increased sediment runoff	Land drains - Low Watercourses - Medium	Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate)

Potential impact during construction	Importance of receptors	Magnitude of impacts	Significance of potential effects
Pollutants from leakages and spillages	Land drains - Low Watercourses – Medium Groundwater – Medium	Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate)
Change in surface water runoff rates and patterns	Land drains - Low Watercourses – Medium Project Area - Medium	Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate)
Surface water flooding	Land drains - Low Watercourses – Medium Project Area – Medium Scheme – Very High	Moderate adverse Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate) Highly significant (Major)
Groundwater flooding	Land drains - Low Watercourses – Medium Project Area – Medium Scheme – Very High	Negligible Negligible Minor adverse Minor adverse	Insignificant (Negligible) Insignificant (Negligible) Insignificant (Minor) Low significance (Moderate)
Scheme partially within an area at residual tidal flood risk	Scheme - Very High	Moderate adverse	Highly significant (Major)

Operational Phase

9.54 The following potential impacts on water resources and flood risk during the operational phase have been identified based on the assessment approach above:

- The operation of the GB Onshore Scheme will not require the use of significant volumes of water, nor will it generate significant volumes of wastewater on account of the limited staff required for operation, therefore the site is unlikely to have significant impacts on water supply and wastewater generation.
- Increased areas of hard standing and modifications to land drains within the Project Area may alter surface water runoff rates and patterns to the Project Area and surrounding area.
- Uncontrolled surface water runoff may lead to surface water flooding on the Project Area and surrounding area.
- The GB Onshore Scheme is partially located within an area that is at residual risk of tidal flooding.

Table 9.7 Potential impacts during operation

Potential impact during operation	Importance of receptors	Magnitude of impacts	Significance of potential effects
Increase in water demand	Kent Medway WRZ – High	Negligible	Insignificant (Minor)
Increase in wastewater generation	Southern Water network – Low	Negligible	Insignificant (Negligible)
Change in surface water runoff rates and patterns	Land drains - Low Watercourses – Medium	Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate)

Potential impact during operation	Importance of receptors	Magnitude of impacts	Significance of potential effects
	Project Area – Medium	Moderate adverse	Low significance (Moderate)
Surface water flooding	Land drains - Low	Moderate adverse	Insignificant (Minor)
	Watercourses – Medium	Moderate adverse	Low significance (Moderate)
	Project Area – Medium	Moderate adverse	Low significance (Moderate)
	Scheme – Very High	Moderate adverse	Highly significant (Major)
Scheme partially within an area at residual tidal flood risk	Scheme – Very High	Moderate adverse	Highly significant (Major)

Decommissioning and demolition

9.55 Potential effects on water resources and flood risk during decommissioning and demolition are expected to be the same as those identified during construction, and are identified as follows:

- Works to decommission the cable beneath the natural embankment that forms the existing tidal flood defence line. may have the potential to increase the risk of tidal flooding.
- Processes during the demolition phase may require significant volumes of water supply.
- Processes during the demolition phase may generate significant volumes of wastewater.
- There is potential for machinery and demolition works on the site to cause a disturbance of the ground leading to an increase in sediment runoff to surrounding surface water resources.
- Leakages and spillages from machinery during decommissioning and demolition have the potential to result in pollutant pathways that may impact surrounding groundwater and surface water resources.
- Increased areas of hard standing across the site may alter surface water runoff rates and patterns to the Project Area and receiving Grain Marsh during the construction phase.
- Uncontrolled surface water runoff may lead to surface water flooding on the Project Area and surrounding area.
- There is a risk of flooding to the Project Area should significant amounts of groundwater be encountered during demolition.
- The Project Area is partially located within an area that is at residual risk of tidal flooding; there is residual risk of tidal flooding during the demolition phase.

9.56 Table 9.6 identifies the significance of these potential effects.

Mitigation

Introduction

9.57 Through the adoption of best practice construction methods, operational management, and design of the GB Onshore Scheme, there are several measures that will reduce the risk and hence likelihood that some potential impacts on water resources or flood risk would occur. Mitigation measures for the proposed converter station, substation and DC cable have been assessed collectively.

9.58 For construction related impacts, these measures will be developed, detailed and implemented via a Construction and Environmental Management Plan (CEMP).

Construction Phase

Works Adjacent to Flood Defences

9.59 The installation of the cable beneath the coastal embankment, which forms the existing tidal flood defence line, will require a Flood Risk Activity Permit from the Environment Agency.

9.60 Modifications to the embankment along the coastline will be avoided by using horizontal directional drilling (HDD) construction methods (as opposed to trenching or cut and cover techniques) to drill underneath the defences. The depth of the defences and appropriate standoff distances will be agreed in consultation with the Environment Agency prior to works being undertaken.

Water Demand During Construction

9.61 Processes during the construction phase that may require significant volumes of water supply include supply for washing down and potable water for sanitary facilities for site staff. The most intensive use of water, for the mixing of concrete, will be done off-site where possible and therefore will not affect water supply to the Project Area.

9.62 Water supply to the site during construction phase will be provided from the existing Southern Water sources, via an application to use an existing water supply for building purposes.

Waste Water Generation During Construction

9.63 Wastewater generation on construction sites includes effluent from sanitary facilities provided on-site and from washing down and wheel wash facilities. It is expected that foul water generated at the Project Area will be drained via the existing combined sewers in the surrounding area, following treatment if required. If dewatering is required during excavations, then abstracted water may be discharged to the Southern Water network, following sediment removal.

Surface Water Management During Construction

9.64 As detailed in Appendix 9B, suitable construction phasing should be used to enable the SuDS features to be constructed at the beginning of the works. This would ensure that any rainfall events during construction of the substation and converter building would be intersected and attenuated by the SuDS before being discharged at a restricted rate into the agreed receiving waterbodies, in agreement with the North Kent Marshes IDB.

Sediment in Runoff During Construction

9.65 It is proposed that surface water quality monitoring of the receiving waterbodies should be undertaken throughout construction to ensure any discharges from the works are not adversely impacting these waterbodies.

9.66 Should any negative impacts be identified such as water pollution, site drainage pathways will be immediately reviewed.

9.67 The following mitigation measures will be put in place and embedded within the CEMP:

- Development of an Erosion and Sediment Control Plan prior to execution of the Proposed Scheme;
- Sufficient rumble pads will be provided at site access points to prevent tracking of sediments onto public roads;

- Sediment traps will be provided at downstream edges of site to treat runoff prior to it leaving site; and,
- Where possible, all runoff will be directed to the onsite sediment basin for treatment.

Leaks and Spillages of Contaminants During Construction

9.68 There is potential for hydraulic leaks from plant and machinery, as well as spills from chemical storages and sources such as concrete mixing to result in pollutant pathways to surrounding water resources.

9.69 In relation to leaks and spillages of contaminants, the following mitigation measures will be embedded within a CEMP to reduce the risk of leaks and spills:

- An emergency spillage action plan will be produced and included within the CEMP, which site staff will have read and understood, and will have been trained in its implementation on site;
- Any damage to the drainage network will be repaired as soon as practical;
- Any maintenance of plant and machinery will take place in a bunded impermeable area a minimum 20 m from any external drainage lines and the onsite waterbodies and those adjacent to the boundary;
- The majority of concrete used will be pre-mixed and delivered from an off-site source, thereby negating the need to mix concrete on-site and reducing the creation of alkaline wastewater. Any mixing and handling of wet concrete on-site will be undertaken in designated impermeable areas, away from any drainage channels or surface water; and,
- A designated impermeable area will be used for any washing down or equipment cleaning associated with concrete or cementing processes and wastewater will be discharged to the foul drainage system (with approval from Southern Water) or contained and removed by tanker to a suitable discharge location via a licensed waste operator.

Operational Phase

Water Demand and Wastewater Generation During Operation

9.70 Water requirements and wastewater generation during operation will be minimal; and will entail provision of sanitary facilities for a small team of onsite staff.

9.71 Should larger teams of site personnel be needed for periods of maintenance, temporary welfare facilities will be provided, and suitable arrangements made at that time.

Surface Water Management During Operation

9.72 The proposed Drainage Strategy for the site is described in Appendix 9B and summarised below.

9.73 During operation, the GB Onshore Scheme will generate several storm and wastewater sources including process waste, foul waste from sanitary facilities and surface water runoff from buildings, car parks and landscaped areas. Process and foul water management will be addressed as information about the sources of these flows becomes available and the design progresses.

9.74 All surface water will be collected by rainwater pipes, gullies and linear drainage channels from all areas of hardstanding including building roofs, carparks and access roads. As defined in Appendix 9B, runoff will be attenuated onsite by the proposed SuDS features, prior to being conveyed via swales to discharge at greenfield runoff rates to the defined receiving waterbodies, in agreement with the North Kent Marshes IDB.

9.75 The total volume of storage required, to attenuate surface water runoff arising from the 100 year plus 20% climate change storm event, is approximately 6000 m^3.

Surface Water Quality During Operation

9.76 Silt traps will be incorporated into the surface water pipe networks to intersect silt and sediment before runoff is attenuated within the SuDS features. Silt traps will require periodic maintenance to ensure they remain operational throughout the design life of the GB Onshore Scheme.

9.77 There is a residual risk of silts and sediments entering the SuDS features. However, the nature of the proposed SuDS will provide a treatment train and will trap potentially contaminated sediments within the vegetation, thus preventing the conveyance of silts and sediments into the receiving waterbodies.

9.78 Oil separator units will be installed upstream of all attenuation systems on all drainage serving roads and yard areas, where potential hydrocarbon contamination could occur.

Tidal Flood Risk - Finished Floor Levels

9.79 The proposed converter station and substation are located in the southwestern part of the Project Area, located away from the settlement of Grain and towards the existing industrial developments in the vicinity.

9.80 Correspondence with the Environment Agency included in the FRA Report has confirmed that proposed infrastructure associated with the convertor station and substation should be set above the flood level for the defended 0.5% AEP flood event, including climate change over the lifetime of the development. In this location, this corresponds to a flood level of 3.1 m AOD.

9.81 The platform for the converter station and substation will be set above this level including a suitable freeboard.

Decommissioning and Demolition Phase

9.82 The potential effects during the decommissioning and demolition phase are very similar to those identified during the construction phase. The same mitigation measures will therefore be applied during the decommissioning and demolition phase.

Residual Impacts

Introduction

9.83 The following sections identify the residual effects of the Project during the construction and operational phases, following the implementation of the mitigation described previously.

Construction Phase

Water Demand During Construction

9.84 Water demand for construction processes may represent a short-term, temporary increase in supply volumes to the site. This is assessed as having potentially an adverse, low magnitude impact on Southern Water's available water resources due to the overall demand from this supply being minimal with respect to all supply within the WRZ. On this basis and the designation of the Kent Medway WRZ as being of High importance, the impact would be localised, short-term and would therefore result in a minor adverse effect. This effect is considered not significant.

Waste Water Generation During Construction

9.85 The construction activities may result in an increase in the volumes of wastewater generated. An increase in wastewater volumes generated can increase pressure on the capacity of the Wastewater Treatment Works. It can also lead to a potential increase in the volume of water spilled into the watercourses, via Combined Sewer Overflows (CSOs) in the Southern Water network.

9.86 The rate at which the Project Area can discharge to the Southern Water sewer network is restricted by the size of the existing sewer connections (for which automatic connection is accepted). New connections would, however, be subject to an agreement, prior to construction under the Water Industry Act. If no additional connections to the sewer network are obtained, then the maximum discharge into the sewer network will not exceed the existing situation. If Southern Water determine that there is not capacity within the local sewer network or existing connections, it will be necessary to upgrade the network prior to any works taking place. As a result, any impact on flood risk (via CSO discharges) will therefore be very low. Due to the Thames Estuary having High importance and the impact magnitude on the flood risk being allocated low, the overall effect for wastewater generation throughout construction would be minor. This effect is considered not significant.

9.87 Due to the dilution provided within the sewer network and the Thames Estuary itself, it is considered that there would be a very low impact on the water quality, water supply or fisheries via CSO discharges and the Thames Estuary being allocated a High importance, the overall effect would be minor. This effect is considered not significant.

Residual Tidal Flood Risk – Flood Warning and Response During Construction

9.88 The Environment Agency issue flood warnings to alert to the potential risk of flooding during tidal surge conditions. Those managing the construction phase will subscribe to the Environment Agency's Flood Warning Service.

9.89 A Flood Warning and Response Plan should be prepared detailing the planned response in the event of receiving a flood warning, and in the event of a breach or overtopping of the flood defences. This is likely to be a part of a health and safety planning prepared for the construction phase.

9.90 Access for site personnel to the proposed converter station will be via the B2001/ Grain Road via the development of a new access point and internal road; this will be the primary point of access during both the construction and operation of the GB Onshore Scheme. Temporary access for construction of the proposed DC cable route will also be taken from West Lane further to the north which provides access to Rose Court Farm and Peat Way.

9.91 Both of these routes enable safe dry access away from the site to an area in Flood Zone 1 low probability of tidal flooding.

Operational Phase

Residual Tidal Flood Risk - Flood Warning and Response

9.92 The operating company for the GB Onshore Scheme will subscribe to the Environment Agency's Flood Warning Service.

9.93 A Flood Warning and Response Plan will be prepared detailing the planned response in the event of receiving a flood warning, and in the event of a breach or overtopping of the flood defences. This is likely to be a part of a wider business continuity and health and safety planning for the operation of the GB Onshore Scheme.

9.94 As during the construction phase, access to the proposed converter station will be via the B2001/ Grain Road from the development of a new access point and internal road. This route provides safe dry access to an area in Flood Zone 1 low probability of tidal flooding.

Residual Tidal Flood Risk - Safe Refuge

9.95 During ordinary operation the proposed converter station will be staffed by a small team on site with a minimum of two operators present. During normal operation there will be approximately six personnel on site, divided between three shifts over a 24-hour period. During regular maintenance and/ or repairs the number of personnel present on site would increase with the number of staff proportionate to the nature of the maintenance or repair works being undertaken.

9.96 The residual risk is the risk that remains after flood defence measures have been taken into consideration. In order to manage this residual risk a place of safe refuge should be provided on the site.

9.97 The safe refuge should be set above the flood level for the undefended 0.5% AEP flood event including an allowance for climate change over the lifetime of the development. Reference to the Environment Agency's Kent Coastal Modelling Study (Ref 9.4) sets this level at 5.2 m AOD.

Table 9.8 Summary of Potential Effects and Incorporated Mitigation

Potential impact	Importance of receptors	Magnitude of impacts	Significance of potential effects	Mitigation	Residual effect
CONSTRUCTION					
Reduced integrity of tidal flood defences and increase in tidal flood risk	Residential areas on fringe of All Hallows – High Project Area – Medium Grain Marsh – Low	Major adverse Major adverse Major adverse	Highly significant (Major) Significant (Major) Low significance (Moderate)	Flood Risk Activity Permit to ensure suitable construction approach	Insignificant (Minor)
Increase in water demand	Kent Medway WRZ – High	Moderate adverse	Significant (Moderate)	Managed through the CEMP	Insignificant (Minor)
Increase in wastewater generation	Southern Water network - Low	Moderate adverse	Insignificant (Minor)	Managed through the CEMP	Insignificant (Minor)
Increased sediment runoff	Land drains - Low Watercourses - Medium	Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate)	Managed through the CEMP	Insignificant (Minor)
Pollutants from leakages and spillages	Land drains - Low	Moderate adverse	Insignificant (Minor)	Managed through the CEMP	Insignificant (Minor)

Potential impact	Importance of receptors	Magnitude of impacts	Significance of potential effects	Mitigation	Residual effect
	Watercourses – Medium Groundwater – Medium	Moderate adverse Moderate adverse	Low significance (Moderate) Low significance (Moderate)		
Change in surface water runoff rates and patterns	Land drains - Low Watercourses – Medium Project Area - Medium	Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate)	Managed through the CEMP	Insignificant (Minor)
Surface water flooding	Land drains - Low Watercourses – Medium Project Area – Medium Scheme – Very High	Moderate adverse Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate) Highly significant (Major)	Managed through the CEMP	Insignificant (Minor)
Groundwater flooding	Land drains - Low Watercourses – Medium Project Area – Medium Scheme – Very High	Negligible Negligible Minor adverse Minor adverse	Insignificant (Negligible) Insignificant (Negligible) Insignificant (Minor) Low significance (Moderate)	Managed through the CEMP	Insignificant (Minor)
Scheme partially within an area at residual tidal flood risk	Scheme - Very High	Moderate adverse	Highly significant (Major)	Flood Warning and Evacuation Plan. Safe access to area of low flood risk available.	Insignificant (Minor)
OPERATION					
Increase in water demand	Kent Medway WRZ – High	Negligible	Insignificant (Minor)	NA	Insignificant (Minor)
Increase in wastewater generation	Southern Water network – Low	Negligible	Insignificant (Negligible)	NA	Insignificant (Negligible)
Change in surface water runoff rates and patterns	Land drains - Low Watercourses – Medium	Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate)	Drainage strategy demonstrates suitable surface water	Insignificant (Minor)

Potential impact	Importance of receptors	Magnitude of impacts	Significance of potential effects	Mitigation	Residual effect
	Project Area – Medium	Moderate adverse	Low significance (Moderate)	management approach	
Surface water flooding	Land drains - Low Watercourses – Medium Project Area – Medium Scheme – Very High	Moderate adverse Moderate adverse Moderate adverse Moderate adverse	Insignificant (Minor) Low significance (Moderate) Low significance (Moderate) Highly significant (Major)	Drainage strategy demonstrates suitable surface water management approach	Insignificant (Minor)
Scheme partially within an area at residual tidal flood risk	Scheme – Very High	Moderate adverse	Highly significant (Major)	FRA demonstrates suitable measures to mitigate residual tidal flood risk, including requirements for finished flood levels for converter station; Flood Warning and Evacuation Plan; safe access to area of low flood risk; place of safe refuge.	Insignificant (Minor)

Decommissioning and Demolition Phase

9.98 The residual effects during the decommissioning and demolition phase are the same as those identified during the construction phase.

Cumulative Effects

9.99 As described in Chapter 12, the following schemes have been considered in the assessment of inter-project cumulative effects with respect to flooding and water resources:

- NGET OHL Works – facilitating the connection of the GB Onshore Scheme to the National Electricity Transmission System.
- GB Offshore Scheme – installation of the subsea cable beyond MLW.
- Six residential properties; Port Victoria Road, Isle of Grain, Rochester, ME3 0EN.
- Outline planning application for the development of up to 464,685 m2 of built employment floorspace and up to 245 m2 of floorspace for a business park management centre; Grain Road Isle Of Grain Rochester Kent ME3 0AE.
- Construction and operation of a cementitious grinding facility and associated development; Grain Road, Isle of Grain, ME3 0DW.
- Cement Plant; Thamesport Isle of Grain Rochester Medway ME3 0AP.
- Proposed development of a new cement plant at London Thamesport.

Cumulative effects during demolition and construction

9.100 Cumulative effects to water resources during demolition and construction processes are associated with the generation of sediments and the release into the sewer drainage network; spillage and leakage of oils and fuels; leakage of wet concrete; cement and disturbance of contaminated land; suspended sediments; disturbance to groundwater and foul drainage.

9.101 Measures exist to manage and control these effects and reduce the magnitude and significance of effects to a minimum as outlined within this chapter. These measures should also be adopted at other local construction sites as a matter of standard practice. Therefore, as a result of these control measures, the cumulative effect is **negligible**.

9.102 Cumulative effects on flood risk during demolition and construction processes are associated with alterations to the ground surface and drainage patterns, and alterations to the flood defence infrastructure. The NGET OHL Works may include the development of a new tower located directly north of the proposed substation location. This area of potential additional hardstanding has been accounted for within the FRA and the drainage strategy and storage area volumes include these works. The remaining schemes identified above do not intersect the same surface water flow paths as the GB Onshore Scheme. Therefore, there are not considered to be any cumulative effects with respect to flood risk during construction and demolition.

Cumulative effects during operation

9.103 As described above, the schemes identified above are not located within proximity to the GB Onshore Scheme. There are not considered to be any cumulative effects with respect to flood risk during operation.

Summary of Assessment

9.104 No significant effects to water resources and flood risk are expected during the construction or operation of the Scheme assuming mitigation measures outlined in Section 9.6 are undertaken in accordance with the FRA and a suitable CEMP and Flood Warning and Evacuation Plan, secured by a planning condition.

9.105 There will be no significant residual effects during construction assuming mitigation measures outlined in Section 9.6 are undertaken in accordance with the CEMP, secured by a planning condition.

9.106 Whilst the residual tidal flood risk remains, the flood warning and evacuation plan, as well as the provision of safe access and a place of safe refuge, secured by planning conditions, will reduce the impact magnitude as no long- term damage or risk to life would result.

9.107 The cumulative assessment concludes that there would be no significant cumulative effects with respect to water resources and flood risk.

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Ref 9.11 HMSO (1991); Water Resources Act 1991

Ref 9.12 HMSO (2003); Water Act 2003

Ref 9.13 HMSO (2014); Water Act 2014

Ref 9.14 HMSO (1995); Environment Act 1995

Ref 9.15 HMSO (1990); Environmental Protection Act 1990

Ref 9.16 HMSO (1991); Land Drainage Act 1991

Ref 9.17 HMSO (2010); Flood and Water Management Act 2010

Ref 9.18 HMSO (2003); 'The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003'

Ref 9.19 HMSO (1999); The Anti-Pollution Works Regulations

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Ref 9.22 European Commission (2006); Directive 2006/118/EC, on the protection of groundwater against pollution and deterioration, PE-CONS 3639/1/100 Rev 1 Luxembourg

Ref 9.23 HMSO (2009); 'The Environmental Damage Regulations'

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Ref 9.28 Medway Council, Report on Development Options Consultation 2017

Ref 9.29 Environment Agency, 2008, Thames Estuary 2100 Plan

Ref 9.30 Environment Agency; ‘Pollution Prevention Guidelines 01: Understanding Your Environmental Responsibilities – Good Environmental Practices’

Ref 9.31 Environment Agency; ‘Pollution Prevention Guidelines 02: Above Ground Oil Storage Tanks’.

Ref 9.32 Environment Agency; ‘Pollution Prevention Guidance 03: Use and Design on Oil Separators in Surface Water Drainage Systems’

Ref 9.33 Environment Agency; ‘Pollution Prevention Guidance 05: Works and maintenance in or near water’

Ref 9.34 Environment Agency; ‘Pollution Prevention Guidelines 06: Working at construction or demolition Sites’

Ref 9.35 Environment Agency; ‘Pollution Prevention Guidelines 07: Refuelling Activities

Ref 9.36 Environment Agency; ‘Pollution Prevention Guidelines 21: Pollution Incident Response Planning’

Ref 9.37 CIRIA (2001); Control of water pollution from construction Sites: Guidance for consultants and constructors. C532

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/waterstressed-classification-2013.pdf

10. Transport & Access

Introduction

10.1 This chapter has been prepared by AECOM. It reports the results of baseline studies and the assessment of the potential impacts of the GB Onshore Scheme as described in Chapter 3.

10.2 Traffic and transport impacts are interrelated with Noise and Vibration impacts, and therefore reference should also be made to Chapter 07 Noise & Vibration.

Chapter Structure

10.3 The remainder of this chapter is structured as follows:

- **Approach to Assessment**. Sets out the discipline specific approach to the assessment in accordance with relevant guidance;
- **Basis of Assessment**. Sets out the key assumptions which have been made in undertaking the impact assessment;
- **Planning Policy & Applicable Legislation**. Provides a summary of the key points of planning policy and legislation which have been considered as part of the assessment;
- **Baseline Conditions**. Reports the results of desktop and field studies undertaken to establish existing conditions;
- **Potential Impacts**. Identifies the potential impacts on traffic and transport which may occur as result of construction and operation;
- **Mitigation**. Identifies the mitigation which is proposed including measures which are incorporated into the siting, design and construction of the underground cable;
- **Residual Impacts**. Reports the residual effects which remain taking into account proposed mitigation and identifies whether these are significant or not;
- **Cumulative Effects**. Identifies the inter-project cumulative effects which may occur in combination with other developments; and
- **Summary of Assessment**. Provides a summary of the key findings of the impact assessment.

Approach to Assessment

10.4 This section describes the approach to the identification and assessment of traffic and transport impacts resulting from the construction and operation of the GB Onshore Scheme.

Consultation

10.5 Whilst no formal scoping opinion was received for the proposed development, Medway Council Highways have been consulted when developing the methodology and deliberating data collection requirements, as a result of the data collected and assumptions made have been discussed with Medway and officers have been kept informed throughout the process. Advice regarding baseline traffic surveys, collision data analysis and abnormal load routing has been provided by Medway Council and taken on board during the production of this chapter of the Environmental Statement.

Scope of Assessment

10.6 The geographical boundary of the assessment has been determined by the estimated percentage increases in traffic on the local road network as a result of the construction phase of the proposed development. Traffic volumes during the construction phase rather than the operational phase has been chosen because the traffic levels associated with the operation and maintenance of the site is anticipated to be low.

10.7 Potential effects on human health are considered as far as the potential for the proposed GB Onshore Scheme to result in an increased frequency of road traffic accidents. Effects to human health beyond this are not considered applicable to the assessment and have been scoped out.

Assessment Guidance

10.8 The methodology for assessing the impact of development-generated traffic has been based on that outlined in Institute of Environmental Assessment's (IEA) 'Guidelines for the Environmental Assessment of Road Traffic' (January 1993). IEA is now known as the Institute for Environmental Management and Assessment. The IEA guidelines state that a link on the highway network should be included within the study if one of the following criteria is met:

- Traffic flows increase by more than 30% (or HGV flows increase by more than 30%);
- Traffic flows in sensitive areas increase by more than 10%.

Assessment Criteria

10.9 The significance of effect is determined by both the sensitivity of the receptors on the link affected and the magnitude of the impact exerted on it.

Receptor Sensitivity

10.10 Table 10.1 lists examples of receptors and their sensitivity based on guidance provided within National Policy Statements (NPS); National Planning Policy Framework (NPPF); and Department for Transport (DfT) Circular 02/13, The Strategic Road Network and The Delivery of Sustainable Development, 2013.

Table 10.1: Receptor Sensitivity Criteria (Transport & Access)

Sensitivity	Description
Very High	Schools, colleges, playgrounds, hospitals, retirement homes.
High	Heavily congested junctions, residential properties very close to carriageway.
Medium	Congested junctions, shops/businesses, areas of heavy pedestrian / cycling use, areas of ecological/nature conservation, residential properties close to carriageway.

Sensitivity	Description
Low	Tourist/visitor sites, places of worship, residential areas set back from the highway with screening.
Negligible	Those people and places located away from the affected highway link.

Magnitude of Impact

10.11 Table 10.2 provides general criteria for defining the magnitude of impact. Magnitude is determined by the scale, duration frequency and reversibility of the effect.

Table 10.2: Magnitude of Impact Criteria (Transport & Access)

Magnitude	Description	Illustrative Criteria
High	HGV Construction Traffic	High number of construction vehicles using roads over a protracted period of time. More than a 40% increase for more than 6 months.
	Pedestrians/Cyclists	Limited or no facilities for pedestrians and cyclists with limited crossing facilities and low-quality linkages to the local facilities.
	Severance	Increase in total traffic flows of 90% and above (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	High increase in traffic at known collision locations.:
Medium	HGV Construction Traffic	Moderate number of construction vehicles using roads over a protracted time period. • 16-39% increase for more than 6 months; or • More than 40% increase for 3-6 months.
	Pedestrians/Cyclists	Few facilities for pedestrians and cyclists with limited crossing facilities and linkages to the local facilities.
	Severance	Increase in total traffic flows of 60-89% (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	Moderate increase in traffic at known collision locations.
Low	HGV Construction Traffic	Small number of construction vehicles using roads over a short period of time. • 6-15% increase for more than 6 months; • 31-39% for 3-6 months; or • >40% increase for less than 3 months.
	Pedestrians/Cyclists	Facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities.
	Severance	Increase in total traffic flows of 30-59% (or increase in HGV flows over 10% based on the sensitivity of the receptors).
	Road Safety	Minor increase in traffic at known collision locations.
Negligible	HGV Construction Traffic	Occasional construction vehicles using roads over a short period of time. • Less than 5% Increase for more than 6 months; or • Between 6-30% increase for 3- 6 months; or • Between 31-40% for less than 3 months.
	Pedestrians/Cyclists	Dedicated facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities.
	Severance	Increase in total traffic flows of 29% or under (or increase in HGV flows under 10%).
	Road Safety	Negligible increase in traffic at known collision locations.

Significance of Effects

10.12 The significance of effects are evaluated using the table below. The IEA guidelines require that significant effects are identified. An effect is considered significant when they are predicted to be either ‘major’ or ‘moderate’ within the matrix.

Table 10.3: Significance of Effects Matrix

Magnitude of Impact	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Assessment Method

10.13 Reference should be made to Chapter 03 Proposed GB Onshore Scheme of the Environmental Statement, which provides a full description of the construction and operation of the GB Onshore Scheme.

10.14 The remainder of this section, which forms the basis of the assessment is structured as follows:

- Construction traffic volumes;
- Construction programme;
- Construction traffic distribution and assessment;
- Construction assumptions; and
- Decommissioning and demolition traffic activity.

Construction Traffic Volumes

10.15 Information regarding the likely number and types of vehicular trips that will be necessary to construct the proposed converter station, proposed DC cable route and permanent access road has been primarily based on numbers derived and benchmarked against comparable projects in the UK, namely the Interconnexion France-Angleterre 2 (IFA2) electricity interconnector project.

10.16 Based on the fact the proposed converter station and permanent access road will be raised, in parts, above the existing ground level, the related additional fill volumes required have been converted into additional vehicles required. This provides a robust indication of the number of vehicle movements that would be expected.

10.17 The traffic volumes for the proposed substation have been based on the similar Littlebrook 400 kV Gas Insulated Switchgear (GIS) Substation assessment.

10.18 This assessment provides an estimate of the number of vehicular movements that will occur during the construction period. The construction traffic has been allocated across the duration of the construction period. The construction traffic volumes provided are based on realistic worst-case estimates, as the finalised numbers are subject to the appointment of a Contractor.

10.19 Construction trips generated by the proposed converter station have been split into worker trips (assumed as 1 car per worker, which is considered as a worst-case scenario as some would be expected to travel using other modes such as car share, public transport etc.) and HGV trips (assuming 1 HGV = 16 tonne Max Articulated vehicle). Some of the generated trips will be larger vehicles such as cranes and the delivery of transformers to site, however these will be infrequent events.

10.20 The breakdown of total two-way vehicle movements expected as part of the construction phase, along with those expected in the peak month is summarised in Table 10.4. Construction traffic was provided as a monthly profile, which has then been converted into an average weekly profile by dividing by four (average of four weeks per month). An average daily total has then been assumed by dividing the weekly total by six (assuming a six-day working week, Monday to Saturday).

Table 10.4: Converter Station Estimated Construction Traffic (Two-Way Movements)

Vehicle Type	Construction Phase Total Number	Peak Month – Monthly Total	Peak Month – Daily Total
Cars	31,140	216	39
Max. Articulated HGV	25,057	1,220	55
Large Equipment Vehicle	147	33	1

Vehicle Type	Construction Phase Total Number	Peak Month – Monthly Total	Peak Month – Daily Total
Transformer Vehicle	10	4	Not accounted for
25ft Crane	2	1	Not accounted for
100ft Crane	2	1	Not accounted for
Mobile Platform	2	1	Not accounted for
Total	**56,360**	**1,476**	**95**

10.21 Whilst it is accepted that there will be movements of larger construction vehicles in addition to the HGVs, such as cranes and transformer vehicles, the number of daily movements for vehicles of those types is expected to be small, therefore has not been considered as part of the assessment.

10.22 Some works may be required to be carried out overnight where there is an engineering need, such as the pouring of concrete which must be continuous or jointing work for the DC cable which must maintain a stable environment. These activities would be limited and would result in only a small number of associated vehicle movements. As this number would be low, further assessment of traffic outside of the current daytime periods was not considered necessary.

10.23 For robustness, it is assumed that construction of the proposed substation would take place at the same time as the proposed converter station.

Table 10.5: Substation Estimated Construction Traffic (Two-Way Movements)

Phase	Period	Peak LVs/Day	Peak HGVs/day
	Peak Period		
Civil Engineering	2021-2022	40	40
Electrical	2022-2023	40	16
	Average Period		
Civil Engineering	2021-2022	40	8
Electrical	2022-2023	40	3

Table 10.6: Combined Estimated Construction Traffic (Two-Way Movements) (Peak)

Phase	Peak Cars & LVs/day	Peak HGVs/day	Total
Converter	39	55	94
Substation	40	40	80
Total	**79**	**95**	**174**

Construction Programme

10.24 Construction of the proposed converter station and substation is planned to begin in 2021 and is anticipated to last approximately three years.

10.25 Construction works across this period will include the below activities, in descending order:

- Preparatory works including access road construction and site establishment;
- Civil construction works including earthworks, foundations and erection of buildings;
- Mechanical and electrical works including installation of AC and DC cables;

- Testing, commissioning and site reinstatement including landscape planting.

10.26 A summary of the various elements of the construction phase is provided in Table 10.7.

Table 10.7: Estimated Construction Programme

Construction Phase Element	Start Date	Completion Date	Construction Duration
Proposed Permanent Access Road	2021	2021	4 months
Proposed Converter Station Site & DC Underground Cable Route	2021	2023	36 months
Proposed Substation	2021	2023	36 months

10.27 Whilst traffic would be expected throughout the construction period, only the peak month for traffic has been assessed. This ensures that a robust realistic worst-case traffic scenario is considered.

10.28 The daily trips to and from the Project Area have been considered in terms of their overall percentage impact on the roads within the Zone of Influence (ZoI).

Construction Traffic Distribution Methodology

10.29 The construction traffic detailed in the above sections has been distributed onto the local road network within the ZoI to facilitate the assessment work.

10.30 Traffic distribution diagrams have been produced to aid the process of assignment onto the local road network within the ZoI.

10.31 In order to calculate traffic distribution of workers travelling to and from the Project Area each day a simple gravity model has been developed.

10.32 It is currently unknown where workers or construction materials may originate, therefore following discussions with officers at Medway Council it was concluded that in order to predict the distribution of traffic origin has been based on the approximate populations of large settlements (>6,000 people) within a 60 minute drive time of the Project Area.

10.33 For those settlements towards the maximum journey time of 60 minutes, a weighting of 0.7 has been applied to reflect the additional distance needed to travel, hence the reduced likelihood of people or goods travelling from that area.

10.34 Table 10.8 indicates the distribution based on each settlement identified.

Table 10.8: Worker Location Distribution

Settlement	Population	Distance Weighting	Weighted Population	Distribution %
Hoo	8,945	1	8,945	1.1%
Gillingham	104,157	1	104,157	12.3%
Chatham	76,792	1	76,792	9.1%
Rochester	62,982	1	62,982	7.4%
Snodland	10,211	1	10,211	1.2%
Gravesend	74,000	1	74,000	8.7%
Aylesford	10,660	1	10,660	1.3%

Settlement	Population	Distance Weighting	Weighted Population	Distribution %
Swanscombe	6,300	1	6,300	0.7%
Dartford	97,365	0.7	68,156	8.0%
Bexley	246,100	0.7	172,270	20.3%
Sittingbourne	62,500	0.7	43,750	5.2%
Maidstone	113,137	0.7	79,196	9.3%
Grays	36,601	0.7	25,621	3.0%
Faversham	19,316	0.7	13,521	1.6%
Cantebury	55,240	0.7	38,668	4.6%
Ashford	74,204	0.7	51,943	6.1%
Total	**1,058,510**	**N/A**	**847,171**	**100%**

10.35 The above distribution percentages were then applied to the relevant road links within the ZoI in order to carry out the impact assessment. The assessment and identification of specific links was identified and agreed during scoping discussions with the Local Highway Agency (LHA) and identifies all the current traffic data available to this assessment. The links represent the local and strategic network providing vehicular access to the site for Construction, operational and maintenance activity. This is summarised in Table 10.9.

Table 10.9: Worker Distribution Percentage by Road Link

Site No.	ATC No. / DfT Count Point.	Road Link	Distribution %
ATC 1	ATC 1	B2001 East of Access	0%
ATC 2	ATC 2	A228 Grain Rd at Stoke	100.0%
ATC 3	ATC 3	B2001 West of Access	100.0%
DfT 1	56776	A228 Grain Road	100.0%
DfT 2	56827	A228 Four Elms Hill Beacon Hill	99.0%
DfT 3	70385	A289 Wainscott Primary School	16.8%
DfT 4	56816	A228 Frindsbury Road	4.9%
DfT 5	70384	A2 Chatham Docks	16.8%
DfT 6	70386	A2 opposite Featherby Rd	16.8%
DfT 7	70381	A289 between A226 and B2000	39.3%
DfT 8	56415	A228 Gun Lane	0.0%
DfT 9	6099	Rochester Bridge	15.9%
DfT 10	56008	M2 btwn J1 & J2	22.0%
DfT 11	6010	M2 btwn J2 & J3	22.0%
DfT 12	73645	M2 btwn J4 & J5	11.8%
DfT 13	78142	A287 btwn A2 & M2	0.0%
DfT 14	36100	A2 w of J1 of M2	39.3%
DfT 15	16092	A2 btwn M25 & B255	30.2%
DfT16	38792	A227 Dartford Crossing	2.9%

Site No.	ATC No. / DfT Count Point.	Road Link	Distribution %
DfT 17	7824	M25 S of A2	0.0%
DfT 18	36099	A2 W of M25	19.6%

Construction Traffic Assessment

10.36 Construction traffic associated with the proposed GB Onshore Scheme has been distributed onto the local highway network to calculate the resultant percentage increase on each link within the ZoI.

10.37 The average daily construction traffic for the peak month generated by the proposed converter station has been subsequently added to the 2021 and 2023 Base two-way traffic flows, which represent the start and finish years of the construction period.

Construction Assumptions

10.38 A number of assumptions relating to traffic and transport have also been included as part of the assessment which formed part of the agreement of scope with the LHA. These include operational hours of construction activity for vehicles on the local and strategic network. These assumptions are described below.

- The period of 07:00-19:00, Monday to Saturday (6-day assessment period) has been assessed. Whilst the operation of the site may be less, in terms of hours, activity to and from the site will commence and end long after the site closes as it has been agreed that distribution will be within a 60-minute drive time from the site. Furthermore, in order to understand the peak activity associated with construction traffic over the network a much wider period of assessment has been undertaken encompassing a 12-hour day. Using 12-hour data is considered as 'best practice' as referred to in the Institute of Highways and Transportation guidance for Transport Assessments (1994);
- The impacts of construction traffic have been assessed using traffic count data collected during a neutral month, November 2018 over a 6-day period on Grain Road;
- For the impact on the wider SRN (Strategic Road Network) and other notable routes in the wider area, DfT AADT data from 2017 has been used;
- All baseline traffic data has been factored up to 2021 and 2023 levels using TEMPRO v7.2 software.

10.39 The A228/ B2001 Grain Road is the only road access to the Isle of Grain. Access to the proposed converter station will be via the B2001 Grain Road from the development of a new access point and internal road, this will be the primary point of access during construction and operation of the GB Onshore Scheme.

10.40 Temporary access for construction of the proposed DC cable route will also be taken from West Lane further to the north which provides access to Rose Court Farm and Peat Way which may also be used for access to the DC cable route and landfall location.

Design Mitigation

10.41 The permanent access road will provide access during the construction of the proposed development.

10.42 Highway improvements would also be included on the B2001 itself, with a right turn ghost island and acceleration/ deceleration lanes incorporated, designed in accordance with Design Manual for Road and Bridges (DMRB) (Ref 25-4) standards. These improvements will be subject to approval with the local Highway Authority and as such will form part of the planning conditions associated with these proposals.

Planning Policy & Applicable Legislation

10.43 The proposed development has been considered in the context of a number of national and local planning and transport guidelines and policies. The following are summarised in the following sections:

- The National Planning Policy Framework (NPPF);
- Medway Local Transport Plan 3 (2011-2026); and
- Emerging Medway Local Plan (2018-2035).

National Planning Policy Framework (NPPF)

10.44 The NPPF provides a framework for local communities and Authorities to development relevant local development plans and strategies. A revised version of the NPPF was released in July 2018.

10.45 The NPPF has two key themes:

- Providing a greater level of integration and simplification of the planning policies governing new development nationally;
- Contribute to the achievement of sustainable development from an economic, social and environmental perspective.

10.46 The NPPF is in favour of sustainable development, which should be reflected in local development plans and frameworks to ensure that sustainable development and the needs of an area are identified and subsequently approved without delay.

10.47 The NPPF is based on a range of core planning principles, which are aimed at supporting the focus on sustainable plan-led development.

10.48 Transport specific policies play a key role in supporting and achieving the core planning principles and are intrinsically linked to the objective of sustainable development. The NPPF specifically states that development should only be prevented or refused on transport grounds if there would be an unacceptable impact on highway safety or where the residual cumulative impacts of development are severe.

10.49 Paragraph 108 of the NPPF states that whilst assessing applications for development, it should be ensured that:

- appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;
- safe and suitable access to the Project Area can be achieved for all users; and
- any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.

10.50 In terms of parking, paragraph 106 states that maximum parking standards for residential and non-residential developments should only be set if there is a clear and compelling justification that they are necessary for managing the local road network.

10.51 The core planning principles above provide a framework to provide inclusive, accessible, well connected and sustainable development.

Medway Local Transport Plan 3 (LTP3 2011-2026)

10.52 This document is the long-term Transport Strategy that will help place-shape Medway for the 15-year period of the plan. The strategy will be delivered by short term Implementation Plans, which will set out a three-year rolling programme of actions. Medway's three-year Implementation Plans will link the plan priorities and transport objectives with available financial resources for delivery including the LTP funding allocation from government.

10.53 It is the overarching strategy for Medway, setting the ambitions for Medway with the key aim for Medway to have a thriving, diverse and sustainable economy matched by an appropriately skilled workforce supported by a Higher Education Centre of Excellence. Collaborative working has taken place in developing the Sustainable Community Strategy and LTP3.

10.54 The Thames Gateway Kent Business Plan sets out for Medway to focus on the evolution of a regional riverside city, with cultural, educational, tourism and hi-tech facilities. Grain on the Hoo Peninsula is identified as a national hub for port-related activities, energy production, environmental technology and a value added industry. The transport objectives developed for LTP3 need to address the development ambitions in the Thames Gateway Kent Business Plan.

10.55 The Medway's LTP3 will significantly contribute to the delivery of the strategy through the following transport objectives:

- **Transport objective 1** - Highway maintenance. To undertake enhanced maintenance of the highway network in the most sustainable way practical;
- **Transport objective 2** - Improving infrastructure capacity. To respond to regeneration by efficiently and safely managing and improving Medway's road network, including improving road freight movements through Medway;
- Medway Council will work with key strategic partners including Kent County Council and Network Rail to seek to:
  - Continue to improve the A228 to Grain;
  - Improve the Thamesport freight line, including Hoo junction;
  - Improve the efficiency of road-based freight movements through Medway, with HGV traffic being directed away from unsuitable roads;
  - Ensure major freight traffic generating developments provide access to the rail network for freight movements;
  - Encourage freight movements to use rail and river transport;
  - Monitor growth in freight movements originating from International Gateways throughout Kent and work sub-regionally to mitigate negative consequences; and
  - Investigate the provision of faster and more reliable highway linkages from business, storage and distribution sites to the strategic highway network supporting wider connectivity.
- **Transport objective 3** - Improving public transport. Principle of objective: To respond to the regeneration of Medway by encouraging travel by public transport including improving the quality, reliability, punctuality and efficiency of services;
- **Transport objective 4** – Encouraging active travel and improving health. To contribute to improving health by promoting and developing transport corridors that encourage personal movement and by improving air quality;
- **Transport objective 5** - Improving travel safety. To reduce casualties on Medway's roads and to encourage changes to travel habits by the implementation of Safer Routes to School projects.

Emerging Medway Local Plan Pre-Consultation Draft (2018-2035)

10.56 Medway Council is preparing a new Local Plan to provide direction for future growth, and growth for all. A Development Strategy technical report has been prepared for the new Local Plan for Medway along with our Medway 2035 document. The report set out the ambitions for the plan, options for how Medway could grow and draft policies for managing development.

10.57 The transport polices within the emerging Local Plan have been prepared in accordance with national planning policy and the Medway policy framework, including the Local Transport Plan (2011-2026). Relevant sections to this application are as follows:

Policy T1: Promoting Sustainable Transport

- Support the Medway Local Transport Plan (2011-26) and subsequent iterations during the plan period, along with the associated three-year Implementation Plans and strategies.
- Ensure development is located and designed to enable sustainable transport.
- Mitigate the impacts of new development according to Transport Assessments and Transport Statements, or refuse development where its residual cumulative impacts are severe.
- Require a Travel Plan for development which will generate significant amounts of movement.
- Plan for strategic road network and rail improvements.
- Improve public transport provision and the walking and cycling network.
- Develop an integrated transport strategy for Medway to deliver sustainable growth.
- Identify the need for and if required define the location for park and ride facilities.
- Engage with the relevant authorities to address the impacts of the proposed Lower Thames Crossing.
- Undertake any necessary revisions to the adopted Parking Standards.
- Improve air quality as a result of vehicular emissions.

Policy T11: Cycle parking and storage

- Development proposals will be expected to comply with the cycle parking standards in accordance with the council's adopted Parking Standards.
- Long term cycle parking facilities for residents, visitors and/ or employees of the development must be conveniently located; safe to use; secure; weatherproof; and be well integrated into the building and/ or layout of the GB Onshore Scheme.
- Short term cycle parking facilities should be conveniently located in relation to the public realm, provide effective security for cycles and be safe to use.

Policy T12: Managing the transport impact of development Transport Assessments

- The council expects proposals that will generate a significant amount of movement to be supported by a Transport Assessment. Applicants are encouraged to refer to the adopted Guidance Note for Transport Assessments. Travel Plans Travel Plans will also be required for developments above threshold sizes, specified by the council.

Other Guidance Documents

10.58 In addition to the above policies and documents, the following guidance documents have been taken into account in the production of the chapter. These have provided guidance for the methodology and design guidelines on which the permanent access road designs have been based.

- Travel Plans, Transport Assessments and Statements – Planning Practice Guidance
- (Department for Communities and Local Government, March 2014);
- Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic' – January 1993;
- Design Manual for Road and Bridges (DMRB); and
- DMRB Volume 11, Section 2, Part 5 – HA 205/08 Assessment and Management of Environmental Effects.

Baseline Conditions

10.59 Access to the proposed converter station and substation will be via the B2001 Grain Road. An existing unnamed road runs west/ northwest from Grain Road along the southern boundary of the site, which is the preferred point of access during construction and operation of the GB Onshore Scheme.

10.60 There are also access points from Grain Road to Perry's Farm through part of the Project Area, as well as from West Lane further to the north which provides access to Rose Court Farm and Peat Way which may also be used for temporary and/ or permanent access.

10.61 Prediction of construction effects has focused on activities that could directly and indirectly impact on receptors within the defined study area. The ZoI includes those roads which may be utilised during construction, and upon which there is the potential for a significant impact.

Surrounding Highway Network (ZoI)

10.62 The southern boundary lies adjacent to the B2001 Grain Road. The B2001 heads west, continuing into the A228 and is the only route along the along the Hoo Peninsula to the Isle of Grain, linking the site with Rochester, Chatham Docks and the A2/ M2 for onwards destinations. The following roads on the surrounding highway network will be described in this subsection:

- The B2001 Grain Road/ High Street;
- The A228;
- Chapel Road;
- Power Station Road;
- The A289; and
- The M2/ A2.

The B2001 Grain Road / High Street

10.63 The B2001 is a 3.5 km stretch of road that extends west from the eastern shore of the Hoo Peninsula, through the village of Grain and past the proposed development site before ending west of London Thamesport where the A228 begins. The B2001 is known as High Street through Grain village and is subject to a 30 mph speed limit. Through the village the road is mostly fronted by residential properties which have direct vehicular access via private driveways. There is a convenience store and post office on the High Street with on-street parking. There are bollards along the footpath of the southern boundary to prevent vehicles being parked on both sides of the carriageway that would otherwise block traffic.

10.64 The B2001 High Street, B2001 Grain Road and Chapel Road form a T-junction west of Grain. Heading west, Grain Road leaves the village as a single-carriageway with a speed limit of 40 mph. Power Station Road connects with Grain Road before the access to Perry's Farm (application site). Continuing west, Grain Road passes the access to London Thamesport before reaching the A228.

The A228

10.65 The A228 takes over from the B2001, heading west passing Strood and connecting with Junction 2 of the M2, 16 km and 19 km away, respectively. The A228 ends in Royal Tunbridge Wells in south-west Kent. It is the only route off the Hoo Peninsula from the site. Up until the roundabout junction at High Halstow the A228 is an unlit single-carriageway road subject to a 40 mph speed limit enforced by average speed cameras. Other than passing through the village of Stoke, the road is bound by fields. West of the High Halstow roundabout the national speed limit applies.

10.66 1.2 km west of High Halstow the A228 is known as Peninsula Way and becomes dual-carriageway subject to the national speed limit. Upon entering the suburban fringes of Strood the A228 returns to single-carriageway and a 30 mph speed limit at the change occurs at a roundabout with the A289, which heads south towards the Medway Tunnel and Chatham Docks.

10.67 The A228 passes through Strood before joining the M2 at Junction 2 via a grade-separated dumbbell junction.

Chapel Road

10.68 Chapel Road heads south-east through Grain from a T-junction with the B2001. It is subject to a 30 mph speed limit, fronted for the most part by residential properties with footpaths and street lighting along its length. Bus stops and a few commercial properties are also located adjacent to the carriageway. Minor residential streets connect with Chapel Road at priority junctions.

Power Station Road

10.69 Power Station Road is the access road to Grain Power Station. It is single-carriageway and approximately 750 m from the priority junction to the wider extent of the power station. 500 m east of the proposed site access. The larger oil-fired plant closed in 2012 however there is now a CCGT plant operating on site which means Power Station Road is still used albeit to a lesser extent.

A289

10.70 The A289 forms a 15 km north-eastern bypass of the Medway Towns of Chatham, Rochester and Strood. From Junction 1 of the M2, the A289 heads in a north-east direction towards the A228/ A289/ B2108 roundabout on the Hoo Peninsula, with the A228 continuing east towards Grain. Between these junctions, the A289 is known as Hasted Road and is a dual-carriageway and subject to the national speed limit. There is a central reservation with street lighting throughout.

10.71 The A289 continues south of the A228 roundabout, remaining a dual-carriageway. After 1 km a 50 mph speed limit is introduced and the A228 passes through the Medway Tunnel. 1 km east of the Medway Tunnel, the A289 form a large signalised junction with the B2004 and the access to Chatham Docks

10.72 The A289 continues south-east, the surroundings becoming more residential. The road becomes subject to a 40 mph speed limit and remains dual carriageway until a four-arm roundabout with the A2.

M2

10.73 The M2 is subject to the national speed limit and stretches 40 km south of Junction 1, the grade-separated junction with the A2 and A289. The route bypasses the Medway towns to the south-west. The carriageway is four-lanes wide in both directions up until Junction 4 south of Gillingham, where it reduces to two. The M2 ends at Junction 7 where it reconnects with the A2 and A299.

A2

10.74 The A2 runs from London to Dover and forms part of the Primary Route Network. Whilst the M2 bypasses the Medway Towns the A2 passes through the centre of Rochester and Chatham.

10.75 North of Junction 1 of the M2, the A2 is four lanes wide, subject to the national speed limit and heads west towards London. 15 km west of Junction 1, the A2 forms a grade-separated junction with the M25 to the south and the A282 to the north. The A282 heads north over the Dartford Crossing before re-joining the M25.

Baseline Traffic

10.76 Baseline traffic levels have been established in order to quantify the magnitude of impact of the development traffic. Automatic Traffic Counters (ATC) and data obtained from the DfT has been used to derive the baseline. Table 10.10 and Table 10.11 list the baseline flows on each of the links.

Automatic Traffic Counters

10.77 ATCs were placed on the B2001 Grain Road near the proposed Project Area access and recorded 24-hour traffic flows over a seven-day period. The surveys were initially conducted from the 1st November 2018 – 7th November 2018. ATC 1 and 3 were found to be faulty and were subsequently re-surveyed from the 9th November to the 15th November. Table 10.10 shows the seven-day average 24-hour flows at each of the ATC sites.

Table 10.10: ATC Surveys

Site No.	Road Link	All Traffic	HGV	HGV %
ATC 1	B2001 East of Access	2,946	390	13.2%
ATC 2	B2001 West of Access	2,947	312	10.6%
ATC 3	A228 Grain Rd at Stoke	4,241	818	19.3%

DfT Traffic Counters

10.78 DfT record AADT flows for every junction-to-junction link on the 'A' road and motorway network in Great Britain. Table 10.11 shows the data recorded during the most recent count at each link.

Table 10.11: DfT Traffic Counters

Site No.	DfT Count Point	Road Link	All Traffic	HGV	HGV %
DfT 1	56776	A228 Grain Road	8582	1584	18.5%
DfT 2	56827	A228 Four Elms Hill Beacon Hill	33024	1355	4.1%
DfT 3	70385	A289 Wainscott Primary School	43021	2169	5.0%
DfT 4	56816	A228 Frindsbury Road	15904	376	2.4%
DfT 5	70384	A2 Chatham Docks	34242	686	2.0%
DfT 6	70386	A2 opposite Featherby Rd	34882	594	1.7%
DfT 7	70381	A289 between A226 and B2000	3313	52386	6.3%
DfT 8	56415	A228 Gun Lane	146	6787	2.2%
DfT 9	6099	Rochester Bridge	448	35138	1.3%
DfT 10	56008	M2 btwn J1 & J2	10650	100486	10.6%
DfT 11	6010	M2 btwn J2 & J3	9823	99296	9.9%
DfT 12	73645	M2 btwn J4 & J5	6928	69055	10.0%
DfT 13	78142	A287 btwn A2 & M2	1146	35681	3.2%
DfT 14	36100	A2 w of J1 of M2	10217	126325	8.1%
DfT 15	16092	A2 btwn M25 & B255	10849	131863	8.2%
DfT16	38792	A227 Dartford Crossing	18578	115926	16.0%
DfT 17	7824	M25 S of A2	13997	114976	12.2%
DfT 18	36099	A2 W of M25	4919	108301	4.5%

Traffic Growth

10.79 Tempro v7.2 has been used to derive growth factors that enable the conversion of past and present traffic counts to the predicted future baseline flows. Tempro is a program developed by the DfT providing forecast traffic growth projections for the UK based on regional characteristics and as such provides a national standardised approach to forecasting growth for future year assessment. Growth factors specific to Medway have been extracted from Tempro for this exercise.

10.80 As traffic counts were conducted in 2018 they require being factored up to predicted 2021 and 2023 levels, the start and finish years of the construction period.

10.81 The data from the DfT counters was collected in 2017, with the exception of point 16 at the Dartford Crossing which was 2014, and have also been factored up to 2021 and 2023 levels.

10.82 Table 10.12 below shows the Tempro growth factors applied to each data set according to year.

Table 10.12: Tempro v7.2 Growth Factors

Base Year	Construction Begin Year (2021)	Construction End Year (2023)
2014	1.1222	1.1544
2017	1.0698	1.1005
2018	1.0520	1.0822

Receptor Sensitivity

10.83 A number of receptors have been identified where impacts have subsequently been assessed. For the purposes of the assessment, the receptors have been selected based on engineering judgement and are cognisant of the examples quoted in Table 10.1. They include areas where residential/ business properties and schools are close to the carriageway and key links and junctions on the local and strategic highway networks. The receptors have been assigned to the nearest traffic counter. The locations, along with their baseline sensitivity (following the criteria outlined in Table 10.1) are provided in Table 10.13.

Table 10.13: Receptors within Study Area

Site	Receptor Location	Site Location	Sensitivity Rating	Description	Distance from Site Access
1	Chapel Road	ATC 1	Medium	Shops/Businesses, Residential properties close to the carriageway	450m
2	B2001 Grain Road	ATC 1	Medium	Residential properties close to the carriageway	750m
3	London Thamesport	ATC 2	Low	London Thamesport	1.4km
4	A228 Grain Road East of Stoke	ATC 3	Medium	Medway Estuary and Marshes SPA	3.7km
5	A228 Grain Road at Stoke	ATC 3	Low	Residential properties set back from the carriageway with screening	5.3km
6	A289 at Wainscott	DfT 3	Very High	Wainscott Primary School	16.1km
7	A289	DfT 3	High	Medway Tunnel / Medway City Estate Access	17km
8	A228 Findsbury Rd	DfT 4	Very High	St. Mary's Medical Centre	18km
9	A228 Findsbury Rd	DfT 4	Medium	Shops/Businesses, Residential properties close to the carriageway	18.5km
10	A289 Pier Road	DfT 5	Very High	Universities at Medway – Chatham Maritime	18.7km
11	J1 of M2	DfT 14	Medium	M2 / A2 / A289 Grade Separated Junction	20.8km

Site	Receptor Location	Site Location	Sensitivity Rating	Description	Distance from Site Access
12	A2 Sovereign Blvd	DfT 6	Very High	Danecourt Special School	24km

Road Safety

10.84 Collision Data has been analysed to determine whether or not there are any underlying road safety issues on the surrounding highway network. STATS19, which is a code designating the protocol which outlines information to be collected whenever an injury crash is reported to the Police and is used to refer to Britain's official Road Accident Statistics, which are derived from Police STATS19 returns and compiled by the Department for Transport, data was obtained from crashmap.co.uk for the most recent five-year period available was analysed within the study area shown in Figure 10.1. The study area covers the village of Grain, the B2001 continuing west along the A228 until Upper Stoke. There have been a total of 15 collisions within the study area, five of which caused serious injury. Table 10.14 lists the collisions according to year of occurrence and severity.

Table 10.14: Collision Data by Year and Severity

Year	Severity			
	Slight	Serious	Fatal	Total
2013	1	0	0	**1**
2014	3	1	0	**4**
2015	2	1	0	**3**
2016	4	3	0	**7**
2017	0	0	0	**0**
Total	**10**	**5**	**0**	**15**

Source: crashmap.co.uk (accessed 08/01/2019)

Collisions Involving Goods Vehicles

10.85 Table 5.6 shows five collisions involved a goods vehicle (an average of one collision per year). Three of these were recorded as being slight in severity whilst the remaining two caused serious injury. The serious collision recorded in 2014 also involved a motorbike. The serious collision in 2016 involved two goods vehicles and a car, with the driver of a lorry sustaining the serious injury.

Table 10.15: Summary of Collisions (Goods Vehicles Only)

Year	Severity			
	Slight	Serious	Fatal	Total
2013	1	0	0	**1**
2014	2	1	0	**3**
2015	0	0	0	**0**
2016	0	1	0	**1**
2017	0	0	0	**0**
Total	**3**	**2**	**0**	**5**

Source: crashmap.co.uk (accessed 08/01/2019)

Collisions Involving Vulnerable Road Users

10.86 Vulnerable road users were involved in five of the collisions, three were categorised as 'serious' and two 'slight'. Two of the collisions that caused serious injury involved cyclists, both involving no other road user. A slight injury to a pedestrian was caused by a goods vehicle in 2014 within the village of Grain. In 2014 a serious injury was sustained by a motorcyclist who was involved in a collision with a goods vehicle at the entrance to London Thamesport on the B2001.

Summary of Collision Data

10.87 Collision data has been reviewed for the most recent five-year period available within the study area, which covers the village of Grain, the B2001 and the A228 until Upper Stoke. There have been a total of 15 collisions within the study area, five of which caused serious injury. There were no collisions recorded within proximity of the proposed Project Area access, nor were there any clusters of collisions identified within the study area.

Conclusion

10.88 Due to the low number of collisions and no discernible pattern in the locations, it is considered that the GB Onshore Scheme will not have a significant impact on the highway safety record in the surrounding area.

Potential Impacts

Overview of Potential Impacts

10.89 This section assesses the temporary impacts of percentage increase in traffic associated with the construction of the GB Onshore Scheme on the surrounding road network and receptors.

10.90 The worst-case potential impacts of traffic are likely to be temporary in nature (e.g. the peak period of construction).

10.91 Whilst traffic would be expected throughout the construction period, only the peak month for traffic has been assessed. This ensures that a robust worst-case traffic scenario is considered.

10.92 As described in the Approach to Assessment section of this chapter, a number of impacts have been specifically assessed:

- HGV construction traffic;
- Road Safety;
- Severance; and
- Pedestrian/ Cycle amenities.

10.93 The assessment of significance of each of the above elements has been assessed using the criteria set out in Table 10.2.

HGV Construction Traffic Impacts

10.94 The nature of effect is based on the worst-case scenario percentage increase in traffic.

10.95 The most significant traffic impacts will occur in the 2021 assessment year, as in 2023 the base traffic is marginally higher therefore the additional construction related traffic does not have as much of an overall impact. It is assumed that the worst-case traffic impact will last longer than six months.

10.96 Consequently, a percentage change has been calculated to provide an indication of the level of impact generated by the traffic upon the key road links within the ZoI.

Road Safety Impacts

10.97 A summary of the potential effects on road safety during the construction phase has been provided in Table 10.17. The magnitude of potential impacts, described in Table 10.2 is summarised below:

- High – High increase in traffic at known collision locations;
- Medium – Moderate increase in traffic at known collision locations;
- Low – Minor increase in traffic at known collision locations; and
- Negligible – Negligible increase in traffic at known collision locations.

Severance Impacts

10.98 A summary of the potential effects on severance during the construction phase has been provided. The determination of potential impact magnitude is based on the information in Table 10.2.

Pedestrian/ Cycle Impacts

10.99 The magnitude of potential impacts, described in Table 10.2 is summarised below:

- High – Limited or no facilities for pedestrians and cyclists with limited crossing facilities and low quality linkages to the local facilities;
- Medium – few facilities for pedestrians and cyclists with limited crossing facilities and linkages to the local facilities;
- Low – Few facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities; and

- Negligible – Dedicated facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities.

HGV Construction Traffic Impacts

10.100 Table 10.16 presents summaries of the potential effects of the additional HGV traffic generated by the GB Onshore Scheme in the 2021 assessment year. The summary contained in Table 10.16 is as a result of the assessment criteria of significance being met at specific receptors. These are then assessed as to their significance of effect.

10.101 Tables showing all traffic scenarios are provided in Appendix 10.A.

Table 10.16: Construction HGV Traffic Impact Significance of Effect

Receptor Site No.	Receptor Location	Sensitivity Rating	HGV Traffic Increase	Magnitude	Sig of Effect
1	Chapel Road	Medium	0%	Negligible	Negligible
2	B2001 Grain Road	Medium	0%	Negligible	Negligible
3	London Thamesport	Low	28.9%	Medium	Minor
4	A228 Grain Road East of Stoke	Medium	11.0%	Low	Minor
5	A228 Grain Road at Stoke	Low	11.0%	Medium	Minor
6	A289 at Wainscott	Very High	0.7%	Negligible	Minor
7	A289	High	0.7%	Negligible	Negligible
8	A228 Findsbury Rd	Very High	1.1%	Negligible	Minor
9	A228 Findsbury Rd	Medium	1.1%	Negligible	Negligible
10	A289 Pier Road	Very High	2.1%	Negligible	Minor
11	J1 of M2	Medium	0.3%	Negligible	Negligible
12	A2 Sovereign Blvd	Very High	2.4%	Negligible	Minor

10.102 Table 10.16 shows that at worse the significance of effect will only be minor. HGV % increase is greatest between the proposed Project Area access and the London Thamesport access. The ATC counters indicate greater volumes of HGVs in the baseline traffic west of Thamesport on Grain Road so the development impact decreases further.

10.103 It is not expected that HGVs will travel east of the proposed Project Area site access into the village of Grain so it has been assumed there will be a negligible impact to links east of the Project Area. However the CTMP will ensure that all contractors working on the site and operators during the operation and maintenance will be informed of the most direct and appropriate route to the strategic network, thereby reducing the risk of any increase in HGV activity into the village of Grain.

Road Safety Impacts

10.104 Table 10.17 presents a summary of the potential effects on road safety during the construction phase. At six receptor locations there is expected to be a minor increase in total traffic Therefore, in accordance with the criteria outlined earlier in Chapter, the impact magnitude for the sites has been identified as ‘Low’. At all receptors the effects are therefore not significant.

Table 10.17: Road Safety Impact Significance of Effects

Receptor Site No.	Receptor Location	Sensitivity Rating	Increase in Traffic at Known Collision Locations	Magnitude	Sig of Effect
1	Chapel Road	Medium	Negligible	Negligible	Negligible
2	B2001 Grain Road	Medium	Negligible	Negligible	Negligible
3	London Thamesport	Low	Minor	Low	Negligible
4	A228 Grain Road East of Stoke	Medium	Minor	Low	Minor
5	A228 Grain Road at Stoke	Low	Minor	Low	Negligible
6	A289 at Wainscott	Very High	Negligible	Negligible	Minor
7	A289	High	Negligible	Negligible	Minor
8	A228 Findsbury Rd	Very High	Negligible	Negligible	Minor
9	A228 Findsbury Rd	Medium	Negligible	Negligible	Negligible
10	A289 Pier Road	Very High	Negligible	Negligible	Minor
11	J1 of M2	Medium	Negligible	Negligible	Negligible
12	A2 Sovereign Blvd	Very High	Negligible	Negligible	Minor

Severance Impacts

10.105 Table 10.18 presents a summary of the potential effects on severance during the construction phase. Tables showing all traffic scenarios are provided in Appendix 10.A.

10.106 Six of the twelve receptors experience a negligible effect, five are minor and one moderate based on the assessment methodology.

10.107 Receptor site 4 is the Medway Estuary SPA and experiences the moderately significant impact according to Table 10.18. With it being an ecological site there is only a limited amount of severance that can be caused by traffic. There are no footpaths, amenities or facilities on either side of the road and therefore there is little scope for pedestrians to experience any potential severance effects. As a result the effect of severance as a result of vehicular activity associated with these proposals is insignificant.

Table 10.18: Severance Significance of Effects of Construction Traffic)

Receptor Site No.	Receptor Location	Sensitivity Rating	HGV % Increase	Magnitude	Sig of Effect
1	Chapel Road	Medium	0%	Negligible	Negligible
2	B2001 Grain Road	Medium	0%	Negligible	Negligible
3	London Thamesport	Low	28.9%	Low	Negligible

Receptor Site No.	Receptor Location	Sensitivity Rating	HGV % Increase	Magnitude	Sig of Effect
4	A228 Grain Road East of Stoke	Medium	11.0%	Medium	Moderate
5	A228 Grain Road at Stoke	Low	11.0%	Low	Negligible
6	A289 at Wainscott	Very High	0.7%	Negligible	Minor
7	A289	High	0.7%	Negligible	Minor
8	A228 Findsbury Rd	Very High	1.1%	Negligible	Minor
9	A228 Findsbury Rd	Medium	1.1%	Negligible	Negligible
10	A289 Pier Road	Very High	2.1%	Negligible	Minor
11	J1 of M2	Medium	0.3%	Negligible	Negligible
12	A2 Sovereign Blvd	Very High	2.4%	Negligible	Minor

Pedestrian / Cycling Impacts

10.108 Table 10.19 presents a summary of the potential effects on pedestrians and cyclists during the construction phase. At the worst-affected receptor location (4), there are limited or no pedestrian cycling facilities available, therefore with the criteria outlined in Table 10.2 (Impact Magnitude Criteria), the impact magnitude for the sites has been identified as moderate, but as there is minimal existing pedestrian and cycle activity within the vicinity of the Project Area the impact to pedestrian and cycling activity as a result of these proposals is not significant.

Table 10.19: Pedestrian / Cyclist Significance of Effects of Construction Traffic)

Receptor Site No.	Receptor Location	Sensitivity Rating	Pedestrian / Cycling Impact	Magnitude	Sig of Effect
1	Chapel Road	Medium		Low - footpaths	Minor
2	B2001 Grain Road	Medium		Medium - footpath	Moderate
3	London Thamesport	Low		Low – dropped kerbs	Negligible
4	A228 Grain Road East of Stoke	Medium		High – no footpaths (but nothing to walk to)	Major
5	A228 Grain Road at Stoke	Low		Negligible – sig crossing	Negligible
6	A289 at Wainscott	Very High		Negligible - footbridge	Negligible
7	A289 Medway City Estate	High		Negligible – sig crossings	Minor
8	A228 Findsbury Rd	Very High		Negligible – sig crossings	Minor
9	A228 Findsbury Rd	Medium		Negligible	Negligible
10	A289 Pier Road	Very High		Negligible - footbridge	Minor
11	J1 of M2	Medium		Negligible - footbridge	Negligible

Receptor Site No.	Receptor Location	Sensitivity Rating	Pedestrian / Cycling Impact	Magnitude	Sig of Effect
12	A2 Sovereign Blvd	Very High		Negligible – foot/cycle path segregated	Minor

10.109 When combined with receptor sensitivity values, this results in one of the receptors experiencing a 'major' significant effect.

10.110 However, it should be noted that there are currently very few pedestrians/ cyclists using the roads in the vicinity of the receptor and due to the nature of the roads, very few additional pedestrian/ cyclist movements would be expected in the future. The works are also expected to be temporary, therefore any effects will only be apparent for a limited period and therefore would be Minor and not significant.

Decommissioning Effects

10.111 The effects during the decommissioning phase would be no worse than those presented throughout the previous sections of this Chapter, as decommissioning would essentially be the reverse of the construction period. The impacts, unless there were significant levels of development and an increase in pedestrian and cycle activity would therefore be no worse in scale, nature and duration, with the resultant effects considered likely to be not significant.

Mitigation

Overview of Mitigation

10.112 In order to minimise any effect relating to traffic and transport, a number of mitigation measures have been proposed. Mitigation would be committed and delivered through the outline Construction Traffic Management Plan (CTMP) which will be agreed prior to construction with Medway Council.

Construction Traffic Management Plan

10.113 CTMP Mitigation relating to traffic movements associated with the construction of the GB Onshore Scheme would be focused primarily on HGV traffic, as the additional car/ Light Goods Vehicle (LGV) trips will have a negligible impact on future traffic flows. However, the impacts of car/ LGV trips could also be mitigated through the encouragement of worker car share.

10.114 Based on the assessment criteria of HGV traffic, the only method of reducing the overall significance of effect would be through a reduction in overall HGV traffic during construction (either by reducing the total number required or re-routeing traffic). This will not be possible, hence the residual impacts would remain the same post mitigation. However, there are a number of softer measures that would help to lessen the general impacts of the construction traffic.

10.115 The CTMP will include the following:

- Location of Project Area and the entry/ exit arrangements;
- Traffic routeing plans – defining the routes to be taken by HGVs to the Project Area. For example, prioritising the use of A and B-roads as far as possible, avoidance of built-up areas and other sensitive locations;
- Construction hours and delivery times stipulated to best avoid peak periods;
- Strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions, timing restrictions and where access is prohibited;
- Measures to protect the public highway (e.g. wheel wash facilities);
- Measures for the monitoring of the CTMP to ensure compliance from drivers and appropriate actions in the event of non-compliance;
- Mechanism for responding to traffic management issues arising during the works (including concerns raised from the public) including a joint consultation approach with relevant highways authorities;
- Details of traffic management requirements; and
- Strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions (statutory limits: width, height, axle loading and gross weight), timing restrictions (if applicable) and where access is prohibited.

10.116 Control measures will include:

- All construction traffic to adhere to the Traffic Route Plans included in the CTMP;
- All vehicles will be able to access and egress the Project Area in a forward gear, with sufficient room off the public highway to allow them to wait without blocking the main carriageway;
- Welfare facilities will be provided so as to minimise the need for off-site trips by staff during the working day;
- At all Project Area accesses, suitable supervision will be provided as required to ensure that traffic is controlled at access points during construction (for example banksman checking road traffic and controlling construction vehicle movements) and mud deposits on the roads are minimised; and

- Where required, traffic signals (in accordance with New Roads and Street Works Act (NRSWA), (Ref 25-7) or stop-go boards will be used to control road traffic. Road signs will conform to Chapter 8 of TSRG (Traffic Signs Manual, Ref 25-8) and NRSWA.

Road Safety

10.117 Whilst the majority of impacts relating to road safety are 'Negligible' or 'Minor', the access from the public highway at the B2001 would use Banksmen to manage the movement of HGVs on and off the public highway. Warning signage would be provided on the approaches to the access junction.

Pedestrians and Cyclists

10.118 As part of a Travel Plan developed for the GB Onshore Scheme, measures such as an internal site layout to accommodate the movement of pedestrian and cyclists would be designed. This would provide benefits within the Project Area, but would not provide benefits to external receptors.

10.119 There would however be very few pedestrian/ cyclist movements expected as part of the construction phase of the development, which relates to the relatively low number of additional workers expected.

Travel Plan

10.120 A Travel Plan would be introduced in order to encourage sustainable travel to the Project Area. The Travel Plan would include measures such as; encouragement of car sharing and public transport usage, better marketing of information and implementation of a Travel Plan Co-ordinator. Where appropriate, a shuttle bus to transport workers to key interchange locations could be introduced.

10.121 An important element in ensuring the success of the construction phase and reducing the effects on traffic receptors is effective communication with local communities before and during the construction process, and in particular to inform them of the timing of construction activities and to help alleviate any concerns they may have. To address this the Applicant will ensure, in line with NRSWA and any Section 278 Agreements with the Highway Authorities, that the Contractor maintains good communication with affected communities, keeping them informed about the timing and extent of activities which may affect them.

10.122 So far as practicable material will be retained on site including the retention of all soils and spoils, therefore minimising the need to move material on and off the site.

10.123 It is considered that with the implementation of the above measures, any minor effects on road users during the construction period will be reduced further. Where appropriate, HGVs would access and egress in a forward gear. At all accesses, warning signage will be provided on the approaches to the access junctions.

Residual Impacts

10.124 This section of the report outlines the residual effects of the potential traffic impacts, following the application of mitigation. As previously stated, only the construction phase has been considered in this assessment as the traffic impact will be negligible during the operational period of the development.

HGV Construction Traffic

10.125 Table 10.20 summarises the residual effects of the additional HGV traffic generated by the proposed converter station site on a weekday and a Saturday following the implementation of associated mitigation.

Table 10.20: HGV Traffic Impact Significance of Effects of Construction Traffic)

Receptor Site No.	Receptor Location	Sensitivity Rating	HGV % Increase	Magnitude	Sig. of Effect (Without Mitigation)	Sig. of Effect (With Mitigation)
1	Chapel Road	Medium	0%	Negligible	Negligible	Negligible
2	B2001 Grain Road	Medium	0%	Negligible	Negligible	Negligible
3	London Thamesport	Low	28.9%	Medium	Minor	Minor
4	A228 Grain Road East of Stoke	Medium	11.0%	Low	Minor	Minor
5	A228 Grain Road at Stoke	Low	11.0%	Medium	Minor	Minor
6	A289 at Wainscott	Very High	0.7%	Negligible	Minor	Minor
7	A289	High	0.7%	Negligible	Negligible	Negligible
8	A228 Findsbury Rd	Very High	1.1%	Negligible	Minor	Minor
9	A228 Findsbury Rd	Medium	1.1%	Negligible	Negligible	Negligible
10	A289 Pier Road	Very High	2.1%	Negligible	Minor	Minor
11	J1 of M2	Medium	0.3%	Negligible	Negligible	Negligible
12	A2 Sovereign Blvd	Very High	2.4%	Negligible	Minor	Minor

10.126 As indicated in Table 10.20, the highest level of significance on any of the links is classified as ‘Minor’.

10.127 The measures introduced as part of the CTMP would help to lessen the general impacts of the construction traffic. For example, the use of A and B-roads would be prioritised as far as possible, together with the avoidance of built-up areas such as Strood, Rochester, Chatham and other sensitive locations where there is a viable alternative.

Road Safety Impacts

10.128 Table 10.21 presents a summary of the residual effects on road safety during the construction phase.

Table 10.21: Road Safety Impact Significance of Effects of Construction Traffic)

Receptor Site No	Receptor Location	Sensitivity Rating	Increase in Traffic at Known Collision Locations	Magnitude	Sig of Effect (Without Mitigation)	Residual Significance
1	Chapel Road	Medium	Negligible	Negligible	Negligible	Negligible
2	B2001 Grain Road	Medium	Negligible	Negligible	Negligible	Negligible
3	London Thamesport	Low	Minor	Minor	Negligible	Negligible
4	A228 Grain Road East of Stoke	Medium	Minor	Minor	Minor	Minor
5	A228 Grain Road at Stoke	Low	Minor	Minor	Negligible	Negligible
6	A289 at Wainscott	Very High	Negligible	Negligible	Minor	Minor
7	A289	High	Negligible	Negligible	Minor	Minor
8	A228 Findsbury Rd	Very High	Negligible	Negligible	Minor	Minor
9	A228 Findsbury Rd	Medium	Negligible	Negligible	Negligible	Negligible
10	A289 Pier Road	Very High	Negligible	Negligible	Minor	Minor
11	J1 of M2	Medium	Negligible	Negligible	Negligible	Negligible
12	A2 Sovereign Blvd	Very High	Negligible	Negligible	Minor	Minor

10.129 The majority of links classified as experiencing either a 'negligible' or 'minor' residual significance of impact. The link directly to the west of the Project Area experiences an impact of moderate significance according to the assessment methodology, however due to the lack of built-up land in its surroundings the impact is not expected to be significant.

Pedestrian / Cycling Impacts

10.130 Table 10.22 presents a summary of the residual effects on pedestrian and cycling during the construction phase.

Table 10.22: Severance Significance of Effects of Construction Traffic)

Receptor Site No.	Receptor Location	Sensitivity Rating	Ped / Cycle Impacts	Magnitude	Sig. of Effect (Without Mitigation)	Sig. of Effect (With Mitigation)
1	Chapel Road	Medium		Low - footpaths	Minor	Minor
2	B2001 Grain Road	Medium		Medium - footpath	Moderate	Minor

Receptor Site No.	Receptor Location	Sensitivity Rating	Ped / Cycle Impacts	Magnitude	Sig. of Effect (Without Mitigation)	Sig. of Effect (With Mitigation)
3	London Thamesport	Low		Low – dropped kerbs	Negligible	Negligible
4	A228 Grain Road East of Stoke	Medium		High – no footpaths (but nothing to walk to)	Major	Moderate
5	A228 Grain Road at Stoke	Low		Negligible – sig crossing	Negligible	Negligible
6	A289 at Wainscott	Very High		Negligible - footbridge	Negligible	Negligible
7	A289	High		Negligible – sig crossings	Minor	Minor
8	A228 Findsbury Rd	Very High		Negligible – sig crossings	Minor	Minor
9	A228 Findsbury Rd	Medium		Negligible	Negligible	Negligible
10	A289 Pier Road	Very High		Negligible - footbridge	Minor	Minor
11	J1 of M2	Medium		Negligible - footbridge	Negligible	Negligible
12	A2 Sovereign Blvd	Very High		Negligible – foot/cycle path segregated	Minor	Minor

10.131 The impact magnitude for pedestrian/ cycling movements is driven by the level of existing amenities available. As there are little or no facilities available at some of the receptor locations and very few cyclists/ pedestrians are expected as part of the construction, the residual significance has been reduced. Sites 2 and 4 are examples of this, where the ATC traffic counters picked up an average of 9 and 6 two-way cycle movements, respectively.

10.132 The residual effects on pedestrians and cyclists has therefore been considered not significant in this assessment.

Decommissioning Effects

10.133 The residual effects during the decommissioning phase would be no worse than those presented within Potential Impacts sections, as decommissioning would essentially be the reverse of the construction period unless there were significant levels of development and an increase in pedestrian and cycle activity. The impacts would therefore be no worse in scale, nature and duration, with the resultant effects considered likely to be not significant.

Cumulative Effects

10.134 This section considers the inter-project and intra-project cumulative impacts relating to traffic and transport. Reference should be made to the cumulative assessment chapter (12) which also identifies the committed developments to be considered within the assessment.

Scope of Cumulative Assessment (Inter-Project Impacts)

10.135 This section considers the inter-project impacts, which relate to other committed developments in the vicinity of the Project Area.

10.136 Table 10.23 details the committed developments considered as part of the proposed converter station traffic and transport assessment.

10.137 The developments identified within Chapter 12 Cumulative Assessment have been reviewed and further review of relevant documentation relating to the committed developments has been undertaken to ascertain whether there would be any potential traffic impacts generated by these sites. The next stage of the process was to discount sites from the identified list if they were not deemed to generate traffic impacts.

10.138 For example, if traffic was not to be generated at the same time as that of the proposed converter station construction period and the volume of traffic was not considered significant, the committed development was omitted from the assessment at this point.

10.139 As shown in Table 10.23, none of the committed development sites have been included as part of the initial traffic and transport assessment. These sites were then assessed further to ascertain their potential effects on the proposed converter station site.

Table 10.23: Register of Nearby Developments (Stage 1 Cumulative Effects Assessment)

ID	Project	Status	Expected Construction	Relationship with the GB Onshore Scheme	Traffic Impact
1	NGET OHL Works – connection of the GB Onshore Scheme to the NETS.	Proposed – no application submitted	Construction expected to coincide with the construction of the proposed substation.	0 m – to connect with the proposed substation.	No – scale of work too small for impact
2	GB Offshore Scheme – subsea cable installation beyond MLWS.	Proposed – Scoping Opinion Request issued; planning application to be submitted in line with GB Onshore Scheme.	Construction period will align with the installation of the DC cable of the GB Onshore Scheme	0 m – connects directly to the subsea DC cable at MLWS.	No – works offshore
3	Six residential properties; Port Victoria Road, Isle Of Grain, Rochester, ME3 0EN	Outline application submitted and validated in June 2018. Planning decision is pending. Planning Reference: MC/18/1871	No details of intended construction period provided.	Approx. 580 m east (Grain)	No - scale of work too small for impact
4	Outline planning application for the development of up to 464,685 m^2 of built employment floorspace and up to 245 m^2 of floorspace for a business park management centre;	Original application (Planning Reference MC/09/1628) approved with conditions March 2010. Latest conditions discharged June 2019.	No known timeframes for construction.	Phase 1 is approx. 1.2 km southwest	No – Site to be constructed at the same time as GB Onshore, however no construction traffic information is

ID	Project	Status	Expected Construction	Relationship with the GB Onshore Scheme	Traffic Impact
	Grain Road Isle Of Grain Rochester Kent ME3 0AE				currently available
5	Construction and operation of a cementitious grinding facility and associated development; Grain Road, Isle of Grain, ME3 0DW	Scoping Opinion request for the importation of clinker and granulated blast furnace and development of a grinding facility. Scoping Opinion submitted July 2019. Planning Reference: MC/19/1793	EIA Scoping at this stage only	Approx. 1.7 km southwest	No – There is no Transport Assessment available at this stage.
6	Cement Plant; Thamesport Isle Of Grain Rochester Medway ME3 0AP Proposed development of a new cement plant at London Thamesport.	Planning application validated February 2019. Planning Reference: MC/19/0299	No construction programming information provided within submission documents.	Approx. 2 km southwest	Requires Assessment

10.140 The Thamesport Cement Limited site was considered to require further assessment. The Environmental Statement (Feb 2019, PDE Consulting Limited) submitted in support of the application states that the site is a cement production plant, including ancillary facilities and access on land within London Thamesport, Isle of Grain. The site extends approximately 8.67 hectares including the access, with the operational area of the development occupying 2.2 hectares. It lies within the administrative boundary of Medway Council approximately 7.7 km east of Hoo and is situated on the northern bank of the River Medway.

10.141 There has been no Transport Assessment submitted as part of the application, however operational traffic volumes are provided as part of the aforementioned Environmental Statement and within the associated Air Quality Assessment, January 2019 produced by White Young Green. The assumed operational opening year for the GB Onshore Scheme has been stated as 2020, which coincides with the identified peak construction scenario of 2021 for the GB Onshore development.

10.142 The Environmental Statement suggests the following regarding HGV movements:

> *"Adopting 24 working days in the month of June would give rise to 67 load outs per day (134 movements), however to accommodate larger contracts as described above we have assumed a peak of 90 loads out per day (180 movements). To allow for the provision of supplies and services to the facility an allowance of a further 16 HGV movements per day has been adopted so this would give a likely worst case scenario of 196 HGV movements (98 in: 98 out) per day. Given the substantial drop in trading levels within the wider Port and the permitted numbers of HGV movements associated therewith, this number of HGV movements is not likely to be significant."*

10.143 The Air Quality Assessment presents baseline 2017 traffic data sourced from DfT counters and growthed to the proposed opening year of 2020 using the TEMPRO factor of 1.0531 representing the 'Do Minimum' scenario. All data is presented as Annual Average Daily Traffic (AADT). The development trips to calculate the 'Do Something' scenario were distributed throughout the local highway network assuming an equal dispersion of traffic at each major junction, prioritising traffic flows westwards towards the M2.

10.144 As described in the Environmental Statement, traffic flows associated with the development have been calculated using a worst-case scenario. Based on the 20 parking spaces at the development and the 24hr operation, as well as the 196 HGV movements.

10.145 Using the data from these assessments and comparing them to the equivalent count locations used for the GB Onshore scheme Results in the following development trips, shown in Table 10.24, from the Cement Plant that will be considered within this cumulative assessment. It should be noted that the GB Onshore assessment included more count locations and a geographically broader trip distribution assessment.

Table 10.24: Thamesport Cement Plant Development Trips

		2020										
		2017 Base Year			Do Minimum			Do Something			Dev Trips Only	
Corresponding GB Onshore Counter	Link	AADT	HGV %	HGVs (veh)	AADT	HGV %	HGVs (veh)	AADT	HGV %	HGVs (veh)	AADT	HGV
ATC 1 and 2	Grain Road – East of site	2606	1.3	34	2744	1.3	36	2764	1.3	36	20	0
ATC 3	Grain Road – West of site	8582	18.5	1588	9038	18.5	1672	9294	20.1	1868	256	196
DfT 01	A228 North of Christmas Lane	8582	18.5	1588	9038	18.5	1672	9279	20.1	1865	241	193
DfT 02	Four Elms Road – West of Main Road Hoo	33024	4.1	1354	34778	4.1	1426	34996	4.6	1610	218	184

10.146 Table 10.13 of this Chapter states the sensitive receptors that have been identified and subsequently assessed. Three of these sensitive receptors can therefore be considered within a cumulative assessment as shown in Table 10.25.

Table 10.25: Comparable Receptors within Study Area

Site	Receptor Location	Site Location	Sensitivity Rating	Description	Distance from Site Access
1	Chapel Road	ATC 1	Medium	Shops/Businesses, Residential properties close to the carriageway	450m
2	B2001 Grain Road	ATC 1	Medium	Residential properties close to the carriageway	750m
3	London Thamesport	ATC 2	Low	London Thamesport	1.4km

10.147 As described in the Potential Impacts section the most significant traffic impacts will occur in the 2021 assessment year, as in 2023 the base year traffic is marginally higher therefore reducing the percentage HGV impact from the additional construction related traffic.

10.148 In order to update the Construction HGV Traffic Impact Significance of Effect assessment, the development only trips from the Thamesport Cement Plant were added to the baseline traffic flows growthed to 2021 from the original assessment along with the construction vehicle movements associated with the GB Onshore Scheme.

10.149 For the three receptors that are able to be assessed this results in the following changes in significance, shown in Table 10.26, to the results presented in Table 10.16.

Table 10.26: Construction HGV Traffic Impact Cumulative Significance of Effect

Receptor Site No.	Receptor Location	Sensitivity Rating	HGV Traffic Increase	Magnitude	Sig of Effect
1	Chapel Road	Medium	0%	Negligible	Negligible
2	B2001 Grain Road	Medium	0%	Negligible	Negligible
3	London Thamesport	Low	18%	Medium	Minor

10.150 The increased HGV activity resulting from the Thamesport Cement Plant has the result of increasing general levels of HGV traffic on the local highway network. As a result the percentage change of HGV traffic generated by construction activities for the GB Onshore scheme represent a lower magnitude of change in HGV proportions than under the previous assessment. The only receptor to change was receptor number 3 where the HGV traffic increase reduced from 28.9% to 18%. The magnitude and significance of effect however remained the same.

10.151 Receptor number 3 represented the largest effect under the original assessment and although not all of the receptors have been assessed due to the lack of available information on the Thamesport Cement Plant, it can be assumed that the Cement Plant traffic would follow a similar trip distribution pattern to that of the GB Onshore traffic and the resulting significance of effect values at all receptors would remain similar as a result. In fact the increased levels of operational HGV traffic from the Cement Plant, would raise general background traffic HGV proportions, lessening the order of magnitude of effect from the GB Onshore scheme. The assessment carried out in the Potential Impacts section represents a robust worst-case assessment and therefore Road Safety, Severance and Pedestrian/ Cycling impacts have not been re-considered within the cumulative assessment.

Scope of Cumulative Assessment (Intra-Project Impacts)

10.152 This section considers the intra-project impacts, which relate to construction activities concerning the proposed DC cable route.

10.153 For the purposes of this assessment, the traffic impacts generated by each of the components of the GB Onshore Scheme have been combined.

10.154 The construction period for the GB Onshore Scheme is scheduled to take place between 2021 and 2023.

10.155 Although it is unlikely that the peak construction periods will coincide, an assessment has been undertaken to determine the impacts of this scenario, were it to occur.

10.156 Only traffic generated by the proposed DC cable route Temporary Construction Facilities (TCFs) closest to the proposed converter station have been considered as part of the assessment due to the proximity to the Project Area.

10.157 As with the other assessments contained within this chapter, a 2021 assessment year has been assumed for the associated converter station traffic. Traffic relating to the proposed DC cable route construction has then been added to indicate the intra-project traffic impacts.

10.158 When combined, the impacts on receptors are considered to remain not significant.

Summary of Assessment

10.159 This chapter reports the results of the baseline studies and the assessment of the potential impacts of traffic and transport of the GB Onshore scheme.

Overview of Baseline Conditions

10.160 Access to the proposed converter station and substation will be via the B2001 Grain Road. An existing unnamed road runs west/ northwest from Grain Road along the southern boundary of the site, which is the preferred point of access during construction and operation of the GB Onshore Scheme.

10.161 Prediction of construction effects has focused on activities that could directly and indirectly impact on receptors within the defined study area. The ZoI includes those roads which may be utilised during construction, and upon which there is the potential for a significant impact.

10.162 The southern boundary lies adjacent to the B2001 Grain Road. The B2001 heads west, continuing into the A228 and is the only route along the along the Hoo Peninsula to the Isle of Grain, linking the site with Rochester, Chatham Docks and the A2/ M2 for onwards destinations.

10.163 Baseline traffic levels have been established in order to quantify the magnitude of impact of the development traffic. ATC and data obtained from the DfT has been used to derive the baseline.

10.164 ATCs were placed on the B2001 Grain Road near the site access and recorded 24-hour traffic flows over a seven-day period. The surveys were initially conducted from the 1st November 2018 – 7th November 2018. ATC 1 and 3 were found to be faulty and were subsequently re-surveyed from the 9th November to the 15th November.

10.165 DfT record AADT flows for every junction-to-junction link on the ‘A’ road and motorway network in Great Britain. DfT traffic data was used for the remainder of the ZoI.

10.166 Collision data has been reviewed for the most recent five-year period available within the study area, which covers the village of Grain, the B2001 and the A228 until Upper Stoke. There has been a total of 15 collisions within the study area, five of which caused serious injury. There were no collisions recorded within proximity of the site access, nor were there any clusters of collisions identified within the study area.

10.167 Due to the low number of collisions and no discernible pattern in the locations, it is considered that the proposed development will not have a significant impact on the highway safety record in the surrounding area.

Overview of Residual and Cumulative Effects

10.168 In summary, the results of the assessments indicate that the impacts are likely to be not significant. However, some receptors experience an effect deemed ‘moderate’ using the assessment methodology outlined in the ‘Approach to Assessment’ section. These concern Severance and Pedestrian facilities on Grain Road (Receptor 4).

10.169 It has been demonstrated that these impacts should not be considered significant due to the lack of pedestrians or cyclists around to experience the effect brought on by the increase in HGV traffic.

10.170 A search of the planning portal revealed no committed developments that are likely to have any significant impact when combined with the traffic generated by the GB Onshore Scheme. Whilst not yet classified as a committed scheme the Thamesport Cement Limited site was considered to require further assessment. It was found that the increased HGV activity generated from the Thamesport Cement Plant which increases general levels of HGV traffic on the local highway network. As a result, the percentage change of HGV traffic generated by construction activities for the GB Onshore Scheme represent a lower magnitude of change in HGV proportions than under the previous assessment. The increased levels of operational HGV traffic from the Cement Plant, would raise general background traffic HGV proportions, lessening the order of magnitude of effect from the GB Onshore Scheme.

11. Ground Conditions

Introduction

11.1 This Chapter assesses the potential impacts from the construction and operation of GB Onshore Scheme in relation to ground conditions. This Chapter considers ground conditions within the context of the potential for land contamination to impact upon the GB Onshore Scheme, or to be disturbed or caused by the GB Onshore Scheme. The Chapter establishes the method followed for the assessment, summarises the regulatory and policy framework related to the ground conditions topic and describes the existing environment in the area surrounding the application boundary. Following this, the potential impacts, mitigation, residual and cumulative impacts of the GB Onshore Scheme are discussed.

11.2 The area defined as the application boundary (depicted on Figure 11.1) is interchangeably referred to as the ''Project Area' as appropriate throughout this Chapter.

Approach to Assessment

Previous Assessment

11.3 An Environmental Liability Desk Study[6] report was prepared for the Project Area in August 2018. This report has been used to inform the baseline conditions and has been included for reference in Appendix 11.A (with commercially-sensitive information removed).

Consultation

11.4 A Screening Report[7] was prepared and associated Screening Opinion sought from Medway Council in November 2018 the schedule of responses is presented in Appendix 3.1, covering all disciplines including ground conditions. No comments for the Ground Conditions discipline were received in relation to the GB Onshore Scheme screening report. Comments from the Offshore Screening Report were responded to by the Environment Agency; this details that contamination of soils and sediments may be an issue of concern, and further assessment is required, particularly in relation to perceived "minimal impacts" from sediment disturbance. The Environment Agency also noted that disturbed contaminated sediments may have a broader impact than just localised sediment release.

Data and Information

11.5 A Landmark Envirocheck data report has been obtained in GIS data format for the Project Area to provide environmental data that includes potential sources of contamination, previous industrial land uses and sensitive land uses and receptors. The data was obtained as part of the preparation of the Environmental Liability Desk Study and purchased in May 2018, and the data was relicensed in May 2019 to allow for its continued use.

11.6 Requests for further information in relation to potential sources of contamination identified during the assessment process, water abstractions, pollution incidents, discharges to controlled waters and landfilling within the study area were sent to the Environment Agency and Medway Council on the 30th May 2019. The Environment Agency responded to requests detailing records they hold within 2km of a single point near Perry's Farm. This information included six discharge consents, four pollution incidents, four records of historical landfills and details of one groundwater abstraction licence which could be located on plans.

11.7 Details of a further seventy-three pollution incidents were supplied but their location was not held by the Environment Agency, due to the level of pollution being recorded as minor or no impact on the environment. Medway Council responded to requests for information, however it was considered that there was no need for further engagement at this stage given the level of information already available.

11.8 The Defence Infrastructure Organisation (DIO) were also contacted as a result of recommendation from the Environment Agency as they held no information on former military land present within the study area. A reply was received from the Defence Business Service who stated they hold no records of this area of military land as all records dating prior to 1993 are held in the UK National Archives.

11.9 No Local Geological Sites (LGS) have been identified within the study area based on the information provided by the GeoConservation Kent website and so no engagement with local geological groups has been undertaken.

[6] Isle of Grain Environmental Liability Desk Study (2018)
[7] NeuConnect: Great Britain to Germany Interconnector, GB Onshore Scheme Screening Report. November 2018.

Assessment Method

Introduction

11.10 The ground conditions topic has been assessed using published information and existing information from historical site investigation/ assessments which are referenced accordingly throughout this Chapter. This section outlines the proposed assessment methodology.

11.11 General and topic-specific guidance presented in the Design Manual for Roads and Bridges (DMRB) Volume 11[8], together with relevant industry guidance and practice applied when undertaking EIA for ground conditions has been considered in the preparation of this Chapter. Further details can be found in the Planning Policy and Legislation section of this Chapter.

Geographical Scope

11.12 The study area for the ground conditions assessment comprises the Project Area and an additional radial zone of 250 metres (m). A radial zone of 1 kilometre (km) is considered for groundwater, and surface water abstractions within the context of identifying potential receptors to any soil and/ or groundwater contamination and is herein referred to as the 'extended study area'. This study area is appropriate for the consideration of historical and current potentially contaminative land uses which may have resulted in contamination and is consistent with how study areas for ground conditions are defined with other schemes, which in the absence of specific published guidance is based on professional judgement and accepted best practice within the industry.

11.13 The study area and the extended study area are illustrated on Figure 11.1.

11.14 The Environmental Liability Desk Study describes how the application boundary is distributed over three separate land parcels. Within the Environmental Liability Desk Study the area surrounding Perry's Farm, including the area of the proposed converter station, substation, access track and cable sealing end compound is subdivided into 'Area 1', 'Area 2' and 'Area 3' based on historical landfilling activity. This zoning has been retained in the Chapter to assist in describing the baseline conditions and is depicted on Figure 11.1.

Temporal Scope

11.15 The temporal scope covers the construction and operational phases of the GB Onshore Scheme.

Geology and Soils

11.16 Geology has been assessed using published information and existing information available from the Environmental Liability Desk Study report undertaken in 2018.

Geo-conservation Sites

11.17 No geological Sites of Special Scientific Interest (SSSI) or LGS have been identified within the study area. Therefore, these receptors are scoped out of the assessment.

Mineral Resources

11.18 Parts of the study area contain former sand and gravel workings, some of which are now occupied by water bodies, others have been utilised for landfill.

11.19 As per the Medway Development Strategy (2012-2035), the study area is not located within a Mineral Area of Search. Part of the study area is noted to overlap with an area earmarked as a 'disposal to land resource area', which is crossed by the proposed access track and the proposed DC cable route. It is noted that this area of land has already been subject to landfilling. Given this the GB Onshore Scheme is considered to be consistent with the Medway Development Strategy.

[8] Highways Agency, Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 Geology and Soils, 1999

11.20 The Project Area is not located in an area affected by coal mining and so this is scoped out of the assessment.

Land Instability

11.21 Reference to land stability is included within the 'Baseline Conditions' section drawing on information provided within the Envirocheck data and Environmental Liability Desk Study report. However, where land instability is identified to be an issue, it will be investigated and addressed with an engineering solution as part of the detailed design and so is not assessed within this Chapter.

Land Contamination

11.22 Areas of potential ground contamination have been identified within the study area. In line with the Environment Agency's Contaminated Land Report CLR11[9], the assessment of land contamination takes the form of a tiered, risk-based approach, as summarised here:

- Tier 1: qualitative risk assessment based on a desk top study of available information to identify potential sources of contamination, receptors to contamination and potential pathways between them. The identified sources, pathways and receptors are presented in the form of a Conceptual Site Model (CSM) showing the potential contaminant linkages (PCL);
- Tier 2: If PCLs are identified, this means there is a theoretical risk to receptors from contamination and intrusive investigation should be used to provide data to inform a generic quantitative risk assessment (GQRA). The GQRA involves comparison of site-specific, laboratory analytical data against appropriate generic assessment criteria (GAC) for human health and/or controlled waters which represent minimal or tolerable risk; and
- Tier 3: detailed quantitative risk assessment to identify whether contamination identified above minimal or tolerable risk levels represents an unacceptable risk and therefore requires mitigation, such as remediation.

Screening Assessment

11.23 A qualitative assessment of the risks posed by land contamination within the ground conditions study area has been undertaken by first assigning a 'site rating' (on a scale of 1 to 5) to each identified historical or current area of potential land contamination identified in the baseline review. The site rating has been determined using the tables provided in Appendix 11.B (part 11.B1). The site rating is based partly on the relationship between the identified area of potential land contamination and its proximity to the Project Area (Appendix 11.B, Table 11.B1.1) together with the extent of any proposed cut/ fill earthworks to be undertaken to facilitate the GB Onshore Scheme (Appendix 11.B, Table 11.B1.3). The site rating also considers the nature of the current and/ or historical land use, as certain land uses typically result in a greater potential for contamination of the ground to have occurred (Appendix 11.B, Table 11.B1.2). The lower the site rating then the lower the risk. Professional judgement has been applied in reviewing the generated site ratings. Generally, site ratings of two or less are considered not to pose a significant risk and have not been considered for further assessment. Site ratings of three or more have been considered further.

11.24 The next step for screening relates to a review of sensitive receptors and their proximity to the potential contaminated site; a combination of this review and the site rating defines whether a site advances to the detailed assessment stage for further risk and impact assessment which is described in the following sections.

[9] Environment Agency (2004), Contaminated Land Report (CLR11) Model Procedures for the Management of Land Contamination.

Risk and Impact Assessment

11.25 The approach to assessing the potential impacts of the GB Onshore Scheme has been undertaken by comparing the risk levels at baseline with the CSM and the risk levels for the construction and post-construction stages respectively, to determine any change in risk at each stage.

11.26 Potential risks have been determined and assessed based on the likelihood (or probability) and consequence using the principles noted in the National House Building Council (NHBC), Environmental Agency and Chartered Institute of Environmental Health (CIEH) report R&D66[26]. This provides guidance on development and application of the consequence and probability matrix to risk assessment and broad definitions of consequence. The risk matrix is presented in Table 11.1.

Table 11.1: Estimation Level of Risk

Probability	Consequence			
	Severe	Medium	Mild	Minor
High likelihood	Very high risk	High risk	Moderate risk	Low risk
Likely	High risk	Moderate risk	Moderate/low risk	Low risk
Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

11.27 The significance of the effects of land contamination has been assessed by comparing the difference in risk for each contaminant linkage at baseline to those at construction and at post construction stages. Where there is shown to be a decrease in risk the GB Onshore Scheme is assessed as having a potential beneficial effect on the environment in the long term.

11.28 The definitions of the significance criteria to be used are presented in Table 11.2. This provides details of how increases and decreases in the contamination risks identified are related to the significance criteria adopted. Potential effects that are determined as being ‘moderate’ or ‘major’ are classed as ‘significant’ effects. Where an effect is anticipated to be ‘neutral’ or ‘minor’, these effects are classed as ‘not significant’.

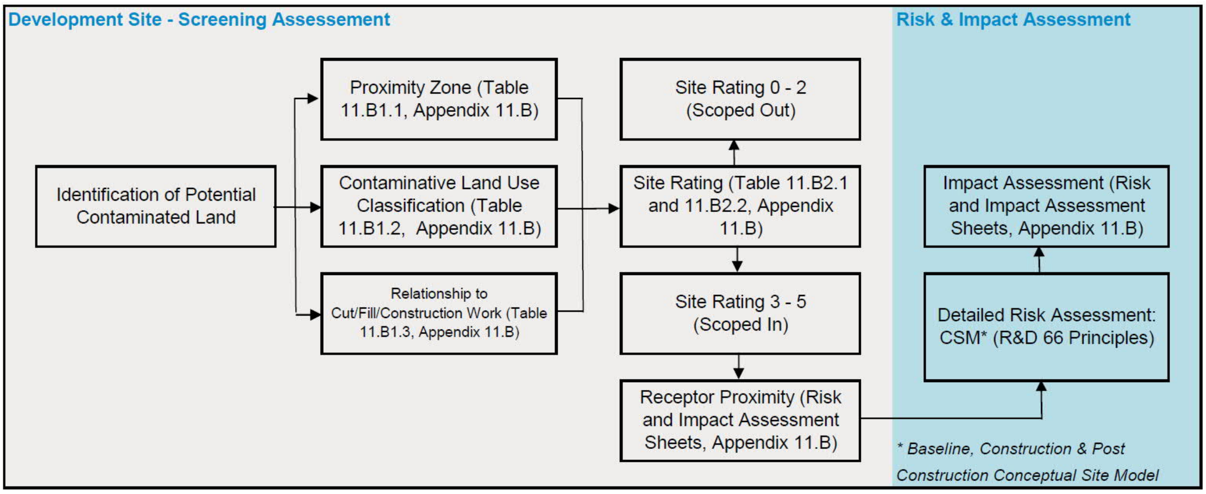
Table 11.2: Significance Criteria

Potential impact during construction	Importance of receptors
Major adverse effect	An increase in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. from land that has a very low contamination risk in the baseline becomes a high or very high risk
Moderate adverse effect	An increase in contamination risk of 2 or 3 risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk
Minor adverse effect	An increase in contamination risk of 1 risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate/low risk
Neutral effect	No change in contaminated land risks
Minor beneficial effect	A reduction in contamination risk of 1 risk level in the risk matrix, e.g. land that has a moderate/low contamination risk in the baseline becomes a low risk

Potential impact during construction	Importance of receptors
Moderate beneficial effect	A reduction in contamination risk of 2 or 3 risk levels in the risk matrix, e.g. land that has a high contamination risk in the baseline becomes a moderate/low or low risk
Major beneficial effect	A reduction in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk

11.29 A flow chart summarising the screening, risk and impact assessment steps is presented as Figure 11.2.

Figure 11.2: Summary of screening, risk and impact assessment steps



Assumptions & Limitations

11.30 The assessment undertaken for ground conditions has been based on the evaluation of available key documentation provided by the British Geological Survey (BGS), Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency, the Landmark Envirocheck GIS data, Natural England, Medway Council, and other data sources including the Environmental Liability Desk Study report. Unless stated otherwise, the data presented in other consultant's reports has not been independently verified.

11.31 Whilst some reference to land stability is included within the baseline conditions section, an engineering solution will be determined at detailed design phase, which will be signed off by the local planning authority.

11.32 It is assumed that a detailed Construction Environmental Management Plan (CEMP) will be secured by a condition as part of the outline planning permission. The CEMP will be prepared by the appointed Contractor for their part of the construction works. The CEMP will be developed in conjunction with stakeholders to ensure compliance with legislative and best practice requirements for construction phase mitigation methods and environmental requirements. The assessment has been undertaken on the assumption that a CEMP will be prepared and assumes such mitigation contained within it is in place.

Planning Policy & Applicable Legislation

Legislative Context

11.33 The following key legislation (UK Acts/ Regulations) is of direct relevance to the assessment of effects of the GB Onshore Scheme on, and to, ground conditions.

11.34 Current legislation relating to contaminated land in the UK is contained within Part 2A of The Environmental Protection Act (EPA) 1990, which was inserted by s57 of the Environment Act 1995 and by s86 of the Water Act 2003 and elaborated upon within the Contaminated Land (England) Regulations 2006 [S.I. 2006/1380] (amended 2012 [S.I. 2012/263]). Under Part 2A, sites are identified as 'contaminated land' if they are: causing significant harm, if there is a significant possibility of significant harm, or if the Project Area is causing, or could cause, significant pollution of controlled waters (i.e. both surface and groundwater).

The Water Act 2003[10]

11.35 The Water Act 2003 introduced a revision to the wording of the EPA, which requires that if a site is causing or could cause significant pollution of controlled waters, it may be determined as contaminated land. Once a site is determined to be contaminated land then remediation may be required to render significant pollutant linkages insignificant (i.e. the source-pathway-receptor relationships that are associated with significant harm to human health and/ or significant pollution of controlled waters), subject to a test of reasonableness.

The Water Resources Act 1991[11]

11.36 The Water Resources Act 1991 provides statutory protection for controlled waters (i.e. streams, rivers, canals, marine environment and groundwater) and makes it an offence to discharge to controlled waters without the permission or consent of the regulators of these areas.

The Building Act 1984 and the Building Regulations & c (Amendment) Regulations 201612

11.37 The Building Act 1984 and in particular the associated Building Regulations & c (Amendment) Regulations 2016 are key when considering structural and design aspects of a development in terms of the geotechnical properties of the ground. The Building Act 1984 requires that buildings are constructed so that ground movement caused by swelling, shrinkage, freezing, landslip or subsidence of the sub-soils will not impair the stability of any part of the building. Notably, the Building Regulations & c (Amendment) Regulations 2016 also control ground gas mitigation which is a particularly pertinent consideration when considering land contamination.

Other relevant legislation

11.38 Other legislation (EU Directives, followed by UK Acts then Regulations) of relevance to this topic, and not already outlined above, includes:

- The Water Framework Directive (2000/60/EC)[13;]
- The Groundwater Directive (2006/118/EC)[14;]
- The Environmental Quality Standards (EQS) Directive (2008/105/EC)[15;]
- The Environmental Liability Directive (2004/35/EC)[16];
- The Environment Act 1995[17];
- The Town and Country Planning Act 1990[18;]
- Environmental Permitting (England and Wales) Regulations 2016[19;]

[10] Her Majesty's Stationery Office (2003), The Water Act 2003.
[11] Her Majesty's Stationery Office (2009), The Water Resources Act 1991
[12] Her Majesty's Stationery Office (1984), The Building Act 1984; The Building Regulations & c (Amendment) Regulations 2016.
[13] EU (2000), The Water Framework Directive (2000/60/EC).
[14] EU (2006), The Groundwater Directive (2006/118/EC).
[15] EU (2008), The Environmental Quality Standards (EQS) Directive (2008/105/EC).
[16] EU (2004), The Environmental Liability Directive (2004/35/EC);
[17] Her Majesty's Stationery Office (1995), The Environment Act 1995;
[18] Her Majesty's Stationery Office (1990), Town and Country Planning Act 1990
[19] Her Majesty's Stationery Office (2016), The Environmental Permitting (England and Wales) Regulations 2016.

- Hazardous Waste (England and Wales) (Amendment) Regulations 2016[20];
- Contaminated Land (England) (Amendment) Regulations 2012[21];
- Environmental Damage (Prevention and Remediation) (England) Regulations 2015[22]; and
- Anti-Pollution Works Regulations 1999[23].

Planning Policy and Guidance

11.39 The following planning policy and guidance documents are of direct relevance to the assessment of effects of the GB Onshore Scheme on ground conditions.

National Planning Policy

11.40 National planning policy is established within the recently revised National Planning Policy Framework (NPPF)[24]. Relevant policy references/summaries are presented in Table 11.3.

Table 11.3: Revised National Planning Policy Framework (Department for Communities and Local Government (DCLG), 2018)

Policy reference	Summary
Paragraph 117	Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.
Paragraph 118 c)	Planning policies and decisions should give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.
Paragraph 170 a)	Planning policies and decisions should contribute to and enhance the natural and local environment by: …. protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan).
Paragraph 170 e)	Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.
Paragraph 170 f)	Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.
Paragraph 171	Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework…...
Paragraph 178 a)	Planning policies and decisions should ensure that: …a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation).

[20] Her Majesty's Stationery Office (2016), The Hazardous Waste (England and Wales) (Amendment) Regulations 2016.
[21] Her Majesty's Stationery Office (2012), Contaminated Land (England) (Amendment) Regulations, 2012.
[22] Her Majesty's Stationery Office (2015), Environmental Damage (Prevention and Remediation) (England) Regulations, 2015.
[23] Her Majesty's Stationery Office (1999), Anti-Pollution Works Regulations 1999.
[24] Her Majesty's Stationery Office (2019), National Planning Policy Framework, 2019.

Policy reference	Summary
Paragraph 178 b)	Planning policies and decisions should also ensure that after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.
Paragraph 178 c)	Planning policies and decisions should also ensure that… adequate site investigation information, prepared by a competent person, is presented.
Paragraph 179	Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.
Paragraph 180	Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.
Paragraph 183	The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

11.41 The NPPF Planning Practice Guidance sections on 'land affected by contamination' and 'land instability' have also been taken into account and provide further detail regarding the approach to assessing and managing land contamination and instability.

11.42 Other relevant policy/ guidance includes the Department of the Environment, Transport and the Regions guidance 'Soil Strategy for England'[25]. This sets out national objectives for the sustainable management of soil. The four key objectives detailed in that strategy, which have been taken into account in this assessment are:

- agricultural soils will be better managed and threats to them will be addressed;
- soils will play a greater role in the fight against climate change and in helping us manage our impacts;
- soils in urban areas will be valued during development and construction practices will ensure vital soil functions can be maintained; and
- pollution of our soils is prevented, and our historic legacy of contaminated land is being dealt with.

Local Planning Policy

11.43 Medway Council has a legal duty to prepare plans that cover the Medway area and to manage and regulate most forms of built development.

11.44 The Medway Local Plan 2003 was adopted and implemented on 14th May 2003, replacing the former Medway Towns Local Plan 1992 and the Medway Local Plan Deposit Version 1999. Policy S13 'Isle of Grain' and Policy BNE23 'Contaminated Land' are considered of particular relevance to the ground conditions topic.

11.45 Medway Council are currently working on a new Local Plan which will replace the 2003 Medway Local Plan and cover the period up to 2037. Subject to the outcomes of an independent examination by a planning inspector, the emerging Local Plan will be adopted in 2021.

Guidance/ Best Practice

11.46 The following includes a non-exhaustive list of additional guidance considered pertinent and applicable to the ground conditions topic:

[25] Department of the Environment, Transport and the Regions (2009), Soil Strategy for England, 2009.

- Contaminated Land Report (CLR11) Model Procedures for the Management of Land Contamination, 2004[26];
- CIRIA C665, assessing risks posed by hazardous ground gases to buildings, 2007[27];
- BS 10175 (2011 +A2 2017), Investigation of Potentially Contaminated Sites - Code of Practice[28];
- BS 8576 (2013), Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)[29];
- BS 8485 (2019), Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings[30]; and
- Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66[31].

[26] Environment Agency (2004), Contaminated Land Report (CLR11) Model Procedures for the Management of Land Contamination, 2004.
[27] CIRIA C665 (2007), Assessing risks posed by hazardous ground gases to buildings, 2007.
[28] British Standard BS 10175 (2011 +A1 2013), Investigation of Potentially Contaminated Sites - Code of Practice.
[29] British Standard BS 8576 (2013), Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs).
[30] British Standard BS 8485:2015 +A1:2019 (2019), Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
[31] National House Building Council, Environment Agency and Chartered Institute of Environmental Health (2008), Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66.

Baseline Conditions

Baseline Data Collection

11.47 Establishment of the baseline environment has involved reference to existing data sources and consultation with statutory bodies and other organisations. Information has been obtained from the following sources:

- BGS[32];
- DEFRA[33];
- Environment Agency[34];
- Landmark GIS Data[35];
- Natural England[36];
- Medway Council[37];
- GeoConservation website[38]; and
- Historical site investigation information pertinent to the ground conditions topic including any relevant information recorded in the Environmental Liability Desk Study.

Baseline conditions

11.48 This section focuses on the baseline conditions for the application boundary in its current condition and presents an overall CSM for the Project Area. Reference is therefore made to surface water, groundwater and sensitive sites such as ecological features which are also discussed in more detail in Chapter 9 (Water Resources & Flood Risk) and Chapter 6 (Ecology & Nature Conservation).

11.49 Various components of the GB Onshore Scheme are referenced in this section to help define the baseline conditions, these are further detailed in Chapter 3.

Ground Conditions

Geology

11.50 Data obtained from the BGS does not show the presence of artificial deposits, such as made ground or fill. However, Areas 1 and 2 surrounding Perry's Farm is an area of active landfill, albeit no longer receiving waste, with some areas having been returned to agricultural use and others never developed from agricultural use. Anecdotal information suggests this area to be historical landfill although a site inspection undertaken in May 2019 has not confirmed this to be the case and the area north of the main track appears to be former pits, some filled with water. Similarly, the land adjacent north of Area 1 is in an area containing former sand and gravel workings. Details provided by the Environment Agency at the time of submission indicate that the site has never been permanently capped.

11.51 Superficial geology is mapped to be River Terrace Deposits, comprising sand and gravel. In the western part of the proposed substation/ converter station area (Area 3), Head Deposits are indicated which comprise clay, silt, sand and gravel. There is mapped to be an area Alluvium to the north west of this. A sequence of Head Deposits, Alluvium and Tidal Flats deposits (clay, silt and sand) are present towards the coastline near to the landfall location of the DC cable route.

[32] British Geological Survey (BGS) (2019), https://www.bgs.ac.uk/.
[33] Department for Environment, Food and Rural Affairs (2019), https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs.
[34] Environment Agency (2019), https://www.gov.uk/government/organisations/environment-agency.
[35] Landmark Envirocheck Report (Order Number: 193022474_1_1, dated 5th February 2019).
[36] Natural England (2019), https://www.gov.uk/government/organisations/natural-england.
[37] Medway Council (2019), https://www.medway.gov.uk/.
[38] GeoConservation Kent (2019), https://www.geoconservationkent.org.uk/

11.52 Historical BGS borehole records indicate the depths of these deposits vary from approximately 4.7 m in the west of the Project Area to 1.9 m in the east of the Project Area. This is broadly consistent with records associated with the historical landfill sites where deposits are noted to be approximately 5 m thick in 'Area 1' (consisting of River Terrace sand and gravel deposits) and 2 m thick in 'Area 2' of the Project Area (consisting of gravelly clay). No records are held for the western side of the study area as this has not been subject to extraction or landfilling activities. It is understood from the Environmental Liability Desk Study that Area 1 has been restored to pre-extraction level through landfilling and Area 2 has not yet been in-filled or restored. In the land parcels north of West Lane, the River Terrace sand and gravel is reported by the Environmental Liability Desk Study to have been extracted down to the London Clay. It is understood from the Environmental Liability Desk Study that this area was not infilled with waste following extraction which is consistent with observations made during the aforementioned site inspection.

11.53 The superficial deposits at the Project Area are recorded to be underlain by the London Clay. This comprises blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt, plus sometimes silt and layers of sandy clay[32]. Based on historical documentation/ BGS borehole records presented in the Environmental Liability Desk Study, the London Clay has been encountered between 6.2 m above Ordnance Datum (AOD) (to the north western part of Perry's Farm land) and 8.8 m AOD (to the northwest of Perry's Farm land). No faulting is reported in the area of the study area by the BGS.

Hydrogeology

11.54 The London Clay bedrock is classified as Unproductive strata. These are defined as geological strata with low permeability with negligible significance for water supply or river base flow. The River Terrace Deposits are classified as a Secondary A aquifer and Head and Alluvium deposits are classified as a Secondary Undifferentiated Aquifer. These are defined as permeable strata capable of supporting water supplies at a local scale and, in places, form an important source of base flow to rivers.

11.55 The Project Area is not located within a Source Protection Zone (SPZ), and no SPZ are located within the extended study area.

11.56 According to information from the Environment Agency, excluding abstractions of less than twenty cubic metres a day (which do not require a licence), one abstraction license has been identified in the extended study area relating to two locations, denoted Points 'A' and 'B'. Points A and B of the abstraction licences fall within areas of apparent former mineral extraction near the Project Area approximately 190m to the northeast and 140m southwest of the DC cable route and approximately 170m and 200m from the landfall location respectively. This abstraction was granted to J Clubb on the 13th September 1993 for mineral washing. The source of supply is listed as 'River Gravel and ditch' and so it can be inferred from the record that the abstraction is at least in part from surface water, but it is unclear if this relates to both locations or just one with the other being sourced from groundwater via a borehole. Although there is no information indicating this licence has been cancelled or revoked, mineral extraction activities have now ceased in the areas surrounding the licence locations. Therefore, it is assumed that the abstraction is no longer active and as such does not represent a sensitive receptor.

11.57 The Environmental Liability Desk Study highlights that, groundwater in monitoring wells at the Perry's Farm land has been measured at between approximately 6 m AOD and 12 m AOD; it notes that, based on the geological information available , this places it within the River Terrace Deposits and that the inferred direction of groundwater flow is broadly to the northwest. More detail in relation to long-term groundwater monitoring data is provided in Section 3 of the Environmental Liability Desk Study.

Mineral Extraction

11.58 Parts of the study area contain former sand and gravel workings, some of which are now occupied by water bodies. These relate to open cast sand and gravel and open cast common clay and shale sites and further detail is provided within the Environmental Liability Desk Study report. However, the resources within the area of the proposed substation/ converter station are not deemed to be appropriate for commercial extraction based on previous studies as indicated within the Screening Report. The Project Area is not located within an area affected by underground mining.

Radon

11.59 The Project Area is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level) and is therefore not considered to be affected by Radon.

Coal Mining

11.60 The Project Area is not considered to be located in an area likely to be affected by coal mining.

Land Stability

11.61 Information contained within the Envirocheck data indicates that ground stability hazards may exist within the study area. These are presented in Table 11.4.

Table 11.4: BGS ground stability hazard potential

Hazard	Hazard potential
Shrinking or Swelling Clay	low to no hazard
Landslide	very low hazard
Ground Dissolution	no hazard
Compressible Ground	moderate to no hazard
Collapsible Ground	very low to no hazard
Running Sand	very low hazard

Soil Chemistry

11.62 Based on information indicated within the Envirocheck data, natural background concentrations for certain heavy metals are reported as follows for the area:

- arsenic (15 - 25mg/kg);
- cadmium (<1.8 mg/kg);
- chromium (60 - 120mg/kg);
- lead (<100mg/kg); and
- nickel (15 - 30mg/kg).

11.63 Information provided by the United Kingdom Soil Observatory (UKSO)[39] BGS broadly supports the above ranges.

Soil and groundwater contamination potential

General

11.64 This section discusses the hydrology, sensitive sites and regulatory/ third party data available from the baseline sources reviewed.

Hydrology

11.65 There are numerous surface water features present, both within the Onshore GB Scheme, and within the extended study area. The key features are listed below and further details are provided in Chapter 9 (Water Resources & Flood Risk):

- Thames Estuary, an Estuarine and Coastal Water Body under the Water Framework Directive (WFD) present to the east of the study area, at the landfall location.
- An elongated pond, approximately 260 m in length and orientated north west to south east along the access road to Perry's Farm, partially traversing the boundary of the proposed DC cable route,

[39] United Kingdom Soil Observatory (UKSO) (2019), http://mapapps2.bgs.ac.uk/ukso/home.html

- A large pond is present to the northeast of the Project Area boundary adjacent south of West Lane, indicated to be a fishing pond in the Environmental Liability Assessment.
- A water feature is present 135 m – 480 m to the east of the DC Cable Route, near the coast line, a pond connecting a series of small streams; and
- A network of creeks, streams or small rivers is present adjacent west of the Project Area boundary, including Hamshill Fleet approximately 370 m northwest.

11.66 According to information received from the Environment Agency, there are three Pollution Incident Register records within the study area, two within the application boundary, with the other located approximately 50 m north and associated with an existing pond area. These incidents relate to a 'Land Impact Category 2 Significant Incident' and 'Water Impact Category 2 Significant Incident' for one of the onsite Pollution Incidents and 'Water Impact Category 3 Minor Incident' for the remaining two. The on-site incidents occurred on the 19th September 2013 and 1st May 2018 associated with 'other' pollutants and landfill leachate, the offsite occurred on the 27th May 2014 from 'other' pollutants.

11.67 One discharge consent for domestic property (multiple, including farms) is indicated by the information provided by the Environment Agency. A second record is indicated a few meters away by the Envirocheck data; this is for the same property type and so is assumed to relate to the same discharge consent. The data from Envirocheck indicates this is relating to sewage discharges – final/ treated effluent to land/ soakaway.

11.68 As detailed in 'Baseline Conditions' section, only one abstraction license is recorded by the Environment Agency within the extended study area which, at least in part, appears to be from surface water. However, it is assumed that the abstraction is no longer active and as such does not represent a sensitive receptor.

Regulatory Data and Third-Party Information

11.69 A summary of the regulatory data as recorded by the Environment Agency, Landmark (in their Envirocheck data package) and the Environmental Liability Desk Study is presented in this Section as part of Tables 11.5 and 11.6. Where data appears to relate to similar information, records have been grouped based on professional judgment. Any relevant third-party information is also summarised.

Table 11.5: Summary of on-site Regulatory Data and Third-Party Information

Type	Comments	Location Details
Discharge Consents	No entries	
Pollution Incidents	Pollution incident – environmental impact – Land: Significant Incident (Cat 2); Water: Significant Incident (Cat 2). Incident date 01/05/2018 Pollution incident – environmental impact – Land: Significant Incident (Cat 2); Water: Minor Incident (Cat 3). Incident date 19/09/2013	In the northern part of Area 3 in Perry's Farm Land In the northern part of Area 3 in Perry's Farm Land
Integrated Pollution Prevention Controls	No entries	
Registered and Historical Landfill Sites	J Clubb Ltd, Perry's Farm. Medium input (between 25,000 and 75,000 tonnes per year). No known restriction on source of waste. Operational as far as is known (since 1996). Reference: P/03/34. In addition, there is a superseded record (from 1990) for this ref. stating large input (Equal to or greater than 75,000 and less than 250,000 tonnes per year), with no known restriction on source of waste.	Covering Areas 1 and 2 of Perry's Farm Land

Type	Comments	Location Details
	J Clubb Ltd, Whitehall Farm. Deposited waste included inert waste. First input 1983, last input 1993. References: EAHLD19253 & P/06/25, P/03/25, 21DP. Medium input (between 25,000 and 75,000 tonnes per year). No known restriction on source of waste. Licence lapsed/cancelled/defunct/not applicable/surrendered. It should be noted that the land owner has stated no knowledge of the area of Whitehall Farm being used for landfill.	Covering part of the DC Cable Route to the north-east of West Lane
Licensed Waste Management Facilities	J Clubb Limited (expired). Class: A4: Household, Commercial & Industrial Waste Landfill, ref. 19397. Issue date: 02/07/1990 J Clubb Limited (modified). Process: Inert Landfill. Issue date: 09/11/2005; modified date: 12/05/2010	Covering all of the Perry's Farm land, but likely to just be limited to Areas 1 and 2.
BGS Recorded Mineral Sites	Perry's Farm Quarry (dormant). Opencast, sand and gravel, ref 5882	Located within the route of the DC Cable in Area 2 of Perry's Farm land.
Hazardous Substances Consents	No entries	
Historical Tanks	No entries	
Trade Directory Entries	No entries	

Table 11.6: Summary of off-site Regulatory Data and Third-Party Information

Type	Comments	Location
Discharge Consents	Domestic Property (multiple) (incl. farm house) 1,2,3 and 4 High Grove, Sewage Discharges - Final/Treated Effluent - Not Water Company. Groundwater Via Standpipe & Soakaway. Ref: Npswqd005270	36 m east, on Highgrove off Grain Road
Pollution Incidents	Pollution incident – environmental impact – Land: Significant Incident (Cat 2); Water: Minor Incident (Cat 3). Incident date 27/05/2014	56 m north east of Site boundary in pond off West Lane
Integrated Pollution Prevention Controls	Two entries for J Clubb Limited, ref. BP3335SR, effective date 31/03/2008 and YP3733MV (both listed as revoked)	52 m east, located at Perry's Farm buildings.
Historical Landfill Sites	Indicated on-site landfill that extends beyond the application boundary	
Licensed Waste Management Facilities	Indicated on-site waste management facility that extends beyond the application boundary boundary	
BGS Recorded Mineral Sites	Perry's Farm sand and gravel Quarry. Status: ceased. Type: open cast. Ref: 50748	173 m west of DC Cable Route boundary, near West Lane
	2 entries: Rose Court Farm sand and gravel Status: ceased. Type: open cast. Ref:50746	140 m – 150 m east and west of DC Cable Route.
	Whitehall Farm Quarry, common clay and shale. Status: active. Type: open cast. Ref: 2502.	95 m west of DC Cable Route.
Hazardous Substances Consents	Perry's Farm, storage of unknown hazardous substances (status unknown). Reference MC2007/2081, dated 21/12/2007	124 m east, located at Perry's Farm buildings.
Historical Tanks	Historical tank entries within oil refinery land (various dates: 1968, 1969, 1983)	240 m southeast historical tank entries within oil refinery land 375 m south of Perry's Farm: historical

Type	Comments	Location
		tanks point classed as electrical substation facilities (1987)
Trade Directory Entries	J Clubb Ltd. Office - sand, gravel and other aggregates (inactive)	35 m east of the DC cable rout boundary

Sensitive sites

11.70 North Kent Marshes Environmentally Sensitive Area (ESA) borders the north-western boundary of the substation/ converter station area.

11.71 Thames Estuary & Marshes Special Protection Area (SPA) and RAMSAR sites border the northeast shoreline and then extends westwards, situated approximately 150 m north of the northern edge of the Project Area. The Thames Estuary and Marshes SSSI covers the same area, with the addition of a designated area within St James Park 590 m east of the Project Area boundary.

11.72 Medway Estuary Marine Nature Reserve (MNR) borders the northeast shoreline and falls within the Project Area boundary of the DC Cable Route at the Landfall Area.

Land Use Summary

11.73 Current Ordnance Survey (OS) Mapping[40], aerial imagery[41], and data from Landmark have been reviewed to identify the present land uses within the study area.

Current/ Recent land use

11.74 Part of the Project Area forms the Perry's Farm landfill (Area 1 and Area 2), the associated permit is still operational, although the landfill is not currently receiving waste. Some areas have been returned to agricultural use, and others never developed from agricultural use.

11.75 Leachate breakthrough at the surface has been recorded, and this occurs to the east of the Perry's Farm building, which is off Project Area, but forms part of the Perry's Farm landfill. Measures have been implemented (drainage and siltbuster) to address leachate. The Project Area is also partially in use as agricultural land.

11.76 Other potentially contaminative current/recent land uses identified off site, but within the study area, include Perry Farm and two other small farms (and associated buildings), a fire station and an air conditioning and refrigeration contractors.

Historical land use

11.77 The Perry's Farm land parcel was acquired by J Clubb in the late 1980s. Prior to this it is indicated to have comprised agricultural land. Planning permission for aggregate extraction and backfilling with waste was granted in 1990 by Kent County Council (KCC), and the site was licensed to accept cement precipitator waste until 1999. Detail from the land owner indicates that the area of landfilling on Perry's Farm had been split into two cells and does not cover the whole of the licenced area. These cells are hereafter referred to as 'Area A' (within Area 1) and 'Area B' (within Area 2). Area A has been subject to the historical deposition of Cement Kiln Dust (CKD), a hazardous waste. Area B has been restricted to receiving inert waste only.

11.78 The land adjacent to the north east of Perry's Farm is indicated to have comprised mostly agricultural land, with a military installation present along the shoreline in 1940, No records of this are held by the DIO based on the engagement undertaken. From 1997 planning permission was granted for sand and gravel extraction in this area. Washing plant was reported within this area during the extraction of aggregate at the sand and gravel workings at the Perry's Farm land. Material is understood to have been transferred to the washing plant via a conveyor located along the eastern edge of the Perry's Farm workings. Areas of historic landfill are also indicated within the Envirocheck data, known as Whitehall Farm Landfill, however the land owner indicated no knowledge of landfilling occurring within this area.

[40] Ordnance Survey (2019), https://osmaps.ordnancesurvey.co.uk
[41] Google Earth (2019), www.google.com/maps.

11.79 In addition to the former Perry's Farm Landfill, the potentially infilled land and former military land to the north and the disused oil pipeline running through Area 3 of Perry's Farm, other potentially contaminative historical land uses identified within the study area include the Kent Oil Refinery and several former ponds (assumed infilled/ partially infilled). Th Environment Agency information provided indicated that gas related activity land and import terminals have superseded Oil refinery since 1980s and that the area may have been assessed and remediated by National Grid.

Conceptual site model (CSM)

11.80 To determine potential contaminant linkages, a CSM has been developed. The topography, geology, hydrogeology and hydrology are the main factors that influence the way in which potential contaminants in the soil or groundwater can be transported on or off the Project Area, and the ways in which contamination can affect different receptors. Potential receptors are summarised initially in this section. Potential sources and pathways linking any sources to the defined receptors are then identified.

Receptors

11.81 Receptors have been identified based on the proposed future land use as well as the environmental setting and sensitivity of the Project Area and study area. Table 11.7 presents the sensitive receptors identified that have been considered within the assessment. Figure 11.3a, 11.3b and 11.3c depict controlled waters, sensitive sites and human health receptors respectively within the study area and extended study area as appropriate.

Table 11.7: Summary of receptors

Receptor type	Receptor description		Receptor Sensitivity
Human Health	Future construction and maintenance workers;		High
Human Health	Future site users (employees at the converter station and substation, agricultural workers, landfill management operatives)		Moderate
Human Health	Current site users (e.g. agricultural workers, landfill management operatives)		Moderate
Human Health	Off-site residents and workers in Isle of Grain village, nearby farms and industrial areas to the south of the Project Area		Moderate
Property	Existing or future buildings and structures		Low
Property	Proposed interconnector cable and associated infrastructure		Low
Property	Other buried services or conduits		Low
Property	Crops and livestock on the reclaimed landfill or on neighbouring land or land returned to direct/indirect public use (where uncontrolled access).		Low
Controlled Waters	Surface Water	Ponds and connecting streams 140m east	Moderate
Controlled Waters	Surface Water	Elongated pong between Perry's Farm's areas 1 and 2	High

Receptor type	Receptor description		Receptor Sensitivity
		Fishing Pond south of West Lane	Hight
		Network of creeks, streams and rivers including Hamshill Fleet to the northwest	Moderate
		Thames Estuary and coastal water body	Moderate
	The River Terrace Deposits (where not extracted) are classified as a Secondary A aquifer. Other superficial deposits including the Head and Alluvium classed as Secondary Undifferentiated Aquifer.		Low/Moderate
Sensitive Sites	Thames Estuary to the northeast and north (SSSI, SPA, RAMSAR);		High
	North Kent Marshes to the west (SSSI, SPA, RAMSAR, ESA);		High
	Medway Estuary Marine Nature Reserve (MNR) to the northeast; and		Moderate
	Medway Estuary and Marshes to the east (SSSI)		High

Potential sources of contamination

11.82 A summary of the potential sources of land contamination within the study area identified following the baseline review is presented in this section with those sites identified within 250 m of the Project Area summarised in Table 11.8.

Table 11.8: Summary of potential sources of land contamination within the application boundary and within the study area

Land uses within the application boundary	Land Uses outside the application boundary
• Current undeveloped land / former Perry's Farm Landfill and buried disused oil pipeline (CL05)	• Current residential land use / former Perry's Farm (including current storage of farm activity related materials) (CL01)
• Current undeveloped land / former mineral workings and historical landfills (assumed potentially infilled) (CL11)	• Current Farm (CL02)
• Buried disused oil pipeline (CL12)	• Current Farm (CL03)
	• Current Fire Station (CL04)
	• Current undeveloped land / former military land use (CL06)
	• Current unoccupied land / former Kent Oil Refinery (CL07)
	• Current undeveloped land/ former pond (assumed infilled) (CL08)

	• Current pond / former pond (assumed infilled) (CL09)
	• Current undeveloped land / former pond (assumed infilled) (CL10)

Potential Pathways

11.83 Potential pathways associated with the application boundary have been identified as the following:

Human Health

- Ingress of ground gas or vapour into buildings. Inhalation of VOC or ground gas;
- Ingestion of, inhalation of and dermal contact with soil particulates;
- Dermal contact with or ingestion of leachate following uncontrolled discharge at the landfill surface;
- Permeation of plastic potable water supply pipes by VOC or hydrocarbons.

Property (including buried infrastructure)

- Ingress of ground gas or vapour into buildings or service conduits;
- Direct contact with chemicals of potential concern (COPC) in soil, groundwater or contact with leachate (including CKD, a hazardous waste);
- Ingestion/ uptake by crops and livestock.

Controlled Waters

- Partitioning/ leaching of COPC from soil into pore water;
- Migration of COPC in recharge to groundwater in the River Terrace Deposit or other superficial deposits;
- Lateral migration of COPC in shallow groundwater present in the River Terrace Deposits or other superficial deposits with discharge as basal flow into surface water receptors;
- Overland flow into surface water features and shallow groundwater arising from uncontrolled leachate discharge at the landfill surface.

Sensitive Sites

- Lateral migration of COPC in shallow groundwater present in the River Terrace Deposits or other superficial deposits with discharge as basal flow into protected areas (e.g. SSSI);
- Overland flow into protected areas, arising from uncontrolled leachate discharge at the landfill surface.

Conceptual site model summary

11.84 A review of the baseline conditions indicates that there is generally a moderate/ high potential for ground contamination to exist associated with the site which is primarily driven by the onsite landfill presence and known leachate breaches from the landfill. In addition, there are potentially contaminated sites located in the study area that could interact with the site including military land, farms, landfill, former mineral extraction workings, and infilled ponds and pits. Based on the CSM, potential contaminant linkages have been identified and these are discussed in Appendix 11.B.

Future Baseline

11.85 The potential for the baseline ground conditions to change in the lead up to the construction of the GB Onshore Scheme is limited to the extent to which any new development necessitates remediation or mitigation measures to control potential contamination releases. Should there be any new development in the study area on potentially contaminated land, it would need to be suitable for its intended use as set out in the NPPF. To meet this requirement new development sites may require remediation to be undertaken. This would mean that some areas described as having potentially contaminative current and/or historical land use, may no longer be of significance at the time of construction of the GB Onshore Scheme.

11.86 The potential for the baseline conditions to change would also depend on whether any land has been classified as contaminated land by the Local Authority (Medway Council) under Part 2A of the Environmental Protection Act 1990. A number of mechanisms drive these determinations therefore they are difficult to predict. Where Part 2A determinations are made, the potential baseline change would occur where remediation works are subsequently undertaken.

11.87 The Cumulative Impacts section of this Chapter outlines that, with the exception of those related to the Proposed Scheme, there is only one committed development within the study area. Based on the available information, it is not considered that the future baseline will be materially different to that outlined in this section.

Potential Impacts

Proposed Converter Station & Substation

Temporary Impacts

11.88 A number of activities will occur at the Project Area during the construction phase that have the potential to interact with the underlying ground conditions. These are considered to include, but may not be limited to, the following:

- Soil stripping;
- Cut and fill earthworks;
- Excavations for foundations and ground works for the proposed substation, converter station and cable sealing end compound, drainage, utilities and AC cable;
- Dewatering of excavations;
- Excavated materials management and soil storage; and
- Establishment of temporary construction compounds and the storage of hazardous materials within them for use in construction e.g. fuels and oils.

11.89 There will be two temporary construction compounds including laydown areas and storage areas near the proposed substation/ converter station these will be located to the south and west of the proposed converter station. An access road will serve the proposed features entering from the south east from the B2001/ Grain Road.

Ground Conditions

Materials Management

11.90 The scope of the works within the proposed substation/ converter station area of the Project Area includes for preliminary works, site establishment, and earthworks. This will include land re-profiling in order to establish a level platform on which the proposed converter station will be constructed. Other civil engineering works and construction works will include construction of building foundations.

11.91 There is expected to be a surplus of excavated materials following the cut and fill earthworks to create the development platform. These materials will either need to be managed on site, managed off site or disposed of off-site.

Aquifer Permeability

11.92 Re-profiling of the site may increase the landform height in some areas, which may result in increased loading and localised decreased permeability of the underlying ground conditions. Any ground improvement adopted to support a shallow foundation solution for the proposed substation/ converter station area or associated with any connection works for the AC cable may also have this effect, although it is acknowledged that a piling solution may be more likely given the high anticipated loadings associated with the substation/ converter station. However, as detailed previously there is only one abstraction licence within the extended study area, this is located in an area of apparent inactive mineral workings and so it is considered that there are no sensitive water abstractions that could be affected by a localised reduction in permeability.

Dewatering and Drainage

11.93 Dewatering of excavations may be required which will generate a quantity of groundwater that will need to be managed and discharged appropriately from the Project Area. An abstraction licence is required when extracting more than twenty cubic metres a day. Where discharges from site are uncontrolled this could result in pollution of the receiving waters, which may impact on surface water quality. If too much water is discharged, or the discharge rate is too high in the absence of sufficient controls, the capacity of the receiving surface water environment could be exceeded which may cause flooding off site in the wider area. The discharge of groundwater will require an environmental permit from the Environment Agency.

11.94 As detailed in the ground conditions baseline conditions section there is only one abstraction license within the extended study area, this is located in an area of apparent inactive mineral workings and so it is considered that there are no sensitive water abstractions that could be affected by dewatering activities and it is expected that discharges will be required to be managed in accordance with permitting and dewatering requirements.

11.95 It is anticipated that land drains will be present in agricultural land within the study area and the potential exists for these to be temporarily severed as a result of earthworks or foundation excavations for the proposed substation/ converter station and associated AC cable.

11.96 Potential impacts to groundwater quality from construction activities are considered below.

Soil and Groundwater Contamination

Human Health – Construction Workers

11.97 The handling of excavated soils, construction materials and the use of construction machinery all include the potential to introduce hazardous materials and potential impacts to construction workers. Construction workers have the potential to come into contact with fuels and other chemicals during construction activities, posing a potential risk to human health through dermal contact, ingestion and inhalation.

11.98 Prior to construction activities taking place it is contingent on the appointed Contractor that risk assessments will be undertaken in full accordance with the Health and Safety at Work Act[42] to restrict and manage any potential exposure to harmful substances. Potential impacts specific to construction workers are expected to be mitigated by the specification and implementation of appropriate Personal Protective Equipment (PPE) and site controls which will be managed through the CEMP (which will be prepared prior to the commencement of construction activities and signed off by Medway Council), as well as procedures in accordance with the Principal Contractor's Construction Phase Plan, as required under the Construction Design and Management (CDM) Regulations 2015[43].

Human Health – Neighbouring Site Users, Occupiers and the General Public

11.99 Neighbouring site users, occupiers and the general public immediately adjacent to, or in proximity to the proposed construction activities, could be impacted upon. Contaminated soils encountered during earthworks including the creation of stockpiled materials, may be exposed to wind and rain which may increase dispersal through the spread of soil dust in air and/ or soil in uncontrolled water run-off, in the absence of mitigation.

11.100 It is possible that construction works could introduce contaminants into the environment through accidental release or unexpected contamination may also be uncovered. In the event that soil derived dusts and/ or run-off do migrate to affect neighbouring properties and their occupants, this would be a short-term impact.

Controlled Waters

11.101 Hazardous materials will be introduced and stored on-site during construction, in the form of diesel fuel, oils, chemicals and solvents, as well as construction materials such as cement and bentonite. Chemicals and solvents might include detergents, degreasers, paints, thinners, firefighting fluids, resins and glues. Improper handling and use of hazardous materials has the potential to introduce contaminants into underlying soils and groundwater which may in turn result in impacts to surface water courses through groundwater migration or uncontrolled run off. Leakages/ spillages from materials and fuel storage areas or from the incorrect disposal of waste/ surplus material, could also impact on the underlying ground and hydrogeological conditions which would affect the groundwater resource potential.

11.102 The increased use of water during construction works, e.g. for dust suppression, wheel washing, drilling or dewatering may lead to increased potential for contaminated water to be

[42] The Health and Safety Commission and the Health and Safety Executive, (1974), Health and Safety at Work etc. Act
[43] Health and Safety Executive, (2015), Managing Health and Safety in Construction: Construction (Design and Management) Regulations

generated and increased surface water run-off. This poses a risk to the underlying aquifers and to nearby surface water features that may interact with groundwater.

Sensitive Sites

11.103 Sensitive sites in proximity to the proposed construction activities, could be impacted upon. Contaminated soils encountered during earthworks including the creation of stockpiled materials, may be exposed to wind and rain which may increase dispersal through the spread of soil dust in air and/ or soil in uncontrolled water run-off, in the absence of mitigation.

Longer Term, Operational and Permanent Impacts

Ground Conditions

11.104 There are not expected to be any longer term, operational or permanent impacts on ground conditions resulting from the operation of the proposed substation/ converter station or proposed ancillary infrastructure.

11.105 In view of appropriate drainage solutions being implemented, no potential longer term, operational or permanent impacts on hydrogeological conditions associated within the proposed substation/ converter station and ancillary infrastructure have been identified.

Soil and Groundwater Contamination

11.106 During the operation of the proposed substation/ converter station minor quantities of fuels and other chemicals may be stored and used in association.

11.107 In the event of an uncontrolled release of such fuels or other chemicals, either from storage areas or during handling, contamination of the ground may occur. The magnitude of impact will depend on the type of material released, as well as the quantity and timing of the release and the sensitivity of the receiving environment. The nearest receptors will be direct employees involved with dealing with the uncontrolled release, groundwater contained within the underlying aquifer and the nearby surface water features. The greatest potential effects would arise from large-scale, uncontained releases of materials, which have a high environmental toxicity and which are resistant to degradation (such as diesel oil).

Human Health – Future Employees and Site Maintenance Workers

11.108 Ground cover within the proposed substation/ converter station area will comprise predominantly hardstanding or gravel surfacing. In the event of an uncontrolled release, the potential exists for personnel in the proposed substation/ converter station area to be exposed to potentially hazardous materials through dermal contact, ingestion and/or inhalation pathways.

Controlled Waters

11.109 Within the proposed substation/ converter station area, operations will be contained with no uncontrolled discharges to land, surface water or groundwater. Chemical substances and hazardous materials should be stored in accordance with Environment Agency guidance and applicable storage regulations and it is assumed that accredited operational and environmental management standards will be employed for activities undertaken during the operational stage.

11.110 The foundations associated with the proposed substation/ converter station may provide a preferential pathway for contaminants to migrate to non-contaminated soils and subsequently into groundwater throughout the operational period. However, any contamination encountered during construction would be expected to be removed, treated and/or mitigated as part of the construction process.

Property – Proposed Buildings and Below Ground Infrastructure

11.111 Certain organic contaminants in soil or groundwater (hydrocarbons and solvents) can permeate through or corrode pipe work and possibly contaminate water supplies. Plastic water supply pipes can be at risk of attack from oils and phenols. Additionally, concrete infrastructure can be subject to attack from acids and high sulphate concentrations in soils.

Sensitive Sites

11.112 Ground cover within the proposed substation/ converter station area will comprise predominantly hardstanding or gravel surfacing. In the event of an uncontrolled release, the potential exists for sensitive sites in the vicinity of proposed substation/ converter station area to be exposed to potentially hazardous materials through dust migration or surface run off pathways.

Decommissioning Impacts

11.113 Decommissioning impacts are assumed to be similar to, but no worse than, the temporary impacts defined in the assessment of construction impacts on the basis of the similar nature of activities envisaged during construction and decommissioning.

Proposed DC Cable Route

Temporary Impacts

11.114 A number of activities will occur at the site during the construction phase that have the potential to interact with the underlying ground conditions. These have been identified as:

- Topsoil and subsoil stripping;
- Excavations for proposed DC cable route using trenching and trenchless cable installation techniques;
- Laying of DC cable using alternative methods, such as laying the cable in surface troughs and covering or capping
- Dewatering of excavations;
- Installation of pre and post construction drainage;
- Excavated materials management and soil storage;
- Imported material for backfill of excavations; and
- Establishment of temporary construction compounds and the storage of hazardous materials within them for use in construction, e.g. fuels and oils.

Ground Conditions

Materials Management

11.115 Inappropriate materials management could have adverse potential impacts on the GB Onshore Scheme. Associated potential impacts may relate to the creation/re-use of waste, suitability for use (both chemically and geotechnically) and quantities used for example. The construction of the proposed DC cable route, where in open cut, will require a single trench accommodating two DC cables as well as up to four cable conduits or ducts to allow for other cables to be installed with minimal impact. Open cut installation will be adopted wherever feasible, but it is envisaged that the application of trenchless installation techniques (e.g. horizontal directional drilling (HDD)) will be required in some locations, particularly at the landfall area. Alternative methods are available, such as laying the cable in surface troughs and covering or capping these, which has the benefit of not disturbing any areas of historical landfill.

Dewatering and Drainage

11.116 Dewatering of excavations is expected to be required which will generate a quantity of groundwater that will need to be managed and discharged appropriately from the site. An abstraction licence from the Environment Agency is required when extracting more than twenty cubic metres a day. Where discharges from site are uncontrolled this could result in pollution of the receiving waters, which may impact on surface water quality. If too much water is discharged, or the discharge rate is too high in the absence of sufficient controls, the capacity of the receiving surface water environment could be exceeded which may cause flooding off site in the wider area. The discharge of groundwater will require an environmental permit from the Environment Agency as well as consent from the Internal Drainage Board (IDB) where discharging to an IDB maintained water course or drain.

11.117 As detailed previously there is only one abstraction license within the extended study area, this is located in an area of apparent inactive mineral workings and so it is considered that there are no sensitive water abstractions that could be impacted from dewatering activities and it is expected that discharges will be required to be managed in accordance with permitting and dewatering requirements.

11.118 It is anticipated that land drains will be present in any areas of agricultural land within the study area and the potential exists for these to be temporarily severed as a result of open cut trench excavations for the proposed DC cable route (most notably in the far southern extent where it enters the western part of the Perry's Farm land parcel (Area 3)). This could impact on local near surface ground conditions by reduced drainage and increased water retention if not re-instated during construction.

Soil and Groundwater Contamination

Human Health – Construction Workers

11.119 The handling of excavated soils, construction materials and the use of construction machinery all include the potential to introduce hazardous materials and potential impacts to construction workers. Construction workers have the potential to come into contact with fuels and other chemicals during construction activities, posing a potential risk to human health through dermal contact, ingestion and inhalation.

11.120 Prior to construction activities taking place it is contingent on the appointed Contractor that risk assessments will be undertaken in full accordance with the Health and Safety at Work Act to restrict and manage any potential exposure to harmful substances. Potential impacts specific to construction workers are expected to be mitigated by the specification and implementation of appropriate Personal Protective Equipment (PPE) and site controls which will be managed through the CEMP, which will be prepared prior to the commencement of construction activities and signed off by Medway Council, as well as procedures in accordance with the Principal Contractor's Construction Phase Plan, as required under the Construction Design and Management (CDM) Regulations 2015.

Human Health – Neighbouring Site Users, Occupiers and the General Public

11.121 Neighbouring site users, occupiers and the general public immediately adjacent to, or in proximity to the proposed construction activities could be impacted upon by construction activities. Contaminated soils encountered during earthworks including the creation of stockpiled materials, potentially may be exposed to wind and rain which may increase dispersal through the spread of soil dust in air and/ or soil in uncontrolled run off, in the absence of mitigation.

11.122 It is possible that construction works could introduce contaminants into the environment through accidental release or unexpected contamination may also be uncovered. In the event that soil derived dusts and/ or run-off do migrate to affect neighbouring properties and their occupants, this would be a short-term impact.

Groundwater and Surface Water

11.123 The increased use of water during construction works, e.g. for dust suppression, wheel washing or dewatering may lead to increased potential for contaminated water to be generated and in turn increased surface water run-off. This poses a risk to the underlying aquifers and to nearby surface water features that may interact with groundwater.

11.124 Where trenchless techniques are undertaken, potential impacts may arise through the inaccurate design depth, whereby excavations or drilling may create pathways for drilling fluids, or other fluids used during construction, to reach groundwater receptors. Where crossing water courses or drains, and where using HDD, drilling too shallow could create a contamination pathway to sensitive surface water receptors, should a break out of drilling fluids, or other fluids used during construction, occur through the bed of the overlying watercourse. This is of particular relevance when working within loose granular deposits, such as those that may be encountered at the landfall location as part of the Tidal Flat deposits. Aside from the intertidal area, the only surface water features likely to be traversed by the proposed DC cable route will be the drain from the leachate system (typically following the proposed DC cable route north of West Lane), the elongated pond (located along the access track to Perry's Farm) and an unnamed drain at the southern extent of the proposed DC cable route.

Longer Term, Operational and Permanent Impacts

Ground Conditions

11.125 There are not expected to be any longer term operational or permanent impacts on ground conditions resulting from the operation of the proposed DC cable route. On completion, there will be limited permanent above ground infrastructure with the exception of cable marker posts at locations along the route and it is planned to restore the land and features that have been affected by the construction works to a condition suitable for its original use/ function.

11.126 In view of appropriate drainage solutions being implemented, no potential longer term, operational or permanent impacts on hydrogeological conditions associated within the proposed DC Cable Route have been identified.

Soil and Groundwater Contamination

11.127 There are not expected to be any operational risks from contaminated soil and groundwater to, or from, the proposed DC cable route. This is because, once constructed the cable would not represent a potential source of contamination and it will be designed for the ground conditions into which it is constructed.

Decommissioning Impacts

11.128 Decommissioning impacts are assumed to be similar to, but no worse than, the temporary impacts defined in the assessment of construction impacts on the basis of the similar nature of activities envisaged during construction and decommissioning.

Mitigation

Design Mitigation

General

11.129 This section outlines the design mitigation associated with the GB Onshore Scheme with respect to the ground conditions topic. As design mitigation is by its nature applied by default as part of the design, the associated mitigation will be secured by planning condition as part of the outline planning consent.

Substation/ Converter Station

General

11.130 Mitigation by design has been a consideration since the early optioneering stages. Opportunities have been taken, where possible, to avoid potential ground constraints and in particular any areas of landfilling or potentially infilled ground in relation to the site selection for the proposed substation/ converter station and associated infrastructure. As the AC cable route will be sited in the immediate vicinity of the proposed substation/ converter station, no additional ground disturbance is envisaged as part of accommodating the AC cables.

11.131 Chemical substances and hazardous materials will be stored in accordance with Environment Agency Pollution Prevention Guidance (withdrawn but widely considered good practice)[44] and applicable storage regulations and accredited operational and environmental management standards will be employed for these activities.

11.132 A ground investigation is in the process of being undertaken as part of design development. The outcomes of these further studies will inform the final adopted foundation solutions, the cut/ fill extents, dewatering strategies, the extent to which excavation support is required and also the extent to which ground gas mitigation is required.

11.133 Materials used in buildings and infrastructure will be specified accordingly, taking due account of the ground conditions such as elevated sulphate or ground gases. The assessment methodology set out in BRE Special Digest 1 (2005)[45] will be adopted to determine the appropriate concrete classification.

11.134 Ground gas assessment and mitigation will be undertaken and implemented in accordance with BS 8485 (2015)[46] and CIRIA guidance document C665 (2007)[47] based on the findings from the ground investigation and subsequent monitoring.

11.135 Mitigating controls that will be adopted during construction that influence how construction interacts with the ground conditions are set out later in this section.

Proposed DC Cable Route

11.136 Mitigation by design has been a consideration since the early routeing and optioneering stages. Opportunities have been taken, where possible, to avoid potential ground constraints and in particular any areas of landfilling or potentially infilled ground. In addition, the Limits of Deviation (LoD) approach allows for cable routeing refinement to take place once detailed design and additional survey data has been collected, which will provide flexibility to reduce construction and operation impacts as the detailed design stage develops.

11.137 The preferred method for installation of the proposed underground DC cable will be by open cut methods with the cables laid in trenches or within buried ducts (subject to the ground conditions and cable specifications). However alternative methods are available, such as laying the cable in surface troughs and covering or capping these; this has the benefit of not disturbing any areas of historical landfill

[44] Environment Agency Pollution Prevention Guidance 1 to 28 (withdrawn 2015
[45] Building Research Establishment (BRE) SD1, (2005), Concrete in Aggressive Ground;
[46] British Standards Institute BS 8485, (2015), Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
[47] CIRIA, (2007), CIRIA Guidance C665. Assessing risks posed by hazardous ground gases to buildings

11.138 The Proposed scheme routes the DC cable along an area of hardstanding to the east of the Perry's Farm Landfill capping, in turn avoiding any significant disturbance/ interaction with the underlying landfill materials,

11.139 As detailed in the 'Mitigation' section, alternative methods of cable installation are available, such as laying the cable in surface troughs and covering or capping these; this has the benefit of not disturbing any areas of historic landfill which is particularly relevant to the proposed DC cable route.

11.140 A ground investigation will be undertaken as part of design development. This information will inform how the proposed DC cable route will be constructed and the extent to which excavation support and dewatering may be required. It will also be used to confirm the depth that the proposed DC cables will be placed taking due account of any minimum vertical clearances specified by affected asset owners (e.g. the IDB and the presence of watercourses and land drains). It is assumed that where excavation support is deemed to be necessary, as defined by prior ground investigation, this will be adopted during construction.

11.141 There is always the potential for unexpected soil and/ or groundwater to be encountered, which recognises the inherent limitations of ground investigation compared to the extent of excavation works that will be required to be undertaken during construction. Mitigating controls that will be adopted during construction that influence how construction interacts with the ground conditions, are set out in the remainder of this section.

Construction Mitigation

Legislation and Regulation

11.142 A significant amount of legislation bears relevance to construction work and its actual and potential interactions with ground conditions. A CEMP will be developed and secured by planning condition that will contain measures to ensure compliance with relevant standards and legislation. The CEMP will set out the environmental mitigation requirements and also the project level expectations on how the proposed substation, converter station, AC/ DC cable routes and ancillary infrastructure will be constructed.

Ground Stability

11.143 There may be a requirement to provide temporary support for excavations. Such support may include benching of excavations, shoring or the construction of retaining walls (e.g. sheet piles) or struts to mitigate the risk associated with settlement or excessive spalling. It is expected that the need for such control would be established during detailed design and where specified and implemented correctly, would be sufficient to mitigate any residual effects.

Soil and Groundwater Pollution Control Mitigation

11.144 Measures contained within the CEMP would be designed to limit the potential for dispersal and accidental releases of potential contaminants, soil-derived dusts and uncontrolled run-off to occur during construction. For example, the CEMP will set out how material is to be excavated and stockpiled to minimise the potential for run-off, soil degradation or wind dispersal of dusts. The use of biodegradable netting and the binding of the surface through temporary grass seeding will be specified together with dampening procedures during dry weather. Sheeting may be used if any material is identified to be hazardous with a view to limiting water ingress and potential leachate generation. Soil storage and handling areas will be defined prior to construction commencing. In the event of uncontrolled releases occurring, the CEMP and the Contractor's own method statements contained in their Construction Phase Plan (CPP) will also set out the measures required to ensure that the extent and impact of any such releases are contained and ultimately remediated.

11.145 A Pollution Response Plan will be in place prior to the commencement of construction works. The plan will outline key pollution mitigation measures to be adopted including a Control of Substances Hazardous to Health (COSHH)/ fuel inventory and key contacts to be notified in the event of a significant pollution incident, which may subsequently lead to the contamination of controlled waters or soils. All bulk fuel and COSHH items will be stored in accordance with the relevant Environment Agency Pollution Prevention Guidance notes40 (withdrawn but widely considered good practice) and storage regulations. Tanks and dispensing pumps will be locked when not in use to prevent unauthorised access.

11.146 Any hazardous materials will be stored in designated locations with specific measures to prevent leakage and the release of their contents. This will include a requirement to position storage areas at least 10 m away from surface water features/ drains (and take into consideration the positions of any groundwater abstraction wells), on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain at least 110% of the contents. Valves and trigger guns will be protected from vandalism and kept locked when not in use.

11.147 Only well-maintained plant will be used during construction to minimise the potential for accidental pollution from leaking machinery or damaged equipment. Static machinery and plant are expected to be stored in hardstanding areas when not in use and, where necessary, to make use of drip trays beneath oil tanks/ engines/ gearboxes/ hydraulics. Spill response kits containing equipment that is appropriate to the types and quantities of materials being used and stored during construction will be maintained on Project Area for the duration of the works.

11.148 The CEMP will set out procedures for dealing with unexpected soil or groundwater contamination that may be encountered. This would typically require affected works to stop to enable appropriate people to be notified, and further characterisation and risk assessment to be undertaken, before remediation or mitigation proposals are agreed with all required stakeholders.

11.149 Potential exposure impacts specific to construction workers during site preparation and construction would be mitigated by the following measures and through working in accordance with CIRIA C741 4th Edition 'Environmental Good Practice On Site' (2015)[48].

- measures to minimise dust generation;
- provision of PPE, such as gloves, barrier cream, overalls etc. to minimise direct contact with soils;
- provision of adequate hygiene facilities and clean welfare facilities for all construction site workers;
- monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e. to suitably trained personnel only, and use of specialist PPE, where necessary; and
- preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation[49].

11.150 Specific mitigation measures may be required in the form of treating/ remediating any contamination encountered during construction (e.g. any contamination that may be associated with any potentially contaminative sites identified as part of the assessment, notably the landfills and areas of potentially infilled land). This will be confirmed based on information gathered through ground investigation.

Excavated Materials Management

11.151 Prior to construction, a strategy will be prepared as part of the design development, which will set out how the earthworks stage of the construction phase will be undertaken. Where necessary the strategy will consider what excavated materials can be reused, or are required within the development of the various components of the GB Onshore Scheme, and what materials are surplus and require either disposal or onward management to ensure appropriate re-use. The strategy will also define whether any geotechnical improvement may be required, prior to re-use or disposal.

11.152 To minimise the effects on soil resources during any earthworks, including materials management following foundation construction in relation to the substation/ converter station, high standards of soil handling and management will be employed with a view to minimising where possible the double handling of soils and the extent to which exposed soils will be left vulnerable to erosional processes.

11.153 The re-use of excavated materials during construction will be governed by either a Materials Management Plan developed in accordance with the CL:AIRE Definition of Waste: Development

[48] Environmental good practice on site guide (fourth edition) (C741) (2015)
[49] The Health and Safety Commission and the Health and Safety Executive, (1974), Health and Safety at Work etc. Act

Industry Code of Practice[50], an environmental permit or a relevant exemption. The CL:AIRE Code of Practice is a voluntary framework for excavated materials management and re-use. Following this framework results in a level of information being generated that is sufficient to demonstrate to any regulator that excavated material has been re-used appropriately and is suitable for its intended use. It demonstrates that waste material has not been used in the development. The Materials Management Plan details the procedures and measures that will be taken to classify, track, store, reuse and dispose of all excavated materials that will be encountered during the development works.

11.154 The disposal of soil waste, contaminated or otherwise to landfill sites would be best mitigated by minimisation of the overall quantities of waste generated during construction, and by ensuring that excavated material consigned to landfill cannot, as an alternative, be put to use either on Project Area or on other sites.

11.155 Where there is a requirement to dispose of surplus excavated materials off site as waste, the material will be characterised to determine firstly whether it is Hazardous or Non-Hazardous waste in accordance with the Environment Agency's Technical Guidance WM3[51] and then once this is established, the appropriate disposal facility will be determined through Waste Acceptance Criteria (WAC) analysis, as required.

Groundwater and Dewatering

11.156 If groundwater is not adequately controlled then excavations may flood or become unstable, and the efficiency of construction operations will be impacted. Where the volume of groundwater requiring dewatering exceeds twenty cubic metres a day then an abstraction permit will be obtained from the Environment Agency. Consents will also be obtained where discharging to watercourses including IDB managed water courses or public sewer. Control measures adopted for dewatering/ discharges will be agreed with the Environment Agency as part of the permitting process.

11.157 The adopted dewatering techniques will be appropriate to the type of excavation and hydrogeological conditions. The hydraulic conductivity of the ground within each excavation or trench section will be considered to establish the required abstraction volume to achieve the necessary drawdown of groundwater levels. The type of dewatering undertaken may include the use of cut off walls, sump dewatering and potentially well point dewatering with some provision for attenuation capacity to allow for water treatment and/or settlement prior to final discharge.

11.158 The inclusion of attenuating capacity for dewatering will ensure that discharge rates are controlled and this will effectively mitigate against the capacity of the receiving surface water environment being exceeded.

11.159 Further detailed hydrogeological assessment will be undertaken to design temporary works and dewatering particularly in areas that desk study and/ or ground investigation has identified a potential shallow groundwater table, highly permeable deposits or where dewatering is required and there are groundwater abstractions located nearby. Further hydrogeological assessment may include targeted ground investigation and permeability testing, groundwater level monitoring, or pumping tests whereby water from a test well is pumped at a controlled rate whilst the flow rate from the well, and the drawdown in an array of observation wells at varying distances from the test well, is observed. The information from these tests would be used to construct a hydrogeological model to predict the potential transmissivity and drawdown effects of dewatering.

11.160 Routeing within the LoD will seek to be at least 50 m away from any groundwater abstractions. There is only one abstraction license within the extended study area, this is located in an area of apparent inactive mineral workings and so it is considered that there are no sensitive water abstractions that could be affected.

11.161 Due to the requirement to protect controlled waters (groundwater and surface water), further risk assessments will need to be undertaken at all trenchless crossing locations to ensure that the ground model is understood and potential risks quantified prior to construction. Detailed design will seek to control the potential for ground or surface water contamination to occur, for

[50] CL:AIRE, (March 2011), 'Definition of Waste: Development Industry Code of Practice
[51] Environment Agency, (2015), 'Waste classification guidance on the classification and assessment of waste. 1st Edition'

example, through specifying vertical alignments that minimise the potential for "break out" of drilling fluids, or other fluids used in construction, therefore reducing potential impacts on ground and surface water quality. This is particularly relevant where designing works within granular materials or in particularly sensitive groundwater environments.

Land Drains

11.162 Pre-construction surveys to identify land drains should be carried out to inform the detailed design, which would seek to avoid or re-instate any land drains affected.

Residual Impacts

General

11.163 This section presents the outcome of the soil and groundwater potential contamination assessment undertaken and assumes that mitigation measures that will be adopted such as a CEMP (including appropriate PPE and site controls) will be implemented during construction with any benefits from remediation undertaken in relation to the GB Onshore Scheme realised at the post-construction stage.

11.164 In line with the assessment approach and Appendix 11.B, an initial screening process has been undertaken on the potential land contamination sites identified in the baseline review. The screening process seeks to identify areas of current or historical contaminative land use that might pose contamination risks during construction and operation of the GB Onshore Scheme.

11.165 The following factors have been used to generate site rating scores for the sites identified as part of the screening process. Further information on the criteria used is provided in Appendix 11.B:

- the location of the potential land contamination site in relation to the Project Area;
- the extent of any proposed cut/fill earthworks to be undertaken to facilitate the GB Onshore Scheme and the type of earthworks to be undertaken at the closest point to the potential land contamination site e.g. primarily whether this is earthworks cut or fill. Given the earthworks/detailed design is ongoing and the current understanding is a combination of both cut and fill across all components of the GB Onshore Scheme, a conservative assumption has been made that all of the Project Area may have some degree of cut taken during earthworks; and
- the presence of sensitive receptors e.g. underlying sensitive groundwater aquifers (Secondary A and B aquifers), surface watercourses, human, property and ecological receptors.

11.166 For potential contaminated land sites that present a low risk (site ratings of zero, one or two), as determined in accordance with Appendix 11.B, Table 11.B2.1, these have not been taken further in the assessment. For potential contaminated land sites with ratings of three or higher (moderate to higher risk), and which are summarised in Table 11.B2.2 in Appendix 11.B and indicated on Figure 11.4, these have been assessed further. A total of three sites have been excluded, with a total of nine sites included for more detailed assessment. Of these, three sites are located partially within the Project Area boundary and six sites are located within 250 m of the Project Area boundary.

11.167 For the sites identified for further assessment, site-specific CSM have been produced: one for the baseline conditions; one for the construction phase; and one for the post construction (operation) phase. Sites of similar land use and history have been grouped where appropriate. The CSM are presented in Appendix 11.B.

11.168 As detailed in the Future Baseline section of this Chapter, the assessment does not consider that the future baseline will be materially different to the current baseline outlined in the Baseline Conditions section.

Construction

Temporary Effects

11.169 To determine whether there are any potential temporary effects on human health, groundwater, surface water, buildings or sensitive sites during the construction phase, the baseline and construction risk levels, as defined in their respective CSM have been compared.

11.170 Where there is no predicted change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be neutral.

11.171 An increase in risk at the construction stage compared to baseline would result in an adverse effect and conversely, any improvement resulting from construction, for example where remediation is undertaken, or a contaminant linkage is removed, would result in a beneficial effect. Whilst adoption of the measures expected to be included as part of a CEMP would make it unlikely that there would be significant adverse effects during construction e.g. through the control of surface run off and dust, it is considered that there may still be some temporary minor adverse effects during construction from ground disturbance or groundwater controls which may inadvertently mobilise contamination or create preferential pathways.

11.172 The assessment of temporary effects has shown that whilst there are predicted **minor adverse** impacts associated with the construction stage, none of these would be regarded as significant following adoption of the measures noted in the 'Mitigation' section. A summary of the assessment, split by component for additional clarity, is provided in Table 11.9 and the key considerations are outlined below. Details of the full assessment are presented in Appendix 11.B.

Table 11.9: Summary of Construction Temporary Effects

Risk and impact assessment CSM	Construction impact significance for substation / converter station	Construction impact significance for DC cable route
Historical infilled land and landfills (within and extending outside of the application boundary)	Neutral to minor adverse	Neutral to minor adverse
Buried disused oil pipeline (within and extending outside of the application boundary)	Neutral	Neutral
Former ponds (assumed infilled) (outside of the application boundary)	Neutral	N/A
Former Kent Oil Refinery (outside of the application boundary)	Neutral	N/A
Former military land use (outside of the application boundary)	N/A	Neutral
Current and former farm land (outside of the application boundary)	Neutral	Neutral

11.173 The greatest risks identified are to controlled waters during construction (earthworks/ remediation). There is considered to be a potential for temporary increases in risk during construction due to the potential for ground disturbance, dewatering and contaminant mobilisation/ migration that may result from these activities. The impact significance has been assessed to range from neutral to temporary minor adverse (not significant) during this phase of works as the CEMP will include appropriate measures to control and mitigate potential impacts therefore preventing a significant effect.

11.174 Construction compounds would include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures expected to be set out within a CEMP prepared prior to the commencement of construction activities, will include a Control of Substances Hazardous to Health (COSHH)/ fuel inventory, storage of COSHH in accordance with relevant Environment Agency Pollution Prevention Guidance notes and storing any hazardous materials in designated locations with specific measures to prevent leakage and release of their contents. No significant temporary effects are identified.

Permanent Effects

11.175 To determine whether there are any potential permanent effects, the baseline and post-construction CSM have been compared. A summary of the assessment, split by component for additional clarity, is provided in Table 11.10 and the details of these comparisons are presented in Appendix 11.B.

Table 11.10: Summary of Construction Permanent Effects

Risk and impact assessment CSM	Post-construction impact significance for substation / converter station	Post-construction impact significance for DC cable route
Historical infilled land and landfills (within and extending outside of the application boundary)	Neutral	Neutral to minor beneficial
Buried disused oil pipeline (within and extending outside of the application boundary)	Neutral	Neutral
Former ponds (assumed infilled) (outside of the application boundary)	Neutral	N/A
Former Kent Oil Refinery (outside of the application boundary)	Neutral	N/A
Former military land use (outside of the application boundary)	N/A	Neutral
Current and former farm land (outside of the application boundary)	Neutral	Neutral

11.176 The assessment has shown that the construction of the GB Onshore Scheme has predicted **neutral** to **minor beneficial** effects. It is considered that the effects of the development will be neutral, as areas of potential contamination will be returned to their original state or improved following construction. A beneficial effect is not considered in the case of the substation/ converter station development as it is restrained to an area which has not been subject to landfilling and remains undeveloped, and in turn remediation in this area would not be envisaged. A neutral to minor beneficial effect is considered in association with the proposed DC cable route in order to capture the areas of the proposed route that may interact with potentially contaminative land, whilst acknowledging the geographical extent of any associated remediation will be limited; furthermore, the routing of the DC cable along an area of hardstanding to the east of the Perry's Farm Landfill capping, will avoid any significant disturbance/ interaction with the underlying landfill materials.

Operation

11.177 There are not expected to be any significant operational effects on ground conditions as the design of the GB Onshore Scheme is expected to include both best practice and statutory measures that would contain and control any releases of contaminants to the Project Area and its associated infrastructure during the operation period.

Decommissioning

11.178 Decommissioning effects are assumed to be similar to but no worse than the temporary effects defined in the assessment of potential construction impacts on the basis of the similar nature of activities envisaged during construction and decommissioning.

Summary

11.179 In summary, it is considered that there are no significant adverse construction or operation stage effects in relation to ground conditions. There are predicted to be **neutral** to **minor beneficial** effects associated with remediation of the Project Area.

Impact of Climate Change and Major Accidents and Disasters

Climate Change

11.180 Based on climate predictions[52], the UK will experience more extreme weather. Hotter, drier summers and warmer, wetter winters will become more common. The frequency and severity of short periods of high rainfall will increase.

[52] Met Office, 2018, UK Climate Projections 2018 (UKCP18),

11.181 Potential impacts associated with climate change include, but are not limited to:

- Increased frequency and severity of short periods of high rainfall may adversely affect groundwater / surface water
- Decreased aquifer recharge may lead to depleted groundwater resources.
- Increased frequency and severity of drought event may adversely affect magnitude and duration of dust generation.
- Drier climate and high temperatures may adversely affect soil quality.
- Flooding and severe storms may promote increased erosion that adversely affects soil quality.

11.182 The impact of climate change upon the Proposed Scheme has been qualitatively assessed by way of a potential future baseline scenario, similar to that outlined earlier in this Chapter. It is not considered that the potential impacts associated with climate change would significantly alter the predicted effects relative to those described in the current assessment.

Major Accidents and Disasters

11.183 Risks associated with major accidents and disasters may include, but are not limited to, the following with the scope of the ground conditions discipline:

- Physical damage or contamination of aquifer or water abstraction borehole/ well/ reservoir.
- Spillage or longer term seepage of pollutants into groundwater or surface water.
- Fire, explosion, release or exposure to harmful gas/ materials.
- Extreme weather (e.g. flood, drought, heat wave, snow, high winds).
- Collapse/ damage to structures/ infrastructure.
- Fatality/ injury to member of public (e.g. pedestrians, nearby residents) during construction/ operation.
- Emergency response impacts on designated environmental receptors.

11.184 Potential impacts associated with major accidents and disasters would be considered to be reduced to as low as is reasonably practicable assuming all mitigation measures outlined are correctly implemented.

Cumulative Impacts

11.185 Potential cumulative effects may be realised if ground remediation, or significant earthworks, from other developments or activities were planned to occur at the same time, and in close proximity to the Project Area. The cumulative effect may be quite localised in terms of potential construction related impacts on local receptors, but ultimately in combination the residual post construction effects could be beneficial if, for example, areas are remediated or brought into beneficial use from an otherwise derelict condition.

11.186 There are committed developments linked to the Project Area including a new lattice tower (50m tall) north of the substation and associated down leads from the tower direct to the substation, as well as new underground cables between the cable sealing end compound and the substation. It is not considered that any of these committed developments will generate significant cumulative effects in relation to ground conditions as, whilst they are not part of the GB Onshore Scheme, in the context of cumulative effects they are considered to be part of the sequence in preparing the Project Area for subsequent re-development. Consideration has been given as to whether temporal overlap of the committed developments could in combination lead to cumulative effects. However, in the context of the ground conditions assessment and the mitigation contained within a CEMP (to be prepared), it is not considered that any overlap between the GB Onshore Scheme and the aforementioned committed developments will generate cumulative effects for ground conditions.

11.187 A review of the Medway Council planning portal was undertaken in September 2018 as part of preparing the Screening report (November 2018) in order to identify other proposed and committed developments within the vicinity of the GB Onshore Scheme. The planning portal has been reviewed to ensure the committed developments considered at the time of submission are current and those developments identified within the study area are outlined below:

- Employment floorspace and business park management centre; Grain Road Isle Of Grain. Approximately 1.2km southwest of the Project Area. Original planning application approved with conditions, latest conditions discharged, no known timeframes for construction.

11.188 The employment and business park management floorspace considered as part of the cumulative assessment are not located in an area where earthworks associated with the GB Onshore Scheme will directly interact. On this basis, it is not considered that it will generate cumulative effects in relation to ground conditions and the GB Onshore Scheme and is not considered further as part of this assessment.

Summary of Assessment

11.189 The ground conditions topic assesses the potential impacts of the construction and operation of the GB Onshore Scheme in relation to ground conditions.

11.190 In view of the mitigation outlined, it is considered that there are no significant adverse construction or operation stage effects in relation to ground conditions. There are predicted to be **neutral** to **minor beneficial** effects associated with remediation of the Project Area.

11.191 The assessment of temporary effects has shown that whilst there are predicted **minor adverse** impacts associated with the construction stage, none of these would be regarded as significant following adoption of the measures as part of a CEMP which will be prepared prior to the commencement of construction activities and signed off by Medway Council.

11.192 There are not expected to be any significant operational effects on ground conditions as the design of the GB Onshore Scheme is expected to include measures that would contain and control any releases of contaminants to the Project Area and its associated infrastructure during the operation period.

11.193 Decommissioning effects are assumed to be similar to but no worse than the temporary effects defined on the basis of the similar nature of activities envisaged during construction and decommissioning.

11.194 It is not considered that any of the identified committed schemes will generate cumulative effects in relation to ground conditions.

12. Cumulative Assessment

Introduction

12.1 This Chapter considers the potential for cumulative effects, including intra-project and inter-project effects, to occur as a result of the GB Onshore Scheme. It draws on the results of the technical assessments of the GB Onshore Scheme as reported in chapters 5 to 11 of the Environmental Statement.

Cumulative Effect Assessment

Overview

12.2 The cumulative effects assessment follows guidance set out in the Institute of Environmental Management and Assessment (IEMA) 'State of Environmental Impact Assessment Practice in the UK' Report.

12.3 IEMA's Report recognises two major sources of cumulative effects:

- Intra-project effects: These effects occur where a single receptor is affected by more than one source of effect arising from different aspects of a project. An example of an intra-project effect would be where a local resident is affected by dust, noise and traffic disruption during the construction of a project, with the results being a greater nuisance than each individual effect alone; and
- Inter-project effects: These effects occur as a result of a number of developments, which individually might not be significant, but when considered together could result in a significant cumulative effect on a common receptor, and will include developments separate from and related to the project.

Intra-Project Effects

12.4 The 'Assessment of Intra-Project Effects' section of this chapter reports the assessment of intra-project effects where a common receptor is being affected by two or more effects reported in different specialist assessments.

Inter-Project Effects

12.5 The 'Assessment of Inter-Project Effects' section of this chapter reports the assessment of inter-project effects. The effects have been considered in the specialist assessments but are also reported here on a project by project basis.

Assessment of Intra-Project Effects

Identification of Potential Intra-Project Effects

Identification of Potential Effects

12.6 Intra-project effects may also occur where a common receptor is being affected by two or more effects reported in different specialist assessments e.g. the two separate impacts may interact or combine to result in an intra-project effect. The first step in the assessment has been to consider where there is the potential for an intra-project effect to occur. An overview of where potential intra-project effects may interact or combine between specialist assessment topics may occur is provided in Table 12.1. An 'X' in the table denotes that a potential intra-project effect could occur, however, this does not mean that an intra-project effect will arise. An 'O' in the table denotes a potential indirect cumulative effect, for example the removal of vegetation will directly impact on ecological resources, but may also have an indirect impact on visual amenity as this vegetation may have screened views of the Project Area previously. These linkages have been developed in consideration of whether or not receptors are shared between specialist assessment topics, and also in consideration of the proposed GB Onshore Scheme.

Table 12.1: Potential for Intra-project Cumulative Effects

	L&V (Ch05)	Ecology (Ch06)	Noise (Ch07)	Heritage (Ch08)	Water (Ch09)	Transport (Ch10)	Ground (Ch11)
L&V (Ch05)		O	X	X			O
Ecology (Ch06)	X		X		X		X
Noise (Ch07)	X	X				X	
Heritage (Ch08)	X						
Water (Ch09)		X					
Transport (Ch10)			X				
Ground (Ch11)	O	X			O		

12.7 The second step, taking account of the above, has been to review the results of specialist assessments to identify potential common receptors and the residual effects which they are predicted to experience. The specialist assessments reported in the ES have identified a number of effects which would occur as result of the construction and operation of the GB Onshore Scheme ranging from negligible or minor significance (such effects are classed as not significant) to moderate or major significance (such effects are classed as significant). Several effects on one or more receptors could theoretically interact or combine to result in an intra-project effect which is significant. When considering intra-project effects, the mitigation measures as set out within the assessment chapters have been taken into account i.e. only residual effects (after mitigation) are considered.

12.8 Intra-project effects have only been identified where more than one specialist assessment chapter has identified a residual effect of minor significance or greater on an individual or group of common receptors. Where residual effects are regarded to be negligible for any one technical assessment it is considered that any potential intra-project cumulative effect would not be significant and therefore further detailed assessment is not required.

Assessment of Potential Effects

Impact on Amenity During Construction

12.9 An intra-project effect on residents and visitors could result from construction of the GB Onshore Scheme due to a combination of noise and visual effects leading to a reduction in amenity. Potential receptors are predominantly the residential properties in the near vicinity of the Project Area, namely on the B2001/ Grain Road, along West Lane. This may also impact on the users of the proposed coastal path that will extend along West Lane.

12.10 Visual effects have been assessed from a number of different viewpoints which are representative of the views which would be experienced from residential properties in the vicinity of the GB Onshore Scheme, including from West Lane, which would cover users of the coastal path. Visual amenity effects during construction from West Lane, the Circular Walk 3 in the Allhallows Marshes (and therefore the proposed Coastal Path), and the properties on Stoke Road were regarded to be potentially significant.

12.11 Noise effects have been assessed based on the construction works which will be undertaken and potential receptors have been identified based on their proximity to the Project Area. The extent of the effect experienced by receptors will depend on the nature of construction works and the proximity of receptors to them. Individually these effects are not regarded as being significant.

12.12 Construction effects from noise are temporary and intermittent, both through the day and the construction period. Visual effects will be constant throughout the construction period albeit the magnitude of the effect will change as construction progresses due to the differing equipment in use, and extent of temporary change to land cover. Whilst receptors may experience a cumulative reduction in amenity, such effects will be short term, temporary and intermittent and therefore when considered in-combination the significance of effects will not increase. As a result it is predicted that a small number of receptors in close proximity to the Scheme (typically within less than 0.5 km) will experience moderate adverse intra-project effects which are therefore significant.

Impact on Amenity During Operation

12.13 At year one of operation of the GB Onshore Scheme, visual amenity impacts to the users and residents of West Lane, the Circular Walk 3 (and the proposed Coastal Path), and the properties on Stoke Road were assessed to be the same as during construction, and therefore significant, as the proposed reinstatement would not yet be established. However by year 15 of operation when the landscaping plan is established visual amenity from the users of Circular Walk 3 and the residences on Stoke Road would be negligible, whilst properties on West Lane and the users of the proposed coastal path would remain moderate adverse and significant.

12.14 During operation noise impacts are regarded as being not significant, including from residential receptors in closer proximity that West Lane. As such the intra-project effects are considered to be no greater than moderate adverse for the residents on West Lane and the users of the coastal path.

Assessment of Inter-Project Effects

Identification of Inter-Project Effects

Overview

12.15 The assessment of inter-project cumulative effects has followed a tiered approach:

- Identify the study area, or likely extent to which cumulative effects may persist;
- Identify all projects within the study area recording all projects that reasonably can be considered as having a potential cumulative impact in combination with the GB Onshore Scheme;
- Information gathering about the identified developments; and
- Assessment of inter-project effects.

12.16 A review of the Medway planning system was undertaken, specifically on the Isle of Grain, including those at application stage or that have been granted approval as well as potential developments for which a local plan allocation may exist.

12.17 In order to assess the potential for inter-project effects to occur in combination with the identified developments the following was undertaken:

- For developments where a planning application has been submitted information presented within the Environmental Statement or application material has been reviewed.
- For developments that are known to be proposed (either via screening or scoping opinion requests or following presentation of information in the public domain) but where an Environmental Statement (or other environmental reports) has not yet been prepared or submitted, any readily available information has been utilised.
- For developments which may occur in the vicinity of the GB Onshore Scheme the relevant local plans have been reviewed to identify any planning allocations.

12.18 Following information gathering from available sources, the effects of the GB Onshore Scheme have been considered in combination with the potential effects from other developments that are both reasonably foreseeable and are geographically located in a position where environmental impacts could act together to result in an inter-project effect.

12.19 In assessing inter-project effects, it should be acknowledged that the relative contributions that different projects make to a cumulative effect, and carefully consider whether a cumulative effect occurs at all. For example, effects associated with a large scale project may be significant, and whilst a smaller project may contribute to this effect, the cumulative effect of the smaller project and the larger project is only considered to be significant if it is of greater significance than the effect of either project in isolation.

12.20 Inter-project effects are generally unlikely to arise unless the other developments are in close proximity to a component of the GB Onshore Scheme (i.e. the proposed converter station and substation site and/ or the proposed DC cable route), recognising that actual distance varies with the nature of the potential effect and nature of the receptor.

12.21 The study area for the consideration of inter-project effects has been developed taking account of the predicted extent of impacts associated with the different elements of the GB Onshore Scheme (i.e. effects from the construction of the proposed converter station and substation, and effects from installation of the proposed DC cable route). The study area extends to the point at which the associated effects become insufficient to contribute in any meaningful way to those of another development.

12.22 The study area for each environmental assessment topic is defined in the relevant technical chapter (Chapters 5 to 11). Information on the likely extent of impacts associated with other developments in the area has also been considered.

Identification of Projects for Consideration within the Cumulative Assessment

12.23 The identification of potential and committed developments within the vicinity of the GB Onshore Scheme (i.e. on the Isle of Grain) identified developments that were considered to have the potential for inter-project effects (e.g. cumulative landscape and visual impacts have potential to occur over a greater distance than, for example, cumulative noise or archaeology impacts).

12.24 Table 12.2 provides a long list of other proposed developments considered for their potential for inter-project effects.

Table 12.2: Register of Nearby Developments

ID	Project	Status	Expected Construction	Relationship with the GB Onshore Scheme
1	NGET OHL Works – connection of the GB Onshore Scheme to the NETS.	Proposed – no application submitted	Construction expected to coincide with the construction of the proposed substation.	0 m – to connect with the proposed substation.
2	GB Offshore Scheme – subsea cable installation beyond MLWS.	Proposed – Scoping Opinion Request issued; planning application to be submitted in line with GB Onshore Scheme.	Construction period will align with the installation of the DC cable of the GB Onshore Scheme	0 m – connects directly to the subsea DC cable at MLWS.
3	Six residential properties; Port Victoria Road, Isle Of Grain, Rochester, ME3 0EN.	Outline application submitted and validated in June 2018. Planning decision is pending. Planning Reference: MC/18/1871	No details of intended construction period provided.	Approx. 580 m east (Grain).
4	Outline planning application for the development of up to 464,685 m^2 of built employment floorspace and up to 245 m^2 of floorspace for a business park management centre; Grain Road Isle Of Grain Rochester Kent ME3 0AE.	Original application (Planning Reference MC/09/1628) approved with conditions March 2010. Latest conditions discharged June 2019.	No known timeframes for construction.	Phase 1 is approx. 1.2 km southwest
5	Construction and operation of a cementitious grinding facility and associated development; Grain Road, Isle of Grain, ME3 0DW.	Scoping Opinion request for the importation of clinker and granulated blast furnace and development of a grinding facility. Scoping Opinion submitted July 2019. Planning Reference: MC/19/1793	EIA Scoping at this stage only	Approx. 1.7 km southwest
6	Cement Plant; Thamesport Isle Of Grain Rochester Medway ME3 0AP. Proposed development of a new cement plant at London Thamesport.	Planning application validated February 2019. Planning Reference: MC/19/0299	No construction programming information provided within submission documents.	Approx. 2 km southwest

12.25 All of the developments listed above have been considered by the technical specialists in assessing the potential cumulative effects when considered in combinations with the GB Onshore Scheme.

12.26 Where environmental information has not been available it has been assumed that all projects would be constructed and operated to good practice standards and approval of the appropriate regulatory bodies and stakeholders.

12.27 The location of the other developments in relation to the GB Onshore Scheme is shown in Figure 12.1.

Assessment of Inter-Project Effects

Overview

12.28 The following sub-sections identify whether or not the specialist assessments undertaken as part of the Environmental Impact Assessment (EIA) (as reported in Chapters 5 to 11 of this Environmental Statement) have identified any potential cumulative effects from the GB Onshore Scheme in combination with those projects identified in Table 12.2. Where specialist assessments scoped out the need to assess the potential cumulative effects with these projects these have not been recorded within this section.

12.29 Detailed assessment of potential cumulative effects are reported within the technical assessment chapters.

Project ID 1 – NGET OHL Works

12.30 The potential for cumulative effects between the NGET OHL Works and the GB Onshore Scheme were considered as part of the Landscape and Visual Amenity, Cultural Heritage and Water Resources and Flood Risk technical assessments. However within each of these assessments there were no conclusions of potentially significant cumulative impacts.

Landscape and Visual Amenity

12.31 The potential erection of a new lattice tower to support the connections of the GB Onshore Scheme was recognised to result in a new structure within the landscape. The assessment noted that this would be seen in the context and in alignment with the existing OHL and therefore will not result in a material change to the landscape or further impact amenity views from the surrounding area beyond those effects likely to be experienced as a result of the GB Onshore Scheme.

Cultural Heritage

12.32 It is assessed that there is the potential for cumulative effects to as yet unknown archaeological assets that extend beyond the boundary of the GB Onshore Scheme to the location of the proposed new tower foundations. However the potential for an impact to occur as a result of the GB Onshore Scheme is already recorded as a potentially significant impact, and as such the cumulative effect will not be significantly greater than as already recorded.

Water Resources and Flood Risk

12.33 Whilst the NGET OHL Works are a separate project, due to the proximity of the project to the GB Onshore Scheme and through consultation with NGET throughout the development of the project, an allowance has been made for the potential development of a new lattice tower as part of the GB Onshore Scheme assessment, drainage strategy and mitigation. Therefore no potential cumulative effects are predicted from flood risk and drainage. It is assumed that during construction standard good practice will be utilised and therefore potential cumulative effects on water quality will also be avoided and/ or minimised.

Project ID 2 – GB Offshore Scheme

12.34 The potential for cumulative effects between the GB Offshore Scheme and the GB Onshore Scheme were considered as part of the Ecology and Nature Conservation and Cultural Heritage technical assessments. However within each of these assessments there were no conclusions of potentially significant cumulative impacts.

Ecology and Nature Conservation

12.35 Based on the spatial context of the GB Onshore Scheme and the GB Offshore Scheme aligning at MLWS, the potential for cumulative impacts to the internationally and nationally designated Thames Esturary and Marshes SPA, Ramsar and SSSI site was further considered. However when considering that the installation of subsea DC cable would be undertaken as part of the same activity and at a time that avoids the most sensitive period for the designated features, any cumulative impact are not predicted to be significant.

Cultural Heritage

12.36 It is assessed that there is the potential for cumulative effects to as yet unknown archaeological assets that extend beyond the boundary of the GB Onshore Scheme to the location of the proposed new tower foundations. However the potential for an impact to occur as a result of the GB Onshore Scheme is already recorded as a potentially significant impact, and as such the cumulative effect will not be significantly greater than as already recorded.

Project ID 3 – Residential Properties

12.37 Following consideration across all environmental disciplines, no inter-project cumulative effects have been identified beyond those identified in their individual assessments.

Project ID 4 – Phase 1 of Grain Business Park

12.38 Following consideration across all environmental disciplines, the cementitious grinding facility was only considered further in the Landscape and Visual Amenity Assessment. However due to the distance between the projects and the existing infrastructure at Thamesport and the Grain LNG facility any potential cumulative effects are not predicted to be significant.

Project ID 5 – Cementitious Grinding Facility

12.39 Following consideration across all environmental disciplines, no inter-project cumulative effects have been identified beyond those identified in their individual assessments.

Project ID 6 – Cement Plant

12.40 Following consideration within the transport assessment, with the information available, it is concluded that the worst-case scenario has been considered and that the cumulative impact of both projects on the local highway network would not be greater than either project in isolation.

Summary of Assessment

12.41 A cumulative assessment has been undertaken to take in to account both inter-project and intra-project effects.

12.42 Intra-project effects has considered the impact of multiple environmental topics on the same receptor (i.e. the combined impact of increased disturbance (such as noise) and reduced visual amenity on walkers and visitors, as well as in-combination effects from different components the Scheme (i.e. the proposed DC cable route and the proposed converter station) on the same receptor.

12.43 Inter-project effects have considered the potential cumulative impacts from the simultaneous development of the UK Onshore Scheme with other projects within the near vicinity of the Scheme. A systematic review of projects either already within or known to soon enter the planning system were reviewed by each of the specialists to determine potential cumulative impacts.

Intra-Project Effects

12.44 The assessment potential cumulative effects on an individual receptor from different components of the GB Onshore Scheme, and from multiple sources has determined that whilst there have been some impacts identified these are not likely to be of greater significance than when considering the potential effects individually. Intra-project effects are limited to the amenity of residential receptors, and users of surrounding walking routes adjacent to the Project Area.

Inter-Project Effects

12.45 Of the six short-listed projects identified that had the potential to result in cumulative impacts when taken in to consideration with the GB Onshore Scheme, potential impacts associated with the proposed NGET OHL Works, GB Offshore Scheme and the cement plant at Thamesport were considered for further assessment. However it was concluded that any potential cumulative impacts would not be significantly impacted as a result of the simultaneous development or operation of the GB Onshore Scheme and these other projects.

13. Schedule of Mitigation

Introduction

13.1 This chapter sets out, in a single location, all of the measures proposed to mitigate the potential environmental impacts associated with the construction and operation of the GB Onshore components of the GB Onshore Scheme.

Approach to Mitigation

13.2 As set out within Chapter 4 of the ES, a hierarchal approach to the development of mitigation measures has been adopted with the objective of avoiding, preventing or reducing adverse effects as much as possible through project design. Equally, mitigation has been developed to maximise or enhance any potential beneficial effects.

13.3 The Environmental Impact Assessment (EIA) has been undertaken in parallel with the development of the GB Onshore Scheme; this has presented opportunities to incorporate mitigation into its design.

13.4 The approach below sets out how mitigation has been developed and categorised:

- **Design Measures**: These are measures which are embedded within the fundamental design for the GB Onshore Scheme or which would help to inform – or where required, restrict – the Contractor's detailed scheme design.
- **Construction Measures**: These are measures which are incorporated into the parameters of how the scheme will be constructed by the Contractor.
- **Other Measures**: These are measures which are required – or reflect best practice – but can neither be categorised as design or construction measures.
- **Compensatory Measures**: Following the hierarchal approach above, this is the least-preferable option and relates to measures required in the event that an effect cannot be effectively mitigated.

Purpose of the Schedule of Mitigation

13.5 A wide variety of mitigation measures are identified within Chapters 5 to 11 of the ES. The purpose of the Schedule of Mitigation is to provide a single reference point for all mitigation such that it can be easily transposed into each relevant Construction Management Plan, or other form of project control.

13.6 The register also provides an 'at a glance' summary of how mitigation will be delivered for example, whether it is embedded in design or to be applied during construction.

13.7 Each mitigation measure has been given a unique reference based on the specialist area it relates to; this also provides a useful reference for any future documents governing project construction.

13.8 For some topics, it should be noted that 'common' mitigation measures have been identified which may also be adopted by another specialist topic; for example, pollution-prevention mitigation measures may be applicable to both Water Resources and Ground Conditions. For completeness and to avoid the risk of future omission in project controls, common measures have been repeated for each specialist theme.

Landscape and Visual

Table 13.1 - Schedule of Mitigation for the GB Onshore Scheme (Landscape and Visual)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Design	Converter Station and Substation	LV01	**Landscape** The location of the proposed converter station and substation has been located as close as possible alongside the existing industrial development at the National Grid Liquified Natural Gas (LNG) terminal and away from the majority of residential properties in Grain. The proposed siting and massing of converter station and substation alongside the existing industrial complexes and the proposed landscape reinstatement would improve the landscape fit and therefore reduce potential impacts on the setting of the North Kent Marshes Special Landscape Area (SLA) and Allhallows to Stoke Marshes Landscape Character Area (LCA).	Embedded within the design of the GB Onshore Scheme.
Design	Converter Station and Substation	LV02	**Landscape** Appropriate boundary vegetation within the Project Area has been developed to improve the interface between the built edge of the converter station and substation and the transition to the adjacent marshland landscape. The combination of boundary vegetation on a slightly raised earth mound would also help to reduce the overall scale and mass of the proposed building façades. The proposed selection of scrub and wetland species has been developed in conjunction with ecologists and makes reference to the landscape character guidelines set out to improve and restore the characteristic feature of the Allhallows to Stoke Marshes LCA.	Embedded within the design of the GB Onshore Scheme.
Design	Access Road	LV03	**Landscape** The proposed location and working width of the primary access road has been selected in part to minimise physical impacts on the Project Area and the immediate context. The proposed route and 5.5 m working width would be in keeping with the existing landscape pattern and layout with a simple connection to the B2001/ Grain Road.	Embedded within the design of the GB Onshore Scheme.
Design	Converter Station and Substation	LV04	**Biodiversity** The outline Landscape Plan has been developed to enhance the biodiversity found within the Project Area. The introduction of a Sustainable Drainage System (SuDS) detention basin, attenuation pond and swale each planted with marginal wetland	Embedded within the design of the GB Onshore Scheme.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
			species will create a green corridor and more complex vegetation structure and improve the biodiversity value within the Project Area.	

Ecology and Nature Conservation

Table 13.2 - Schedule of Mitigation for the GB Onshore Scheme (Ecology and Nature Conservation)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Design	Converter Station and Substation	ECO01	**Overall Scheme Design** The design of the GB Onshore Scheme will deliver compliance with industry good practice and environmental protection legislation during both construction and operation e.g. prevention of surface and ground water pollution, fugitive dust management, noise prevention or amelioration.	Embedded within the design of the GB Onshore Scheme.
Design / Construction	DC Cables	ECO02	**Drilling** The use of a Horizontal Directional Drilling (HDD) cable installation method to minimise habitat loss and disturbance within the intertidal zone. HDD conduits will be drilled at sufficient depth to ensure disturbance to surface habitats and species as a result of drilling vibrations will not occur.	Embedded within the design of the GB Onshore Scheme. Sustainable installation method embedded within construction phase.
Construction	DC Cables	ECO03	**Drilling** Drilling fluids required for HDD operations will be carefully managed to minimise the risk of breakouts into the marine environment. Specific avoidance measures would include: • The use of biodegradable drilling fluids that Pose little or no risk (‘PLONOR substances’) where practicable • Drilling fluids will be tested for contamination to determine possible reuse or disposal • If disposal is required, drilling fluids would be transported by a licensed courier to a licensed waste disposal site. • The end of the ducts would be bundled in order to capture discharges from the breakout points.	Requirement during construction phase.
Construction	Scheme-Wide	ECO04	**Construction Environmental Management Plan** The preparation and implementation of a Construction and Environmental Management Plan (CEMP) to manage the environmental effects of the GB Onshore Scheme and to demonstrate compliance with environmental legislation, which will then be implemented by the selected construction contractor. The CEMP, Emergency Spill Response Plan and a Waste Management Plan shall be developed and	Requirement during construction phase. A detailed CEMP, Emergency Spill Response Plan and a Site Waste Management Plan will be prepared by the Contractor before commencement of works.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
			implemented for the installation phase of the Project in accordance with the Coastal and Marine Environmental Site Guide (John et al., 2015).	
Construction	Scheme-Wide	ECO05	**Non-Native Species** The latest guidance from the GB Non-Native Species Secretariat (2015) will be followed and a Biosecurity Plan produced to cover cable installation and any maintenance or repair works. All project vessels shall adhere to the International Convention for the Control and Management of Ships' Ballast Water and Sediments with the aim of preventing the spread of Invasive Non-Native Species (INNS).	Good construction practice embedded into how the scheme will be developed. A Biosecurity Plan will be prepared by the Contractor before commencement of works.
Construction	DC Cables	ECO06	**Marine Pollution** All Project vessels will be required to comply with the International Regulations for Preventing Collisions at Sea (1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) with the aim of preventing and minimising pollution from ships. Most critically, all vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan).	Good construction practice embedded into how the scheme will be developed. A Marine Pollution Contingency Plan will be prepared by the Contractor before commencement of works.
Construction	DC Cables	ECO07	**Benthic Ecology** Where practicable, the cable route will be micro routed around sensitive benthic ecology receptors as identified from surveys of the Project Route Corridor.	Good construction practice embedded into how the scheme will be developed.
Construction	DC Cables	ECO08	**Spoil** Dredge spoil will be deposited adjacent to the cable route to minimise the footprint of disturbance effects.	Good construction practice embedded into how the scheme will be developed.
Construction	DC Cables	ECO09	**Cable Installation** Cable installation will be carried out on a 24-hour basis in order to reduce the overall installation time and associated disturbance of benthic ecological receptors.	Good construction practice embedded into how the scheme will be developed.
Design	Scheme-Wide	ECO10	**Landscape** An outline landscape design will be delivered which includes boundary planting incorporating tree and shrub planting.	Embedded within the design of the GB Onshore Scheme.
Design	Scheme-Wide	ECO11	**Landscape and Biodiversity** A SuDS detention basin, attenuation pond and swale will each be planted with marginal wetland species; further development of the landscape design will take place to support the application and detailed design, in particular any ecological mitigation requirements.	Embedded within the design of the GB Onshore Scheme.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	ECO12	**Protected Species** Standard environmental best practice and mitigation will be implemented to ensure construction and operation of the GB Onshore Scheme complies with legislation relating to protected species and does not compromise the local conservation status of ecological receptors present within or in the vicinity of the GB Onshore Scheme.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO13	**Protected Species** Obtaining, where required, protected species licences from Natural England sufficiently in advance of the works to meet with the optimum time for mitigation and to minimise any changes to the construction programme; production of mitigation strategies for protected species and application for species licences for translocation of animals away from construction areas where required	Good construction practice embedded into how the scheme will be developed; licence to be obtained by the Contractor where required.
Construction	Scheme-Wide	ECO14	**Vegetation Clearance** Site vegetation clearance undertaken in advance of construction and at an appropriate time of year so as to avoid incidental injuring or killing of reptiles.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO15	**Water Vole - *Arvicola amphibius*** Avoidance where possible of lagoons and ditch with potential to support the Water Vole (a legally protected species). Where avoidance is not possible, mitigation measures will be implemented in consideration of the legal status of the species.	Good construction practice embedded into how the scheme will be developed.
Construction	DC Cables	ECO16	**Cable Corridor Habitat** Habitat removed from within the DC cable corridor will be restored post-construction.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO17	**Lagoons** The lagoons outside of the site boundary will be retained.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO18	**Landscaping** Soft landscaping will be utilised on site to create diverse habitats for locally important species, using trees and shrubs of local provenance.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO19	**Nesting Birds** The key nesting bird period - March to August (inclusive) - will be avoided for site vegetation clearance. For any vegetation clearance proposed outside of this time, the site will be checked for the presence of any nest by a suitably qualified ornithologist, prior to removal; if active nests are found, appropriate buffer zones would be put in place and the area monitored until the young birds have fledged	Good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	DC Cables	ECO20	**Marsh Harrier - *Circus aeruginosus*** Noise disturbance, during construction of the DC cable, has the potential to directly impact breeding Marsh Harrier, if such works are undertaken during the breeding season (typically March to August inclusive). Therefore, to avoid any such impacts, the mitigation will be adopted and formalised into the CEMP such that construction of the DC cable, within 200 m of the Marsh Harrier territory, will not be undertaken between March and August, inclusive.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ECO21	**Lighting** The lighting for the GB Onshore Scheme, during construction and operation, would be appropriately designed to minimise impacts on bats and off-site habitats (details to be confirmed). Brightness would be as low as legally possible and the times during which the lighting is to be used limited to provide some dark periods, if possible subject to safety requirements. Lighting would be directed to where it is needed to avoid any horizontal light spillage. Any upward lighting would be minimal to avoid light pollution and disturbance to foraging and commuting bats. Limiting the height of lighting columns and directing light at a low level would reduce the ecological impact of lighting on bats and off-site habitats. An outline Lighting Strategy will be prepared. Any lighting that is required for the construction and operation of the GB Onshore Scheme will be directed away from surrounding habitat to minimise light disturbance to off Site habitats.	Good construction practice embedded into how the scheme will be developed. An outline Lighting Strategy will be prepared by the Contractor prior to the commencement of works.
Construction	DC Cables	ECO22	**Benthic Ecology** Deployment of anchors/anchor chains on the seabed will be kept to a minimum in order to reduce disturbance to seabed within the intertidal zone; the preferred method of cable installation in the intertidal would be boat-based, as whilst there is potential for small non-significant effects to intertidal habitats and species from beaching of the barge and vessel anchorage, the alternative shore based option would be associated with a much larger potential Zone of Influence (ZoI) and magnitude of effect although the significance is predicted to remain as minor adverse	Good construction practice embedded into how the scheme will be developed.
Design / Construction	Scheme-Wide	ECO23	**Operational Noise** Operational noise impacts will be controlled by detailed design and mitigation measures; if required, this will be determined by the appointed contractor. The project specification will require that internal operational sound levels in nearby	Good construction practice embedded into how the scheme will be developed. Requirement embedded into the project specification.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
			residential properties do not exceed Noise Rating (NR) 20. This limit applies to the cumulative operational sound of the converter station and the substation.	
Design / Construction	Scheme-Wide	ECO24	**Backup Generator** Although the noise of the proposed backup generator is not anticipated to be significant, it will be necessary to apply Best Practicable Means (BPM) with respect to its operation. BPM is likely to include: • Minimising the running of the generator i.e. keeping testing times as short as possible; • Positioning the generator such that line of sight to nearby receptors is blocked as much as possible to provide the maximum acoustic screening thereby minimising potential operational noise impacts; and • Providing an acoustic enclosure to the generator if required.	Good construction practice embedded into how the scheme will be developed. Requirement embedded into the project specification.

Noise and Vibration

Table 13.3 - Schedule of Mitigation for the GB Onshore Scheme (Noise and Vibration)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	NVIB01	**Construction Environmental Management Plan** A CEMP will be prepared and implemented by the construction contractors. The final CEMP will include the relevant noise and vibration criteria, giving regard to the criteria presented within the ES, proposed surveys and a range of BPM which are likely to include the following: • Implementing processes to minimise noise before works begin and ensuring that BPM are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities where appropriate; • Ensuring that modern plant is used, complying with the latest European noise emission requirements. Selection of inherently quiet plant where possible; • Use of lower noise piling (such as rotary bored or hydraulic jacking) rather than driven piling techniques if any piling is required, where possible; • Off-site pre-fabrication, where practical; • All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use; • Ensuring contractors are made familiar with current legislation and the guidance in British Standard (BS) 5228 which should form a prerequisite of their appointment; • Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials around the Project Area to be conducted in such a manner as to minimise noise generation; • Consultation with Medway Council and local residents as appropriate to advise of potential noisy works that are due to take place; and • Monitoring of any noise complaints, and reporting to the contractor for immediate investigation.	Good construction practice embedded into how the scheme will be developed. A CEMP will be prepared by the Contractor prior to the commencement of works.
Construction	Scheme-Wide	NVIB02	**Construction Traffic Management Plan** A Construction Traffic Management Plan (CTMP) will be implemented, which will present the haul routes and road management procedures used to manage traffic movements within the works areas, the construction compound and on the local road network in the vicinity of the closest Noise Sensitive Receptors (NSRs).	Good construction practice embedded into how the scheme will be developed. A CTMP will be prepared by the Contractor prior to the commencement of works.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	NVIB03	**Noise and Vibration Best Practice** The best available operational methods will be employed at all times, having regard to the principles of BPM to minimise noise and vibration from the development.	Good construction practice embedded into how the scheme will be developed.
Design / Construction	Scheme-Wide	NVIB04	**Operational Noise** Operational noise impacts will be controlled by detailed design and mitigation measures; if required, this will be determined by the appointed contractor. The project specification will require that internal operational sound levels in nearby residential properties do not exceed NR 20. This limit applies to the cumulative operational sound of the converter station and the substation.	Good construction practice embedded into how the scheme will be developed. Requirement embedded into the project specification.
Design / Construction	Scheme-Wide	NVIB05	**Backup Generator** Although the noise of the proposed backup generator is not anticipated to be significant, it will be necessary to apply BPM with respect to its operation. BPM is likely to include: • Minimising the running of the generator i.e. keeping testing times as short as possible; • Positioning the generator such that line of sight to nearby receptors is blocked as much as possible to provide the maximum acoustic screening thereby minimising potential operational noise impacts; and • Providing an acoustic enclosure to the generator if required.	Good construction practice embedded into how the scheme will be developed. Requirement embedded into the project specification.

Archaeology and Cultural Heritage

Table 13.4 - Schedule of Mitigation for the GB Onshore Scheme (Archaeology and Cultural Heritage)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	ARCH01	**Archaeological Investigations - Overview** The results of the Archaeological Desk Based Assessment (DBA) has identified that there is the potential for archaeological remains to survive within the Site. Mitigation measures, in the form of a staged programme of archaeological investigation, recording and dissemination, if deemed appropriate by Kent County Council (KCC), could be employed to establish the presence and significance of archaeological remains within the Site. An outline programme of initial investigations follows based on the results of the desk-based assessment and impact assessment and in consultation with KCC.	Good construction practices embedded into how the scheme will be developed, as required. Pending confirmation from KCC, a range of archaeological investigation measures will be secured.
Construction	Scheme-Wide	ARCH02	**Geoarchaeological Investigation** A programme of sample recovery and analysis may be undertaken to investigate paleoenvironmental conditions and soil sediment development that may be relevant to the research of archaeological remains recovered within the vicinity. This would be achieved through trial pit excavations or other geotechnical soil sample retrieval methods (such as soil cores or boreholes).	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ARCH03	**Targeted Watching Brief** A programme of observation, investigation and recording of archaeological remains during or alongside construction activities in which the contractor's preferred method of working would be controlled as necessary to allow archaeological recording to take place to the required standard. Targeted watching briefs can be undertaken in specific cases where the presence of potential remains has been demonstrated, but where detailed investigation prior to the main construction programme is unjustified, unfeasible due to safety or logistical considerations, or undesirable.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ARCH04	**General Watching Brief** A programme of observation, investigation and recording of archaeological remains during or alongside construction activities in which the contractor's preferred method of working would be controlled as necessary to allow archaeological recording to take place to the required standard.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	ARCH05	**Strip Map and Sample Investigation** A flexible programme of fieldwork, which is of particular value where the presence of archaeological remains is known but the extent of areas requiring archaeological excavation is unclear. Topsoil and overburden would be stripped under archaeological control, over a defined area, in order to carefully expose archaeological remains. This work will be undertaken prior to the main construction programme in order to allow sufficient time for archaeological recording. A scope of work appropriate to record any archaeological remains exposed would be agreed on site during consultation with KCC.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ARCH06	**Trial Trench Evaluation** Either targeted or sample-based investigation in which mechanical excavated trenches are excavated in order to establish the presence/absence, location, extent, and character of archaeological deposits or activity foci identified by non-intrusive baseline survey methods. Trial trenching would also inform the need for further appropriate mitigation. Trial trenching would be applied to areas where no significant archaeological remains have been identified to control the risk to the construction programme and to 'unforeseeable' finds.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ARCH07	**Detailed Excavation** Detailed Excavation would be undertaken where significant archaeological remains are either known previously or discovered during works. This may be targeted at specific area locations such as the sites of archaeological interest identified during the baseline assessment or identified as the result of a programme of trial trench evaluation or watching brief monitoring.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	ARCH08	**Written Scheme of Investigation** Any appropriate archaeological investigation or mitigation measures would be undertaken in accordance with an Archaeological Project Design and Written Scheme of Investigation (WSI) prepared and approved in advance with KCC and Medway Council. All archaeological investigations will be undertaken by suitably qualified archaeologists who will be monitored as necessary by KCC to ensure compliance with both the agreed project design and professional standards.	Where required or deemed appropriate by KCC, good construction practice embedded into how the scheme will be developed.

Water Resources and Flood Risk

Table 13.5 - Schedule of Mitigation for the GB Onshore Scheme (Water Resources and Flood Risk)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Design / Construction	DC Cables	WAT01	**Embankment Protection** Modifications to the embankment along the coastline will be avoided by using HDD construction methods (as opposed to trenching or 'cut and cover') to drill underneath the defences. The depth of the defences and appropriate standoff distances will be agreed in consultation with the Environment Agency prior to works being undertaken. The installation of the cable beneath the coastal embankment, which forms the existing tidal flood defence line, will also require a Flood Risk Activity Permit (FRAP) from the Environment Agency.	Embedded within the design of the GB Onshore Scheme. Sustainable installation method embedded within construction phase. A FRAP will be obtained prior to the commencement of works, further offering the opportunity for adjustments to help minimise impact.
Design / Construction	Scheme-Wide	WAT02	**Water Demand** Processes during the construction phase that may require significant volumes of water supply include supply for washing down and potable water for sanitary facilities for site staff. The most intensive use of water, for the mixing of concrete, will be done off-site where possible and therefore will not affect water supply to the Project Area. Water supply to the site during construction phase will be provided from the existing Southern Water sources, via an application to use an existing water supply for building purposes. Water requirements during operation will be minimal and will entail provision of sanitary facilities for a small team of onsite staff. Should larger teams of site personnel be needed for periods of maintenance, temporary welfare facilities will be provided, and suitable arrangements made at that time.	Good construction practice embedded into how the scheme will be developed. Ongoing monitoring of demand and appropriate actions undertaken by the Contractor as and when required.
Design / Construction	Scheme-Wide	WAT03	**Wastewater** Wastewater generation on construction sites includes effluent from sanitary facilities provided on-site and from washing down and wheel wash facilities. It is expected that foul water generated at the Project Area will be drained via the existing combined sewers in the surrounding area, following treatment if required.	Good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		WAT03 (Cont.)	If dewatering is required during excavations, then abstracted water may be discharged to the Southern Water network, following sediment removal. Wastewater generation during operation will be minimal and will entail provision of sanitary facilities for a small team of onsite staff. Should larger teams of site personnel be needed for periods of maintenance, temporary welfare facilities will be provided, and suitable arrangements made at that time.	Ongoing monitoring of demand and appropriate actions undertaken by the Contractor as and when required.
Construction	Scheme-Wide	WAT04	**Sustainable Drainage System Phasing** Suitable construction phasing will be used to enable the SuDS features to be constructed at the beginning of the works. This would ensure that any rainfall events during construction of the substation and converter building would be intersected and attenuated by the SuDS before being discharged at a restricted rate into the agreed receiving waterbodies, in agreement with the North Kent Marshes Internal Drainage Board (IDB).	Good construction practice and approach to scheduling which will be embedded into how the scheme is developed.
Construction	Scheme-Wide	WAT05	**Ongoing Water Quality Monitoring** Surface water quality monitoring of the receiving waterbodies should be undertaken throughout construction to ensure any discharges from the works are not adversely impacting these waterbodies. Should any negative impacts be identified such as water pollution, site drainage pathways will be immediately reviewed.	Good construction practice embedded into how the scheme will be developed. Proactive ongoing monitoring undertaken by the Contractor.
Construction	Scheme-Wide	WAT06	**Construction Environmental Management Plan (Sediment Runoff)** The following mitigation sediment-specific measures will be put in place and embedded within the CEMP: • Development of an Erosion and Sediment Control Plan prior to execution of the Proposed Scheme; • Sufficient rumble pads will be provided at site access points to prevent tracking of sediments onto public roads; • Sediment traps will be provided at downstream edges of site to treat runoff prior to it leaving site; and, • Where possible, all runoff will be directed to the onsite sediment basin for treatment.	Good construction practice embedded into how the scheme will be developed. An Erosion and Sediment Control Plan will be prepared by the Contractor prior to the commencement of works. A CEMP will be prepared by the Contractor prior to the commencement of works.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	WAT07	**Construction Environmental Management Plan (Leaks, Spillages and Contaminant)** There is potential for hydraulic leaks from plant and machinery, as well as spills from chemical storages and sources such as concrete mixing to result in pollutant pathways to surrounding water resources. In relation to leaks and spillages of contaminants, the following mitigation measures will be embedded within a CEMP to reduce the risk of leaks and spills: • An emergency spillage action plan will be produced and included within the CEMP, which site staff will have read and understood, and will have been trained in its implementation on site; • Any damage to the drainage network will be repaired as soon as practical; • Any maintenance of plant and machinery will take place in a bunded impermeable area a minimum 20 m from any external drainage lines and the onsite waterbodies and those adjacent to the boundary; • The majority of concrete used will be pre-mixed and delivered from an off-site source, thereby negating the need to mix concrete on-site and reducing the creation of alkaline wastewater. Any mixing and handling of wet concrete on-site will be undertaken in designated impermeable areas, away from any drainage channels or surface water; and, • A designated impermeable area will be used for any washing down or equipment cleaning associated with concrete or cementing processes and wastewater will be discharged to the foul drainage system (with approval from Southern Water) or contained and removed by tanker to a suitable discharge location via a licensed waste operator.	Good construction practice embedded into how the scheme will be developed. A CEMP will be prepared by the Contractor prior to the commencement of works.
Design / Construction	Converter Station and Substation	WAT08	**Surface Water Management** During operation, the GB Onshore Scheme will generate several storm and wastewater sources including process waste, foul waste from sanitary facilities and surface water runoff from buildings, car parks and landscaped areas. Process and foul water management will be addressed as information about the sources of these flows becomes available and the design progresses. All surface water will be collected by rainwater pipes, gullies and linear drainage channels from all areas of hardstanding including building roofs, carparks and access roads.	Embedded within the design of the GB Onshore Scheme. Ongoing, proactive approach to water management as information on flows becomes available.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		WAT08 (Cont.)	Runoff will be attenuated onsite by the proposed SuDS features, prior to being conveyed via swales to discharge at greenfield runoff rates to the defined receiving waterbodies, in agreement with the North Kent Marshes IDB.	
Construction	Converter Station and Substation	WAT09	**Surface Water Quality** Silt traps will be incorporated into the surface water pipe networks to intersect silt and sediment before runoff is attenuated within the SuDS features. Silt traps will require periodic maintenance to ensure they remain operational throughout the design life of the GB Onshore Scheme. There is a residual risk of silts and sediments entering the SuDS features. However, the nature of the proposed SuDS will provide a treatment train and will trap potentially contaminated sediments within the vegetation, thus preventing the conveyance of silts and sediments into the receiving waterbodies Oil separator units will be installed upstream of all attenuation systems on all drainage serving roads and yard areas, where potential hydrocarbon contamination could occur.	Good construction practice embedded into how the scheme will be developed.
Design	Converter Station and Substation	WAT10	**Tidal Flood Risk** Correspondence with the Environment Agency included in the Flood Risk Assessment (FRA) Report confirmed that proposed infrastructure associated with the convertor station and substation should be set above the flood level for the defended 0.5% Annual Exceedance Probability (AEP) flood event, including climate change over the lifetime of the development. This corresponds to a flood level of 3.1 m Above Ordnance Datum (AOD). The platform for the converter station and substation will be set above this level including a suitable freeboard.	Embedded within the design of the GB Onshore Scheme informed by the Environment Agency.

Transport and Access

Table 13.6 - Schedule of Mitigation for the GB Onshore Scheme (Transport and Access)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	TRA01	**Construction Traffic Management Plan** Mitigation would be committed and delivered through the outline Construction Traffic Management Plan (CTMP) which will be agreed prior to construction with Medway Council. The CTMP will include the following: • Location of site and the entry/ exit arrangements; • Traffic routeing plans – defining the routes to be taken by Heavy Goods Vehicles (HGVs) to the site. For example, prioritising the use of A and B-roads as far as possible, avoidance of built-up areas and other sensitive locations; • Construction hours and delivery times stipulated to best avoid peak periods; • Strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions, timing restrictions and where access is prohibited; • Measures to protect the public highway (e.g. wheel wash facilities); • Measures for the monitoring of the CTMP to ensure compliance from drivers and appropriate actions in the event of non-compliance; • Mechanism for responding to traffic management issues arising during the works (including concerns raised from the public) including a joint consultation approach with relevant highways authorities; • Details of traffic management requirements; and • Strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions (statutory limits: width, height, axle loading and gross weight), timing restrictions (if applicable) and where access is prohibited.	Good construction practice embedded into how the scheme will be developed. The contractor will prepare a CTMP prior to the commencement of works.
Construction	Scheme-Wide	TRA02	**CTMP Controls** In addition to the areas of focus referenced in 'TRA01', the following control measures will be adopted by the scheme: • All construction traffic to adhere to the Traffic Route Plans included in the CTMP; • All vehicles will be able to access and egress the site in a forward gear, with sufficient room off the public highway to allow them to wait without blocking the main carriageway; • Welfare facilities will be provided so as to minimise the need for off-site trips by staff during the working day;	Good construction practice embedded into how the scheme will be developed. The contractor will prepare a CTMP prior to the commencement of works.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		TRA02 (Cont.)	• At all site accesses, suitable supervision will be provided as required to ensure that traffic is controlled at access points during construction (for example banksman checking road traffic and controlling construction vehicle movements) and mud deposits on the roads are minimised; and • Where required, traffic signals (in accordance with New Roads and Street Works Act (NRSWA), (Ref 25-7) or stop-go boards will be used to control road traffic. Road signs will conform to Chapter 8 of TSRG (Traffic Signs Manual, Ref 25-8) and NRSWA.	
Construction	Converter Station and Substation / Access Road	TRA03	**Road Safety** Whilst the majority of impacts relating to road safety are 'Negligible' or 'Minor', the access from the public highway at the B2001 would use Banksmen to manage the movement of HGVs on and off the public highway. Warning signage would be provided on the approaches to the access junction.	Good construction practice embedded into how the scheme will be developed.
Construction	Converter Station and Substation / Access Road	TRA04	**Travel Plan** A Travel Plan would be introduced in order to encourage sustainable travel to the site. The Travel Plan would include measures such as; encouragement of car sharing and public transport usage, better marketing of information and implementation of a Travel Plan Co-ordinator. Where appropriate, a shuttle bus to transport workers to key interchange locations could be introduced. An important element in ensuring the success of the construction phase and reducing the effects on traffic receptors is effective communication with local communities before and during the construction process, and in particular to inform them of the timing of construction activities and to help alleviate any concerns they may have. To address this the Applicant will ensure, in line with NRSWA and any Section 278 Agreements with the Highway Authorities, that the Contractor maintains good communication with affected communities, keeping them informed about the timing and extent of activities which may affect them. So far as practicable material will be retained on site including the retention of all soils and spoils, therefore minimising the need to move material on and off the site.	Good construction practice embedded into how the scheme will be developed. A Travel Plan will be prepared by the Contractor prior to the commencement of works. Proactive local engagement. Ongoing, proactive approach to travel management as demand evolves.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		TR04 (Cont.)	It is considered that with the implementation of the above measures, any minor effects on road users during the construction period will be reduced further. Where appropriate, HGVs would access and egress in a forward gear. At all accesses, warning signage will be provided on the approaches to the access junctions.	
Design / Construction	Converter Station and Substation / Access Road	TR05	**Pedestrians and Cyclists** As part of a Travel Plan developed for the proposed site, measures such as an internal site layout to accommodate the movement of pedestrian and cyclists would be designed. This would provide benefits within the site, but would not provide benefits to external receptors. There would however be very few pedestrian/ cyclist movements expected as part of the construction phase of the development, which relates to the relatively low number of additional workers expected.	Good construction practice embedded into how the scheme will be developed.

Ground Conditions

Table 13.7 - Schedule of Mitigation for the GB Onshore Scheme (Ground Conditions)

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Design	AC Cables	GEO01	**AC Cables** As the AC cable route will be sited in the immediate vicinity of the proposed substation/ converter station, no additional ground disturbance is envisaged as part of accommodating the AC cables.	Embedded within the design of the GB Onshore Scheme.
Construction	Scheme-Wide	GEO02	**Chemical and Hazardous Material Storage** Chemical substances and hazardous materials will be stored in accordance with Environment Agency Pollution Prevention Guidance (withdrawn but widely considered good practice) and applicable storage regulations and accredited operational and environmental management standards will be employed for these activities. Any hazardous materials will be stored in designated locations with specific measures to prevent leakage and the release of their contents. This will include a requirement to position storage areas at least 10 m away from surface water features/ drains (and take into consideration the positions of any groundwater abstraction wells), on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain at least 110% of the contents. Valves and trigger guns will be protected from vandalism and kept locked when not in use.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	GEO03	**Ground Gas** A ground investigation is in the process of being undertaken as part of design development. The outcomes of these further studies will inform the final adopted foundation solutions, the cut/ fill extents, dewatering strategies, the extent to which excavation support is required and also the extent to which ground gas mitigation is required.	Good construction practice embedded into how the scheme will be developed. Proactive ongoing approach to ground gas mitigation.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		GEO03 (Cont.)	Materials used in buildings and infrastructure will be specified accordingly, taking due account of the ground conditions such as elevated sulphate or ground gases. The assessment methodology set out in BRE Special Digest 1 (2005) will be adopted to determine the appropriate concrete classification. Ground gas assessment and mitigation will be undertaken and implemented in accordance with BS 8485 (2015) and CIRIA guidance document C665 (2007) based on the findings from the ground investigation and subsequent monitoring.	
Design / Construction	DC Cables	GEO04	**Ground Constraints** Opportunities have been taken, where possible, to avoid potential ground constraints and in particular any areas of landfilling or potentially infilled ground. In addition, the Limits of Deviation (LoD) approach allows for cable routeing refinement to take place once detailed design and additional survey data has been collected, which will provide flexibility to reduce construction and operation impacts as the detailed design stage develops. The preferred method for installation of the proposed underground DC cable will be by open cut methods with the cables laid in trenches or within buried ducts (subject to the ground conditions and cable specifications). However alternative methods are available, such as laying the cable in surface troughs and covering or capping these; this has the benefit of not disturbing any areas of historical landfill The Proposed scheme routes the DC cable along an area of hardstanding to the east of the Perry's Farm Landfill capping, in turn avoiding any significant disturbance/ interaction with the underlying landfill materials.	Embedded within the design of the GB Onshore Scheme. Proactive approach to refinement of the cable route depending on specific ground constraints. Good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Construction	Scheme-Wide	GEO05	**Ground Stability** There may be a requirement to provide temporary support for excavations. Such support may include benching of excavations, shoring or the construction of retaining walls (e.g. sheet piles) or struts to mitigate the risk associated with settlement or excessive spalling. It is expected that the need for such control would be established during detailed design and where specified and implemented correctly, would be sufficient to mitigate any residual effects.	Good construction practice embedded into how the scheme will be developed. Proactive ongoing management of ground risks.
Construction	Scheme-Wide	GEO06	**Construction Environmental Management Plan (Contaminant)** Measures contained within the CEMP would be designed to limit the potential for dispersal and accidental releases of potential contaminants, soil-derived dusts and uncontrolled run-off to occur during construction. For example, the CEMP will set out how material is to be excavated and stockpiled to minimise the potential for run-off, soil degradation or wind dispersal of dusts. The use of biodegradable netting and the binding of the surface through temporary grass seeding will be specified together with dampening procedures during dry weather. Sheeting may be used if any material is identified to be hazardous with a view to limiting water ingress and potential leachate generation. Soil storage and handling areas will be defined prior to construction commencing. In the event of uncontrolled releases occurring, the CEMP and the Contractor's own method statements contained in their Construction Phase Plan (CPP) will also set out the measures required to ensure that the extent and impact of any such releases are contained and ultimately remediated.	Good construction practice embedded into how the scheme will be developed. A CEMP will be prepared by the Contractor prior to the commencement of works.
Construction	Scheme-Wide	GEO07	**Pollution Response Plan** A Pollution Response Plan will be in place prior to the commencement of construction works. The plan will outline key pollution mitigation measures to be adopted including a Control of Substances Hazardous to Health (COSHH)/ fuel	Good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		GEO07 (Cont.)	inventory and key contacts to be notified in the event of a significant pollution incident, which may subsequently lead to the contamination of controlled waters or soils. All bulk fuel and COSHH items will be stored in accordance with the relevant Environment Agency Pollution Prevention Guidance (PPG) notes 40 (withdrawn but widely considered good practice) and storage regulations. Tanks and dispensing pumps will be locked when not in use to prevent unauthorised access.	A Pollution Prevention Plan will be prepared by the Contractor prior to the commencement of works.
Construction	Scheme-Wide	GEO08	**Plant Equipment** Only well-maintained plant will be used during construction to minimise the potential for accidental pollution from leaking machinery or damaged equipment. Static machinery and plant are expected to be stored in hardstanding areas when not in use and, where necessary, to make use of drip trays beneath oil tanks/ engines/ gearboxes/ hydraulics. Spill response kits containing equipment that is appropriate to the types and quantities of materials being used and stored during construction will be maintained on Project Area for the duration of the works.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	GEO09	**Impacts to Workers** Potential exposure impacts specific to construction workers during site preparation and construction would be mitigated by the following measures and through working in accordance with CIRIA C741 4th Edition 'Environmental Good Practice on Site' (2015): • Measures to minimise dust generation; • Provision of Personal Protective Equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils; • Provision of adequate hygiene facilities and clean welfare facilities for all construction site workers; • Monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e. to suitably trained personnel only, and use of specialist PPE, where necessary; and	Good construction practice embedded into how the scheme will be developed. The contractor will be required to work in accordance with CIRIA 'Environmental Good Practice on Site'.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		GEO09 (Cont.)	• Preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation.	
Construction	Scheme-Wide	GEO10	**Material Remediation** Specific mitigation measures may be required in the form of treating/ remediating any contamination encountered during construction (e.g. any contamination that may be associated with any potentially contaminative sites identified as part of the assessment, notably the landfills and areas of potentially infilled land). This will be confirmed based on information gathered through ground investigation.	Good construction practice embedded into how the scheme will be developed. Proactive ongoing management of contaminant risk as more information becomes available through, for example, ground investigations.
Construction	Scheme-Wide	GEO11	**Earthworks Strategy** Prior to construction, a strategy will be prepared as part of the design development, which will set out how the earthworks stage of the construction phase will be undertaken. Where necessary the strategy will consider what excavated materials can be reused or are required within the development of the various components of the GB Onshore Scheme, and what materials are surplus and require either disposal or onward management to ensure appropriate re-use. The strategy will also define whether any geotechnical improvement may be required, prior to re-use or disposal.	Good construction practice embedded into how the scheme will be developed. An Earthworks Strategy will be prepared by the Contractor prior to the commencement of works.
Construction	Scheme-Wide	GEO12	**Soil Management** To minimise the effects on soil resources during any earthworks, including materials management following foundation construction in relation to the substation/ converter station, high standards of soil handling and management will be employed with a view to minimising where possible the double handling of soils and the extent to which exposed soils will be left vulnerable to erosional processes.	Good construction practice embedded into how the scheme will be developed.
Construction	Scheme-Wide	GEO13	**Material Re-Use and Management** The re-use of excavated materials during construction will be governed by either a Materials Management Plan developed in accordance with the CL:AIRE Definition of Waste: Development Industry Code of Practice , an environmental	Good construction practice embedded into how the scheme will be developed. A Materials Management Plan will be developed prior to the commencement of works.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
		GEO13 (Cont.)	permit or a relevant exemption. The CL:AIRE Code of Practice is a voluntary framework for excavated materials management and re-use. Following this framework results in a level of information being generated that is sufficient to demonstrate to any regulator that excavated material has been re-used appropriately and is suitable for its intended use. It demonstrates that waste material has not been used in the development. The Materials Management Plan details the procedures and measures that will be taken to classify, track, store, reuse and dispose of all excavated materials that will be encountered during the development works.	
Construction	Scheme-Wide	GEO14	**Soil Disposal** The disposal of soil waste-contaminated or otherwise-to landfill sites would be best mitigated by minimisation of the overall quantities of waste generated during construction, and by ensuring that excavated material consigned to landfill cannot, as an alternative, be put to use either on Project Area or on other sites. Where there is a requirement to dispose of surplus excavated materials off site as waste, the material will be characterised to determine firstly whether it is Hazardous or Non-Hazardous waste in accordance with the Environment Agency's Technical Guidance WM3 and then once this is established, the appropriate disposal facility will be determined through Waste Acceptance Criteria (WAC) analysis, as required.	Good construction practice embedded into how the scheme will be developed. Assessment of an appropriate disposal facility as informed by WAC.
Design / Construction	Scheme-Wide / Cable Routes	GEO16	**Routeing** Routeing within the LoD will seek to be at least 50 m away from any groundwater abstractions. There is only one abstraction license within the extended study area, this is located in an area of apparent inactive mineral workings and so it is considered that there are no sensitive water abstractions that could be affected.	Good construction practice embedded into how the scheme will be developed.

Mitigation	Project Component	Reference	Description of Mitigation	How Measures will be Secured
Design / Construction	Scheme-Wide	GEO17	**Controlled Water Management** Due to the requirement to protect controlled waters (groundwater and surface water), further risk assessments will need to be undertaken at all trenchless crossing locations to ensure that the ground model is understood, and potential risks quantified prior to construction. Detailed design will seek to control the potential for ground or surface water contamination to occur, for example, through specifying vertical alignments that minimise the potential for "break out" of drilling fluids, or other fluids used in construction, therefore reducing potential impacts on ground and surface water quality. This is particularly relevant where designing works within granular materials or in particularly sensitive groundwater environments.	Good construction practice embedded into how the scheme will be developed. Proactive ongoing approach to management of risks to controlled waters informed by ground investigations and modelling / detailed design.

14. Summary & Conclusions

Introduction

14.1 This chapter summarises the results of the Environmental Impact Assessment (EIA) of the potential effects of the construction and operation of the components of NeuConnect (also referred to as 'the Project') that are located at Grain, UK to Mean Low Water Spring (MLWS) (the 'GB Onshore Scheme'), as presented in this Environmental Statement ES.

About NeuConnect

14.2 NeuConnect is a 1400 megawatt (MW) interconnector between Great Britain and Germany. The Project will create the first direct electricity link between Great Britain and German energy networks; two of the largest electricity markets in Europe. The new link will create a connection for electricity to be transmitted in either direction between Great Britain and Germany. The Project comprises approximately 700 kilometres (km) of subsea and underground High Voltage Direct Current (HDVC) cables, with onshore converter stations linking into the existing electricity grids at Grain in Great Britain and at Wilhelmshaven in Germany. The subsea cables will traverse through British, Dutch and German waters.

14.3 In Great Britain the GB Onshore Scheme extend as far as MLWS. The GB Onshore Scheme will comprise the following main elements:

- Cable sealing end compound within a fenced compound occupying an area of approximately 1,600 square metres (m^2) or 0.16 hectares (ha).
- Substation within a fenced compound occupying an area of approx. 6,400 m^2 or 0.64 ha. The substation will comprise a single building and some outdoor electrical equipment, and an internal road will allow access to equipment within the compound.
- Approximately 50 metre (m) long AC cable route from the substation to the converter station. The AC cable may be either underground or above ground.
- Converter station within a fenced compound occupying an area of approximately 62,500 m^2 or 6.25 ha. The converter station will comprise buildings and some outdoor electrical equipment, as well as internal roads around the buildings/ equipment.
- Access to the GB Onshore Scheme will be taken from the existing junction on the B2001/ Grain Road. The existing junction will be improved and a new approximately 850 m long permanent access road will be constructed. This provide access to both the proposed converter station and substation compounds.
- An approximate 1,550 m long underground DC cable route from the converter station to the landfall point.
- At the point of landfall, there will be a Transition Joint Pit (TJP), where underground and subsea DC cables are joined together (subsea cable are slightly larger than underground cables due to additional protective armouring).
- From the TJP and across the intertidal zone subsea DC cables will be installed in buried ducts for a distance of approximately 1,700 m.

Development of the GB Onshore Scheme

14.4 The development of the GB Onshore Scheme has been undertaken in parallel to the consideration of environmental and technical constraints and restrictions. The siting and orientation of the components of the GB Onshore Scheme, and the landscape of the Application Boundary have been designed to best align the development to the existing surroundings.

14.5 The GB Onshore Scheme is subject to further detailed design by the appointed Contractor, and as such the design of GB Onshore Scheme is set in terms of maximum parameters within which the final design will be constructed. In undertaking the EIA in parallel to the development of the maximum parameters a number of embedded mitigation measures have been included within the design that have avoided or minimised potential environmental impacts. This approach allows for flexibility and efficiencies for the Contractor whilst also establishing commitments and requirements that will be embedded within the construction methods and final design of the GB Onshore Scheme.

Results of the EIA

Landscape & Visual

14.6 The Landscape and Visual Impact Assessment (LVIA) considered the potential effects on the landscape and visual receptors at the construction phase, year 1 of operation and year 15 of operation from the GB Onshore Scheme. The LVIA also assesses the likely significant cumulative effects of the GB Onshore Scheme when considered in combination with the cumulative schemes.

14.7 In respect of effects on the landscape fabric and landscape character, the assessment found that significant effects during construction would be limited to the eastern edge of the Allhallows to Stoke Marshes LCA. Significant effects would arise from the loss of agricultural land as a result of construction activity at the proposed converter station and substation site as well as the DC cable route corridor. These effects would be short term during construction and there would be no physical change to the most distinctive landscape elements of the marshland. The landscape assessment concludes that there would be no significant effects at years 1 and 15 of operation. The assessment also concludes that the North Kent SLA would not be significantly affected.

14.8 In respect of visual amenity, of the nine viewpoints assessed during construction, visual receptors at three of the viewpoints would be significantly affected over the short term, with the furthest viewpoint located 3.9 km from the Project Area. The source of significant effects was due to receptors of medium sensitivity where the scale and extent of construction activity would be a prominent addition within the overall composition of the view. At year 1 of operation of the GB Onshore Scheme, the number of viewpoints significantly affected would be the same due to the scale and prominence of the proposed converter station and substation within close proximity views. At year 15 of operation of the GB Onshore Scheme, the number of viewpoints significantly affected would be reduced to one, at West lane. This finding relates to the establishment of landscape planting at the western edge of the Project Area which would reduce the prominence of the proposed converter station and substation over time.

14.9 The cumulative assessment concludes that there would be no significant cumulative effects on the landscape and visual receptors.

Ecology

14.10 The Ecological Impact Assessment (EcIA) considered the potential effects associated with the GB Onshore Scheme on Ecology and Nature Conservation. It evaluated relevant ecological receptors (including nature conservation designations, priority habitats, protected species and invasive non-native species (INNS)) associated with the GB Onshore Scheme, with each being assigned a nature conservation value (sensitivity).

14.11 Thereafter, the GB Onshore Scheme's potential impacts and effects on ecological receptor conservation status, inter-relationships, and their contribution to local (and if appropriate regional and national) biodiversity were identified. The assessment takes into account impact avoidance design measures and management activities when determining the significance of potential effects.

14.12 The assessment found that the residual effects – those that will remain after the implementation of mitigation measures – and not significant during construction or operation of the GB Onshore Scheme. Requirements for mitigation relating to potential effects are minimal and relate primarily to requirements to comply with good practice and relevant legislation.

Noise & Vibration

14.13 The assessment considered the potential significant impacts from noise and vibration generated from the construction and operation of the GB Onshore Scheme. The assessment was based on existing noise levels monitored from various surrounding receptors, namely residential properties within close proximity to the Project Area.

14.14 From the assessment of the potential noise and vibration generated during construction, including noise generated by construction traffic, it was concluded that the potential impacts to adjacent residences would not be significant. This assessment was based on the adoption of 'best practicable means' of mitigation measures to control noise, which would be documented within a Construction Environment Management Plan (CEMP) to ensure Contractor compliance. A project route map and delivery schedule would also be required to control construction traffic, in line with active onsite management of access points.

Noise emissions from operational activities will be considered during the detailed design, however the assessment concluded that the appropriate operational noise limits can readily be achieved at the nearest residential receptor, and therefore operational impacts will not be significant.

Cultural Heritage

14.15 The cultural heritage assessment considered the potential impact of the GB Onshore Scheme on designated and local heritage assets and their setting, during construction and operation, and also considered the likely risk of disturbing previously unrecorded assets.

14.16 The GB Onshore Scheme would not affect any World Heritage Sites, Registered Battlefields, Registered Parks and Gardens or Scheduled Monuments. It will cause change to the settings of two Listed Buildings, and two non-designated built heritage assets. Furthermore, the GB Onshore Scheme would directly impact on five non-designated archaeological assets located within the Site, and may impact on potential archaeological remains dating to the Palaeolithic, Iron Age, Roman, medieval, post-medieval, and modern periods.

14.17 The construction phase of the GB Onshore Scheme would have a temporary Minor adverse effect on the grade II listed World War II Anti-Tank Obstacles on the foreshore. The operational phase of the GB Onshore Scheme would have a Minor adverse effect on the Church of All Saints, Allhallows. Convention and professional judgement dictate that neither effect is significant.

14.18 The construction and operational phases of the GB Onshore Scheme would have Negligible to Minor adverse effects on the non-designated built heritage assets of Rosecourt Farm and Perry's Farm and Wilford's Farm. Convention and professional judgement dictate that these effects are not significant.

14.19 Five archaeological assets have been identified within the Site consisting of the remains of the post-medieval White Hall Farm, the remains of medieval ridge and furrow, the remains of a Second World War camp, and the remains of the a modern outfarm south of White Hall Farm. The fifth asset consists of a dipole anomaly of possible anthropogenic origin which is assessed in the GB Offshore Scheme ES Chapter 16. It has also been determined that the Site holds a potential to contain Palaeolithic, Iron Age, Roman, medieval, post-medieval and modern remains ranging in value from negligible to high.

14.20 It has been established that the GB Onshore Scheme would result in the truncation and/ or removal of archaeological assets, resulting in, at most, a permanent major adverse effect to the archaeological resource which would be significant. It has been recommended that a staged program of archaeological investigations is undertaken to identify the extent and further assess the significance of known and potential archaeological remains within the Site.

Water Resources & Hydrology

14.21 The residual impacts resulting from the proposed construction of the converter station, substation and DC cable have been considered collectively, considering potential impacts in regards to flood risk, water demand and discharge, surface water management and the risk of pollution or contaminant release.

14.22 As part of the development of the design of the GB Onshore Scheme Sustainable Drainage Systems (SuDS) have been incorporated within the landscaping masterplan, including two attenuation basins connected via swales to collect runoff from the Project Area. These SuDS have been design to accommodate increased runoff from the areas of hardstanding introduced to the area, and also compensation for some loss of flood storage capacity.

14.23 The phasing of construction activities will be managed to ensure that the SuDS measures are implemented at the beginning of construction to allow these measures to mitigate potential impacts from runoff. Further good practice measures will be embedded within the CEMP to avoid impacts from leaks and spillages of contaminants and sediment in runoff during construction, such as the use of rumble pads and sediment traps, and the use of hardstanding, bunded areas for the storage and use of potential contaminants.

14.24 A Flood Warning and Response Plan will be prepared prior to construction commencing detailing the planned response in the event of receiving a flood warning from the Environment Agency.

14.25 Based on the implementation of such mitigation measures there will be no significant residual effects during the construction of the GB Onshore Scheme.

14.26 No significant effects to water resources and flood risk are expected during the operation of the GB Onshore Scheme assuming a suitable Flood Warning and Evacuation Plan is established.

Transport & Access

14.27 Access to the proposed converter station and substation will be via the B2001 Grain Road. An existing unnamed road runs west/ northwest from Grain Road along the southern boundary of the site, which is the preferred point of access during construction and operation of the GB Onshore Scheme.

14.28 Prediction of construction effects has focused on activities that could directly and indirectly impact on receptors within the defined study area. The ZoI includes those roads which may be utilised during construction, and upon which there is the potential for a significant impact.

14.29 The results of the assessments indicate that the impacts are likely to be not significant. However, some receptors experience an effect deemed ‘moderate’. These concern Severance and Pedestrian facilities on Grain Road. These are not considered to be significant due to the lack of pedestrians or cyclists around to experience the effect brought on by the increase in HGV traffic.

Ground Conditions

14.30 The ground conditions topic assesses the potential impacts of the construction and operation of the GB Onshore Scheme in relation to ground conditions.

14.31 The assessment of temporary effects has shown that whilst there are predicted minor adverse impacts associated with the construction stage, none of these would be regarded as significant following adoption of the measures as part of a CEMP which will be prepared prior to the commencement of construction activities.

14.32 There are not expected to be any significant operational effects on ground conditions as the design of the GB Onshore Scheme is expected to include measures that would contain and control any releases of contaminants to the Project Area and its associated infrastructure during the operation period.

14.33 It is not considered that any of the identified committed schemes will generate cumulative effects in relation to ground conditions.

Cumulative Effects

14.34 A cumulative assessment has been undertaken to take in to account both inter-project and intra-project effects.

14.35 Intra-project effects has considered the impact of multiple environmental topics on the same receptor (i.e. the combined impact of increased disturbance (such as noise) and reduced visual amenity on walkers and visitors, as well as in-combination effects from different components the Scheme (i.e. the proposed DC cable route and the proposed converter station) on the same receptor.

14.36 Inter-project effects have considered the potential cumulative impacts from the simultaneous development of the GB Onshore Scheme with other projects within the near vicinity of the Project Area. A systematic review of projects either already within or known to soon enter the planning system were reviewed by each of the specialists to determine potential cumulative impacts.

Intra-Project Effects

14.37 The assessment potential cumulative effects on an individual receptor from different components of the GB Onshore Scheme, and from multiple sources has determined that whilst there have been some impacts identified these are not likely to be of greater significance than when considering the potential effects individually. Intra-project effects are limited to the amenity of residential receptors, and users of surrounding walking routes adjacent to the Project Area.

Inter-Project Effects

14.38 Of the six short-listed projects identified that had the potential to result in cumulative impacts when taken in to consideration with the GB Onshore Scheme, potential impacts associated with the proposed NGET OHL Works, GB Offshore Scheme and the cement plant at Thamesport were considered for further assessment. However it was concluded that any potential cumulative impacts would not be significantly impacted as a result of the simultaneous development or operation of the GB Onshore Scheme and these other projects.

Conclusions

14.39 The results of the EIA ensure that the LPA and statutory consultees as well as other interested parties including local communities are aware of the GB Onshore Scheme's environmental impacts and whether these may be significant or not. The purpose of identifying the significant effects (adverse and beneficial) is to ensure that they may be considered alongside other material considerations in determining the applications for planning permission.

14.40 The EIA of the GB Onshore Scheme has identified and assessed the likely significant effects which would result from its construction and operation. Through the iterative development of the design in line with the EIA, NeuConnect Britain Limited, the Applicant, has prevented or reduced a number of potentially significant environmental effects. However, given the scale of the GB Onshore Scheme some significant environmental effects are unavoidable and as such some will remain following mitigation. As set out above, the significant environmental effects will be limited to landscape character during construction, visual amenity during construction and operation, and potentially to unrecorded archaeological assets during construction (although impact would be permanent. The operational impacts regarded to be significant are from West Lane only, which would include users of the road and users of the Coastal Path (which is yet to be established).

14.41 The GB Onshore Scheme has been designed to measures to help mitigate identified potential impacts, including the enhancement and establishment of boundary screening planting, for the provision of green corridors and to phase the development in to the existing landscape context in-fitting with the industrial units to the south of the existing overhead line. Further to this mitigation embedded in the design, the Applicant has committed to a number of additional measures to be implemented during construction to further avoid and minimise potential adverse impacts.

14.42 Should planning permission for the GB Onshore Scheme be granted the Applicant is committed to working with their appointed Contractor(s) to reduce the GB Onshore Scheme's environmental effects as far as practicable in finalising the detailed scheme design and undertaking construction works. This approach will ensure that the actual effects of the GB Onshore Scheme would be no greater than the likely effects identified and assessed in this ES.