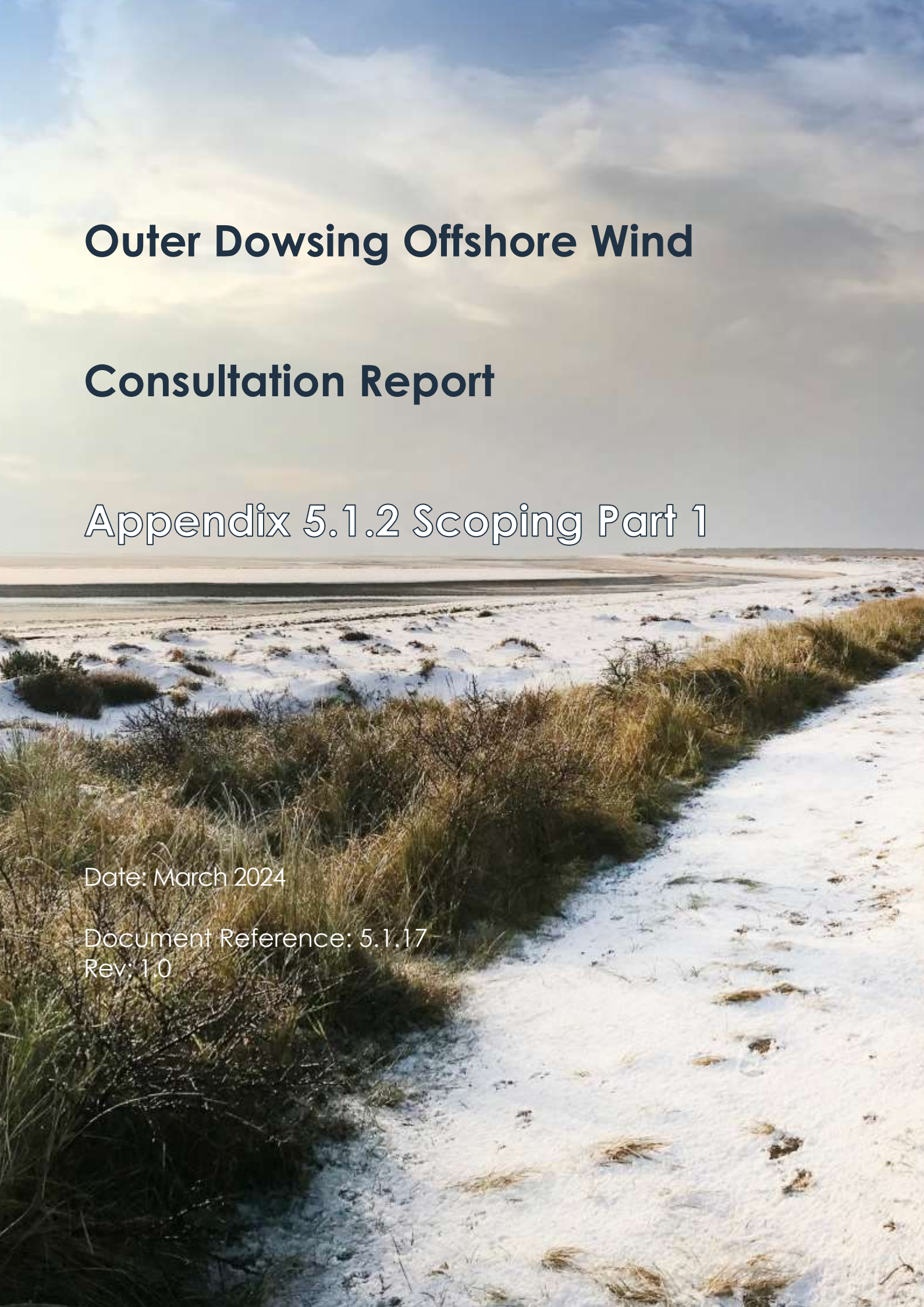

Outer Dowsing Offshore Wind

Consultation Report

Appendix 5.1.2 Scoping Part 1

Date: March 2024

Document Reference: 5.1.17
Rev: 1.0

Company:	**Outer Dowsing Offshore Wind**	Asset:	**Whole Asset**
Project:	**Whole Wind Farm**	Sub Project/Package:	Whole Asset
Document Title or Description:	Appendix 5.1.2 Scoping		
Internal Document Number:	PP1-ODOW-DEV-CS-REP-0143	3rd Party Doc No (If applicable):	N/A

Rev No.	Date	Status / Reason for Issue	Author	Checked by	Reviewed by	Approved by
1	March 2024	DCO Application	ODOW	ODOW	ODOW	ODOW

Appendix 5.1.2 Scoping

This Appendix includes the following documents:

- Annex 5.1.2A Scoping Report
- Annex 5.1.2B Scoping Opinion
- Annex 5.1.2C Notification to provide an ES and Intent to Submit a Request for a Scoping Opinion

Outer Dowsing Offshore Wind

Scoping Report

Date: July 2022

Document No: 123-ODO-CON-K-RA-000002-01

Rev: v1.0

OUTER DOWSING OFFSHORE WIND

Company:	Outer Dowsing Offshore Wind	**Asset:**	Whole Asset
Project:	Whole Wind Farm	**Sub Project/Package:**	Whole Asset
Document Title or Description:	Scoping Report		
Document Number:	123-ODO-CON-K-RA-000002-01	**3rd Party Doc No (If applicable):**	N/A

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Rev No.	Date	Status / Reason for Issue	Author	Checked by	Reviewed by	Approved by
v1.0	July 2022	Final	GoBe Consultants Ltd	BT	RF	CJ

Table of Contents

Acronyms

Acronym	Meaning
AADT	Annual Average Daily Traffic
ADS	Archaeology Data Service
AfL	Agreement for Lease
AIL	Abnormal Indivisible Loads
AIP	Aeronautical Information Publication
AIS	Automatic Identification System
AL1	Cefas Guideline Action Level 1
AL2	Cefas Guideline Action Level 2
ALAR	Abnormal Load Assessment Report
ALARP	As Low As Reasonably Practicable
ALC	Agricultural Land Classification
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
ANSP	Air Navigation Service Provider
AONB	Areas of Outstanding Natural Beauty
AoS	Area of Search
APFP	Applications: Prescribed Forms and Procedure
AQAL	Air Quality Acceptable Limit
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ASR	Annual Status Report
ATC	Air Traffic Control
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
AURN	Automatic Urban and Rural Network
AW	Ancient Woodland
BCT	Bat Conservation Trust
BDMPS	Biologically Defined Minimum Population Scales
BEIS	Department for Business, Energy & Industrial Strategy
BERR	Business Enterprise and Regulatory Reform
BGS	British Geological Survey
BMAPA	British Marine Aggregate Producers Association
BMV	Best and Most Versatile
BODC	British Oceanographic Data Centre
BP	Before Present
BPM	Best Practicable Means
BSI	British Standards Institution
BTO	British Trust for Ornithology

Acronym	Meaning
CAA	Civil Aviation Authority
CBRA	Cable Burial Risk Assessment
CCC	Climate Change Committee
CCS	Carbon Capture and Storage
CCTV	Closed-Circuit Television
CCUS	Carbon Capture Utilisation and Storage
CD	Chart Datum
CDM	Construction Design and Management Regulations
CEA	Cumulative Effects Assessment
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CI	Confidence Interval
CIEEM	Chartered Institute of Ecology and Environment Management
CION	Connections and Infrastructure Option Note
CIRIA	Construction Industry Research and Information Association
CMS	Construction Method Statement
COMAH	Control of Major Accident Hazards
COWRIE	Collaborative Offshore Wind Energy Research into the Environment
CPRE	Campaign to Protect Rural England
CRM	Collision Risk Modelling
CSIP	Cable Installation and Specification Plan
CSM	Conceptual Site Model
CTA	Control Area
CTMP	Construction Traffic Management Plan
DAERA	Department of Agriculture, Environment and Rural Affairs
DAS	digital aerial surveys
DBA	Desk Based Assessment
DC	Direct Current
EU DCF	European Union Data Collection Framework
DCLG	Department for Community and Local Government
DCM	Drained Coastal Marshes
DCO	Development Consent Order
DDT	Dichlorodiphenyltrichloroethane
DDV	Drop Down Video
DECC	Department of Energy & Climate Change, now Department of Business, Energy and Industrial Strategy (BEIS)
Defra	Department for Environment, Food and Rural Affairs
DLUHC	Department for Levelling Up, Housing and Communities
DMRB	Design Manual for Roads and Bridges
DP	Dynamic Positioning
DPF	Diesel Particulate Filters
DSM	Digital Surface Model
DSP	Development Services Provider

Acronym	Meaning
DTI	Department of Trade and Industry
DTM	Digital Terrain Model
EC	European Commission
ECA	Emission Control Area
ECC	Export Cable Corridor
ECHP	European Centre for Health Policy
EDR	Effective Deterrence Range
EEA	European Economic Area
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMF	Electromagnetic fields
EMS	European Marine Site
ENA	Energy Networks Association
EPA	Environmental Protection Act
EPP	Evidence Plan Process
EPS	European Protected Species
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
ES	Environmental Statement
ESCA	European Subsea Cable Association
ETG	Expert Topic Group
ETI	Energy Technology Institute
EU	European Union
EUMOFA	EU Market Observatory for Fisheries and Aquaculture
EUNIS	European Nature Information System
FEPA	Food and Environment Protection Act
FFC	Flamborough and Filey Coast
FIR	Flight Information Region
FL	Flight Level
FLiDAR	Floating Light Detection and Ranging
FLO	Fisheries Liaison Officer
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables
FRA	Flood Risk Assessment
FSA	Formal Safety Assessment
GB	Great Britain
GBP	Great British Pound
GBS	Gravity Base Structure
GCN	Great Crested Newt
GDP	Gross Domestic Product

Acronym	Meaning
GEART	Guidance for Environmental Assessment of Road Traffic
GHG	Greenhouse Gas
GIG	Green Investment Group
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GTR4 ltd	The special project vehicle created in partnership between Green Investment Group and TotalEnergies
GVA	Gross Value Added
GW	Gigawatt
GWD	Groundwater Directive
HADA	Humber Aggregate Dredging Association
HAT	Highest Astronomical Tide
HAZID	Hazard Identification
HDD	Horizontal Directional Drilling
HDV	Heavy-Duty Vehicle
HER	Historic Environment Record
HEY	Hull and East Yorkshire
HGV	Heavy Goods Vehicles
HIA	human health impact assessment
HLC	Historic Landscape Character
HMRI	Helicopter Main Routing Indicators
HND	Holistic Network Design
HRA	Habitats Regulations Assessment
HSC	Historic Seascape Characterisation
HSE	Health, Safety and Environment
HTZ	Helicopter Traffic Zones
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IAMMWG	the Inter Agency Marine Mammal Working Group
IAQM	Institute of Air Quality Management
IBTS	International Bottom Trawl Surveys
ICAO	International Civil Aviation Organisation
ICES	International Council for the Exploration of the Sea
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IDB	Internal Drainage Boards
IECS	Institute of Estuarine and Coastal Studies
IEMA	Institute of Environmental Management and Assessment
IFCA	Inshore Fisheries & Conservation Authority
IFISH	Integrated Fisheries System Holding) Database
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules

Acronym	Meaning
IHBC	Institute of Historic Building Conservation
IHLS	International Herring Larval Survey
ILT	Inspectie Leefomgeving en Transport
IMO	International Maritime Organisation
INNS	Invasive Non-Native Species
IOF	Important Ornithological Features
IOMU	Infrastructure and Other Marine Users
IP	Interested Parties
IPA	Important Plant Areas
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
IUCN	International Union for Conservation of Nature
JCP	Joint Cetacean Protocol
JHWS	Joint Health and Wellbeing Strategies
JNAPC	Joint Nautical Archaeology Policy Committee
JNCC	Joint Nature Conservation Committee
KIS	Kingfisher Information Service
KISORCA	Kingfisher Information Service – Cable Awareness
kJ	Kilojoule
kV	Kilovolt
LAQM	Local Air Quality Management
LARS	Lower Airspace Radar Service
LAT	Lowest Astronomical Tide
LB	Listed Buildings
LCA	Landscape Character Area
LCC	Lincolnshire County Council
LCRM	Land Contamination Risk Management
LDV	Light-Duty Vehicle
LEA	Local Economic Area
LEP	Local Enterprise Partnership
LFN	Low Frequency Noise
LFP	Lost Frontiers Project
LGV	Light Goods Vehicle
LiDAR	Light Detection and Ranging
LLA	Local Landscape Area
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LPA	Local Planning Authority
LRN	Local Road Network
LSE	Likely Significant Effect
LTRA	Local Tourism and Recreation Area

Acronym	Meaning
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAG	magnetometer
MAH	Major Accident Hazards
MAIB	Marine Accident Investigation Branch
MAREA	Marine Aggregate Regional Environmental Assessment
MarESA	Marine Evidence based Sensitivity Assessment
MBES	Multi-beam System
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MCEU	Marine Consents and Environment Unit
MCZ	Marine Conservation Zone
MDA	Managed Danger Area
MDS	Maximum Design Scenario
MERP	Marine Ecosystems Research Programme
METAR	Meterological Aerodrome Report
MFE	Mass Flow Excavation
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	mean low-water springs
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MMU	minimum mapping units
MOD	Ministry of Defence
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MPS	Marine Policy Statement
MS	Method Statement
MSL	Mean Sea Level
MT	Million Tonnes
MU	Management Unit
MW	Mega Watt
MW&SQ	Marine Water and Sediment Quality
N/A	Not Applicable
NATS	National Air Traffic Services
NCA	National Character Areas
NCERM	National Coastal Erosion Risk Mapping
NCP	Norfolk Coast Partnership
NEP	Northern Endurance Partnership
NERC	Natural Environment and Rural Communities
NEWS	Non-Estuarine Waterbird Surveys
NFFO	National Federation of Fishermen's Organisations

Acronym	Meaning
NFU	National Farmers Union
NGET	National Grid Electricity Transmission
NGR	National Grid Reference
NGESO	National Grid Electricity System Operator
NHS	National Health Service
NHSC	National Historic Seascape Characterisation
NI	Northern Ireland
NIC	National Infrastructure Commission
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NRHE	National Record of Historic Environment
NRMM	non-road mobile machinery
NRW	National Resources Wales
NSIP	Nationally Significant Infrastructure Project
NSPP	North Sea Palaeolandscapes Project
NSR	Noise-Sensitive Receptors
NSTA	North Sea Transition Authority
NTSLF	National Tide and Sea Level Facility
NUC	Not Under Command
NVQ	National Vocational Qualification
NVZ	Nitrate Vulnerable Zone
O&M	Operation and Maintenance
OCM	Open Coastal Marshes
OCP	Organochlorine Pesticide
OCTMP	Outline Construction Traffic Management Plan
ODOW	Outer Dowsing Offshore Wind (The Project)
ONS	Office for National Statistics
OP	Offshore Platform
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
ORE	Offshore Renewable Energy
OREI	Offshore Renewable Energy Installation
ORP	Offshore Reactive Platforms
OS	Ordnance Survey
OSP	Offshore Substation Platform
OSPAR	Oslo / Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
OTNR	Offshore Transmission Network Review
OTP	Outline Travel Plan
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discoveries

Acronym	Meaning
PAH	Polycyclic Aromatic Hydrocarbon
PAM	Passive Acoustic Monitoring
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCM	Pollution Climate Mapping
PDS	Project Design Statement
PEA	Preliminary Ecological Apprasil
PEIR	Preliminary Environmental Information Report
PEMMP	Project Environmental Management and Monitoring Plan
PEMP	Project Environmental Management Plan
PHE	Public Health England
PIA	Personal Injury Accident
PLQRA	Primary Land Quality Risk Assessment
POM	Particulate Organic Matter
PPE	personal protective equipment
PPG	National Planning Practice Guidance
PSA	Particle Size Analysis
PSR	Primary Surveillance Radars
PTS	Permanent Thgreshold Shift
PVA	The population viability analysis
R2	Round 2
RAF	Royal Air Force
RB	Registered Battlefields
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathway
RCS	reactive compensation station
REC	Regional Environmental Characterisation
REWS	Radar Early Warning Systems
RIAA	Report to Inform Appropriate Assessment
RNLI	Royal National Lifeboat Institution
RPG	Registered Park and Garden
RRH	Remote Radar Head
RSPB	Royal Society for the Protection of Birds
RWC	Realistic Worst Case
RYA	Royal Yatching Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SBP	Sub-bottom Profiler
SCADA	Supervisory Control and Data Acquisition
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SCOS	Special Committee on Seals
SEA	Strategic Environmental Assessment

Acronym	Meaning
SLVIA	seascape, landscape and visual assessment
SMP	Shoreline Management Plan
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Bodies
SNS	Southern North Sea
SNSSTS II	Southern North Sea Sediment Transport Study Phase 2
SoS	Secretary of State
SOSS	Strategic Ornithological Support Service
SOV	Service Offshore Vessel
SoW	Scope of Works
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SPMP	Scour Protection Management Plan
SPMT	Self-Propelled Modular Transporters
SPZ	Source Protection Zones
SRN	Strategic Road Network
SSC	Suspended Sediment Concentration
SSR	Secondary Surveillance Radar
SSS	Side Scan Sonar
SSSI	Site of Special Scientific Interest
TCA	Trade and Cooperation Agreement
TCE	The Crown Estate
TGN	Technical Guidance Notes
The Inspectorate	Planning Inspectorate
TJB	Transition Joint Bay
TMZ	Transponder Mandatory Zone
TP	Transition Piece
TRA	Temporary Reserved Area
TSHD	Trailer Suction Hopper Dredger
TTS	Temporary Threshold Shift
TWT	The Wildlife Trust
UHRS	Ultra-high Resolution Seismic
UK	United Kingdom
UKFEN	UK Fisheries Economic Network
UKFIM	UK Fisheries Information Mapping
UKHO	United Kingdom Hydrographic Office
UKSAP	UK Storage Appraisal Project
UNFCCC	United Nations Framework Convention on Climate Change
UWWTD	Urban Waste Water Treatment Directive
UXO	Unexploded ordnance
VFR	Visual Flight Rules

Acronym	Meaning
VMP	Vessel Management Plan
VMS	Vessel Monitoring System
WBCSD	World Business Council for Sustainable Development
WCH	Walkers, Cyclists and Horse-riders
WEBS	Wetland and Bird Survey
WFD	Water Framework Directive
WHO	World Health Organization
WHS	World Heritage Sites
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator
WWI	World War One
WWII	World War Two
XLPE	Cross Linked Polyethylene Cable
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Project Background

1.1.1 In September 2019, The Crown Estate (TCE), as manager of the seabed, initiated a new leasing round process, known as Leasing Round 4 in order to make new areas of the seabed available for offshore wind development. It aimed to identify at least 7 GW of new offshore wind projects in English and Welsh waters, with the potential to deliver electricity for more than six million homes. The Offshore Wind Leasing Round 4 tender process concluded in February 2021, selecting six proposed new offshore wind projects in the waters around England and Wales.

1.1.2 GTR4 Limited (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant', was successful in the auction process securing Preferred Bidder status for an area in the southern North Sea. The project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company) and TotalEnergies. Known as Outer Dowsing Offshore Wind (ODOW, hereafter referred to as 'the Project'). The Project is currently subject to a Plan-Level Habitats Regulations Assessment (HRA), being carried out by TCE as the competent authority. This Scoping Report is submitted on the basis that the Agreement for Lease (AfL), formalising the seabed exclusivity and development rights for the Project, will be confirmed by TCE when the Plan-Level HRA process has been concluded.

1.1.3 The Project is a proposed offshore windfarm located approximately 54 km off the coast of Lincolnshire, England, comprising of an offshore generating station and covering an area of seabed, at this stage, of up to 500 km^2. The Applicant intends to reduce the size of the array area from 500 km^2 to an area of up to 300 km^2 prior to consent.

1.1.4 The Project qualifies as a Nationally Significant Infrastructure Project (NSIP), as defined by Section 15(3) of the Planning Act 2008 (HM Government, 2008) and as a result, an application for a Development Consent Order (DCO) will be submitted to the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS) (which will include deemed Marine Licences). The DCO will be accompanied by an ES prepared through an EIA process in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended in 2020 and hereafter will be referred to as the EIA Regulations) (HM Government, 2017), the development falling under Schedule 2 of the EIA Regulations, alongside a variety of other supporting information in response to the legislative requirements summarised under Section 2 of this report.

1.2 Purpose of the Report

1.2.1 This Scoping Report has been submitted to support a request for a formal Scoping Opinion on the Project from the Planning Inspectorate (hereafter The Inspectorate), on behalf of the SoS. It has been prepared in accordance with Regulation 10 of the EIA Regulations (HM Government, 2017).

1.2.2 This Scoping Report is intended to provide all of the information required under the EIA Regulations to allow a Scoping Opinion to be granted. It presents an overview and description of the Project as well as a review of the potential impacts associated with the construction, operations, maintenance, and decommissioning phases of the Project on the physical, human and biological environments. It goes on to propose a proportionate approach to addressing potential impacts through the EIA process and, where appropriate, by the adoption of mitigation measures. The proposed approach builds on and makes reference to agreements already made through discussion with stakeholders regarding selected topics, prior to the publication of this report (see Section 5).

1.2.3 Specifically, and to comply with Regulation 10 of the EIA Regulations, this Scoping Report provides:

- Plans sufficient to identify the area required for the construction, operation and decommissioning of the Project; and
- A brief description of the nature and purpose of the Project developments and potential effects on the environment.

1.2.4 The Scoping Report is intended to:

- Identify the likely key environmental features which have the potential to be affected by the Project;
- Outline the data that will be collected to facilitate a detailed understanding of the environmental baseline, providing the basis for the assessment of the potential impacts of the Project through the remaining EIA process;
- Provide an overview of the potential issues arising from the Project, with the aim of delivering a focused and proportionate EIA;
- Provide justification for focusing the EIA on particular issues which have the potential to be significant (in EIA terms); and
- Reduce the emphasis on issues which are demonstrably not significant (in EIA terms).

1.2.5 The ES, which will describe and summarise the EIA, will be based on the Scoping Opinion, which is informed by the recommendations of the consultees and the information contained within this Scoping Report and by ongoing engagement with relevant stakeholders and interested parties throughout the remainder of the pre-application period including the formal statutory consultation required by the Planning Act 2008 and informed by the publication of the Preliminary Environmental Information report (PEIR).

1.3 Notification of Accompanying Environmental Statement

1.3.1 Pursuant to Regulation 8(1)(b) of the EIA Regulations, the Applicant hereby gives notice (also issued in writing to The Inspectorate on 17th June 2022) that the application for a DCO for the Project will be accompanied by an ES. The ES will include at least the information set out in Regulation 14(a) - (e) and any additional information specified in Schedule 4 relevant to the specific characteristics of the Project and to the environmental features likely to be significantly affected. It will include the information required for reaching a reasoned conclusion on the Likely Significant Effects (LSE) of the Project, as well as the outcomes of the scoping process as set out by the Scoping Opinion.

1.4 The Applicant

1.4.1 The Applicant is GTR4 Limited (a joint venture between Corio Generation and TotalEnergies), trading as Outer Dowsing Offshore Wind.

1.4.2 TotalEnergies, a global multi-energy company, has expertise in offshore operations and maintenance thanks to its historical activities. TotalEnergies is already developing and building offshore wind projects with a cumulative capacity of approximately 6 GW, including three floating offshore wind projects in Europe and Asia. As part of its ambition to get to net zero by 2050, TotalEnergies is building a portfolio of activities in renewables and electricity that should account for up to 40% of its sales by 2050. At the end of 2020, TotalEnergies' gross power generation capacity worldwide was around 12 GW, including 7 GW of renewable energy. TotalEnergies will continue to expand this business to reach 35 GW of gross production capacity from renewable sources by 2025, and then 100 GW by 2030 with the objective of being among the world's top 5 in renewable energies.

1.4.3 Corio Generation is a specialist offshore wind business, dedicated to harnessing the world's greatest energy supply. With a unique blend of sector-leading expertise and deep access to long-term capital, Corio applies a long-term partnership approach to the creation and management of projects, taking them from origination, through development and construction, and into operations. Corio's 15 GW pipeline is one of the largest in the world, spanning established and emerging markets, as well as floating and traditional fixed-bottom technologies. These next generation offshore wind projects will help form the backbone of the net-zero global energy system while meeting the energy needs of communities and corporate off takers sustainably, reliably, safely and responsibly. Corio Generation is a Green Investment Group (GIG) portfolio company, operating on a standalone basis. GIG is a specialist green investor within Macquarie Asset Management, part of Macquarie Group.

1.5 Scoping Area Boundary

1.5.1 The Project's array area, offshore scoping boundary and onshore scoping boundary is presented in Figure 1.5.1. The offshore and onshore scoping boundaries for the Project are presented separately in Figure 1.5.2 and Figure 1.5.3 respectively. These scoping boundaries include both the offshore wind farm (OWF) array area, for which Preferred Bidder status has been awarded by TCE, and the broader AoS within which it is currently anticipated that the associated onshore and offshore infrastructure will be installed. Further details on defining both the onshore and offshore AoS' are detailed in Section 4.

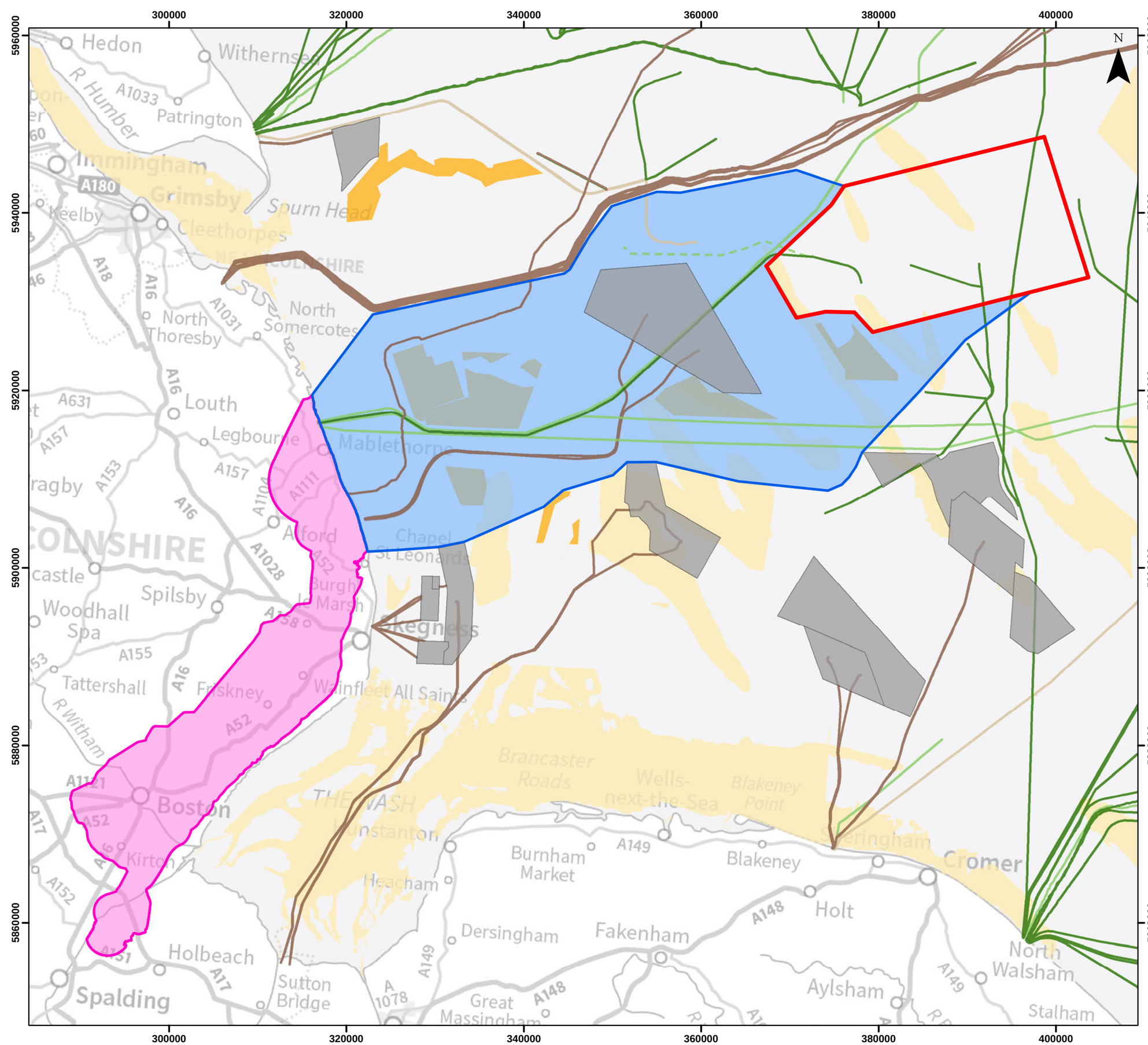
1.5.2 The location for the Project's array area was selected through the consideration of various environmental and engineering/technical constraints (described in Section 3).

1.5.3 At present, the Project does not have a confirmed grid connection point (although the Project has made a grid connection application and has received a holding offer from National Grid). The preferred grid connection point for the project will be determined through the Offshore Transmission Network Review (OTNR) Holistic Network Design (HND) process which has identified potential grid connection options for the Project. Initiated by the Minister for Energy, Clean Growth and Climate Change, the OTNR process is being managed by BEIS with support from Ofgem, the National Grid Electricity System Operator (NGESO) and TCE. Further information on the OTNR process is provided in relation to the site selection and alternatives process in Section 4.

1.5.4 The provisional outcomes of the OTNR process include two possible grid connection options - a location known as 'Lincolnshire Node' (Lincs Node) which is located close to the coast in Lincolnshire, or a connection at the junction of existing overhead lines at Weston Marsh, to the south of Boston, Lincolnshire (see Figure 1.5.4). Once the final outcome of the OTNR is confirmed, the existing holding grid connection offer will be amended to reflect the OTNR conclusion. The Project will then be able to determine the optimal onshore cable route needed to connect to this location.

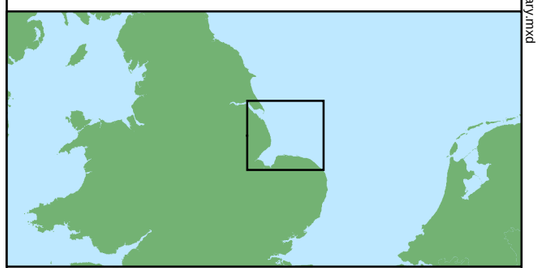
1.5.5 Both of these options are currently being considered during the preliminary site selection process, and are included for the purposes of defining the onshore AoS and scoping boundary. The refinement of the final option is subject to the outcomes of the OTNR and the final grid connection offer received by the Project.

1.5.6 Associated with the onshore grid connection options, the Project has also determined indicative AoS for offshore ECC from the array to potential cable landfall areas at the coast and indicative broad AoS for the onshore cable routes from the cable landfalls to both of the grid connection options, including AoS for onshore substations in the vicinity of the grid connection locations; combined these constitute the scoping area boundary.



Legend

- Site Boundary
- Offshore Scoping Boundary
- Onshore Scoping Boundary
- Offshore Wind Farm
- Cable - Active
- Cable - Not In Use
- Pipeline - Active
- Pipeline - Not In Use
- Pipeline - Abandoned
- Aggregates Area
- Annex I Sandbanks



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:400,000

The Project's array area location and offshore and onshore scoping boundary

Figure 1.5.1

OUTER DOWSING OFFSHORE WIND

Date: 23/07/2022
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Revision: 0.1

GoBe

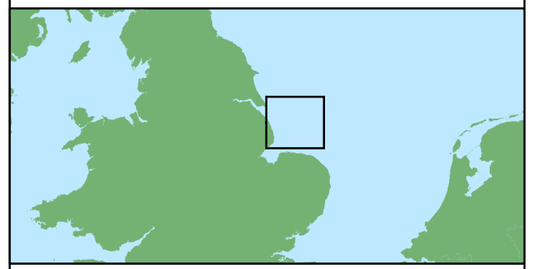
320000 340000 360000 380000 400000

5960000 5940000 5920000 5900000 5880000

N

Legend

- Site Boundary
- Offshore Scoping Boundary
- Onshore Scoping Boundary
- Offshore Wind Farm
- Cable - Active
- Cable - Not In Use
- Pipeline - Active
- Pipeline - Not In Use
- Pipeline - Abandoned
- Aggregates Area
- Annex I Sandbanks



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:300,000

The Project's array area location and offshore scoping boundary

Figure 1.5.2

OUTER DOWSING OFFSHORE WIND

Date: 23/07/2022
Produced By: BPHB
Revision: 0.1

GoBe

Contains ESRI Basemapping;

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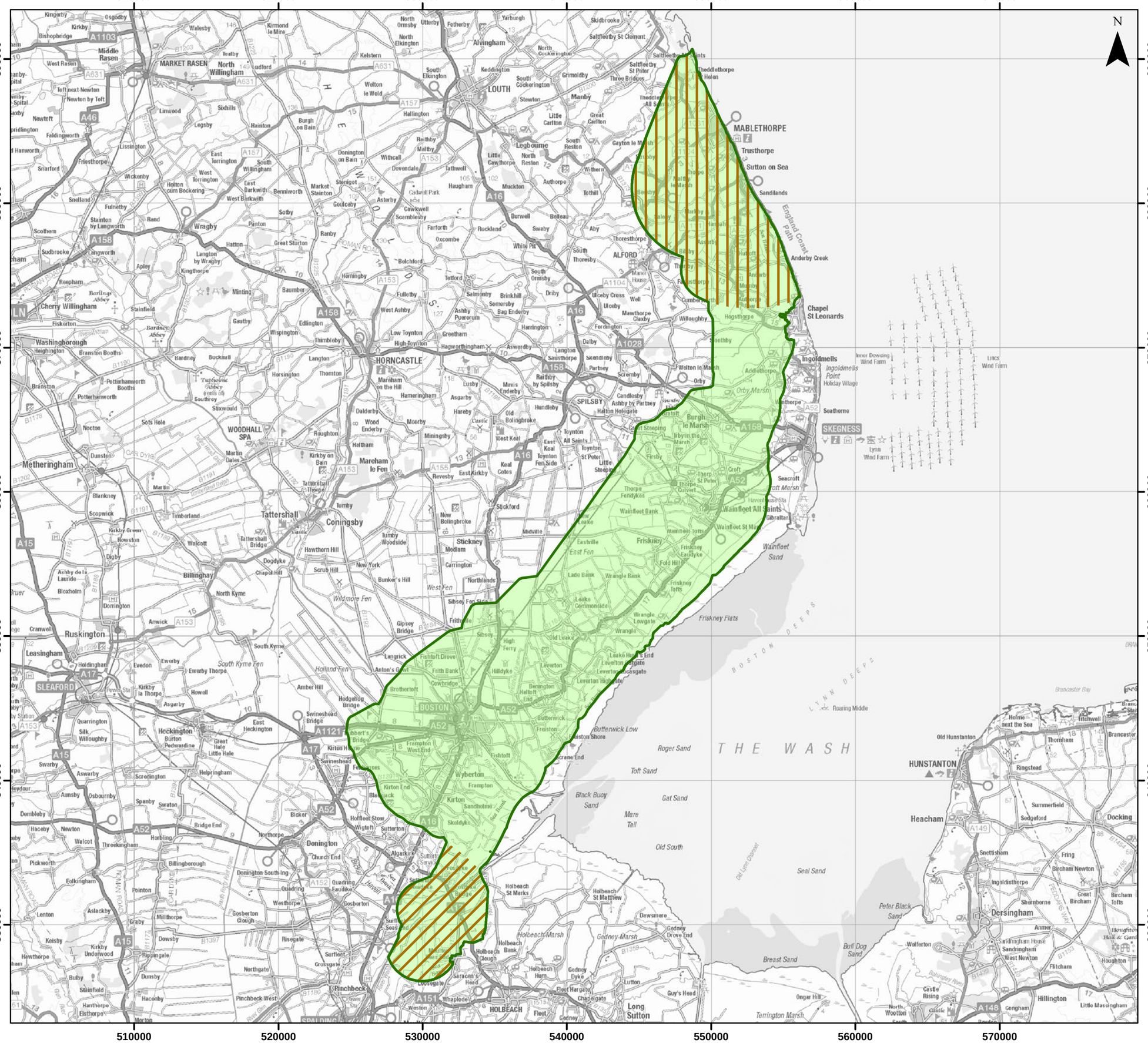


Legend

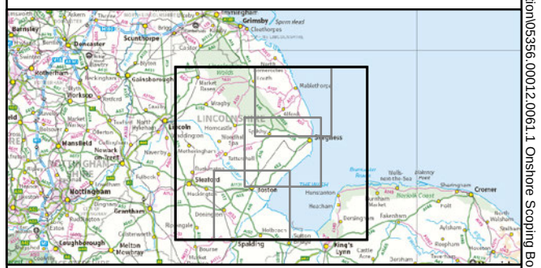
Onshore Scoping Boundary

Indicative Grid Connection Search Areas

Lincolnshire Node

Weston Marsh

Sources:



Coordinate System: British National Grid

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Scale: 1:250,000

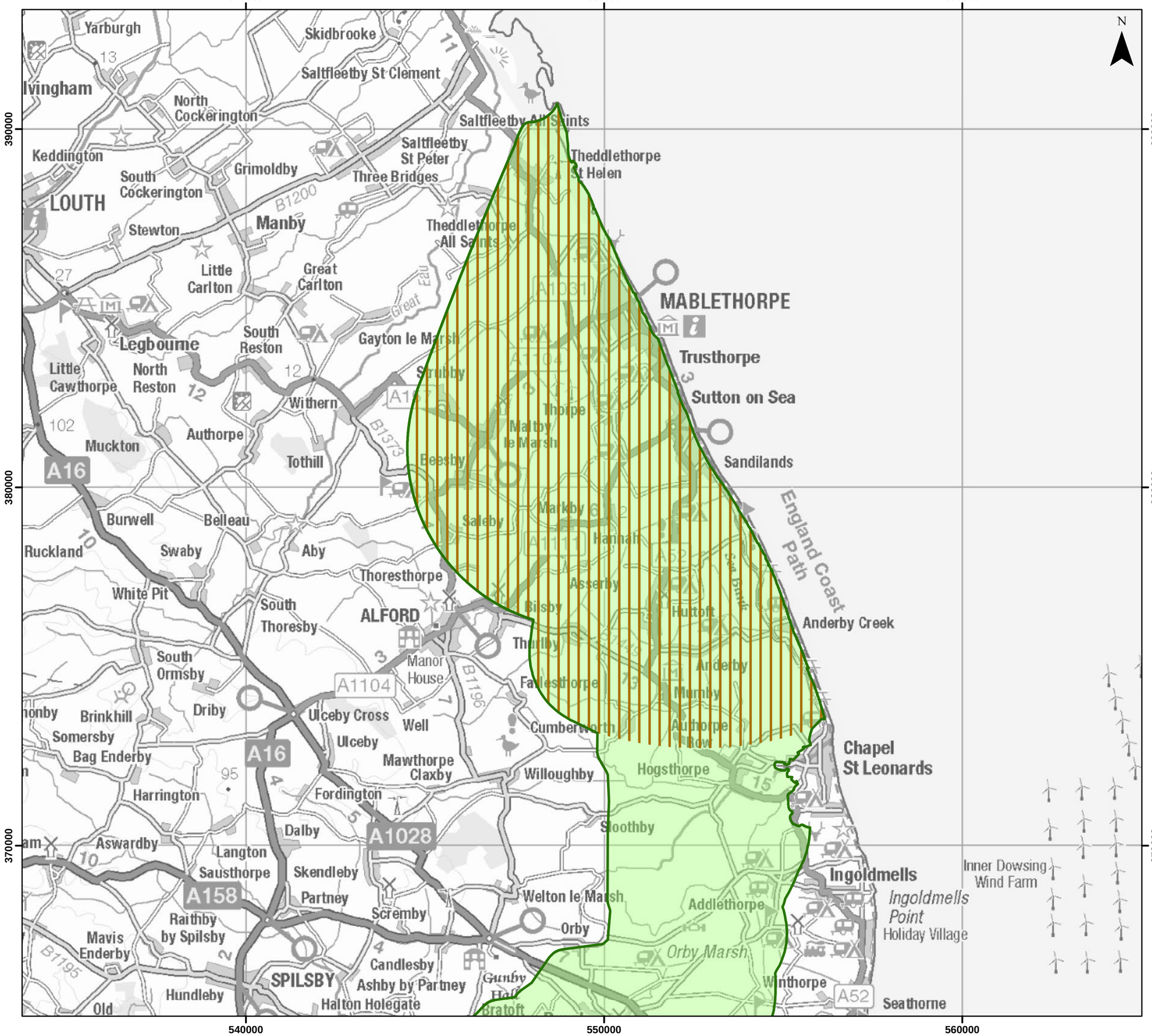
Onshore Scoping
Onshore Scoping Boundary and
Indicative Grid Connection Search Areas

Figure 1.5.3

OUTER DOWSING OFFSHORE WIND

Date: 22/06/2022
Produced By: JRS
Revision: 0.1

SLR



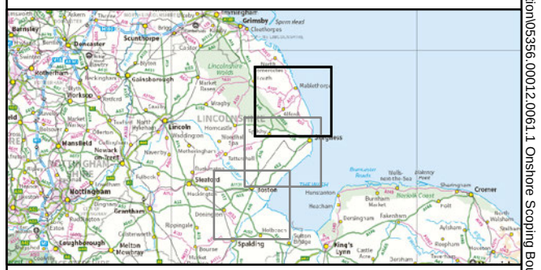
Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node

Sources:



Coordinate System: British National Grid

0 2 4 km

Scale: 1:100,000

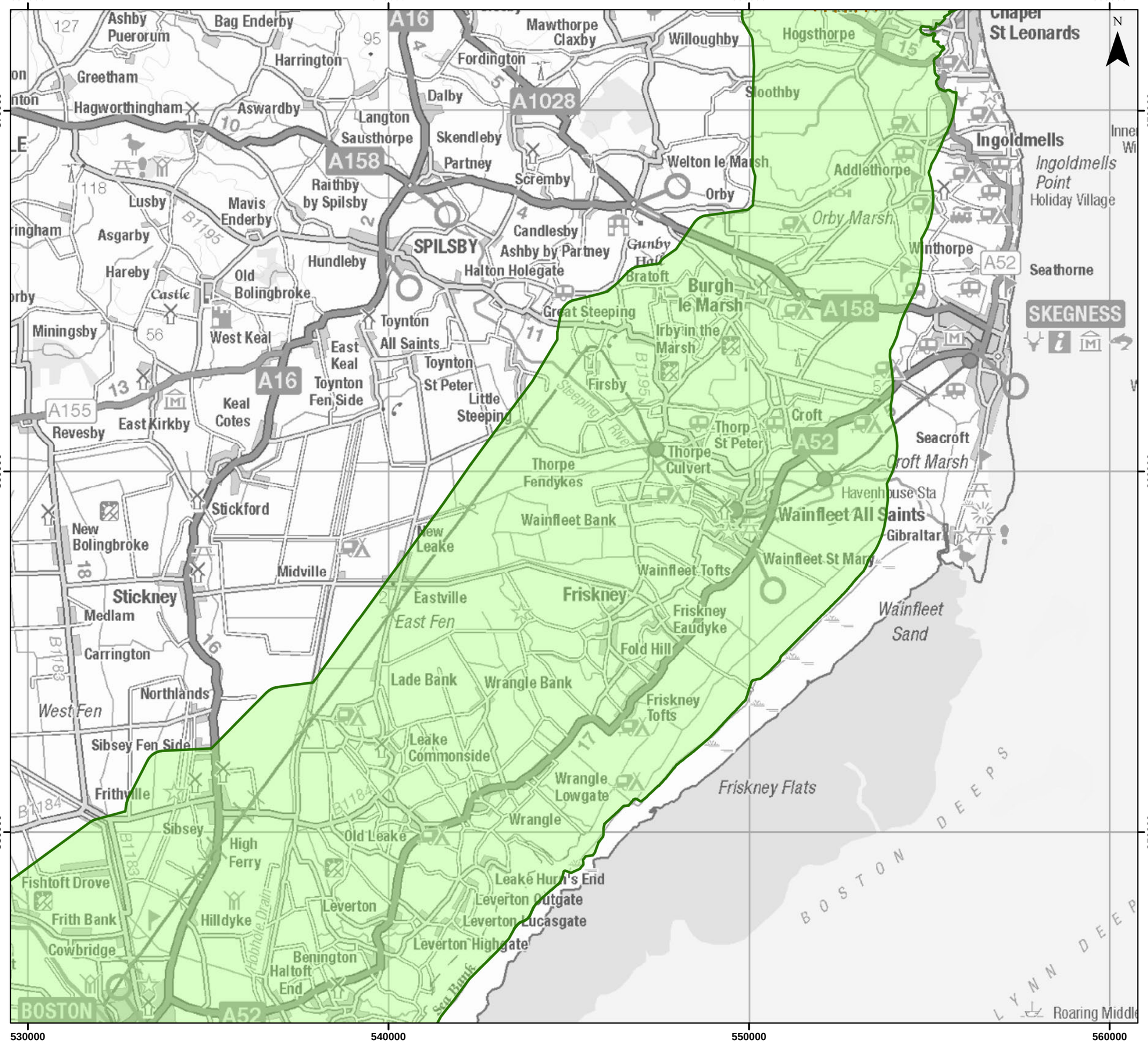
Onshore Scoping
Onshore Scoping Boundary and
Indicative Grid Connection Search Areas

Figure 1.5.4

OUTER DOWSING OFFSHORE WIND

Date: 22/06/2022
Produced By: JRS
Revision: 0.1

SLR



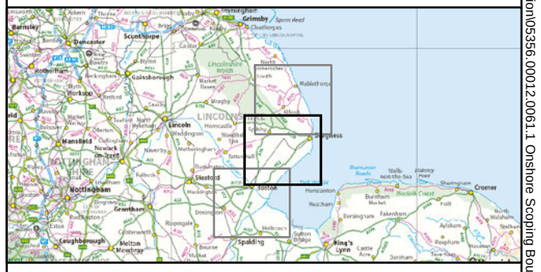
Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node

Sources:



Coordinate System: British National Grid

0 2 4 km

Scale: 1:100,000

Onshore Scoping
Onshore Scoping Boundary and
Indicative Grid Connection Search Areas

Figure 1.5.5

OUTER DOWSING OFFSHORE WIND

Date: 22/06/2022
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Revision: 0.1

SLR

520000 530000 540000

350000 340000 330000

N

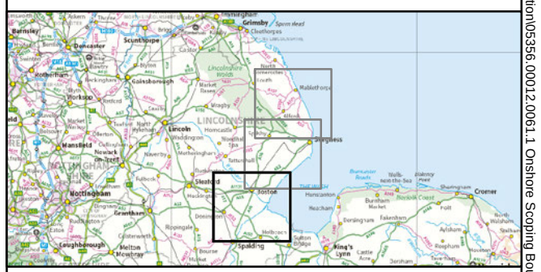
Legend

Onshore Scoping Boundary

Indicative Grid Connection Search Areas

Weston Marsh

Sources:



Coordinate System: British National Grid

0 2 4 km

Scale: 1:100,000

Onshore Scoping
Onshore Scoping Boundary and
Indicative Grid Connection Search Areas

Figure 1.5.6

OUTER DOWSING OFFSHORE WIND

Date: 22/06/2022
Produced By: JRS
Revision: 0.1

SLR

1.6 The EIA Scoping Team

1.6.1 GoBe Consultants Ltd (GoBe) have been commissioned by the Applicant as the Development Services Provider (DSP) to provide environmental and consenting services to support the development of the Project. GoBe will be supported through the EIA process by a number of additional sub-consultants who will be responsible for particular specialisms. This EIA Scoping Report has been produced by GoBe working closely with the wider team (see Table 1.7.1).

1.6.2 GoBe's EIA activities and ESs are accredited at a Company level by the Institute of Environmental Management and Assessment (IEMA) under the EIA Quality Mark Scheme. This demonstrates GoBe's commitment to ensuring EIA is undertaken at high quality and in accordance with best practice, as well as demonstrating compliance with Regulation 14(4) of the EIA Regulations, requiring that the ES will be prepared by competent experts. GoBe is also ISO9001 accredited for its Quality Management System.

1.7 Scoping Report Structure

1.7.1 The structure of this Scoping Report is presented in Table 1.7.1.

Table 1.7.1: Scoping Report Structure

Section Number	Section Title	Prepared By (Lead)
1	Introduction	GoBe Consultants Ltd
2	Need, Policy and Legislative Context	GoBe Consultants Ltd
3	Project Description	GoBe Consultants Ltd
4	Site Selection and Consideration of Alternatives	GoBe Consultants Ltd
5	EIA Methodology	GoBe Consultants Ltd
6	Consultation Process	GoBe Consultants Ltd
7	Offshore Environment	
	▪ Marine Physical Processes	▪ GoBe Consultants Ltd
	▪ Marine Water and Sediment Quality	▪ GoBe Consultants Ltd
	▪ Benthic and Intertidal Ecology	▪ GoBe Consultants Ltd
	▪ Fish and Shellfish Ecology	▪ GoBe Consultants Ltd
	▪ Marine Mammals	▪ SMRU Consulting Ltd (with GoBe Consultants Ltd)
	▪ Offshore and Intertidal Ornithology	▪ GoBe Consultants Ltd
	▪ Marine and Intertidal Archaeology	▪ Maritime Archaeology
	▪ Commercial Fisheries	▪ Poseidon Aquatic Resource Management Ltd
	▪ Shipping and Navigation	▪ Anatec Ltd
	▪ Aviation, Radar, Military and Communication	▪ Cyrrus Ltd
	▪ Seascape, Landscape and Visual	▪ Optimised Environments Ltd (OPEN)

Section Number	Section Title	Prepared By (Lead)
	▪ Marine Infrastructure and Other Users	▪ GoBe Consultants Ltd
8	Onshore Environment	
	▪ Onshore Air Quality	▪ SLR Consulting Ltd
	▪ Onshore Archaeology and Cultural Heritage	▪ SLR Consulting Ltd
	▪ Onshore Ecology and Ornithology	▪ SLR Consulting Ltd
	▪ Geology and Ground Conditions	▪ SLR Consulting Ltd
	▪ Hydrology and Flood Risk	▪ SLR Consulting Ltd
	▪ Land Use	▪ SLR Consulting Ltd
	▪ Noise and Vibration	▪ SLR Consulting Ltd
	▪ Traffic and Transport	▪ SLR Consulting Ltd
	▪ Landscape and Visual Assessment	▪ OPEN Ltd
9	Wider Scheme Aspects	
	▪ Socio-Economic Characteristics	▪ BiGGAR Economics (with Gobe Consultants Ltd)
	▪ Human Health	▪ GoBe Consultants Ltd
	▪ Climate Change	▪ GoBe Consultants Ltd
12	Summary and Next Steps	GoBe Consultants Ltd
13	References	GoBe Consultants Ltd

2 Need, Policy and Legislative Context

2.1 The Need for the Project

2.1.1 The need for the Project arises from the United Kingdom's (UK) Government's ambition to deliver 50 GW of renewable energy from offshore wind by 2030.

2.1.2 The commitment to offshore wind targets was originally set out in the Offshore Wind Sector Deal agreed between the Government and the offshore wind industry in 2019. Originally targeting 30 GW of operating capacity by 2030, this figure was increased to 40 GW in the Energy White Paper published in 2020, as part of the plan for the green industrial revolution. In its Sixth Carbon Budget, published in 2020, the Climate Change Committee (CCC) recommended that offshore wind should become the backbone of the whole UK energy system, growing from 40 GW of capacity in 2030 to 100 GW or more by 2050. In October 2021, the UK Government has committed to decarbonise the UK's electricity system by 2035.

2.1.3 Most recently, the UK Government has outlined an even greater level of ambition in the British Energy Security Strategy[1] (HM Government, 2022), which sets out an ambition to reach 50 GW of offshore wind by 2030. As part of this strategy, investing in offshore wind generation has been listed as one of the UK Government's '10 Point Plan', contributing to a carbon net zero by 2050. The British Energy Security Strategy is anticipated to support 90,000 jobs in offshore wind by 2028, with a goal of accelerating offshore wind deployment, ensure energy security and stabilise consumer prices in the longer term.

2.1.4 Green infrastructure development has also been identified as one of the UK Government's COVID-19 pandemic and post-Brexit economic recovery strategies[2]. The Project represents an essential contribution to the 50 GW by 2030 ambition set by the UK, with the development programme focused on ensuring the Project is generating by 2030 in response to this policy demand.

2.1.5 As discussed in the strategies and government incentives above, offshore wind projects such as the Project, offer the UK a wide range of additional benefits including economic growth, energy security and decarbonisation. To summarise, there are four primary drivers for the development of offshore wind energy to which the Project will make a contribution:

- The need to reduce greenhouse gas emissions, in line with the UK Government's strategy to reach net zero emissions across the economy by 2050 and meet its statutory target for a 100% reduction over 1990 emission levels by the same date;
- The need for national energy security, with reduced reliance on fossil fuels and exposure to volatile global wholesale energy prices;

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf
[2] https://www.instituteforgovernment.org.uk/sites/default/files/publications/Building-a-green-recovery.pdf

- The need to maximise economic opportunities from energy infrastructure investment for the UK; and
- The need to produce affordable energy.

2.2 UK Energy Policy and the Role of Renewable Energy

2.2.1 Global temperature rise as a result of greenhouse gas emissions in the atmosphere is associated with potential impacts on weather, ecosystems, human health and welfare. In the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (DECC, 2011a – currently subject to update), predictions are made that a continuation of global emission trends, including emissions of greenhouse gases such as carbon dioxide, could lead average global temperatures to rise by up to 6°C by the end of this century. The potential impacts associated with such a global temperature rise include (DECC, 2014):

- Increased frequency of extreme weather events such as floods and drought;
- Reduced food supplies;
- Impacts on human health;
- Increased poverty; and
- Ecosystem impacts, including species extinction.

2.2.2 A commitment by the UK was made during the 26th Conference of the Parties (COP26) in Glasgow in 2021 to pursue efforts to limit the global temperature increase to within 2°C of the pre-industrial average temperature, with an aspiration for an improved limit of 1.5°C. The UN Climate Change Conference UK 2021 states that for the first time, COP26 agreed a position on phasing down unabated coal power and focused on driving goals across the globe on:

- Mitigation - reducing emissions;
- Adaptation - helping those already impacted by climate change;
- Finance - enabling countries to deliver on their climate goals; and
- Collaboration - working together to deliver even greater action.

2.2.3 Table 2.2.1 summarises some of the relevant, most recent policy and legislation relating to the mitigation of climate change and the development of renewable energy including from OWF developments such as the Project.

Table 2.2.1 – Summary of relevant policy & legislation relating to mitigating climate change and the development of renewable energy from offshore wind

Policy / Legislation	Summary of Requirements
United Nations Framework Convention on	The United Framework Convention on Climate Change (UNFCCC) met in Paris 2015 and set out an international agreement by all parties to limit global temperature increase to below 2°C, while pursuing efforts to limit the increase to 1.5°C.

Policy / Legislation	Summary of Requirements
Climate Change (Paris climate agreement)	
The Climate Change Act 2008	The Climate Change Act 2008 (HM Government, 2008) commits the UK to a net reduction in greenhouse gas emissions against the 1990 baseline by 2050, including a 34% reduction by 2022 and an 80% reduction by 2050.
Climate Change Act 2008 (2050 Target Amendment) Order 2019	Amending the Climate Change Act 2008 to implement a target of a net reduction in greenhouse gas emissions of at least 100% against the 1990 baseline (superseding the 80% target in the Climate Change Act 2008).
The Energy Act 2013	The Energy Act 2013 makes provisions to incentivise investment in low carbon electricity generation, ensure security of supply, and help the UK meet its emissions reduction and renewables targets; it included the framework for Contracts for Difference (CfD) as well as introducing requirements to enable a statutory 2030 decarbonisation target range for the UKs electricity sector.
Clean Growth Strategy 2017	The Clean Growth Strategy (2017) promoted 'clean growth' as growing national income while cutting greenhouse gas emissions. It aimed to promote further growth of offshore wind by holding auctions of CfDs, working with the industry to develop a Sector Deal for offshore wind, and to provide further funding for innovation in offshore wind.
National Infrastructure Assessment 2018	The first National Infrastructure Assessment by the National Infrastructure Commission (NIC, 2018) recommended that half of the UK's power is provided by renewables by 2030.
Net Zero Strategy: Build Back Greener 2021 (Presented to Parliament pursuant to Section 14 of the Climate Change Act 2008)	The Net Zero Strategy is a long-term plan for a transition that will take place over the next three decades and sets out key targets and delivery pathway of reaching net zero emissions by 2050 and 40 GW of offshore wind by 2030.
Energy White Paper: Powering our Net Zero Future	Increase in operating capacity to 40 GW by 2030, as part of the plan for the green industrial revolution. The 2020 white paper puts net zero and the effort to fight climate change at its core.
Sixth Carbon Budget	Published in 2020, the CCC recommended that offshore wind should become the backbone of the whole UK energy system, growing from 40 GW of capacity in 2030 to 100 GW or more by 2050.
British Energy Security Strategy	UK Government created the British Energy Security Strategy in 2022, where investing in offshore wind generation has been listed as one of the UK Government's '10 Point Plan', contributing to a carbon net zero by 2050.

2.3 Planning Policy and Legislation

The Planning Act 2008

2.3.1 The Planning Act 2008 (as amended) is the primary legislation that established the legal framework for applying for, examining, and determining applications for NSIPs taking into account the guidance in NPSs.

National Policy Statements

2.3.2 NPSs are produced by the UK Government and set out the Government's policy for the delivery of energy infrastructure and provides the legal framework for planning decisions for major infrastructure projects. A DCO application for the Project will be assessed and decided on by the Inspectorate in the context of the policy set out within the NPSs. The three NPSs[3] currently in place and of relevance to the Project are:

- NPS EN-1 Overarching Energy (DECC, 2011a);
- NPS EN-3 Renewable Energy Infrastructure (DECC, 2011b), which covers nationally significant renewable energy infrastructure (including offshore generating stations in excess of 100 MW); and
- NPS EN-5 Electricity Networks Infrastructure (DECC, 2011c), which covers the electrical infrastructure associated with an NSIP.

2.3.3 It is noted that the process of updating these NPSs is currently underway, with draft revisions set out for consultation in September 2021 by the Department for Business, Energy & Industrial Strategy (BEIS). The EIA and DCO application will take account of the requirements of the revised NPS when formally adopted within the meaning of Section 104 of the Planning Act 2008.

Marine and Coastal Access Act 2009

2.3.4 The Marine and Coastal Access Act (MCAA) 2009[4] introduced new planning and management systems for overseeing the marine environment, most notably through the requirement to obtain marine licences for works at sea (including the deposition or removal of any substance or object from the sea below Mean High Water). The MCAA 2009 created a strategic marine planning system that seeks to promote the efficient, sustainable use and protection of the marine environment, guided by the Marine Policy Statement (MPS) and a series of Marine Plans. The MCAA 2009 provides the framework for a marine licencing system, which is administered by the Marine Management Organisation (MMO) for activities in English waters, a statutory consultee within the DCO application process. The MCAA 2009 also amended certain provisions of the Planning Act 2008.

[3] At the time of writing, the Project note that the NPSs are subject to review. The PEIR and subsequent ES will refer to the most up-to-date and relevant versions as appropriate.
[4] https://www.legislation.gov.uk/ukpga/2009/23/contents

2.3.5 The MCAA 2009 also enabled the designation of Marine Conservation Zones (MCZs) and Highly Protected Marine Areas (HPMAs). MCZs and HPMAs are types of Marine Protected Areas (MPAs) in England, Wales and UK offshore waters, which seek to protect a range of nationally important marine wildlife, habitats, geology and geomorphology. A MCZ assessment will be undertaken as part of the Project's DCO application.

Marine Planning Policy

2.3.6 The MPS adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans and establishes how decisions affecting the marine area should be made in order to enable sustainable development. The marine plans and MPS will be considered in developing the application for consents for the Project, which lies within the East Area (Inshore & Offshore) marine plan areas.

Deemed Marine Licencing

2.3.7 Licensable marine activities of relevance to the Project include construction and maintenance works in the sea or on the seabed and the deposition of any substance or object in the sea or on or under the seabed (such as the disposal of dredged material), as well as the operational maintenance activities associated with the Project.

2.3.8 Marine licences for the Project pursuant to the provisions of the MCAA 2009 will be subject to a deemed application as part of the application for the DCO through provisions in Section 149A of the Planning Act 2008, with the MMO acting as a statutory consultee to the DCO process.

The Environmental Impact Assessment Regulations

2.3.9 The legislative framework for EIA was originally provided by European Council Directive 2014/52/EU (the EIA Directive) which was transposed into English law for NSIPs by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). These came into force on 16 May 2017 and are the relevant EIA regulations applicable to the Project.

2.3.10 It should be noted that the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 made under the European Union (Withdrawal) Act 2018 (as amended), made the necessary changes to domestic legislation which governs EIA as a result of the UK leaving the European Union (EU), and ensures that the 2017 EIA Regulations continue to apply in substantially the same way as they did before the UK's departure from the EU.

Habitats Regulation Assessment

2.3.11 European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) implemented in England and Wales by the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017.

2.3.12 Following the UK's departure from the EU, the Habitats Directive (via the Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations)) continue to provide the legislative backdrop for HRA in the UK (incorporating also the requirements of the European Council Directive 2019/147/EC on the conservation of wild birds).

2.3.13 Whilst the terms "the Habitats Regulations", "European sites" and HRA caselaw continue to be used, European sites in the UK are now collectively termed the "National Site Network" and no longer form part of the Natura 2000 network (Defra, 2021). The National Site Network includes Special Areas of Conservation (SACs), for habitats and species, and Special Protection Areas (SPAs), for birds.

2.3.14 Under the Habitats Regulations, the competent authority (the SoS for BEIS in this case) must consider whether a plan or project has the potential to have an adverse effect on the integrity of the features of a National Site Network site (either alone or in-combination with another plan or project), a process known as a HRA, which includes the undertaking by the competent authority of an Appropriate Assessment.

2.3.15 HRA is a four stage process, starting with screening which is being undertaken concurrently with this scoping exercise, followed by appropriate assessment for those sites and features for which a LSE is identified at screening, which will be reported in a Report to Inform Appropriate Assessment (RIAA) – a draft of which will be subject to formal consultation as part of the Section 42 consultation required under the Planning Act 2008.

2.3.16 The requirement for stages 3 and 4 (collectively referred to as derogation, and incorporating the requirement for compensation) will ultimately be determined by the conclusions of the RIAA, but noting that the Project is already progressing early consideration of 'in-principle' derogation requirements and compensation options, which will be subject to discussion with relevant stakeholders throughout the pre-application period.

2.3.17 The Project currently is subject to the outcomes of the Plan-Level HRA currently being undertaken by TCE. The Plan-Level HRA assesses the potential impact of the preferred bidding areas that were selected through the Round 4 process on the UK's network of designated sites and protected habitats and species. The Plan-Level HRA is due to be finalised in Summer 2022 (see Section 4).

Biodiversity Net Gain

2.3.18 The UK Environment Act 2021 addresses the vision set out in the UK Government's 25 Year Environment Plan (Defra, 2018) with a specific requirement for 'net gain'. The principle of net gain is the requirement for developments to increase habitat or 'biodiversity net gain' following operations. Following consultation, the policy has been tightened with a 10% net gain requirement confirmed in England (with a few exceptions) and for this to be maintained for at least 30 years.

2.3.19 Current planning policy in the UK does account for biodiversity net gain, though this is not yet compulsory in the intertidal and marine areas. However, consultation on marine net gain has been undertaken and it is expected that biodiversity net gain in the marine environment will be a material consideration for the Project's DCO application. At the time of writing, no formal guidance has been produced on the delivery of marine net gain measures.

Other Relevant Legislation

2.3.20 A variety of other environmental legislation is relevant to the development of the Project and will be considered during the development of the DCO application including, but not necessarily limited to, the following:

- The OSPAR Convention;
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention);
- The Convention on Biological Diversity;
- The Wildlife and Countryside Act 1981;
- Countryside and Rights of Way Act 2000;
- Natural Environment and Rural Communities Act 2006 (NERC);
- The Commons Act 2006;
- Water Environment (Water Framework Directive, hereafter WFD) (England and Wales) Regulations 2017; and
- Marine Strategy Regulations 2010.

3 Description of the Project

3.1 Introduction

3.1.1 This section provides an overview of the proposed Project, setting out the indicative design and main onshore and offshore components. The key activities and methodologies that will be undertaken during construction, operations and maintenance (O&M) and decommissioning are outlined, including indicative key parameters and timescales[5].

3.1.2 A more detailed project design envelope will be developed throughout the pre-application process and will be provided in the application for DCO, with final design refinement during the pre-construction (post-consent) phase. The Project design envelope will be developed in parallel with the EIA process and will be influenced by the results of environmental and technical studies as well as giving due consideration to the outcomes of ongoing stakeholder consultation.

3.1.3 It should be noted that at the time of writing, the exact offshore and onshore Export Cable Corridor(s) (hereafter ECC) and precise location(s) for the onshore infrastructure (such as the onshore substation) have not yet been defined; however, AoS have been identified for the purposes of scoping (see Figure 1.5.2 and Figure 1.5.3 (see Section 1)).

3.1.4 Details of the Site Selection Study and the development of the AoS (for the purposes of scoping) are presented in Section 4 of this Scoping Report. Following the further refinement of the Project design and the AoS offshore and onshore, a final Red Line Boundary (proposed Order Limits) will be defined for assessment in the PEIR/ ES, and fixed for the final DCO application. All Project infrastructure will ultimately be installed within the Order Limits (as defined in the DCO) if consent is granted.

3.2 Need for Project Design Flexibility

3.2.1 Where necessary (or appropriate), a range of parameters for each aspect of the Project will be defined in the PEIR/ ES and the Maximum Design Scenario (MDS) for each particular receptor and/ or impact will be identified and considered during the EIA process. This approach to design flexibility is known as the 'project design envelope' approach or the 'Rochdale Envelope' approach (the Inspectorate, 2012a).

3.2.2 As noted in the Inspectorate Advice Note Nine (the Inspectorate, 2012a), the Rochdale Envelope approach may be employed where the developer may not know the exact specifications of infrastructure that will comprise the proposed project. The note states that:

[5] It should be noted that all parameters provided in this section are preliminary and indicative and subject to change as a result of the design process and may, therefore, vary from those subsequently presented in the PEIR/ ES. However, the parameters provided are considered to be sufficient for the purposes of scoping; as far as possible, the approach to scoping has been to take a precautionary approach and assume the largest/ worst case parameters for each project element.

"The 'Rochdale Envelope' is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted".

3.2.3 The use of the Rochdale Envelope approach is also recognised in the Overarching NPS for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b)[6]. It is the approach that has been used in the majority of DCO applications for OWF projects.

3.2.4 In the case of OWFs, NPS EN-3 (paragraph 2.6.42) recognises that:

"Owing to the complex nature of OWF development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:

- *Precise location and configuration of turbines and associated development;*
- *Foundation type;*
- *Exact turbine tip height;*
- *Cable type and cable route; and*
- *Exact locations of offshore and/or onshore substations."*

3.2.5 NPS EN-3 (paragraph 2.6.43) (DECC, 2011b) continues:

"The Secretary of State should accept that wind farm operators are unlikely to know precisely which turbines will be procured for the site until sometime after any consent has been granted. Where some details have not been included in the application to the Secretary of State, the applicant should explain which elements of the scheme have yet to be finalised, and the reasons. Therefore, some flexibility may be required in the consent. Where this is sought and the precise details are not known, then the applicant should assess the effects the Project could have to ensure that the Project as it may be constructed has been properly assessed (the Rochdale Envelope)".

3.2.6 NPS EN-3 also states that:

"The 'Rochdale Envelope' is a series of maximum extents of a project for which the significant effects are established. The detailed design of the Project can then vary within this 'envelope' without rendering the ES inadequate".

3.2.7 At this early phase, the Project description is indicative and the 'envelope' has been designed to include sufficient flexibility to accommodate further refinement during detailed design. This section therefore sets out a series of options and/ or parameters for which maximum and/ or indicative values are used to outline what is intended to represent a realistic MDS for the Project.

3.2.8 A more detailed, and refined, project design envelope will be presented in the PEIR and subsequently in the ES (which will accompany the application for a DCO to the SoS.

[6] The current draft revised NPS retain the recognition of the use of Rochdale Envelopes.

3.3 Key Project Components

Project Location

3.3.1 A geographical overview of the search areas for offshore and onshore project infrastructure is presented in Figure 1.5.2 and Figure 1.5.3 respectively.

3.3.2 The array area covers an area of up to 500 km^2 and lies approximately 54 km east of the Lincolnshire coast. The Applicant intends to reduce the size of the array area from 500 km^2 to an area of up to 300 km^2 prior to consent. Water depths vary across the array area between approximately 5 to 50 m below chart datum (CD).

3.3.3 The wind farm array (the generating station) will be connected to the National Grid Electricity Transmission System (NGET) by export cables which will be located within an offshore ECC running from the array area to the coast.

3.3.4 Export cable landfall is currently expected to be at a location along the Lincolnshire coastline, between Saltfleetby All Saints in the north and Chapel St Leonards in the south. The preferred landfall will ultimately be determined by further site selection work once the location of the onshore grid connection point offered by National Grid is confirmed (following the conclusion of the OTNR process).

3.3.5 Onshore export cables will be laid within an onshore cable route corridor from the chosen landfall to a substation located in the vicinity of the grid connection (see also Section 4 for details on the grid connection options and associated OTNR process).

Overview of Main Project Components

3.3.6 The key components of the Project are summarised in Table 3.3.1 and subsequently described in outline in the following sections.

Table 3.3.1: Key project components

Project location	Infrastructure component	Detail	Details included in:
Array	Wind Turbine Generators (WTGs)	The WTGs convert wind energy to electricity. Key components include rotor blades, gearboxes (if required for WTG model), transformers, power electronics and control equipment. Offshore turbine models are continuously evolving and improving; therefore, the exact wind turbine model will be selected post-consent from the range of models available at the time of procurement, with maximum parameters for the turbines identified herein rather than a specific turbine output rating.	Table 3.4.1
Array	Offshore Platform (OP)	OPs include offshore substation platforms (OSP), which collect the power generated by WTGs through the inter-array cables and connect the transmission export cables to shore. They also may	Table 3.4.9

Project location	Infrastructure component	Detail	Details included in:
		include accommodation platforms to host personnel during the lifetime of the wind farm.	
Array	Foundations	WTGs and OPs will be supported by foundation structures permanently attached to the seabed. These are typically fabricated from steel or concrete. A limited number of foundation designs is currently being considered.	Table 3.4.3 to Table 3.4.8 and Table 3.4.10 to Table 3.4.15
Array	Inter-array cables	Buried subsea cables that will connect the WTGs to one of the OPs, typically in branched strings.	Table 3.4.16
Array and offshore ECC	Scour and cable protection	In order to protect the seabed around foundation structures from scour and cables in the event that full or adequate burial cannot be achieved (or where other seabed assets are crossed), protection materials may be placed on the seabed.	Paragraph 3.4.22 *et seq*
Offshore ECC	Offshore export cables	Cables connecting the OPs to the cable landfall at the adjacent coastline (includes inter-link cables).	Table 3.4.17 and Table 3.4.18
Offshore and onshore ECC	Reactive Compensation Station	In the event that HVAC transmission is used, depending on the final ECC length, it may be necessary to boost the reactive power within the supply by installing a reactive compensation station either onshore or offshore.	Table 3.4.17 and Section 3.4
Landfall	Landfall and Transition Joint Bays (TJB)	The landfall is the area where the export cables are brought ashore and joined to the onshore cables in TJBs.	Section 3.5
Onshore ECC	Onshore export cables	Cables installed following the route between the landfall and the onshore substation and then to the NGET substation	Figure 1.5.3, Table 3.5.1 and Table 3.5.2
Onshore substation	Onshore substation	The onshore substation will include all necessary electrical plant to meet the requirements of the NGESO.	Table 3.5.3 and Table 3.5.4
Onshore ECC	Grid connection	Cables connecting the Project onshore substation to the NGET substation.	Figure 1.5.3, Table 3.5.1 and Table 3.5.2
Additional Developments	Miscellaneous	Energy system balancing and network stability facilities may be included as part of the development, for example battery energy storage.	Section 3.7

3.3.7 This Scoping Report presents a search area for the cable routing options currently being considered (Figure 1.5.1). It should be noted that at the time of writing, the final onshore cable route has not been defined.

3.4 Offshore Project

Wind Turbine Generators (WTGs)

3.4.1 The indicative key design parameters for the WTGs are presented in Table 3.4.1. The WTGs will incorporate tapered tubular towers and three blades attached to a nacelle, housing mechanical and electrical generating equipment (see Figure 3.4.1). All WTGs will be located within the offshore array area; note that the final layout of the WTGs will not be defined in the DCO application.

Table 3.4.1: WTG indicative key design parameters

Parameters	Design Envelope
Maximum number of WTGs	100
Indicative maximum number of WTGs assuming maximum rotor diameter	75
Maximum blade tip height above LAT (m)	403
Maximum rotor diameter (m)	340

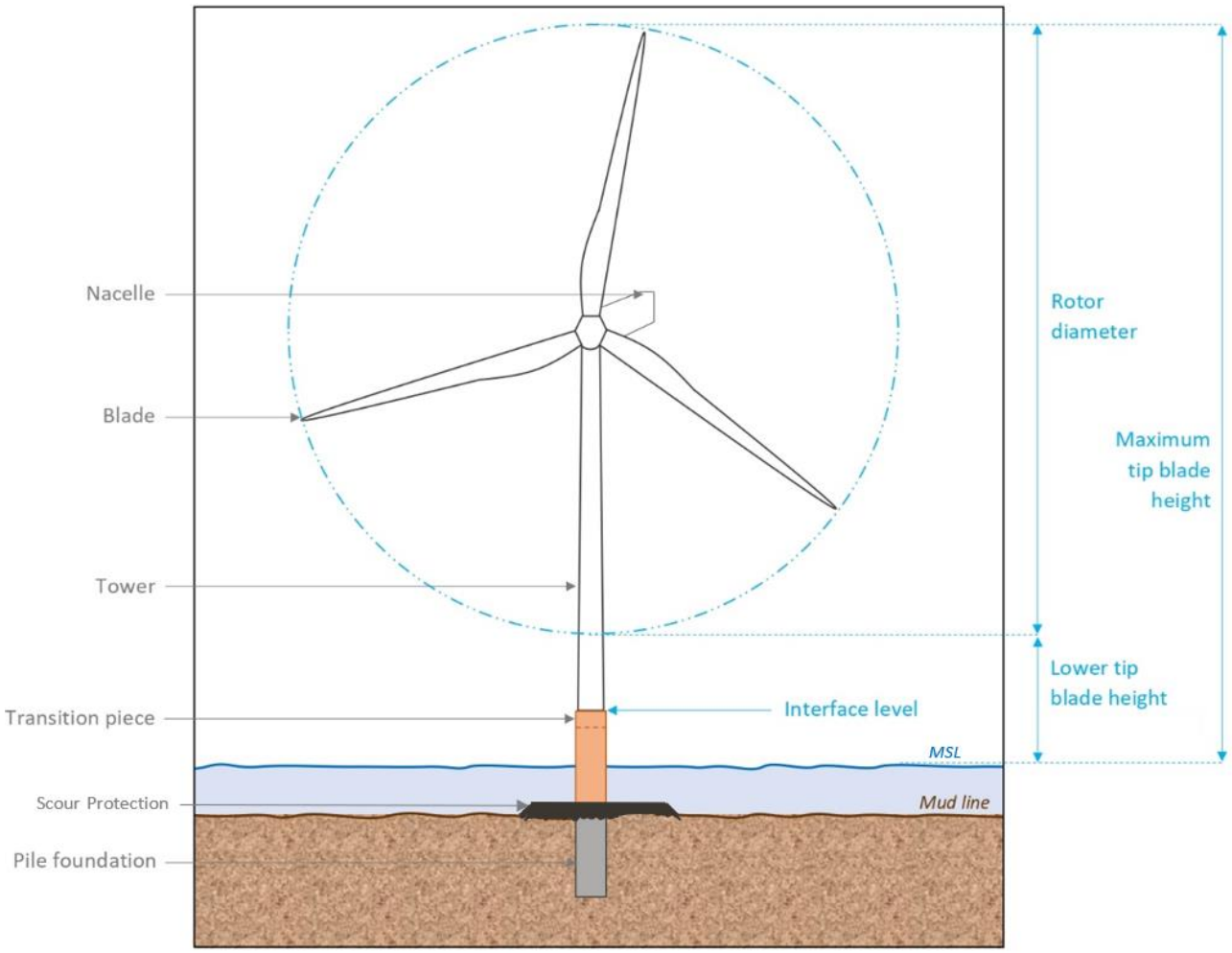


Figure 3.4.1: Typical Wind Turbine Generator

WTG Foundations

3.4.2 The factors influencing the choice of WTG foundation for a specific project typically include:

- Health, Safety and Environment (HSE) and operational considerations;
- the type of wind turbine to be used;
- the nature of the ground conditions on the site;
- the water depth;
- sea conditions (i.e. prevailing wave and current climate); and
- supply chain constraints and overall cost.

3.4.3 The foundation type selected will ultimately be dependent on the final detailed site investigations, engineering design studies and the procurement process.

3.4.4 At this stage, a range of foundation types are being considered, summarised in

3.4.5 Table 3.4.2.

Table 3.4.2: WTG foundation options

Type	Description	Example figure	Details provided in
Monopile foundation	Monopile foundations are tubular structures, consisting of a number of sections of rolled steel plates welded together. In most cases a Transition Piece (TP) is fitted over the monopile and secured via a bolted or grouted connection. In other cases the monopile will connect directly to the wind turbine tower flange (a TP-less solution).	Figure 3.4.2	Table 3.4.3
Suction bucket monopile foundation	Suction bucket monopile foundations consist of a single tubular structure fixed to the seabed by a suction caisson. The suction buckets are typically hollow steel cylinders, capped at the upper end.	Figure 3.4.3	Table 3.4.4
Gravity base structure (GBS) foundation	GBS are typically concrete structures which are floated to site and then ballasted when in the correct location. The stability of the foundation is achieved by its weight.	Figure 3.4.4	Table 3.4.5
Pin piled jacket foundation	Piled jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints). The foundation is secured to the seabed by hollow steel pin-piles sitting within a sleeve or leg which is part of the jacket. Piling may take place either once the jacket is in position (post-piling), or alternatively piles can be pre-piled prior to jacket installation. The piles rely on frictional and end bearing properties of the seabed for support. Unlike monopiles, there is no separate TP; the TP and ancillary structure is fabricated as an integral part of the jacket.	Figure 3.4.5	Table 3.4.6
Suction bucket jacket foundation	Suction bucket jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction caissons. The suction buckets are typically hollow steel cylinders, capped at the upper end, which are fitted underneath the legs of the jacket structure. Unlike monopiles, but similar to piled jacket foundations, there is no separate TP; the TP and ancillary structure is fabricated as an integrated part of the jacket structure and is not installed separately offshore.	Figure 3.4.6	Table 3.4.7
GBS jacket foundation	GBS jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) with heavy masses at the base. The foundation is secured to the seabed by the weight of the foundation.	Figure 3.4.7	Table 3.4.8

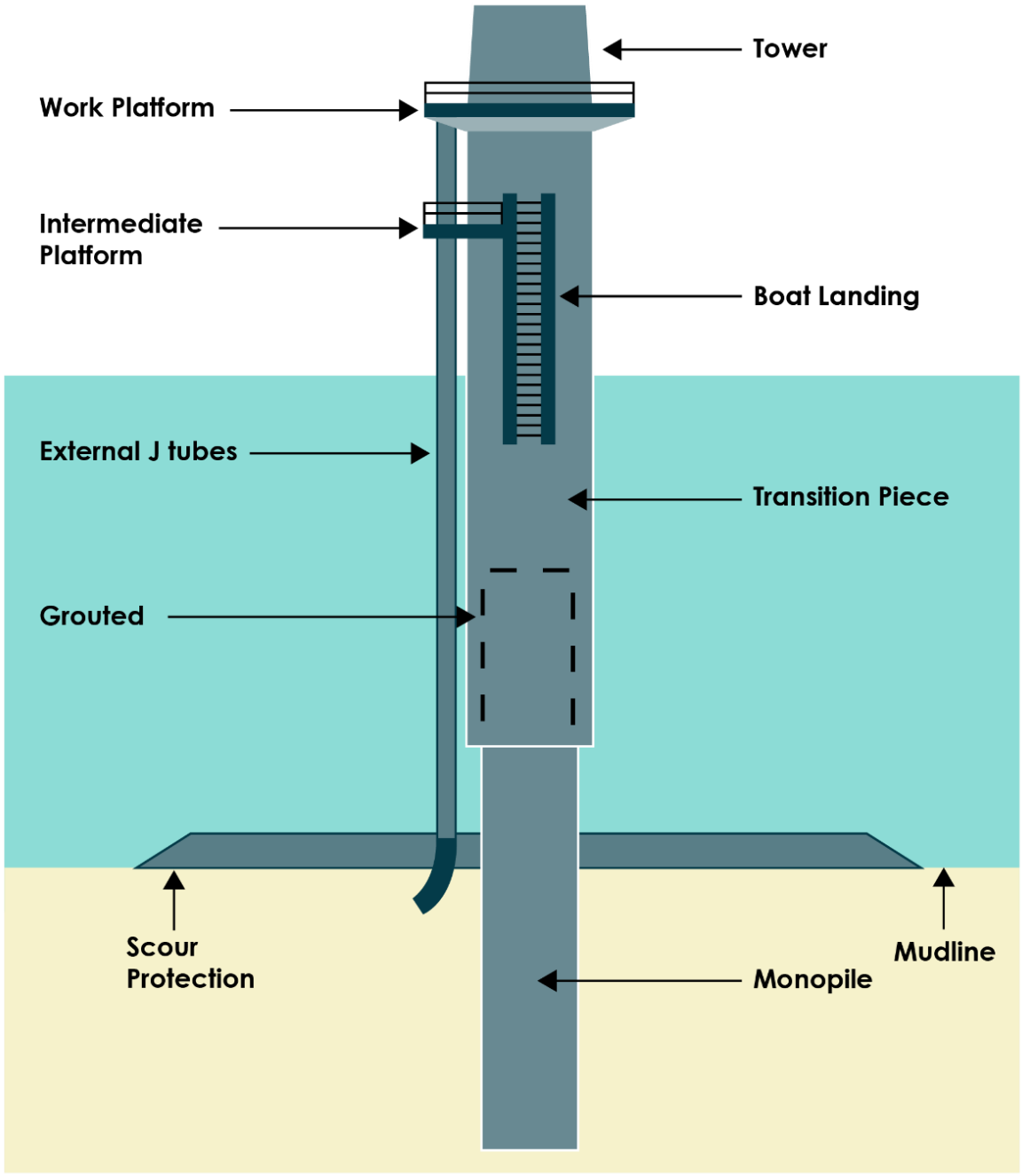


Figure 3.4.2: Example of indicative monopile foundation

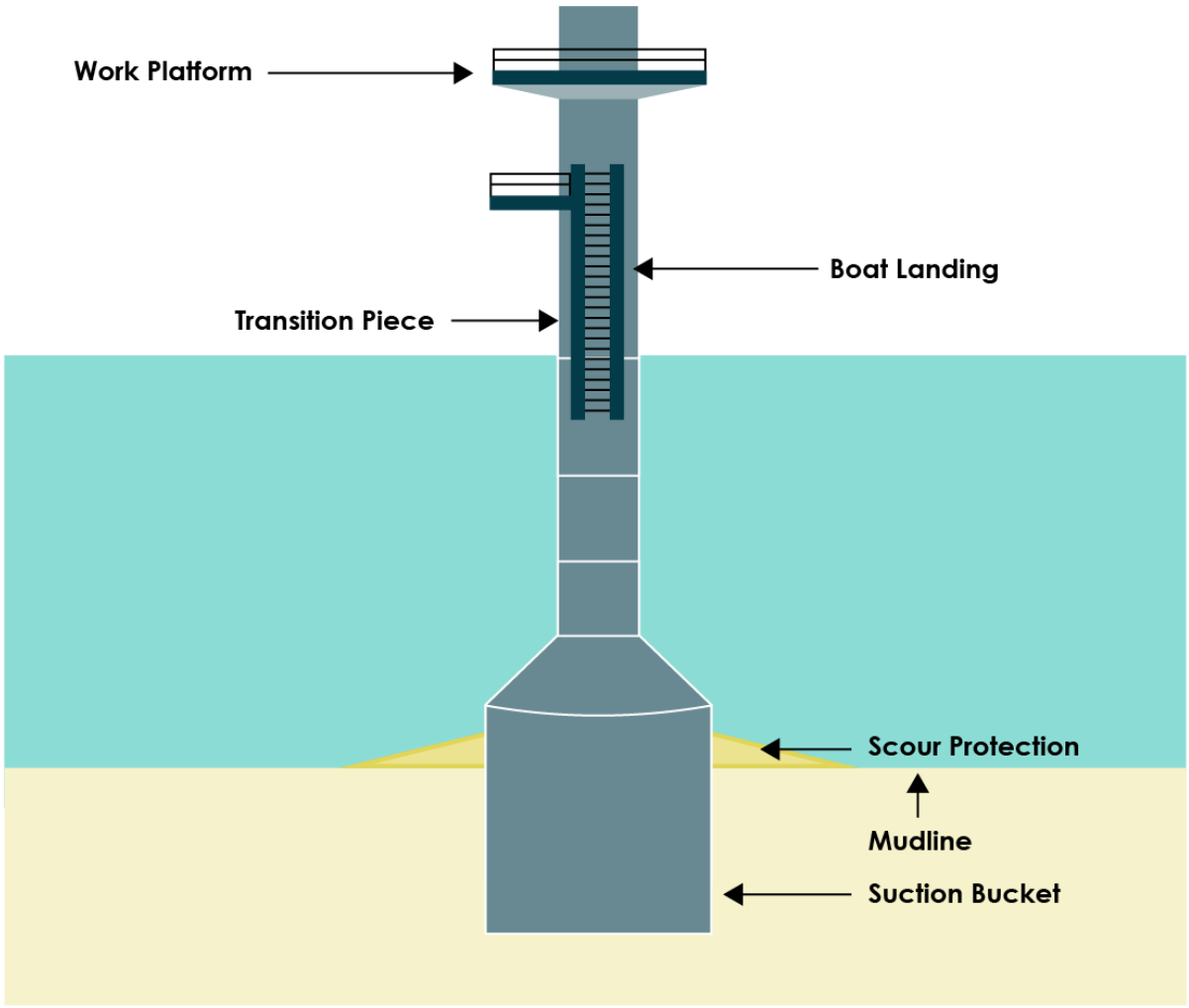


Figure 3.4.3: Example of indicative suction bucket monopile foundation

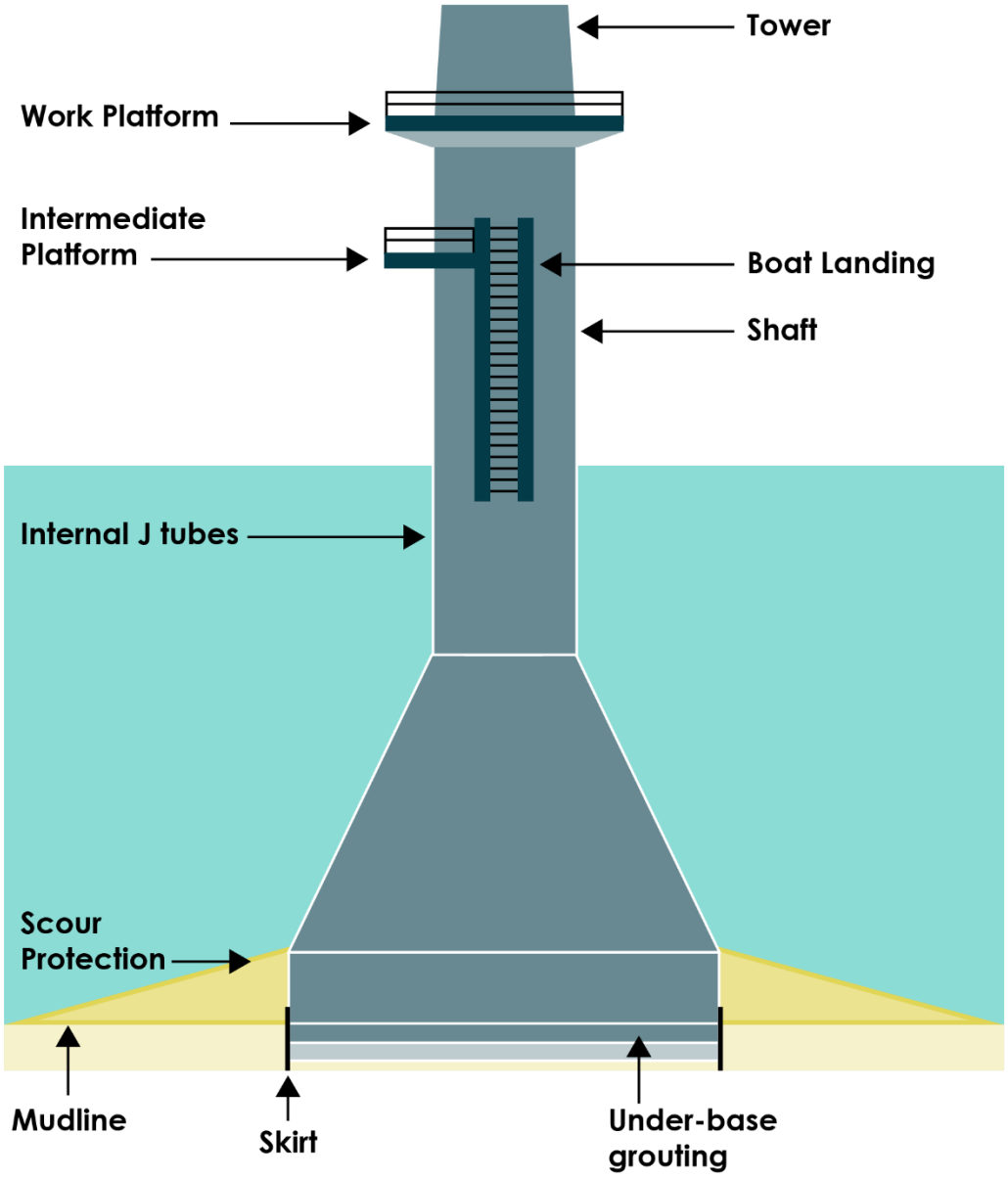


Figure 3.4.4: Example of indicative GBS monopile foundation type

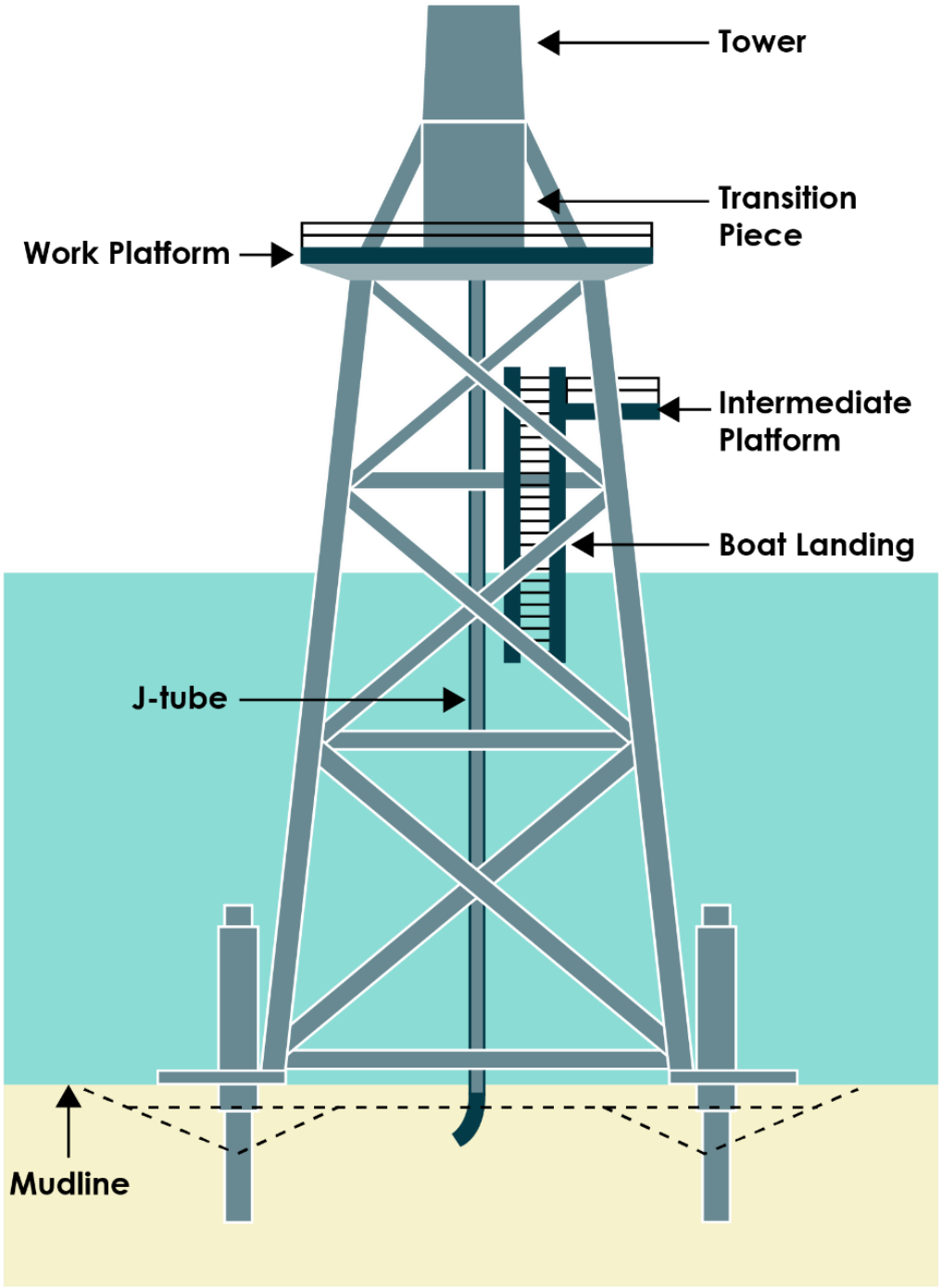


Figure 3.4.5: Example of indicative pin piled jacket foundation type

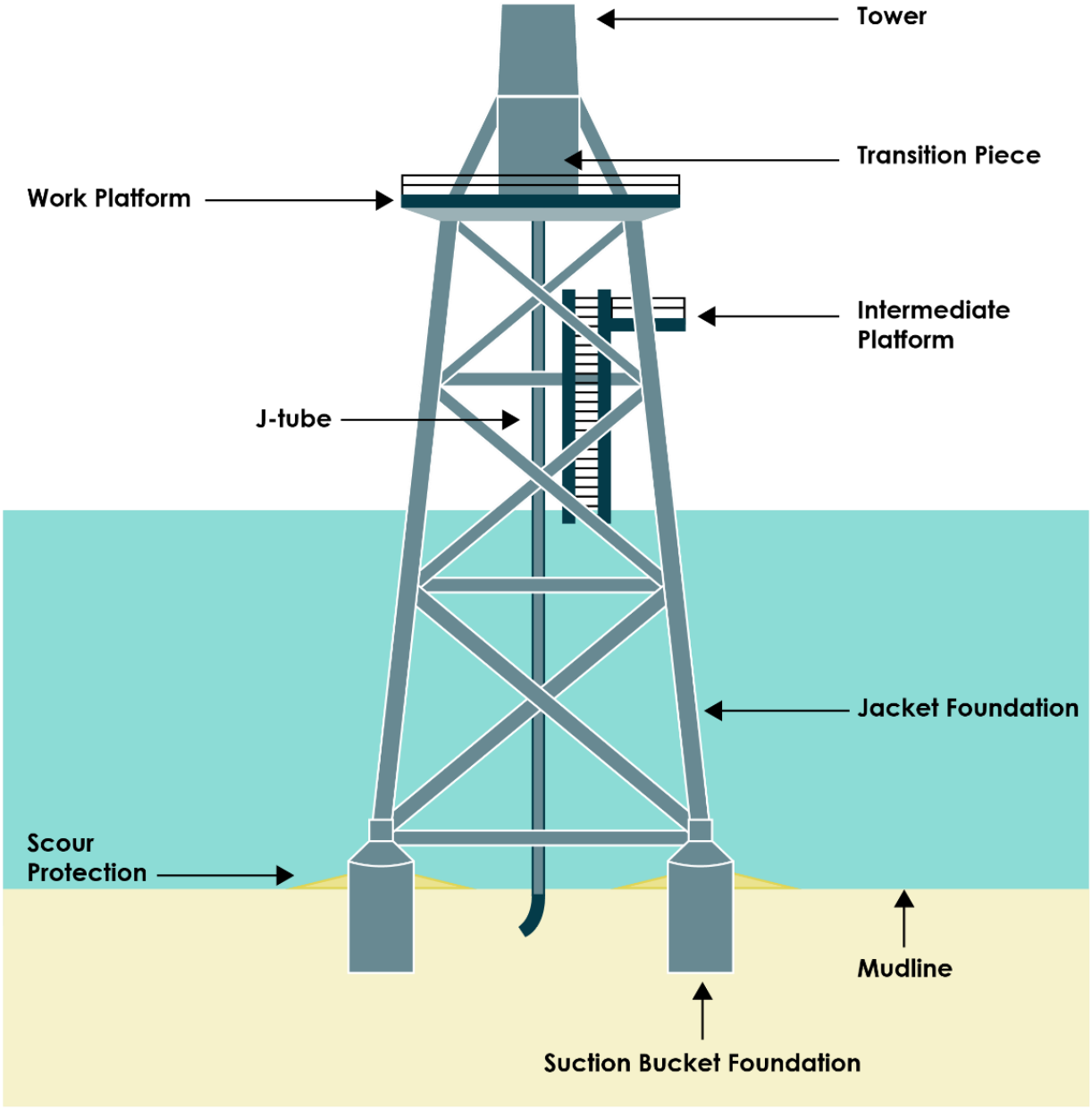


Figure 3.4.6: Example of indicative suction bucket jacket foundation type

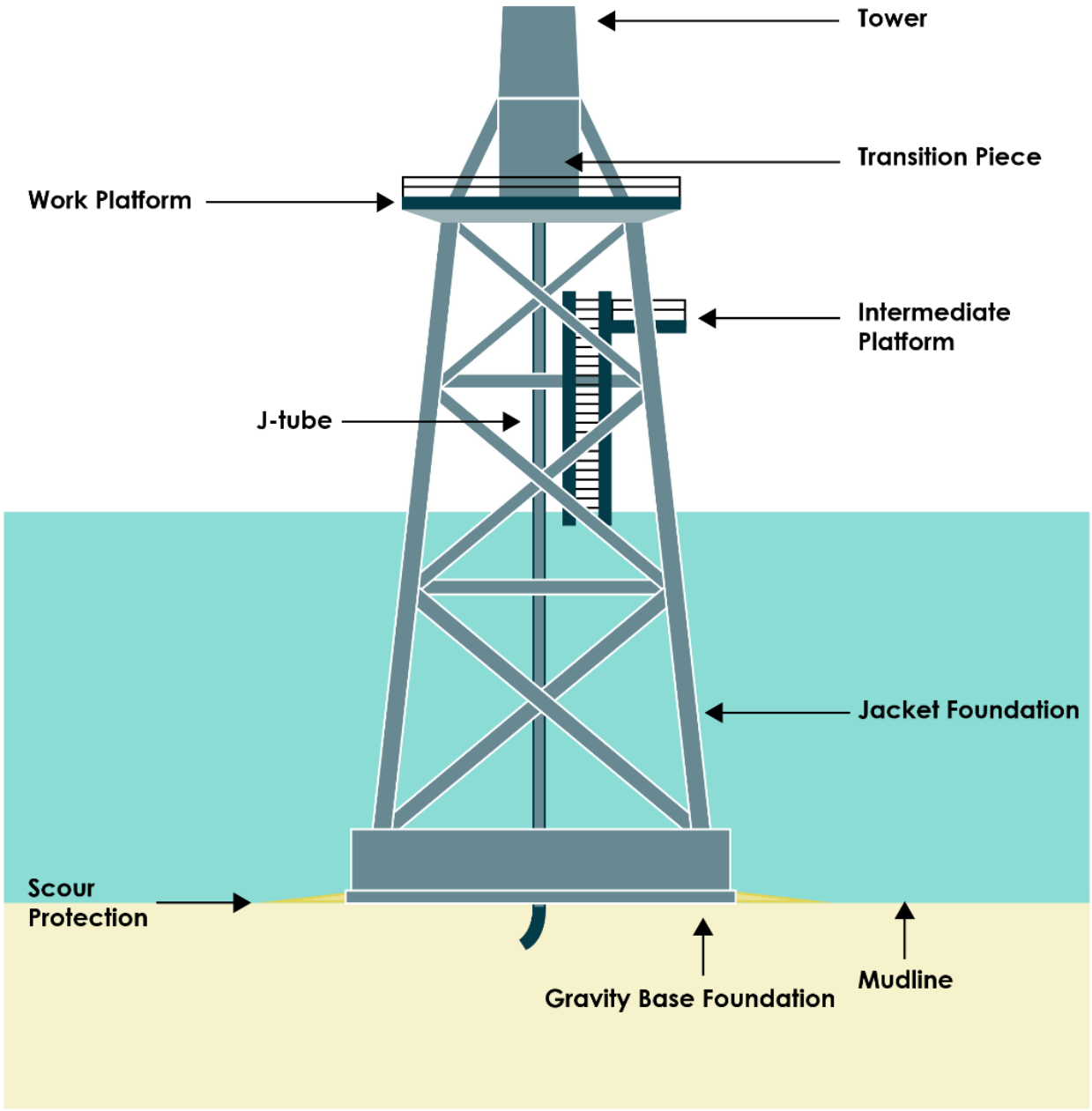


Figure 3.4.7: Example of indicative GBS jacket foundation type

Table 3.4.3: Indicative key design parameters for WTG monopile foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum pile diameter (m)	15
Maximum footprint per foundation[7] (m^2)	180
Maximum hammer energy (kJ)	5,500

Table 3.4.4: Indicative key design parameters for WTG suction bucket monopile foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum bucket diameter (m)	40
Maximum footprint per bucket (m^2)	1,300
Suction bucket height above seabed (m) excluding structural supports	2

Table 3.4.5: Indicative key design parameters for WTG GBS monopile foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum number of bases per WTG	1
Maximum base diameter (m)	53
Maximum diameter of base and seabed preparation (m)	93
Maximum footprint per base (including seabed preparation) (m^2)	6,700

Table 3.4.6: Indicative key design parameters for WTG pin-piled jacket foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum number of legs per WTG	4
Minimum number of legs per WTG	3
Maximum separation of adjacent legs at seabed level (m)	45
Maximum separation of adjacent legs at LAT level (m)	25
Maximum pin pile diameter (m)	5

[7] excluding scour protection

Parameters	Design Envelope
Maximum footprint per pin pile (m^2)	20
Number of pin piles (per WTG foundation)	3 to 4
Maximum hammer energy (kJ)	3,000

Table 3.4.7: Indicative key design parameters for WTG suction bucket jacket foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum number of legs per WTG	3
Maximum number of buckets per WTG	3
Maximum bucket diameter (m)	20
Maximum footprint per bucket (m^2)	320
Maximum separation of adjacent legs at seabed level (m)	45
Separation of adjacent legs at LAT (m)	25

Table 3.4.8: Indicative key design parameters for WTG GBS jacket foundations

Parameters	Design Envelope
Maximum number of WTG foundations	100
Maximum number of legs per WTG	3
Maximum number of bases per WTG	3
Maximum base diameter (m)	53
Maximum base diameter (including seabed preparation) (m)	93
Maximum footprint per base (including seabed preparation) (m^2)	6,700

WTG Installation

3.4.6 The wind turbines and foundations are likely to be installed using specialist installation vessels with jack-up, anchors or dynamic positioning (DP) technology.

3.4.7 Different methods will be required for the installation of foundations dependent upon the type(s) chosen. Some of these methods may first require seabed preparation to level the area (such as dredging) before placement of foundations, including, for example, levelling and clearance of boulders and debris.

3.4.8 Following foundation installation, the WTGs will be installed. Commonly, towers and nacelles are pre-erected or erected individually at the site using a suitable installation vessel. It is possible that due to the length of the towers multiple tower section lifts may be required. Blades are subsequently fitted to the tower nacelle structure as individual components or in a part assembled state.

Offshore Platforms (OPs)

3.4.9 OPs hosting electrical systems collect the power generated by the WTGs (via the inter-array cables) and export it (through the export cable) to shore via the OSP. They step-up and stabilise the voltage of power generated offshore and reduce the potential electrical losses.

3.4.10 Table 3.4.9 presents the indicative maximum design parameters for the OPs. It covers different types of OP depending on the type of the connection - alternating (High Voltage Alternating Current (HVAC)) or direct current (High Voltage Direct Current (HVDC)).

3.4.11 If HVAC is the transmission system used, it is anticipated that a HVAC booster platform (also refer as reactive compensation platform) could be required along the ECC.

3.4.12 At this stage the Project is also considering the option of using an accommodation platform to facilitate the operation of the wind farm.

Table 3.4.9: Indicative key design parameters for OPs

Parameters	Design Envelope
Maximum number of OPs	7
Foundation Options	Pin piles/GBS/Monopiles/Suction buckets
Maximum topside height (m) (including crane)	113 (LAT)
Maximum topside width (m)	100
Maximum topside length (m)	180

Offshore Platform Foundations

3.4.13 A range of foundation types are currently being considered for the OPs as summarised in Table 3.4.9. The maximum design parameters for each foundation type, for the OPs, are presented in Table 3.4.10 to Table 3.4.15.

Table 3.4.10: Indicative key design parameters for offshore platform monopile foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum pile diameter (m)	15
Maximum footprint per foundation excluding scour protection (m^2)	180
Maximum hammer energy (kJ)	5,500

Table 3.4.11: Indicative key design parameters for offshore platform suction bucket monopile foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum number of legs per platform	2
Maximum number of buckets per platform	2
Maximum bucket diameter (m)	40
Maximum footprint per foundation (m^2)	2,600

Table 3.4.12: Indicative key design parameters for offshore platform GBS monopile foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum base diameter (m)	150
Maximum seabed preparation diameter (m)	250
Maximum footprint per foundation (including seabed preparation) (m^2)	62,500

Table 3.4.13: Indicative key design parameters for offshore platform pin-piled jacket foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum number of legs per platform	8
Pin pile diameter (m)	5
Maximum footprint per pin pile (m^2)	20
Number of pin piles (total)	112
Maximum hammer energy (kJ)	3,000

Table 3.4.14: Indicative key design parameters for offshore platform suction bucket jacket foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum number of legs per platform	8

Parameters	Design Envelope
Maximum number of buckets per platform	8
Maximum bucket diameter (m)	30
Maximum footprint per bucket (m^2)	710

Table 3.4.15: Indicative key design parameters for offshore platform GBS jacket foundations

Parameters	Design Envelope
Maximum number of OP foundations	7
Maximum base diameter (m)	150
Maximum seabed preparation diameter (m)	250
Maximum footprint per foundation (including seabed preparation) (m^2)	62,500

Inter-Array Cables

3.4.14 The inter-array cables will connect the WTGs to each other and to the OSPs.

3.4.15 Table 3.4.16 outlines the general parameters for inter-array cables.

Table 3.4.16: Indicative key design parameters for the inter-array cables

Parameters	Design Envelope
Indicative range for length of inter-array cables (km)	475 – 700
Maximum width of seabed disturbed during installation (m)	10
Total footprint of disturbance during installation (km^2)	7.0

Inter-Array Cable Installation

3.4.16 Currently the following installation (burial[8]) methodologies are being considered for the inter-array cables:

- Jet-trenching;
- Pre-cut and post-lay ploughing or simultaneous lay and plough;
- Mechanical trenching (such as chain cutting);

[8] Cables will be surface laid where burial is not possible.

- Dredging (typically Trailer Suction Hopper Dredger (TSHD) and backhoe dredging or water injection dredging);
- Mass flow excavation (MFE);
- Rock cutting;
- Burial sledge;
- Sandwave and boulder clearance;
- Jet sledding (hybrid of jet trencher and cable plough); and
- Vertical injector burial (for very deep burial).

3.4.17 The cables will either be directly buried using the above techniques or pulled into a duct /pipe that will be installed using the above techniques.

3.4.18 Seabed preparation may be required prior to the installation of the inter-array cables, including, for example, the potential removal of debris, boulders and/ or sandwaves.

Offshore Export Cables

3.4.19 The transmission technology proposed for the Project may be by either HVAC or HVDC technology. Table 3.4.17 and Table 3.4.18 presents the design envelope for the offshore export cables for HVAC and for HVDC respectively.

Table 3.4.17: Indicative key design parameters for offshore export cables (HVAC)

Parameters – HVAC	Design Envelope
Maximum number of export cable circuits	6
Maximum number of cables	6
Indicative cable insulation technology	Cross Linked Polyethylene Cable (XLPE)
Maximum cable voltage (kV)	400
Indicative external cable diameter (mm)	350
Maximum offshore cable length per export cable (km)	80
Indicative Export Cable Corridor width for construction (km)	2.5
Maximum width of seabed disturbed during installation excluding anchors and crossings[9] per cable (m)	30

[9] Cables will be surface laid where burial is not possible. Note burial depths may vary based on conditions such as sandwaves.

Table 3.4.18: Indicative key design parameters for offshore export cables (HVDC)

Parameters – HVDC	Design Envelope
Maximum number of export cable circuits	2
Maximum number of cables	4
Indicative cable insulation technology	XLPE or Mass Impregnated
Maximum cable voltage (kV)	600
Indicative external cable diameter (mm)	350
Maximum offshore cable length per cable (km)	80
Indicative ECC width (km)	2.5
Maximum width of seabed disturbed during installation excluding anchors and crossing per cable (m)	30

Offshore Export Cable Installation

3.4.20 Export cable installation methods currently under consideration are as previously listed for the inter-array cables, including possible pre-lay seabed preparation requirements.

Platform Link Cables

3.4.21 A number of platform link cables will also be required between the OSSs, which will have the same characteristics as the export cables. Up to 6 platform link cables may be required.

Scour and Cable Protection

Scour Protection

3.4.22 Scour can occur around the base of foundations; this is when seabed sediment is winnowed away as a result of the flow of water around the structure. The following methods of scour protection may be used around the bases of the WTG and/ or OP foundations:

- Rock or gravel placement;
- Concrete mattresses;
- Flow energy dissipation devices;
- Protective aprons or coverings (solid structures of varying shapes, typically prefabricated in concrete or high-density plastics);
- Ecological based solutions; and
- Bagged solutions.

3.4.23 Scour protection installation may involve some seabed preparation prior to installation depending on soil conditions and on the type(s) of foundation(s) chosen. Based on experience of other developments, it is likely that the maximum area of scour protection per WTG foundation (including structure footprint area) will be around 11,400 m^2 (worst case is GBS).

Cable Protection

3.4.24 As far as practicable, all offshore cables will be buried. However, where it is not possible to bury cables (inter-array and export) to an adequate depth it may be necessary to install cable protection to prevent scour and minimise the risk of cable exposure. Details of the volumes and assumptions relating to cable protection (for both export and inter-array cables) will be included in the Project Description within the PEIR/ ES.

3.4.25 An analysis of the requirement for the cables to cross existing infrastructure (such as existing or proposed subsea cables and pipelines) will be provided within the PEIR/ ES along with realistic worst case (RWC) design parameters to enable a detailed assessment to be undertaken.

Other Design Considerations

3.4.26 Consent for unexploded ordnance (UXO) removal will be sought in a future Marine Licence application when geophysical survey data of suitable spatial resolution is available to identify and quantify UXO. However, the effects of removal of UXO will be considered as part of the EIA process.

3.4.27 The requirements for vessel types and numbers will be provided in the PEIR/ ES to inform the relevant assessments (such as, for example, marine mammals, ornithology and shipping and navigation).

3.4.28 A floating LiDAR (FLiDAR) has been installed within the array area. The FLiDAR will collect a range of measurements, including offshore wind data.

3.5 Onshore Project

Onshore Export Cables

3.5.1 Cables will be delivered in sections and buried in trenches, with the ground surface subsequently re-instated to its pre-existing condition as far as reasonably practical. Cable sections will be connected within jointing bays located at intervals along the onshore route.

3.5.2 The cables shall follow the prescribed route onshore and will be either directly buried or installed within a cable duct.

3.5.3 The indicative key parameters for the onshore export cables are presented in Table 3.5.1 and Table 3.5.2.

Table 3.5.1: Indicative key design parameters for onshore export cables maximum design scenario (HVAC)

Parameters - HVAC	Design Envelope
Maximum number of export cable circuits	6
Maximum number of cables	18
Maximum number of cable trenches	6
Indicative Power Cable insulation technology	XLPE
Maximum cable voltage (kV)	400
Indicative length of cable corridor (km)	80
Indicative external cable diameter (mm)	220
Maximum number of TJBs	6
Number of joint bays along the onshore cable corridor	480
Total construction area for TJBs (m^2)	42,000
Width of cable construction corridor (m)	80
Minimum cable trench depth (m)	0.9
Maximum cable trench depth (m)	3
Width of topsoil affected per cable (m)	2

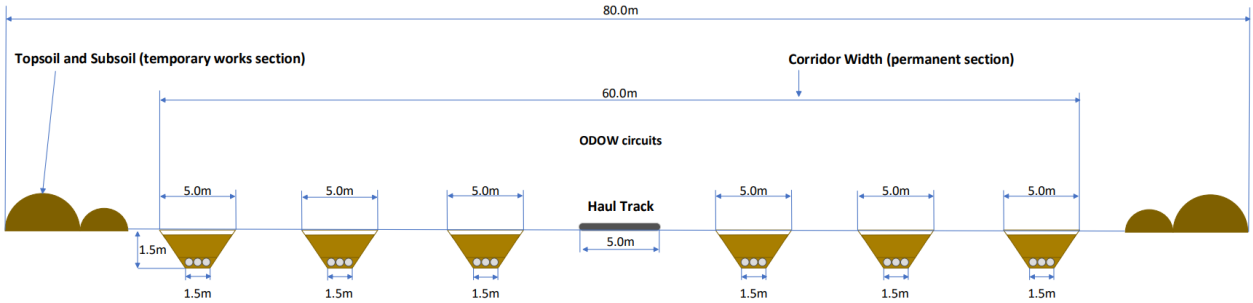


Figure 3.5.1: Example onshore cable construction corridor cross section for 6 HVAC cable circuits (18 cables)

Table 3.5.2: Indicative key design parameters for onshore export cables maximum design scenario (HVDC)

Parameters – HVDC	Design Envelope
Maximum number of export cable circuits	2
Maximum number of export cables	4
Maximum number of cable trenches	2
Indicative Power Cable insulation technology	XLPE or Mass Impregnated
Maximum cable voltage (kV)	600
Indicative length of cable corridor (km)	80
Indicative external cable diameter (mm)	220
Maximum number of TJBs at the landfall	1
Number of joint bays along the onshore cable corridor	480
Total construction area for TJBs (m^2)	42,000
Width of cable construction corridor (m)	55
Minimum cable trench depth (m)	0.9
Maximum cable trench depth (m)	3
Width of topsoil affected per cable (m)	2

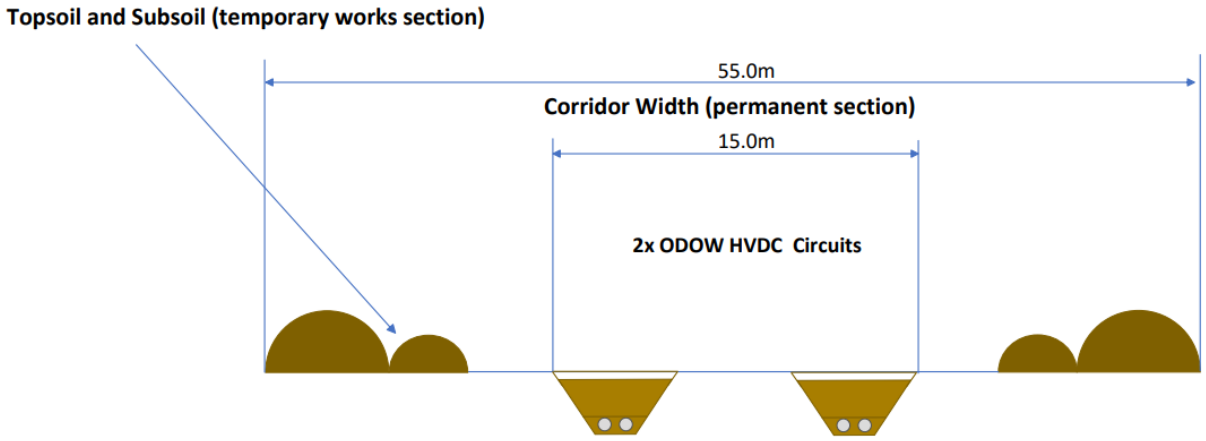


Figure 3.5.2: Example onshore cable construction corridor cross section for 2 HVDC cable circuits (4 cables)

3.5.4 Cable installation techniques are well-established and incorporate environmental management and mitigation measures as standard practice. Precise installation methods will differ according to the nature of the environment through which the cable is being installed. Most of the cable route will be constructed using an open cut method of cable construction. Where an open trench approach is not possible due to significant obstructions (e.g. a major road or watercourse) non-trenching techniques may be employed, such as HDD.

3.5.5 During construction of the cable trenches the topsoil and subsoil will be stripped and stored on site within the temporary working corridor of the Project onshore cable corridor. The procedures followed will be in line with best practice and agreed through the Code of Construction Practice or an appropriate management plan.

3.5.6 Jointing bays (an underground concrete structure holding the joint between sections of the onshore export cables) will be required. The detailed design of these components will be defined post-consent (if granted).

3.5.7 Details of the proposed cable corridor (including access corridors), jointing bays and installation methods (and parameters) will be included within the PEIR/ ES.

Onshore Substation and Reactive Compensation Station

3.5.8 The Project will require the construction of project specific onshore electrical infrastructure facilities. These facilities may include:

- One onshore substation containing the electrical components for transforming and converting the power exported through the onshore cables to 400kV and to adjust the power quality and power factor, as required to meet as required to meet the GB NGESO Grid Code for supply to the National Grid, including cables between substation and National Grid; and
- Up to one onshore reactive compensation station (OnRCS) (if required). In the case of a HVAC transmission, this may be required to enable the capacity of the export cables to be compensated (if not positioned offshore) thus allowing generated power to be transmitted efficiently to the grid connection point.

3.5.9 Discussions with National Grid on the opportunity to coordinate the Project works with its future works are still ongoing. This could include the inclusion in the DCO application of part of the works associated with the National Grid onshore substation.

3.5.10 Grading, earthworks and drainage will be undertaken initially within the onshore electrical infrastructure facilities footprint. Foundations will then be installed which will either be ground-bearing or piled, based on the prevailing ground conditions.

3.5.11 The proposed building substructures will be predominantly composed of steel and cladding materials although brick/block-built structures are sometimes employed. The structural steelwork is likely to be fabricated and prepared off site and delivered to site for erection activities. The steelwork may be erected with the use of cranes. Cladding panels (typically composite) may be delivered to site ready to erect and be fixed to the steelwork. In addition, there could be unhoused equipment, such as compensation transformers and water tanks. Noise enclosers and lightning masts may be constructed to an approximate height of 30m.

3.5.12 A key aspect of the substation installation will be the delivery of the transformers, shunt reactors and harmonic filters. Due to their size and weight, these items will be classified as Abnormal Indivisible Loads (AILs) and delivered via specialist means and offloaded with the use of cranes, Self-Propelled Modular Transporters (SPMTs) or skids. The majority of the remaining equipment is anticipated to be erected with the use of small mobile plant and lifting apparatus.

3.5.13 The onshore electrical infrastructure facilities will be required throughout the lifetime of the Project. Their key parameters are presented in Table 3.5.3 and Table 3.5.4.

Table 3.5.3: Indicative key design parameters for the onshore substations maximum design scenario

Parameters	Design Envelope
Maximum number of substations	1
Indicative site area (up to the permanent fencing) per onshore substation (m^2)	240,000
Indicative temporary working area per onshore substation (m^2)	240,000
Type of onshore substation being considered	Converter station (HVDC) or Substation (HVAC)
Maximum building height (m)	25
Maximum lightning mast height (m)	30

Table 3.5.4: Indicative key design parameters for the OnRCS maximum design scenario

Parameters	Design Envelope
Maximum number of OnRCS	1
Indicative site area (up to the permanent fencing) per OnRCS (m^2)	8,000
Indicative temporary working area per OnRCS (m^2)	12,000
Maximum building height (m)	25
Maximum lightning mast height (m)	30

Other Onshore Design Considerations

3.5.14 Average vehicle movements will be provided to inform the PEIR/ES assessments for the construction phase of the onshore works, including movements of abnormal loads, Heavy Goods Vehicles (HGV) movements and movements of Light Goods Vehicle (LGV) and cars associated with the construction activities.

3.6 Cable Landfall

3.6.1 The cable landfall is expected to lie within the AoS indicated in Figure 1.5.1, with the final landfall selected to align with the final grid connection location, onshore and offshore cable routes. Further details of the process to identify and select the preferred landfall will be presented in the PEIR/ ES.

3.6.2 The offshore cables will be brought ashore at the cable landfall, with techniques for the installation of the offshore export cables across the intertidal areas likely to be either by trenchless techniques (for example Horizontal Directional Drilling (HDD)) or by open-cut trenching techniques.

3.6.3 The offshore export cables will be jointed to the onshore cables in TJBs on the landward side of the landfall site. A TJB is an underground concrete structure holding the joint between the offshore and onshore export cable circuits.

3.6.4 Landfall installation may also require some form of beach access for construction vehicles, depending on the preferred method of installation identified and the preferred landfall location.

3.6.5 Further details of each of landfall installation methodologies will be included in the Project Description within the PEIR/ ES.

3.6.6 Cable installation techniques are well-established and incorporate environmental management and mitigation measures as standard practice. Precise installation methods will differ according to the nature of the environment through which the cable is being installed. Most of the cable route will be constructed using an open cut method of cable construction. Where an open trench approach is not possible due to significant obstructions (e.g. a major road or watercourse) non-trenching techniques may be employed, such as HDD.

3.6.7 During construction of the cable trenches the topsoil and subsoil will be stripped and stored on site within the temporary working corridor of the Project onshore cable corridor. The procedures followed will be in line with best practice and agreed through the Code of Construction Practice or an appropriate management plan.

3.6.8 Jointing bays (an underground concrete structure holding the joint between sections of the onshore export cables) will be required. The detailed design of these components will be defined post-consent (if granted).

3.6.9 Details of the proposed cable corridor (including access corridors), jointing bays and installation methods (and parameters) will be included within the PEIR/ ES.

Other Onshore Design Considerations

3.6.10 Average vehicle movements will be provided to inform the PEIR/ ES assessments for the construction phase of the onshore works, including movements of abnormal loads, HGV movements and movements of LGV and cars associated with the construction activities.

3.7 Additional Associated Development

3.7.1 The Project is currently evaluating the option of incorporating additional associated development in the DCO application, for example battery storage or green hydrogen production facilities. Where these are taken forward, further details will be provided in the PEIR/ ES.

3.7.2 The Project may seek consent for additional infrastructure to assist with the provision of transmission capacity for NGET therefore helping to facilitate co-ordinated grid solutions arising from the OTNR process. Subject to the conclusion of these discussions this could involve underground cables and/ or substations to be added into the Project DCO application.

3.8 Operations and Maintenance

3.8.1 During the operational period, scheduled and unscheduled monitoring and maintenance activities will be required. The maintenance activities will be categorised as either preventative or corrective maintenance. Preventive maintenance will be undertaken according to a service schedule, whereas corrective maintenance will be needed to cover unexpected repairs, component replacements, retrofit campaigns and breakdowns.

Offshore

3.8.2 A number of different vessel types may be required for O&M activities. During the operational phase of the Project there will be no planned maintenance or replacement of the subsea cables, however repairs may be required should the cable fail or be damaged. Periodic surveys will be undertaken to ensure the cables remain buried and/ or sufficiently protected and, if they do become exposed, then corrective maintenance will be undertaken (such as deployment of cable protection or reburial).

3.8.3 The wind farm could be maintained from shore using a fleet of O&M vessels (e.g. crew transfer vessels, supply vessels, autonomous surface vessels (ASVs)) and/ or helicopters or could be maintained using an offshore base (such as an accommodation vessel, Service Offshore Vessel (SOV), or mother ship).

3.8.4 The O&M base (onshore, offshore or both) will be determined by the O&M strategy following final decision (i.e. post consent) when the technical specifications of the development are known, including the location of the O&M base(s) and the WTG type.

3.8.5 A detailed breakdown of O&M activities for which the Project is seeking consent will be provided in the PEIR/ ES. The EIA will seek to assess expected maintenance activities based on experience and best practice, however additional consents or licences will be applied for during the life of the Project for unforeseen requirements as required.

Onshore

3.8.6 Onshore, the O&M requirements will be largely corrective, accompanied by infrequent on-site inspections of the onshore transmission infrastructure. However, the onshore infrastructure will be constantly monitored remotely, and there may be O&M staff visiting the onshore substation to undertake works on a regular basis (currently expected to be once per week).

3.8.7 The onshore substation will not be manned; and security at the substation will be provided through the use of perimeter fencing and closed-circuit television (CCTV). Periodic access to TJBs may also be required for inspection.

3.9 Decommissioning

3.9.1 At the end of the operational lifetime of the OWF, it is anticipated that all of the offshore structures above the seabed level, together with all subsea cables, will be completely removed. Onshore, it is expected that cable would be left in-situ to avoid adverse effects on the environment and communities.

3.9.2 The decommissioning sequence will generally be the reverse of the construction sequence (reverse lay) and involve similar types and numbers of vessels and equipment.

3.9.3 Closer to the time of decommissioning, it may be decided that removal of infrastructure would lead to greater environmental impacts than leaving components in situ, in which case certain components may not be fully decommissioned. Any final decommissioning methodology will adhere to industry best practice, rules and regulations at the time of decommissioning.

3.9.4 In addition, at the appropriate time, it is possible that there may be an option to repower the Project by partially or fully replacing the wind farm components to extend the Project operational period.

3.10 Programme

3.10.1 It is anticipated, that if granted consent, the wind farm will be operational by 2030, with construction currently expected to commence in 2027. A more detailed programme will be provided in the PEIR/ ES to inform the detailed assessments (including in-combination and cumulative assessments).

4 Site Selection and Consideration of Alternatives

4.1 Introduction

4.1.1 The requirement to set out the alternatives considered by the Applicant in developing a project proposal is set out in Schedule 4 (paragraph 2) of the EIA Regulations including the requirement to show why the chosen option was ultimately selected. This schedule, specifically, requires the Applicant to provide a description of the reasonable alternatives considered and the process for site selection.

4.1.2 The consideration of alternatives and the site selection options is an iterative process undertaken as part of the Project development and forming part of the EIA process and, therefore, at the time of writing, this process is not yet complete. The scoping is being undertaken at a relatively early stage of the development and EIA.

4.1.3 The Project's PEIR and the final ES and DCO application will set out in full the options considered by the Applicant in developing the final form of the application and will provide, inter alia, further detail on the rationale for the final project design, including the process of site selection for the OWF array and the associated onshore and offshore cable routes, coastal cable landfall location, onshore substation site and the grid connection location, by reference to the relevant environmental, technical and commercial considerations. The final ES and DCO application will also describe any refinements made to the Project that may have occurred as a result of the EIA process and also refinements made in response to the statutory consultation process and stakeholder feedback.

4.1.4 This section of the Scoping Report provides an overview of the early consideration of alternatives and the site selection context to date for the Project and sets out the intended process for continuing the necessary studies to refine the final project design.

4.2 The Project Round 4 Array Area Site Selection

Offshore Wind Leasing Round 4

4.2.1 In November 2017, TCE launched an Offshore Wind Leasing Round 4 process consisting of four bidding areas. This process involved TCE undertaking a regional characterisation exercise using available data, spatial constraints analysis and supported by stakeholder engagement to identify regions around the coasts of England and Wales and within English and Welsh waters that were considered to be the least constrained for further offshore wind development. The Round 4 leasing process was intended to make new areas of the seabed available for offshore wind development and aimed to identify areas for the development of at least 7 GW of new offshore wind projects. The process concluded in February 2021, with six proposed new offshore wind projects in the waters around England and Wales.

4.2.2 In February 2021, the Applicant was awarded the Preferred Bidder status by TCE as part of the Round 4 leasing process for a project up to 1.5 GW of wind capacity within an area located within TCE's Eastern Bidding Region.

4.2.3 The Project is subject to the outcomes of the Plan-Level HRA currently being undertaken by TCE. The Plan-Level HRA assesses the potential impact of the preferred bidding areas that were selected through the Round 4 process on the UK's network of designated sites and protected habitats and species. The Plan-Level HRA is due to be finalised in Spring/ Summer 2022.

4.2.4 The Applicant expects to enter into an AfL for the Project upon conclusion of the Plan-Level HRA.

Project Array Area

4.2.5 The Applicant identified a potential Project area within the Preferred Bidding Area within TCE's Eastern Bidding Region. The Project area was identified following a detailed evaluation of environmental, technical, and commercial factors.

4.2.6 The boundary of the 500 km^2 of the Project's array area was defined using an iterative process which involved consideration of a variety of environmental and technical constraints, including but not necessarily limited to:

- Key shipping routes and shipping density, areas designated by the International Maritime Organisation (IMO) for routeing measures or traffic separation schemes, designated anchorages, etc.;
- Oil and gas infrastructure (such as pipelines, platforms, wellheads, etc.) and current or possible oil and gas licence blocks, including consideration of likely or known future decommissioning timeframes and safety zones;
- Ministry of Defence (MOD) activity including air defence radar, firing ranges, danger and exercise areas;
- National Air Traffic Services (NATS) radar;
- Commercial fisheries activity;
- Environmental designations (e.g. Special Areas of Conservation (SACs), SPAs and MCZs);
- Marine fish spawning and nursery areas and key habitats;
- Ornithological interest (e.g. potential use of the area by a variety of seabird species);
- Major existing or proposed infrastructure (including other existing or proposed OWFs, subsea cables, etc.);
- The distance from adjacent coastlines and in particular areas subject to landscape designations (such as Areas of Outstanding Natural Beauty (AONB), Heritage Coast, etc.);
- Geological conditions (surface and sub-surface geology);
- Landscape and visual designations; and
- Metocean considerations (waves, tides, wind speeds, etc.).

4.2.7 Under the terms of the seabed lease which would ultimately be granted by TCE, there is a requirement to reduce the Project array area from the current 500 km^2 down to 300 km^2. It is intended that this will be undertaken prior to consent, through consideration of the data and analysis undertaken through development of the Project and EIA processes, taking account of key environmental and technical constraints and in consultation with relevant stakeholders.

4.3 Community Engagement

4.3.1 The Applicant will consult with local communities that may be affected by the Project, providing information on the proposals and seeking comments, feedback and information that can then have an influence on the final form of the development expressed in the DCO application. This is likely to include both 'informal' consultation with local communities and interest groups, as well as the statutory community engagement required under the Planning Act 2008.

4.3.2 The approach to the statutory consultation with local communities will be set out in the SoCC which will be subject to consultation with the relevant LPA, which will also set out the timing for the Section 47 statutory consultation process.

4.3.3 The approach to engagement with local communities is likely to take various forms, subject to discussion with the relevant LPA. Consultation approaches are likely to include virtual and in-person public exhibitions, project website (www.outerdowsing.com), the issuing of newsletters, focused community events, notices in local publications, the use of social media, and continued engagement with local elected officials and community representatives.

4.4 The Project Round 4 Onshore Site Selection

Offshore Transmission Network Review (OTNR)

4.4.1 Historically, an OWF developer would apply to the NGESO for a grid connection under a process previously referred to as the CION process (Connections and Infrastructure Option Note); the NGESO would then respond with a grid connection offer. The Project made a grid application during the Round 4 leasing process and currently has a holding offer from the NGESO for non-specific point on the east coast.

4.4.2 However, the traditional CION process was superseded by the OTNR being led by BEIS. The OTNR was launched in July 2020 and is intended to take a holistic and strategic approach to the future development of the offshore wind transmission system. The OTNR was established to investigate the way that the offshore transmission network is designed and delivered, consistent with the UK's ambition to deliver net zero emissions by 2050. This review includes a 'Pathway to 2030' (which includes all Round 4 projects) within which a HND will be developed.

4.4.3 The HND process which is intended to identify the optimum grid connection options for those projects expected to enter into operation between 2025 and 2030, including the Project. The process aims to balance economic, environmental, and community impacts, and includes consideration of coordinated connection options where these are feasible. Proposals for an enduring connection regime that will apply to later projects and are also being developed as part of the OTNR.

4.4.4 At the time of writing, the OTNR published its findings on 7th July 2022 which identified two possible grid connections options for the Project – a location known as 'Lincs Node' which is located close to the coast in Lincolnshire, or a connection at the junction of existing overhead lines at Weston Marsh, to the south of Boston, Lincolnshire. Once the final outcome of the OTNR is confirmed, the existing holding grid connection agreement will be amended to reflect the final recommendation of the OTNR. This in turn will allow for the Project to confirm the optimal alignment of the onshore cable route and landfall location.

4.4.5 Due to the timescales involved in developing the Project and the need to continue to progress with a properly informed EIA process, the Applicant has chosen to request a Scoping Opinion at the current time prior to final confirmation of the outcome so the OTNR and the final grid connection offer being made, but at a time when a reasonably limited number of options remain, allowing a robust Scoping Opinion to be developed.

4.4.6 Undertaking scoping at this stage and the need to progress the EIA is considered essential in ensuring the Project can make a timely consent application and ensure it will meet its necessary contribution to the 50 GW by 2030 ambition set out in the Government's British Energy Security Strategy (BEIS, 2022).

4.5 Area of Search (AoS) and Preliminary Site Selection

4.5.1 Currently, the Project is undertaking preliminary site selection and appraisal work, incorporating an evaluation of the environmental, social, technical, and commercial constraints and opportunities to start to evaluate ECC options offshore and onshore, as well as cable landfall and onshore substation locations with the AoS defined within this Scoping Report, and in response to the two options identified in the preliminary OTNR outputs. Whilst the finalisation of the HND process and the requirement for the subsequent final grid offer means that site selection work undertaken by the Project is necessarily limited, the Project is nonetheless progressing preliminary site selection work for offshore ECC, landfalls, onshore cable routes and onshore substation site AoS, initially to inform this Scoping Report.

4.5.2 The current offshore and onshore AoS being considered by the Project are presented in Section 1.5 (Figure 1.5.2 and Figure 1.5.3), reflecting the Applicant's preliminary assessment of those grid connection options identified in the draft OTNR outputs (namely the Lincs Node and Weston Marsh).

Defining the Offshore AoS

4.5.3 The Project's offshore AoS, including the array area and offshore ECC was designed to ensure it wholly falls within the boundary of the 'cable regions' identified in the TCE Plan-Level HRA.

4.5.4 The determination of the Project's array area is detailed in Section 4.2.

4.5.5 The offshore ECC will be determined within the current AoS by considering existing 'hard constraints' such as, existing offshore windfarms, including Triton Knoll, Race Bank, Lincs and Inner Dowsing, cables, pipelines, designated anchorages, ship routeing measures, aggregate dredging areas, etc. and key 'soft' constraints including designated sites and the features for which those sites are designated, as well as technical considerations that drive cable routeing and installation feasibility. The process of developing route options and identifying the preferred cable route corridor will be reported as part of the final EIA and will be undertaken in consultation with key stakeholders.

4.5.6 The offshore ECC will also be determined in part by the availability of suitable cable landfall sites at the adjacent coastline. Currently, the AoS within which cable landfall options will be evaluated extends along the Lincolnshire coastline, between Saltfleetby All Saints in the north and Chapel St Leonards in the south. Preferred landfall options will be identified through a consideration of environmental, social, and technical considerations (such as, technical feasibility for cable installation at the coast and in the nearshore area, designated sites, land use, proximity to dwellings, connectivity to the hinterland for onwards onshore routing, etc.). As for the offshore routing, the process of developing and identifying the preferred landfall options will be reported as part of the final EIA and will be undertaken in consultation with key stakeholders.

Defining the Onshore AoS

4.5.7 The Project's onshore AoS has been identified based on the potential onshore grid connection points indicated by the outputs of the OTNR process, namely the Lincs Node or Weston Marsh, and connections from these locations to AoS for potential landfall locations. The onshore AoS has been defined to be broad enough at this early stage to either avoid or provide sufficient space to route around potential constraints such as, for example, designated sites, urban areas, and other built infrastructure.

4.5.8 Further onshore site selection work to identify preferred onshore cable route options and sites for the onshore substation and any other necessary onshore infrastructure will be progressed further once the NGESO have confirmed the final grid connection location.

4.5.9 The siting and eventual design of the onshore substation will be undertaken with due consideration of the National Grid "Horlock Rules" and NPS policies which are designed to encourage good design and make sure that all environmental effects are given appropriate consideration.

4.6 Further Site Selection Process

4.6.1 The final site selection process will be reported in a site selection and alternatives report and summarised in the PEIR and final ES to accompany the DCO application. This will incorporate the process and outcomes of the OTNR and the definition of the final grid connection point, as well as the work subsequently undertaken to define and optimise the transmission infrastructure from the Project's array area to the location of the connection to the National Grid transmission network.

4.6.2 The process will aim to ensure a balanced consideration of the environmental, social, technical, and commercial implications for all options that are developed within the current AoS and following the process summarised above.

4.6.3 The final route corridor and site options developed will be used as the focus for the EIA studies, including site specific data collection which will then be reported in the PEIR and the final ES.

4.6.4 It is noted that the current uncertainty around final, precise grid connection and associated routing/siting of the transmission infrastructure may, to some extent, limit the ability for consultees to comment in detail on the requirements of the EIA whilst noting that the project has chosen to come forward for scoping at a time when the known options have been narrowed to two connection locations by the outcomes of the OTNR process. It is hoped that this will allow a robust Scoping Opinion to be adopted, whilst noting that the Project will continue to engage post-scoping with key stakeholders, including through the Evidence Plan Process (EPP) as well as through the statutory consultation process required under the Planning Act 2008, and as the site selection process evolves, in order to ensure the final scope of the EIA is sufficient to address any issues associated with the final scheme design.

4.6.5 An indicative process for the further site selection and alternatives assessment is set out in Figure 4.6.1.

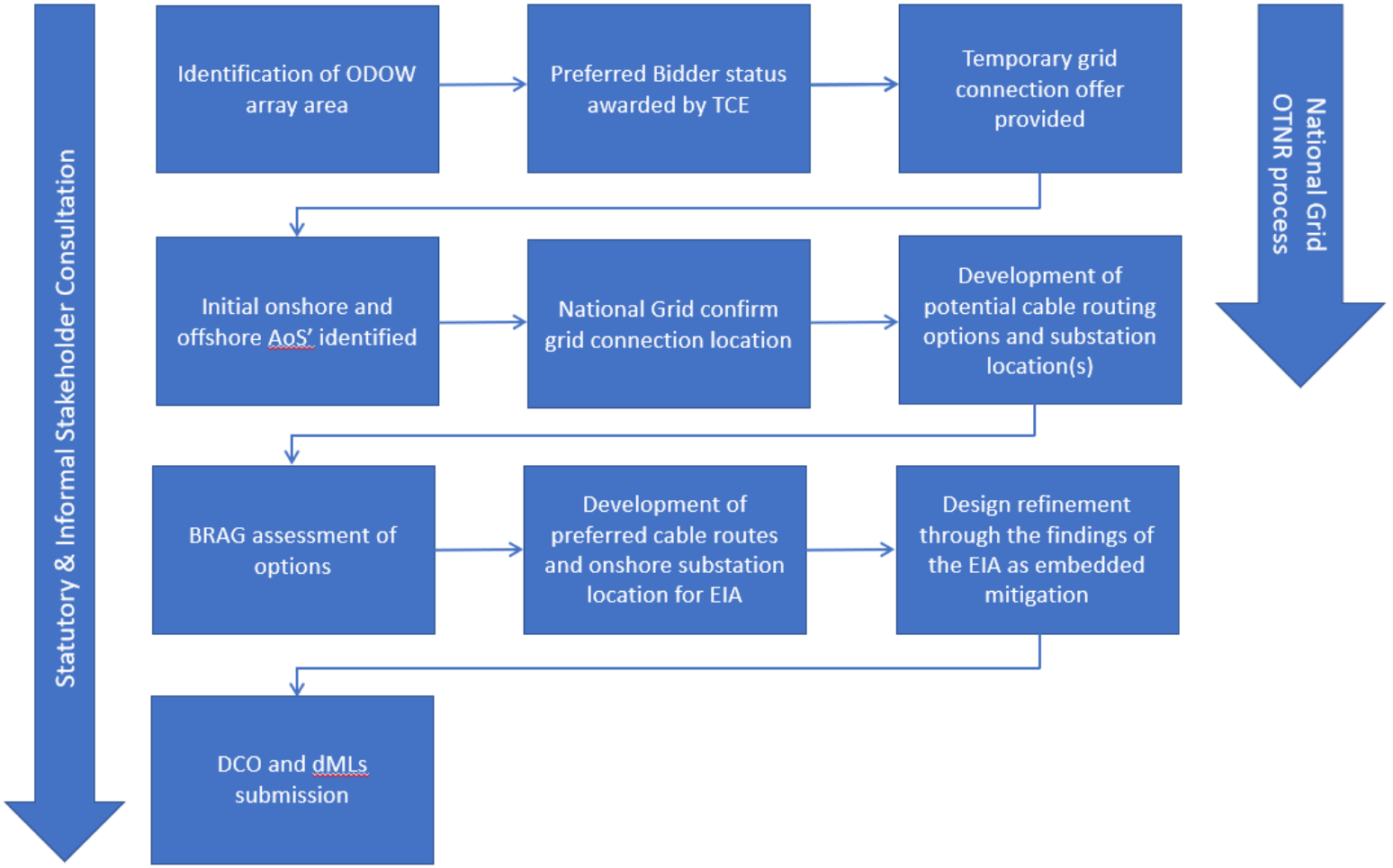


Figure 4.6.1: Indicative site selection and alternatives process for the Project

5 EIA Methodology

5.1 Introduction

5.1.1 The information provided in this section sets out the proposed approach to the EIA for the Project, including the manner in which impacts and effects will be addressed through the EIA process. The processes set out in this section are intended to describe the general EIA approach that will be adopted, noting that for some topics or issues a different approach may be adopted in line with best practice and / or relevant guidance and standards. These differences are identified in the topic specific sections of this Scoping Report where they are known at this stage, and in all cases the approach to the EIA will be developed and refined through discussion with relevant stakeholders.

5.1.2 The purpose of EIA is to provide a systematic analysis of the impacts of a proposed development in relation to the existing (baseline) environment. The results of the EIA are summarised in an ES and intended to provide regulators and stakeholder with the information necessary to make a reasoned judgement on the likely significant effects arising and to allow the decision maker to evaluate the acceptability of the development and its potential impacts across all of its phases; in the case of the Project the EIA will evaluate the impacts arising from the construction, operational and decommissioning phases.

5.2 The Requirement for EIA

5.2.1 The legislative requirement for the undertaking of an EIA process for the Project is set out in Section 2: Need, Policy and Legislative Context, but in summary derives from the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). The EIA will be prepared in compliance with the requirements of the EIA Regulations, and with due regard to the relevant advice notes issued by The Inspectorate (including Advice Note Three (EIA consultation and notification), Advice Note Six (preparation of applications), Advice Note Seven (EIA preliminary information, screening and scoping), Advice note Nine (Rochdale Envelope), Advice Note Twelve (Transboundary matters), and Advice Note Seventeen(Cumulative effects).

5.2.2 This application is being brought forward as a DCO, in this context a number of NPS will be relevant. The Project will take into account all relevant guidance and specific approaches, including draft NPS' and relevant NPS' at the time of writing.

5.2.3 The Project's EIA will also have due regard to the matters set out in the NPS EN-1, NPS EN-3 & NPS EN-5 in relation to the potential environmental effects arising from offshore wind projects and associated transmission infrastructure (see Section 2).

5.3 EIA Best Practice

5.3.1 The approach to the Project EIA and the production of the ES will give due regard to relevant guidance and be conducted in line with current offshore wind industry best practice; relevant guidance includes, but may not be limited to:

- Assessment of the environmental impact of offshore windfarms (OSPAR Commission, 2008);

- Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environment Protection Act 1985 and Coastal Protection Act 1949 requirements (Cefas, 2004);
- Natural England's Approach to Offshore Wind: Our ambitions, aims and objectives (Natural England, 2021)
- Cumulative Impact Assessment Guidelines - Guiding Principles For Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Cefas, 2012);
- Guidelines for Environmental Impact Assessment (IEMA, 2004);
- Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA, 2016);
- Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017); and
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland (CIEEM, 2019).

5.3.2 Additional guidance relevant to the assessment of the impacts of the Project on specific receptors and in relation to specific issues will be given due regard and is set out in the topic specific sections of this Scoping Report.

5.4 Proportionate EIA

5.4.1 The EIA Regulations require the assessment process to focus on the likely significant effects on the environment arising from the Project. Focusing on those impacts most likely to give rise to significant effects requires the adoption of a proportionate approach to the EIA, an approach in line with that advocated by IEMA (the professional body for EIA practitioners).

5.4.2 For the Project, the following definition of proportionality in the EIA will be adopted:

"Proportionate EIA – relative to the actual or perceived risk of likely significant effect, with due regard to the precautionary principle and uncertainty, and measured by the proportionate scope and approach to the corresponding assessment and reporting; ensuring our outputs are accessible and understandable and provide a proportional level of evidence to the risk."

5.4.3 Proportionality will be achieved by adopting several key themes:

- Proposing an appropriate scope for the EIA (starting with this Scoping Report and continuing through discussions with stakeholders);
- Through the approach adopted for each assessment and the level of information and analysis required to demonstrate the potential or otherwise for likely significant effects;
- By making the EIA and associated DCO application documents as accessible and useful as possible;
- Through engagement with stakeholders on the proportionate form and content of the EIA and the scope of the assessments for each receptor and potential impact;

- By encouraging proportionality in the Project design process; and
- By adopting appropriate tools to build in and communicate proportionality, including the outcomes of the EIA, such as the commitments register, and an accessible register of potential impacts and their effects.

5.5 Overview of the EIA Process

5.5.1 The main phases of the Project's EIA process are summarised in Figure 5.5.1, noting that many of the activities will run in parallel rather than entirely sequentially (for example certain of the baseline data gathering is underway at the time of this scoping exercise).

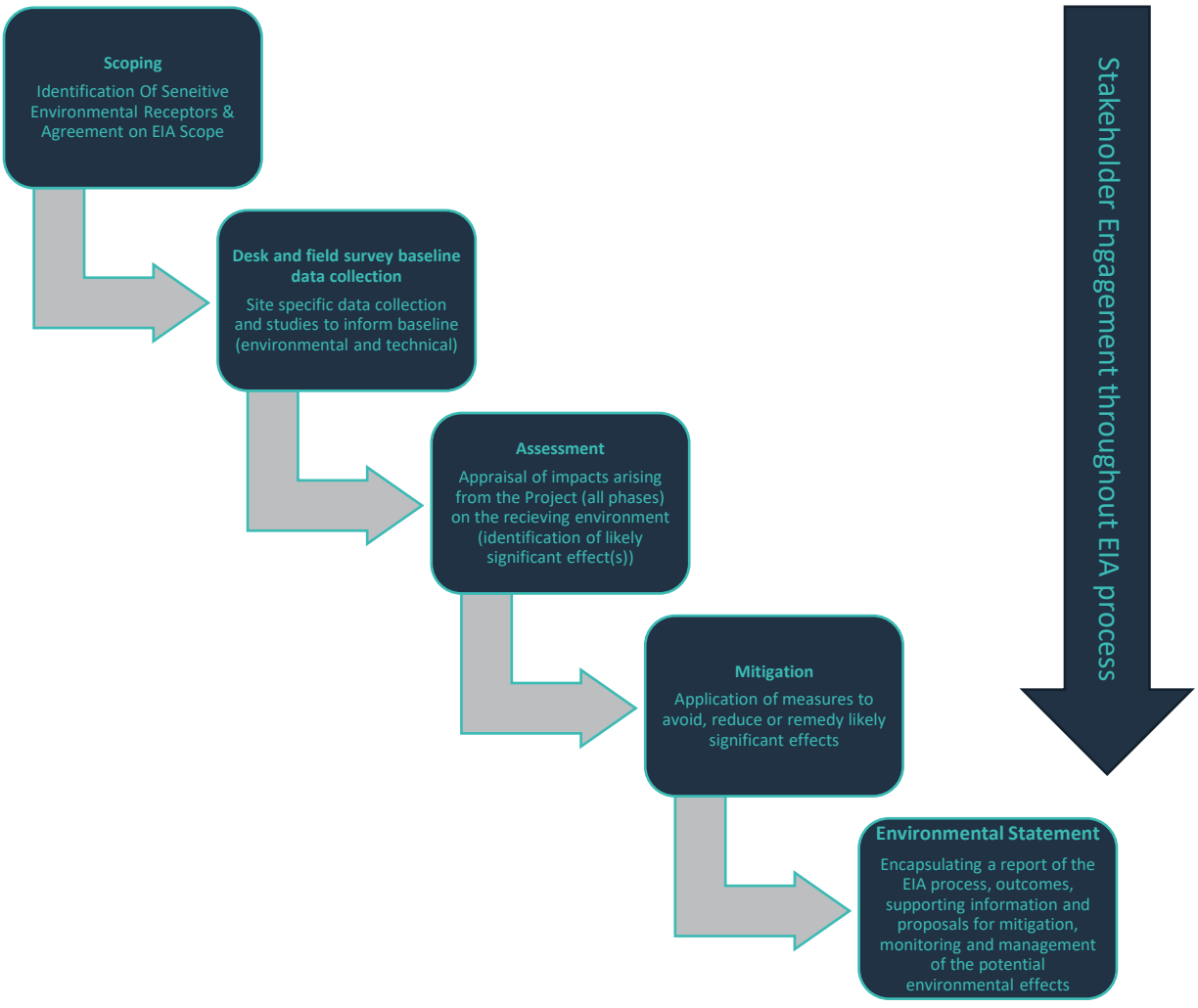


Figure 5.5.1: Overview of the proposed Project's EIA process

5.5.2 The proposed approach to data gathering, EIA studies and the identification of potential impacts and sensitivities are set out in respect to the key environmental receptors in Section 7 to 9 of this Scoping Report, covering both the onshore and offshore elements of the Project, and with the study areas defined in Section 1.

5.5.3 It is recognised that the actual approach to the EIA is likely to evolve in some regards as new information becomes available during the pre-application period, as the Project design evolves and as a result of ongoing discussions with stakeholders. An important part of this iterative process will be the statutory consultation process, informed by the publication of the Preliminary Environmental Information Report (PEIR), (supported as far as possible by as much site-specific data as possible at the time of the consultation).

5.6 The Approach to Scoping

5.6.1 The Inspectorate's Advice Note Seven (The Inspectorate, 2020a) sets out guidance on the scoping process and observes that the Scoping Opinion, where one is requested by an Applicant, is an important document which should form the basis of the final ES accompanying the DCO application. The advice note identifies that the scoping process allows for an early identification of likely significant effects that might arise and provides an opportunity to agree where aspects and matters can be scoped out from further assessment. This is a key step in developing a proportionate approach to the EIA process.

5.6.2 This Scoping Report seeks to identify the potential impacts that might arise from the Project based on what is known of the Project and the baseline environment at this stage, taking account of the extensive evidence base for offshore wind development in the southern North Sea region (noting that there are numerous other offshore wind projects in the near vicinity of the Project). The Applicant has identified those issues and potential impacts where a likely significant effect would not occur and that should therefore be scoped out the EIA, providing a proportionate level of justification in each case (noting the guidance in this respect set out in Advice Note Seven).

5.6.3 Those impacts/issues scoped in and out of the EIA are clearly identified in each of the topic sections of this Scoping Report (Section 7 to 9).

5.7 The Proposed EIA Methodology

Baseline Characterisation

5.7.1 The existing environment (the baseline) will be described as a basis for the EIA of the potential impacts arising from the Project. Characterisation will be undertaken within a study area defined for each topic and will broadly consist of the collation of existing desk top information, augmented where necessary by the collection of site specific information and/or data. The proposed approach for each topic is set out in respect to the key environmental receptors in Section 7 to 9 of this Scoping Report.

5.7.2 In each case and for each topic, a step-wise approach will be adopted which may be summarised as follows:

- Determine the proposed study area (typically defined by the area that might be potentially affected by the impacts arising from the Project – otherwise known as the Zone of Influence (ZoI));

- Undertake a preliminary desk top study of available information; and
- Where the existing information is deemed insufficient to provide an adequate baseline, undertake further information or data gathering.

5.7.3 The sufficiency of baseline information and the need for and scope of additional studies will be the subject of consultation with key stakeholders, including, for example, that already under way as part of the Project's EPP (see Section 6).

5.7.4 Consideration will also be given to how the prevailing baseline for each receptor might evolve in the future (the future scenario) and in addition, what the 'do nothing' scenario might equate to in the face of, for example, climate change and associated, ongoing biodiversity loss, in the absence of the Project.

Identifying the Maximum Design Scenario (MDS)

5.7.5 As noted in Section 3, the EIA will incorporate the consideration of a project design envelope (also sometimes referred to as a 'Rochdale Envelope') and therefore, as part of the EIA process for each receptor and potential impact, the MDS will be identified, described and justified and subsequently used as the basis for the 'realistic worst case' assessment. Due regard will be given to the guidance provided in the Inspectorate's Advice Note Nine: Rochdale Envelope (The Inspectorate, 2018).

5.7.6 The MDS approach is intended to ensure that the assessment is based on the Project design scenario that will have the greatest potential impact. It can then be assumed that any other (lesser) scenarios will have an impact that is no greater than the MDS considered.

Sensitivity, Magnitude and Significance

5.7.7 In most cases the assessment of the potential impacts on each receptor will be described using a standard EIA matrix approach, allowing each resulting environmental effect to be allocated a level of significance, in line with standard EIA best practice. The assessment will consider direct, indirect, secondary, cumulative, inter-related and transboundary effects (being beneficial or adverse), in line with the requirements of the EIA Regulations.

5.7.8 The significance will be determined by combining the assessment of the magnitude of the potential impact with the sensitivity of the receptor. Key uncertainties or limitations will be identified.

5.7.9 The intention of the EIA methodology is to provide a transparent and consistent approach to assessing the potential environmental effects arising, providing a framework for the application of professional and expert judgement.

Determining Magnitude

5.7.10 The magnitude of an impact will be determined taking account of the following sorts of factors:

- Extent - The area over which an impact occurs;
- Duration - The time during which the impact occurs;
- Frequency - How often the impact occurs; and

- Severity - The degree of change relative to the baseline level.

Determining Sensitivity

5.7.11 The sensitivity of the receptor will be determined by assessing the following sorts of considerations:

- Adaptability - The degree to which a receptor can avoid or adapt to an impact;
- Tolerance - The ability of a receptor to accommodate temporary or permanent change without a significant adverse impact;
- Recoverability - The temporal scale over and extent to which a receptor will recover following an impact; and
- Value - A measure of the receptor's importance, rarity and worth.

Allocating Significance

5.7.12 The significance of an effect, either adverse or beneficial, will be determined by combining the magnitude and the sensitivity using a matrix approach, an example of which is provided in Figure 5.7.1. In general, only the categories of Moderate and Major will be considered significant in EIA terms, however the exact definition of these terms will be defined further within each topic section.

5.7.13 For example, if the magnitude of the impact is assessed as High (negative/adverse) and the sensitivity of the receptor is assessed as Negligible, then the significance will be Minor adverse (see Figure 5.7.1), and therefore will not be considered significant in EIA terms.

NEGATIVE/ ADVERSE MAGNITUDE / POSTIVE / BENEFICIAL MAGNITUDE	SENSITIVITY: High	SENSITIVITY: Medium	SENSITIVITY: Low	SENSITIVITY: Negligible
High	Major - Significant	Major - Significant	Moderate - Significant	Minor – Not Significant
Medium	Major - Significant	Moderate - Significant	Minor – Not Significant	Negligible – Not Significant
Low	Moderate - Significant	Minor – Not Significant	Minor – Not Significant	Negligible – Not Significant
Negligible	Minor – Not Significant	Minor – Not Significant	Negligible – Not Significant	Negligible – Not Significant
Low	Moderate - Significant	Minor – Not Significant	Minor – Not Significant	Negligible – Not Significant
Medium	Major - Significant	Moderate - Significant	Minor – Not Significant	Negligible – Not Significant
High	Major - Significant	Major - Significant	Moderate - Significant	Minor – Not Significant

Figure 5.7.1: An example of a matrix for determining the significance of effects

Applying Mitigation

5.7.14 The Project will apply a tiered mitigation approach, including 'embedded' mitigation designed into the Project, standard control measures and such additional mitigation as may be required in response to likely significant effects identified through the EIA process, in line with EIA best practice (e.g. IEMA, 2016). The mitigation hierarchy is summarised in Table .

Table 5.7.1: The Project's tiered mitigation

Mitigation Type	Description
Primary	Mitigation measures 'designed in' and included in the project description
Secondary	Mitigation measures that respond to the outcomes of the EIA in relation to adverse significant effects, necessary to achieve the required outcome
Tertiary	Mitigation measures which will be required regardless of the EIA process as they are imposed as a result of e.g. legislative requirements and/or standard industry practices

5.7.15 As advocated in the IEMA Guidance (2016) only potential effects arising from the final design, incorporating all primary and tertiary mitigation will be assessed, noting that given the maturity of the offshore wind sector in the southern North Sea region, effective mitigation measures (often 'primary' and 'tertiary') for many of the potential impacts associated with offshore wind developments are well developed and widely accepted.

5.7.16 Where likely significant effects are identified as a result of the EIA process, additional (secondary) mitigation will be adopted and the residual significance will be described with the mitigation in place.

5.7.17 All mitigation adopted by the Project will be set out in a commitments register which will be developed as part of the EIA process and subject to consultation with stakeholders.

Monitoring Requirements

5.7.18 Where necessary, normally in response to likely significant effects, key uncertainties or the applicable statutory requirements, the need for environmental monitoring will be identified as part of the EIA process.

5.8 Cumulative Effects

5.8.1 In accordance with the EIA Regulations, the Project's EIA will also consider the potential for cumulative effects to occur – that is effects arising from the Project alongside effects arising on the same receptor from another existing or proposed plan or project. The approach to the Cumulative Effects Assessment (CEA) will take account of the advice provided in the Inspectorate's Advice Note Seventeen (The Inspectorate, 2019) and will consider other plans or projects on a tiered basis (relating to certainty of implementation) as follows:

- Tier 1
  - Projects under construction
  - Consented projects (not yet under construction)
  - Projects with consent applications but not yet determined

- Tier 2
    - Projects on the Inspectorate's Programme of Projects where a Scoping Report has been submitted
- Tier 3
    - Projects on the Inspectorate's Programme of Projects where a Scoping Report has not been submitted
    - Projects identified in the relevant Development Plan;
    - Projects identified in other plans and programmes which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

5.8.2 It is proposed that projects that are built and operational at the time that any baseline survey data were collected will be classified as part of the baseline conditions. The most up to date details for all other plans/projects will be used as the basis of the CEA, including for those projects already implemented, the final 'as built' details.

The Longlisting and Shortlisting Process

5.8.3 A detailed search to produce a 'longlist' and a 'shortlist' of projects to be considered in the CEA will be undertaken and subsequently used as appropriate in the assessment of cumulative effects for each receptor/potential impact, with each project allocated to one of the Tiers listed above.

5.8.4 For offshore projects, plans and projects will be screened based on both their proximity to the Project but also the range over which receptors may be cumulatively affected (for mobile species such as birds or marine mammals, for example, this could be very extensive with many relevant projects drawn into the long list). Screening criteria for the offshore CEA long list will be developed and subject to consultation through the EPP.

5.8.5 The longlist for onshore plans and projects will be generated by identifying relevant projects within a CEA search area, determined based on the largest likely ZoI identified, with plans and projects included subject to discussion and agreement with relevant stakeholders.

5.8.6 Subsequently each longlist will be screened at the individual topic CEA level, to identify those longlist plans or projects for which a receptor-source-pathway (spatially and/or temporally) exists whereby cumulative effects with the Project might occur; a detailed assessment of the shortlist plans and projects will then be undertaken.

5.9 Inter-Related Effects

5.9.1 The potential for inter-related impacts arising from the Project will also be considered as part of the EIA process. The assessment will consider the potential for all effects on a given receptor to interact, whether that be spatially or temporally, resulting in the identification of inter-related effects on that receptor (for example all effects on human amenity - noise and air quality, access, and traffic acting together to create a greater inter-related effect).

5.10 Transboundary Effects

5.10.1 Regulation 32 of the EIA Regulations sets out the requirement to consider potential transboundary impacts, where a project might have an adverse effect on the environment of an adjacent EU member state, as well as setting out the procedures to be followed. The requirements are further set out in the Inspectorate's Advice Note Twelve (The Inspectorate, 2020b).

5.10.2 The location of the Project in relation to the borders with adjacent states is set out in Figure 5.10.1. The limits of the French, Belgian, Dutch, German and Danish Exclusive Economic Zones (EEZs) are located approximately 225 km (south), 196 km (south east), 263 km (north east) and 277 km (north east) respectively from the Project array area.

5.10.3 The Applicant will set out the potential transboundary impacts for the Project in the EIA (under each topic assessment) supported as appropriate by consultation with interests from relevant member states (for example where non-UK fishing interests are identified in the vicinity of the Project).

5.10.4 A screening matrix for transboundary impacts has been provided in

5.10.5 Appendix A – Transboundary Screening. The primary purpose of the Transboundary Annex is to provide a screening assessment of potential transboundary impacts which have the potential to affect other European Economic Area (EEA) States.

5.10.6 No transboundary effects will occur from the onshore aspects of the Project and as such no consideration of transboundary impacts from these aspects of the scheme will be presented in the EIA.

5.10.7 Transboundary impacts have been screened out for offshore aspects, except in relation to the following topics where, based on current information available, the Project has the potential to have significant effects on the environment in other EEA States:

- Marine Mammals;
- Offshore and Intertidal Ornithology;
- Commercial Fisheries;
- Shipping and Navigation; and
- Aviation, Radar, Military and Communication.

5.10.8 These topics have been screened into the transboundary assessment and likely significant effects will be reported in the topic specific sections of this Scoping Report.

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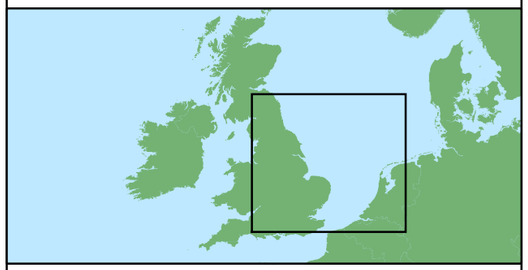
6000000
5800000
N
Denmark
Germany
United Kingdom
Netherlands
Belgium
France

Legend

Site Boundary

Exclusive Economic Zone (EEZ)

- Belgium
- Denmark
- France
- Germany
- Netherlands
- United Kingdom



Coordinate System: WGS 1984 UTM Zone 31N

0 50 100 km

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The proximity to the EEZ of adjacent states to the Project Array Area

Figure 5.10.1

OUTER DOWSING OFFSHORE WIND

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6 Consultation Process

6.1 Introduction

6.1.1 Formal consultation with interested parties (prior to the submission of the DCO application) is an inherent part of the DCO process prescribed in the Planning Act 2008. Ongoing and 'informal' consultation with a range of stakeholders and local communities alongside these statutory requirements, is a standard and integral part of the EIA and wider pre-application process.

6.1.2 This section provides a brief overview of the consultation requirements and the proposed approach to consultation as the EIA process continues throughout the pre-application phase for the Project.

6.2 Statutory Consultation Requirements

6.2.1 As outlined in The Inspectorate's Advice Note Three (The Inspectorate, 2017a), it is the Applicants responsibility to "ensure that their pre-application consultation fully accords with the requirements of the Planning Act 2008, including associated regulations, and that they have regard to relevant guidance".

6.2.2 A particular emphasis of the Planning Act 2008 is pre-application consultation with all potentially affected stakeholders and interested parties, including local communities, requiring the Applicant to:

- Consult with the local authorities (as prescribed in Section 43 of the Planning Act 2008) on what information should be included in the Statement of Community Consultation (SoCC), which will set out how the Applicant proposes to consult with the local community, as prescribed in Section 47 of the Planning Act 2008;
- Make the SoCC available for public inspection, advertise where the SoCC may be inspected and carry out consultation in accordance with it;
- Consult the local authorities and other persons/ bodies prescribed under Section 42 of the Planning Act 2008, Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the APFP Regulations) and otherwise notified to the Applicant under Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations);
- Notify the SoS, prior to consulting under Section 42, of a proposed DCO application in accordance with Section 46 of the Planning Act 2008;
- Publicise the proposed application in accordance with Section 48 of the Planning Act 2008 and paragraph 4 of the APFP Regulations;
- Have regard to the relevant responses to publicity and consultation as required by Section 49 of the Planning Act 2008; and
- Prepare a consultation report to accompany the DCO application as required by Section 37(3)(c) of the Planning Act 2008.

6.2.3 Under Regulation 10 (6) of the 2017 EIA Regulations, the Inspectorate must also consult with relevant stakeholders (as defined by the EIA Regulations) prior to providing the Applicant with a Scoping Opinion.

6.3 Approaches to Stakeholder Engagement

6.3.1 The Applicant recognises that effective and meaningful consultation is an integral part of its development activities and is committed to ensuring that it maintains a transparent approach to consultation and stakeholder engagement.

6.3.2 The main objectives for stakeholder engagement will be to:

- Identify and actively engage with those statutory bodies, non-governmental organisations, other national and international organisations, the local community and landowners who may be affected by the proposed development;
- Develop a transparent consultation and engagement strategy that meets the requirements for pre-application consultation under the Planning Act 2008;
- Prioritise consultation with those likely to be directly affected;
- Maintain open and honest communications with all stakeholders; and
- Recognise the interests and viewpoints of stakeholders and where appropriate, use the feedback to inform the design of the Project and development activities.

6.4 The Evidence Plan Process

6.4.1 Since September 2012, prospective applicants of NSIPs located in England and Wales, have been able to request and agree 'Evidence Plans' with relevant stakeholders as a means to manage and record informal consultation during the pre-application phase.

6.4.2 The process followed in the preparation of the Evidence Plan is aimed at producing a voluntary, non-legally binding agreement between the Applicant and the relevant statutory authorities and advisers and other relevant stakeholders who are party to the EPP. This agreement covers those matters to be addressed by the EIA and HRA process (the scope) and the data that will be used to support the assessments. The EPP also considers the methods to be used for data analysis and the assessment of potential impacts, while promoting discussions on the precise scope for the final EIA which will ultimately accompany the application and build on the views expressed in the Scoping Opinion.

6.4.3 Throughout the EPP, discussions will be ongoing to further refine the final scoped out and scoped in aspects of the Project for PEIR and ES based on the final design scenario.

6.4.4 The Applicant has established an EPP for the Project, taking account of the guidance provided within Annex H of the Inspectorate's Advice Note Eleven (The Inspectorate, 2017b). Whilst the EPP was initially developed to focus on HRA issues, there are parallels with a broader range of EIA topics and therefore the scope of the Project's EPP has been expanded to include relevant EIA topics, beyond the HRA. The EPP will cover the offshore and onshore aspects of the project (the latter to be refined as the grid connection option is refined thought the OTNR process) and will facilitate discussion with key stakeholders.

6.4.5 Agreement on a Terms of Reference (ToR) document has been sought by the Project from all parties currently engaged in the EPP steering group. The ToR sets out the general rules of working, roles and responsibilities and engagement during the process which are in accordance with the guidance in Advice Note Eleven.

6.4.6 The Project EPP comprises a steering group overseeing the progress, together with expert topic groups (ETGs) incorporating various relevant stakeholders which will discuss the technical detail relating to various topic related themes; the proposed structure and ETG are shown in Figure 6.4.1 and attendees are shown in Table 6.4.1. The ETGs may expand into further workstreams dealing with topic specific matters, as required and as agreed with stakeholders through the specific ETG.

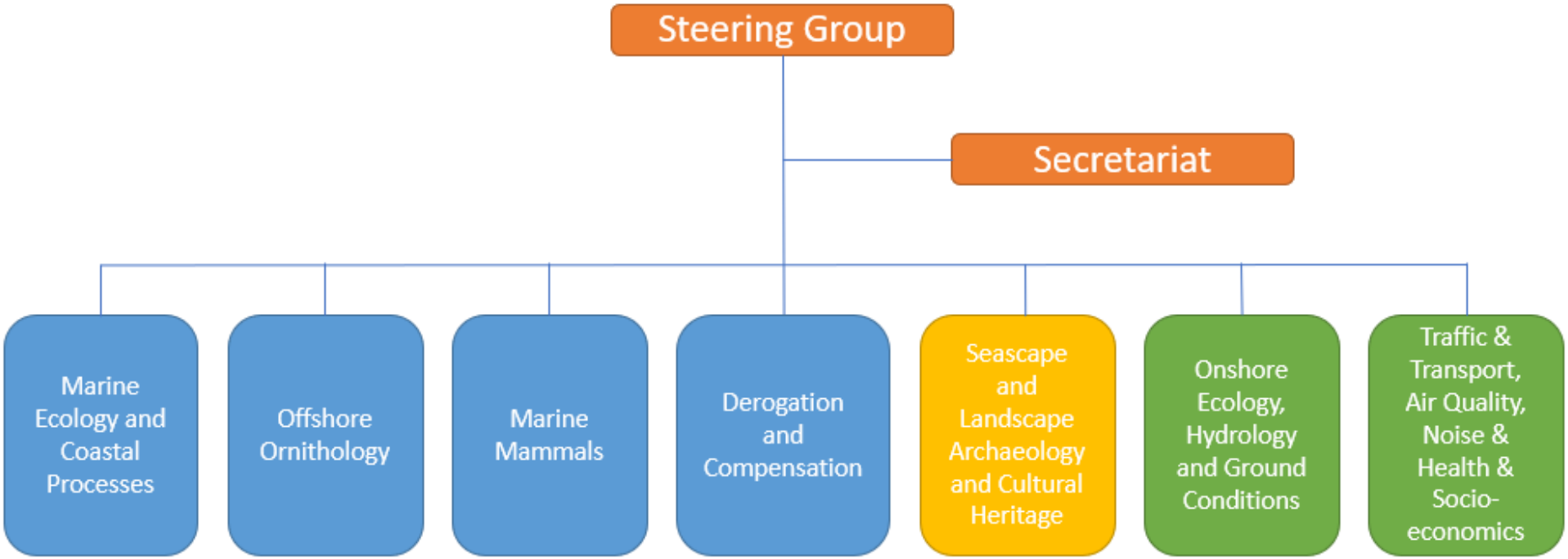

Figure 6.4.1: The Project Evidence Plan Process Overview

Table 6.4.1: ETG Members

ETG	Members
Marine Ecology and Coastal Processes	MMO Natural England Environment Agency Cefas
Offshore Ornithology	MMO Natural England Royal Society for the Protection of Birds (RSPB)
Marine Mammals	MMO Natural England The Wildlife Trust Cefas
Derogation and Compensation	MMO Natural England RSPB
Seascape and Landscape, Archaeology and Cultural Heritage	Natural England Historic England Local Planning Authority (LPA) County Council
Onshore Ecology, Hydrology and Ground Conditions	Natural England Environment Agency Wildlife Trust RSPB Water Board Drainage Board LPA County Council
Traffic and Transport, Air Quality, Noise, Health and Socio-Economics	Highways England Local Tourism Board Environment Agency LPA County Council

6.4.7 The Project EPP was initiated in November 2021 with the first steering group meeting and the first ETG meetings were subsequently held in January 2022 which focused on scoping. Further EPP meetings will be programmed throughout the pre-application phase. The EPP to date has been primarily focused on offshore matters due to the lack of certainty associated with the grid connection point and therefore cable routing options and the relevant potentially affected LPAs and other onshore stakeholders. Following confirmation from the OTNR of the draft recommendations for grid connection points for the Project, the Applicant has approached the relevant LPAs and other stakeholders to invite them to join the EPP.

6.4.8 LPAs have been invited to attend the EPP Steering Group, with the LPA(s) and other relevant stakeholders also invited to attend appropriate ETGs.

6.5 Non-Evidence Plan Engagement

6.5.1 For those EIA topics not included in the Project EPP, extensive 'informal' consultation will be conducted throughout the pre-application phase through targeted engagement; this will include engagement on topics including but not necessarily limited to:

- Commercial fisheries;
- Shipping and navigation;
- Aviation and civil and military radar;
- Other owners and operators of infrastructure in the vicinity of the project (including oil and gas operators, pipeline and cable operators, marine aggregate dredging operators, adjacent OWF interests, utilities operators and statutory undertakers, etc.);
- Onshore topics not included in the EPP (direct discussions with relevant statutory and non-statutory stakeholders);
- National Grid;
- Land interests;
- TCE; and
- Local community groups.

6.5.2 Engagement commenced on a number of the above parties since the award of Preferred Bidder status of the Project in February 2021, and further meetings will be held at appropriate milestones throughout the development of the EIA process and alongside engagement under the statutory requirements set out in the Planning Act 2008.

6.6 Reporting on Consultation

6.6.1 Feedback received will be considered as the project proposals develop and will be reported as part of the DCO application in the Consultation Report.

6.6.2 The Consultation Report will detail the consultation that has been undertaken in support of the Project's DCO application. The report will take into account The Inspectorate's Advice Note Fourteen (The Inspectorate, 2021) which provides detail on compiling the Consultation Report.

6.6.3 The Consultation Report responds to one of the key requirements set out in the Planning Act 2008 which places a statutory obligation on applicants to complete a process of pre-application consultation. This consultation will be undertaken with prescribed bodies, LPAs and people with an interest in the land to which the application relates (under Section 42 of the Planning Act 2008), with local communities (under Section 47) and more widely through the general notification of a proposed application (under Section 48).

6.6.4 The primary purpose of the Consultation Report is to provide details of the statutory pre-application consultation which will be undertaken by the Project and to capture and reflect upon the responses received and to have regard to the views expressed. The Consultation Report will also capture non-statutory consultation which has taken place outside of the requirements of the Planning Act 2008.

6.6.5 Furthermore, the Consultation Report will provide details of SoCC, the EPP and the resulting Statements of Common Ground (SoCG) with statutory stakeholders.

7 Offshore Environment

7.1 Marine Physical Processes

Introduction

7.1.1 This section of the Scoping Report identifies the marine physical process elements of relevance to the Project array area and offshore ECC Area of Search (AoS). It considers the potential effects from the construction, operation and maintenance (O&M) and decommissioning of the Project, seaward of Mean High Water Springs (MHWS), both alone and cumulatively, on marine physical processes and sets out the proposed scope of the EIA.

7.1.2 This section should be read alongside the following sections of this Scoping Report:

- Section 7.2: Marine Water and Sediment Quality.

7.1.3 For the purposes of both this Scoping Report and the subsequent Offshore EIA Report, marine physical processes includes the following elements:

- Morphology, including bathymetry, geology, surficial sediments and seabed form;
- Hydrodynamics, including tidal and non-tidal influences, and waves; and
- Sediment transport, including suspended sediment.

7.1.4 Marine physical processes pathways are closely linked to seabed, coastal and water quality receptors. This section covers the marine physical process pathways and receptors present within the study area.

Study Area

7.1.5 The marine physical processes study area for the Project, is defined as:

- Near-field:
  - The array area;
  - The offshore ECC AoS;
  - Proposed export cable landfall area; and
- Far-field:
  - Coastal and seabed zones outside those previously defined areas, but within the vicinity of the array area and ECC AoS that may be influenced by physical processes – informed through further analysis of the marine physical process pathways.

7.1.6 Of note is that this study area may be further refined following detailed assessments of tidal excursions and specifically sediment transport pathways to allow a definition of the ZoI.

Baseline Environment

Overview of Available Data Sources

7.1.7 This initial understanding of the baseline (pre-development) environment has been informed through a high-level, desk-based review of publicly-available literature and data sources. A further and more detailed consideration of the information sources presented in Table 7.1.1 will be carried out during the EIA stage of works. The Project intends to undertake a series of site-specific survey campaigns to supplement existing information through the provision of higher quality (spatial; temporal) information. These are also presented in Table 7.1.1.

Overview of Baseline Environment

7.1.8 An understanding of the baseline marine physical processes which control the features, pathways and receptors within the study area has been derived from the available data sources and literature (Table 7.1.1). Regional context is provided where appropriate and dependent upon the scale of the processes discussed. This baseline understanding, as presented below, will be further developed following completion of project-specific surveys and updated in following phases of the EIA process.

Morphology

7.1.9 This section provides an overview of the bathymetry, geology, surficial sediments and seabed features of relevance to the Project (Figure 7.1.1).

Bathymetry

7.1.10 Located at its closest point, approximately, 54 km offshore, water depths within the array area range between 5 m and 40 m (Lowest Astronomical Tide (LAT)). As shown in Figure 7.1.1, the shallower water depths correspond with the presence of sand banks, for which further information is provided in a subsequent section. Water depths along the offshore ECC AoS generally range between 10 m and 30 m (LAT), dependent on bathymetric features. Water depths typically shallow uniformly towards the coast.

Geology

7.1.11 The geology of the study area is a complex anticline of Cretaceous Chalk, Jurassic and Triassic bedrock overlain by glacial till (clay, sand and gravel debris deposited from ice sheets) known as the Bolders Bank formation (Museum of London Archaeology (2010); Cathie (2021)). A Holocene layer, typically no greater than 5 m, overlies the underlying bedrock except in Silver and Sole Pits where the bedrock is exposed (Cathie, 2021).

Surficial Sediments

7.1.12 Within the array area sands and gravel material characterises the surficial seabed sediments. The seabed within the offshore ECC AoS is also generally characterised by surficial sand and gravel sediments. However, within this AoS, there is a localised presence of muddy sediments; typically restricted to within bathymetric deeps, for example Inner Silver Pit and at localised areas in shallower water depths (DECC, 2016). The distribution of surficial sediments is illustrated in Figure 7.1.2.

Table 7.1.1: Key sources of publicly available information for marine physical processes

Source	Summary	Spatial Coverage of Study Area
Metocean Data (waves; tides; winds)		
Atlas of UK Marine Renewable Energy Resources. Source: UK Renewables Atlas - ABPmer (www.renewables-atlas.info)	Low resolution modelled hindcast wave, wind and hydrodynamic data. Summary data provided only.	Full coverage
British Oceanographic Data Centre (BODC) Source: www.bodc.ac.uk/	Hydrodynamic data (current speed; direction) from single point locations and discrete deployment depths	Partial coverage
National Tide and Sea Level Facility (NTSLF) Source: www.ntslf.org	Tidal water levels from point locations at the coast	Partial coverage
SEASTATES Metocean Data and Statistics Interactive Map Source: www.seastates.net/	Modelled hindcast wave and hydrodynamic data	Full coverage
Cefas WaveNet data Source: www.cefas.co.uk/cefas-data-hub/wavenet/	Wave records from point locations, including Holderness, Chapel Point and Dowsing	Partial coverage
Measurements for existing OWF and associated extensions that are within the public domain (available via the Marine Data Exchange)	Hydrodynamic data (current speed; direction) from single point locations and discrete deployment depths	Partial coverage
The Project's metocean assessment	Numerical modelling to inform design criteria	Partial coverage
The Project's metocean deployments	Single buoy in the array centre	Partial coverage
Morphology (bathymetry, geology, coastal, seabed and suspended sediments) and Sediment Transport		
Southern North Sea Sediment Transport Study Phase 2 (SNSSTS II) Source: HR Wallingford (2002)	Information on observed and modelled littoral and seabed sediment transport	Partial coverage
British Geological Society (BGS) Offshore GeoIndex Map Source: www.bgs.ac.uk/GeoIndex/offshore.htm	Seabed sediment maps (based on Folk classification) and borehole records from point locations. Data gaps exist in the coastal zone.	Full coverage

Source	Summary	Spatial Coverage of Study Area
Cefas Suspended Sediment Climatologies around the UK	Monthly and seasonal Suspended Particulate Matter (SPM) maps	Full coverage
United Kingdom Hydrographic Office (UKHO) Admiralty Chart data Source: UKHO (2021)	Bathymetric data	Full coverage
DTI Technical Report: Sandbanks, sand transport and OWFs Source: Kenyon and Cooper, 2005	Detail on offshore and littoral sediment transport, including morphological form and behaviour of offshore sandbanks	Partial coverage
The Humber Regional Environmental Characterisation Source: Tappin *et al.*, 2011	Physical processes, bathymetry, morphology and geology off the east coast of England	Partial coverage
Anglian Regional Coastal Monitoring Programme Source: https://coastalmonitoring.org/anglian/	Monitoring data to inform coastal characteristics and change, including topographic survey data, aerial imagery and oceanographic data.	Partial coverage
East Riding Regional Coastal Monitoring Programme Source: https://coastalmonitoring.org/eastriding/		Partial coverage
National Coastal Erosion Risk Mapping (NCERM) Source: https://data.gov.uk/dataset/7564fcf7-2dd2-4878-bfb9-11c5cf971cf9/national-coastal-erosion-risk-mapping-ncerm-national-2018-2021	Upper and lower estimates of erosion risk at a particular location, within which the actual coastline location is expected to be, for temporal periods relating to Shoreline Management Plans (SMP).	Partial coverage
The Project's geophysical surveys (2021; 2022)	Array area and final offshore ECC	Full coverage
The Project's geotechnical surveys (2022)	Nearshore area and offshore ECC	Full coverage
The Project's benthic surveys (2022) Including sediment sampling	Array area and offshore ECC	Full coverage
The Project's metocean deployments Including turbidity sampling	Single buoy in the array centre	Partial coverage
Future Changes		
UK Climate Projections Science Report: UKCP18 Marine report. Source: Palmer *et al*. (2018)	Sea level rise predictions for coastal locations	Partial coverage

Source	Summary	Spatial Coverage of Study Area
IPCC Sixth Assessment Report, the Framework for Assessment of Changes To Sea-level (FACTS) Source: https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool		Partial coverage
Generic		
Physical processes ES and technical reports for existing OWF and associated extensions that are within the public domain: Hornsea projects; Triton Knoll; Race Bank; Dudgeon Shoal (and Extension); Sheringham Shoal (and Extension); Lynn and Inner Dowsing; Humber Gateway, Westermost Rough.	Baseline physical process (hydrodynamic; morphological; coastal) conditions of relevance to the respective OWFs. Physical processes assessments for each of the OWF.	Partial and full coverage relative to the location of the respective OWFs.
SEA– SEA2 Source: https://assets.publishing.service.gov.uk	Baseline physical processes (hydrodynamic; morphological; coastal) within SEA Region2	Full coverage
OWFDevelopment: SEA (R2 Wind): Environmental Report Source: https://assets.publishing.service.gov.uk	Baseline physical processes (hydrodynamic; morphological; coastal) within the North West, Greater Wash and Thames Estuary strategic areas	Full coverage

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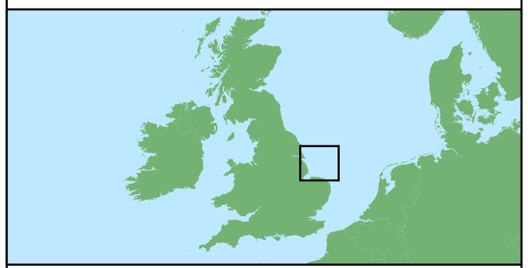
Humber Estuary
Spurn Head
The Binks
Silver Pit
Haddock Bank
Sole Pit
Outer Dowsing Channel
Outer Dowsing Shoal
East Dudgeon Shoals
Dudgeon Shoal
Inner Dowsing
Race Bank
Gibraltar Point
The Wash

Legend

- Site Boundary
- Offshore ECC Area of Search
- Physical Processes Study Area

Depth (m)

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:500,000

Marine Physical Processes Study Area

Figure 7.1.1

OUTER DOWSING OFFSHORE WIND

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300000
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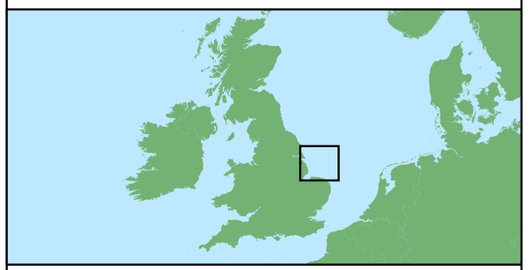
N

Legend

- Site Boundary
- Offshore ECC Area of Search
- Physical Processes Study Area

Seabed Sediments (FOLK)

- 1.1.1 Mud
- 1.1.2 (gravelly) Mud
- 1.2.1 sandy Mud
- 1.2.2 (gravelly) sandy Mud
- 1.3.1 muddy Sand
- 1.3.2 (gravelly) muddy Sand
- 2.1.1 Sand
- 2.1.2 (gravelly) Sand
- 3.1.1 gravelly Sand
- 3.2.1 sandy Gravel
- 3.3.1 Gravel
- 4.1.1 gravelly Mud
- 4.3.1 gravelly muddy Sand
- 4.4.1 muddy sandy Gravel
- 5. Rock and Boulders



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Surficial Seabed Sediments with the Offshore Array Area and towards Landfall

Figure 7.1.2

OUTER DOWSING OFFSHORE WIND

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Seabed Features

7.1.13 The array area is bound to the east (seaward) by Sole Pit, an offshore depression considered to have formed during Quaternary glaciations (Briggs *et al*., 2007) and by the Outer Dowsing Channel on its western (landward) boundary. Areas of sand waves are present, providing an indication of the direction of sediment transport. Notable offshore seabed features located within the array area and offshore ECC AoS, as illustrated in Figure 7.1.1, are summarised below:

- Array area:
  - Outer Dowsing Shoal: partially located within the western extent of the array, this shallow water bank, aligned north-west to south-east, shallows to a depth of 4 m with associated gravel and sand deposits (Museum of London Archaeology (2010)).
  - Haddock Bank: Located central to the array, this bank has an irregular plan shape and exhibits complex fining patterns across an uneven seabed topography (Holmes and Wild (2003)). The surficial medium to very coarse sands exhibit a generally steady decrease in mean grain size from the south-west to the north-east across the bank (Holmes and Wild (2003)).
- Offshore ECC AoS:
  - Notable seabed features include the Race Bank – North Ridge – Dudgeon Shoal and Inner Dowsing sand bank systems, located at the southern boundary of the offshore ECC. The former is an example of a sinusoidal sand bank with which smaller sand banks are associated. Inner Dowsing has a characteristic elongated shape and is composed of coarse sand with gravel deposits with which megaripples and sand waves are associated. Both features have water depths less than 10 m (LAT) (Centrica (RBW) Ltd (2008)). Inner Dowsing is considered to be a relict feature whilst Race Bank and North Ridge are active features exhibiting clockwise sediment transport in response to tidal forcing (Triton Knoll Offshore Wind Farm, 2010).
  - Inner Silver Pit, located landward of array area, is an elongated, over-deepened and enclosed paleo-valley partly filled with unconsolidated sediments. Geological evidence suggests that this bathymetric deep may have been formed by similar processes as Sole Pit and specifically by erosion underneath a grounded ice sheet and later by tidal scour (Balson, 1999). The Inner Silver Pit is, approximately, 60 km long, 10 km wide and 50 m deep (Holmes and Wild (2003)). As with the Outer Silver Pit, sediment within the feature is likely to be mobilised by tidal currents in a north – south direction and further enhanced by larger storm events (Proctor *et al*., 1999).

Coastal Form

7.1.14 The coastal form at the landfall sites is summarised below according to available information including that from the relevant SMP.

- Offshore ECC AoS:

- The Lincolnshire coastline, bound by the Humber Estuary in the north and The Wash in the south, can be characterised by a wide sandy beach, overlying Bolder Clay, which reduces in width towards the south. The beaches have been shown to be accreting and steepening. Sand dunes are present along the back of the beaches at certain locations (Scott Wilson, 2010). There are a number of hard defences present within the southern section of this coastline, between Saltfleet Haven and Gibraltar Point where the beach is typically narrower (Environment Agency, 2019a). Gibraltar Point is located at a distinct orientation change of the coastline into The Wash, and represents a spit maintained by sediment transport from the Lincolnshire and North Norfolk coasts, in addition to that from offshore sand banks (Environment Agency, 2010).
- The present form of the Lincolnshire beaches has been directly influenced by an annual beach nourishment scheme which has involved the placement of almost 17 million m^3 of sand since 1994 (Environment Agency, 2019a; 2019b). The Wash is a tidally-dominated embayment. Tidal asymmetry is ebb-dominated within the four rivers feeding the embayment such that fines are discharged into the bay. Consequently, the embayments' intertidal area has been generally accreting over the last 2,000 years (Environment Agency, 2010).
- Humber Estuary and Spurn Head, located at the northern extent of the Lincolnshire coastline, are also notable coastal features:
    - The Humber Estuary is a tidally-dominated single spit estuary, the mouth of which is characterised by sand flats, linear banks and inter-tidal mud flats. The Humber is ebb-dominated with a high SSC transported beyond the mouth on the ebb tide (E.ON, 2008). At the estuary mouth is The Binks, a sand bank feature which dries at low water and is composed of gravelly sand waves.
    - Spurn Head is located at the southern extent of the Yorkshire coastline and is a sand and gravel spit across the entrance to the Humber Estuary. Material eroded from the Holderness Cliffs is transported along the coast to this feature and into the Humber Estuary. Historical mapping suggests that since the 1680's, the dominant trends have been the south-westwardly lengthening of the Head into relatively deep water, westward (landward) migration and re-orientation of the Neck, and the progressive accretion across the nearshore zone (the Binks) (Lee and Pethick, 2018). Spurn Head is considered vulnerable to overwashing (HR Wallingford, 2012).

Sediment Transport

7.1.15 Regional-scale assessments indicate a net north-westerly direction of bedload transport within the array area and the eastern part of the offshore ECC AoS, which are located seaward of a bedload parting zone (Figure 7.1.3; Kenyon and Cooper, 2005). The tidal regime will dominate bedload sediment transport in the deeper water, with wave action only becoming meaningful in shallower locations.

7.1.16 Further inshore, there is a dominant southwards bedload sediment transport pathway, with an inshore direction into The Wash (Figure 7.1.3). This region includes part of the offshore ECC AoS west of Race Bank and Inner Silver Pit. Littoral transport diverges along the Yorkshire and Lincolnshire coastlines such that sediment is transported towards the mouth of The Wash and the Humber Estuary.

300000
350000
400000
450000
6000000
5950000
5900000
N

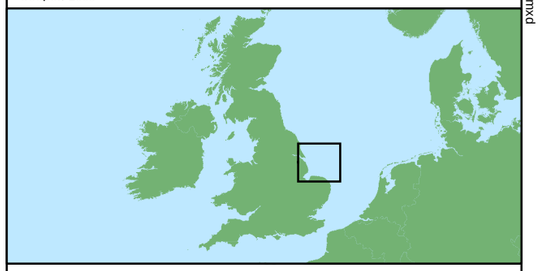
Legend

- Site Boundary
- Offshore ECC Area of Search
- Physical Processes Study Area
- Longshore Transport
- Bed Load Transport
- Bed Load Parting
- SEA Boundary

Depth (m)

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

Longshore Transport, Bed Load Transport and Bed Load Parting from Kenyon and Cooper, 2005



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:550,000

Surficial Seabed Sediments with the Offshore Array Area and towards Landfall

Figure 7.1.3

OUTER DOWSING OFFSHORE WIND

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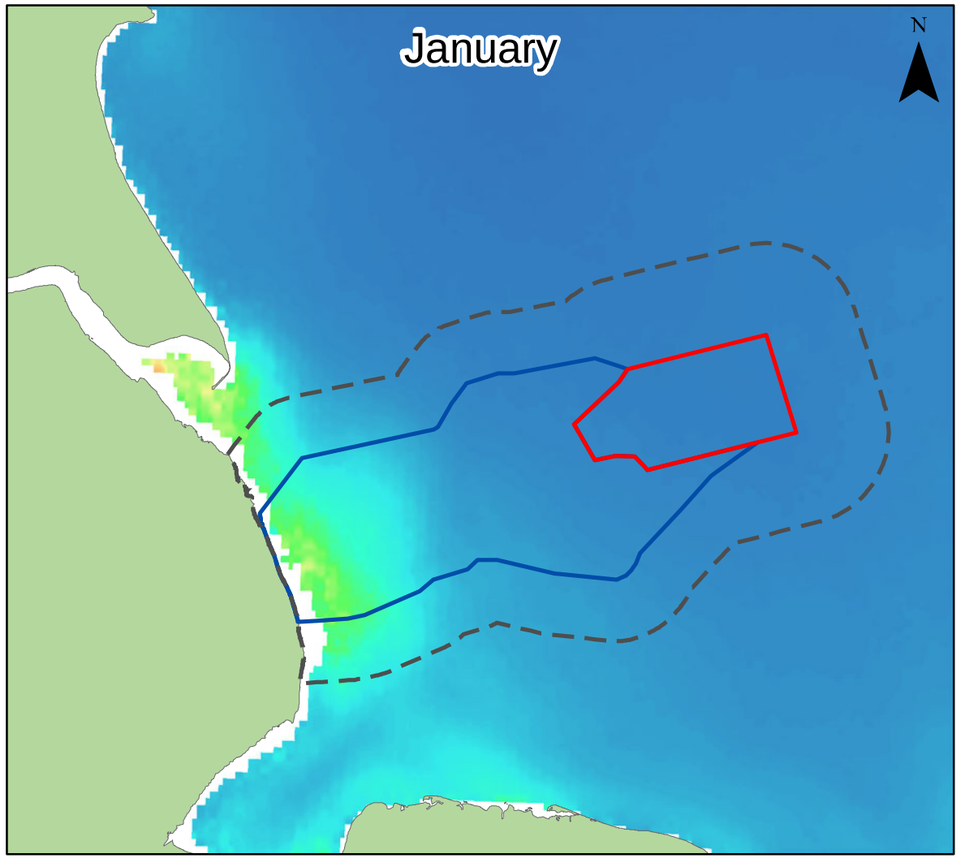
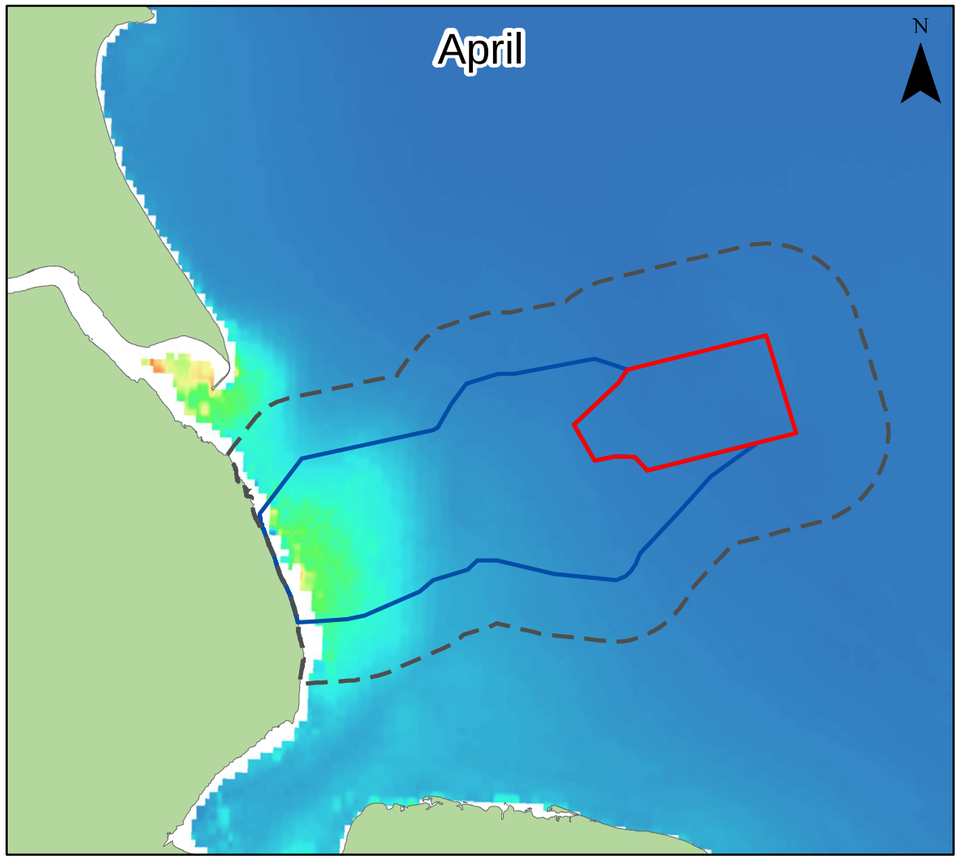
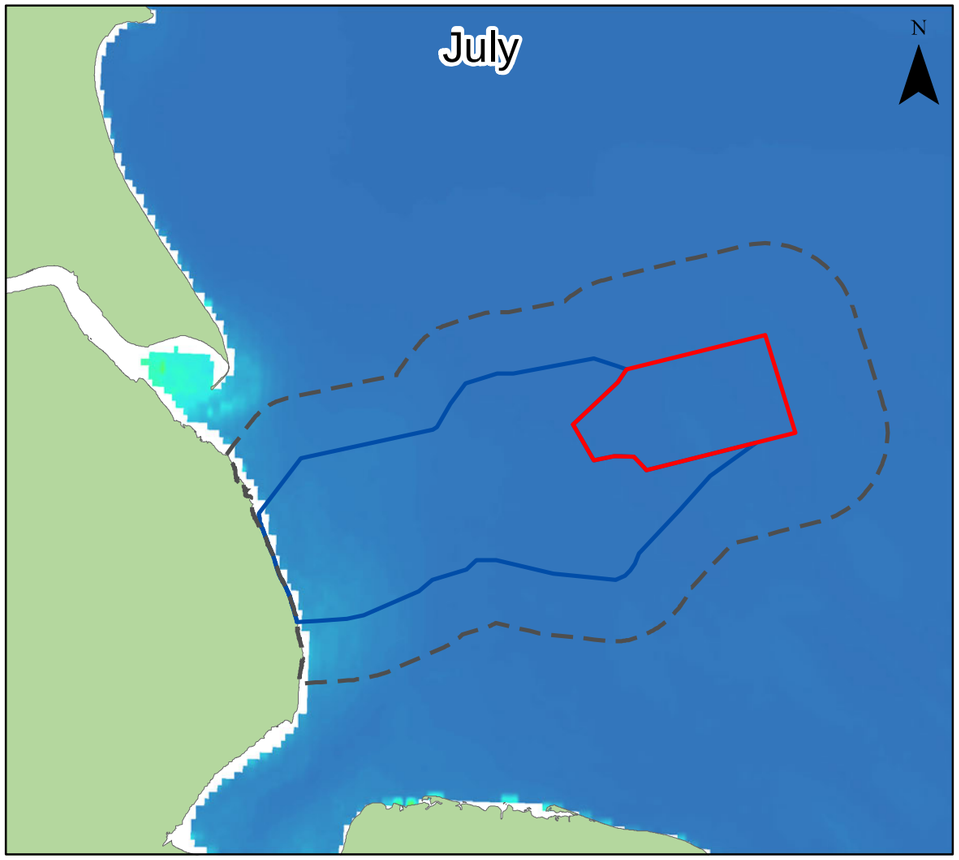
7.1.17 SPM provides an indication of turbidity and is highly variable according to water depth and the marine physical processes in the area (i.e., tide, current and wind regimes). As a result of distance from terrestrial sources, for example the Holderness Cliffs, combined with a generally low fine seabed sediment signature (Figure 7.1.2), low surface concentrations of up to 5 mg/l (Figure 7.1.4) were recorded between the period 1998 to 2015 (Cefas, 2016) within the Project array area. Higher values will occur during spring tides and storm conditions, with the greatest concentrations encountered close to the bed.

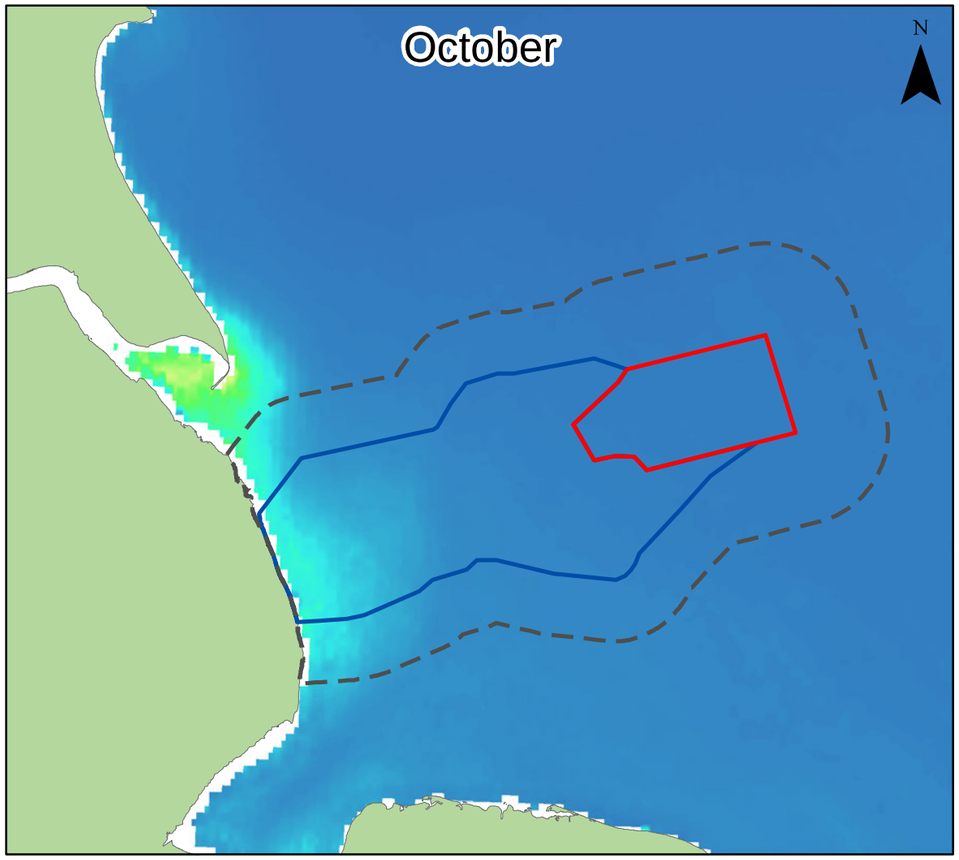
7.1.18 The finer sediments transported southwards from the erosion of the Holderness Cliffs combine with muds transported out of the Humber Estuary, forming a plume which moves offshore to the south-east and towards the southern North Sea. The majority of the plume's suspended load is deposited outside UK Territorial Waters (Defra, 2002).

- Offshore ECC AoS:
  - Surface SPM levels within the nearshore zone of the offshore ECC AoS are directly under the influence of terrestrial sources from the Humber Estuary and Holderness Cliffs, such that concentrations reach circa 60 mg/l, between the period 1998 to 2015 (Cefas, 2016). Maximum values coincide with the winter months when a greater frequency of storm events and fluvial inputs (including storm runoff) can be expected to occur. During the summer months, for example July, maximum values are of the order of 12 mg/l.









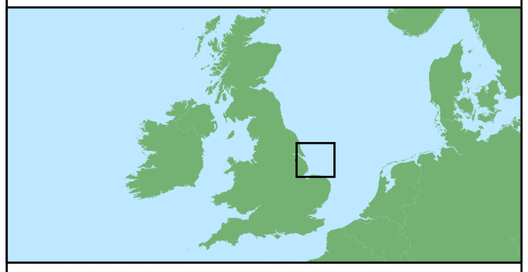
Legend

- Site Boundary
- Offshore ECC Area of Search
- Physical Processes Study Area

SPM Concentrations (mg/l) (CEFAS, 1998-2015)

High : 100

Low : 0



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:1,000,000

Average Suspended Particulate Matter (Cefas, 2016)

Figure 7.1.4

OUTER DOWSING OFFSHORE WIND

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Hydrodynamics

7.1.19 This section provides an overview of the influences of tidal, non-tidal and wave processes on the Project.

Tides

7.1.20 The southern North Sea tidal regime is under the influence of an amphidromic point located close to the Danish coast, such that the tides rotate anti-clockwise around this point. Modelled mean spring and neap tidal ranges in the centre of the array are 3.62 m and 1.76 m, respectively (MetOceanWorks, 2021). Both the spring and neap tidal ranges increase in a shoreward direction with distance from the amphidrome.

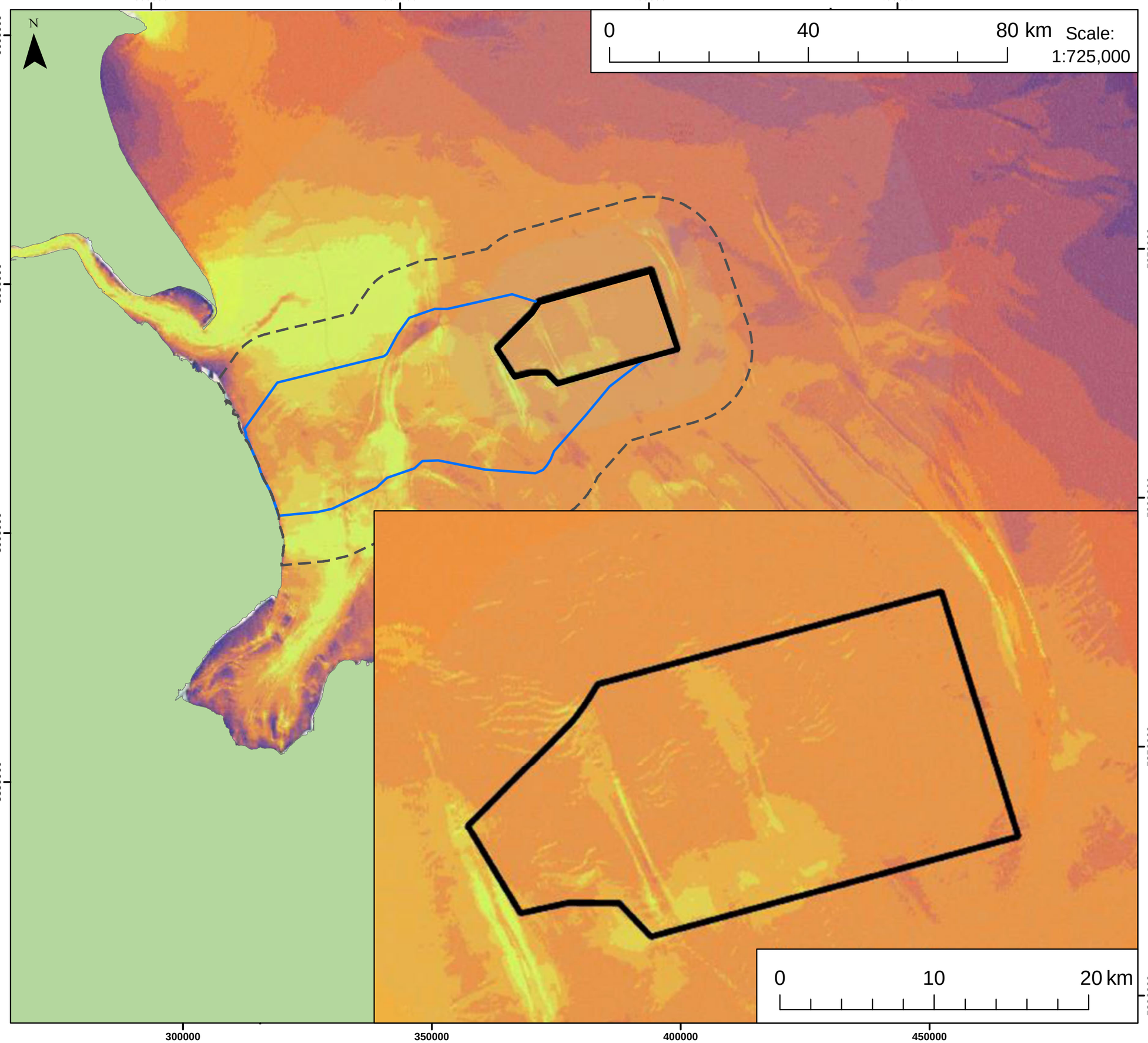
7.1.21 Variations in current speeds within the array and further afield occur in response to the presence of notable seabed and coastal features. As shown in Figure 7.1.5, the faster current speeds occur at those locations where deeper water channels, for example the Outer Dowsing Channel, are present. Modelled mean and 1 in 50-year return period surface current speeds are 0.53 and 1.49 m/s, respectively, for the centre of the array area. Current flows decrease towards the seabed due to drag effects with the seabed (MetOceanWorks, 2021). Depth-averaged spring tidal current speeds in the offshore ECC AoS increase closer to the shore, exceeding 1.4 m/s in Inner Silver Pit (Figure 7.1.5). Notably, benign current speeds, of the order observed within the Wash and Humber Estuaries, occur within the northern extents of the Inner Silver Pit (Figure 7.1.5).

7.1.22 Regional tidal ellipses provide some indication of current flow direction across the site, showing the strongest flows are orientated north north-west to south south-east flow offshore (ABPmer, 2017). Detailed metocean assessments (MetOceanWorks, 2021) within the array area support this rectilinear flow axis, and further confirm that, in addition to the direction of the strongest flow, the principal flow is along the north-west to south-west axis (Figure 7.1.6). Localised departures to this general pattern are expected in the vicinity of offshore banks and channels.

7.1.23 The tidal regime exerts primary control upon the sediment transport regime in the offshore environment (Triton Knoll OWF Limited, 2010).

Non-Tidal Influences

7.1.24 Superimposed upon regular tidal behaviour are various non-tidal influences, which mainly originate from meteorological effects. An example is surges, formed by rapid changes in atmospheric pressure causing the water levels to fluctuate considerably above or below the tidal level. The height of a 1 in 50 year return period storm surge at Lowestoft has been defined as 1.93 m (Flather and Williams, 2000) and 1.88 m within the array (MetOceanWorks, 2021).

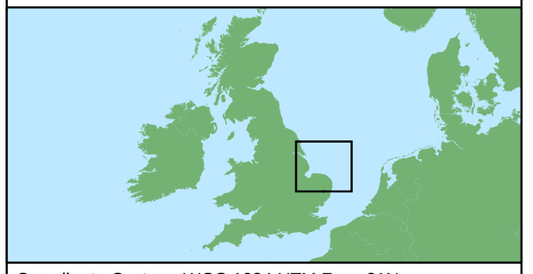


Legend

- Physical Processes Study Area
- Offshore ECC Area of Search
- Site Boundary

Depth-averaged Current Speed (m/s)

- < 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1
- 1 - 1.2
- 1.2 - 1.3
- 1.3 - 1.4
- > 1.4



Coordinate System: WGS 1984 UTM Zone 31N

Maximum Modelled Depth-Averaged Spring Tidal Current Speeds (MetOceanWorks, 2021)

Figure 7.1.5

OUTER DOWSING OFFSHORE WIND

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Contains ESRI Basemapping; EMDOnet Geology 2016

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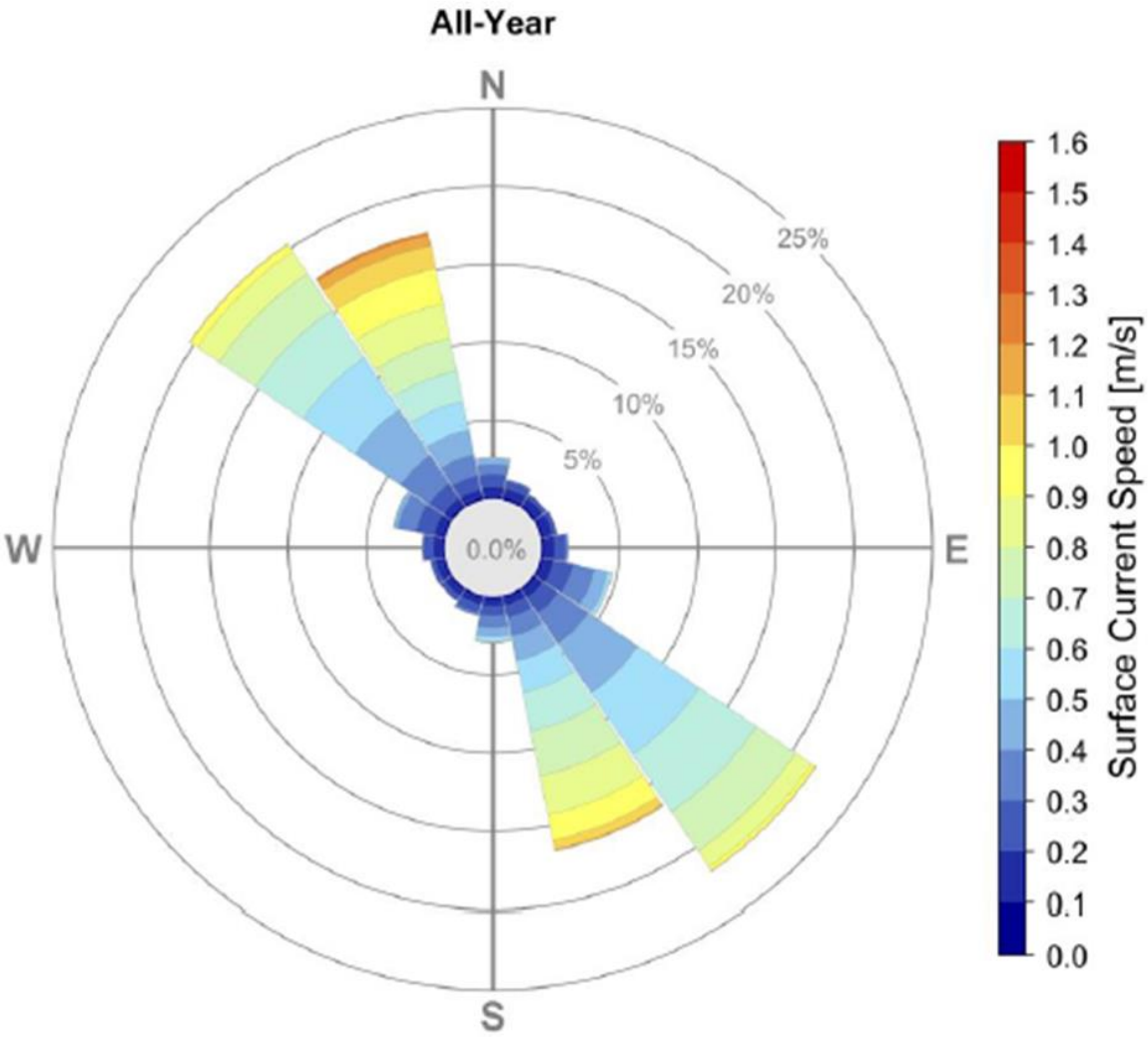

Figure 7.1.6: Surface current speed and direction for an annual period (MetOceanWorks, 2021)

Waves

7.1.25 The Project is subject to waves generated within the North Sea basin. Annual significant wave heights within the array area and offshore ECC AoS are within the range of 0.76 to 1.25 m, decreasing in a shoreward direction due to shallowing water effects (ABPmer, 2017). A more detailed assessment of the metocean conditions within the array area indicates that, for the centre of the array, wave heights are of the order of 5.3 m, 6.8 m and 8.3 m for return periods of 1, 10 and 100 years, respectively (MetOceanWorks, 2021). Waves typically originate from the north, north north-west and south south-east, as illustrated in Figure 7.1.7.

7.1.26 The wave regime exerts the dominant forcing to sediment (littoral) transport within the nearshore zone. It has been shown that there is little variation in the nearshore wave height over a range of return periods, suggesting that that wave shoaling is limited up to the coast (Triton Knoll OWFLimited, 2010). Influence upon sediment transport offshore typically only occurs in the offshore during extreme events.

Frontal Systems and Stratification

7.1.27 Frontal zones mark boundaries between water masses, including tidally mixed and stratified areas, and are numerous on the European continental shelf (DECC, 2016). Located over 50 km from the array is the Flamborough Front, which marks the transition between the well-mixed southern North Sea and stratified northern North Sea water bodies. This seasonal feature develops during summer months, approximately, 10 km offshore from Flamborough Head and generally follows the 50 m isobath (Hill *et al*., 1993).

Future Changes

7.1.28 A consideration of the future baseline, including the associated variation, is provided in the context of the operating lifetime of the Project. For the current purposes of this scoping document, the Representative Concentration Pathway (RCP) 8.5 (high emissions) scenario (Palmer *et al*., 2018) has been presented.

7.1.29 UKCP18 suggests that an increase in mean sea level (MSL) of 0.7 m at 2100 along the Lincolnshire coast (Palmer *et al*., 2018). Future changes in storm surges have been predicted to be undistinguishable from background variation (Lowe *et al*., 2009).

7.1.30 Wave energy is predicted to decrease, such that by 2100 a decrease larger than 10% have been modelled in the North Sea (RCP8.5 scenario; Bonaduce *et al*., 2019; Meucci *et al*., 2020). Inter-decadal variability may be largely due to the influence of local weather in the North Sea (EDF ENERGY, 2021).

7.1.31 Generally, under the RCP8.5 scenario (high-emissions scenario), by 2100, shoreline advance is predicted to occur south of the Humber Estuary to The Wash (Vousdouka *et al*., 2020).

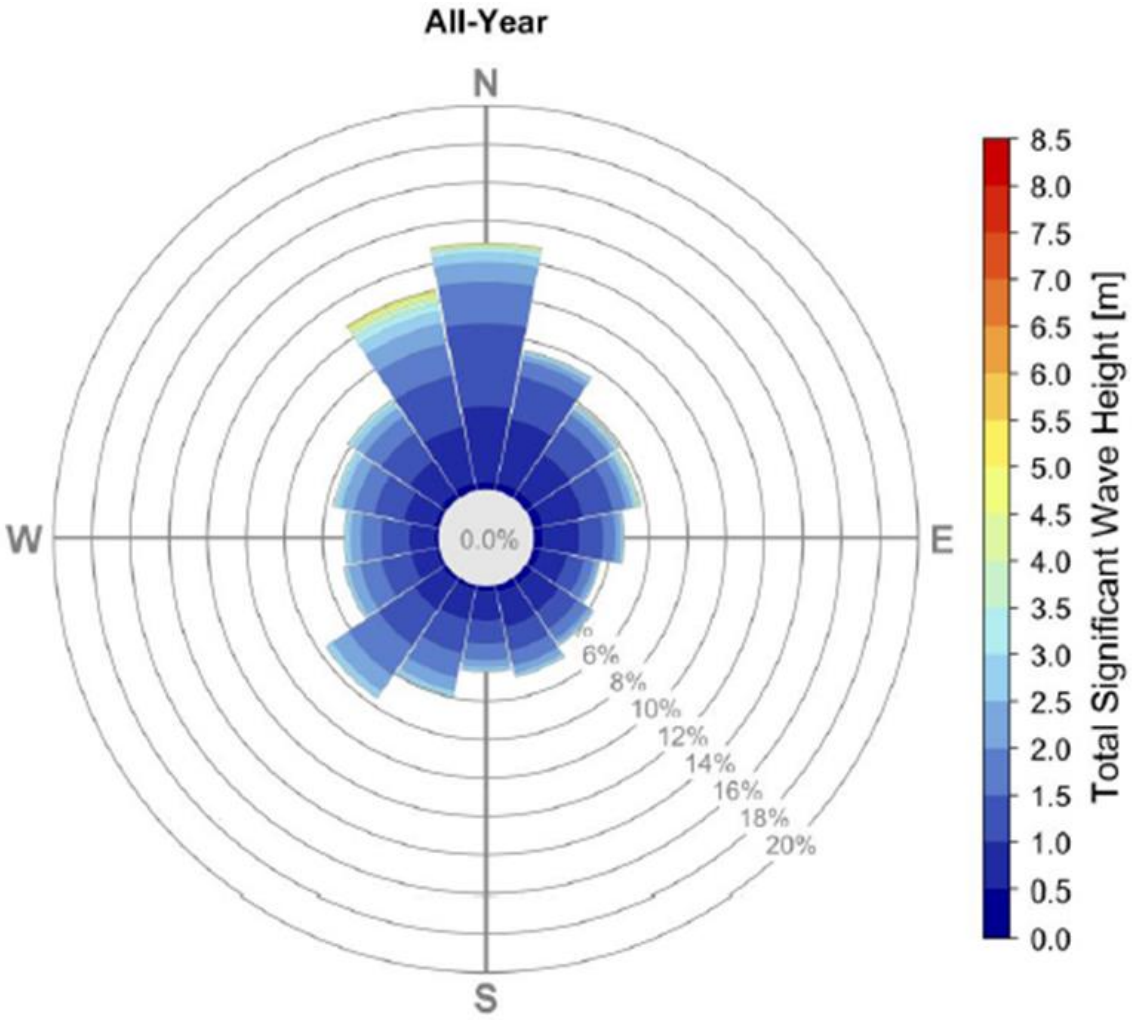

Figure 7.1.7: Array area annual wave rose for Hm0 and direction (MetOceanWorks, 2021)

Designated Sites and Protected Species

7.1.32 Designated sites in the vicinity of the study area, which are designated for the protection and conservation of marine habitats up to MHWS are shown in Figure 7.1.8. A comprehensive list, with detail of the relevant protected features, is provided below:

- North Norfolk Sandbanks and Saturn Reef SAC:
  - Reefs; and
  - Sandbanks which are slightly covered by sea water all of the time.
- Haisborough, Hammond and Winterton SAC:
  - Reefs; and
  - Sandbanks which are slightly covered by sea water all of the time.
- Cromer Shoal Chalk Beds MCZ:
  - Infralittoral rock;
  - Circalittoral rock;
  - Subtidal chalk and sand;
  - Subtidal coarse and mixed sediments;
  - Peat and clay exposures; and
  - North Norfolk Coast (subtidal).
- The Wash and North Norfolk Coast SAC:
  - Reefs;
  - Sandbanks which are slightly covered by sea water all of the time;
  - Mudflats and sandflats not covered by seawater at low tide; and
  - Large shallow inlet and bays.
- Inner Dowsing, Race Bank and North Ridge SAC:
  - Reefs; and
  - Sandbanks which are slightly covered by sea water all of the time.
- Humber Estuary SAC:
  - Sandbanks which are slightly covered by sea water all the time;
  - Estuaries;
  - Mudflats and sandflats not covered by seawater at low tide;
  - Coastal lagoons;
  - Salicornia and other annuals colonizing mud and sand;
  - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);

- Holderness Offshore MCZ:
  - Subtidal sand;
  - Subtidal coarse and mixed sediments; and
  - North Sea glacial tunnel valleys.
- Holderness Inshore MCZ:
  - Intertidal sand and muddy sand;
  - Circalittoral rock;
  - Subtidal mud and sand;
  - Subtidal coarse and mixed sediments; and
  - Spurn Head (subtidal).

7.1.33 A number of coastal (SSSI) are also present:

- Offshore ECC AoS:
  - Humber Estuary – 2000480 SSSI: designated for nationally important habitats;
  - Saltfleetby – Theddlethorpe Dunes SSSI: designated for the flora and fauna and research into the processes of coastal development;
  - Chapel Point – Wolla Bank SSSI: national importance in the Geological Conservation Review;
  - Gibraltar Point SSSI: designated for habitats and coastal geomorphology; and
  - The Wash SSSI: designated for habitats and species supported.

7.1.34 Whilst relevant to this scoping stage of the EIA, project refinement, including that of the offshore ECC and associated landfall, will inherently result in a refinement of the designated sites considered within the PEIR and ES stages of the project.

7.1.35 The Project is aware that a number of proposed Highly Protected Marine Areas are being developed for consultation, which may include the Inner Silver Pit. The extent, specific features and type of restricted activities which may be covered under any designation are currently unknown, however these sites will be appropriately considered in future assessments once this information is available.

7.1.36 Notably, a standalone Habitats Regulation Assessment (HRA) Screening report will be produced detailing all matters associated with European designations.

300000
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5950000
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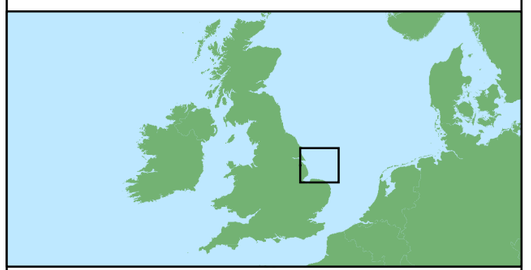
Holderness Inshore
Holderness Offshore
Humber Estuary
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point
Inner Dowsing, Race Bank and North Ridge
North Norfolk Sandbanks and Saturn Reef
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point
The Wash and North Norfolk Coast
Cromer Shoal Chalk Beds
Haisborough, Hammond and Winterton

Legend

- Site Boundary
- Offshore ECC Area of Search
- Physical Processes Study Area
- Marine Conservation Zones
- Special Areas of Conservation



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Designated Sites of relevance to Marine Physical Processes

Figure 7.1.8

OUTER DOWSING OFFSHORE WIND

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Proposed Approach to the Environmental Impact Assessment

7.1.37 This section outlines the proposed approach to the Project EIA, including relevant guidance, embedded mitigation measures and those impacts which have been scoped into the assessment.

Proposed Assessment Methodology

7.1.38 The EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of marine physical processes will also follow the guidance documents presented below and where they are specific to this topic:

- Environmental impact assessment for offshore renewable energy projects (BSI, 2015);
- Coastal Process Modelling for OWFEnvironmental Impact Assessment: Best Practice Guide (Lambkin *et al*., 2009);
- Guidelines in the use of metocean data through the lifecycle of a marine renewable development (ABPmer *et al*., 2008);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects. (Cefas, 2011);
- National Resources Wales (NRW) Monitoring Evidence Report No: 243 Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects. (Brooks *et al*, 2018);
- Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry. Department for Business Enterprise and Regulatory Reform in association with Defra. (BERR, 2008);
- General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation (JNCC and Natural England, 2011);
- Offshore Windfarms: Guidance note for Environmental Impact Assessment in Respect of FEPA and CPA requirements (Cefas, 2004);
- Review of environmental data associated with post-consent monitoring of licence conditions of OWFs'. MMO Project No: 1031. (Fugro-Emu, 2014);
- Best Practice Advice for Evidence and Data Standards for offshore renewables projects (Natural England, 2022);
- Further review of sediment monitoring data'. (COWRIE ScourSed-09).' (ABPmer, HR Wallingford & Cefas, 2010);
- Review of Round 1 Sediment process monitoring data - lessons learnt. (Sed01)' (ABPmer *et al*., 2007);
- Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02)' (HR Wallingford *et al*., 2007); and

- Potential effects of offshore wind developments on coastal processes. (ABPmer and METOC, 2002).

7.1.39 A more detailed literature review will be developed for the PEIR and subsequent ES, building upon the high-level outline provided within this Scoping Report. Project specific survey outputs will be used to enhance the understanding of the baseline conditions.

7.1.40 A numerical model will be developed to factor in project specific surveys and a range of representative baseline conditions. The model will be applied to investigate the source-pathway-receptor relationship for those issues scoped in (Table 7.1.2) and based upon the realistic MDS, as provided in Section 3. Numerical model outputs will be supplemented with the Evidence Base, using existing studies from comparable projects.

Relevant Embedded Mitigation Measures

7.1.41 The Applicant is currently considering the implementation of the following embedded mitigation measures within the Project Design which will be of relevance to marine physical processes:

- Scour protection. The timely installation of scour protection would provide embedded mitigation to any seabed sediments that would otherwise be disturbed by scouring. Scour protection may take the form of:
    - Rock/ gravel placement;
    - Concrete mattresses;
    - Flow energy dissipation devices;
    - Protective aprons or coverings;
    - Ecological based solutions; and
    - Bagged solutions.
- Cable protection. Whilst the primary option for cable protection will be burial, there are a number of protection measures that will be considered if burial is not possible. Further information regarding this mitigation will be included in the Project Description within the PEIR and subsequent ES.

Potential Impacts Scoped In

7.1.42 A range of potential impacts on marine physical processes have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. These have been developed based upon the definition of the Project at this scoping stage of the EIA (Section 3), embedded mitigation, the level of understanding of the baseline at this stage, the available Evidence Base for marine physical process effects, relevant policy and guidance (Section 2), the question-led approach and the professional judgement of qualified physical process specialists. The impacts that have been scoped into the Project's EIA are outlined in Table 7.1.2, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact. The EIA impact assessment will also draw upon the available Evidence Base, where appropriate e.g. analogous wind farm developments and environmental conditions.

7.1.43 Marine physical processes are typically best described as pathways in most cases, rather than receptors. Accordingly, although outputs from the marine physical processes assessments will be reported in a stand-alone ES chapter, for the most part they will not be accompanied by statements of 'effect significance'. Instead, the information on changes to the marine physical process pathways will be used to inform other EIA topic assessments, such as:

- Marine Sediment and Water Quality;
- Benthic Subtidal and Intertidal Ecology;
- Fish and Shellfish Ecology;
- Marine Mammals; and
- Commercial Fisheries.

7.1.44 The scoping of indirect impacts from the identified marine physical process pathways will be assessed within the relevant topics.

7.1.45 The physical process features that are considered as potential receptors will be guided by tidal excursions, as to be further quantified using project specific numerical modelling, and will include the following features:

- The adjacent coastline;
- Nearby offshore, designated, sub-tidal sandbanks and sandwave areas; and
- Nationally or internationally designated sites with interest features below MHWS (seabed / sedimentary / geological) interest features.

Table 7.1.2: Impacts proposed to be scoped into the assessment for marine physical processes

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Increases in SSC resulting in elevated turbidity and consequential changes to seabed levels.	Temporary elevations in SSC due to construction related activities (e.g. seabed preparation, foundation drilling, sandwave clearance, cable installation and landfall HDD activities). This could in turn result in changes to the seabed/ coastal bed levels, through deposition of the suspended material and changes to the surficial sediment type.	The assessment of potential changes to SSC and bed levels caused by construction activities will primarily be undertaken using numerical models. Results will be provided for a range of hydrodynamic conditions and sediment types, as experienced at the site. The RWC (in terms of plume extent, concentration and sediment deposition) will be assessed. Available baseline information and site-specific surveys alongside the Project Design Statement (PDS) will provide the data inputs for this assessment.
Potential impacts to seabed morphology (sandbanks, sandwave areas and notable bathymetric depressions).	Activities such as seabed preparation, sandwave levelling and cable trenching have the potential to directly disturb the seabed morphology.	The potential for disturbance to the seabed morphology will be assessed based on a consideration of sediment transport potential, the dimensions of any seabed features present and the available evidence base.
Modifications to littoral transport, coastal behaviour (erosion), including at landfall.	Where the offshore export cables make landfall, they must transition through the intertidal and coastal zones. The methods available for installing cables in such environments may physically disturb or disrupt the coastal morphology to differing degrees depending on the construction methods employed and any structures installed. At the	The short-term physical impact of export cable installation at the landfall will be assessed using available relevant coastal processes data (for example coastal monitoring reports). The assessment will consider outputs from sediment plume modelling in addition to observational evidence from other suitably analogous projects. The available baseline information and the planned site-specific surveys will provide the data inputs for this assessment.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	time of construction, any disturbance is likely to be localised to the landfall site.	
Operation and Maintenance		
Modifications to the wave and tidal regime, and associated potential impacts to morphological features.	The interaction between the planned infrastructure, for example the wind turbine and OSP foundations, cable protection or cable crossings, and the baseline metocean regime (waves; tides) may result in localised changes to tidal current speeds, wave energy and turbulence. These changes may, in turn, impact upon adjacent physical features, both offshore and along the coast. The effect of increased turbulence on sediment transport immediately adjacent to individual foundations may also cause scour (considered as a separate impact below). Further afield, but still within the extent of the array, the effect on tidal currents is evident as a series of discrete wake features extending downstream along the tidal axis from each foundation. The effect of a foundation on individual waves is typically not measurable in practice. However, the cumulative effect of numerous foundations is generally accepted to be a slight reduction in wave height that is not normally considered significant in EIA terms (e.g. RWE, 2021).	Persistent changes to wave and currents may have a net influence over time on patterns of sediment transport (rates and directions), with consequential impacts to seabed and coastal morphology. The sensitivity of these patterns to change will depend upon the: relative importance of currents and/or waves; magnitude and extent of any effect; nature of the seabed substrate; and degree to which the system is presently in balance (e.g. could a small change reverse the direction of net transport, or, is the present rate and direction of transport essential to the maintenance of a dynamic morphological feature). The importance of small changes to instantaneous wave and current parameters will be evaluated in the context of the wide range of natural temporal variations and longer-term trends. The wave assessment will also include consideration of the potential for the wind farm array to reduce wave energy in its lee that may in turn alter wave patterns, which may have an impact on long term coastal forcing conditions. Potential changes to the tidal (water levels and currents) and wave regimes caused by the presence of the wind farm

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
		structures will be assessed using a numerical modelling approach. Consideration will also be afforded to sufficiently analogous wind farm developments and metocean conditions, with consideration of the environmental setting and the foundation type, number and layout. Potential changes to the sediment transport regime will be primarily assessed on the nature and magnitude of any impacts on the tidal and wave regimes (which control the rates and patterns of sediment transport). Consideration will then be given to whether the nature or rate of sediment supply across the wider area might be otherwise affected by the Project.
Decommissioning		
Increases in SSC and changes to seabed levels.	Activities such as foundation and cable removal (if required) can cause increases in SSC as a result of seabed disturbance. The transport of the disturbed material and the eventual deposition could in turn result in variations in bed levels and changes to the sediment type.	Decommissioning activities are likely to result in a lesser rate of sediment disturbance than that already considered in relation to the construction phase. As such, it is expected that no further quantitative assessment of the actual (similar or lower) resulting levels of SSC or the fate of locally re-suspended sediments will be undertaken. This will be confirmed following finalisation of the PDS and in particular whether the decommissioning methodology provides a smaller impact than construction, for example in terms of suspended sediment rates and volumes.
Potential impacts to seabed morphology (sandbanks, sandwaves and pits).	Operations relating to the removal of infrastructure (if required) have the potential to directly disturb the local seabed morphology.	Once any infrastructure previously affecting physical processes is removed, there will be a subsequent adjustment towards equilibrium conditions. This may include changes to the regional

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Modifications to littoral transport, coastal behaviour (erosion) including at landfall.	Where the offshore export cables make landfall, they must transition through the intertidal and coastal zone. The methods identified for removing or decommissioning the cable and/or cable protection aspects may physically disturb the local morphology.	coastal morphology by local enhancement or interruption of a littoral sediment transport pathways. The potential for impacts relating to the decommissioning of cables and/or cable protection measures at the landfall will be assessed as described in relation to the construction and operation phases. This will include the consideration of observational evidence from analogous cable decommissioning activities and with reference to the metocean baseline understanding and the wider evidence base.
Cumulative		
Increases in SSC and changes to seabed levels.	Should installation (cable/ foundation) activities occur simultaneously alongside other marine seabed works, for example aggregate dredging (Section 7.12), there exists the potential for suspended sediment plumes to act cumulatively.	Sediment plume modelling will assess the potential dispersion of any suspended sediment plumes from Project installation activities alongside the tidal flow directions to ascertain the likelihood for SSC to act cumulatively with other marine industries. Due regard will be taken for the timing and location of the other seabed works, including for the aggregate industry the Area Involved publications.

Impacts Proposed to be Scoped Out

7.1.46 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for marine physical processes. These impacts are outlined in Table 7.1.3, together with a justification for scoping them out.

Table 7.1.3: Impacts proposed to be scoped out of the assessment for marine physical processes.

Impact	Justification for Scoping Out
Construction	
N/A	N/A
Operation and Maintenance	
Seabed scouring	The wind farm infrastructure has the potential to cause localised seabed scouring, resulting in bathymetric changes and localised alterations to sediment transport patterns. Given that the Applicant has proposed the use of scour protection where it is required, thus reducing the risk of scour, it is considered that that impact can be scoped out of the EIA assessment.
Cumulative modifications to the wave and tidal regime and associated potential impacts to the sediment transport regime.	Available assessments suggest that modifications to the wave and tidal regime remain within small distances from the foundations. Consequently, it is anticipated that there is no likelihood of local or regional changes in the sediment transport regime. Furthermore, the Project is located: (i) updrift from the North Norfolk Sandbanks and Saturn Reef SAC; and (ii) (ii) parallel to the Inner Dowsing, Race Bank and North Ridge SAC such that there is no sediment transport pathway connection with these designated sites. As such, it is considered that the cumulative impacts of the Project and other projects or activities within the Greater Wash/ Humber area can be scoped out of the EIA assessment.
Decommissioning	
N/A	N/A

Potential Transboundary Effects

7.1.47 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

7.1.48 No transboundary impacts on marine physical process pathways are anticipated to occur as a result of the Project activities during construction, O&M or decommissioning. Any predicted impacts on these pathways will largely be localised to within the study area and will therefore not give rise to effects on the marine environment beyond UK waters, therefore, Marine Processes transboundary effects are proposed to be scoped out.

Summary of Next Steps

7.1.49 The methodology provided above will be used to guide the marine physical processes EIA.

7.1.50 The study area for marine physical processes baseline within the EIA will be as currently outlined within this section but will be further refined using project specific detailed understanding of the physical processes within the wider area and potential for interactions between project activities and receptors based upon tidal excursions. The scope of the marine physical processes assessment is to characterise and understand the marine physical processes present within the project area, particularly with respect to the metocean regime and associated sediment transport pathways. These will be used to inform other topic specific assessments, for example Benthic Ecology.

7.1.51 Publicly available information and data sources provide an overview to the metocean, bathymetric and sedimentological characteristics for the study area. These will be used in conjunction with the data gathered from the site-specific surveys, namely metocean, geophysical and geotechnical campaigns, to allow for a robust characterisation of the baseline marine physical process environment. The EIA will be supported by a suite of numerical modelling activities, including hydrodynamic (wave and tidal) and sediment plume modelling.

7.1.52 The scenarios upon which the marine physical process assessments will be defined in accordance with the design envelope approach (Section 3). Key considerations in defining the MDS for the marine physical process assessments include the installation methodologies, development programmes, project structures and geographic footprint. Once defined, and alongside the definition of the baseline environment, the likely significant effects on physical process pathways and receptors will be described and assessed.

7.1.53 The physical process assessment will consider the magnitude and duration of the impact, the reversibility of the impact and the timing and frequency of the activity. An assessment of the potential impacts of the Project will be undertaken through application of the Evidence Base, alongside outputs from numerical modelling activities. The outputs from these assessments will be used to inform other EIA topic assessments, for example benthic and intertidal ecology. The significance of any changes will be evaluated against the likely naturally occurring variability in, or long-term changes to, the marine physical environment within the project lifetime due to natural cycles, for example storm events, and/ or climate change.

7.1.54 Consultation will be undertaken at pivotal points throughout the EIA process, for example during scoping and following PEIR, to ensure that the approach, including the application of the Evidence Base alongside numerical modelling, satisfies the requirements of both stakeholders and regulators.

Further Consideration for Consultees

7.1.55 The following bullet points provide specific scoping questions for the topic of marine physical processes:

- Do you agree that the data sources identified, including project specific surveys, are sufficient to inform the marine physical processes baseline for the PEIR and ES?

- Do you agree that all the pathways, receptors and potential impacts have been identified for marine physical processes?
- Do you agree that the impacts described in Table 7.1.3 can be scoped out for marine physical processes?
- For those impacts scoped in (Table 7.1.2), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on the marine physical process receptors?
- Do you have any specific requirements for the marine physical processes modelling methodology?

7.2 Marine Water and Sediment Quality

Introduction

7.2.1 This section of the Scoping Report identifies the Marine Water and Sediment Quality (MW&SQ) elements of relevance to the Project array area and offshore ECC AoS. It considers the potential effects from the construction, O&M and decommissioning of the Project, seaward of MHWS, both alone and cumulatively on MW&SQ and sets out the proposed scope of the EIA.

7.2.2 This section should be read alongside the following sections of this Scoping Report:

- Section 7.1: Marine Physical Processes.

Study Area

7.2.3 The MW&SQ study area for the Project, is defined as:

- Near-field:
  - The array area;
  - The offshore ECC study area; and
  - The proposed export cable landfall area;
- Far-field:
  - Coastal and seabed zones outside those previously defined areas, but in the vicinity of the array area and offshore ECC study area that may be influenced by changes to MW&SQ – informed through further analysis of the marine physical process pathways.

7.2.4 The MW&SQ study area is consistent with that presented in Section 7.1 (Marine Physical Processes) and may be further refined following detailed assessments of tidal excursions and specifically sediment transport pathways to allow a definition of the ZoI.

Baseline Environment

Overview of Available Data Sources

7.2.5 This initial understanding of the baseline (pre-development) environment has been informed through a high-level, desk-based review of publicly available literature and data sources, as presented in Table 7.2.1. A further and more detailed consideration of these information sources will be carried out during the EIA stage of works. The Project intends to undertake a series of site-specific survey campaigns to supplement existing information, as also presented in Table 7.2.1.

Table 7.2.1: Key sources of information for MW&SQ

Source	Summary	Spatial Coverage of Study Area
Anglian River Basin Management Plan (RBMP; and associated data). Source: www.gov.uk/government/publications/anglian-river-basin-district-river-basin-management-plan	The RBMP provides information on the current status, pressures, objectives and programme of measures of the water environment.	Partial coverage
Humber RBMP; and associated data. Source: www.gov.uk/government/publications/humber-river-basin-district-river-basin-management-plan	The RBMP provides information on the current status, pressures, objectives and programme of measures of the water environment.	Partial coverage
Environment Agency Catchment Data Explorer. Source: www.environment.data.gov.uk/catchment-planning	WFD water body classification reported by the Environment Agency, including overall status, ecological status/ potential and chemical status of surface water bodies, and overall status, quantitative status and chemical (groundwater) status for groundwater water bodies.	Partial coverage
Environment Agency Water Quality Archive. Source: www.environment.data.gov.uk/water-quality/view/landing	Data collected by the Environment Agency to quantify the chemical performance of the water environment.	Partial coverage
List of Shellfish Water Protected Areas in England. Source: www.gov.uk/government/publications/water-framework-directive-shellfish-protected-areas	List of Shellfish Water Protected Areas in England, designated by the Water Environment (WFD) (England and Wales) Regulations 2003, since revoked and replaced by the Water Environment (WFD) (England and Wales) Regulations 2017.	Partial coverage
Environment Agency Bathing Water classifications. Source: www.environment.data.gov.uk/bwq/profiles	Data collected by the Environment Agency to quantify the performance of the local bathing waters.	Partial coverage
Food Standards Agency shellfish classifications. Source: www.food.gov.uk/business-guidance/shellfish-classification	Data reported by the Food Standards Agency to classify the performance of the designated bivalve mollusc production areas.	Partial coverage
Environment Agency Nitrate Vulnerable Zones. Source: www.environment.data.gov.uk/farmers	Surface and ground waters designated as being at risk from agricultural nitrate pollution.	Partial coverage

Source	Summary	Spatial Coverage of Study Area
Urban Waste Water Treatment Directive (UWWTD) Sensitive Areas Map – Yorkshire. Source: www.assets.publishing.service.gov.uk/ government/uploads/system/uploads/ attachment_data/file/796768/sensitive-areas-map-yorkshire.pdf	River stretches and bodies of water, including bathing waters and shellfish waters, identified as sensitive areas under the UWWTD.	Partial coverage
UWWTD Sensitive Areas Map – Lincolnshire and Northamptonshire. Source: www.assets.publishing.service.gov.uk/ government/uploads/system/uploads/attachment_data/ file/797779/sensitive-areas-map-lincoln-northamptonshire.pdf	River stretches and bodies of water, including bathing waters and shellfish waters, identified as sensitive areas under the UWWTD.	Partial coverage
Centre for Environment, Fisheries and Aquaculture Science (Cefas) SPM data (Cefas, 2016).	Annual average of non-algal SPM data available from Cefas. These data are based on the satellite derived Ifremer OC5 algorithm (Gohin *et al*., 2011).	Full coverage
OSPAR Intermediate Assessment 2017 (OSPAR, 2017)	This assessment provides OSPAR's understanding of the marine environment's current status.	Full coverage
Westermost Rough Wind Farm Environmental Statement (DONG Energy, 2009)	Characterisation and monitoring data for the Westermost Rough OWF site (e.g., particle size analysis (hereafter PSA); contaminant analysis).	Partial coverage
Hornsea Project One OWF Environmental Statement (Smart Wind Limited, 2013)	Characterisation and monitoring data for the Hornsea Project One OWF (e.g., PSA; contaminant analysis).	Partial coverage
Hornsea Project Two OWF Environmental Statement (Smart Wind Limited, 2015)	Characterisation and monitoring data for the Hornsea Project Two OWF (e.g., PSA; contaminant analysis).	Partial coverage
Hornsea Project Three OWF Environmental Statement (Orsted, 2018)	Characterisation and monitoring data for the Hornsea Project Three OWF (e.g., PSA; contaminant analysis).	Partial coverage

Source	Summary	Spatial Coverage of Study Area
Hornsea Project Four OWF Environmental Statement (Orsted, 2021)	Characterisation and monitoring data for the Hornsea Project Four OWF (e.g., PSA; contaminant analysis).	Partial coverage
Triton Knoll Wind Farm Environmental Statement (RPS Group Plc, 2009)	Characterisation and monitoring data for the Triton Knoll OWF (e.g., PSA).	Partial coverage
Lynn OWF Environmental Statement (Amec, 2002)	Characterisation and monitoring data for the Lynn OWF (e.g., PSA; contaminant analysis).	Partial coverage
Lincs OWF Environmental Statement (Centrica, 2007)	Characterisation and monitoring data for the Lincs OWF (e.g., PSA; contaminant analysis).	Partial coverage
Inner Dowsing OWF Environmental Statement (Offshore Wind Power Ltd., 2002)	Characterisation and monitoring data for the Inner Dowsing OWF (e.g. PSA; contaminant analysis)	Partial coverage
Dudgeon OWF Environmental Statement (Dudgeon OWF Ltd, 2009)	Characterisation and monitoring data for the Dudgeon OWF (e.g., PSA; contaminant analysis).	Partial coverage
Sheringham Shoal OWF Environmental Statement (Scira Offshore Energy Ltd, 2006)	Characterisation and monitoring data for the Sheringham Shoal OWF (e.g., PSA; contaminant analysis).	Partial coverage
Dudgeon and Sheringham Shoal OWF Extensions PEIR (Equinor, 2021)	Characterisation and monitoring data for the Dudgeon and Sheringham Shoal Extensions (e.g., PSA; contaminant analysis).	Partial coverage
Marine Aggregate Regional Environmental Assessment (MAREA) of the Humber and Outer Wash Region (Humber Aggregate Dredging Association (HADA), 2012)	Characterisation of marine aggregates dredging areas in the Humber and Outer Wash area (e.g., PSA and contaminant analysis).	Partial coverage
Project-specific benthic surveys (2022)	Sediment sampling and contaminant analysis to be undertaken, covering the offshore ECC and array areas (up to 60 sampling stations). Laboratory analysis to include PSA, total organic content, trace metals, organotins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and organochlorine pesticides (OCPs; DDT and dieldrin).	Full coverage

Overview of Baseline Environment

7.2.6 This initial understanding of the baseline environment has been informed through a high-level, desk-based review of publicly-available literature and data sources. It has informed the identification of potential impacts on the identified receptors and potential sensitivities within the study area and should be read in conjunction with Section 7.1 (Marine Physical Processes). A further and more detailed consideration of the information sources presented in Table 7.2.1 will be carried out during the EIA stage of works. Regional context is provided where appropriate and dependent upon the MW&SQ attribute discussed. This baseline understanding, as presented below, will also be further developed following completion of project-specific surveys and updated in following phases of the EIA process.

Water Quality

Physical Characteristics

7.2.7 The southern North Sea is characterised by a high degree of spatial and temporal (both annual and inter-annual) variability in SSC. In general, there exists an inshore to offshore gradient in SSC, with the highest concentrations observed close to, and especially at the mouths of, large estuaries such as The Wash and the Humber (Cefas, 2016).

7.2.8 As described and illustrated in Section 7.1 and Figure 7.1.4 (Marine Physical Processes), low surface concentrations of up to 5 mg/l were recorded within the array area during the period 1998 to 2015 (Cefas, 2016). Higher values will occur during spring tides and storm conditions, with the greatest concentrations encountered close to the bed. Within the offshore ECC study area, surface SPM concentrations reach 40 mg/l (Cefas, 2016). Surface SPM levels within the nearshore zone of the offshore ECC AoS are directly under the influence of terrestrial sources from the Humber Estuary and Holderness Cliffs, such that concentrations reach 60 mg/l (Cefas, 2016).

7.2.9 A summary of dissolved oxygen (saturation and concentration), water temperature, salinity and turbidity data collected by the Environment Agency from coastal monitoring points within the study area is provided in Table 7.2.2. This includes the mean ($\bar{x}$), range (min – max) and number of samples reported (n) at the monitoring point between 2017 and 2021. Dissolved oxygen levels and salinity are typically high (to be expected of such offshore waters), with water temperatures and turbidity fluctuating between seasons.

Table 7.2.2: Summary of Environment Agency monitoring data (2017 to 2021) in coastal areas of the offshore ECC study area

Parameter	Units	Environment Agency Monitoring Point			
		North Sea At 500 M Downtide, Aldborough	Lincs Coast Outer Dogs Head 4.5 km O/S	Lincs Coast Chapel-St-Leonard 3.0 km O/S [1]	Lincs Coast Haile Sand Flat
Dissolved oxygen (saturation)	%	$\bar{x}$ = 98.6 (93.7 – 102.4; *n* = 14)	$\bar{x}$ = 100.8 (90.8 – 157.8; *n* = 49)	$\bar{x}$ = 97.2 (85.7 – 117; *n* = 48)	$\bar{x}$ = 101.5 (92.9 – 136.6; *n* = 49)
Dissolved oxygen (as O_2)	mg/l	$\bar{x}$ = 9.0 (7.75 – 10.3; *n* = 14)	$\bar{x}$ = 9.1 (7.08 – 13.1; *n* = 49)	$\bar{x}$ = 8.8 (6.49 – 11; *n* = 48)	$\bar{x}$ = 9.32 (7.74 – 11.1; *n* = 49)
Temperature of water	°C	$\bar{x}$ = 10.2 (5.6 – 16.9; *n* = 14)	$\bar{x}$ = 11.1 (2.7 – 20.0; *n* = 49)	$\bar{x}$ = 11.2 (2.6 – 21.0; *n* = 48)	$\bar{x}$ = 10.8 (2.4 – 19.2; *n* = 49)
Salinity (in situ)	ppt	$\bar{x}$ = 34.3 (33.86 – 34.46; *n* = 14)	$\bar{x}$ = 33.3 (30.2 – 34.4; *n* = 49)	$\bar{x}$ = 32.6 (29.0 – 34.2; *n* = 49)	$\bar{x}$ = 31.0 (23.26 – 33.6; *n* = 49)
Turbidity (in situ)	ftu	$\bar{x}$ = 38.5 (5.1 – 87.3; *n* = 9)	$\bar{x}$ = 16.3 (1.3 – 51.6; *n* = 49)	$\bar{x}$ = 78.0 (1.6 – 262.2; *n* = 48)	$\bar{x}$ = 31.7 (2.6 – 98.5; *n* = 49)

[1] Lincs Coast Chapel-St-Leonard 3.0 km O/S is located at the southwards boundary of the offshore ECC AoS (Figure 7.2.1).

Water Framework Directive (WFD)

7.2.10 The WFD (2000/60/EC), which came into force on 22 December 2000, establishes a framework approach to the protection, improvement, management and sustainable use of Europe's rivers, lakes, estuaries, coastal waters and groundwater. The Directive applies to all surface waters, out to one nautical mile seaward of the baseline for territorial waters, and to groundwaters. For management purposes, surface and ground waters are divided into a number of discrete units termed 'water bodies'. The overall objective of the WFD is to achieve good status in all inland, transitional, coastal and ground water bodies by 2015 (now working towards revised objectives for 2021), unless alternative objectives are set and there are appropriate grounds for time limited derogation.

7.2.11 The WFD is implemented in England and Wales through the Water Environment (WFD, England and Wales) Regulations 2017 (commonly termed the Water Framework Regulations), noting these were modified by the Floods and Water (Amendment, etc.) (EU Exit) Regulations 2019 on 31 January 2020. Under the Regulations, the Environment Agency is the Competent Authority for implementation of the WFD in England. Programmes of measures have been developed through a process of RBMP and are set out in regionally based RBMPs. These were first published in 2009 (Cycle 1), and subsequently updated in early 2016 (Cycle 2). The MW&SQ study area is located within the Anglian and Humber River Basin Districts which is reported in the Anglian RBMP (EA, 2016a) and Humber RBMP (EA, 2016b).

7.2.12 A consideration of WFD requirements is necessary for activities and developments which have the potential to cause deterioration in ecological, quantitative and/ or chemical status of a water body, or to compromise improvements which might otherwise lead to a water body meeting its WFD objectives. Therefore, it will be necessary to consider the potential for works associated with the Proposed Development to impact nearby WFD water bodies).

7.2.13 The MW&SQ study area overlaps the Lincolnshire coastal water body (ID: GB640402492000 This coastal water body, which is heavily modified, is currently (2019 interim classifications) at moderate overall status, based on moderate ecological potential and failing chemical status. A summary of current water body status (overall, ecological and chemical) and parameters currently failing to achieve good status is provided in Table 7.2.3.

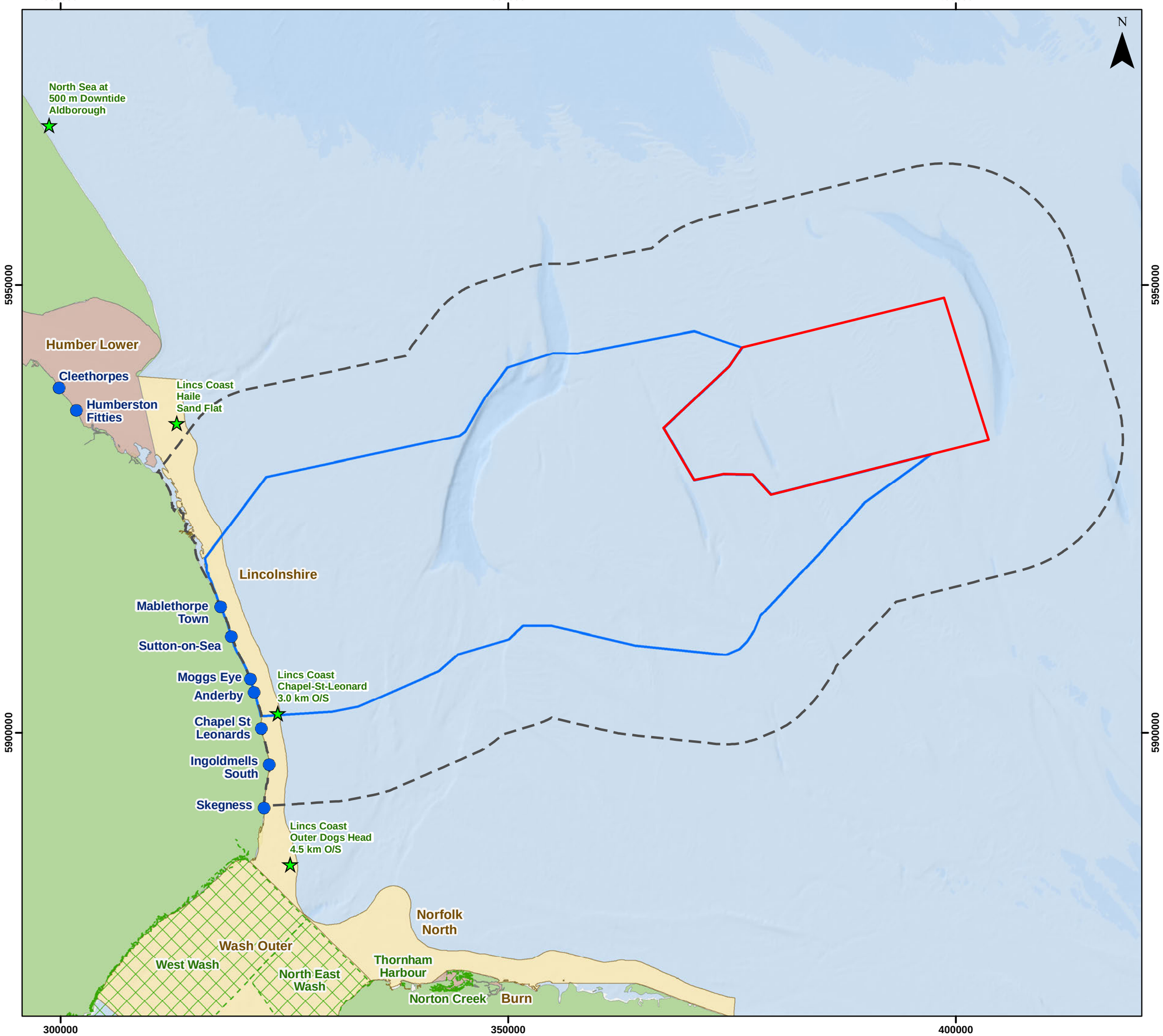
7.2.14 Article 4.9 of the WFD notes that compliance with other community environmental legislation must be ensured, with WFD Protected Areas identified under the following Directives (described further below):

- Bathing Water Directive;
- Shellfish Waters Directive;
- Nitrates Directive; and
- UWWTD.

Table 7.2.3: Summary of WFD water bodies within the offshore ECC study area

Parameter	Lincolnshire
Water Body ID	GB640402492000
Water Body Type	Coastal
Water Body Area (Surface)	170 km^2
Hydromorphological Designation (Reasons)	Heavily modified (Flood protection)
Protected Area Designations	Habitats Directive; Birds Directive; Bathing Water Directive; Shellfish Water Directive
Overall Status (2019)	Moderate
Ecological Potential (2019)	Moderate
Chemical Status (2019)	Fail
Parameters not at Good Status/ Potential	Angiosperms; Phytoplankton; Dissolved inorganic nitrogen; Mitigation measures assessment; Benzo(g-h-i) perylene; Mercury and its compounds; Polybrominated diphenyl ethers (PBDE)
Higher Sensitivity Habitats	Chalk reef (35.6 km^2); Saltmarsh (5.6 km^2)[1]
Lower Sensitivity Habitats	Cobbles, gravel and shingle (7.0 km^2); Intertidal soft sediment (7.5 km^2); Subtidal soft sediments (136 km^2)
Phytoplankton Status (2019)	Moderate
History of Harmful Algae	Not monitored

[1] Shows total size of habitats within a waterbody

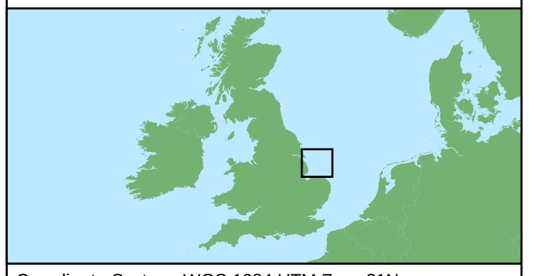


Legend

- Site Boundary
- Offshore ECC Area of Search
- Study Area
- Bathing Water Sites
- Monitoring Stations / Points
- Shellfish Waters

Waterbodies

- Coastal
- Transitional



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:400,000

Designated Waterbody Sites

Figure 7.2.1

OUTER DOWSING OFFSHORE WIND

Date: 24/06/2022
Produced By: BPHB
Revision: 0.1

GoBe

Bathing Water Directive

7.2.15 The 'revised' Bathing Water Directive (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the 'original' Bathing Water Directive (76/160/EEC) and the process used to measure/ monitor water quality at identified bathing waters. The revised Bathing Water Directive focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the original Bathing Water Directive. Bathing waters under the revised Bathing Water Directive are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (intestinal enterococci and *Escherichia coli*) in samples obtained during the bathing season (from 15 May to 30 September).

7.2.16 The original Bathing Water Directive was repealed at the end of 2014 and monitoring of bathing water quality has been reported against revised Bathing Water Directive indicators since 2015, as transposed under the Bathing Water Regulations 2013. The new classification system considers all samples obtained during the previous four years and, therefore, data has been collected for revised Bathing Water Directive indicators since 2012.

7.2.17 During the 2019 bathing season (note, bathing waters were not sampled during the 2020 bathing season due to the COVID-19 pandemic and safety concerns for Environment Agency officers), there were 420 identified and monitored bathing waters in England, 105 in Wales, 85 in Scotland and 26 in Northern Ireland; thus, a total of 636 bathing waters across the UK. Nearly all bathing waters in England (98.3%) met the new minimum standards required by the revised Bathing Waters Directive and 71.4% met the very highest Excellent standard; compared to 63.6% in 2015.

7.2.18 Of those designated bathing waters within the MW&SQ study area, four are located within the corridor (Figure 7.2.1). Water quality classifications for these designated bathing waters, covering the period 2016 to 2019, are provided in Table 7.2.4Table 7.2.4: Designated bathing water classifications of relevance to the MW&SQ study area.

Table 7.2.4: Designated bathing water classifications of relevance to the MW&SQ study area

Bathing Water	Classification			
	2016	2017	2018	2019
Skegness	Excellent	Excellent	Excellent	Excellent
Ingoldmells South	Excellent	Excellent	Excellent	Excellent
Chapel St Leonards	Excellent	Excellent	Excellent	Excellent
Anderby[1]	Excellent	Excellent	Excellent	Excellent
Moggs Eye[1]	Excellent	Excellent	Excellent	Excellent
Sutton-on-Sea[1]	Excellent	Excellent	Excellent	Excellent
Mablethorpe Town[1]	Excellent	Excellent	Excellent	Excellent
Humberston Fitties	Excellent	Excellent	Excellent	Good
Cleethorpes	Good	Good	Excellent	Excellent

[1] Bathing Water located within the offshore ECC AoS Shellfish Waters Directive

7.2.19 The Shellfish Waters Directive (2006/113/EC) was repealed in December 2013 and subsumed within the WFD. However, the Shellfish Water Protected Areas (England and Wales) Directions 2016 require the Environment Agency (in England) to endeavour to observe a microbial standard in all 'Shellfish Water Protected Areas'. The microbial standard is 300 or fewer colony forming units of *E. coli* per 100 ml of shellfish flesh and intravalvular liquid. The Directions also requires the EA, in England, to assess compliance against this standard to monitor microbial pollution (75% of samples taken within any period of 12 months must be below the microbial standard, and sampling/ analysis must be in accordance with the Directions).

7.2.20 There are no Shellfish Water Protected Areas located within the study area; however, there are several Shellfish Water Protected Areas within The Wash (Table 7.2.4), the nearest being West Wash approximately 13 km to the south of the offshore ECC AoS (Department for Environment, Food and Rural Affairs (Defra), 2016).

Nitrates Directive

7.2.21 The Nitrates Directive (91/676/EEC) aims to reduce water pollution from agricultural sources and to prevent such pollution occurring in the future (nitrogen is one of the nutrients that can affect plant growth). Under the Nitrates Directive, surface waters are identified if too much nitrogen has caused a change in plant growth which affects existing plants and animals and the use of the water body.

7.2.22 The Lincolnshire coastal water body is not designated under the Nitrates Directive; however, large areas of the Lincolnshire coast are designated as surface water Nitrate Vulnerable Zones (NVZ).

Urban Waste Water Treatment Directive (UWWTD)

7.2.23 The UWWTD (91/271/EEC) aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. The Directive sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. In general, the Directive requires that collected waste water is treated to at least secondary treatment standards for significant discharges. Secondary treatment is a biological treatment process where bacteria are used to break down the biodegradable matter (already much reduced by primary treatment) in waste water. Sensitive areas under the UWWTD are water bodies affected by eutrophication of elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

7.2.24 The Woldgrift Drain Eutrophic Sensitive Area and Mablethorpe Town ((a Bathing Water Sensitive Area) are both located within the MW&SQ study area.

Sediment Quality

7.2.25 Sediment type is an important factor when considering the potential presence of contaminants within sediments. Sediments with a finer particle size, such as clays and muds (<63 µm), can act as adsorption surfaces for contaminants that may be released into the water column if the sediment is disturbed (Cefas, 2001). Sediments with larger particle sizes (e.g., sands and gravel; >63 µm) are not typically associated with anthropogenic contaminants.

7.2.26 Hydrocarbons in particular are closely linked to the spatial distribution of sediment types, decreasing from the northern to the southern North Sea, where coarser sediments are more prevalent. The concentrations of metals in sediments are generally higher in the coastal zone and within estuaries, decreasing offshore, indicating that river input and run-off from land are significant sources. As noted in Section 7.1 (Marine Physical Processes), the sediments within the array area have been characterised as typically sandy and gravelly sands and as such would not be expected to contain elevated concentrations of anthropogenic contaminants. Closer to shore, for example within estuarine mudflats and within bathymetric deeps, such as Inner Silver Pit, mud content of sediments increases and, as such, it could be expected that contamination levels may be higher.

7.2.27 There are no formal quantitative Environmental Quality Standards (EQS) for the concentration of contaminants in sediments, although the WFD has introduced optional standards for a small number of priority (hazardous) substances. Cefas has prepared a series of Guideline Action Levels to assist in the assessment of dredged material (and its suitability for disposal to sea). In general, contaminant levels in material below Cefas Guideline Action Level 1 (AL1) are of no concern and are unlikely to influence the licensing decision. However, material with contaminant levels above Cefas Guideline Action Level 2 (AL2) is generally considered unsuitable for disposal at sea. Material with contaminant levels between AL1 and AL2 may require further consideration before a decision can be made. The Cefas Guideline Action Levels provide a useful context for sediment quality and potential for effects due to seabed disturbance from proposed activities within the study area.

7.2.28 ECCs for the Hornsea Project One, Hornsea Project Two, Hornsea Project Three and Hornsea Project Four Offshore Wind Farms provide context for the MW&SQ study area. For each project, the respective Environmental Statements (Smart Wind Limited, 2013; 2015; Orsted, 2018; 2021) provide details of sediment contamination, with a general trend of increasing trace metal concentrations towards the coastal/ intertidal area. Concentrations of arsenic exceeded AL1 at numerous sample locations, with the Humber Estuary assumed to be a significant source to the North Sea (Whalley *et al*., 1999). Organotin and OCP concentrations were typically below limits of detection, while PAHs were low but relatively elevated in the inshore regions.

7.2.29 Comprehensive grab surveys were undertaken to sample and analyse sediment type across the Triton Knoll OWF array area, located immediately to the southwest of the Project array area. Results of PSA highlighted the predominantly coarse nature of sediments in the wider area (gravel and sand). A desk study identified that contaminant concentrations were unlikely to be elevated within the Triton Knoll OWF array area, hence no sampling for contaminants was undertaken (RPS Group Plc, 2009).

7.2.30 As part of the Triton Knoll benthic subtidal ecology characterisation, two sediment samples collected within the ECC were analysed for trace metals and PAHs. These samples are located within the offshore ECC AoS for the Project. Trace metal concentrations were consistently below AL1 for all metals except cadmium, which exceeded AL1 but remained well below AL2. At both sample locations, 100 µg/ kg was exceeded for both phenanthrene and fluoranthene, and at one sample site for naphthalene and pyrene, although this was not found to be at a level considered to be of concern to the marine environment during cable trenching and laying operations (RPS Group Plc., 2009).

7.2.31 Sediment samples collected in July and October 2019 from an Environment Agency monitoring point ('Lincolnshire WFD Generic Benthic Invertebrates') within the offshore ECC AoS were analysed for trace metals and PCBs. Arsenic and mercury concentrations were above AL1 in five out of the six samples collected, but each were below AL2. All other trace metal concentrations were well below AL1, or limits of detection. The sum of ICES 7 PCB congeners were below AL1 in all but one sample, which marginally exceeded AL1.

7.2.32 Sediment analysis was undertaken in the area of the Lynn & Inner Dowsing Offshore Wind Farms array areas and cable routes, which overlap with the MW&SQ study area. No trace metals exceeded AL2, although lead and chromium marginally exceeded AL1 (Amec, 2002; Offshore Wind Power Ltd., 2002).

7.2.33 To support the Lincs OWF Environmental Statement, sediment analysis was undertaken within that project's array area and ECC, which overlap with the MW&SQ study area. Trace metal concentrations were mostly below AL1, and all below AL2.

Proposed Approach to the Environmental Impact Assessment

7.2.34 This section outlines the proposed approach to the Project EIA, including relevant guidance, embedded mitigation measures and those impacts which have been scoped into the assessment.

Proposed Assessment Methodology

7.2.35 The EIA will follow the general approach outlined in Section 5 (EIA Methodology) of this Scoping Report. In addition to the general approach and guidance outlined in Section 5 (EIA Methodology), the assessment of MW&SQ will also comply with the following guidance documents where they are specific to this topic:

- WFD assessment: estuarine and coastal waters – commonly referred to as 'Clearing the Waters for All' (EA, 2016c);
- Advice Note Eighteen: The WFD (The Inspectorate, 2017);
- Coastal Process Modelling for OWF Environmental Impact Assessment: Best Practice Guidance (Collaborative Offshore Wind Energy Research into the Environment (COWRIE), 2009);
- Department of Business Enterprise and Regulatory Reform (BERR) - Review of Cabling Techniques and Environmental Effects Applicable to the OWF Industry (BERR, 2008);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Cefas, 2011);
- Environmental impact assessment for offshore renewable energy projects (British Standards Institution (BSI), 2015); and
- OSPAR Assessment of the Environmental Impacts of Cables (OSPAR, 2009).

7.2.36 A more detailed literature review will be developed for the PEIR/ ES, building upon the high-level outline provided within this Scoping Report. Project-specific survey outputs will be used to enhance the understanding of the baseline conditions.

WFD Compliance Assessment

7.2.37 A WFD compliance assessment for the Project will be provided as a standalone document to accompany the PEIR, and the subsequent ES and final DCO application. This assessment will be prepared in accordance with the 'WFD assessment: estuarine and coastal waters' guidance (EA, 2016c). The purpose of the WFD compliance assessment will be to demonstrate that the proposed activities associated with the Project will not result in the deterioration of relevant water bodies and will not jeopardise potential future objectives under the WFD (i.e., the achievement of overall good status through good ecological and chemical status/ potential). The WFD assessment will be informed by relevant topic specific assessments in the PEIR and ES.

Relevant Embedded Mitigation Measures

7.2.38 The Applicant is currently considering the implementation of the following embedded mitigation measures within the Project Design which will be of relevance to MW&SQ:

- A Project Environment Management Plan (PEMP) will be produced post-consent and implemented to cover the construction and O&M phases of the Project. The PEMP will include a Marine Pollution Contingency Plan (MPCP) to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. MMO, Maritime and Coastguard Agency (MCA) and the project site co-ordinator).

- A Construction Method Statement (CMS) which will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures.
- Scour protection – the timely installation of scour protection would provide embedded mitigation to any seabed sediments that would otherwise be disturbed by scouring. Scour protection may take the form of:
    - Rock/ gravel placement;
    - Concrete mattresses;
    - Flow energy dissipation devices;
    - Protective aprons or coverings;
    - Ecological based solutions; and
    - Bagged solutions.
- Cable protection – whilst the primary option for cable protection will be burial, there are a number of protection measures that will be considered if burial is not possible. Further information regarding this mitigation will be included in the Project Description within the PEIR/ ES.

7.2.39 The requirement and feasibility of any mitigation measures will be subject to consultation with relevant statutory consultees throughout the EIA process.

Potential Impacts Scoped In

7.2.40 A range of potential impacts on MW&SQ have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. These have been developed based upon the definition of the Project at this scoping stage of the EIA (Section 3), embedded mitigation, the level of understanding of the baseline at this stage, available evidence base for MW&SQ effects, relevant policy and guidance and professional judgement of qualified specialists. The impacts that have been scoped into the EIA are outlined in Table 7.2.5 together with a description of any proposed additional data collection (e.g., site-specific surveys) and/ or supporting analyses (e.g., modelling) to enable an assessment of the impact. The EIA will also draw upon the available evidence base, where appropriate (e.g. analogous wind farm developments and environmental conditions).

7.2.41 MW&SQ is a receptor in its own right, but also an impact pathway of relevance to other receptors. Accordingly, outputs from the MW&SQ assessments will be reported in a stand-alone PEIR and ES chapters, with information on potential changes to the MW&SQ pathways used to inform other EIA topic assessments, such as:

- Benthic Ecology and Intertidal Ecology (Section 7.3);
- Fish and Shellfish Ecology (Section 7.4);
- Marine Mammals (Section 7.5); and
- Commercial Fisheries (Section 7.8).

7.2.42 The scoping of indirect impacts from the identified MW&SQ pathways will be assessed within the relevant topics.

Table 7.2.5: Impacts proposed to be scoped into the assessment for MW&SQ

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (e.g., Modelling)
Construction		
Deterioration in water quality due to suspension of sediments	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on marine water quality. This can be a result of temporary increase in SSC as the associated effects (reduction in water clarity and increases in nutrient concentrations).	A characterisation of the baseline will be provided, including details of the presence and extent of sediment types using existing and new site-specific survey data for both the array and the final offshore ECC. The sensitivity of the environment to the impact will be determined through available literature, designations and expert judgement. The magnitude of the impact will be informed by the marine physical processes assessment, including numerical modelling of the predicted sediment plume concentrations and longevity. Further details regarding the proposed approach to quantifying SSC is provided in Section 7.1 (Marine Physical Processes).
Release of sediment-bound contaminants from disturbed sediments	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on marine water quality. This can be a result of temporary re-suspension of contaminants within the seabed sediments.	The presence and extent of sediment-bound contaminants will be described using existing and new site-specific survey data for both the array area and the offshore ECC. The sensitivity of the environment to the impact will be determined through available literature, designations and expert judgement. The magnitude of the impact will be informed by the Marine Physical Processes assessment (Section 7.1), including the numerical modelling of the predicted sediment plume concentrations and longevity.
Deterioration in water clarity due to the release of drilling mud	The principal issue for MW&SQ receptors relating to bentonite release to the water column is the potential for an increase in SSC (and so turbidity) within the water column and potential reduction in bacterial mortality.	The assessment will present the maximum volume (and rate) in which inert drilling mud may be released into the environment. The determination of the sensitivity of receptors will utilise the same approach as has been outlined for the impact 'Deterioration in water quality due to suspension of sediments'.

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (e.g., Modelling)
Operation and Maintenance		
Deterioration in water quality due to suspension of sediments from O&M activities	Sediment disturbance arising from O&M activities, such as cable reburial and cable repair, may result in adverse effects on marine water quality (including release of sediment-bound contaminants, reduction in clarity and increases in nutrient concentrations).	The same approach will be adopted as impact 'Deterioration in water quality due to suspension of sediments' and 'Release of sediment-bound contaminants from disturbed sediments' during construction activities.
Decommissioning		
Deterioration in water quality due to re-suspension of sediments	Similar to during construction activities, decommissioning could result in temporary increases in suspended SSC and the associated effects (including release of sediment bound contaminants, reduction in clarity and increases in nutrient concentrations).	The same approach will be adopted as impact 'Deterioration in water quality due to suspension of sediments' and 'Release of sediment-bound contaminants from disturbed sediments' during construction activities.
Cumulative		
N/A		

Impacts Proposed to be Scoped Out

7.2.43 Based on the baseline environment information currently available and the project description outlined in Section 3 (Project Description), a number of impacts are proposed to be scoped out of the EIA for MW&SQ. These impacts are outlined in Table 7.2.6, together with a justification for scoping them out.

Table 7.2.6: Impacts proposed to be scoped out of assessment for MW&SQ

Impact	Justification for Scoping Out
Construction	
Accidental releases or spills of materials or chemicals	During construction activities, accidental spills or releases could occur without appropriate mitigation in place. However, the likelihood and potential impact of an incident will be substantially reduced by the implementation of a PEMP, with associated MPCP. Based on embedded mitigation within the design, it is proposed, subject to consultation with stakeholders and feedback received on this Scoping Report, that this impact is scoped out from further consideration within the EIA.
Operation and Maintenance	
Deterioration in water quality due to re-suspension of sediments and contaminants resulting from scour	There is the potential that sediment could be re-suspended as a result of scour around project infrastructure (including WTGs and cable protection). Given that the volume of suspended sediment released during operation via scour will be much lower than during construction, it is proposed that this impact will be scoped out from further consideration within the EIA. Furthermore, the effect will be highly localised and associated volumes of mobilised sediment (and associated contaminants) are considered to be within the range of natural variability. Therefore, subject to stakeholder consultation and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
Accidental releases or spills of materials or chemicals	The same justification as impact 'Accidental releases or spills of materials or chemicals' during construction activities.
Decommissioning	
Accidental releases or spills of materials or chemicals	The same justification as impact 'Accidental releases or spills of materials or chemicals' during construction activities.
Cumulative	
Release of sediment-bound contaminants from disturbed sediments in water quality due to cumulative effects with other projects and plans	The potential effects of the Project on MW&SQ will be highly localised and small scale, and it is considered unlikely that cumulative impacts will occur. As such, no cumulative impacts are anticipated with other OWFs or other activities in the region. In accordance with the approach agreed for previous projects, such as East Anglia THREE and Norfolk Vanguard, it is proposed, subject to consultation with stakeholders and feedback received on this Scoping Report, that this cumulative impact is scoped out from further consideration within the EIA.

Impact	Justification for Scoping Out
Accidental releases or spills of materials or chemicals	The same justification as impact 'Accidental releases or spills of materials or chemicals' during construction activities.

Potential Transboundary Effects

7.2.44 A description of how the potential transboundary effects will be assessed is provided in Section 5. The limits of the closest EEZ are the Dutch and Belgian boundaries located at, approximately, 95 km (east) and 196 km (southeast) from the array area and ECC study area, respectively.

7.2.45 Due to the localised nature of any potential impacts (e.g., suspended sediment plumes), transboundary impacts will not occur and therefore it is suggested that transboundary impacts will be scoped out from further consideration within the EIA for MW&SQ.

Summary of Next Steps

7.2.46 The methodology provided above will be used to guide the MW&SQ EIA.

7.2.47 The study area for the MW&SQ baseline within the EIA will be as currently outlined within this section. The scope of the MW&SQ assessment is to characterise and understand MW&SQ within the study area, particularly with respect to the contaminant pathways and water quality designations (e.g., bathing waters). These will be used to inform other topic specific assessments, such as Benthic Ecology.

7.2.48 The scenarios upon which the MW&SQ will be assessed will be defined in accordance with the design envelope approach (Section 3). The proposed approach to the assessment for the MW&SQ PEIR and ES chapters will first include the definition of the MDS on which the assessments will be based. The assessment will be informed by the Marine Physical Processes assessment (Section 7.1), and in particular the assessment of changes in SSC and bed deposition supported by numerical modelling studies.

7.2.49 Additional site-specific geophysical surveys, sediment sampling and sediment analysis are planned to help fill data gaps that currently exist across the MW&SQ study area. Surveys will identify the potential areas of sediment contamination and quantify contamination levels within the study area.

Further Consideration for Consultees

7.2.50 The following bullet points provide specific scoping questions for the topic of MW&SQ:

- Do you agree that the data sources identified, including project specific surveys (see Project-specific benthic surveys (2022) in Table 7.2.1), are sufficient to inform the offshore and intertidal MW&SQ baseline for the PEIR and ES?
- Are you aware of any point sources of contaminants within the study area which may be of concern? If so, are any data available for these?
- Have all potential impacts resulting from the Project been identified for marine water quality receptors?

- Have all potential impacts resulting from the Project been identified for marine sediment quality receptors?
- Do you agree that the most appropriate guidance for the WFD compliance assessment is the EA's 'WFD assessment: estuarine and coastal waters' (Clearing the Waters for All) and the Inspectorate Advice Note 18?
- Do you agree that the impacts described in Table 7.2.6 can be scoped out?
- For those impacts scoped in (see Table 7.2.5), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on MW&SQ pathways and receptors?

7.3 Benthic Subtidal and Intertidal Ecology

Introduction

7.3.1 This section of the Scoping Report identifies the benthic subtidal and intertidal ecology elements of relevance to the Project array area and offshore ECC AoS. This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on benthic subtidal and intertidal ecology within the study area and sets out the proposed scope of the EIA.

7.3.2 This section considers the potential effects on benthic habitats and species within the defined study area up to Mean High Water Spring (MHWS) mark. Habitats landward of the MHWS are considered in Section 8.3.

7.3.3 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.1: Marine and Physical Processes; and,
- Section 7.4: Fish and Shellfish.

Study Area

7.3.4 For the purposes of this scoping exercise the benthic subtidal and intertidal ecology study area is presented in Figure 7.3.1 and comprises the area within which the Project may install offshore infrastructure (i.e., the offshore area's array area and the offshore ECC AoS) and a wider area considering the maximum ZoI associated with secondary impacts.

7.3.5 The ZoI buffer, therefore, encompasses the area over which suspended sediments may travel following disturbance as a result of the Project activities; for the purposes of scoping, this has assumed a precautionary buffer that extends 15 km around the array area and 10 km around the offshore ECC AoS boundary. The buffer has been identified based on experience from other projects in the wider region and expert judgement as a reasonable distance within which indirect effects (for example, resulting from increased SSC and deposition). The study area will be refined as required post-scoping to take account of site-specific sediment plume modelling work that will be undertaken as part of the marine physical processes assessment, consultation with key stakeholders and particularly through the EPP, as well as to reflect refinements in the project design. An adaptive and refined study area for PEIR and ES will be defined based on project-specific physical processes modelling carried out at the EIA stage.

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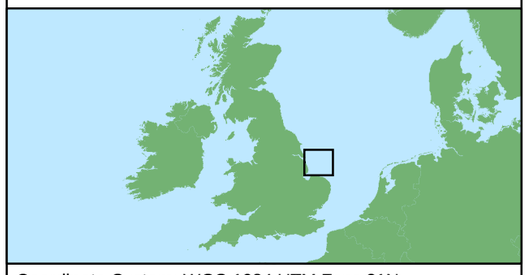
- Site Boundary
- Offshore ECC Area of Search
- Benthic Ecology Study Area



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:375,000

Benthic subtidal and intertidal ecology study area

Figure 7.3.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Data Sources

7.3.6 A number of benthic subtidal and intertidal ecology datasets have been reviewed and collated to inform this Scoping Report. Table 7.3.1 sets out data sources that have been used to understand and characterise the baseline environment within the benthic study area for the purposes of scoping and will be used to inform the EIA baseline. The baseline description will also make use of the Cefas OneBenthic Baseline tool which collates a variety of the existing data into a single database. Figure 7.3.2 presents the data points available through the Cefas OneBenthic Baseline tool that will be downloaded to support the benthic characterisation

7.3.7 In addition, a programme of site-specific benthic ecology baseline characterisation surveys (Table 7.3.1) will be completed in 2022 and this will be used to characterise the benthic environment of the array area, a surrounding buffer zone and the preferred cable route. Sampling stations will be selected following interpretation of the site-specific geophysical survey data to ensure representative sample across all likely habitat types.

Table 7.3.1: Key sources of information for benthic subtidal and intertidal ecology for the Project.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
New Survey Data		
Project-specific Benthic Ecology Baseline Characterisation Survey	This scope of work (SoW) maps and characterises the benthic ecosystem, including habitats and species of flora and fauna. This will provide a robust profile of the array and ECC (once confirmed) that will support the EIA process. These surveys are planned for 2022. The array area surveys have been undertaken in Q2 informed by geophysical data; including 80 grab samples (analysed for faunal and PSA composition; including total carbon content); 30 drop down video (DDV); 30 samples for contaminant analysis; and eight epibenthic trawls. The ECC survey is planned for Q3 2022 and will comprise up to 60 grab sample stations; 30 DDV; 30 samples for contaminant analysis; and seven epibenthic trawls. Intertidal phase 1 and 2 surveys will be conducted in 2022. The SoW also includes appropriate lab work, data analysis and reporting.	This characterisation will provide a profile of the array area and ECC (once confirmed), as well as an appropriate buffer zone.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
Project-specific Geophysical Data Collection	Includes shallow geophysical, ultra-high resolution seismic (UHRS), side scan sonar (SSS), echo sounder (multi-beam system) (MBES), magnetometer, high frequency sub-bottom profiler (SBP) and vibrocore collection. These surveys will be used to build a profile of any objects in the area e.g., wrecks	Survey of the proposed array and a surrounding 500m buffer and ECC (once confirmed).
Existing Project Data		
Lynn and Inner Dowsing Offshore Wind Farms (Various datasets) including: Pre-construction characterisation surveys (AMEC, 2002); *Sabellaria spinulosa* mapping survey (Envision, 2004) Lynn and Inner Dowsing Geophysical and Biological Survey report (EGS (International) Ltd, 2010) Post-construction monitoring survey reports (EGS, 2010; 2011; RPS, 2014)	Baseline surveys carried out to characterise the benthic environment and inform EIA on OWF projects.	Provides data relevant to the inshore area of part of the current AoS for the offshore ECC.
Lincs OWF Benthic Baseline Survey Report (EMU. 2005)	Baseline surveys carried out to characterise the benthic environment and inform EIA on OWF projects.	Provides data relevant to the inshore area of part of the current AoS for the offshore ECC.
Triton Knoll Electrical Systems Benthic Ecology - Subtidal Ecology Technical Report (RWE, 2015), 2008 – 2011.	This report collates data from benthic grab, DDV and geophysical surveys.	Provides data relevant to the inshore area of part of the current AoS for the offshore ECC.
Humber Gateway datasets and studies including: Baseline study of marine ecology (ICES, 2005);	Survey data taken from subtidal and intertidal macrofaunal sampling and sediment analysis.	Provides data relevant to the inshore area of part of the current AoS for the offshore ECC.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
Benthic monitoring programme (PMSL, 2012; 2013)		
Hornsea Zonal Characterisation Survey (2010)	DDV and grab sampling that took place across a grid of 5 km by 5 km.	Survey data covers the wider Hornsea study area and is relevant to the study area described above.
Hornsea Project One Array Survey (2010 – 2011)	DDV and grab sampling for the Hornsea One project. Epibenthic beam trawling was also carried out.	Although this does not cover the precise study area array, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Hornsea Project Two array Survey (2012)	DDV and grab sampling for the Hornsea Two project. Epibenthic beam trawling was also carried out in some zones.	Although this does not cover the precise array study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Dogger Bank Creyke Beck A and B Environmental Statement (Forewind, 2013)	Benthic grab samples and DDV characterised offshore array and cable route.	Includes samples collected for the Dogger Bank ECC, the inshore part of which lies close to the current AoS for the offshore ECC.
Westermost Rough datasets and studies including: • Pre-construction benthic survey (Gardline and Titan, 2013); • Pre-construction environmental monitoring survey reports	Benthic grab samples and DDV characterised offshore array, ECC and control sites around the Westermost Rough OWF.	Provides data relevant to the inshore area of part of the current AoS for the offshore ECC.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
(Westermost Rough Ltd, 2014)		
Hornsea Project Three OWF Benthic Ecology Technical Report (Ørsted, 2018). This report was used to inform the Hornsea Four scoping exercise.	This technical report provides analysis of site-specific sampling data collected across the wider geographic region and has been drawn upon for this scoping section.	Although this does not cover the precise array area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Hornsea Project Four OWF Benthic Ecology Technical Report (Ørsted, 2020).	This technical report details analysis of data collected throughout the wider geographic region and benthic study area.	Data covers the wider geographic region and study area.
Literature		
Humber Regional Environmental Characterisation (REC) (Tappin *et al.*, 2012)	This study was a regional characterisation of the wider Humber area to support an aggregate dredging licensing process and included data from DDV, epifaunal beam trawls, and faunal and sediment grab samples.	Data were not collected from the array area but includes data relevant to parts of the current AoS for the offshore ECC, as well as data providing wide regional context.
Cefas OneBenthic Baseline Tool	Collates time-series data collected around active dredging licence area including: Areas 514/1, 2, 3, 4; Areas 106/1, 2, 3 and 400; Area 493; Areas 481, 2; Area 1805; Area 197; and Areas 515/1, 2.	Provides wide geographic coverage of area adjacent to the array area and inshore to the west of the array area within the AoS.
Publicly Available Datasets		
EMODnet broad scale seabed habitat map for Europe (EUSeaMap) (2021) EUNIS 2019 habitat types (EMODnet, 2021). available at: https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/	EUSeaMap (2021) – EUNIS 2019 habitat types is a predictive habitat map covering European seas. Habitats are described in the European Nature Information System (EUNIS).	These maps cover the entire array area, as well as inshore cable corridor areas.

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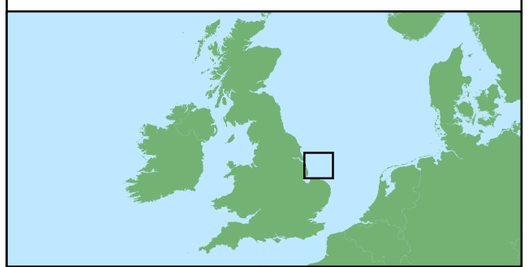
- Site Boundary
- Offshore ECC Area of Search
- Benthic Ecology Study Area

OneBenthic Faunal Data Points (Cefas)

- A1
- A2a
- A2b
- B1a
- B1b
- C1a
- C1b
- D1
- D2a
- D2b
- D2c
- D2d



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:375,000

OneBenthic Baseline tool data coverage within the study area

Figure 7.3.2

OUTER DOWSING OFFSHORE WIND

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Overview Of Baseline Environment

7.3.8 The following characterisation has been informed by the data detailed in Table 7.3.1 from extant data to understand benthic habitat types and species present in the wider region. This characterisation has been divided into sections of the Project study area which includes the 15 km buffer.

Array

7.3.9 According to EUSeaMap (2021) the primary sediment type within the array study area is circalittoral coarse sediment, with offshore circalittoral coarse sediment, circalittoral sand and circalittoral mixed sediment also present (Figure 7.3.3). This source uses the EUNIS 2019 habitat classification system.

7.3.10 Detailed sampling campaigns have been undertaken across the region to inform assessments associated with aggregate extraction licence areas and OWF projects. Site specific studies have utilised predominately grab sampling and DDV campaigns augmented with geophysical data to characterise the respective survey areas. The Cefas OneBenthic Baseline tool collates these datasets and identifies clustering associated with benthic species assemblages using grab data.

7.3.11 Within the array area faunal clusters labelled D2a and D2c were widespread and common. The faunal cluster D2a is typically dominated by species in the following taxa Spionidae, Glyceridae and Terrebellidae and nematodes worms (Nemertea). D2c is typically dominated by polychaete worms in the taxa Nephytyidae, Spionidae and Ophelidae. These areas are typically associated with low species richness and abundance values.

7.3.12 This broadly aligns with biotopes recorded in the Humber region particularly further offshore where the following Eunis habitats have been identified:

- *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand
- *Abra prismatica*, *Bathyporeia elegans* and polychaetes in deep circalittoral sand

Export Cable AoS

7.3.13 The offshore ECC AoS covers a large inshore area off the Lincolnshire coast. According to EUSeaMap predictive modelling the offshore AoS varies with areas of circalittoral coarse sediment and larger areas of circalittoral sand and mixed sediment. Inshore, closer to the Humber estuary, there is areas of finer sediments predicted to comprise sandy mud or muddy sand.

7.3.14 OneBenthic Baseline faunal clusters note a more diverse range of faunal clusters in the inshore area. Similar faunal clusters are noted as the array area with D2c common as well as faunal clusters labelled A1, A2a, C1a and D2a. Faunal clusters A1 and A2a are typically associated with higher species richness and abundance.

7.3.15 Figure 7.3.4 shows faunal clusters in relation to predicted substrate in the study area. This highlights that the D2a cluster to be more associated with sandy sediments, whilst A2a is more aligned with mixed sediments.

7.3.16 Data collated as part of the Humber Regional Environmental Characterisation indicates a broader range of habitat types in the inshore region including sublittoral coarse sediment, sublittoral sand and sublittoral biogenic reefs. Areas supporting sublittoral biogenic reef typically align with the faunal cluster A2a where *S. spinulosa* is a dominant species.

7.3.17 The REC study noted that inshore sediment habitats were largely populated by *Mysella bidentata* and *Thyasira* spp., circalittoral fine sands populated by *Echinocyamus pusillus*, *Ophelia borealis*, Abra prismatica. Also present in inshore area were *Mytilus edulis* beds situated on sublittoral sediment and *Nephtys cirrosa* and *Bathyporeia* spp. upon infralittoral sand sediments. Functional biological communities were also found in abundance in the inshore regions of the wider Humber area forming the northern region of the landfall study area. These communities included *S. spinulosa* reef, barnacles (the most common species of which was *Balanus crenatus*), ascidians and tube worms. In sandy areas *S. spinulosa* constructs tubes and forms aggregations of these tubes, filter feeding on particulate organic matter (POM).

7.3.18 A site specific epibenthic trawl campaign was undertaken to enable characterisation of the benthic communities present within the study area. Prior to the trawls, a DDV was used to check for the presence of sensitive habitats, with one of the originally planned trawl locations moved due to the presence of potential *S. spinulosa* reef. The study area was largely populated by barnacles, *Spisula solida, Asterias rubens and Nephtys caeca*. Small, isolated veneers of *S. spinulosa* were present in the site (albeit in patchy areas forming crusts rather than reefs) and indicates the health of the sandbank system10. The marine Invasive Non-Native Species (INNS) species, slipper limpets *Crepidula fornicata,* were recorded across the area.

Landfall

7.3.19 The landfall site of the ECC has not yet been confirmed but is currently being planned to make landfall along the Lincolnshire coast between Saltfleetby All Saints and Chapel St Leonards.

7.3.20 The Lincolnshire coast is typically characterised by beaches with medium sands which grade into more varied sands, gravelly sands and mixed sediments further offshore. The intertidal area is varied with extensive beaches to the north of Mablethorpe. Between Mablethorpe and Chapel St Leonards beaches are typically narrower and often exhibit quite steeply shelving profiles (TKOWL, 2014).

[10] JNCC site details: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030371

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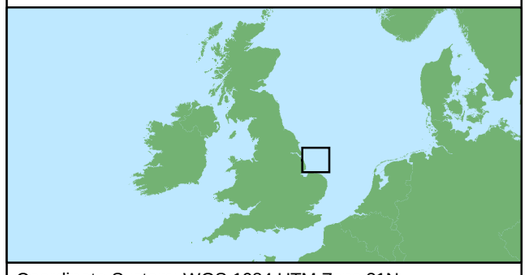
400000
N
5950000
5900000

Legend

- Site Boundary
- Offshore ECC Area of Search
- Benthic Ecology Study Area

Predicted Seabed Substrate (EUSeaMap - 2016)

- Fine mud
- Mud to muddy sand
- Muddy sand
- Sandy mud
- Sandy mud to muddy sand
- Sand
- Mixed sediment
- Coarse and mixed sediment
- Coarse sediment
- Rock or other hard substrata
- Cymodocea beds
- Cymodocea nodosa meadows
- Dead mattes of Posidonia oceanica
- Posidonia oceanica meadows
- Seabed
- Unknown



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:375,000

Predicted habitat types within the benthic survey area (EUSeaMap, 2021)

Figure 7.3.3

OUTER DOWSING OFFSHORE WIND

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Legend

- Site Boundary
- Offshore ECC Area of Search
- Benthic Ecology Study Area

Predicted Seabed Substrate (EUSeaMap - 2016)

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- Sandy mud
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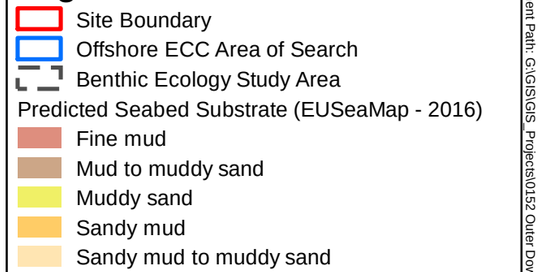
- Mixed sediment
- Coarse and mixed sediment
- Coarse sediment
- Rock or other hard substrata
- Cymodocea beds
- Cymodocea nodosa meadows
- Dead mattes of Posidonia oceanica
- Posidonia oceanica meadows
- Seabed
- Unknown

OneBenthic Faunal Data Points (Cefas)

- A1
- A2a
- A2b
- B1a
- B1b
- C1a
- C1b
- D1
- D2a
- D2b
- D2c
- D2d



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:375,000

OneBenthic faunal data points and EUSeaMap predicted seabed substrate

Figure 7.3.4

OUTER DOWSING OFFSHORE WIND

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Designated Sites and Protected Species

7.3.21 For the purposes of this Scoping Report, a review has been undertaken to identify designated sites in the benthic subtidal and intertidal ecology study area which are either designated for benthic subtidal and intertidal ecology interest or habitats/ species which are dependent on or associated with benthic subtidal and intertidal ecology.

7.3.22 A number of international and national designated sites have been identified within the study area (Figure 7.3.5). The array area does not overlap with any sites designated for benthic interest, with the decision to avoid any habitat SACs made as part of the site selection process at the bid stage.

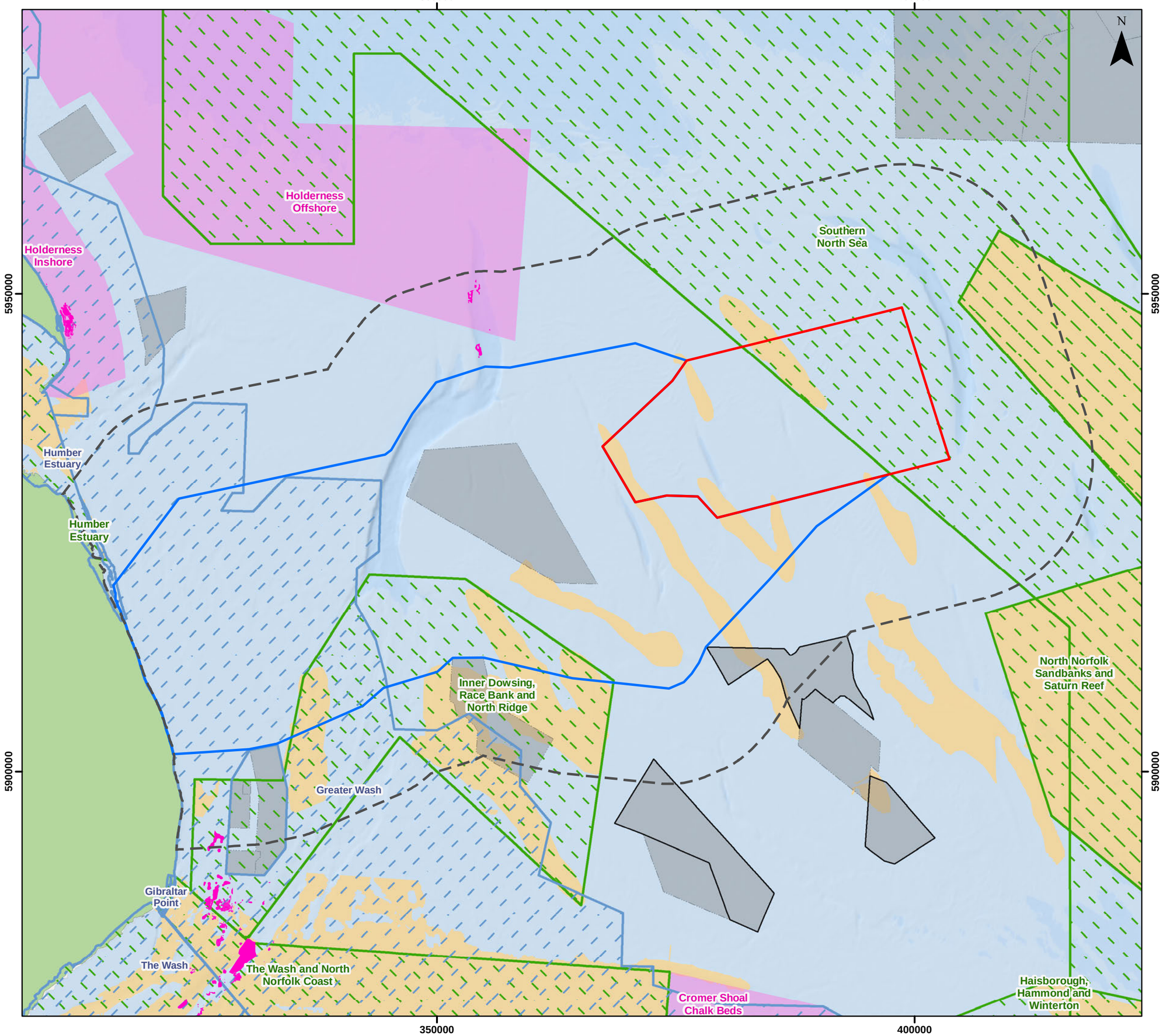
7.3.23 Species and habitats that fall into specific categories are eligible for legal protection from activities that have the potential to harm them under Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora; more commonly known as the EC Habitats Directive (1992) as amended. This legislation has been mirrored into UK legislation via The Conservation of Habitats and Species Regulations (2017) ("the Habitats Regulations") and The Conservation of Offshore Marine Habitats and Species Regulations (2017) ("the Offshore Habitats Regulations). These are known as Annex I habitats, and they are protected by a network of Special Areas of Conservation (SACs) which form part of the National Site Network that aims to establish a network of important high-quality conservation sites that will make a significant contribution to the conservation of such habitats. As depicted in Figure 7.3.5, Annex I sandbanks, 'sandbanks slightly covered by seawater all the time' have been recorded across the array area and offshore ECC although they lie outside of the designated SACs.

7.3.24 The offshore ECC AoS overlaps with a portion of the Inner Dowsing, Race Bank, and North Ridge SAC. Table 7.3.2 details sites designated for benthic species and habitat features. The Inner Dowsing, Race Bank and North Ridge SAC spans across the 12 nautical mile boundary, lying partly in offshore waters, which are managed by Joint Nature Conservation Committee (JNCC), and partly in inshore waters, which are managed by Natural England. The SAC covers an area of 845 km^2 and encompasses a wide range of sandbank types as well as *S. spinulosa* (JNCC & Natural England 2010) and is important within the context of tidal flows and sediment transport processes into the Wash and the wider Norfolk coast.

7.3.25 The Project is aware that a number of proposed Highly Protected Marine Areas are being developed for consultation, which may include the Inner Silver Pit. The extent, specific features and type of restricted activities which may be covered under any designation are currently unknown, however these sites will be appropriately considered in future assessments once this information is available.

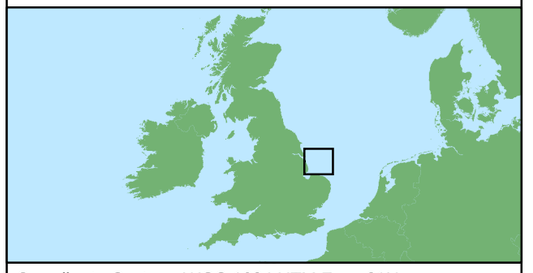
Table 7.3.2. Designated sites within the benthic subtidal and intertidal ecology study area

Site	Qualifying Feature
National Site Network Sites	
North Norfolk Sandbanks and Saturn Reef SAC:	Reefs and sandbanks which are slightly covered by sea water all of the time.
Inner Dowsing, Race Bank and North Ridge SAC:	Reefs and sandbanks which are slightly covered by sea water all of the time.
Humber Estuary SAC:	Sandbanks which are slightly covered by sea water all the time, estuaries, mudflats and sandflats not covered by seawater at low tide, coastal lagoons, Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*).
National Designations	
Holderness Inshore MCZ:	Intertidal sand and muddy sand, circalittoral rock, subtidal mud and sand, subtidal coarse and mixed sediments, and Spurn Head (subtidal).
Humber Estuary SSSI:	Intertidal mudflats and sandflats; coastal saltmarsh and the associated saline lagoons; sand dunes and standing waters.



Legend

- Site Boundary
- Offshore ECC Area of Search
- Benthic Ecology Study Area
- Offshore Wind Farms
- Future Wind Farm Extensions
- Special Protection Area
- Special Area of Conservation
- Marine Conservation Zone
- Annex I Sandbank
- Annex I Reefs



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:375,000

Designated protected sites and features within the benthic subtidal and intertidal ecology study area

Figure 7.3.5

OUTER DOWSING OFFSHORE WIND

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Proposed Approach to the Environmental Impact Assessment

7.3.26 This section outlines the proposed EIA approach for benthic subtidal and intertidal ecology. This includes proposed assessment methodology, relevant embedded mitigation measures, as well as those measures scoped into and out of the assessment.

Proposed Assessment Methodology

7.3.27 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of benthic subtidal and intertidal ecology will also give due regard to the following guidance documents where they are specific to this topic and methodology:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial Freshwater, Coastal and Marine (CIEEM, 2018);
- Strategic Review of Offshore Windfarm Monitoring Data Associated with FEPA Licence Conditions (Cefas 2010);
- Review of post-consent OWF monitoring data associated with licence conditions (MMO 2014b);
- Overarching NPS for Energy (NPS EN-1) (Department of Energy and Climate Change, 2011);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards - Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind application V2. (Natural England, 2021);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase III: Expectations for data analysis and presentation at examination for offshore wind applications V1. (Natural England, 2021);
- RenewableUK (2013) Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in OWF.
- Guidance note for EIA in respect of FEPA and CPA requirements (Cefas, 2004);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Guidance on Environmental Considerations for OWF Development (OSPAR, 2008); and
- Sensitivity of features based upon the Marine Evidence-based Sensitivity Assessment (MarESA) framework where possible (MarLIN, 2022).

Relevant Embedded Mitigation Measures

7.3.28 As part of the project design process, several designed-in measures have been proposed to reduce the potential for impacts on environmental receptors. The current, relevant embedded mitigation measures in relation to benthic subtidal and intertidal ecology are listed as follows:

- Array site selection, chosen to avoid overlap with designated sites to protect benthic habitat features.
- Where possible, cables will be buried to reduce the impacts of Electromagnetic fields (EMF) on sensitive benthic receptors and minimise the requirement for additional cable protection.
- Carry out a cable burial risk assessment (CBRA) which will be described within the Cable Installation and Specification Plan (CSIP).
- Scour Protection Management Plan (SPMP).
- Where possible, micro-siting of project infrastructure around sensitive benthic features. These features will be identified through a review of the available benthic data and sensitivity will be determined using the MarESA sensitivity assessment.
- A Project Environmental Management Plan (PEMP) (for the construction and operation phases) and Decommissioning Plan (for the decommissioning phase) will be produced and followed. This will include a MPCP which will safeguard the marine environment in the event of accidental pollution occurring as a result of Project activities. Plans will also highlight key organisations and contact details in the event of a spill (e.g. Environment Agency, Natural England and the MCA.

Potential Impacts Scoped In

7.3.29 A range of potential impacts on benthic subtidal and intertidal ecology have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.3.3, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 7.3.3: Impacts proposed to be scoped into assessment for benthic subtidal and intertidal ecology.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required And Any Analyses (Such As Modelling)
Construction		
Temporary Habitat Disturbance	There is the potential for direct habitat disturbance during construction activities in the array area and along the offshore ECC due to e.g., cable laying, foundation installation, and the use of jack up vessels or vessel anchoring.	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The area of habitat disturbance will be defined using the MDS drawn from the project design envelope. The sensitivity of benthic communities to the temporary impact will be determined through information in the available literature and by the application of expert judgment. MarESA assessments will be used to determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.
Temporary increase in suspended sediment and sediment deposition	Sediment disturbance arising from construction activities, such as, for example, cable laying and foundation installation, may result in adverse effects on benthic communities. This can be a result of a temporary increase in SSC and associated sediment deposition and smothering.	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The effects on benthic subtidal and intertidal ecology from increased suspended sediment and sediment deposition will be informed by the conclusions of the marine physical processes assessments (see Section 7.1). The sensitivity of the benthic communities to the suspended sediments and smothering will be determined through information in the available literature and by the application of expert judgment. MarESA assessments will be used to determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required And Any Analyses (Such As Modelling)
Direct and indirect seabed disturbance leading to the release of sediment contaminants	Seabed disturbance during construction could lead to the mobilisation of existing sediment contaminants that could have an impact on the benthos.	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The effects on benthic subtidal and intertidal ecology from changes to water quality will be informed by the conclusions of the MW&SQ assessments (see Section 7.2). The sensitivity of benthic communities to the sediment contaminants will be determined through information in the available literature and by the application of expert judgment. MarESA assessments will be used to determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.
Operation and Maintenance		
Long-term habitat loss/ alteration	There is the potential for long-term/ permanent habitat loss or alteration directly associated with the presence of e.g., WTG and OSP foundations, scour and cable protection.	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The area of habitat loss will be defined using the MDS drawn from the project design envelope. The sensitivity of benthic communities to habitat loss will be determined through information in the available literature and by the application of expert judgment. MarESA assessments will be used to determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.
Temporary habitat disturbance	There is the potential for direct habitat disturbance of the seabed during planned and unplanned maintenance through e.g. the use of jack up vessels	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The area of habitat disturbance will be defined using the MDS drawn from the project design envelope. The sensitivity of benthic communities to the temporary impact will be determined through information in the available literature and by the application of expert judgment. MarESA assessments will be used to

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required And Any Analyses (Such As Modelling)
	or cable repair or replacement.	determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.
Colonisation of hard substrates	Man-made substructures e.g., WTG and platform foundations and associated scour/ cable protection on the seabed are expected to be colonised by a variety of marine organisms. This can result in an increase in local biodiversity and alterations to the near field benthic ecology.	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The potential impacts on benthic ecology receptors will be considered in terms of the potential effects on the biodiversity and productivity of the near field benthos. The additional hard substrate available for colonisation will be defined using the MDS drawn from the project design envelope. The sensitivity of benthic communities to the effects resulting from the colonisation of the wind farm infrastructure will be determined through information in the available literature and by the application of expert judgment. MarESA guidance will be used to assess the sensitivity of benthic communities to the introduction of man-made hard substrates and substructures.
Decommissioning		
The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase and will therefore be assessed in the same way as set out above; however, there will also be an assessment of the loss of additional habitat arising from the removal of any infrastructure that have been colonised during the operational phase of the project.		
Cumulative		
Temporary increases in Suspended Sediment Concentration (SSC) and associated deposition	Sediment disturbance arising from construction activities, such as, for example, cable laying and foundation installation, may result in adverse effects on benthic communities. This can be a result of a temporary	The baseline characterisation of the benthic subtidal and intertidal habitats and features will be informed through the use of existing data and the collection of site-specific survey data (as summarised in Table 7.3.1). The effects on benthic subtidal and intertidal ecology from increased suspended sediment and sediment deposition will be informed by the conclusions of the marine physical processes assessments (see Section 7.1). The sensitivity of the benthic communities to the suspended sediments and smothering will be determined through information in the available literature and by the application of expert judgment.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required And Any Analyses (Such As Modelling)
	increase in SSC and associated sediment deposition and smothering.	MarESA assessments will be used to determine the sensitivity of benthic communities to the impact. The vulnerability and resilience of the characterising species of benthic communities will be considered.

Impacts Proposed to be Scoped Out

7.3.30 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for benthic subtidal and intertidal ecology. These impacts are outlined in Table 7.3.4 together with a justification for scoping them out.

Table 7.3.4. Impacts proposed to be scoped out of assessment for benthic subtidal and intertidal ecology

Impact and Development Stage	Justification for Scoping Out
Accidental Pollution Event during construction, O&M and decommissioning stages.	Chemical and oil inventories on vessels working during construction, O&M and decommissioning stages will be small in size and in the event of an accidental spill, hydrocarbons would rapidly be dispersed or diluted. Additionally, all vessels operating on the project will be required to comply with strict environmental controls set out within a PEMP and associated MPCP which will minimise the risk and set out provisions for responding to spills during Construction. Due to the implementation of control measures and small quantities of hydrocarbons and chemicals it is proposed to scope this impact out of further consideration within the EIA.
Increased risk of introduction or spread of Marine INNS during O&M stages.	This impact is being proposed to be scoped out in consideration of the mitigation and control of invasive species measures in line with IMO (2019). These standards and procedures will be incorporated into the PEMP and are embedded in the project design and as such ensure that no significant effects will arise from INNS.
Changes in physical processes resulting from the presence of the OWF subsea infrastructure e.g., scour effects, changes in wave/ tidal current regimes and resulting effects on sediment transport during O&M stages.	With embedded mitigation measures implemented it is unlikely there will be significant impacts. Impact will be spatially and temporally minimal. The proportion of the area likely to be disturbed is likely to be less than 5% of the total array area. This is based on the ES of previous projects of a similar size to the Project. Physical process modelling on adjacent projects has predicted small, local impacts on benthic communities from disturbance of this nature. For these reasons the impact is proposed to be scoped out.
EMF effects generated by inter-array and export cables during O&M stages. This may have indirect effects on benthic ecology.	Previous OWF project monitoring of invertebrate species associated with the study area has revealed no behavioural changes as a result of EMF. As well as this, embedded mitigation measures (e.g., cable burial being the preference for all cables) that will be implemented will increase the distance between sensitive species and the source of EMF, reducing the likelihood of behavioural responses from species. For this reason, it is considered that the risk of impact from EMF is not significant and will be scoped out.

Impact and Development Stage	Justification for Scoping Out
Cumulative	
The impacts scoped into the assessment for the Project alone, are generally spatially restricted to within the near field of the array and the offshore ECC. With the exception of those impacts identified in Table 7.3.3, it is proposed that all other impacts with limited spatial extent, where not having an effect on a designated species, site or feature, are scoped out of further assessment within the EIA.	

Potential Transboundary Effects

7.3.31 It is anticipated that no transboundary impacts on benthic subtidal and intertidal ecology will result from the construction, operation, maintenance or decommissioning stages of the Project. Any impacts on the benthic subtidal or intertidal environment will be localised in nature and likely limited, for indirect effects, to one tidal excursion from the impact source. Given the distance from the nearest adjacent EEZ of a member state, it is considered that transboundary impacts will not occur and it is, therefore, proposed that transboundary impacts on benthic subtidal and intertidal ecology are scoped out from further consideration within the EIA.

Summary of Next Steps

7.3.32 The benthic subtidal and intertidal EIA will be carried out in accordance with the methodology set out in Section 5.

7.3.33 The proposed approach to the assessment for benthic subtidal and intertidal ecology PEIR chapter will first include the definition of the worst-case scenarios on which the assessments will be based. The geographic footprint of the project and the impacts resulting from any changes to physical processes, including scour effects and changes in the sediment transport will be key considerations in defining the worst-case scenarios for benthic subtidal and intertidal ecology receptors.

7.3.34 Characterisation of the benthic subtidal and intertidal ecology will be informed by a more detailed interrogation of extant data and full analysis of the benthic and geophysical survey data to identify relevant benthic habitats and species. The survey data will be available to inform the EIA and will be reported in the PEIR. Site-specific benthic surveys will be carried out to inform and support the baseline characterisation.

7.3.35 Studies that will support the benthic subtidal and intertidal assessment will be completed. This will include the physical processes modelling used to inform the study area at EIA stage.

7.3.36 PEIR production will be carried out and assessments will be refined for the final ES stage.

7.3.37 Throughout the application process, consultation with relevant statutory and non-statutory organisations will be held as part of the EPP which is set out in Section 6. Consultations with various bodies will focus on the following key topics:

- Refining the cable corridor in reference to designated sites for the protection of benthic features;

- Consultation on scope of EIA;
- Consultation on proposed survey plans and consultation on undertaking benthic surveys;
- Consultation on PEIR; and
- Consultation on mitigation measures if the final cable corridor may result in impacts to designated sites and protected features.

Further Consideration for Consultees

7.3.38 The following bullet points provide specific scoping questions for the topic of benthic subtidal and intertidal ecology:

- Do you agree that the data sources identified, including the project specific geophysical and benthic surveys, are sufficient to inform the benthic subtidal and intertidal ecology baseline for the PEIR and ES?
- Have all potential impacts resulting from the Project been identified for benthic subtidal and intertidal receptors?
- Do you agree that the impacts described in Table 7.3.4 can be scoped out?
- For those impacts scoped in (Table 7.3.3), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on benthic subtidal and intertidal ecology receptors?

7.4 Fish and Shellfish Ecology

Introduction

7.4.1 This section of the Scoping Report identifies the fish and shellfish ecology elements of relevance to the Project array area and offshore ECC AoS. This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on fish and shellfish ecology and sets out the proposed scope of the EIA.

7.4.2 This section of the Scoping Report describes the methodology to be used within the EIA, an overview of the baseline conditions across the study area, the datasets to be used to inform the EIA, the likely significant effects to be considered within the EIA, and how these likely significant effects will be assessed for the purpose of an EIA.

7.4.3 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.1: Marine Physical Processes;
- Section 7.2: Marine Water and Sediment Quality;
- Section 7.3: Benthic and Intertidal Ecology; and
- Section 7.8: Commercial Fisheries.

Study Area

7.4.4 For the purposes of this scoping exercise, the study area for the fish and shellfish ecology assessment is presented in Figure 7.4.1 and is defined as the area within which the Project may install offshore infrastructure (i.e. the offshore array area and the offshore ECC AoS) and a wider area taking into account the maximum ZoI associated with secondary impacts that may arise from the proposed development.

7.4.5 The ZoI buffer, therefore, encompasses the area over which suspended sediments may travel following disturbance as a result of the Project activities; for the purposes of scoping this has been assumed a precautionary buffer that extends 15 km around the array area and 10 km around the offshore ECC AoS. The buffer has been identified based on experience from other projects in the wider region and expert judgement as a reasonable distance within which indirect effects (such as from, for example, sediment plumes, are most likely to have the potential to give rise to likely significant effects). The study area will be refined as required post-scoping to take account of site-specific sediment plume modelling work that will be undertaken as part of the marine physical processes assessment, consultation with key stakeholders and particularly through the EPP, as well as to reflect refinements in the project design – and particularly the development of a defined offshore ECC.

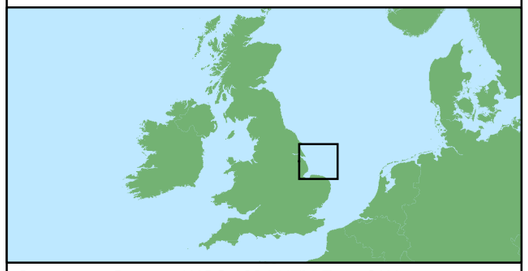
7.4.6 An adaptive and refined study area for the PEIR and ES will be defined based on project-specific physical processes modelling carried out at the EIA stage. The study area for PEIR and ES will also be defined based on site-specific underwater noise modelling to account for potential impacts from noise, which will be considered in relation to the species and habitats found throughout the wider southern North Sea biogeographic region and data available on the spawning and nursery grounds within this area. Site-specific predictive noise modelling will be undertaken as part of the EIA and reviewed to further define the study area. The study area will therefore take account of the impact with the greatest ZoI on species likely to be present within the relevant area.

7.4.7 The current study area overlaps with the International Council for the Exploration of the Sea (ICES) rectangles 35F0, 35F1, 36F0 and 36F1 (see Section 7.8) and provides a regional context on fish and shellfish ecology and is sufficient to cover potential effects outside of the array area and offshore ECC AoS.

300000
350000
400000
5950000
5900000
N

Legend

- Site Boundary
- Offshore ECC Area of Search
- Fish and Shellfish Ecology Study Area



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Fish and Shellfish Ecology Study Area

Figure 7.4.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

7.4.8 This Scoping Report section and initial understanding of local fish and shellfish ecology were developed using data from multiple sources, as summarised in Table 7.4.1, which will be subject to further review as the basis for developing the EIA baseline characterisation. Data collected by previous projects in the relevant geographical area to the Project in addition to a desk-based review of publicly available data sources and literature have been considered. Any new information or evidence which becomes available as the EIA process continues during the pre-application phase will be considered where appropriate and as necessary to support the assessment of fish and shellfish within the study area. This information will be further supplemented by findings of industry wide studies and relevant information obtained through consultation with relevant stakeholders (including, for example, the MMO, Natural England and the Eastern Inshore Fisheries & Conservation Authority (IFCA)).

7.4.9 The data available from existing literature and relevant surveys provide an appropriate evidence base for fish and shellfish populations within the study area, sufficient for the purposes of EIA and it is intended that these are utilised to characterise the fish and shellfish receptors in the vicinity of the array area and offshore ECC. Given the significant extent of publicly available data covering fish and shellfish species in the area to enable a robust characterisation of the receiving environment, including identification of relevant valued fish and shellfish receptors, additional site-specific fish and shellfish ecology surveys are not proposed to be undertaken. However, there will be site specific geophysical survey and grab samples which will be analysed for spawning habitat potential for species such as herring and sandeel.

7.4.10 In addition, site specific samples for PSA data will be collected as part of the benthic ecology site specific surveys (see Section 7.3) and will also be used to estimate the distribution of suitable spawning substrates within the study area for key demersal spawners (and specifically herring and sandeel). The fish and shellfish ecology assessment will also be informed by noise modelling, and coastal processes modelling.

Table 7.4.1: Key sources of information for fish and shellfish ecology

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
New Survey Data		
Site-specific Benthic Ecology Baseline Characterisation Survey	This SoW maps and characterises the benthic ecosystem, including habitats and species of flora and fauna. This will provide a robust profile of the array and ECC(once confirmed) that will support the EIA process. These surveys are planned for 2022. Surveys will include benthic grabs; DDV; epibenthic trawls; PSA; sediment total carbon content; sediment	This characterisation will provide a profile of the array area and offshore ECC(once confirmed), as well as an appropriate buffer zone.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
	contaminant analysis; and lab work, data analysis and reporting.	
Site-specific Geophysical Survey	Includes shallow geophysical, UHRS, SSS, echo sounder MBES), magnetometer, high frequency SBP and vibrocore collection. These surveys will be used to build a profile of any objects in the area e.g. wrecks.	Survey of the proposed array and a surrounding 500 m buffer and ECC (once confirmed).
Existing Project Survey Data		
Lynn, Inner Dowsing and Lincs OWFs fish and shellfish surveys, benthic and geophysical surveys (Brown and May Marine Ltd., 2005; EMU,2005)	Characterisation surveys undertaken to inform the EIA for the various projects.	Provides data that overlaps with the inshore area of the offshore ECC AoS.
Hornsea Zonal Characterisation Survey (2010)	DDV and grab sampling took place across a grid of 5 km by 5 km. Otter trawl surveys comprising spring and autumn surveys conducted in 2011 using a high-opening 5 m otter trawl with a 40 mm cod-end designed to catch semi-pelagic as well as demersal species. An epibenthic beam trawl campaign was completed in November and December 2010 using a 2 m epibenthic beam trawl with a 5 m cod-end.	Survey data covers the wider Hornsea study area and overlaps with the offshore study area described above.
Hornsea One Benthic Subtidal Survey (2010 – 2011)	DDV and grab sampling for the Hornsea One project. Epibenthic beam trawling was also carried out.	Although this does not cover the study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Hornsea Project One Array Survey (2010 – 2011.	An epibenthic beam trawl campaign was completed in July 2010 using a 2 m epibenthic beam trawl with a 5 m cod end.	Although this does not cover the study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
Hornsea Project Two Array Survey (2012)	DDV and grab sampling for the Hornsea Two project. Epibenthic beam trawling was also carried out in some zones using a 2 m epibenthic beam trawl with a 5 m cod end.	Although this does not cover the study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Triton Knoll OWF Fish and Shellfish technical report (TKOWFL, 2012)	Characterisation surveys undertaken to inform the EIA for Triton Knoll OWF.	Surveys completed to the south-west of the array area and overlap the offshore ECC AoS.
Pre-construction environmental monitoring survey reports (Westermost Rough Ltd, 2014)	Includes a pre-construction fish and shellfish baseline survey, in addition to a literature review of the potential effects and impacts of OWFs on the marine environment.	Although this does not cover the study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Triton Knoll Electrical Systems Recreational Fisheries Technical Report (PMSL, 2014) and Benthic Ecology - Subtidal Ecology Technical Report (RWE, 2015)	Review of recreational fisheries data along the Lincolnshire coast. Benthic Ecology Technical Report collates benthic grab, DDV and geophysical survey data from 2008 – 2011.	Although this does not cover the study area, surveys were carried out in an area that forms part of the wider geographic region and the data will therefore be used to inform the wider regional baseline characterisation.
Hornsea Project Three OWF Benthic Ecology Technical Report (Ørsted, 2018) Hornsea Project Three OWF Fish and Shellfish Ecology Technical Report (RPS, 2018).	These technical reports provide an analysis of data collected across the wider geographic region and has been drawn upon for this scoping section.	Data covers the wider geographic region and study area and the data will therefore be used to inform the wider regional baseline characterisation.
Hornsea Project Four OWF Benthic Ecology Technical Report (Ørsted, 2020a) and Hornsea Project Four OWF Fish and Shellfish Ecology Technical Report (Ørsted, 2020b)	These technical reports provide an analysis of data collected across the wider geographic region and has been drawn upon for this scoping section.	Data covers the wider geographic region and study area and the data will therefore be used to inform the wider regional baseline characterisation.

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
Literature		
North Sea fish spawning and nursery grounds (Coull *et al.*, 1998; Callaway *et al.*, 2002; Eaton *et al.*, 2003; Reiss *et al.*, 2010; Ellis *et al.*, 2010, 2012; ICES, 2006, 2019, 2020a, 2020b; Jessop and Maxwell, 2011; Barreto and Bailey, 2015).	These studies map the distribution of North Sea fish and/ or shellfish species' spawning and nursery grounds using various survey data.	Provides data covering the study area.
Technical reports for SEA Areas 2 and 3 (Department of Trade and Industry (DTI), 2001; DTI, 2002).	Description of survey data published in the SEA for SEA Areas 2 (northern North Sea) and 3 (southern North Sea).	Broadscale data with regional coverage.
Humber Regional Environmental Characterisation (REC) (Tappin *et al.*, 2011)	This study was a regional characterisation of the wider Humber area to support an aggregate dredging licensing process and included data from DDV, epifaunal beam trawls, and faunal and sediment grab samples.	Data were not collected from the array area but includes data relevant to parts of the current offshore ECC AoS, as well as data providing wide regional context.
Boyle and New (2018) ORJIP Impacts from Piling on Fish at Offshore Wind Sites: Collating Population Information, Gap Analysis and Appraisal of Mitigation Options.	The study report presents a spatial analysis of the International Herring Larval Survey (IHLS) herring larval data collected over a ten-year period.	Provides data covering the North Sea and relevant herring stocks in the vicinity of the study area and wider region.
Publicly Available Datasets		
IFISH (Integrated Fisheries System Holding) Database11	Fisheries data, including landings and fishing effort data.	This is a national database providing full coverage of the fish and shellfish ecology study area.
British Geological Survey (BGS) Marine Sediment Particle Size dataset sourced from the BGS	National PSA dataset.	This is a national dataset providing full coverage of the fish and shellfish ecology study area.

[11] https://data.cefas.co.uk/search/1/ifish

Source	Summary	Spatial Coverage of Data in Relation to the Study Area
GeoIndex Offshore portal[12]		
Environment Agency Ecology and Fish Data Explorer[13]	Freshwater fish survey data, utilised to inform presence or absence of migratory fish in catchments and estuaries.	This is a regional dataset with coverage across the Humber Estuary.
OneBenthic[14]	Collates time-series data of data collected around active dredging licence area including: Areas 514/1, 2, 3, 4; Areas 106/1, 2, 3 and 400; Area 493; Areas 481, 2; Area 1805; Area 197; and Areas 515/1, 2.	Provides wide geographic coverage of area to adjacent to the array area and inshore to the west of the array area within the study area.
Information on species of conservation interest, JNCC (2007)	Species specific data, of native species of conservation interest.	This data source provides species specific data of native species of conservation interest.
ICES International Bottom Trawl Surveys (IBTS) (2020a)	ICES surveys are standardised and have been used to characterise fish species abundance and distribution over a significant temporal scale.	Surveys cover the greater North Sea regions including parts of the study area.
ICES IHLS (2020b)	ICES IHLS surveys covers most of the potential and historic spawning grounds of herring and provides a quantitative estimate of herring larval abundance to be used as a relative index of the changes in herring spawning stock biomass.	Surveys cover the greater North Sea regions including parts of the study area.
UK sea fisheries annual statistics report (MMO, 2021)	Information on landings of the UK fishing fleet, and the status of commercial fish stocks.	Full coverage of the study area and wider North Sea.
EMODnet broad scale seabed habitat map for Europe (EUSeaMap) (EMODnet, 2021)15	EUSeaMap is a predictive habitat map covering the North Sea. Habitats are described in the EUNIS.	These maps cover the entire array area, as well as inshore regions where cable corridor will be situated.

[12] http://mapapps2.bgs.ac.uk/geoindex_offshore/home.html?_ga=2.180987503.950258115.1631718927-1084102068.1631718927

[13] www.environment.data.gov.uk/ecology/explorer/

[14] www.rconnect.cefas.co.uk/onebenthic_dashboard/

[15] https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/

Overview of Baseline Environment

7.4.11 An overview of the baseline fish and shellfish ecology relevant to the Project (and the Project's wider geographic region) has been established for the purposes of this Scoping Report from an initial review of the data sources and literature listed in Table . This baseline will be refined as the Project develops and the overview of the baseline environment will continue to be updated throughout the EIA process and pre-application period.

Species Present

7.4.12 This characterisation of the species found within the array and offshore ECC AoS has largely been drawn upon from work undertaken in support of various wind farm projects in the vicinity of the study area (see Table 7.4.2), as well as wider information from publicly available sources.

7.4.13 Otter trawl and epibenthic beam trawl surveys conducted between 2010 and 2012 across the former Hornsea Zone (Ørsted, 2018) revealed a species assemblage typical of this area of the North Sea. The fish community was largely characterised by demersal species recorded in abundance during surveys, including whiting *Merlangius merlangus*, dab *Limanda limanda*, plaice *Pleuronectas platessa*, solenette *Buglossidium luteum* and grey gurnard *Eutrigla gurnardus*. Less abundant species included lemon sole *Microstomus kitt*, common sole *Solea solea* and cod *Gadus morhua*. Surveys also recorded smaller demersal species such as the short spined sea scorpion *Myoxocephalus scorpus*, lesser weaver *Echiichthys vipera*, dragonet *Callionymus lyra* and scaldfish *Arnoglossus laterna*. Pelagic species were also recorded during surveys included Atlantic herring *Clupea harengus*, sprat *Sprattus sprattus*, European common squid *Alloteuthis subulate* and European squid *Loligo vulgaris*.

7.4.14 Of the abundant recorded species, a number are of commercial importance including whiting, dab, sprat, herring, plaice, mackerel *Scomber scombrus*, and lemon sole. Less abundant (less than 50% frequency) commercially important species recorded during surveys included cod, haddock *Melanogrammus aeglefinus*, sole, ling *Molva molva* and the spotted ray *Raja montagui*, cuckoo ray *Leucoraja naevus* and thornback ray *Raja 180ammaru*.

7.4.15 The greater sandeel *Hyperlopus lanceolatus* and lesser sandeel *Ammodytidae spp*., (both considered to be ecologically important species as they are important prey items for fish, birds and marine mammals) were recorded during the otter and beam trawl surveys but generally at low abundances (and at less than 25% frequency). However, on the basis of sandeel habitats mapped by Jensen *et al*. (2011) using data collected from fishing vessels targeting sandeels in the North Sea, sandeel habitats are known to occur within the study area.

7.4.16 Site specific epibenthic trawls conducted revealed a similar fish community characterised by demersal species including dab, pogge *Agonus cataphractus* and dragonet as well as the inshore species Lesser weever *Echiichthys vipera* and long-spined sea scorpion *Taurulus bubalis*. A number of commercially important species such as whiting, ling and sole were recorded at low abundances. Both the greater sandeel and lesser sandeel were recorded but at low abundances as well as the smooth sandeel *Gymnammodytes semisquamatus,* while the Raitt's sandeel *Ammodytes marinus* was abundant.

7.4.17 Several shellfish species are also known to be present and abundant within the study area including brown crab *Cancer pagurus*, European lobster *Homarus 181ammarus*, whelk *Buccinum undatum*, brown shrimp *Crangon crangon*, pink shrimp *Pandalus sp*. And Norway lobster *Nephrops norvegicus* (also known as Nephrops), with these species being particularly significant for commercial fisheries within the study area. Whilst Nephrops are likely present in the region, their known spawning and nursery area is located approximately 18 km north-east of the array area.

7.4.18 High abundances of brown shrimp were recorded in the site specific epibenthic trawls with pink shrimp less abundant; both species are common for the area and the North Sea. Brown crab and velvet swimming crab *Necora puber* were recorded in relatively low abundances across the array area.

Species of Commercial Importance

7.4.19 Detailed information on species of commercial importance is provided in the Commercial Fisheries section of the Scoping Report (Section 7.8), which identifies the following fish species: whiting, mackerel, plaice, sole, herring and sandeel, and the following shellfish species: brown crab, European lobster, whelk, King scallop *Pecten maximus* and Nephrops, as species of commercial importance to the region. Moreover, regular liaison with local commercial fishermen will aid in identifying key shellfish (primarily crab, lobster and whelk) grounds within the site, and aid in validating the baseline (see Section 7.8).

7.4.20 All of these species are considered to be potentially sensitive to the Project, based on their limited mobility and therefore are considered unable to avoid potential disturbances. These species will therefore be taken forward into the fish and shellfish assessment.

7.4.21 Those species recorded in the former Hornsea Zone surveys are typical of those found within the wider southern North Sea (DTI, 2001a; DTI, 2001b; data from IBTS). Details of those species recorded and other species that are known to be present in the study area are detailed in Table 7.4.2.

Table 7.4.2: Fish and shellfish species recorded, or potentially present, within the study area and wider geographic region

Group/ Species	
Pelagic	
Allis shad *Alosa alosa*	Porbeagle shark *Lamna nasus*
Atlantic horse mackerel *Trachurus trachurus*	Sea trout *Salmo trutta*
Atlantic salmon *Salmo salar*	Sprat *Sprattus sprattus*
Blue whiting *Micromesistius poutassou*	Spurdog *Squalus acanthias*
Herring *Clupea harengus*	Twaite shad *Alosa fallax*
Mackerel *Scomber scombrus*	
Inshore/ Coastal Species	
Butterfish *Pholis gunnellus*	Long-spined sea scorpion *Taurulus bubalis*
Catfish *Anarhichas lupus*	Scaldfish *Arnoglossus laterna*
Four-bearded rockling *Enchelyopus cimbrius*	Scoprionfish *Scorpaenidae*
Gobies *Pomatoschistus spp*.	Short spined sea scorpion *Myoxocephalus Scorpius*
Greater pipefish *Syngnathus acus*	

Group/ Species	
Lesser weaver *Echiichthys vipera*	Wrasses *Labrus spp*
Demersal	
American plaice *Hippoglossoides platessoides*	Norwegian topknot *Phrynorhombus norvegicus*
Bass *Dicentrarchus labrax*	Plaice *Pleuronectes platessa*
Blonde Ray *Raja brachyura*	Pogge *Agonus cataphractus*
Brill *Scophthalmus rhombus*	Pollack *Pollachius pollachius*
Cod *Gadhus morhua*	Poor cod *Trisopterus minutus*
Conger eels *Conger spp.*	Pouting *Trisopterus luscus*
Cuckoo Ray *Raja naevus*	Red Mullet *Mullus barbatus*
Dab *Limanda limanda*	Reticulated dragonet *Callionymus reticulatis*
Dragonet *Callionymus lyra*	River lamprey *Lamprey fluviatilis*
European eel *Anguilla anguilla*	Saithe *Pollachius virens*
Greater sand eel *Hyperoplus lanceolatus*	Sandeels *Ammodytes spp*.
Gurnards – Grey *Eutrigla gurnardus*	Sea lamprey *Petromyzon marinus*
Gurnards – Red *Aspitrigla cuculus*	Sole *Solea solea*
Gurnard – Tub *Trigla 182ammaru*	Solenette *Buglossidium luteum*
Haddock *Melangrammus aeglefinus*	Spotted ray *Raja montagui*
Hake *Merluccius merluccius*	Starry smooth-hound *Mustelus asterias*
Halibut *Hippoglossus hippoglossus*	Striped red mullet *Mullus surmuletus*
Lemon sole *Microstomus kitt*	Thickback sole *Microchirus variegatus*
Lesser spotted dogfish *Scyliorhinus canicular*	Thornback Ray *Raja 182ammaru*
Ling *Molva molva*	Tope *Galeorhinus galeus*
Long rough dab *Hippoglossoides platessoides*	Turbot *Scophthalmus maximus*
Megrim Lepidorhombus whiffiagonis	Whiting *Merlangius merlangus*
Monks or Anglers *Lophius spp*	Witch *Glyptocephalus cynoglossus*
Shellfish	
Brown crab *Cancer pagurus*	Pink Shrimp *Pandulus montagui*
Brown shrimp *Crangon crangon*	Queen Scallops *Aequipecten opercularis*
European common squid *Alloteuthis 182ammarus*	Whelks *Buccinum undatum*
	Squat Lobster *Munida rugosa*
European lobster *Homarus 182ammarus*	Squid *Loligo spp., Sepiola spp*.
Green Crab *Carcinus maenus*	Velvet swimming crab *Necora puber*
King scallops *Pecten maximus*	
Nephrops *Nephrops norvegicus*	

Spawning and Nursery Grounds

7.4.22 The spawning and nursery grounds of several fish species are known to be located within or in close proximity to the study area based on available information on spawning and nursery areas for fish species (Coull *et al*. (1998), supported by data sources from Ellis *et al*. (2010, 2012)). The following provides a high-level summary of the spawning and nursery grounds which will be considered further within the EIA process. The following figures present the geographic locations of these spawning (Figure 7.4.3) and nursery grounds (Figure 7.4.4) in relation to the study area.

7.4.23 The key sensitive receptors with spawning and/ or nursery grounds in the fish and shellfish ecology study area comprise of the following species:

- Sandeel;
- Herring;
- Cod;
- Sole;
- Plaice;
- Brown crab; and
- European lobster

7.4.24 Herring spawning grounds are particularly relevant to this project due to the overlap in these grounds with the north-eastern and western tips of the array area and offshore ECC AoS (see Figure 7.4.2). Herring are demersal spawners, preferring to spawn in areas of courser sediment comprised of sandy gravels to gravel. This herring population spawns in autumn, reaching a peak in September and October. There is some variability in the reported location of herring spawning and nursery grounds. Data from Cefas and Marine Scotland shows that the Project overlaps with historical herring spawning grounds. Whereas data from ICES IHLS shows that active spawning areas are situated primarily north and east of the study area (see Figure 7.4.2).

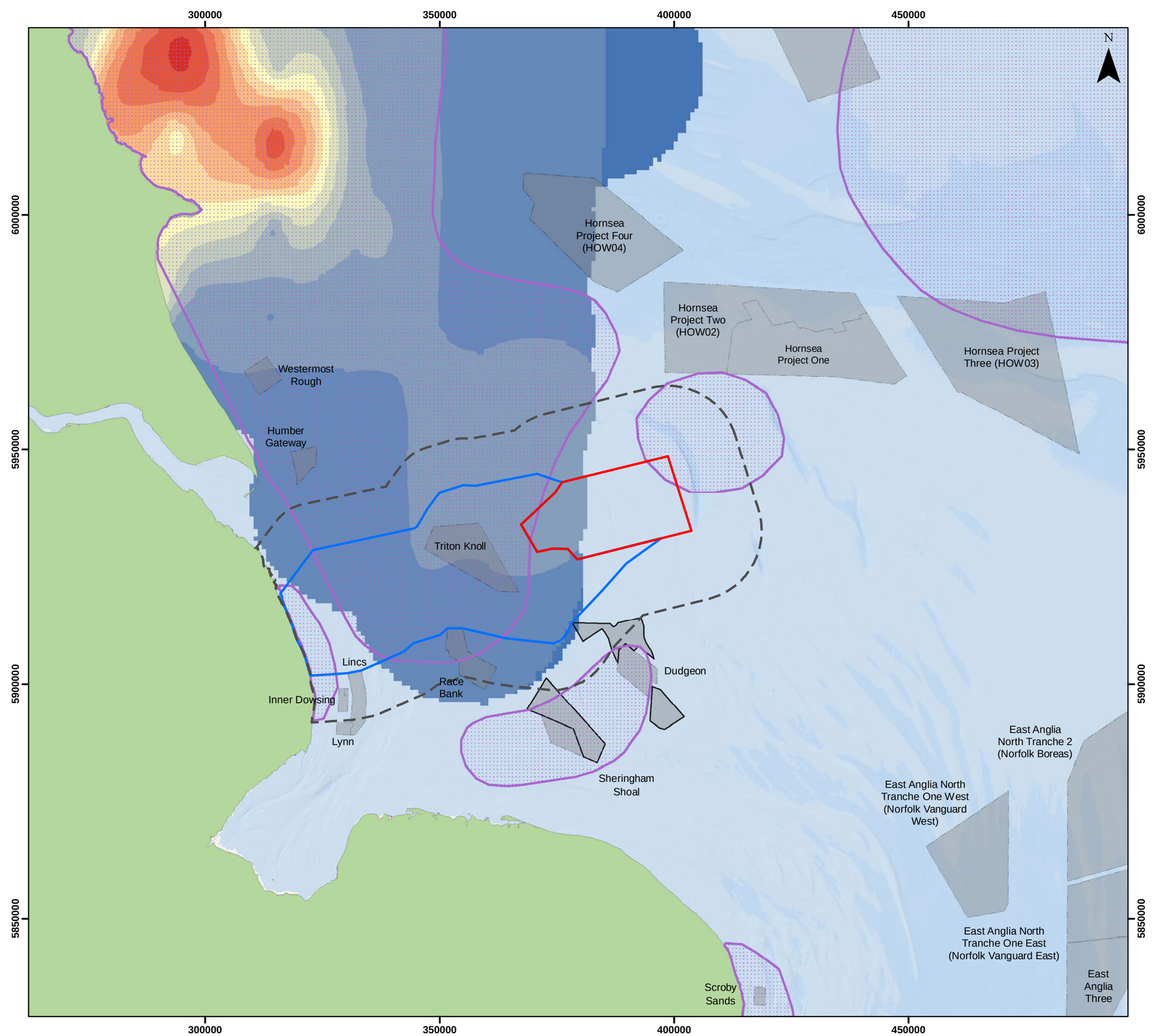
7.4.25 Spawning grounds for lemon sole and low intensity sandeel, cod, plaice and whiting overlap the study area as well as extending over much of the southern North Sea (see Figure 7.4.3). Sandeel are also of particular relevance when considering impacts to spawning areas as they are demersal spawners and are inherently more sensitive to changes to seabed habitats. High intensity sandeel spawning grounds are located to the north-east of the study area.

7.4.26 The spawning grounds for low intensity sandeel, cod and whiting overlap with the full extent of the array area. The array area also overlaps with mackerel spawning grounds in the south-east of the site, with the northern boundary of the array area overlapping a sprat spawning ground and the south-west of the array area overlapping a low intensity sole spawning ground. The current offshore ECC AoS overlaps with low intensity sandeel spawning grounds in its full extent and a large extent of a lemon sole spawning ground. The ECC AoS coincides with a low intensity cod spawning ground in the north-east and a low intensity whiting spawning ground in the south-east.

7.4.27 The fish and shellfish ecology study area coincides with high intensity whiting nursery grounds and low intensity sandeel, whiting, anglerfish, mackerel, plaice, lemon sole, and thornback ray nursery grounds (see Figure 7.4.4). High intensity cod nursery grounds overlap with the full extent of the array area and the north-east area of the offshore ECC AoS. Low intensity mackerel, anglerfish and sandeel nursery grounds overlap the array. The offshore ECC AoS overlaps low intensity plaice, mackerel, lemon sole, whiting, sandeel and thornback ray nursery grounds.

7.4.28 Several shellfish species of commercial importance are known to either spawn or have nursery areas in the southern North Sea. Shellfish spawning in the area includes brown shrimp, pink shrimp and whelk (which spawn in winter) and intense spawning by brown crab as well as European lobster (summer) (Rogers and Stocks, 2001).

7.4.29 In a wider context, the study area for has a spatially limited interaction with a small portion of the overall spawning sites and nursery grounds for these species. The spawning and nursery grounds of these species in the study area form part of far greater spawning and nursery grounds within the North Sea system and are therefore expected to be less impacted by the Project.



Legend

- Site Boundary
- Offshore ECC Area of Search
- Fish and Shellfish Ecology Study Area
- Offshore Wind Farms
- Future Wind Farm Extensions

Spawning Grounds (1998) (Species, Intensity)

- Herring, Undetermined

Total Larval Abundance Per m²

- 0
- 0.1 - 1,500
- 1,500.1 - 6,000
- 6,000.1 - 12,750
- 12,750.1 - 20,500
- 20,500.1 - 28,500
- 28,500.1 - 36,500
- 36,500.1 - 45,500
- 45,500.1 - 55,000
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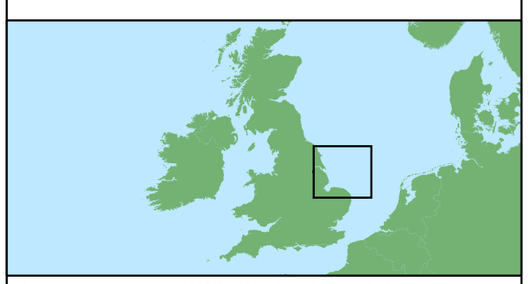
- 66,000.1 - 77,250
- 77,250.1 - 100,000
- 100,000.1 - 120,000



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

Spawning grounds for herring compared to the IHLS data in relation to the Project (Coull et al., 1998)

Figure 7.4.2

OUTER DOWSING OFFSHORE WIND

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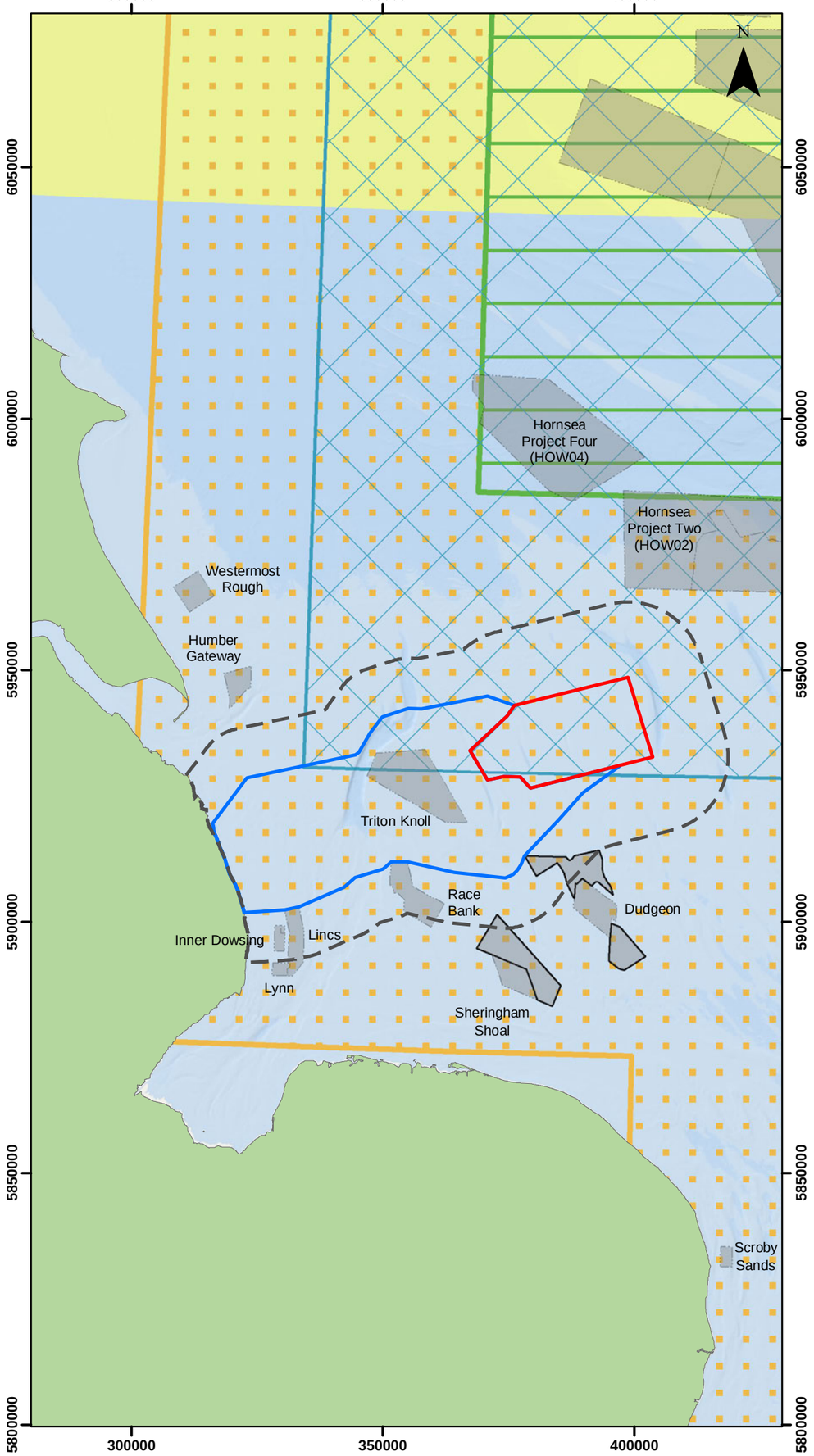
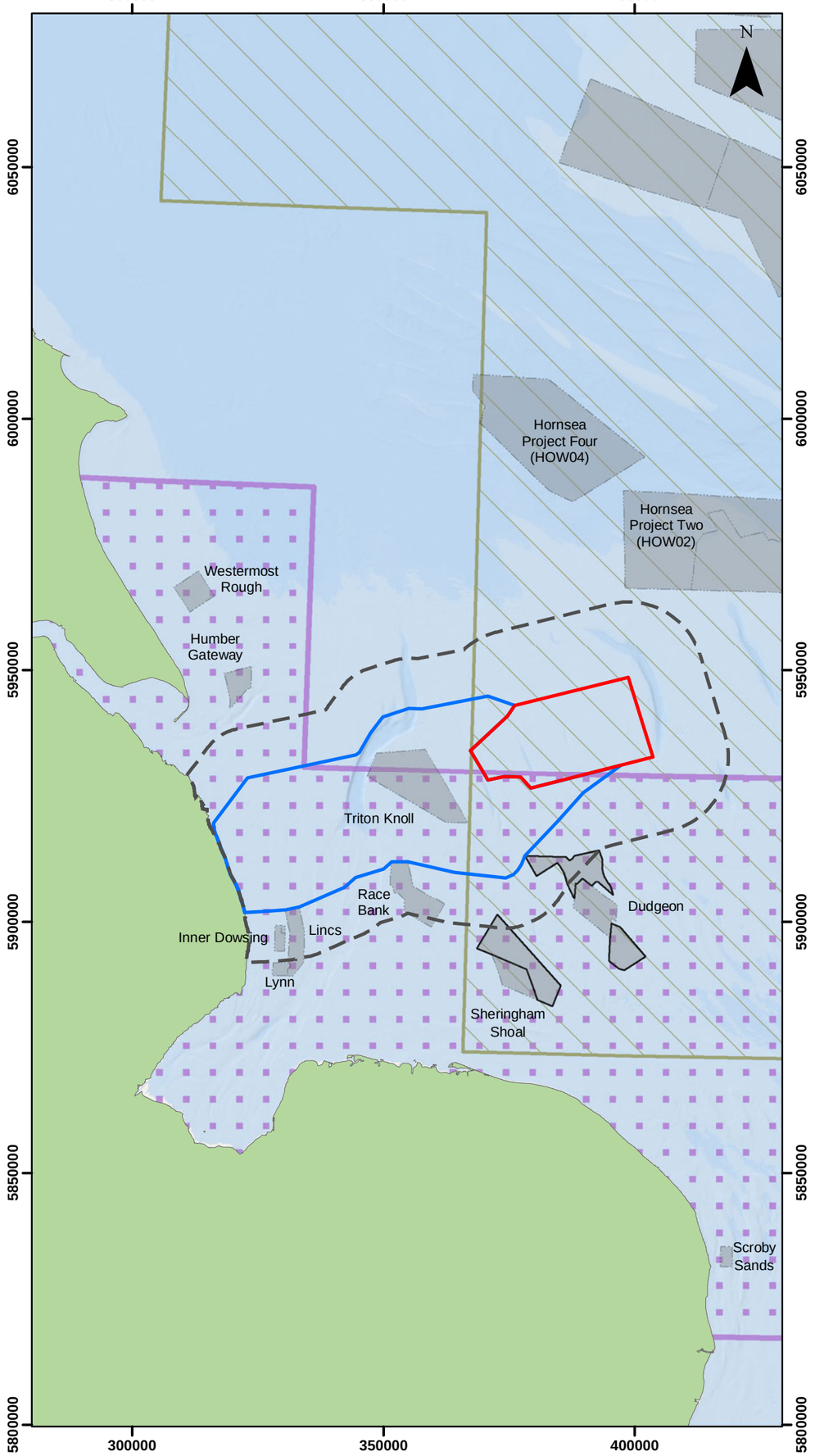


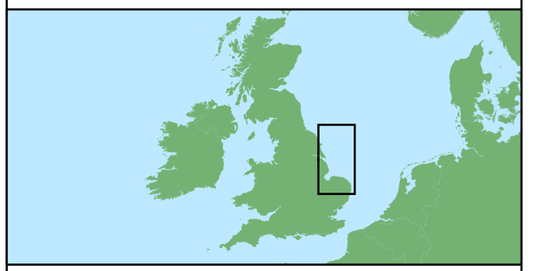


Legend

- Site Boundary
- Offshore ECC Area of Search
- Fish and Shellfish Ecology Study Area
- Offshore Wind Farms
- Future Wind Farm Extensions

Spawning Grounds (2010) (Species, Intensity)

- Cod, L
- Plaice, L
- Sandeel, H
- Sandeel, L
- Sole, L
- Whiting, L



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:1,000,000

Spawning grounds for fish species in relation to the Project (Ellis et al., 2010)

Figure 7.4.3

OUTER DOWSING OFFSHORE WIND

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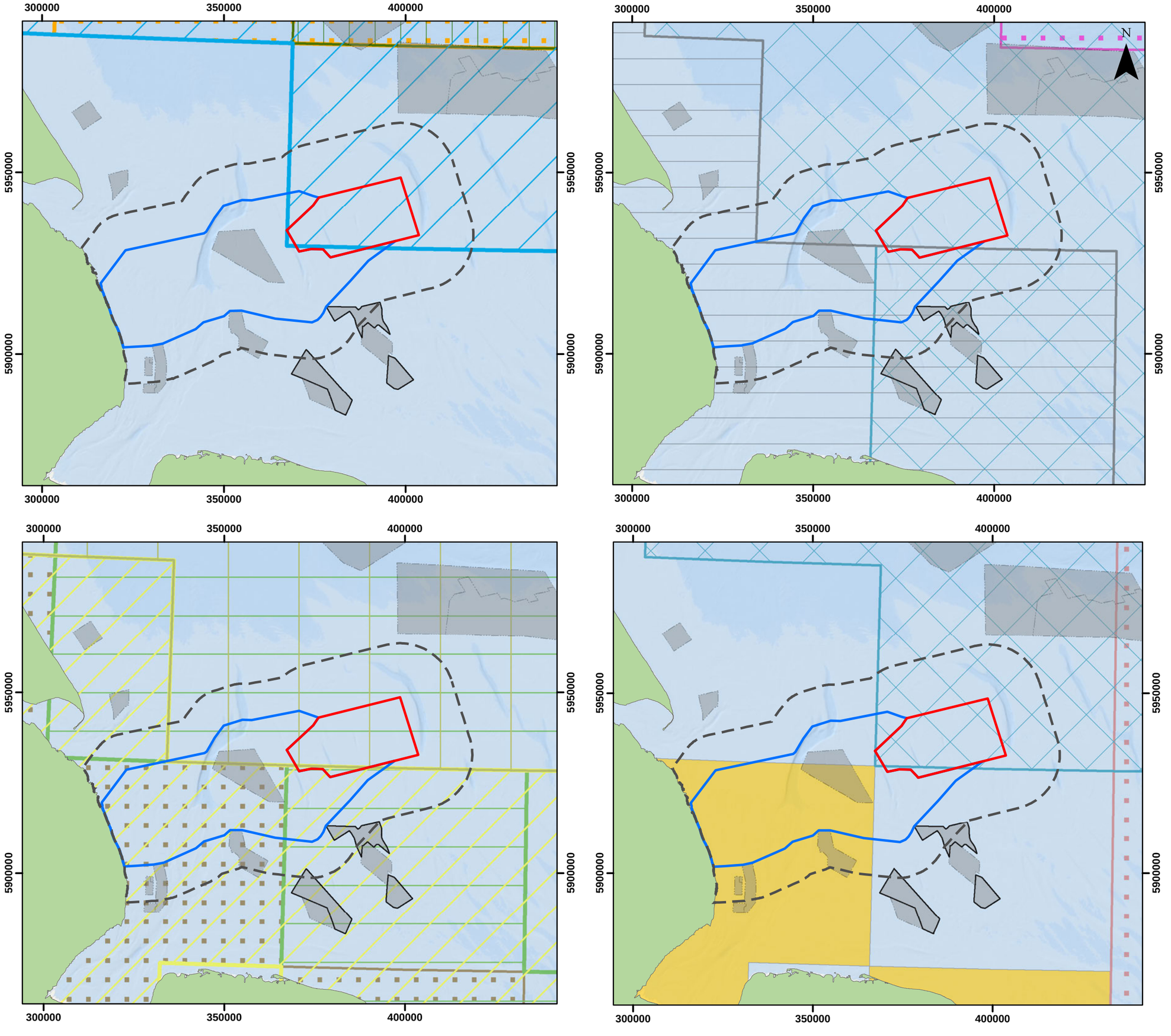
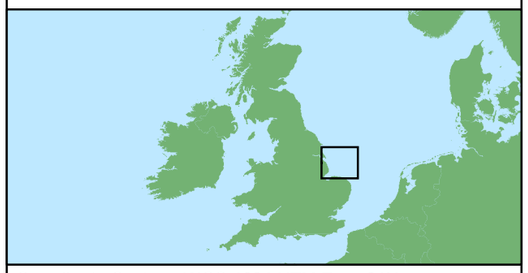


Legend

- Site Boundary
- Offshore ECC Area of Search
- Fish and Shellfish Ecology Study Area
- Offshore Wind Farms
- Future Wind Farm Extensions

Nursery Grounds (2010) (Species, Intensity)

- Anglerfish, L
- Blue whiting, L
- European hake, L
- Plaice, L
- Mackerel, L
- Ling, L
- Sandeel, L
- Sole, L
- Whiting, H
- Whiting, L
- Spurdog, L
- Thornback ray, L
- Tope shark, L



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:1,000,000

Nursery Grounds of Fish Species in relation to the Project (Ellis et al., 2010)

Figure 7.4.4

OUTER DOWSING OFFSHORE WIND

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Designated Sites and Protected Species

Species of Conservation Importance

7.4.30 Within the southern North Sea region, there are records of several marine and estuarine species protected under national, European and international legislation.

7.4.31 Fish species within the study area which are included under the OSPAR list of threatened and/ or declining species, the UK Post-2010 Biodiversity Framework and the International Union for Conservation of Nature (IUCN) Red List are listed below in Table .

Table 7.4.3: Fish species that are protected or considered threatened/ declining, which are potentially present within the array area and wider geographic region.

Legislation	
OSPAR list of threatened and/ or declining species[16]	
Allis shad; Atlantic salmon; Cod; European eel; Porbeagle shark;	Sea lamprey; Spotted ray; Spurdog; and Thornback ray.
UK Post-2010 Biodiversity Framework[17]	
Allis shad (Priority Species); European eel (Priority Species); Lesser sandeel (Priority Species); Mackerel (Priority Species); Plaice (Priority Species);	Porbeagle shark (Priority Species); Spurdog (Priority Species); Tope (Priority Species); and Twaite shad (Priority Species).
IUCN Red List[18]	
Atlantic salmon (Vulnerable); Blonde ray (Near Threatened); European eel (Critically Endangered); Porbeagle shark (Vulnerable);	Spurdog (Vulnerable); Thornback ray (Near Threatened); and Tope (Vulnerable)
Annex II Fish Species EU Habitats Directive (92/43/EEC)	
Allis shad; Atlantic salmon; European eel;	River lamprey; Sea lamprey; and Twaite shad.

7.4.32 Migratory species of conservation importance have the potential to occur within the study area. A number of the key species identified as having the potential to be present within the fish and shellfish ecology study area are listed under conservation legislation (see Table 7.4.3). The Humber Estuary Special Area of Conservation (SAC), just to the north of the ECC AoS includes both the sea lamprey and river lamprey as qualifying designated features.

[16] https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats/fish
[17] https://www.wildlifetrusts.org/wildlife-explorer/marine/fish-sharks-skates-and-rays?page=0
[18] https://www.iucnredlist.org/search?query=Topeshark&searchType=species

7.4.33 On account of the conservation importance of these species to the region, all species listed above are considered to be sensitive receptors and therefore potential impacts on these species from the proposed project will be taken into consideration in the fish and shellfish ecology assessment.

Designated Sites

7.4.34 All designated and protected sites within the study area (Figure 7.4.5), whereby impacts to fish and shellfish receptors could impact the conservation objectives or features of the site by the Project, are described below.

7.4.35 As noted above in paragraph 7.4.32, both sea lamprey and river lamprey are listed as qualifying features of the Humber Estuary SAC, and under the Humber Estuary Ramsar and Humber Estuary Site of Special Scientific Interest (SSSI) designations. These species are known to migrate through the Humber estuary to freshwater spawning habitats.

7.4.36 The Southern North Sea SAC is designated for the Annex II species harbour porpoise *Phocoena phocoena*. The SAC has a conservation objective to maintain the availability of prey habitats and species for the harbour porpoise (which typically consists of non-spiny fish such as herring, whiting and cod, squid and sprat).

7.4.37 The only MCZ of relevance to fish and shellfish receptors with the study area is the Holderness Offshore MCZ which is designated for the Ocean Quahog *Arctica islandica*, a species found in sandy seabed throughout the North Sea.

7.4.38 The Project is aware that a number of proposed Highly Protected Marine Areas are being developed for consultation, which may include the Inner Silver Pit. The extent, specific features and type of restricted activities which may be covered under any designation are currently unknown, however these sites will be appropriately considered in future assessments once this information is available.

Migratory Species

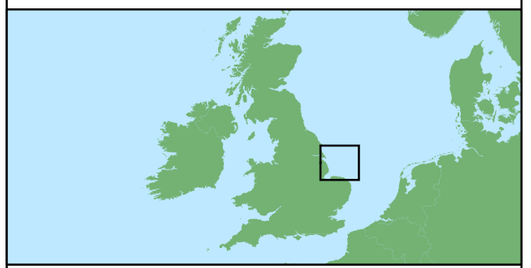
7.4.39 Migratory fish are fish that spend part of their life cycle in freshwater and part in seawater; such species are termed diadromous and anadromous. A number of migratory fish species have the potential to occur in the fish and shellfish study area, migrating to and from rivers and other freshwater bodies in the area which these species use either for spawning habitat (e.g. sea lamprey, river lamprey, twaite shad, allis shad, Atlantic salmon and sea trout) or for growth and development to the adult phase with spawning occurring at sea (i.e. European eel). Sea lamprey[19] and river lamprey[20] are both anadromous species (spawning in freshwater but completing part of their life cycle in the sea) and, as detailed in paragraph 7.4.35 are qualifying designated features of the Humber Estuary SAC.

[19] https://sac.jncc.gov.uk/species/S1095/
[20] https://sac.jncc.gov.uk/species/S1099/

300000
350000
400000
5950000
5900000
N
Flamborough Head
Holderness Inshore
Holderness Offshore
Southern North Sea
Humber Estuary
North Norfolk Sandbanks and Saturn Reef
Inner Dowsing, Race Bank and North Ridge
The Wash and North Norfolk Coast
North Norfolk Coast
Cromer Shoal Chalk Beds
Haisborough, Hammond and Winterton

Legend

- Site Boundary
- Offshore ECC Area of Search
- Fish and Shellfish Ecology Study Area
- Offshore Wind Farms
- Future Wind Farm Extensions
- Special Area of Conservation
- Marine Conservation Zone



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Designated protected areas in relation to the Fish and Shellfish Ecology Study Area

Figure 7.4.5

OUTER DOWSING OFFSHORE WIND

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Proposed Approach to the Environmental Impact Assessment

7.4.40 This section outlines the proposed EIA approach to fish and shellfish ecology. This includes the proposed assessment methodology, relevant embedded mitigation measures, as well as those measures scoped into and out of the assessment.

Proposed Assessment Methodology

7.4.41 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of fish and shellfish ecology will also give due regard to the following guidance documents where they are specific to this topic:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements (Cefas *et al*., 2004);
- Strategic Review of Offshore Windfarm Monitoring Data Associated with FEPA Licence Conditions (Cefas 2010);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy projects (Judd, 2012); and
- Guidance on Environmental Considerations for OWF Development (OSPAR, 2008).
- RenewableUK (2013) Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in OWF.
- Review of post-consent OWF monitoring data associated with licence conditions (MMO 2014b);
- Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report (Popper *et al.,* 2014).
- Information gaps in understanding the effects of noise on fishes and invertebrates (Hawkins *et al*., 2014).
- A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates (Hawkins and Popper, 2016).
- Monitoring Guidance for Underwater Noise in European Seas, Part II Monitoring Guidance Specifications (Dekeling *et al.,* 2014);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase I (Natural England, 2021a);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase III (Natural England, 2021b);

- Overarching National Planning Statement (NPS) for Energy (NPS EN-1) (Biodiversity and Geological Conservation) (Department for Energy and Climate Change (DECC), 2011a), NPS for Renewable Energy (NPS EN-3) (OWF Impacts – Fish) (DECC, 2011b), The UK Marine Policy Statement (HM Government, 2011) along with local planning policies.

7.4.42 In addition, the fish and shellfish ecology EIA will follow the legislative framework as defined by the Conservation of Habitats and Species Regulations 2017, the Conservation of Offshore Marine Habitats and Species Regulations 2017, the Wildlife and Countryside Act 1981 (as amended) and the MCAA 2009 (as amended).

Proposed Approach

7.4.43 To enable the potential impact of the Project to be assessed, a description of the existing fish and shellfish communities, focusing particularly on any areas or features of conservation interest and key life stages/ habitat dependency, will be produced. Potential impacts that may occur on relevant fish and shellfish receptors or associated physical habitat as a result of the planned construction, operation and decommissioning of the Project will then be identified, and an assessment undertaken.

7.4.44 A proportionate approach to the assessment will be adopted with due regard to the MDS. This will include the geographic footprint, the foundations proposed, and the piling hammer energies, etc. alongside the perceived sensitivity of the fish and shellfish receptors. The likely significant effects on receptors will be described, assessed, and, where necessary, measures will be proposed to mitigate the impacts in accordance with the mitigation hierarchy.

7.4.45 The assessment of potential impacts on fish and shellfish receptors will take into account the magnitude and duration of the impact, the reversibility of the impact and the timing and frequency of the activity. The sensitivity of different receptors will also be considered as part of the impact assessment. The sensitivity assessment of the species will take into account the current status of the species, and its importance (locally, regionally, nationally or internationally), alongside the specific vulnerability of each species to the relevant impacts as informed by literature studies and expert opinion.

7.4.46 Cumulative effects will be assessed by taking into consideration any other relevant developments, proposed or existing, that are in the vicinity of the project, and which have the potential to affect the same receptors. Where projects are expected to be completed prior to the construction of the Project, the effects arising from the developments will be considered as part of the baseline and may also be considered as part of the construction and operational cumulative assessment. Projects forming part of the dynamic baseline, and those included in the cumulative assessment will be clearly identified in the PEIR and the ES.

Relevant Embedded Mitigation Measures

7.4.47 As part of the project design process, several designed-in measures have been proposed to reduce the potential for impacts on environmental receptors. The current, relevant embedded mitigation measures in relation to fish and shellfish ecology are listed as follows:

- All cables will be buried where possible to reduce the risk of electromagnetic field (EMF) impacts on sensitive receptors.

- Undertake a cable burial risk assessment for cable protection and detailed within the Cable Specification and Installation Plan.
- A SPMP will be developed. It will include details of the need, type, quantity and installation methods for scour protection.
- Soft starts used during piling operation with lower hammer energies being used initially. These will gradually be increased to higher energies.
- A PEMP and Decommissioning Plan will be produced and followed. These will cover construction, operation, maintenance and decommissioning of the Project and will include a MPCP. This MPCP will outline measures to safeguard the marine environment and species present in the event of an oil spill. This will include potential contaminant releases and authorities that should be contacted and notified should a spill event occur.

Potential Impacts Scoped In

7.4.48 A range of potential impacts on fish and shellfish ecology have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.4.4, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 7.4.4: Impacts proposed to be scoped into the assessment for fish and shellfish ecology

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (such as Modelling)
Construction		
Mortality, injury and behavioural changes resulting from underwater noise arising from construction activity.	Subsea noise resulting from piling activity and other construction related activities (e.g. UXO, dredging, vessels, cable laying, etc.) has the potential to result in physical and behavioural impacts to the fish and shellfish communities within the study area.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. The effects on relevant fish and shellfish species from underwater noise will be considered and informed by underwater noise modelling to predict the likely scale of impact from noise generating activities which will be used to determine the potential magnitude of effect on the fish and shellfish communities, including to spawning and nursery grounds, with due regard to the perceived sensitivity of each receptor, by reference to e.g. Popper *et al.,* 2014 criteria.
Increase in SSC and sediment deposition	Sediment disturbance may arise from a range of construction activities, such as for example, foundation installation and cable installation. Sediment disturbance from foundation installation may comprise the disposal of drill arisings following WTG installation or seabed preparation. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on fish and shellfish receptors and key habitats.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table , identifying the key receptors for the assessment process. The effects on demersal spawning fish (e.g. herring and sandeel) (inclusive of eggs and larvae), as well as other key receptors such as key shellfish species and migratory fish species, from increased SSC and deposition, will be considered and will be informed by the findings and assessment reported within the Marine Processes assessment (see Section 7.2) and including consideration of PSA data collected as part of the site-specific surveys.

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (such as Modelling)
Temporary seabed habitat loss/ disturbance.	There is potential for temporary, direct habitat loss and disturbance due to seabed preparation works for foundations and cable laying operations (including anchor placements and jack-up operations).	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1 identifying the key receptors for the assessment process. Details of the seabed habitat will also be included in the assessment (see Section 7.3). The effects on fish and shellfish receptors (inclusive of eggs and larval stages) as well as other key receptors such as key shellfish species and migratory fish species, from direct habitat loss/ disturbance, will be considered.
Direct and indirect seabed disturbances leading to the release of sediment contaminants	Potential effects from construction may arise from sediment resuspension; whilst in suspension, there is the potential for sediment-bound contaminants, such as metals, hydrocarbons and organic pollutants, to be released into the water column and lead to an effect on fish and shellfish receptors.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. The effects on fish and shellfish receptors (inclusive of eggs and larval stages) will be considered separately for the array and the ECC when finalised, and potential interactions considered. Existing data (sourced from the BGS) and site-specific sediment sampling and contaminants analysis undertaken for nearby projects will be used to inform this assessment along with new site-specific sediment data that will be collected as part of a benthic survey planned for the Project, including data from the Marine Water and Sediment Quality Assessment (see Section 7.2).
Direct damage (e.g. crushing) and disturbance to mobile	Direct damage and disturbance will be a likely occurrence from the foundation and cable seabed preparation, the use of jack-ups and anchored	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (such as Modelling)
demersal and pelagic fish species.	vessels and installation works during construction. Some species, such as sandeel, herring, brown crab, European lobster and Nephrops are more vulnerable than other species.	and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. Impacts on sensitive fish and shellfish species will be considered in terms of the potential magnitude of effect on the fish and shellfish communities, including to spawning and nursery grounds, the sensitivity of the receptors and their regional and/ or conservation importance.
Operation and Maintenance		
Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection.	Potential effects during operation will mostly result from the physical presence of infrastructure (e.g. foundations, scour protection, cable protection, etc.) which will result in long-term habitat loss. This has the potential for impacts on substrate-dependent fish and shellfish, in particular those that have substrate-specific spawning behaviours (e.g. herring and sandeel).	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. Impacts on sensitive fish and shellfish species will be considered in terms of long-term loss of spawning habitats and impacts on species of conservation importance. The area of habitat loss will be defined using a worst-case scenario to determine the maximum loss of seabed, and the potential loss of herring and sandeel spawning grounds.
Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection	Potential effects during operation may result from the introduction of infrastructure such as, for example, foundations, scour protection material and cable protection will result in the introduction of hard substrate. The increased structural complexity from the introduced infrastructure may also provide a habitat or refuge for fish and shellfish species (Hoffman *et al.*, 2000).	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. The potential for impacts on fish and shellfish receptors will be considered in terms of effects on biodiversity and productivity. The potential for effects from the introduction of non-indigenous and invasive species will also be addressed

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (such as Modelling)
		with cross-reference to the benthic subtidal and intertidal ecology assessment. The MDS for the area of introduction of hard substrate will be defined to determine the maximum area of impact.
EMF effects arising from cables.	Underwater cabling necessary for windfarm operation can produce EMF which has the potential to affect the behaviour of EMF sensitive species such as Elasmobranchs. These impacts are usually limited to the immediate cable area and the resulting impacts are considered minor (Normandeu *et al.*, 2011).	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. A desk-based literature review of existing data and past studies of EMF which model varying scenarios (e.g. Hutchison *et al.*, 2021) will be conducted to gain an understanding of the likely magnitude of the effect on fish and shellfish communities.
Underwater noise as a result of operational turbines.	Underwater noise as a result of operational turbines and maintenance vessel traffic has the potential to result in effects on fish and shellfish receptors.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1, identifying the key receptors for the assessment process. A desk-based literature review of existing data and past studies of underwater noise associated with operational OWFs will be conducted to gain an understanding of the likely magnitude of the effect on fish and shellfish communities.
Decommissioning		
The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase and will therefore be assessed in the same way as set out above, however, there will also be an assessment of the loss of additional habitat arising from the removal of any infrastructure that have been used by fish and shellfish communities during the operational phase of the project.		

Impact	Description	Proposed Approach to Assessment including Description of any New Data Collation Required and any Analyses (such as Modelling)
Cumulative		
Mortality, injury and behavioural changes resulting from underwater noise arising from construction activity.	Subsea noise resulting from piling activity and other construction related activities (e.g. UXO, dredging, vessels, cable laying, etc.) has the potential to result in physical and behavioural impacts to the fish and shellfish communities within the study area.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1 identifying the key receptors for the assessment process. The effects on relevant fish and shellfish species from underwater noise will be considered and informed by underwater noise modelling to predict the likely scale of impact from noise generating activities which will be used to determine the potential magnitude of effect on the fish and shellfish communities, including to spawning and nursery grounds, with due regard to the perceived sensitivity of each receptor, by reference to e.g. Popper *et al.,* 2014 criteria.
Increase in SSC and sediment deposition	Sediment disturbance may arise from a range of construction activities, such as for example, foundation installation and cable installation. Sediment disturbance from foundation installation may comprise the disposal of drill arisings following WTG installation or seabed preparation. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on fish and shellfish receptors and key habitats.	The baseline characterisation for the fish and shellfish ecology assessment will be developed using the information and sources listed in Table 7.4.1 identifying the key receptors for the assessment process. The effects on demersal spawning fish (e.g. herring and sandeel) (inclusive of eggs and larvae), as well as other key receptors such as key shellfish species and migratory fish species, from increased SSC and deposition, will be considered and will be informed by the findings and assessment reported within the Marine Processes assessment (see Section 7.2) and including consideration of PSA data collected as part of the site-specific surveys.

Impacts Proposed to be Scoped Out

7.4.49 Based on the baseline information currently available and the project description (outlined in Section 3) a number of potential impacts are proposed to be scoped out of the EIA for fish and shellfish ecology. These impacts are outlined in Table 7.4.5, together with a justification for scoping them out.

Table 7.4.5: Impacts proposed to be scoped out of assessment for fish and shellfish ecology

Impact	Justification for Scoping out
Construction, Operation and Maintenance and Decommissioning	
Accidental pollution during construction stage (Construction, Operation and Maintenance and Decommissioning)	Implementation of PEMMP will be used to mitigate and manage any potential pollution events. Species lifecycle and behaviour determines sensitivity to pollution. For example, highly mobile species are less sensitive to spills.
Direct disturbance resulting from O&M activities (Operation and Maintenance)	The operational disturbance will be limited in spatial extent and length of time. Therefore, the impact on species in the area is considered minor and has been scoped out.
Impacts on fishing pressure due to displacement (Construction, Operation and Maintenance and Decommissioning)	Information will be collated as part of the Commercial Fisheries assessment of the EIA. However, the operational disturbance will be limited in spatial extent, with the risk of displacement considered minor. Therefore, subject to consultation with the Statutory Nature Conservation Bodies (SNCBs) and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish ecology.
Cumulative	
The impacts scoped into the assessment for the Project alone, are generally spatially restricted to within the near field of the array and the offshore ECC. With the exception of those impacts identified in Table 7.4.4, it is proposed that all other impacts with limited spatial extent, where not having an effect on a designated species, site or feature, are scoped out of further assessment within the EIA.	

Potential Transboundary Effects

7.4.50 The localised nature of the impacts arising from the Project upon fish and shellfish populations (including those giving rise to the greatest footprint of effect such as underwater noise from piling) means that effects on the EEZ of other member states would not be expected to occur. It is therefore suggested that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

7.4.51 The proposed approach to PEIR and ES with regards to the study area, method of assessment and data to inform assessment have been identified in this section and Table 7.4.1 of this section.

7.4.52 The proposed approach to the assessment for fish and shellfish ecology PEIR chapter will first include the definition of the worst-case scenarios on which the assessments will be based. The geographic footprint of the Project and the impacts resulting from any changes to physical processes, including scour effects and changes in the sediment transport will be key considerations in defining the worst-case scenarios for fish and shellfish ecology receptors. As part of the assessment for Fish and Shellfish Ecology PEIR chapter, the scope for CEA will be developed and projects forming part of the dynamic baseline, and those included in the cumulative assessment will be clearly identified in the PEIR and the ES.

7.4.53 Characterisation of the fish and shellfish ecology study area will be informed by a more detailed interrogation of extant data and full analysis of the benthic, PSA and geophysical survey data to identify relevant habitats such as spawning potential for herring and sandeel.

7.4.54 Consultation will be held with relevant statutory and non-statutory organisations as necessary and as part of the EPP which is set out in Section 6. Key consultees of relevance to the fish and shellfish assessment include Natural England, MMO, Cefas, the relevant IFCA; The Wildlife Trusts; and the Lincolnshire Local Wildlife Trust, along with representatives from the commercial fishing industry. Key consultees associated with commercial fisheries are provided in Section 7.8.

7.4.55 Consultee responses with regard to fish and shellfish ecology will be considered in developing the final scope of the fish and shellfish ecology assessments in the PEIR and ES chapters.

7.4.56 Of note, a noise propagation model will be undertaken to take into account the worst-case design parameters associated with percussive piling. The model and parameters used in the EIA will be discussed through the aspect specific ETG as part of the EPP. It is anticipated that species sensitivity as set out in Popper *et al.,* 2014, will be applied to determine the potential effects on species based on estimated areas of potential injury and disturbance for fish and shellfish species.

Further Consideration for Consultees

7.4.57 Please find below specific scoping questions relevant to the topic of fish and shellfish ecology:

- Do you agree that the data sources identified are sufficient to inform the fish and shellfish ecology baseline for the PEIR and ES?
- Have all potential impacts resulting from the Project been identified for fish and shellfish receptors?
- Do you agree that the impacts described in Table 7.4.5can be scoped out?
- For those impacts scoped in Table 7.3.3 do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on fish and shellfish receptors?
- Do you have any specific requirements for the fish and shellfish ecology modelling methodology?

7.5 Marine Mammals

Introduction

7.5.1 This section of the Scoping Report identifies the marine mammal elements of relevance to the array area and offshore ECC corridor AoS. This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on marine mammals and sets out the proposed scope of the EIA.

Study Area

7.5.2 The marine mammal study area varies depending on the species, considering individual species ecology and behaviour. For all species, the study area covers the array area and offshore ECC corridor AoS and is extended over an appropriate area considering the scale of movement and population structure for each species. For each species, the area considered in the assessment is largely defined by the appropriate species Management Unit (MU) (defined by the Inter Agency Marine Mammal Working Group, IAMMWG) (IAMMWG, 2021). The study area for marine mammals has been defined at two spatial scales: the MU scale for species specific population units and the site-specific survey areas for an indication of the local densities of each species.

7.5.3 At the MU scale, the Project is located within the following species specific MUs:

- Harbour porpoise: North Sea MU;
- White-beaked dolphin: Celtic and Greater North Seas MU;
- Bottlenose dolphin: Greater North Sea MU;
- Minke whale: Celtic and Greater North Seas MU;
- Grey seals: Southeast England MU (given the typical ranging patterns of grey seals, it is recommended that the MU adopted in the impact assessment is a combination of the Southeast and Northeast England MUs); and
- Harbour seals: Southeast England MU.

7.5.4 The site-specific survey area for all marine mammals is the array area plus a 4 km buffer.

Baseline Environment

Baseline Data Sources

7.5.5 Table 7.5.1 provides an overview of the existing data that are available for marine mammals from desk-based review and details of ongoing survey work.

Table 7.5.1: Key sources of information for marine mammals

Source	Summary	Spatial Coverage
Site-specific surveys	HiDef digital aerial surveys (March 2021 – February 2023). Note: only March 2021 – February 2022 data were available for scoping.	Array area plus a 4 km buffer.
Site-specific geophysical surveys	MMO and PAM detections during surveys conducted between August 2021 – January 2022	Array area plus 500 m buffer. Plus coverage of the Silver Pit area to the west of the array.
Seal habitat preference maps (Carter *et al.,* 2020)	Density surface based on telemetry and count data.	UK waters.
Small Cetaceans in European Atlantic waters and the North Sea (SCANS) III (Hammond *et al.,* 2021)	Aerial and vessel visual surveys for cetaceans, June and July 2016.	All European Atlantic waters. The Project is located in block O.
Joint Cetacean Protocol (JCP) Phase III (Paxton *et al.,* 2016)	Aerial, vessel and land-based surveys, 1994 - 2010.	UK waters. Nearest areas of commercial interest for which data are available are: Norfolk Bank and South Dogger Bank.
Harbour porpoise densities (Heinänen and Skov, 2015)	Vessel and aerial surveys, 1994 – 2011.	UK waters.
Marine Ecosystems Research Programme (MERP) maps (Waggitt *et al.,* 2020)	Collation of data from JCP (aerial and vessel), 1980 – 2018.	European Atlantic Waters.
Special Committee on Seals (SCOS) seal haul-out counts (SCOS, 2021)	August haul-out surveys of harbour and grey seals.	UK wide.
Seal telemetry data provided by the Sea Mammal Research Unit (SMRU)	Data on movement of both harbour and grey seals from tagged individuals.	UK wide.
The Wildlife Trust (TWT) data	Unknown at this stage. TWT will be contacted to obtain any marine mammal data for the relevant area.	
Sea Watch Foundation data	Unknown at this stage. The Sea watch Foundation will be contacted to obtain any marine mammal data for the relevant area.	
Nearby OWFs	Site-specific data collated at nearby OWFs: Dudgeon & Sheringham Shoal Extensions	Offshore wind farm array areas plus buffer (varies by site).

Source	Summary	Spatial Coverage
	Race Bank Triton Knoll Sheringham Shoal Dudgeon Docking Shoal Lincs Lynn Inner Dowsing	

Overview of the Baseline Environment

7.5.6 This section provides a high-level summary of the baseline characterisation of the receiving environment and a high-level summary of the existing environment and key receptors.

Harbour Porpoise

7.5.7 The population estimate for the North Sea MU based on SCANS III data is 346,601 harbour porpoises (95% CI: 289,498 – 419,967) (IAMMWG, 2021). The conservation status of harbour porpoises in UK waters has been updated in JNCC (2019a) which concludes a favourable assessment of future prospects and range, but an unknown conclusion for population size and habitat. This resulted in an overall assessment of conservation status of "Unknown" and an overall trend in conservation status of "Unknown". A trend analysis indicates that the harbour porpoise abundance in the North Sea is stable and has not changed since 1994, although the associated confidence intervals are quite wide.

7.5.8 Harbour porpoises were the most frequently sighted marine mammal species in the site-specific baseline surveys to date (March 2021 – February 2022) consisting of 576 sightings (89% of the marine mammal sightings). Additionally, harbour porpoises have been identified during the project-specific geophysical surveys. During surveys of nearby windfarms (including Triton Knoll, Inner Dowsing, Lynn, Race Bank, Dudgeon and Sheringham Shoal) harbour porpoises were frequently, the most commonly sighted marine mammal in both boat-based and aerial surveys.

7.5.9 The Project is located within SCANS III Block O where there was an estimated density of 0.888 harbour porpoises/km^2 (Hammond *et al.,* 2021). Paxton *et al.* (2016) used the JCP dataset to provide estimates of the density of harbour porpoises at South Dogger Bank and Norfolk Bank (neither area overlaps directly with the Project but are located to the north and south of the Project array area). At South Dogger Bank, density is estimated to be greatest during winter at 1.292 harbour porpoises/km^2 (95% CI: 0.878 – 1.847) and lowest during autumn at 0.351 harbour porpoises/km^2 (95% CI: 0.260 – 0.520). The same seasonal pattern in density is estimated at Norfolk Bank, albeit at an overall lower density, with 0.958 harbour porpoises/km^2 (95% CI: 0.490 – 1.833) during winter and 0.280 harbour porpoises/km^2 (95% CI: 0.126 – 0.595) in autumn.

7.5.10 The Project is located partially within the summer portion of the Southern North Sea SAC for harbour porpoises which was identified as being a discrete and persistent area of high porpoise density (Heinänen and Skov, 2015). The year-round high density in this area has also been demonstrated by the analyses presented in Waggitt *et al.* (2020), with peak breeding season between May and August.

7.5.11 It is expected that harbour porpoises will be present year-round in the array area and ECC AoS, and as such will be included in the quantitative impact assessment that will be presented as part of PEIR and ES.

White-Beaked Dolphin

7.5.12 The population estimate for the Celtic and Greater North Seas MU based on SCANS III data is 43,951 white beaked dolphins (95% CI: 28,439 – 67,924) (IAMMWG, 2021). The conservation status of white beaked dolphin in the UK concludes a favourable assessment of range, but an unknown conclusion for all other factors. This results in an "Unknown" overall assessment of conservation status.

7.5.13 A total of four white-beaked dolphins have been identified in the site-specific baseline surveys to date (March 2021 – February 2022) (<1% of the marine mammal sightings). All four were sighted in March 2021. No white beaked dolphins were recorded during surveys of nearby windfarms using aerial or boat-based methods.

7.5.14 Within SCANS III Block O, there was an estimated density of 0.002 white beaked dolphin/km^2 (Hammond *et al.,* 2021). Paxton *et al.* (2016) used the JCP dataset to provide estimates of the density of white-beaked dolphin at South Dogger Bank and Norfolk Bank during all seasons (neither area overlaps directly with the Project but are located to the north and south of the site). At South Dogger Bank, spring density estimates were highest at 0.050 white beaked dolphin/km^2 (95% CI: 0.020 – 0.126) and winter density estimates were lowest at 0.012 white beaked dolphin/km^2 (95% CI: 0.006 – 0.027). At Norfolk Bank, spring densities were also estimated as the highest at 0.005 white beaked dolphin/km^2 (95% CI: 0.002 – 0.015), although all densities were low with all other seasons estimated at <0.002 white beaked dolphin/km^2. Density distribution maps from Waggitt *et al.* (2020) show a clear pattern of higher densities within the northern North Sea, particularly around the coast of Scotland, with densities decreasing southwards along the east coast of England.

7.5.15 It is expected that white-beaked dolphins will be present year-round in the vicinity of the Project (though in relatively low numbers), and as such will be included in the quantitative impact assessment that will be presented as part of the PEIR and ES.

Bottlenose Dolphin

7.5.16 The population estimate for the Greater North Sea MU based on SCANS III is 2,022 bottlenose dolphins (95% CI: 548 – 7,453) (IAMMWG, 2021). The conservation status of bottlenose dolphin in the UK concludes a favourable assessment of range, but an unknown conclusion for all other factors, resulting in an "Unknown" overall assessment of conservation status.

7.5.17 No bottlenose dolphins have been identified in the site-specific baseline surveys to date (March 2021 – February 2022). A single bottlenose dolphin was observed at Triton Knoll, but no observations were made during other site-specific surveys at nearby windfarms.

7.5.18 Within SCANS III Block O, there were no bottlenose dolphins observed during aerials surveys in 2016 (Hammond *et al.,* 2021). Paxton *et al.* (2016) used the JCP dataset to provide estimates of the density of bottlenose dolphin at South Dogger Bank and Norfolk Bank during all seasons (neither area overlaps directly with the Project but are located to the north and south of the site). All bottlenose dolphin density estimates at both locations were <0.002 bottlenose dolphin/km^2. Sightings of bottlenose dolphins in the southern North Sea are generally considered to be movements of the east coast of Scotland resident population at the most southerly extent of their range (Thompson *et al.,* 2011, Quick *et al.,* 2014).

7.5.19 It is expected that bottlenose dolphins will be present in the vicinity of the Project (though in relatively low numbers), and as such will be included in the quantitative impact assessment that will be presented as part of the PEIR and ES.

Minke Whale

7.5.20 The population estimate for the Celtic and Greater North Seas MU based on SCANS III data is 20,118 minke whales (95% CI: 14,061 – 28,786) (IAMMWG, 2021). The conservation status of minke whale in the UK concludes a favourable assessment of range, but an unknown conclusion for all other factors, resulting in an "Unknown" overall assessment of conservation status.

7.5.21 No minke whales have been identified in the site-specific baseline surveys to date (March 2021 – February 2022). One minke whale was observed during the Dudgeon and Sheringham Shoal Extension site-specific surveys (2018-2020), but none were observed during surveys of other nearby windfarms.

7.5.22 Within SCANS III Block O, there was an estimated density of 0.0100 minke whale/km^2 (Hammond *et al.,* 2021). Paxton *et al.* (2016) used the JCP dataset to provide estimates of the density of minke whale at South Dogger Bank and Norfolk Bank during all seasons (neither area overlaps directly with the Project but are located to the north and south of the site). At South Dogger Bank, summer density estimates are anticipated to be highest at 0.022 minke whale/km^2 (95% CI: 0.012 – 0.070). Densities in all other seasons were estimated at <0.005 minke whale/km^2. At Norfolk Bank, summer densities were also estimated as the highest at 0.002 minke whale/km^2 (95% CI: 0.001 – 0.008), although all densities were low with all other seasons estimated at <0.001 minke whale/km^2. The density distribution maps produced by Waggitt *et al.* (2020) show high density within the northern North Sea, with densities decreasing southwards along the east coast of England, being rare south of Humberside. Densities are estimated to be highest in July (Waggitt *et al.,* 2020).

7.5.23 Minke whales are considered to be summer visitors to the Project area, and as such will be included in the quantitative impact assessment that will be presented as part of the PEIR and ES.

Harbour Seal

7.5.24 The overall conservation status of harbour seals in UK waters has been assessed as unfavourable – inadequate with an "Unknown" overall trend in conservation status (JNCC, 2019c). The most recent August haul out data for harbour seals in the Southeast England MU is from 2016-2019 where 3,752 harbour seals were counted (SCOS, 2021). The 2019 count data can be scaled by the estimated proportion hauled-out (0.72, 95% CI: 0.54-0.88; Lonergan *et al.,* 2013) to provide an estimate of 5,211 harbour seals in the Southeast England MU in 2019 (95% CI: 4,263 –6,948). The 2019 count for the Southeast England MU was 27.6% lower than the mean count between 2012-2018, which may represent the first indication of a population decline and SCOS recommend that research is required to determine the time course and potential causes of this reduction (SCOS, 2021).

7.5.25 A total of 24 harbour seals have been identified in the site-specific baseline surveys to date (March 2021 – February 2022) (4% of the marine mammal sightings). Additionally, harbour seals have been identified during the site-specific geophysical surveys. During surveys of nearby windfarms (including Triton Knoll, Lincs, Dudgeon and Sheringham Shoal Extensions), harbour seals were observed from boat-based surveys. Seals were also sighted during aerial surveys at Lincs; although species identification could not be determined.

7.5.26 The habitat preference maps (Carter *et al.,* 2020) show a high density area harbour seals extending out of the Wash SAC (Figure 7.5.1). Since this species is mostly found in the more coastal waters, the predicted densities within the array area are much lower than those predicted near the Wash, with maximum densities within the array area of 0.21 harbour seals/km^2 (extracted from Carter *et al.,* 2020).

7.5.27 The ECC corridor AoS is located just north of the high density areas that extends seaward from The Wash SAC; however, it is ~5 km from the closest harbour seal haul-outs located within the SAC (outer Knock and outer Dogs Head) (Figure 7.5.1). The impact assessment will assess the potential for construction related activities to result in barrier effects to the movement of harbour seals out of the Wash SAC, but it is unlikely that any project-related activity will impact directly on harbour seal haul-outs.

7.5.28 A total of 86 harbour seals have been tagged in the Southeast England MU since 2003. Most of these (67) were tagged in the Wash, while some (19) were tagged in the Thames area (mainly Margate and Hadley Sands). The telemetry data show a large degree of connectivity between the array area and the Wash SAC, and reasonably high densities of tracks within the array area. Harbour seals are expected to be present year-round in the Project area, and as such will be included in the quantitative impact assessment that will be presented as part of the PEIR and ES.

300000
350000
400000
5950000
5900000
5850000
N

Legend

- Site Boundary
- Offshore ECC Area of Search
- Harbour Seal SAC

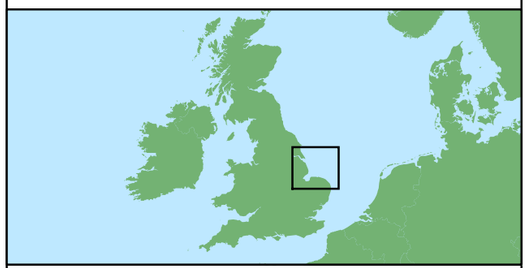
Harbour Seal Haul-out Counts 2019

- 1-5
- 6-10
- 11-15
- 16-50
- 51-100
- >100

% British Isles Harbour Seal At-Sea Population per cell

- 0.00
- 0.00 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- >0.05

Seal haul-out data from SMRU
Seal at-sea distribution from Carter et al. (2020)



Coordinate System: WGS 1984 UTM Zone 31N

0 20 40 km

Scale: 1:600,000

Harbour Seal At-Sea Distribution and August Haul-out Counts

Figure 7.5.1

OUTER DOWSING OFFSHORE WIND

Date: 20/07/2022
Produced By: RRS
Revision: 0.1

GoBe

Grey Seal

7.5.29 The overall assessment of conservation status of grey seals in UK waters has been assessed as "Favourable" with an overall improving trend in conservation status (JNCC 2019b) and population modelling for regularly monitored grey seal breeding colonies across the UK show an increasing trend of 2% p.a. (SCOS, 2021).

7.5.30 The most recent haul out data for grey seals from 2016-2019 in the Northeast England MU is 6,501 seals and in the Southeast England MU 8,667 seals (SCOS, 2021). Given the wide-ranging nature of grey seals and the large degree of movement between the northeast and southeast of England, it is not appropriate to consider these MUs as a discrete population unit in isolation. Therefore, the relevant population against which to assess impacts should be the combined Southeast and Northeast England MUs, resulting in an MU with an estimated 15,168 grey seals. The combined estimated MU size can be scaled by the estimated proportion of grey seals hauled out (0.239, 95% CI: 0.192 - 0.286; Russell *et al.,* 2016a) to produce an estimate of 63,464 grey seals in the Southeast and Northeast England MUs combined (95% CI: 53,035 – 79,000).

7.5.31 The estimated large number of grey seals can be partially attributed to Donna Nook and the Farne Islands which represent significant breeding sites on the east coast of England. Grey seals in eastern England spend the greatest amount of time hauled out during the moulting season (December to April) and breeding season (early November to mid-December) (SCOS, 2021). Consequently, densities of grey seals at sea will typically be lower during these time periods.

7.5.32 The habitat preference maps (Carter *et al.,* 2020) show a high density area for grey seals extending from the Humber Estuary SAC to the Wash (Figure 7.5.2). The Project is located on the edge of this higher density area and the density of grey seals within the array area reaches a maximum of 1.16 seals/ km^2 (extracted from Carter *et al.,* 2020).

7.5.33 The ECC corridor AoS overlaps the main high density area that extends seaward from The Humber Estuary SAC, is located 2 km from the SAC boundary, and is ~6 km from the closest grey seal haul-outs located within the SAC (Donna Nook) (Figure 7.5.2). The impact assessment will assess the potential for construction related activities to result in barrier effects to the movement of grey seals out of the Humber Estuary SAC, but it is unlikely that any project-related activity will impact directly on grey seal haul-outs.

7.5.34 A total of 33 grey seals have been tagged in the southeast England MU since 1988. Most of these (23) were tagged at Donna Nook, while the remaining 10 were tagged at Blakeney. The telemetry data show that while there is a high density of tracks extending out of the Humber Estuary SAC, primarily in a northerly direction, there is comparably low numbers of tracks recorded through the array area.

7.5.35 A total of 41 grey seals have been identified in the site-specific baseline surveys to date (March 2021 – February 2022) (6% of the marine mammal sightings). Additionally, grey seals have been identified during the site-specific geophysical surveys. During surveys of nearby wind farms (including Triton Knoll, Lincs, Dudgeon and Sheringham Shoal Extensions) grey seals have been observed from surveys at all sites. Seals were also sighted during aerial surveys at Lincs; although species identification could not be determined.

7.5.36 Grey seals are expected to be present year-round in the Project area, and as such will be included in the quantitative impact assessment that will be presented as part of the PEIR and ES.

300000
350000
400000
5950000
5900000
5850000
N

Legend

- Site Boundary
- Offshore ECC Area of Search
- Grey Seal SAC

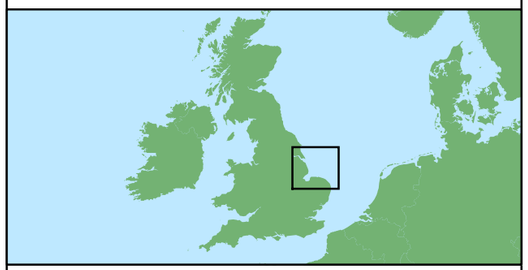
Grey Seal Haul-out Counts 2019

- 1-50
- 50-100
- 100-500
- 500-1000
- 1000-2000
- >2000

% British Isles Grey Seal At-Sea Population per cell

- 0.00
- 0.00 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- >0.05

Seal haul-out data from SMRU
Seal at-sea distribution from Carter et al. (2020)



Coordinate System: WGS 1984 UTM Zone 31N

0 20 40 km

Scale: 1:600,000

Grey Seal At-Sea Distribution and August Haul-out Counts

Figure 7.5.2

OUTER DOWSING OFFSHORE WIND

Date: 20/07/2022
Produced By: RRS
Revision: 0.1

GoBe

Designated Sites and Protected Species

7.5.37 There are several protected areas for marine mammals within the relevant species MUs. These are identified in Table . The Project array area is partly located within the summer portion of the Southern North Sea SAC for porpoise and is near to the Humber Estuary SAC for grey seals and the Wash SAC for harbour seals.

Table 7.5.2: Designated sites and protected areas for marine mammals

Site	Type	Species	Minimum distance from array area (km)
Southern North Sea	SAC	Harbour porpoise (primary reason)	Partially overlaps
The Wash	SAC	Harbour seal (primary reason)	48 km
Humber Estuary	SAC	Grey seal (qualifying feature)	55 km
Berwickshire and North Northumberland Coast	SAC	Grey seal (primary reason)	260 km
Southern Trench	MPA	Minke whale (primary reason)	450 km
Moray Firth	SAC	Bottlenose dolphin (primary reason)	580 km

Proposed Approach to the Environmental Impact Assessment

Guidance

7.5.38 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of marine mammals will also comply with the following guidance documents where they are specific to this topic:

- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications (Natural England, 2021a);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase III: Expectations for data analysis and presentation at examination for offshore wind applications (Natural England, 2021b);
- Marine environment: UXO clearance joint interim position statement21 compiled by Defra, the Department for Business, Energy and Industrial Strategy (BEIS), the MMO, the JNCC, Natural England, the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), the Department of Agriculture, Environment and Rural Affairs (DAERA), NatureScot and Marine Scotland;

[21] https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-interim-position-statement

- Marine Mammal Noise Exposure Criteria: Assessing the severity of marine mammal behavioural responses to human noise (Southall *et al.,* 2021);
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al.,* 2019);
- The protection of marine European Protected Species from injury and disturbance. Guidance for the marine area in England and Wales and the UK offshore marine area (JNCC *et al.,* 2010);
- The Inspectorate Advice Note 7: EIA: Process, Preliminary Environmental Information and Environmental Statements (The Inspectorate, 2020);
- The Inspectorate Advice note 17: Cumulative Effects Assessment (The Inspectorate, 2019);
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for OWF Development (OSPAR, 2008);
- Environmental Impact Assessment for offshore renewable energy projects – guide (British Standards Institute, 2015);
- Approaches to Marine Mammal Monitoring at Marine Renewable Energy Developments (Macleod *et al.,* 2010);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012);
- Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (JNCC, 2020);
- JNCC guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC, 2010a); and
- Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (JNCC, 2010b).

Assessment of PTS and TTS-Onset

7.5.39 Exposure to loud sounds can lead to a reduction in hearing sensitivity (a shift in hearing threshold), which is generally restricted to particular frequencies. This threshold shift results from physical injury to the auditory system and may be temporary (TTS) or permanent (PTS). The PTS and TTS onset thresholds used in this assessment are those presented in Southall *et al.* (2019). The method used to calculate PTS-onset impact ranges for both 'instantaneous' PTS (SPL_{peak}), and 'cumulative' PTS (SEL_{cum}, over 24 hours) will be detailed in the reporting for the underwater noise modelling which will be undertaken and reported as part of the PEIR and the final ES. This is in line with the most recent guidance on the assessment of PTS-onset for offshore wind applications (Natural England, 2021b).

7.5.40 As outlined in the most recent guidance on the assessment of TTS-onset for offshore wind applications (Natural England, 2021b), the ranges that indicate TTS-onset will be modelled and presented in the impact assessment. However, as TTS-onset is defined primarily as a means of predicting PTS-onset, there is currently no threshold for TTS-onset that would indicate a biologically significant amount of TTS; therefore, there is no requirement to assess the potential significance of this impact, and the TTS-onset ranges will be presented for context only.

Assessment of Disturbance – UXO

7.5.41 In line with the recommendations outlined within the recent position statement on Unexploded Ordnance (UXO) clearance[1], the impact assessment will include an assessment for both high-order detonations as well as low-order/low-yield detonations.

7.5.42 For harbour porpoise, the current guidance (JNCC, 2020) is to assume a 26 km Effective Deterrence Range (EDR) for disturbance from high-order UXO clearance. The applicability of this EDR for other species is unknown and as such the 26 km EDR will not be used for other marine mammal species, as per the latest guidance (Natural England, 2021b). In the absence of either a dose-response curve or an EDR to assess disturbance from high-order UXO clearance to other marine mammal species, the TTS-onset thresholds (Southall *et al.,* 2019) will be used as a proxy for disturbance.

7.5.43 There is no guidance available on which thresholds should be used to assess disturbance from low-order UXO clearance. Current risk assessments conducted to support UXO Marine Licence applications are including deflagration as the preferred method, assuming an EDR of 5 km (e.g. Sofia OWF[22]). This approach will be adopted for the assessment of disturbance from low-order detonation of UXOs at the Project.

Assessment of Disturbance - Piling

7.5.44 The assessment of disturbance from pile driven foundations will be based on the current best practice methodology, making use of the best available scientific evidence. This will incorporate the application of a species-specific dose-response approach rather than a fixed behavioural threshold approach, as advised in the most recent guidance on the assessment of behavioural responses for offshore wind applications (Natural England, 2021b). Noise contours at 5 dB intervals will be generated by noise modelling and will be overlain on species density surfaces to predict the number of animals potentially disturbed. This will allow for the quantification of the number of animals that will potentially respond.

7.5.45 Compared to the EDR and fixed noise threshold approaches, the application of a dose-response curve allows for more realistic assumptions about animal response varying with dose, which is supported by a growing number of studies. A dose-response curve is used to quantify the probability of a response from an animal to a dose of a certain stimulus or stressor (Dunlop *et al.,* 2017) and assumes that not all animals in an impact zone will respond. The dose can either be determined using the distance from the sound source or the received weighted or unweighted sound level at the receiver (Sinclair *et al.,* 2021).

[22] Sofia OWFUXO Clearance Marine License Application (GoBe, 2021) MLA/2020/00489

7.5.46 Using a species-specific dose response approach rather than a fixed behavioural threshold to assess disturbance is currently considered to be the best practise methodology and the latest guidance provided in Southall *et al.* (2021) is that "Apparent patterns in response as a function of received noise level (sound pressure level) highlighted a number of potential errors in using all-or-nothing "thresholds" to predict whether animals will respond. Tyack and Thomas (2019) subsequently and substantially expanded upon these observations. The clearly evident variability in response is likely attributable to a host of contextual factors, which emphasizes the importance of estimating not only a dose-response function but also characterizing response variability at any dosage".

Assessment of Cumulative Impacts

7.5.47 The EIA methodology section (Section 5) outlines how potential cumulative effects will be assessed for each receptor group. For marine mammal receptors the approach to cumulative impact assessment will be holistic and combine all potential sources of underwater noise including pile driving at other OWFs together with disturbance from vessels, seismic surveys and any other offshore construction developments that are planned within the relevant MUs for each species.

7.5.48 All offshore projects and impact pathways within the relevant marine mammal MUs will be initially screened into the assessment. All projects and plans considered alongside the Project will be allocated into 'tiers' reflecting their current stage within the planning and development process. This will allow the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out. This approach will allow appropriate weight to be given to each scenario (tier) when considering the potential cumulative impact.

7.5.49 The final list of impacts scoped into the CEA cannot be determined at the Scoping stage. All impact pathways that have a negligible magnitude on marine mammal species from the Project alone assessment will be scoped out of the CEA, however these cannot be identified until the Project alone assessment has been completed. The most significant cumulative impact on marine mammal species is likely to include construction noise, either from concurrent or consecutive offshore developments.

Relevant Embedded Mitigation Measures

7.5.50 The following embedded mitigation measures are relevant to the marine mammal assessment:

- Development of, and adherence to, a Code of Construction Practice (CoCP);
- Development of, and adherence to, a Vessel Management Plan (VMP) (including defined vessel navigational routes, a vessel code of conduct to reduce collision risk and minimize disturbance and identification and avoidance of sensitive areas where possible);
- Implementation of a piling Marine Mammal Mitigation Protocol (MMMP) (to minimize the risk of auditory injury to negligible levels);
- Implementation of a UXO MMMP (to minimize the risk of auditory injury to negligible levels);

- Implementation of a geophysical survey MMMP (to minimize the risk of auditory injury to negligible levels);
- Implementation of a decommissioning MMMP (to minimize the risk of auditory injury to negligible levels);
- Development of, and adherence to, an appropriate PEMP; and
- Development of, and adherence to, a Decommissioning Plan.

Potential Impacts Scoped In

7.5.51 A range of potential impacts on marine mammals have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table , together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 7.5.3: Impacts proposed to be scoped into the assessment for marine mammals

Impact	Description	Proposed Approach to Assessment
Construction		
Underwater noise from pile driving	Underwater noise generated from piling may result in hearing damage and auditory injury (PTS), temporary changes in hearing sensitivity (TTS) and behavioural disturbance and displacement of marine mammal species (this includes barrier effects during the construction phase).	PTS and TTS-onset: Underwater noise modelling using the Southall *et al.* (2019) PTS/ TTS-onset thresholds will be used to estimate impact areas. These will be overlain on species specific density surfaces to estimate the number of animals impacted. Disturbance: Underwater noise modelling using dose-response curves will be used to estimate impact areas. These will be overlain on species specific density surfaces to estimate the number of animals impacted.
Underwater noise from UXO clearance	Underwater noise generated from UXO clearance may result in hearing damage and auditory injury (PTS), temporary changes in hearing sensitivity (TTS) and behavioural disturbance and displacement of marine mammal species.	PTS and TTS-onset: Underwater noise modelling using the Southall *et al.* (2019) PTS/ TTS-onset thresholds will be used to estimate impact areas. These will be overlain on species specific density surfaces to estimate the number of animals impacted. Disturbance: High-order detonation: Harbour porpoise: 26 km EDR, all other species: TTS-onset as a proxy for disturbance Low-order detonation: all species: 5 km EDR The impact ranges will be overlain on species specific density surfaces to estimate the number of animals impacted.
Underwater noise from other construction activities	Underwater noise generated by other construction activities (such as dredging, trenching, cable laying, cutting, etc.) may result in in hearing damage and auditory injury (PTS), temporary changes in hearing sensitivity (TTS) and behavioural disturbance and displacement of marine mammal species.	PTS and TTS-onset: Underwater noise modelling using the Southall *et al.* (2019) PTS/ TTS-onset thresholds will be used to estimate impact areas. These will be overlain on species specific density surfaces to estimate the number of animals impacted.

Impact	Description	Proposed Approach to Assessment
		Disturbance: Information on impact ranges and species-specific responses will be obtained from the relevant literature to inform the assessment.
Vessel collisions	Increased vessel presence in the area creates a potential for increased collision risk for marine mammal species.	Expected vessel numbers will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of construction vessels on marine mammals (e.g. Benhemma-Le Gall *et al.,* 2021).
Vessel disturbance	Increased vessel presence in the area creates a potential for increased disturbance for marine mammal species.	Qualitative approach: Information on impact ranges and species-specific responses will be obtained from the relevant literature to inform the assessment. Assessment of impact will be based on the most up to date scientific evidence on the effect of construction vessels on marine mammals (e.g. Benhemma-Le Gall *et al.,* 2021).
Indirect impacts on prey	Indirect impacts on marine mammal species such as changes in their prey availability and distribution as a result of offshore development phases is possible.	This assessment will be informed by the results of the Fish and Shellfish impact assessment. Assessment of impact will be based on whether or not there is expected to be any significant impact to the key prey species for each marine mammal species.
Water quality changes	Increases in SSC resulting from construction activities may impact on the ability of marine mammals to forage.	This assessment will be dependent on the results of the Physical Processes impact assessment. Based on conclusions on the nature and extent of SSC, an assessment of the impact on marine mammals will be made based on the potential for disruption to foraging.
Operation and Maintenance		
Operational noise	Disturbance and/ or displacement of marine mammals due to the noise generated by operational WTGs.	This assessment will be based on any available data on the operational noise produced by similar sized WTGs. Assessment of impact will be based on data available in the literature on marine mammal behaviour around operational wind farms.
Vessel collisions	Increased vessel presence in the area creates a potential for increased collision risk for marine mammal species.	Expected vessel numbers will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will

Impact	Description	Proposed Approach to Assessment
		be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
Vessel disturbance	Increased vessel presence in the area creates a potential for increased disturbance for marine mammal species.	Qualitative approach: Information on impact ranges and species-specific responses will be obtained from the relevant literature to inform the assessment. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
Indirect impacts on prey	Indirect impacts on marine mammal species such as changes in their prey availability and distribution as a result of offshore development phases is possible.	This assessment will be informed by the results of the Fish and Shellfish impact assessment. Assessment of impact will be based on whether or not there is expected to be any significant impact to the key prey species for each marine mammal species.
Decommissioning		
Underwater noise	Underwater noise generated from decommissioning activities may result in hearing damage and auditory injury (PTS), temporary changes in hearing sensitivity (TTS) and behavioural disturbance and displacement of marine mammal species.	Qualitative approach: impacts assumed to be less than that of construction, risk based assessment.
Vessel collisions	Increased vessel presence in the area creates a potential for increased collision risk for marine mammal species.	Expected vessel numbers will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
Vessel disturbance	Increased vessel presence in the area creates a potential for increased disturbance for marine mammal species.	Qualitative approach: Information on impact ranges and species-specific responses will be obtained from the relevant literature to inform the assessment. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
Indirect impacts on prey	Indirect impacts on marine mammal species such as changes in their prey availability and	This assessment will be informed by the results of the Fish and Shellfish impact assessment. Assessment of impact will be based on whether or

Impact	Description	Proposed Approach to Assessment
	distribution as a result of offshore development phases is possible.	not there is expected to be any significant impact to the key prey species for each marine mammal species.
Water quality changes	Increases in SSC resulting from decommissioning activities may impact on the ability of marine mammals to forage.	This assessment will be dependent on the results of the Physical Processes impact assessment. Based on conclusions on the nature and extent of SSC, an assessment of the impact on marine mammals will be made based on the potential for disruption to foraging.
Cumulative		
Underwater noise	Underwater noise generated from the construction, operation and decommissioning of other projects may result in auditory injury (PTS), temporary changes in hearing sensitivity (TTS) and behavioural disturbance of marine mammal species.	Quantitative approach: A screening process will be undertaken to identify reasonably foreseeable projects and developments which may act cumulatively with the Project ('long list'). Projects will then be allocated into 'Tiers', reflecting their current stage within the planning and development process (The Inspectorate, 2019). This allows the assessment to present several future development scenarios, each with a differing potential for being ultimately built out. A consideration of effect-receptor-pathways, data confidence and temporal and spatial scales will then be given to select projects for a topic-specific 'short-list'. Consideration will also be given to the location of projects relative to the management units of marine mammal receptors. Further screening will then be undertaken to exclude projects where impact pathways are deemed to be negligible. An assessment will then be made of the cumulative number of animals impacted over key project phases for the screened-in impact categories and projects. Where there is information available on the number of animals impacted for each species (e.g., from project-specific modelling presented in EIA reports), this will be used. In the absence of such information, effective deterrence ranges and relevant animals densities will be used. The number of animals predicted to be impacted will be placed in the context of the proportion of relevant

Impact	Description	Proposed Approach to Assessment
		management units, and levels of significance will be assigned. Areas of uncertainty in the assessment will be detailed.
Vessel collisions	Increased vessel presence in the area from other projects creates a potential for increased collision risk for marine mammal species.	Qualitative approach: Cumulative assessment will consider the increased potential for vessel collision with marine mammals due to the increase in vessel movements from other projects. Expected vessel numbers from other projects will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals. Only project-alone impacts assessed as of higher than negligible impact significance will be assessed at a cumulative level.
Vessel disturbance	Increased vessel presence in the area from other projects creates a potential for increased disturbance for marine mammal species.	Qualitative approach: Cumulative assessment will consider the increased potential for disturbance to marine mammals due to the increase in vessel movements from other projects. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals. Only project-alone impacts assessed as of higher than negligible impact significance will be assessed at a cumulative level.

Impacts Proposed to be Scoped Out

7.5.52 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for marine mammals. These impacts are outlined in Table , together with a justification for scoping them out.

Table 7.5.4: Impacts proposed to be scoped out of assessment for marine mammals

Impact	Justification
Accidental pollution (construction, operation & decommissioning)	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate CoCP it has been agreed with SNCBs on consent applications for other OWFs, that mortality is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It is predicted that any impact would be of local spatial extent, short term duration, intermittent and medium reversibility within the context of the regional populations and be not significant in EIA terms. This is considered to be equally applicable to the Project for which construction will be comparable in scale and operation within the same environment to other projects, whilst implementing an appropriate CoCP. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Barrier effects (operation)	A number of recent studies have reported the presence of marine mammals within wind farm footprints. For example, at the Horns Rev and Nysted OWFs in Denmark, long-term monitoring showed that both harbour porpoise and harbour seals were sighted regularly within the operational OWFs, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al.,* 2008). Similarly, a monitoring programme at the Egmond aan Zee OWF in the Netherlands reported that significantly more porpoise activity was recorded within the OWF compared to the reference area during the operational phase (Scheidat *et al.,* 2011) indicating the presence of the windfarm was not adversely affecting harbour porpoise presence. Other studies at Dutch and Danish OWFs (Lindeboom *et al.,* 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating OWFs. In addition, recent tagging work by Russell *et al.* (2014) found that some tagged harbour and grey seals demonstrated grid-like movement patterns as these animals moved between individual WTGs, strongly suggestive of these structures being used for foraging. Previous reviews have also concluded that operational wind farm noise will have negligible barrier effects (Madsen *et al.,* 2006,

Impact	Justification
	Teilmann *et al.,* 2006a, Teilmann *et al.,* 2006b, CEFAS, 2010, Brasseur *et al.,* 2012). All evidence for harbour porpoise and seal species collated to date shows that while individuals may be displaced in the short-term during construction activities, they return to the area of impact after the cessation of activities (e.g. Russell *et al.,* 2016b, Brandt *et al.,* 2018, Benhemma-Le Gall *et al.,* 2021). Therefore, while disturbance leading to temporary displacement may occur, this is expected to be spatially and temporally small scale and thus it is not expected that any stage of the Project will result in a permanent barrier to the movement of marine mammals in the area. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
EMF	Based on the data available to date, there is no evidence of EMFrelated to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping, 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al.,* 2011). To date, the only marine mammal known to show any response to EMF is a non-UK species, the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al.,* 2013). However, this has not been shown in any other species of marine mammal. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Disturbance at haul-outs	There are no grey or harbour seal haul-outs sites in the vicinity of the ECC AoS (Figure 7.5.1 and Figure 7.5.2). The closest haul-out site for grey seals is Donna Nook which is ~6 km from the boundary of the ECC AoS, and the closest haul-out sites for harbour seals is also Donna Nook which are ~5 km from the ECC AoS. Considering this distance and the nature of the construction activities relative to activities which are generally reported to cause disturbance to seals at haul outs (e.g. kayaks and fast-moving vessels within a few hundred metres;), it is not expected that activities during construction will directly impact seal haul-outs; therefore, this impact is scoped out of assessment. (Note: the impacts of underwater noise and barrier effects on seals at sea are scoped in).

Potential Transboundary Effects

7.5.53 There is the potential for transboundary impacts upon marine mammals due to the mobile nature of marine mammal species and the proximity of the Project to the borders of surrounding EEA States, which are within the movement ranges of certain species.

7.5.54 Direct impacts may occur due to underwater noise generated during construction and decommissioning, particularly piling during the installation of foundations. Indirect impacts may cause disturbance to prey (fish) species from loss of fish spawning and nursery habitat and suspended sediments and deposition. The O&M phase is considered less likely to result in significant transboundary impacts.

7.5.55 The probability of transboundary impacts to marine mammals occurring during construction, particularly because of underwater noise from piling, is potentially high although the extent cannot be determined at this stage and will be subject to assessment in the EIA. Behavioural disturbance resulting from underwater noise during construction could occur over large ranges (tens of kilometres) and therefore there is the potential for transboundary effects to occur where subsea noise arising from the Project could extend into waters of other EEA states. These impacts are predicted to be short term and intermittent, with recovery of marine mammal populations to affected areas following completion of all piling activities.

7.5.56 It is proposed that impacts upon marine mammals and their nature conservation interests, in so far as they are scoped into the main EIA process will also be subject to transboundary assessment and are not scoped out at this time.

Summary of Next Steps

- Discussion and agreement with stakeholders on the conversion/correction factors that should be used to account for animals unavailable to detect during the site-specific baseline surveys.
- Discussion and agreement with stakeholders on the density and abundance estimates selected for impact assessment.
- Production of marine mammal baseline characterisation.
- Discussion and agreement with stakeholders on the approach to the assessment of disturbance from UXOs.
- Identification of noise modelling locations and development of the approach to underwater noise modelling to inform PTS/ TTS-onset and disturbance impact assessments.

Further Consideration for Consultees

- Do you agree that the data sources identified are sufficient to inform the marine mammal baseline for the PEIR and ES?
- Do you agree that all the marine mammal protected areas within the study area have been identified?
- Have all potential impacts resulting from the Project been identified for marine mammal receptors?

- Do you agree that the impacts described in Table 7.5.4 can be scoped out?
- For those impacts scoped in (Table 7.5.3), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on marine mammal receptors?
- Do you have any additional specific requirements for the underwater noise modelling and assessment methodology?

7.6 Intertidal And Offshore Ornithology

Introduction

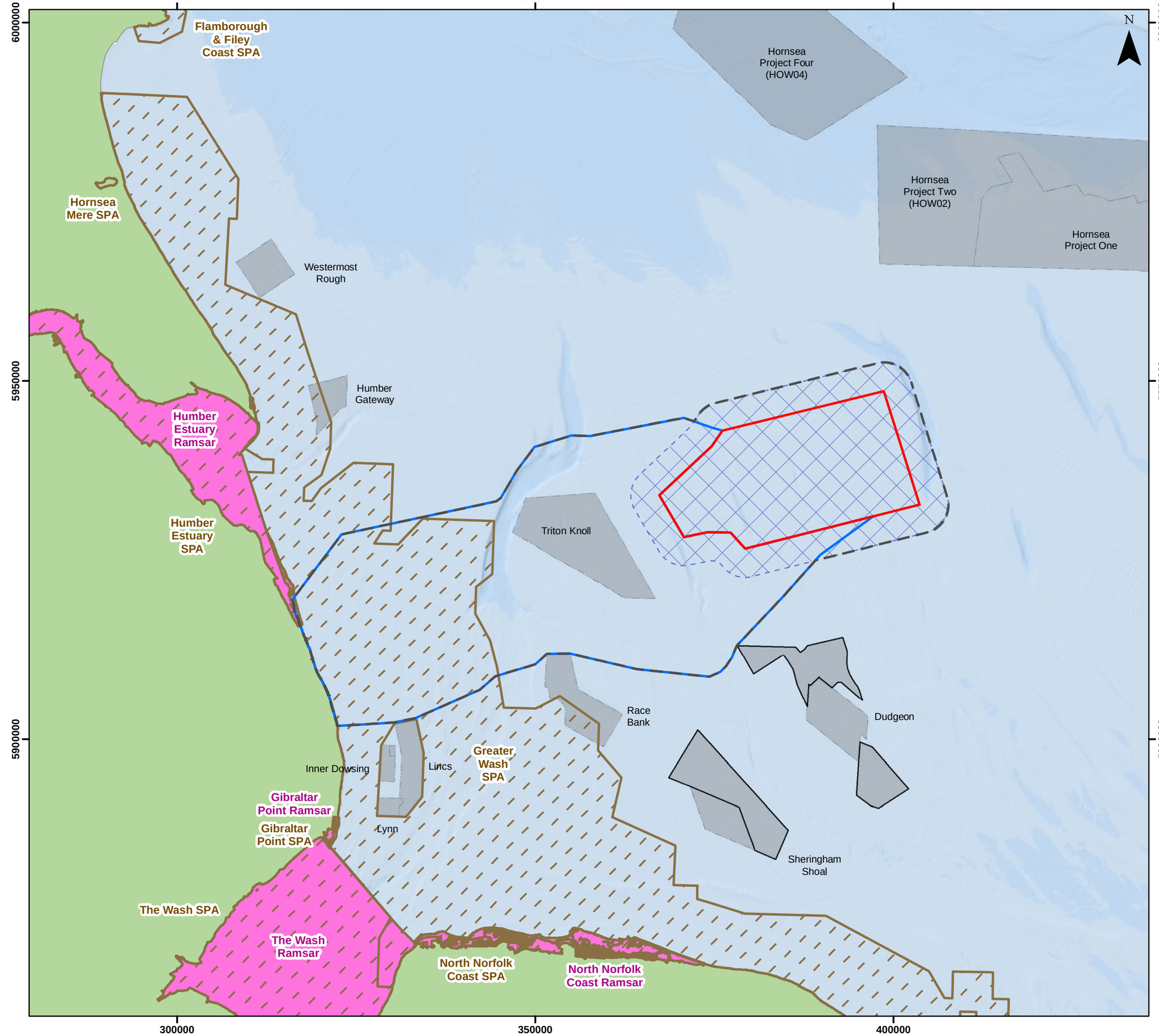
7.6.1 This section of the Scoping Report identifies the intertidal and offshore ornithology elements of relevance to the array areas and offshore ECC AoS. It considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on intertidal and offshore ornithology and sets out the proposed scope of the EIA.

7.6.2 As birds rely on and interact with other habitats and species this section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.4: Fish and shellfish ecology (in terms of key prey resources available to birds); and
- Section 7.3: Benthic subtidal and intertidal ecology (in terms of relevant habitat and key prey resources available to birds); and
- Section 8.3: Onshore ecology for onshore birds

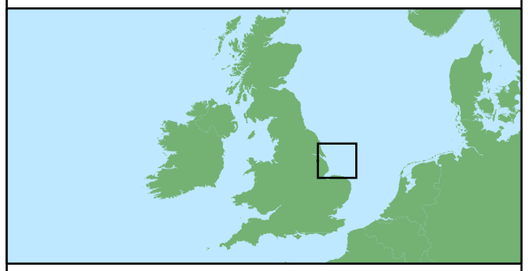
Study Area

7.6.3 The proposed Project is located in the southern North Sea, with WTGs positioned at their closest point approximately 54 km east of the Lincolnshire coast and 57 km north of the Norfolk coast (Figure 7.6.1). The proposed array area covers up to 500 km^2. The Applicant intends to reduce the size of the array area from 500 km^2 to an area of up to 300 km^2 prior to consent. The intertidal and offshore ornithology study area for the Project is defined as the offshore part of the AoS together with the Zones of Influence (ZoIs) and is based on an area which is considered to represent a realistic maximum spatial extent of potential impacts to Important Ornithological Features (IOFs). The study area for the offshore and intertidal ornithology assessment includes the array area with a 4km buffer, the ECC AoS and the cable landfall area (Figure 7.6.1). The study area will be reviewed and amended in response to the refinement of the array area, the identification of any additional impact pathways and in response, where appropriate, to feedback from this scoping exercise and the ongoing stakeholder consultation.



Legend

- Site Boundary
- Offshore ECC Area of Search
- Study Area
- 4km Buffer from Array Area
- Offshore Wind Farms
- Future Wind Farm Extensions
- Special Protection Area
- Ramsar Site



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Ornithological study area and relevant designated sites

Figure 7.6.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

7.6.4 An initial desk-based review of literature and data sources has been undertaken to support this Scoping Report. The key sources of data, presented in Table have been used to characterise the study area for intertidal and offshore bird species for the purposes of this Scoping Report, and will be subsequently used as the basis for the EIA baseline characterisation.

7.6.5 It is important to note that at this stage, the information sources, guidelines, assessment methods and reports applied throughout this scoping section, may be supplemented and/ or updated where appropriate for assessments at the PEIR and ES stages. Furthermore, the ornithological evidence base is constantly expanding with new information becoming available regularly. The Project will stay abreast of new evidence and will consider its usage where appropriate, as necessary.

Table 7.6.1: Key sources of information for intertidal and offshore ornithology

Source	Date	Summary	Coverage of study area
Existing project survey data			
Digital aerial survey data	Commenced 2021	Digital aerial surveys conducted by HiDef Digital Aerial Surveying Ltd. on a monthly basis between March 2021 and February 2023, with two surveys per month between March and August 2022. Note: Twelve months of survey data (March 2021 – February 2022) have been summarised below in Table 7.6.2 for the purposes of this Scoping Report.	Array area plus 4 km buffer. A total of 22 transects with 1.5 km spacing totalling 16.7% coverage using two cameras.
Intertidal bird surveys	2022/ 23	Intertidal bird surveys will take place at the selected landfall site.	Will include the intertidal area and immediate onshore area of the landfall.
Existing offshore windfarm 'grey literature'	Various dates	Information obtained from various offshore windfarm Environmental Statements (i.e. Hornsea 1, 2, 3 & 4, Triton Knoll, Sheringham Shoal, Dudgeon, Race Bank, etc.).	Includes data in the ECC AoS as well as context across the broader region for the array area.
Publicly available datasets			
Designated sites	Various dates	Information of SPAs and other designations relevant to Important Ornithological Features (IOFs) with potential connectivity to the Project. Key source of information	Country wide information on designated sites.

Source	Date	Summary	Coverage of study area
		will be Natural England designated sites portal.	
British Trust for Ornithology (BTO) Non-Estuarine Waterbird Surveys (NEWS)	1984 - 2016	NEWS provides recordings focused on intertidal habitats along the UK coastline. These were conducted in 1984/1985, 1997/98, 2006/07 and 2015/16.	Covers part of the nearshore ECC AoS.
BTO Wetland Bird Survey (WeBS)	Annual Reports	Annual survey reports of wetland waterbirds. Most recent being Frost *et al.*, (2020).	Coverage of UK intertidal and wetland zones. Source contains information which can be drawn upon at a project-specific scale, or a wider regional scale.
National Bird Atlas (Balmer *et al.*, 2013)	2007-2011	Results of five years of breeding season and wintering surveys across the UK at a 10 km resolution.	The ECC AoS overlaps with 20km squares.
Local / County bird reports and atlases	Annual Reports	County atlases covering breeding and non-breeding birds within the surrounding east coast counties. Annual publications produced by local birdwatching groups which summarise sightings and surveys results for East Lincolnshire and the wider north-east coast region.	Coverage across region at various intertidal and wetland and coastal areas.
Wildfowl and Wetlands Trust – Aerial surveys of waterbirds in the UK	2004-2009	Aerial surveys of waterbirds around the UK.	Coverage of inshore waters relevant to the Project from survey grids GW4, GW8, GW9 and GW10.
Literature			
Potential impacts of offshore windfarms on birds	Various dates	Peer reviewed scientific literature regarding the potential impacts from OWF e.g. (Garthe and Hüppop, 2004; Drewitt and Langston, 2006; Stienen *et al.*, 2007; Speakman *et al.*, 2009; Langston, 2010; Band,	Generic information applicable to Project IOFs.

Source	Date	Summary	Coverage of study area
		2012; Cook *et al.*, 2012; Furness and Wade, 2012; Wright *et al.*, 2012; Furness *et al.*, 2013; Johnston *et al.*, 2014a,b; Cook *et al.*, 2014; Dierschke *et al.*, 2017; SNCB, 2017; Cook *et al.,* 2018; Jarrett *et al.*, 2018; Leopold & Verdaat, 2018; Mendel *et al.*, 2019; Goodale & Milman, 2020);	
Bird distribution	Various dates	Publicly available reports of seabird distribution e.g. Stone *et al.*, 1995; Brown and Grice, 2005; Kober *et al.*, 2010; Waggitt *et al.*, 2019; Cleasby *et al.*, 2020; Bradbury *et al.*, 2014; Davies *et al.,* 2021.	UK wide coverage with information that can be drawn upon at a project-specific scale, or a wider regional scale.
Bird breeding ecology	Various dates	Information on the breeding ecology of various bird species e.g. Cramp and Simmons, 1977-94; Del Hoyo *et al.*, 1992-2011; Robinson, 2005.	Generic information applicable to Project IOFs.
Bird population estimates and demographic rates	Various dates	Data on seabird populations and demographic rates for use in assessments e.g. Mitchell *et al.*, 2004; BirdLife International, 2004; Holling *et al.*, 2011; Frost *et al.*, 2019; Musgrove *et al.*, 2013; Furness, 2015; Horswill *et al.*, 2017, JNCC, 2020.	These sources contain information which can be drawn upon at a project-specific scale, or a wider regional scale.
Bird migration and foraging movements	Various dates	Bird movements during breeding season foraging trips and migration e.g. Wernham *et al.*, 2002; Thaxter *et al.*, 2012; Wright *et al.*, 2012; Furness *et al.*, 2018; Woodward *et al.*, 2019; Wakefield *et al.*, 2017; Wakefield *et al.*, 2013; RSPB FAME & STAR tracking data.	These sources contain information which can be drawn upon at a project-specific scale, or a wider regional scale.

Overview of Baseline Environment

7.6.6 To aid clarity, this section is split between the intertidal and offshore components to refine the focus of the ornithological assessments. The intertidal area and related assessments consider IOFs using the habitat between mean high-water springs (MHWS) and mean low-water springs (MLWS), while recognising that some IOFs may nest or roost on the shore above the MHWS. The offshore components of the assessment relate to the IOFs using the habitat seaward of MLWS within the offshore ECC AoS out to the array area and a 4 km buffer surrounding it.

7.6.7 Following an initial desk-based review of the data sources identified in Table 7.6.1 the distribution, abundance, conservation status, biological seasons, behaviour and characteristics of birds in the offshore and intertidal environment have been used to characterise the study area for the purposes of this Scoping Report.

7.6.8 Previous literature and surveys demonstrate that the southern North Sea provides an important habitat for numerous bird species throughout the year. The results from previous offshore windfarm baseline surveys (e.g. Hornsea 1, 2, 3, & 4); evaluations conducted for their Environmental Statements and monitoring reports; extensive ornithological surveys (e.g. Stone *et al.*, 1995); bird tracking studies (e.g. Frederiksen *et al.*, 2012; Woodward *et al.,* 2019); biogeographic population reviews (e.g. Stienen *et al.*, 2007; Furness, 2015); and the analysis of population distribution (e.g. Bradbury *et al.*, 2014; Wakefield *et al.*, 2017) provide evidence for this.

7.6.9 During the breeding season, the southern North Sea region provides foraging, loafing and preening habitat for a range of seabirds, including (but not limited to) gannet, *Morus bassanus*, kittiwake, *Rissa tridactyla*, and various species of auk. During the non-breeding season, the region supports numerous species; divers and seaducks reside in more inshore waters, while auks are found further offshore. The southern North Sea is also subject to pronounced passages of birds during spring and autumn with species such as gannets, skuas, gulls, terns and auks travelling to and from mainland Europe and further afield (Stienen *et al.*, 2007). It is also subject to migratory movements of non-seabirds moving from the UK to mainland Europe or further afield such as waders, wildfowl, passerines and non-passerines. Due to the mix of birds present, it is probable that the array area and the offshore ECC AoS is used at different times of the year by birds (i) overwintering in the area; (ii) foraging from nearby breeding coastal colonies; and (iii) on post-breeding dispersal, migration and pre-breeding return.

7.6.10 HiDef Digital Areal Surveying Ltd. are undertaking two years of digital aerial surveys (DAS) for the Project, with surveys commencing in March 2021. These will provide the most detailed and up-to-date site-specific data on offshore ornithology. At the time of scoping, species counts from the first twelve months of aerial footage (March 2021 – February 2022) are available for the Project. These seabird population data have been summarised for the array area and the 4km buffer only in Table 7.6.2 to provide an initial insight into key species likely to be present at the array area based on the initial six months survey effort. Of the key species listed in Table 7.6.2 the main species of interest for offshore ornithology are considered to be kittiwake, gannet, guillemot *Uria aalge*, and razorbill *Alca torda*.

Table 7.6.2: Raw counts of birds recorded for each species during the first 12 monthly surveys

Species	2021											
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Kittiwake (*Rissa tridactyla*)	910	1492	478	169	484	1002	331	21	36	63	23	197
Razorbill (*Alca torda*)	1120	1149	91	41	578	554	256	167	422	278	76	792
Guillemot (*Uria aalge*)	648	3633	798	185	1403	3824	4345	1022	1095	472	84	651
Red throated diver (*Gavia stellata*)	44	33	2				32	37	57		1	5
Gannet (*Morus bassanus*)	45	150	15	13	57	30		4	1	4	1	3
Black-headed gull (*Chroicocephalus ridibundus*)	1			1	11			8				
Common gull (*Larus canus*)	7	2	1	2	6	43	1	7				5
Fulmar (*Fulmarus glacialis*)	7	9		5	12	4	3		1	2	7	5
Great black-backed gull (*Larus marinus*)	5	4	1			2	35	17	7	14	5	2
Herring gull (*Larus argentatus*)	2	4		6	3		1	2			3	
Lesser black-backed gull (*Larus fuscus*)	1	5	1	4	4		6	1	1			
Little gull (*Hydrocoloeus minutus*)				1	2	2	18	131	4	1		
Little auk (*Alle alle*)	1	2										
Puffin (*Fratercula arctica*)	32	5	5	3	29	215	125	135	69	5		1
Great northern diver (*Gavia immer*)		1										
Sandwich tern (*Thalasseus sandvicensis*)		1	32	7	1		3					
Common tern (*Sterna hirundo*)			19	3			341					
Arctic tern (*Sterna paradisaea*)				1	1	2	9	1				
Arctic skua (*Stercorarius parasiticus*)					1		5					
Great skua (*Stercorarius skua*)						2						
Manx shearwater (*Puffinus puffinus*)					14	1	7					
Oystercatcher (*Haematopus ostralegus*)						3						

Species	2021											
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Shag (*Gulosus aristotelis*)										3	1	1
No ID	253	184	69	41	155	513	793	177	146	134	27	84
Total	**3076**	**6674**	**1512**	**482**	**2761**	**6197**	**6311**	**1730**	**1839**	**976**	**228**	**1746**

7.6.11 Considering only 12 months of data are currently available, heat maps of species distributions are not provided at this stage. While kittiwake, gannet, guillemot and razorbill have been recorded in the first 12 months of site-specific DAS as the most abundant species and are therefore likely to be the main species in relation to the Project, they may be accompanied by other species which are also deemed IOFs as the surveys progress and the full two years of data become available.

7.6.12 Those key species that will be taken forward to impact assessments as IOFs will be those recorded during surveys within the survey area and which are at potential risk due to either their abundance, sensitivity to potential windfarm impacts and/ or due to biological characteristics (such as the proportion of time spent flying at rotor height) which make them at risk of collision.

7.6.13 A list of key species recorded within DAS, and therefore most likely to be considered IOFs, are presented in Table 7.6.3 along with their relevant nature conservation value. For the purposes of this Scoping Report, additional species have been added to Table after the preliminary desk-based review of data sources presented in Table 7.6.1. The main species and their conservation value are presented in Table 7.6.3, which may be subject to change following the results of the ongoing DAS and stakeholder consultation.

Table 7.6.3: Species conservation value table for current key IOFs

Species	Nature Conservation Value
Red-throated diver	Birds of Conservation Concern (BoCC) (Eaton *et al.*, 2015) Green listed, Birds Directive Migratory Species, Birds Directive Annex I, IUCN Red List 'Least Concern'
Gannet	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Kittiwake	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Vulnerable' status
Herring gull	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Near Threatened' status
Lesser black-backed gull	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Great black-backed gull	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Sandwich tern	BoCC Amber listed, Birds Directive Annex I, Migratory Species, IUCN Red List 'Least Concern' status
Guillemot	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Razorbill	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Puffin	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Vulnerable' status

7.6.14 Several bird species are also likely to be reliant on the intertidal habitats of the east coast that lie within the ECC AoS and at the offshore export cable landfall site. The intertidal environment of the Lincolnshire coast is dominated by mobile, sandy beaches backed by low, soft cliffs and sand dunes and is an area of active erosion. The Lincolnshire coast is bounded by the Humber Estuary to the north and The Wash to the south. Intertidal areas of both the Wash and Humber are important habitat for wading birds. However, the coastline between the two lacks any significant areas of intertidal estuary or muddy habitats. As a result, habitat and food resources for intertidal birds are limited and the populations of birds using the coast is likely to be relatively low in comparison to other intertidal locations. Intertidal bird surveys will take place at the selected landfall site.

7.6.15 For this Scoping Report a review of the BTO NEWS survey data covering the area of interest along the Lincolnshire Coast within the offshore ECC AoS and where the offshore export cable landfall will be sited, are summarised in Table 7.6.4. Although the survey area covers a larger region than the ECC AoS, it provides an indication of bird species present within the intertidal area over a prolonged period to identify what the potential key species are for assessment purposes. More detailed data sets, such as BTO WEBS will be used to determine bird numbers in specific locations, such as the ECC AoS.

Table 7.6.4: Population estimates from BTO NEWS survey data collected during the winter (December, January and February) of 2015/16 for intertidal species along the Lincolnshire coast using methodologies set out in Austin *et al.* (2017)

Species	Count	Population Estimate
Bar-tailed Godwit	5	5 (0-15)
Black-headed Gull	577	539 (266-810)
Common Gull	450	414 (161-668)
Common Scoter	80	80 (0-160)
Cormorant	55	54 (2-126)
Curlew	96	96 (0-288)
Dunlin	1	1 (0-3)
Great Black-backed Gull	80	76 (44-107)
Great Crested Grebe	1	1 (0-3)
Great Northern Diver	1	1 (0-3)
Herring Gull	752	686 (356-1,249)
Lesser Black-backed Gull	7	6 (1-11)
Mallard	38	37 (0-79)
Mediterranean Gull	1	1 (0-3)
Mute Swan	41	41 (0-123)
Oystercatcher	69	68 (4-169)
Redshank	19	19 (0-57)
Red-throated Diver	6	5 (2-11)

Species	Count	Population Estimate
Ringed Plover	23	18 (2-48)
Sanderling	132	124 (51-238)
Turnstone	6	6 (0-18)

Designated Sites

7.6.16 The impact assessment will consider potential connectivity of the Project with statutory designated sites for nature conservation, which have birds listed as qualifying features. Four classes of statutory designated sites will be considered: SPAs, pSPAs, Ramsar sites and SSSIs. Sites which may have qualifying features with connectivity to the Project include those designated for breeding seabirds, wintering birds and those for terrestrial, coastal or marine bird interests (typically migratory and / or non-breeding aggregations).

7.6.17 The ECC AoS directly overlaps with the Greater Wash SPA which has offshore ornithological designations for breeding terns and overwintering red-throated diver and common scoter (Figure 7.6.1). Additionally, as breeding and migratory seabirds can travel significant distances it is necessary to consider designated sites beyond the study area. The extent of connectivity between seabird relevant designated sites and offshore windfarms during the breeding season is largely a function of distance and species-specific foraging ranges (i.e. those identified in the review by Woodward *et al.* (2019)). Outside the breeding season patterns of migration are used to infer the origins of species recorded. Terrestrial/ coastal sites designated for migrant species outside the breeding season may therefore be connected on the grounds of passage movements through the site.

7.6.18 Full consideration of connectivity of European Sites (SPAs and Ramsar sites) will be provided in a separate Habitats Regulation Assessment (HRA) Screening report, which will cover in more detail matters associated with the National Site Network and will also be discussed with relevant stakeholders throughout the pre-application phase, as the HRA is developed in parallel with the EIA process.

7.6.19 For the EIA specifically, a review of SSSIs (often overlapping in extent with SPAs and Ramsar sites) will be undertaken to consider potential connectivity with the Project.

7.6.20 Figure 7.6.1 shows the key SPAs and Ramsar sites that lie within or in close proximity to the study area. The key sites identified in relation to ornithological interest are as follows.

- **The Flamborough and Filey Coast (FFC) SPA** is approximately 8,040 ha in area, encompassing terrestrial, coastal and marine habitats supporting breeding seabirds both when they are nesting and when using the nearshore sea surface (extending out to approximately 2 km) for activities such as displaying, washing and preening. The interest features of this site are breeding gannet, razorbill, guillemot and kittiwake and a breeding seabird assemblage of those four species and fulmar as main components with cormorant, shag, herring gull and puffin also part of the breeding seabird assemblage (Natural England, 2014). The FFC SPA is approximately 95 km to the north-west of the array area. All of the interest feature species have been recorded within the array area during the breeding season, except great cormorant, *Phalacrocorax carbo*.
- **The Greater Wash SPA** is approximately 353,580 ha in area, encompassing coastal and marine habitats and extending along the east coast of England between Bridlington Bay in the north and Great Yarmouth in the south. The boundary on the landward side is at mean high water and the seaward boundary is approximately 14 nautical miles from the shore at its furthest extent. The interest features of this site are non-breeding red-throated diver, non-breeding common scoter, non-breeding little gull, breeding Sandwich tern, breeding common tern and breeding little tern. The array area is outside of the SPA and beyond the mean-max foraging range during the breeding season for little tern but within the mean-max foraging range for common tern and sandwich tern that are interest features. Red-throated diver, little gull, Sandwich tern and common tern have been recorded within the array area and the offshore ECC AoS directly overlaps with the Greater Wash SPA.
- **The Wash SPA** covers 62,200 ha and forms part of the larger Wash and North Norfolk Coast Special Area, encompassing extensive wetland and coastal habitats. It is designated for 21 species of waterbird which pass through in high numbers each year and breeding common tern and little tern. The boundary of the SPA is approximately 58 km to the west of the array and 15.7 km south of the ECC AoS.
- **Humber Estuary SPA** covers 37,630 ha in area, encompassing extensive wetland and coastal habitats. It is designated for 23 species of waterbird which pass through in high numbers (c. 154,000) each year. The boundary of the SPA is approximately 58 km to the west of the array and, at its southern extent, overlaps the ECC AoS.
- **Flamborough Head Site of Special Scientific Interest (SSSI)** is approximately 318 ha in area, encompassing terrestrial and coastal habitats. The area of the SSSI extends beyond the area of the FFC SPA as its interest features include grassland habitats and geological features but it does not extend beyond mean low water. The notified bird interest features are breeding fulmar, gannet, kittiwake, guillemot, razorbill and puffin. The SSSI is approximately 95 km to the north-west of the array area and 73.1 km north of the ECC AoS.

- **Hornsea Mere SSSI and SPA** is a terrestrial wetland site noted for its large concentration of little gull that use this site in the late summer to wash and preen. These little gulls will feed in the offshore environment and are an interest feature of the Greater Wash SPA. Little gull is not an interest feature of the Hornsea Mere SSSI nor the Hornsea Mere SPA.

Summary and Key Issues

7.6.21 The key species recorded in the most recent surveys in the array area (March 2021 to February 2022) that are currently expected to form the main focus of the EIA (and HRA) process include the following species: gannet, kittiwake, red-throated diver, razorbill and guillemot.

7.6.22 The key species for the offshore ECC AoS are currently considered to be red-throated diver, which is known to be sensitive to vessel traffic and is an interest feature of the Greater Wash SPA (a designated site overlaps with the offshore ECC AoS).

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.6.23 The approach to the EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of intertidal and offshore ornithology will also comply with the following guidance documents where they are specific to this topic:

- CIEEM guidance (2018; updated 2019)
- Natural England phase I and III guidance documents (Natural England, 2021a; 2021b)

7.6.24 However, whilst this has informed the approach that has been used in this intertidal and offshore ornithology section, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the intertidal and offshore ornithology assessment on IOFs. Where appropriate additional key guidance, assessment documents, supporting literature and expert opinion aid the identification, quantification, consideration and assessment of potential impacts from offshore windfarms on IOFs, such as CIEEM guidance (2018; updated 2019) have also been incorporated.

7.6.25 The assessment approach will use a 'source-pathway-receptor' model, which identifies likely impacts on IOFs resulting from the proposed construction, O&M and decommissioning of the Project intertidal and offshore infrastructure. The parameters of this model are defined as follows:

- Source – the origin of a potential impact (noting that one source may have several pathways and receptors) e.g. an activity such as cable installation and a resultant effect such as re-suspension of sediments;
- Pathway – the means by which the effect of the activity could impact an IOF e.g. for the example above, re-suspended sediment could settle and smother the seabed; and

- Receptor – the element of the receiving environment that is impacted e.g. for the above example, bird prey species living on or in the seabed are unavailable to foraging birds.

7.6.26 The offshore ornithology DAS currently being undertaken will provide information on species (or species-groups if species identification is not possible), abundance, distribution, behaviour, location, numbers, sex and age (where possible), and flight height and direction of ornithological receptors. Data also exists from other sources presented in Table . The EIA will identify the nature of the use of the proposed development area by birds recorded - i.e. seasonal differences and activities (i.e. foraging, overwintering, migrating or other) in order to determine the importance of the proposed development area relative to the wider area for seabirds throughout the year.

7.6.27 Detailed analysis of survey data will include abundance and density estimates (with associated confidence intervals and levels of precision). Site-specific flight height data will be reported from the DAS and will be considered as well as that from the generic flight height data (Johnston *et al.*, 2014a; 2014b) for use in collision risk modelling following consultation with relevant stakeholders.

7.6.28 The following sections of this document provide a high-level description of the proposed impact assessment approach which will be applied to the offshore and intertidal ornithology IOFs. Further detailed discussions on the assessment approach and methodology will be undertaken with relevant stakeholders through the EPP and throughout the pre-application phase.

7.6.29 Two key components of the assessment will be collision risk analysis and displacement analysis. Collision risk modelling (CRM) at offshore windfarms is usually undertaken using the Band (2012) model, with variations applied to account for the variation around standard deviation or mean values for parameters. In addition to the Band (2012) model, a new stochastic collision risk model (sCRM; Donovan, 2018) will be followed for the assessment, which incorporates parameter variability and therefore accounts for a varying degree of uncertainty in input parameters.

7.6.30 The deterministic Band model (Band, 2012) will be used for the CRM as set out by Natural England guidance phase III (Natural England, 2021b) and requirements. The exact CRM parameters for modelling (e.g. avoidance rates, flight height data, nocturnal activity rates) will be based upon this guidance (Natural England, 2021b) and will be agreed with consultees and stakeholders (through the EPP) and clearly defined within the EIA and HRA.

7.6.31 Displacement analysis will be undertaken in line with SNCB guidance (JNCC *et al.*, 2017) using the matrix approach. Species included within the displacement analysis, along with the species-specific mortality rates and displacement rates will be based upon the best available evidence and will be agreed with consultees and stakeholders and clearly defined within the EIA (and HRA). Additionally, the population-level impacts of the resulting potential additional mortality of both collision and displacement will be considered. The population viability analysis (PVA) will be run using JNCC & Natural England's 'Seabird PVA Tool', as advised by Natural England (Natural England, 2021b) and requirements. The methodology and parameters used in the PVA and apportionment will also be based upon the best available evidence, will be agreed with consultees and stakeholders and clearly defined within the EIA (and HRA).

7.6.32 Migratory birds (including seabirds and wildfowl and waders) will be based on the best available assessment tools and approaches. However, it is likely the BTO Strategic Ornithological Support Service (SOSS) Migration Assessment Tool and broad front CRM will be used for relevant species. Approaches will be discussed with SNCBs to establish the most suitable methods.

7.6.33 Bird behaviour and abundance differs depending on time of the year and season. To account for this, separate bio-seasons will be recognised in the baseline technical reporting for the Project and subsequent impact assessments to establish the importance of IOFs at the Project at a particular period of time. Bioseasons for each species will be determined in line with Furness (2015) with relevant amendments made to accommodate for site specific differences, where an evidence base exists which supports this. For species not included in Furness (2015), bio-seasons will be agreed with Natural England throughout the EPP.

Relevant Embedded Mitigation Measures

7.6.34 As part of the design process for the Project, several embedded primary mitigation measures are proposed to reduce the potential for impacts on intertidal and offshore ornithological receptors. These will evolve over the development process as the EIA progresses and also, where necessary, in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

7.6.35 Th Project will seek to implement these environmental measures, and follow various standard sectoral practices and procedures. These procedures are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

- An Offshore Decommissioning Plan will be developed prior to decommissioning.
- Construction and operational maintenance vessels will follow a route from their home port that avoids high concentrations of red-throated diver (a species known to be sensitive to disturbance by boat traffic).

Potential Impacts Scoped In

7.6.36 A range of potential impacts on intertidal and offshore ornithology have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.6.5 together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 7.6.5: Impacts proposed to be scoped into the assessment for intertidal and offshore ornithology

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Disturbance and displacement: Offshore ECC	Construction activities associated with export cable installation may lead to disturbance and displacement of species within the ECC and potentially within surrounding buffers to a lower extent. Potential impacts also limited temporally due to limited duration of construction phase.	A screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded from DAS in very small numbers within the study area or with a low determined sensitivity to disturbance and displacement (as per e.g. Bradbury *et al.*, 2014; Furness *et al.*, 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.
Disturbance and displacement: Intertidal ECC	Construction activities associated with export cable installation may lead to disturbance and displacement of intertidal waterbird species within the ECC and potentially within adjacent areas.	A screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded from intertidal surveys in very small numbers within the study area or with a low determined sensitivity to disturbance and displacement (as per e.g. Bradbury *et al.*, 2014; Furness *et al.*, 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.
Disturbance and displacement: Array	Construction activities within the array area associated with foundations and WTGs may lead to disturbance and displacement of species within the array and potentially within surrounding buffers to a lower extent. Potential impacts are spatially restricted to a small number of foundations/ WTGs	A screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded from DAS in very small numbers within the study area or with a low determined sensitivity to disturbance and displacement (as per e.g. Bradbury *et al.* 2014; Furness *et al.* 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	being constructed at any one time. Potential impacts also limited temporally due to limited duration of construction phase.	relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.
Indirect impacts on IOFs due to effects on prey species habitat loss: Array	Impacts include those resulting from underwater noise (e.g. during piling) or the production of suspended sediments (e.g. during preparation of the seabed for foundations) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	A review of the data and impact assessments for Benthic Subtidal and Intertidal Ecology and Fish and Shellfish PEIR, and subsequent ES, will be conducted within the context of the potential impacts on offshore and intertidal ornithology.
Indirect impacts on IOFs due to effects on prey species habitat loss: Offshore ECC	Impacts include the production of suspended sediments (e.g. during installation of cables) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	A review of the data and impact assessments for Benthic Subtidal and Intertidal Ecology ad Fish and Shellfish PEIR, and subsequent ES, will be conducted within the context of the potential impacts on offshore and intertidal ornithology.
Operation and Maintenance		
Disturbance and displacement: Array	Activities associated with the O&M of WTGs and the presence of WTGs themselves may disturb and displace species within the array area and potentially within surrounding buffers to a lower extent.	Information on the assessment of disturbance and displacement is included in the proposed assessment methodology section above. A matrix approach following JNCC *et al.* (2017) guidance will be used to calculate a range of predicted impact magnitudes. These relate varying levels of displacement (within species-specific buffer distances from WTGs) to varying levels of additional mortality, with consideration then given to the population-level

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
		impacts of the potential additional mortality. Values and ranges of outputs would be discussed and agreed with relevant stakeholders as appropriate.
Collision risk: Array 1	Seabirds flying through the array area during the operational phase of the Project may be at risk of collision with WTGs. Collisions are assumed to be fatal.	CRM will be undertaken using industry-standard approaches (i.e. Band, 2012; Donovan, 2018) to predict potential collision rates from this impact. The population-level impacts of the resulting potential additional mortality will be considered. The exact option and version of the collision risk model to be used, avoidance rates, flight height data, nocturnal activity rates and parameters for modelling will be based upon the best available evidence and will be agreed with stakeholders and clearly defined within the EIA (and HRA).
Collision risk: Array 2	Migrant seabirds, waterbirds and other non-seabirds flying through the array area during the operational phase of the Project may be at risk of collision with WTGs. Collisions are assumed to be fatal.	CRM will be undertaken using industry-standard approaches (i.e. Band (2012) and the BTO SOSS Migration Assessment Tool) to predict potential collision rates from this impact. The population-level impacts of the resulting potential additional mortality will be considered. The exact option and version of the collision risk model to be used, avoidance rates, flight height data and parameters for modelling will be based upon the best available evidence and will be agreed with stakeholders and clearly defined within the EIA (and HRA).
Disturbance and displacement: Offshore ECC	Maintenance activities associated with the ECC during the operational stage of the Project may lead to disturbance and displacement of species within the ECC and potentially within surrounding buffers to a lower extent.	This impact has been scoped in due to red-throated diver as a feature in the Greater Wash SPA. However, the potential impacts along the offshore and intertidal ECC would be highly localised and episodic (i.e. limited to any maintenance or repair of the export cables) and therefore this impact is currently considered unlikely to have a significant effect within the EIA in relation to the ECC.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Indirect impacts on IOFs due to impacts on prey species habitat loss: Array	Impacts include habitat loss due to the presence of turbines that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to the array area impacting foraging seabirds.	A review of the data and impact assessments for Benthic Subtidal and Intertidal Ecology and Fish and Shellfish PEIR, and subsequent ES, will be conducted within the context of the potential impacts on offshore and intertidal ornithology.
Decommissioning		
Disturbance and displacement: Array	Decommissioning activities associated with foundations and WTGs may lead to the disturbance and displacement of species within the array area and potentially within surrounding buffers to a lower extent. Potential impacts will be spatially restricted to a small number of foundations/ WTGs being decommissioned at any one time. Potential impacts also limited temporally due to limited duration of the decommissioning phase.	A screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded only in very small numbers within the study area or with a low determined sensitivity to disturbance and displacement (as per e.g. Bradbury *et al.* 2014; Furness *et al.* 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.
Disturbance and displacement: Offshore ECC	Indirect impacts during the decommissioning phase within the offshore ECC and areas of intertidal landfall through effects on habitats and prey species. Potential impacts will be spatially restricted due to the narrow ECC. Potential impacts also limited temporally due to limited duration of the decommissioning phase.	A screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded only in very small numbers within the study area or with a low determined sensitivity to disturbance and displacement (as per e.g. Bradbury *et al.* 2014; Furness *et al.* 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Indirect impacts on IOFs due to impacts on prey species habitat loss: ECC	Impacts include those resulting from underwater noise or the production of suspended sediments that may alter the distribution, physiology or behaviour of prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active decommissioning works to foraging seabirds.	A review of the data and impact assessments for Benthic Subtidal and Intertidal Ecology and Fish and Shellfish PEIR, and subsequent ES, will be conducted within the context of the potential impacts on offshore and intertidal ornithology.
Cumulative		
Disturbance and displacement during operation: array	Activities associated with the O&M of WTGs and the presence of WTGs themselves at the Project and other projects may disturb and displace species within the study area.	Information on the assessment of disturbance and displacement is included in the proposed assessment methodology section above. A matrix approach following JNCC *et al.* (2017) guidance will be used to calculate a range of predicted impact magnitudes. These relate varying levels of displacement (within species-specific buffer distances from WTGs) to varying levels of additional mortality, with consideration then given to the population-level impacts of the potential additional mortality. Values and ranges of outputs would be discussed and agreed with relevant stakeholders as appropriate.
Collision risk during operation: array	Seabirds flying through the project array area and other projects during the operational phase may be at risk of collision with WTGs. Collisions are assumed to be fatal.	CRM will be undertaken using industry-standard approaches (i.e. Band, 2012; Donovan, 2018) to predict potential collision rates from this impact. The population-level impacts of the resulting potential additional mortality will depend on the season. During the breeding season, any plan/ project that is within mean-maximum foraging range +1SD will be included. During the non-breeding season, any plan/ project that is within the BDMPS region for each species will be considered.

Impacts Proposed to be Scoped Out

7.6.37 Based on the baseline environment information currently available and the project description (outlined in Section 3), and previous offshore wind development to date, a number of impacts are proposed to be scoped out of the EIA for intertidal and offshore ornithology. These impacts are outlined in Table , together with a justification for scoping them out.

Table 7.6.6: Impacts proposed to be scoped out of assessment for intertidal and offshore ornithology

Impact	Justification for scoping out
Construction, Operation and Maintenance and Decommissioning	
Barrier effect: Array	For the purposes of assessment of displacement for resident birds, it is usually not possible to distinguish between displacement and barrier effects. E.g. to define where individual birds may have intended to travel to, or beyond an offshore windfarm, even when tracking data are available. Therefore, in the impact assessment the effects of displacement and barrier effects on resident IOFs are considered together. The small risk of impact to migrating birds resulting from flying around rather than through the WTG array of an offshore windfarm is considered a potential barrier effect but has been scoped out of the assessment. Masden *et al.* (2010, 2012) and Speakman *et al.* (2009) calculated that the costs of one-off avoidances during migration were small, accounting for less than 2% of available fat reserves. Therefore, the impacts on birds that only migrate through the AoS (including seabirds, waders and waterbirds on passage) are considered negligible and these would be scoped out of detailed assessment.
Operation and Maintenance	
Disturbance and displacement: Intertidal ECC	The ECC AoS overlaps the Greater Wash SPA and Humber Estuary SPA but given that potential impacts along the offshore and intertidal ECC would be highly localised and episodic (i.e. limited to any maintenance or repair of the export cables) it is proposed that this impact should be scoped out from further consideration within the EIA in relation to the cable, with the focus of operational disturbance-displacement on the array only.
Cumulative	
All other impacts not including cumulative disturbance/ displacement and collision	All other cumulative impacts will be scoped out as the likelihood that there would be a cumulative impact is low, and the contribution from the Project is likely to be small, and dependent on a temporal and spatial co-incidence of disturbance/ displacement from other plans or projects.

Potential Transboundary Effects

7.6.38 There is a potential for collisions and displacement of IOFs at wind farms outside UK territorial waters, and for international seabird populations to be affected by the Project. This includes, European OWF projects located within the southern North Sea, such as Hollandse Kust, Borssele 3 and 4, etc. Potential impacts relating to OWFs and seabird populations from other countries are considered less likely due to larger distances involved. However, it is likely from the baseline data presented, that transboundary considerations will feature in the offshore ornithology assessment at PEIR.

7.6.39 A quantitative/ qualitative assessment will be undertaken depending on the level of data availability. As the spatial scale of assessment would be increased, the inclusion of non-UK seabird populations for a transboundary assessment would also increase the reference population sizes. The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

Summary of Next Steps

7.6.40 As the project develops, a more detailed methodology for the EIA will be agreed with SNCBs. This will include the production of a method statement and ETG meetings where the methodology will be discussed and adopted accordingly based on relevant advice and perceived risk, progressed as part of the EPP.

7.6.41 The ongoing programme of monthly digital aerial bird surveys for the array (and associated buffer) will continue until February 2023 and will provide the key data source for the ornithology site characterisation and quantification of parameters for the impact assessment (e.g. CRM). For the PEIR, which will be produced to support the statutory consultation process, the assessments will be supported by as much data as is available at the time of drafting, but as a minimum will present the first full year of data.

7.6.42 For the PEIR and ES, information from previous surveys in the wider area will be collated and additional data collection options are also being considered to provide further contextual information, alongside the literature and information sources outlined in Table .

7.6.43 The impact assessment methodology will be based on that described in Section 5, adapted to make it applicable to IOFs, and aligned with the key guidance documents produced on impact assessment of ecological/ornithological receptors (CIEEM, 2018; updated 2019; and Natural England, 2021a; 2021b), evidence from other offshore windfarms and species-specific studies and expert opinion. As the Project develops, a more detailed methodology for the EIA will be agreed with relevant stakeholders. This will include the production of detailed assessment method statements for review by the relevant EPP ETG meetings where the methodology will be discussed and adopted accordingly based on relevant advice and perceived risk.

7.6.44 The sensitivity of each species will be determined based on the size of its population, its conservation status and its known sensitivity to offshore windfarms. Species identified as IOFs will be subject to full impact assessment against the impacts listed in Table . The impact assessment will be undertaken in line with guidance by CIEEM (2018; updated 2019), Natural England (2021b) and expert opinion.

7.6.45 Reference populations for each species and population sizes (i.e. Furness (2015) and data from the National Seabird Monitoring Programme) will be based on the best available information at the time of undertaking the assessment and will be agreed with key stakeholders.

7.6.46 Cumulative effects assessment approach will follow the guidance set out by Natural England (2021b), including development of cumulative/ in-combination numbers considering ongoing applications.

7.6.47 A derogation/ compensation workstream (although strictly HRA rather than EIA) will run in parallel to the HRA process. Information will be presented within the relevant derogation documents which will be developed by the Project.

7.6.48 The PEIR will be produced to support the statutory consultation process, in advance of the final assessment. This will be submitted to relevant stakeholders for review and with the final assessment informed by the comments received.

7.6.49 The process and record of discussions, consultations, stakeholder agreements and any unresolved issues will be summarised within the ES chapter.

Further Consideration for Consultees

- Do you agree that the data sources identified are sufficient to inform the offshore and intertidal ornithological baseline for the PEIR and ES?
- Do you agree with the seabird data collection method i.e. 24 months of DAS of the array area plus a 4km buffer?
- Do you agree that all potential impacts resulting from the Project have been identified for offshore and intertidal ornithological receptors?
- Do you agree with the proposed approach to the assessment for the impacts proposed in Table 7.6.5?
- Do you agree that those seabird species primarily identified as occurring in greatest numbers in the recent DAS of the array area [linked with nearby breeding colonies (SSSI, SPA & pSPA)] and that may be potentially impacted by the construction and operation of the WTG array should form the focus of the ornithological assessment: gannet, kittiwake, red-throated diver, razorbill and guillemot?
- Do you agree that, for the offshore ECC AoS, the species of interest in relation to the potential impacts of the construction (and maintenance) of the offshore cable and landfall is red-throated diver (which is known to be sensitive to vessel traffic and is an interest feature of the Greater Wash SPA)?

7.7 Marine Archaeology

Introduction

7.7.1 This section of the Scoping Report identifies the Marine Archaeology elements of relevance to the Project array area and offshore ECC AoS. This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on Marine Archaeology and sets out the proposed scope of the EIA.

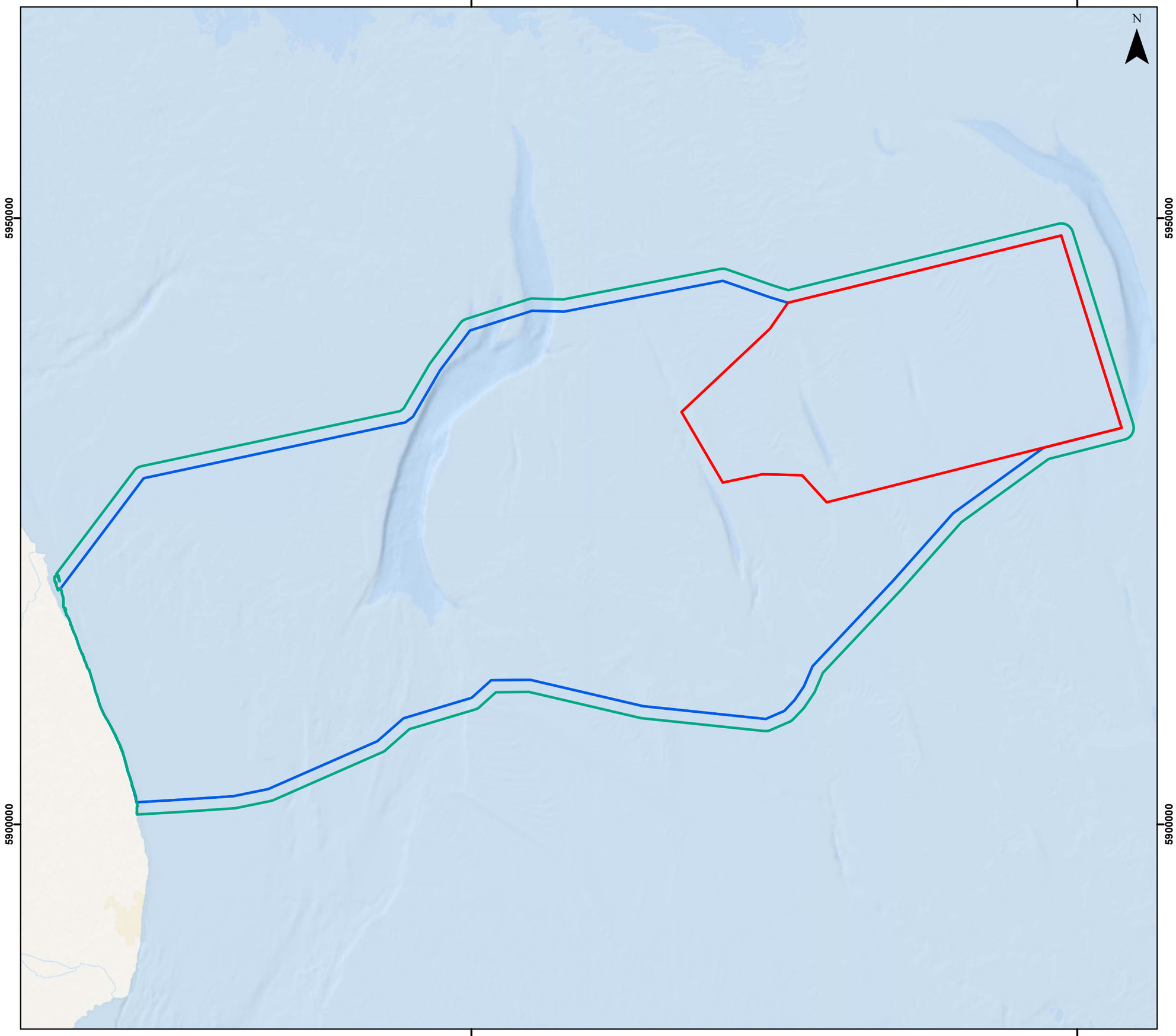
7.7.2 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.1: Marine Physical Processes;
- Section 7.11: Seascape, Landscape and Visual Impact Assessment; and
- Section 8.2: Archaeology (onshore).

Study Area

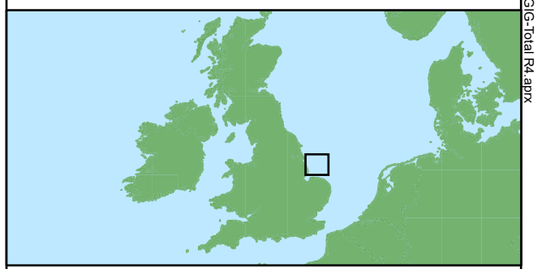
7.7.3 The marine archaeology study area (Figure 7.7.1) for the Project is defined as:

- The array area, the ECC AoS, and a 1 km buffer up to MHWS. The buffered area allows for the consideration of direct and indirect effects on marine archaeological and cultural heritage receptors and is designed to accommodate the potential imprecision of historic marine positioning; and
- It is important to note that the marine archaeology study area will be reviewed and amended for future stages (PEIR and subsequently in the ES) in response to such matters as refinement of the onshore/ offshore AoS, feedback from consultees, and/ or the identification of additional constraints (environmental and/or engineering).



Legend

- Marine Archaeology Study Area
- Site Boundary
- Offshore ECC Area of Search



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:300,000

Marine archaeology study area

Figure 7.7.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Approach

7.7.4 The marine archaeology study area consists of the array area and ECC AoS and 1km buffer that are presented separately within this section.

Overview of Available Data Sources

7.7.5 The following data sources, detailed in Table 7.7.1 were collated and some consulted for this scoping section in order to undertake an initial desk-based review of the known archaeological and cultural heritage assets and likely significant impacts. The remaining datasets will be further outlined and used in support of the DCO application during PEIR and ES phases.

Table 7.7.1: Key sources of information for marine archaeology

Source	Assessment Stage	Summary	Spatial Coverage of Study Area
National Record of Historic Environment (NRHE)	Scoping	Point and polygon data in relation to wrecks and palaeoenvironmental evidence via Archaeology Data Service (ADS) ArchSearch.	Full coverage of the marine archaeology study area.
UKHO wrecks and obstructions (Admiralty Maritime Data Solutions) (wrecksite.eu)	Scoping	Records of known wrecks and obstructions held by the UKHO and available via Admiralty Maritime Data Solutions: Marine Data Portal (2022) and wrecksite.eu.	Full coverage of the marine archaeology study area up to MLWS.
UKHO Admiralty Charts	PEIR/ ES	Admiralty charts and historic mapping relevant to the defined marine archaeology study area.	Full coverage of the marine archaeology study area.
Lincolnshire Historic Environment Record	PEIR/ ES	Point data of local historic environments from Lincolnshire derived from Historic Environment Records held by Lincolnshire Historic Environment Record (HER) Office.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
The North Sea Palaeolandscapes Project (NSPP) (Gaffney *et al.*, 2007)	PEIR/ ES	Palaeolithic and Mesolithic landscape mapping of the North Sea.	Partial coverage of the marine archaeology study area and provides useful characterisation of the directly adjacent subzone.

Source	Assessment Stage	Summary	Spatial Coverage of Study Area
Lost Frontiers Project (LFP)	PEIR/ ES	A continuation of the NSPP. Building on the mapping of Palaeolithic and Mesolithic landscapes of the North Sea, using paleoenvironmental data and ancient DNA. Potential submerged Neolithic landscapes will also be explored.	Data is not yet published for this project but will be considered when this data becomes available.
Technical Report for SEA Area 3 (Flemming, 2002)	PEIR/ ES	Description of palaeolandscape potential of the North Sea basin.	Broadscale data with regional coverage.
Coastal and Intertidal Zone Archaeological Network (CITiZAN)	PEIR/ ES	Interactive mapping of intertidal heritage in England.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
Historic England Peat Database	PEIR/ ES	Database of all intertidal and coastal peats containing location, nature, age and related archaeology.	Limited data within the marine archaeology study area, though peats have been found along the Lincolnshire coast and to the south along the Norfolk coast.
National Historic Seascape Characterisation (NHSC) Database	PEIR/ ES	Database and thesaurus of all intertidal and offshore historic seascapes in the UK.	Full coverage of the marine archaeology study area up to MLWS.
England's Historic Seascapes Marine HLC (Historic Landscape Character) Pilot Study: Withernsea to Skegness (Museum of London 2009)	PEIR/ ES	Description of palaeolandscape and marine archaeological potential in the offshore zone from Withernsea south to Skegness.	Broadscale data with regional coverage.
Site-specific geophysical and geotechnical survey data from the array area and ECC AoS (2021/2022)	PEIR/ ES	Geophysical surveys which include bathymetry, SSS, and magnetometer data collection and geotechnical works which include boreholes and vibrocoring.	Full geophysical survey coverage of the marine archaeology study area. Initial geotechnical works will mainly be designed around engineering

Source	Assessment Stage	Summary	Spatial Coverage of Study Area
			requirements, with archaeological input provided during the planning stages of site investigation works. Geoarchaeological campaigns utilising both the already collected material as well as archaeology specific cores will be undertaken following the submission of Method Statements to Historic England.

Overview of Baseline Environment

7.7.6 The offshore marine archaeological resource can be attributed to five main categories of sites or features:

- Submerged prehistoric landscapes resulting from changes to sea-level and eventual stabilisation of sea-level at or near the present position. Such landscapes may contain highly significant evidence of prehistoric human occupation and/or environmental change;
- Archaeological remains of watercraft deposited when such vessels sank while at sea or became abandoned in an inter-tidal context which subsequently became inundated;
- Remains of aircraft crash sites, either coherent assemblages or scattered material, usually the result of Second World War (WWII) military conflict, but also numerous passenger casualties, particularly during the peak of seaplane activity during the First World War (WWI), though these rarely survive in the archaeological record;
- Structural remains other than watercraft, including such elements as fish traps, abandoned quays, hards, defensive structures or sites lost to coastal erosion may be found within the intertidal zone (between MHWS and MLWS). Marine archaeological and cultural heritage receptors located seaward of MHWS have been considered in this section; and
- Historic Seascape Character: the historic cultural influences which shape present perception of seascapes, its uses and its ability to accommodate change.

Designated Sites

Array Area

7.7.7 There are currently no known archaeological features or sites, including the remains of any aircraft, within the array area that are currently designated under the Protection of Wrecks Act 1973, or any other site designation or statutory protection.

ECC AoS

7.7.8 The remains of two aircrafts UKHO 66921 (Sunderland flying boat) and UKHO 60889 (WWII casualty), both classified by the UKHO as live (a wreck considered to exist) (UKHO via Admiralty Maritime Data Solutions, 2022), are located within the ECC AoS. All military aircraft are automatically protected under the Protection of Military Remains Act 1986 and are then individually designated upon further investigation. There is a high probability that, if located during site investigation activities, the aircraft within the marine archaeology study area could fall under this designation.

7.7.9 Along the Lincolnshire coast, where the ECC AoS makes landfall there are two sites that are designated as SSSI, Chapel Point to Wolla Bank SSSI and Saltfleetby-Theddlethorpe Dunes SSSI, both of which lie within the marine archaeology study area. While there are no designated archaeological features within either area, Chapel Point to Wolla Bank SSSI preserves paleoenvironmental deposits that consist of Holocene sediments and special geological features.

7.7.10 There are no other known archaeological features or sites within the ECC AoS that are currently designated under the Protection of Wrecks Act 1973, or any other site designation or statutory protection.

Submerged Landscapes

7.7.11 The potential for submerged landscapes within the marine archaeology study area is high. Fluctuations in sea-level and temperature in the Palaeolithic resulted in repeated (re)colonisation and abandonment of these landscapes (Cohen *et al*., 2017). South of the marine archaeology study area at Happisburgh and Pakefield, the earliest evidence of hominin occupation of northern Europe (c. 900 thousand years (ka) to 800 ka) comes from sites, features and finds within the coastal and marine zone (Parfitt *et al*. 2005, 2010; Bynoe, 2018).

7.7.12 These periods of (re)colonisation are associated with the retreat of icesheets following the last three glacial maximums:

- Devensian: Upper Palaeolithic c. 100 – 22,000 Before Present (BP) (glacial maximum);
- Wolstonian: Middle Palaeolithic c. 250 – 150,000 BP (glacial maximum); and
- Anglian: Lower Palaeolithic c. 350 – 280,000 BP (glacial maximum).

7.7.13 Due to the effects of ice scouring during each successive glacial period, the North Sea Basin has the highest potential for Palaeolithic material from within the last 100,000 years and increases significantly following the last glacial maximum, at the onset of the Holocene (Flemming, 2002). This is because these former Pleistocene land surfaces have not been eroded or reworked by younger landscapes (Cohen *et al*. 2017).

7.7.14 The prehistoric landscape under the North Sea, referred to as Doggerland, was a core area of human habitation during the Holocene, in particular after the ice sheets receded and when sea-levels rose between 18,000 and 5,500 BC (Gaffney *et al*., 2017). Coastal and submerged peat deposits, likely to be Holocene deposits, can provide a rare opportunity to enhance the understandings of changing human behaviours during the Mesolithic.

7.7.15 There are currently no protected areas or statutory designations in relation to submerged landscapes within the marine archaeology study area.

Historic England Peat Database

7.7.16 Peat deposits are important archives of past human activities that not only preserve archaeological material, but they are also historic landscapes (Historic England, 2021). Due to the anoxic conditions, organic remains can be preserved within peat deposits for thousands of years.

7.7.17 The Historic England Peat Database highlights 10 records of peat along the coast near the ECC landfall site and 33 records throughout the North Sea. Exact coordinates for most of these locations are not confirmed, but the number of records indicates high probability that peat could be found within both the ECC AoS and the array area. The peat database will be analysed further during PEIR.

7.7.18 Two examples of peat were recovered within the ECC AoS in 2015 during trawling and will be further analysed during PEIR.

UKHO Wrecks and Obstructions

7.7.19 There are a total of 200 wrecks, obstructions and fouls recorded by the UKHO within the marine archaeology study area (Figure 7.7.2) that have been categorized based on Historic England's (2022) definition of England's historic and cultural periods (Table 7.7.3). Table 7.7.2 shows the distribution of wrecks within the array area and ECC AoS (and associated buffers).

Table 7.7.2: Total number of wrecks, fouls and obstructions

Location	Number of wrecks, obstruction and fouls
Array Area	15
ECC AoS	168
Buffer	17

Table 7.7.3: UKHO wrecks, fouls and obstructions

Period	Number of Records	Types
Array Area		
Roman (AD 43-AD 410)	0	n/a
Early Medieval (AD 411-1066)	0	n/a
Medieval (1067-1540)	0	n/a
Post-Medieval (1541-1901)	2	Sailing vessel
20th Century (1902-1913/1919-1938)	0	n/a
WWI (1914-1918)	0	n/a
WWII (1939-1945)	0	n/a

Period	Number of Records	Types
Post-WWII (1946-present)	1	Carrier
Aircraft	0	n/a
Unknown Wrecks	2	Trawler, unknown
Obstructions and Foul Ground	10	Fisherman's fastener, chain, masonry, debris, unknown
ECC AoS		
Roman (AD 44-AD 410)	0	n/a
Early Medieval (AD 411-1066)	0	n/a
Medieval (1067-1540)	0	n/a
Post-Medieval (1541-1901)	8	Sailing vessel, steamship, destroyer
20th Century (1902-1913/1919-1938)	9	Steamship, trawler, motor vessel
WWI (1914-1918)	16	Steamship, sailing vessel, trawler, fishing vessel
WWII (1939-1945)	22	Motor vessel, steamship, trawler, corvette, destroyer, tanker, liner
Post-WWII (1946-present)	14	Steamship, fishing vessel, tanker, fishing vessel, ferry, trawler, motor vessel, launch, art installation
Aircraft	2	Flying boat, unknown
Unknown Wrecks	69	Sailing vessel, steamship, wooden vessel, unknown, trawler, fishing vessel
Obstructions and Foul Ground	28	Fisherman's fasteners, debris, pipes, munitions, chain, cable, unknown
Buffer		
Roman (AD 44-AD 410)	0	n/a
Early Medieval (AD 411-1066)	0	n/a
Medieval (1067-1540)	0	n/a
Post-Medieval (1541-1901)	1	Ketch
20th Century (1902-1913/1919-1938)	0	n/a
WWI (1914-1918)	3	Steamship, trawler
WWII (1939-1945)	2	Steamship
Post-WWII (1946-present)	0	n/a
Aircraft	0	n/a
Unknown Wrecks	6	Steamship, unknown
Obstructions and Foul Ground	5	Fisherman's fastener, cable, unknown

NRHE Wrecks, Obstructions, and Sites

7.7.20 There are 40 records in the NRHE dataset within the marine archaeology study area (Table 7.7.4 and Figure 7.7.2) that have been categorized based on Historic England's (2022) definition of England's historic and cultural periods.

Table 7.7.4: NRHE records

Period	Number of Records	Types
Prehistoric (AD 500,000 - AD 43	2	Flint, peat
Roman (AD 44 - AD 410)	1	Potsherd
Early Medieval (AD 411 - 1066)	0	N/A
Medieval (1067 - 1540)	0	N/A
Post-Medieval (1541 - 1901)	7	Fishing enclosure, clay pits, unknown, collier
20th Century (1902 – 1913/ 1919 - 1938)	2	Steamship, motor vessel
WWI (1914 - 1918)	5	Steamship
WWII (1939 - 1945)	8	Motor Vessel, steamship, trawler, tanker
Post-WWII (1946 - present)	1	Trawler
Aircraft	0	N/A
Unknown	14	Unknown, fishing vessel, steamship
Obstructions and Foul Ground	0	N/A

7.7.21 Of these records, 27 correspond with the UKHO records listed in Table 7.7.3. The UKHO positional data uses the WGS84 datum and supersedes the coordinate location of the British National Grid format of NRHE data. The remaining 13 unique records will be further assessed during the PEIR phase and within the final ES in order to further characterize the marine archaeology study area.

Lincolnshire Historic Environment Record (HER)

7.7.22 There are less than 30 records within the Lincolnshire HER which are all situated along the coastline where the Landfall AoS intersects with the marine archaeology study area. The majority of these records are find spots and isolated finds but show evidence of human use and occupation within the region. The relevant records will be mapped and assessed in detail during PEIR and presented in the final ES chapter.

Historic Seascapes

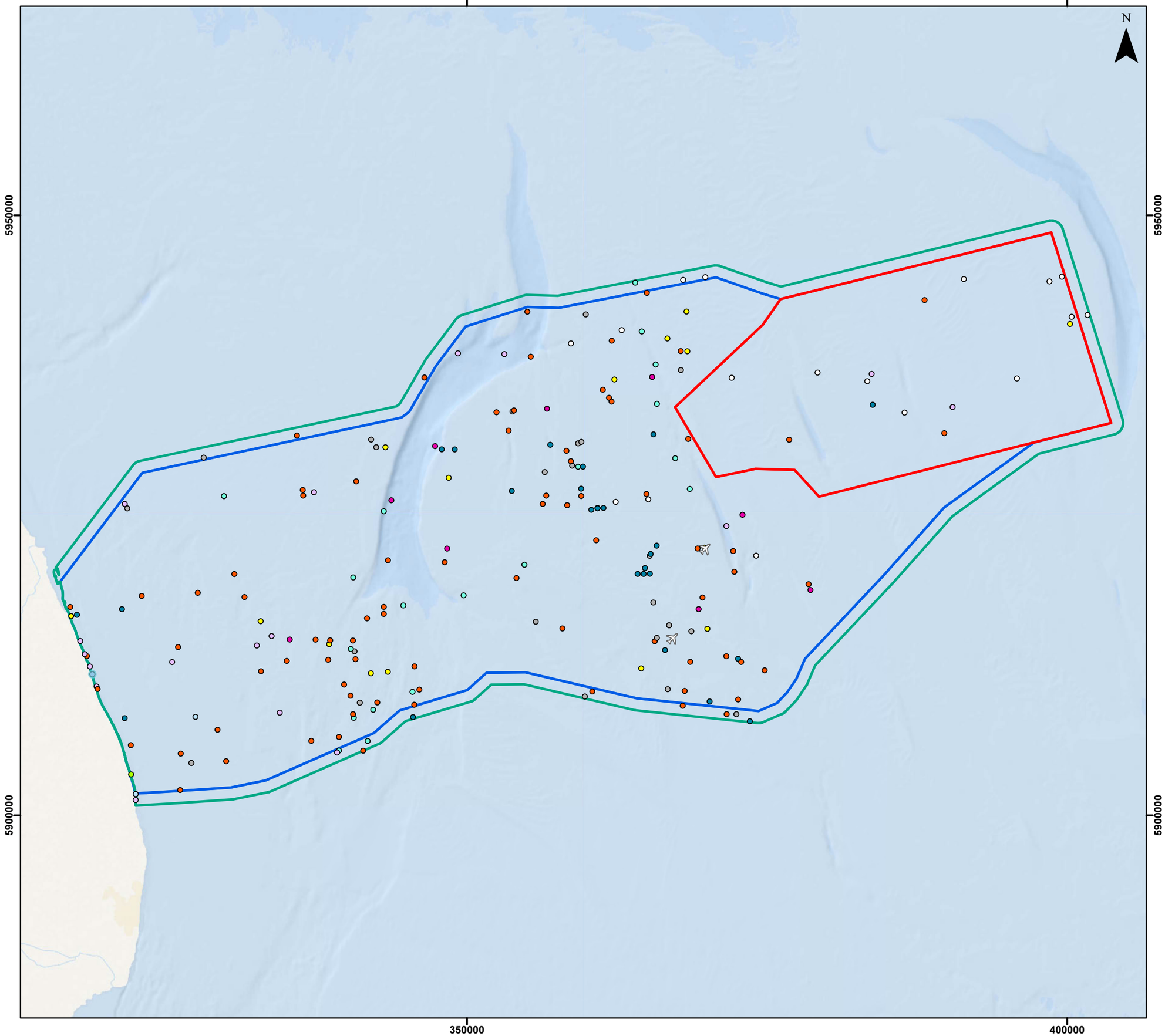
7.7.23 A HSC assessment will be presented in the PEIR and the final ES. The assessment will utilise the NHSC Consolidation (Land Use Consultants, 2017), Historic Seascape Characterisation (HSC) Thesaurus (Historic England, 2017), England Historic Seascapes Marine HLC (Historic Landscape Character) Pilot Study: Withernsea to Skegness (Museum of London, 2009) and other relevant studies.

Site-specific Geophysical and Geotechnical Data

7.7.24 The Project collected geophysical and geotechnical data in 2021/ 2022 that covers array area and ECC AoS and will be assessed in detail during PEIR and presented in the final ES chapter. The geophysical data collected to date consists of bathymetric (MBES), SSS, magnetometer (MAG) and SBP shallow acoustic data.

7.7.25 Pre-application geotechnical works included boreholes and vibrocores within the marine archaeology study area. Additional geotechnical works including archaeology specific cores, will be undertaken upon the review of all geophysical data collected in 2021/ 2022. Analysis of geotechnical investigation will follow the staged approach outlined in the Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE, 2011) and will be in lead to the formation of a deposit model.

7.7.26 The geophysical and geotechnical survey data will be scoped in and assessed by an experienced marine archaeologist in line with guidance outlined in Section 7.7.27. The review of these datasets will be used to develop the marine archaeology baseline, establish archaeological potential and/ or significance, and to develop appropriate impact mitigation primarily through avoidance through the implementation of Archaeological Exclusions Zones (AEZs). Detailed methodologies and mitigation strategies will be discussed with Historic England through the EPP and the development of the marine archaeology Written Scheme of Investigation (WSI) document and associated method statements.



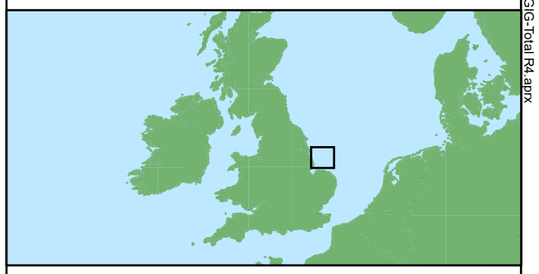
Legend

- Marine Archaeology Study Area
- Site Boundary
- Offshore ECC Area of Search

UKHO and NRHE Data

Period

- Prehistoric
- Roman
- Post-Medieval
- 20th Century
- WWI
- WWII
- Post-WWII
- Aircraft
- Obstruction
- Foul Ground
- Unknown



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:300,000

Known marine archaeological and cultural heritage receptors (UKHO) within the study area

Figure 7.7.2

OUTER DOWSING OFFSHORE WIND

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Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.7.27 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of marine archaeology will also comply with the following guidance documents where they are specific to this topic:

- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014a and 2014b);
- Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE) (2011);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008);
- JNAPC Code of Practice for Seabed Development, Joint Nautical Archaeology Policy Committee (2006);
- Commercial Renewable Energy Development and the Historic Environment, Historic England Advice Note 15 (2021);
- Archaeological WSI for OWF Projects, TCE (2021); and
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, TCE (2014).

7.7.28 Further, the Overarching NPS for Energy (NPS EN-1) (Department for Energy and Climate Change, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy and Climate Change, 2011b) contain planning policy on offshore renewable energy NSIPs, specifically in relation to marine archaeology. NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment and highlight several factors relating to the determination of an application and in relation to mitigation. The assessment of the marine archaeological resource together with the designed-in measures adopted for the project will consider all the relevant NPS EN-1 and NPS EN-3 provisions (including any additional provisions set out in the draft, updated NPSs recently issued by BEIS and that are currently subject to consultation).

Relevant Embedded Mitigation Measures

7.7.29 As part of the design process for the Project, several embedded mitigation measures are proposed to reduce the potential for impacts on marine archaeological and cultural heritage receptors. The embedded measures will evolve over the development process as the EIA progresses and in response to consultation.

7.7.30 The Project is committed to implementing the measures outlined below as well as various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of the Project and hence have been considered in the judgments as to which impacts should be scoped in as presented in Table 7.7.5.

7.7.31 Measures adopted as part of the project will include:

- An Outline Marine WSI which will detail responsibilities through all project stages, describe a comprehensive mitigation strategy and include the implementation of an Outline Protocol for Archaeological Discoveries (PAD);
- AEZs as outlined in the Outline Marine WSI to protect any known and identified marine archaeological receptors and allow the rerouting and micro-siting of seabed structures and cables; and
- Commitments to undertake full archaeological reviews and assessments of all relevant geophysical and geotechnical data collected both pre- and post-consent.

7.7.32 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the pre-application phase.

Potential Impacts Scoped In

7.7.33 A range of potential impacts on marine archaeology and cultural heritage have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.7.5, together with a description of any proposed additional data collection (e.g., site-specific surveys) and/ or supporting analyses (e.g., modelling) to enable an assessment of the impact.

7.7.34 Based on the marine archaeology and cultural heritage information currently available and the project description, at this stage no impacts have been identified to be scoped out of the assessment of marine archaeology and cultural heritage.

7.7.35 The methodology is to be agreed with the statutory advisors and a full scheme of archaeological mitigation will be implemented through the development and implementation of an Outline Marine WSI secured through the deemed marine licence(s) in order for the statutory advisors to be confident that due consideration and appropriate mitigation has been given throughout the EIA process.

Table 7.7.5: Impacts proposed to be scoped into the assessment for marine archaeology

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Removal of sediment containing undisturbed archaeological contexts during seabed preparation ahead of construction.	Direct or indirect effects as a result of exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating total or partial loss of the same.	Known marine archaeological and cultural heritage receptors will be further identified and detailed during the ES assessment process, which will accompany the DCO application, and avoided by establishing AEZs at the project design stage. Unknown and unexpected marine archaeological and cultural heritage receptors will be identified during the archaeological assessment of geophysical and geotechnical data during ES to accompany the DCO application and avoided by establishing AEZs at the project design stage and/ or further investigated where justified. A deposit model will be used to a level commensurate with the level of investigation undertaken as the project progresses. Specific actions required will be established through the EPP. An Outline Marine WSI document will be produced prior to PEIR to set out the approach to mitigation, including the use of AEZs, and detail responsibilities through all project stages. Any programme of analysis will be preceded by a project specific Method Statement (MS) and will adhere to the methodology set out in the Outline Marine WSI. Any additional unknown or unexpected marine archaeology and cultural heritage receptors identified during any of the project stages will be reported using the project specific PAD, which will be produced during PEIR. All agreed methodologies detailed in the Outline Marine
Intrusion of foundations disturbing archaeological contexts.	Direct penetration and compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	
Compression of stratigraphic contexts containing archaeological material from combined weight of WTG or substations.	Direct penetration and compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	
Disturbance of sediment containing potential marine archaeological and cultural heritage receptors (material and contexts) during cable laying operations.	Direct or indirect effects as a result of exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same and direct penetration; compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Penetration and compression effects of jack-up barges and anchoring of construction vessels during seabed preparation and seabed installation operations.	Direct or indirect effects as a result of exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same; direct penetration and compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	WSI will be taken into consideration when previously unknown marine archaeological receptors are documented through a PAD report.
Operation		
Scour effects caused by (a) the presence of WTGs, OSP foundations, and (b) the exposure and replacement of cables or the use of cable protection measures (such as mattressing or remedial cable burial).	Indirect scour effects impacting marine archaeological and cultural heritage receptors and exposing such material to natural, chemical or biological processes and causing or accelerating total or partial loss of the same.	The proposed approach to all known, unknown and unexpected marine archaeology and cultural heritage receptors follows the same approach as the above construction phase.
Penetration and compression effects of jack-up barges and anchoring of construction vessels during O&M activities.	Direct or indirect effects as a result of exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same; direct penetration and compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Decommissioning		
Draw-down of sediment into voids left by removed WTG, OSP foundations or other infrastructure, or cable removal leading to loss of sediment.	Direct or indirect effects as a result of draw-down effects directly impacting or exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same.	The proposed approach to all known, unknown and unexpected marine archaeology and cultural heritage receptors follows the same approach as the above construction phase.
Penetration and compression effects of jack-up barges and anchoring of construction vessels during decommissioning activities.	Direct or indirect effects as a result of exposing marine archaeological and cultural heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same; direct penetration and compression effects on marine archaeological and cultural heritage receptors leading to a partial or total loss of the receptor.	
Cumulative		
Cumulative effects of offshore wind developments within a range of 50 km	Cumulative impacts may include sediment disturbance arising from the installation of the export cables and seabed foundations at other OWF sites, as well as the effects of jack-up barges and anchoring of construction, O&M vessels. Cumulative impacts may expose marine archaeological and cultural heritage receptors to natural, chemical or biological processes, causing or	The impacts on known and identified marine archaeological and cultural heritage receptors is expected to be localized. However, cumulative scour and changes to seabed sediment transport over the long term and the effects, both negative and positive, on marine archaeological and cultural heritage receptors will be assessed at PEIR stage and within the final ES. The cumulative impact study will consider the effects upon a single receptor assessed alongside other proposed and foreseeable projects.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	accelerating partial or total loss of the same.	An Outline Marine WSI document will be produced prior to PEIR to set out the approach to mitigation, including the use of AEZs, and detail responsibilities through all project stages. Any additional unknown or unexpected marine archaeology and cultural heritage receptors identified during any of the project stages will be reported using the project specific PAD, which will be produced during PEIR. All agreed methodologies detailed in the Outline Marine WSI will be taken into consideration when previously unknown marine archaeological receptors are documented through a PAD report.
Cumulative effects of other activities within a range of 50 km	There is the potential for other activities occurring within the region surrounding the marine archaeology study area to create potential cumulative impacts on marine archaeological and cultural heritage receptors.	

Potential Transboundary Effects

7.7.36 The closest median line to the marine archaeology study area is that of the Dutch EEZ which is located approximately 95 km away at its closest point. Due to the localised nature (limited entirely to within the UK EEZ) of any potential impacts on known marine archaeological and cultural heritage receptors, transboundary impacts will not occur and therefore it is proposed that this impact will be scoped out from further consideration within the EIA as further detailed in Section 5.

7.7.37 It should be noted that, while all potential transboundary impacts are proposed to be scoped out, should wrecks or aircrafts of non-British nationality be affected by the Project, further archaeological investigations may be warranted and in line with the procedures that will be outlined in the Outline Marine WSI that will be produced as part of the PEIR phase. Further discussions on protection should include the relevant organisation in the country of relevance. There is also a potential for paleochannels and palaeolandscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes in those cases is expected to be local within the Project and will be mitigated and offset by archaeological assessments of geotechnical data.

Summary of Next Steps

7.7.38 The next steps to be undertaken as part of the DCO application in relation to marine archaeology are summarised below:

- Consultation with statutory advisors: Regular engagement through an EPP and technical panel meetings will be established in order to ensure that the assessment proceeds according to the regulators' requirements;
- Full Baseline Assessment: A full marine archaeological desk-based study will be undertaken ahead of the production of the PEIR which will aim to determine the marine archaeological potential of the development area and the significance of marine archaeological and cultural heritage receptors, both known and unlocated;
- Baseline Historic Seascapes Assessment: A baseline assessment of the Historic Seascape will be undertaken prior to the production of the PEIR. The HSC assessment will draw on the publication; Historic Seascape Characterisation (LUC 2017);
- Archaeological assessments of available marine geophysical and geotechnical survey data: the archaeological assessment will aim to identify marine archaeological and cultural heritage receptors (deposits, finds and sites) and will assign a rating of archaeological potential;
- Full impact assessment: The PEIR and final ES will include an assessment of significance of effects which will consider all aspects of the design scenario in order to determine the impact on all known and newly identified marine archaeological and cultural heritage receptors. It will also detail the designed-in mitigation measures.

- Production of an Outline Marine WSI document: An Outline Marine WSI will be developed in order to detail all marine archaeology embedded mitigation measures and will outline specific packages of work required in order to fulfil those commitments. The Outline Marine WSI will describe the roles and responsibilities of the applicant, statutory advisers and archaeological contractors, and set out the requirements for further surveys and monitoring to deliver all mitigation requirements. The Outline WSI document will be appended to the PEIR and final ES documents; and
- Project-specific Protocol for Archaeological Discoveries (PAD): The PAD will be project specific but based on the guidance outlined in the Protocol for Archaeological Discoveries: Offshore Renewables Projects, TCE (2014). The PAD will ensure the awareness of all managers and contractors undertaking offshore work, prior to or during construction, and throughout operational and decommissioning phases, should material with archaeological potential be located. The draft PAD document will be appended to the PEIR and final ES documents.

Further Consideration for Consultees

- Do you agree that relevant sources of secondary data have been accessed for scoping or identified for use in the PEIR and ES?
- Is there any other baseline information that you feel should be considered?
- Based on the information received to date, do you agree that known marine archaeological and cultural heritage receptors within the study area will be appropriately identified?
- Have the potential impacts on marine archaeological and cultural heritage receptors resulting from the Project, outlined in Table Table 7.7.5, for this stage been identified?
- For those impacts scoped in (Table 7.7.5), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable baseline strategy for managing and mitigating the potential effects of the Project on marine archaeological and cultural heritage receptors?

7.8 Commercial Fisheries

Introduction

7.8.1 This section of the Scoping Report identifies the commercial fisheries elements of relevance to the Project array area and offshore ECC AoS. This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on commercial fisheries and sets out the proposed scope of the EIA.

7.8.2 This section of the Scoping Report should be read alongside the following sections due to the interactions between the technical aspects:

- Section 7.4 Fish and Shellfish Ecology, which includes consideration of potential impacts on species of commercial importance;
- Section 7.9 Shipping and Navigation, which includes consideration of potential impacts on vessel routing and navigational safety; and
- Section 7.12 Infrastructure and Other Users, which includes consideration of potential impacts on charter angling businesses.

Study Area

7.8.3 The Project is located across the boundary of ICES Divisions 4b (central North Sea) and 4c (southern North Sea), within the UK EEZ waters. For the purpose of recording fisheries landings, ICES Divisions 4b and 4c are divided into statistical rectangles23, which are consistent across all Member States operating in the North Sea.

7.8.4 The array area is outside the 12 nm territorial seas boundary, within ICES rectangles 35F1 and 36F1. The ECC AoS overlaps with ICES rectangles 36F1, 35F1, 36F0 and 35F0, and runs from outside 12 nm, through inshore waters to landfall. The study area of this scoping exercise is therefore defined as ICES rectangles 35F1, 36F1, 36F0 and 35F0 and is shown in Figure 7.8.1.

7.8.5 The study area will be reviewed and amended as necessary for subsequent EIA stages (i.e. PEIR, ES) in response to such matters as refinement of the offshore ECC AoS and feedback from consultees.

[23] ICES standardise the division of sea areas to enable statistical analysis of data. Each ICES statistical rectangle is '30 min latitude by 1-degree longitude' in size (approximately 30 x 30 nautical miles). A number of rectangles are amalgamated to create ICES statistical areas.

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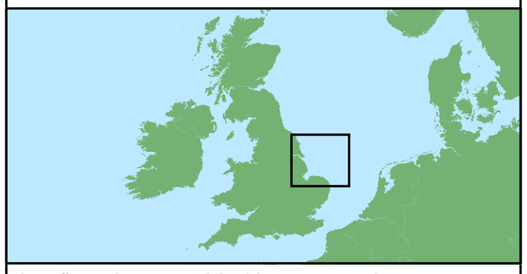
Legend

- Site Boundary
- Offshore ECC Area of Search
- Array Study Area
- ECC AoS Study Area
- ICES Statistical Rectangles

Fishing Limits

- 6 NM
- 12 NM
- 200 NM



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:750,000

Commercial fisheries study area, incorporating ICES rectangles 36F1, 35F1, 36F0 and 35F0

Figure 7.8.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

7.8.6 An initial desk-based review of literature and data sources was undertaken to support this scoping exercise, as presented in Table 7.8.1. Table 7.8.1 also identifies additional sources of information that would be expected to inform the assessment in the PEIR and ES. Where new or updated data sources become available, these will be utilised in preparing the PEIR and ES.

Table 7.8.1: Key sources of information for commercial fisheries

Source	Summary	Spatial Coverage Of Study Area
Landings statistics for the period 2016 to 2020. Sourced from the MMO and the European Union Data Collection Framework (EU DCF). Note EU DCF data is only available up to 2016 by ICES rectangle.	Fisheries landings data for nationally registered fishing vessels landing to their home nation ports.	National dataset providing full coverage of the commercial fisheries study area
Vessel Monitoring System (VMS) data, for the period 2015-2019 Sourced from ICES (2017 data) and the MMO (2015 - 2019 data). Note that the most recent data (from 2017 and 2019) has been presented in this Scoping Report and is considered representative, but that longer term datasets will be analysed within the PEIR and ES.	VMS data for fishing vessels greater than 12 or 15 m in length.	National dataset providing full coverage of the commercial fisheries study area.
First sale value of fisheries landings for the period 2012-2016. Sourced from the EU Market Observatory for Fisheries and Aquaculture (EUMOFA) database. Data yet to be sourced, but will be used to inform the PEIR and ES.	Landings sales values.	National dataset providing full coverage of the commercial fisheries study area.
Key species stock assessments. Sources include ICES and the Eastern and North Eastern Inshore Fisheries and Conservation Authorities (IFCAs). Data yet to be sourced, but will be used to inform the PEIR and ES.	Reports on the status of commercially fished species, which consider to what extent they are being exploited sustainably.	Coverage to be confirmed.
UK Fisheries Information Mapping (UKFIM), with data covering a wide time series.	Commercial fisheries activity data based	Coverage to be confirmed.

Source	Summary	Spatial Coverage Of Study Area
Sourced from TCE. Data yet to be sourced.	upon vessel plotter data.	
Regional OWF PEIR and ES commercial fisheries assessments. Various sources.	Contextual information obtained from commercial fisheries impact assessment for other OWFs located within and in proximity to the study area	Partial overlap with the commercial fisheries study area.

7.8.7 It should be noted that the quantitative datasets identified in Table 7.8.1 may not capture all commercial fisheries activity in the commercial fisheries study area. For instance, the VMS datasets only covers vessels ≥12 m (ICES data) or ≥15 m (MMO data) in length. Note that UK vessels ≥12 m in length have VMS on board, however, to date, the MMO provide amalgamated VMS datasets for ≥15 m vessels only. However, in addition to VMS data, other published data does provide a useful insight into commercial fisheries activity undertaken in inshore areas (e.g. including a number of IFCA publications and surveillance data) and consultation with fisheries stakeholders and industry is expected to further inform assessment in the PEIR/ ES. Consultation will be undertaken to seek to corroborate the findings of desk-based baseline data analysis and to provide insight into specific fishing grounds and activity of any vessels active in the area. Consultation will also be important to inform gear specifications for vessels active in the area, which will allow a full understanding of how different vessels and different gear configurations may be affected. Consultation with local fishermen has already commenced in relation to site investigation surveys, which started in Summer 2021.

7.8.8 Variations and trends in commercial fisheries activity are an important aspect of the baseline assessment and is the principal reason for considering up to five years of key baseline data. Given the time periods considered in this scoping exercise (i.e., 2016 to 2020), existing baseline data may to some extent capture potential changes in commercial fisheries activity resulting from the COVID-19 pandemic, which is understood to have temporarily affected market demand and supply chains. However, changes in fishing patterns resulting from the withdrawal of the UK from the EU would be expected in future data sets, which include data for 2021 onwards. Long term environmental and climatic changes may be expected to be detectable within the five year time series, but may benefit from longer-term analysis dependant on the target species. Inclusion of such longer term analysis will be informed by stakeholder consultation.

7.8.9 Following withdrawal of the UK from the EU, a Trade and Cooperation Agreement (TCA) has been agreed between parties, applicable on a provisional basis from 1 January 2021. The TCA sets out fisheries rights and confirms that from 1 January 2021 and during a transition period until 30 June 2026, UK and EU vessels will continue to access respective EEZs (12-200 nm) to fish. In this period, EU vessels will also be able to fish in allocated parts of UK waters, typically between 6-12 nm, where historic rights allow access by the fishing fleets of authorised EU Members States. Access rights of foreign vessels to UK EEZ waters will remain until at least the end of 2026 with reducing quotas, after which rights will be subject to the conclusion of negotiated agreements. In addition to access rights, the TCA requires that 25% of the EU's fisheries quota in UK waters will be transferred to the UK over the five-year transition period. Overall, the biggest gains for UK fleets targeting the North Sea are for pelagic and demersal stocks, including mackerel, sole and herring. The PEIR/ES will further consider likely changes to the future baseline, primarily associated with withdrawal from the EU, taking into account planned changes in quota allocation.

Overview of Baseline Environment

7.8.10 Landings from the study area by UK-registered vessels had an approximate average annual value of £16.5 million (based on five-years data from 2016 – 2020; MMO, 2021). Landings from ICES rectangle 36F1, within which the majority of the array area is located, accounted for approximately 14% of that value. Landings from ICES rectangle 36F0, through which a small portion of the offshore ECC AoS passes, accounted for approximately 63% of the value. Landings were heavily dominated by shellfish species, targeted using pots and traps, as indicated in Figure 7.8.2. UK landings statistics are published annually by the MMO and include vessels registered to the following UK administrations and British crown dependencies: England, Wales, Scotland, Northern Ireland, Isle of Man, Guernsey and Jersey. Approximately 92% of landings from the study area were made by English-registered fishing vessels, with around 6% of landings made by Scottish-registered vessels, and small landings volumes were made by vessels registered in Wales, Jersey and Northern Ireland.

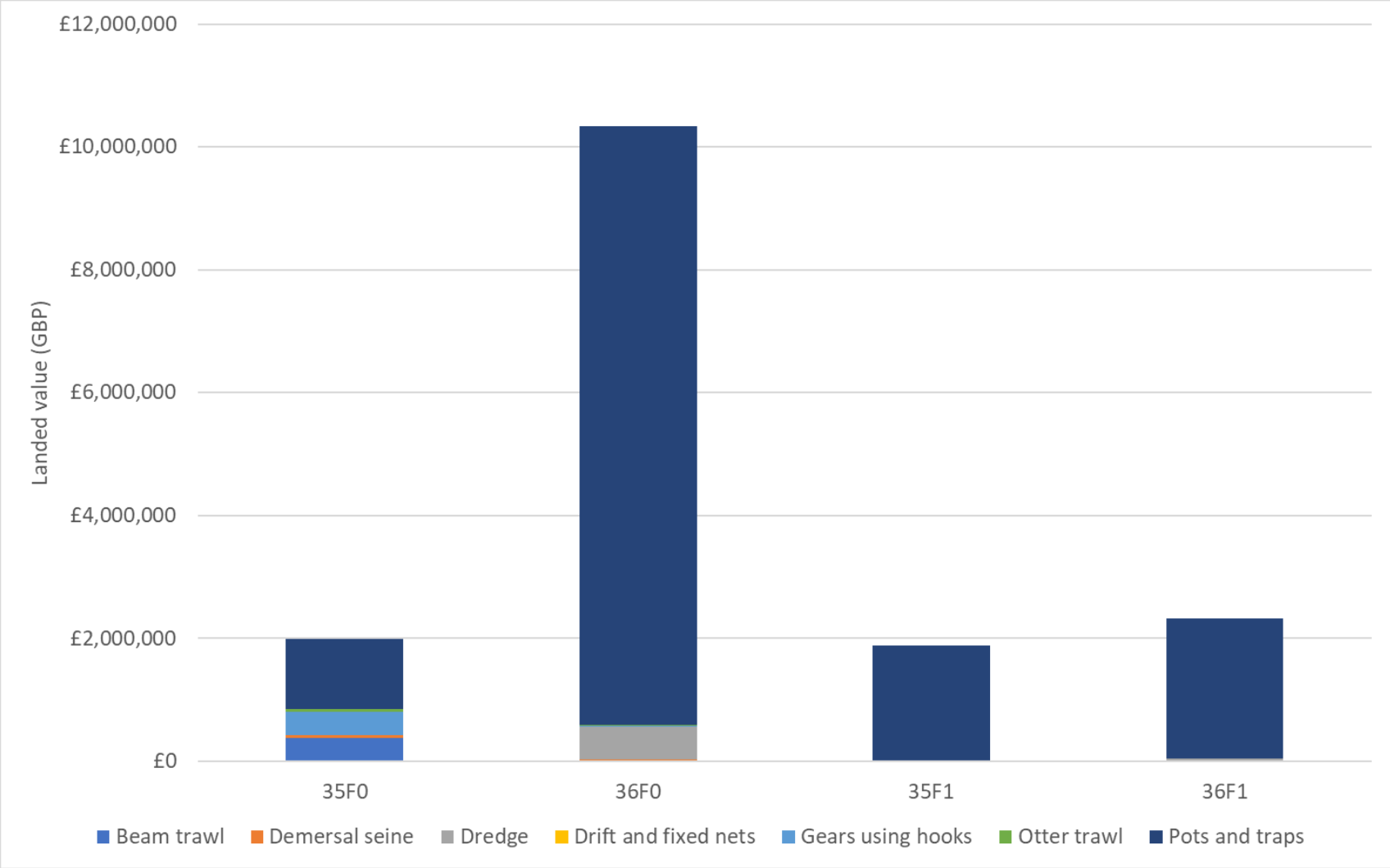

Figure 7.8.2: Average annual value of landings from the study area by ICES rectangle and gear type between 2016 and 2020. Source: MMO, 2021

7.8.11 Landings of brown crab *Cancer pagurus* by English-registered vessels of both under- and over-10 m length deploying pots and traps account for a significant proportion of total landings values across the 2016 to 2020 period (Figure 7.8.3). Landings statistics indicate that the value of brown crab has fluctuated annually but remained high across the five-year period. Landings of lobster *Homarus gammarus* by English-registered vessels have remained consistent across the time series. Landings of whelks *Buccinum undatum* by English-registered vessels have increased across the time series, consistent with this same trend occurring more widely across UK fisheries. King scallops *Pecten maximus* are primarily landed by Scottish-registered dredgers of over 10 m length and Nephrops (also known as Norway lobster, langoustine, or prawns) *Nephrops norvegicus* are landed primarily by English-registered demersal otter trawlers, though no landings are recorded from the study area in 2019 and 2020. A variety of other non-shellfish demersal species are landed from English-registered vessels operating a variety of gear types, including trawls, fixed nets, and gears using hooks. A brown shrimp *Crangon crangon* beam trawl fishery and hand-harvested/ suction dredge cockle *Cerastoderma edule* fishery are focused on The Wash, to the south of the offshore ECC AoS. Herring *Clupea harengus* landings are shown in Figure 7.8.3 below, though it is noted that across the 2016 to 2020 period, herring were landed only in 2020, and only from ICES rectangle 35F0. Landings data indicates the presence of a squid *Loligo spp.* fishery in the study area in 2019 and 2020.

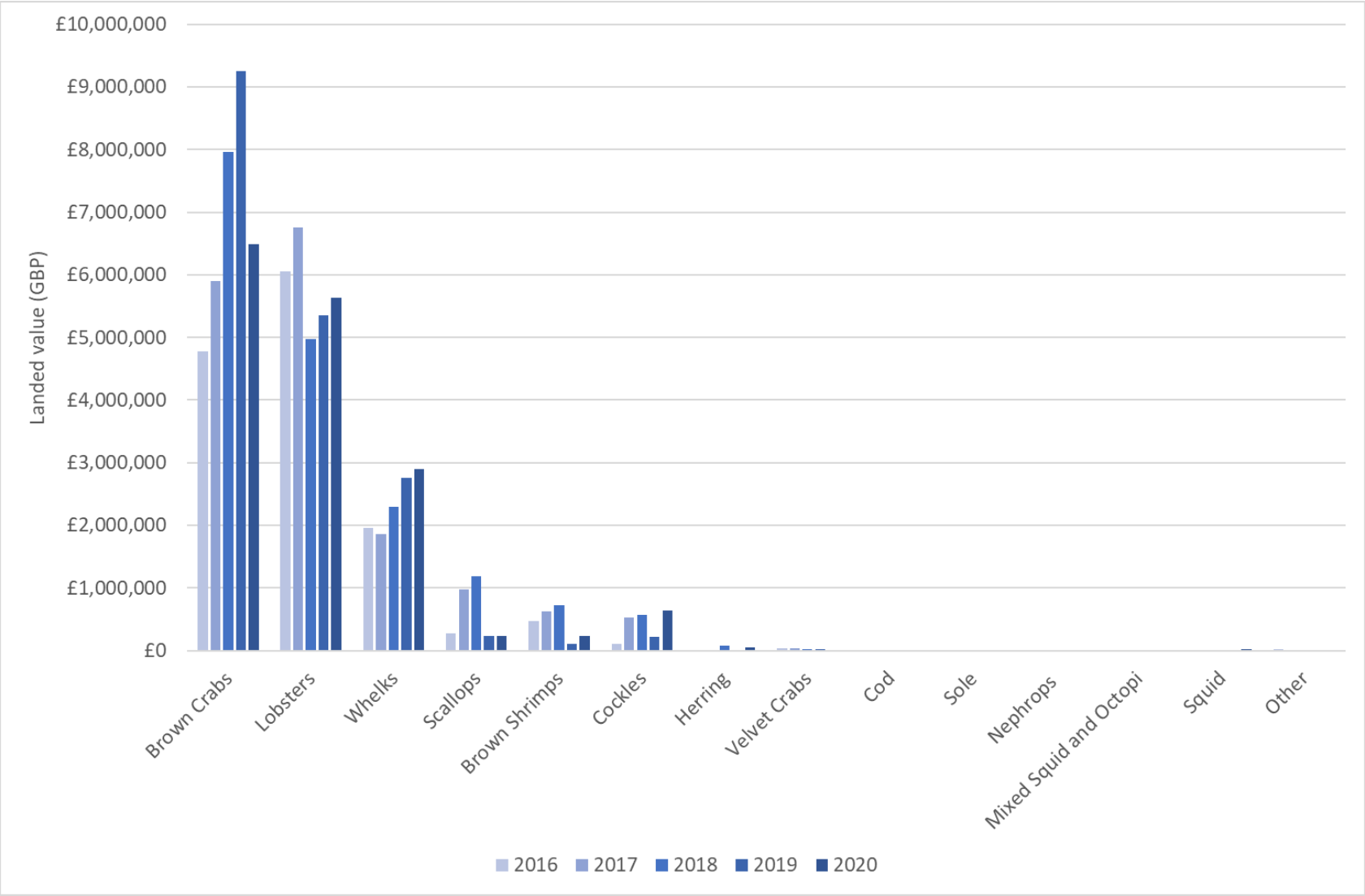

Figure 7.8.3: Average annual value of landings from the study area by species and year between 2016 and 2020. Source: MMO, 2021

7.8.12 Landings by foreign vessels are not accounted for in the description immediately above, though EU vessel landings data by ICES rectangle available for the period 2012 to 2016 (EU DCF, 2021) indicates that landings from the study area are predominantly made by UK-registered vessels (Figure 7.8.4), with approximately 11% of total landings volumes being accounted for by foreign vessels.

7.8.13 EU vessel landings data indicates some activity by French-registered vessels trawling for whiting *Merlangius merlangus* (annual average of 360 tonnes landed from the study area between 2012 and 2016), mackerel *Scomber scombrus* (annual average of 140 tonnes between 2012 and 2016), and herring (annual average of 118 tonnes between 2012 and 2016). Herring and mackerel are highly mobile pelagic finfish species, that move in shoals and are not associated with specific seabed habitats when caught in the mid-water column. As such, these pelagic species are assumed to be available to catch across large areas of the North Sea, during the highly seasonal fisheries. EU vessel landings data also indicates activity by Danish-registered vessels targeting sandeels *Ammodytes marinus* (annual average of 490 tonnes landed from the study area between 2012 and 2016, with landings recorded only in 2013 and 2014), though whilst there was a significant sandeel fishery targeted in and around the study area between 2003-2004, the value of landings fell significantly from 2004 onwards. Landings data also indicates Dutch-registered beam trawlers targeting plaice *Pleuronectes platessa* (annual average of 314 tonnes landed from the study area between 2012 and 2016) and sole *Solea solea* (annual average of 194 tonnes landed from the study area between 2012 and 2016) (EU DCF, 2021).

7.8.14 Within the study area, landings by foreign vessels were greatest from ICES rectangles 36F1 across the 2012 to 2016 period.

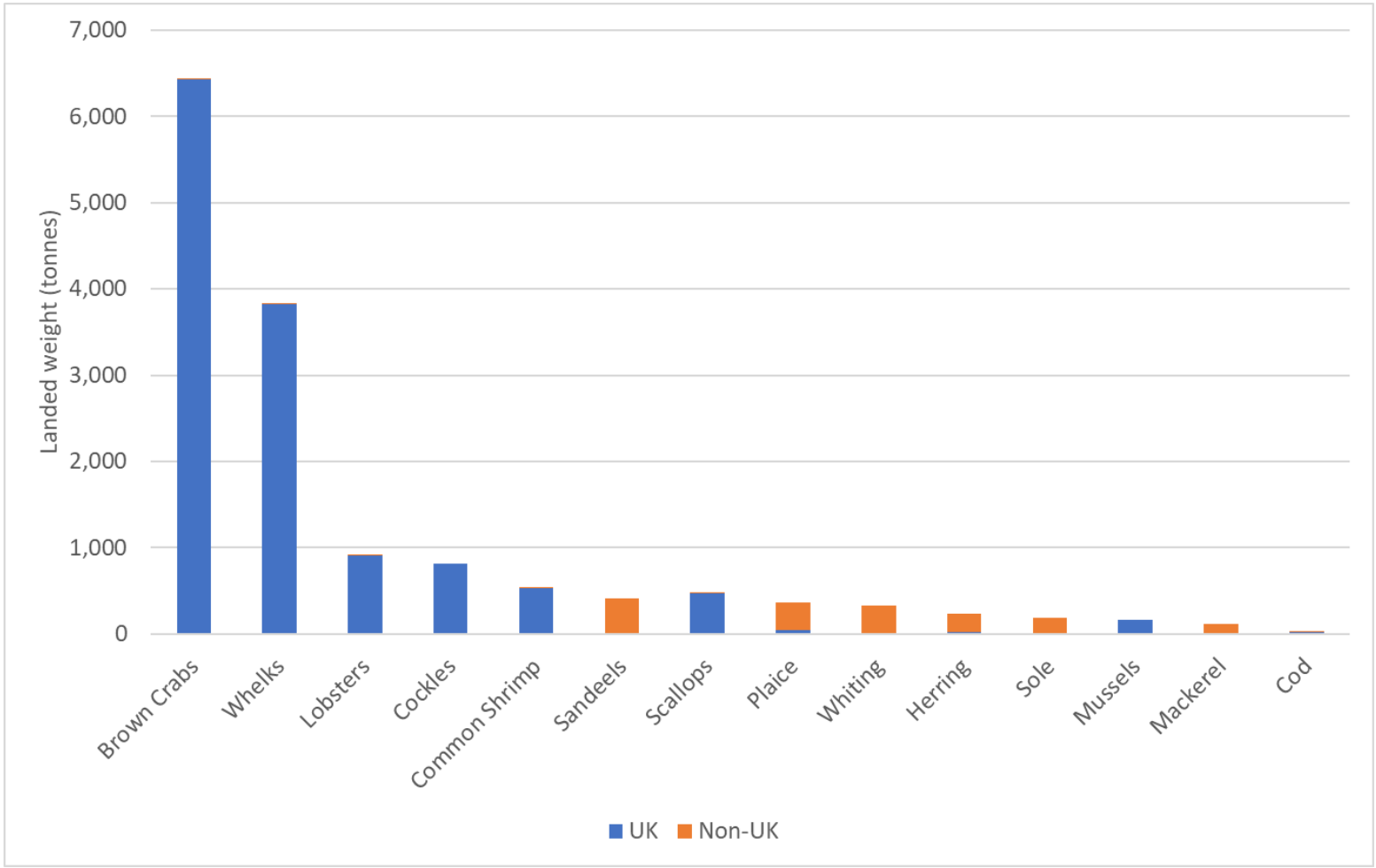

Figure 7.8.4: Average annual weight of landings from the study area by species and vessel nationality between 2012 and 2016. Source: EU DCF, 2021

7.8.15 In addition to landings data, VMS data from 2019 for UK-registered vessels (including crown dependencies) and 2017 for EU-registered vessels (including UK vessels) have also been obtained for the study area. The VMS data for UK-registered vessels indicates that commercial fisheries activity by vessels ≥15 m in length takes place throughout the study area.

7.8.16 Figure 7.8.5 indicates that potting by vessels ≥15 m in length occurs across the array area and throughout the easternmost portion of the offshore ECC AoS.

7.8.17 Figure 7.8.6 indicates that dredging activity is focused outside of the study area. Figure 7.8.7 suggests limited demersal trawling by UK vessels ≥15 m in length within the study area. The VMS dataset does not include vessels less than 15 m in length, which form a significant portion of the UK and crown dependency fleets. Figure 7.8.5 to Figure 7.8.8 are therefore highly likely to under-represent the fishing (particularly potting) activity in the region – particularly in inshore waters - and additional data (e.g. surveillance and landings data), together with stakeholder consultation will inform the assessment of impacts on fleets for the PEIR and ES stages.

7.8.18 The VMS data for EU-registered vessels indicates that beam trawling by vessels over 12 m in length takes place within the study area, with areas of greatest activity located outside of the array area and offshore ECC AoS (Figure 7.8.8).

7.8.19 In summary, based on the data gathered to inform this scoping exercise, the key fleets operating across the study area include (in no particular order):

- UK-registered potters targeting brown crab, whelk and lobster (vessels typically 15 m and under in length, but also including >15 m vessels), operating across the array area and offshore ECC AoS;
- UK-registered scallop dredgers, operating within the offshore ECC AoS; and
- Other UK-registered vessels, principally under 10 m in length, operating from a number of local ports and using a range of gear types and often switching between them, including pots, nets, longlines and trawls, typically inside of the 6 nm limit.

7.8.20 UK-registered beam trawlers targeting brown shrimp in the Wash may be active in the inshore portion of the offshore ECC AoS, though this fishery is focused on waters to the south of the ECC AoS and within the Wash.

7.8.21 Data indicates that activity by non-UK vessels within the study area is not significant, but the following fleets may also sporadically operate across the study area, outside of the 6 nm limit:

- Danish otter trawlers targeting sandeel (vessels >25 m in length), including specific fishing grounds in proximity to the array area;
- French demersal and pelagic trawlers (vessels 15 m to 25 m in length) targeting mobile species that consistently move/ shoal throughout the wider central and southern North Sea, including herring, whiting and mackerel, operating in proximity to the array area; and
- Dutch and Belgian beam trawlers (vessels >25 m in length) targeting demersal species including plaice and sole.

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Legend

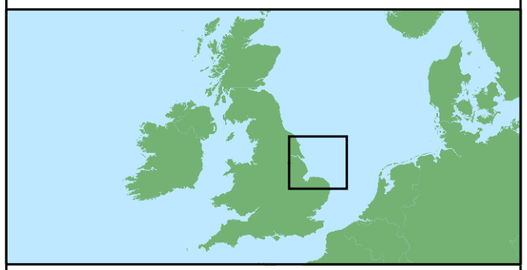
- Site Boundary
- Offshore ECC Area of Search
- ICES Statistical Rectangles

Fishing Limits

- 6 NM
- 12 NM
- 200 NM

UK Potting Value (£), 2019 (vessels ≥15m)

- £0.01 - £5,000.00
- £5,000.01 - £10,000.00
- £10,000.01 - £25,000.00
- £25,000.01 - £50,000.00
- £50,000.01 - £75,000.00
- £75,000.01 - £145,000.00



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Potting landed value (GBP) for UK ≥ 15 m vessels in 2019. Note that uncoloured areas indicate no catches by potting vessels ≥15 m. Source: MMO, 2021

Figure 7.8.5

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Legend

- Site Boundary
- Offshore ECC Area of Search
- ICES Statistical Rectangles

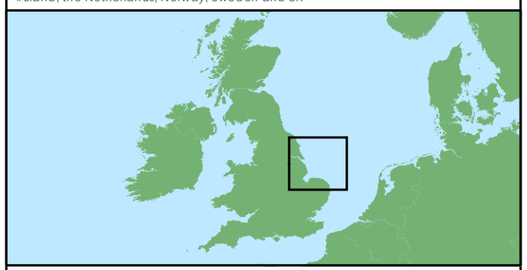
Fishing Limits

- 6 NM
- 12 NM
- 200 NM

UK Dredge Value (£), 2019 (vessels ≥15m)

- £1 - £5,000.00
- £5,000.01 - £10,000.00
- £10,000.01 - £20,000.00
- £20,000.01 - £50,000.00
- £50,000.01 - £100,000.00
- £100,000.01 - £150,000.00
- £150,000.01 - £232,000.00

*Including VMS data for the following countries:Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden and UK



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Dredge landed value (GBP) for UK ≥15 m vessels in 2019. Note that uncoloured areas indicate no catches by dredge vessels ≥15 m. Source: MMO, 2021

Figure 7.8.6

OUTER DOWSING OFFSHORE WIND

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Legend

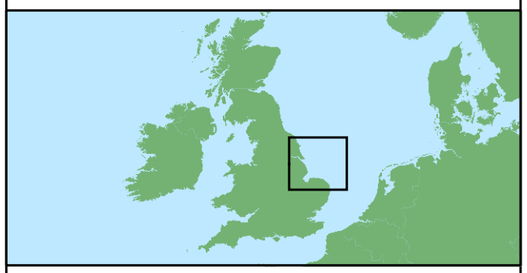
- Site Boundary
- Offshore ECC Area of Search
- ICES Statistical Rectangles

Fishing Limits

- 6 NM
- 12 NM
- 200 NM

UK Otter Trawl Value (£), 2019 (vessels ≥15m)

- £1 - 5000
- £5001 - 10000
- £10001 - 20000
- £20001 - 50000
- £50001 - 75000
- £75001 - 100000
- £100001 - 115000



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Otter trawl landed value (GBP) for UK ≥15 m vessels in 2019. Note that uncoloured areas indicate no catches by otter trawl vessels ≥15 m.
Source: MMO, 2021
Figure 7.8.7

OUTER DOWSING OFFSHORE WIND

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Legend

- Site Boundary
- Offshore ECC Area of Search
- ICES Statistical Rectangles

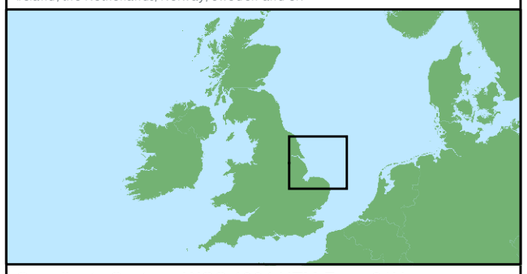
Fishing Limits

- 6 NM
- 12 NM
- 200 NM

EU* Beam Trawl Value (Euro), 2017 (vessels ≥12m)

- 0 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- 20,001 - 50,000
- 50,001 - 100,000
- 100,001 - 150,000
- 150,001 - 1,900,000

* Including VMS data for the following countries:Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden and UK



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

Beam trawl landed value (Euro) for UK and EU ≥12 m vessels in 2017. Note that uncoloured areas indicate no catches by beam trawl vessels ≥12 m.
Source: ICES, 2021
Figure 7.8.8

OUTER DOWSING OFFSHORE WIND

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Designated Sites and Species

7.8.22 In order to protect particular features of designated sites, fisheries management mechanisms may be put in place. These mechanisms can include spatial closures, permit schemes, effort controls, vessel size and fishing gear restrictions and seasonal fishing restrictions. These mechanisms are implemented by the relevant IFCA in waters out to 6 nm and by the MMO in waters between 6 and 12 nm.

7.8.23 Within designated sites that are coincident or proximate to the Project, a number of spatial closures to specific fishing gears have been established via IFCA or MMO byelaws to protect designated features. These are relevant to fisheries activity within the study area. Relevant designated sites with closures include the Humber Estuary SAC and The Wash and North Norfolk Coast SAC (2018 byelaw prohibits use of bottom-towed gear and 'handwork' fishing in specified areas within these SACs), the Inner Dowsing, Race Bank and North Ridge SAC (2022 byelaw prohibits use of bottom-towed gear in specified areas of reef and sandbank) and Dogger Bank SAC (2022 byelaw prohibits use of bottom-towed gear). Any fisheries management measures within MCZs designated in 2019 and coincident with the study area (i.e. Holderness Offshore MCZ and Holderness Inshore MCZ) are yet to be determined.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.8.24 Detailed analysis of baseline datasets will be undertaken in the EIA to characterise long-term (i.e. over several years, typically a five-year period) patterns in commercial fisheries activity across the study area and predict potential impacts upon future activity. Consultation with the commercial fishing industry has commenced and will be continued in order to ground-truth available baseline data and gain further understanding of commercial fisheries activity by smaller vessels across the inshore portion of the study area. Analysis of data and the results of consultation will provide an extended baseline characterisation of the study area, which will underpin and inform the impact assessment.

7.8.25 The commercial fisheries impact assessment will follow the EIA methodology set out in Section 5. Specific to commercial fisheries, the following guidance documents will also be considered:

- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (UK Fisheries Economic Network (UKFEN) and Seafish, 2012);
- Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) Recommendations for Fisheries Liaison: Best Practice guidance for offshore renewable developers (FLOWW, 2014 and BERR, 2008);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010a);
- Developing guidance on fisheries Cumulative Impact Assessment for wind farm developers (Blyth-Skyrme, 2010b);

- Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in OWFs (RenewableUK, 2013);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403 , Cefas, 2012);
- Fisheries Liaison Guidelines - Issue 6 (UK Oil and Gas, 2015);
- Fishing and Submarine Cables - Working Together (International Cable Protection Committee, 2009); and
- Offshore Wind Farms – Guidance note for Environmental Impact Assessment in respect of Food and Environment Protection Act (FEPA) and Coast Protection Act (CPA) requirements (Cefas), Marine Consents and Environment Unit (MCEU), Defra and Department of Trade and Industry (DTI), 2004).

7.8.26 Impacts will be assessed for each relevant fleet/fishery active in the study area, and where relevant, impacts associated with the array area and the offshore ECC AoS will be separately assessed.

Relevant Embedded Mitigation Measures

7.8.27 As part of the design process for the Project a number of designed-in measures are proposed to reduce the potential for impacts on commercial fisheries; these are summarised below.

7.8.28 The Project is committed to implementing these measures (noting they may evolve over the development process as the EIA progresses and in response to consultation), and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of the Project.

7.8.29 Measures adopted as part of the Project will include:

- The Applicant is committed to ongoing liaison with fishermen throughout all stages of the Project, based upon FLOWW (2014, 2015) guidance and the following:
    - Appointment of a company Fisheries Liaison Officer (FLO) to maintain effective communications between the project and fishermen, noting that a FLO has already been appointed and is liaising with fishermen in relation to site investigation surveys. The company FLO will be supported by offshore FLOs, stationed on board survey and installation vessels as required;
    - Appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works;
    - Timely issue of notifications including Notice to Mariners (NtMs), Kingfisher Bulletin notifications and other navigational warnings to the fishing community to provide advance warning of project activities and associated Safety Zones and advisory safety distances; and
    - Development, prior to construction, of a fisheries liaison and co-existence plan, setting out in detail the planned approach to fisheries liaison and means of delivering any other relevant mitigation measures. It is intended that a draft of this plan be submitted at the point of consent application.

- The Applicant is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including the MCA, CAA and Trinity House. The Applicant will also ensure the project is adequately marked on nautical charts.
- The Applicant will ensure that any objects dropped on the seabed during works associated with the project are reported and that objects are recovered where they pose a hazard to other marine users and where recovery is possible.
- Where practicable, cable burial will be the preferred means of cable protection.

7.8.30 Potential mitigation measures will be consulted upon with stakeholders throughout the EIA process.

Potential Impacts Scoped In

7.8.31 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the Project EIA are outlined in Table 7.8.3, together with a description of any proposed additional data collection to enable an assessment of the impact.

Table 7.8.2: Impacts proposed to be scoped into the assessment for commercial fisheries

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
Construction		
Reduction in access to, or exclusion from established fishing grounds	Installation activities and physical presence of constructed infrastructure leading to reduction in access to, or exclusion from established fishing grounds. Potential for some loss of fishing opportunities over the construction period, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the array areas/ offshore ECC AoS.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The effects of exclusion/reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	Displacement from the array area and offshore ECC AoS leading to gear conflict and increased fishing pressure on adjacent grounds. Potential for displacement of commercial fisheries activity, though effect is expected to be localised, and the operational range of relevant fleets will not typically be limited to the array area/ offshore ECC AoS.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The nature and extent of displacement and implications for/of gear conflict will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECC AoS construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
Increased vessel traffic associated with the Project within fishing grounds leading to interference with fisheries activity	Movement of vessels associated with the Project adding to the existing volume of marine traffic in the area, leading to interference of commercial fisheries activity.	Assessment will be informed by the outcomes of the Shipping and Navigation impact assessment and Navigational Risk Assessment (NRA); the conclusions presented in the Shipping and Navigation impact assessment will be considered in determining the magnitude of impact on commercial fisheries.
Operation and Maintenance		
Reduction in access to, or exclusion from established fishing grounds	Physical presence of constructed infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The effects of exclusion/reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	Displacement from the Project leading to gear conflict and increased fishing pressure on adjacent grounds. It is assumed fishing can resume to a degree within the array area. The	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The nature and extent of displacement and implications for/ of gear conflict will be assessed.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
	effect will be long-term but localised, and the operational range of relevant fleets will not typically be limited to the array area/ offshore ECC AoS.	Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECC AoS O&M activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
Physical presence infrastructure leading to gear snagging	Standard industry practice and protocol (e.g. seabed infrastructure will be buried and/ or marked on nautical charts) will minimise the risk of gear snagging, but it remains likely to be an area of industry concern.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS , and access to alternative grounds. The potential nature of gear snagging and associated implications will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted. Safety aspects associated with this impact, including damage to property and vessel stability, will be considered within the Shipping and Navigation impact assessment (NRA).
Increased vessel traffic associated with the Project within fishing grounds	Movement of vessels associated with the Project adding to the existing volume of marine traffic in the area,	Assessment will be informed by the outcomes of the Shipping and Navigation impact assessment and NRA; the conclusions presented in

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
leading to interference with fisheries activity	leading to interference of commercial fisheries activity.	the Shipping and Navigation impact assessment will be considered in determining the magnitude of impact on commercial fisheries.
Decommissioning		
Reduction in access to, or exclusion from established fishing grounds	Decommissioning activities and physical presence of any infrastructure leading to reduction in access to, or exclusion from established fishing grounds. Potential for some loss of fishing opportunities over the decommissioning period, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the array area/ offshore ECC AoS.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The effects of exclusion/ reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	Displacement from the array area and offshore ECC AoS leading to gear conflict and increased fishing pressure on adjacent grounds. Potential for displacement of commercial fisheries activity, though effect is expected to be localised, and the operational range of relevant fleets will not typically be limited to the array area/ offshore ECC AoS.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECC AoS, and access to alternative grounds. The nature and extent of displacement and implications for/ of gear conflict will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECC AoS decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
Physical presence infrastructure leading to gear snagging	Relevant during decommissioning should any infrastructure be left in-situ. Standard industry practice and protocol (e.g. seabed infrastructure will be buried and/ or marked on nautical charts) will minimise the risk of gear snagging, but it remains likely to be an area of industry concern.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array areas and offshore ECC AoS , and access to alternative grounds. The potential nature of gear snagging and associated implications will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 7.8.1) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted. Safety aspects associated with this impact, including damage to property and vessel stability, will be considered within the Shipping and Navigation impact assessment (NRA).
Increased vessel traffic associated with the Project within fishing grounds leading to interference with fisheries activity	Movement of vessels associated with the Project adding to the existing volume of marine traffic in the area, leading to interference of commercial fisheries activity.	Assessment will be informed by the outcomes of the Shipping and Navigation impact assessment (NRA); the conclusions presented in the Shipping and Navigation impact assessment will be considered in determining the magnitude of impact on commercial fisheries.
Cumulative		
The potential impacts considered in the cumulative assessment as part of EIA will be in line with those presented in the rows above for the project-alone assessment, though it is possible that some will be screened out on the basis that the impacts are of negligible significance for		

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses
the Project alone, are highly localised (i.e. they occur only within the Project boundary) or where management measures in place for the Project and other projects will reduce the risk of impacts occurring.		

Impacts Proposed to be Scoped Out

7.8.32 Based on the commercial fisheries information currently available and the project description, some impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 7.8.3, together with a justification for scoping them out.

Table 7.8.3: Impacts proposed to be scoped out of assessment for commercial fisheries

Impact	Justification
Construction, Operation and Maintenance, Decommissioning	
Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the array area	This effect will be localised to safety zones and installed structures and therefore limited deviations to steaming routes are expected. Given adequate notification, it is expected that vessels, which typically have an operational range beyond that of the Project (as indicated by VMS data presented above), will be in a position to avoid temporary construction/ maintenance/ decommissioning areas and installed/ remaining infrastructure with no or minimal impact on their steaming times. The impact is not expected to be significant in EIA terms.

Potential Transboundary Effects

7.8.33 The approach to assessment of potential transboundary impacts is set out in Appendix A – Transboundary Screening Matrix.

7.8.34 International fishing fleets – notably French, Danish, Belgian and Dutch fleets – are known to operate to a limited extent in the current scoping study area, as described in this section. As such, transboundary impacts on non-UK commercial fishing fleets will be considered and their assessment will be integrated into the construction, operation, decommissioning and cumulative impact assessments.

7.8.35 Consultation with stakeholders in other relevant Member States, and data gathered from other relevant Member States, will inform the assessments.

Summary of Next Steps

7.8.36 It is intended that full acquisition and analysis of the baseline data sources listed in Table 7.8.1 is completed. Data analysis will then be corroborated and expanded upon by consultation with the fishing industry and other relevant stakeholders, including the following:

- MMO;
- National Federation of Fishermen's Organisations (NFFO);
- Eastern IFCA;
- Local Fishermen's Associations and Producer Organisations, including inshore fishery groups;
- VisNed (Netherlands), FROM Nord (France) and any other EU Member State representative organisations as identified during baseline data analysis; and

- Individual fishermen as identified by the Company FLO/ other means.

7.8.37 Consultation will continue throughout the application process, will not only seek to validate the baseline, but to identify key stakeholder concerns to inform the impact assessment.

Further Consideration for Consultees

7.8.38 The following questions are posed to consultees to help them frame and focus their response to the commercial fisheries scoping exercise, which will in turn inform the Scoping Opinion:

- Do you agree that the data sources identified are sufficient to inform the commercial fisheries baseline for the Project PEIR and ES?
- Have all potential impacts on commercial fisheries resulting from the Project been identified within this Scoping Report?
- Do you agree that the impacts described in Table 7.8.3 can be scoped out?
- For those impacts scoped in (Table 7.8.2), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on commercial fisheries receptors?
- Do you agree that all relevant stakeholders with which consultation will be undertaken have been identified?

7.9 Shipping and Navigation

Introduction

7.9.1 This section of the Scoping Report identifies the shipping and navigation elements of relevance to the Project, including the array and ECC AoS. This includes preliminary identification of the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on shipping and navigation, and sets out the proposed scope of the EIA.

7.9.2 Following the scoping process these impacts will be assessed as part of the NRA process required by the MCA under Marine Guidance Note (MGN) 654 (MCA, 2021).

7.9.3 Due consideration at Scoping stage has been given to the relevant offshore components as defined in Section 3, namely the subsea cables, WTG, OSPs, and potential Offshore Reactive Platforms (ORP).

Study Area

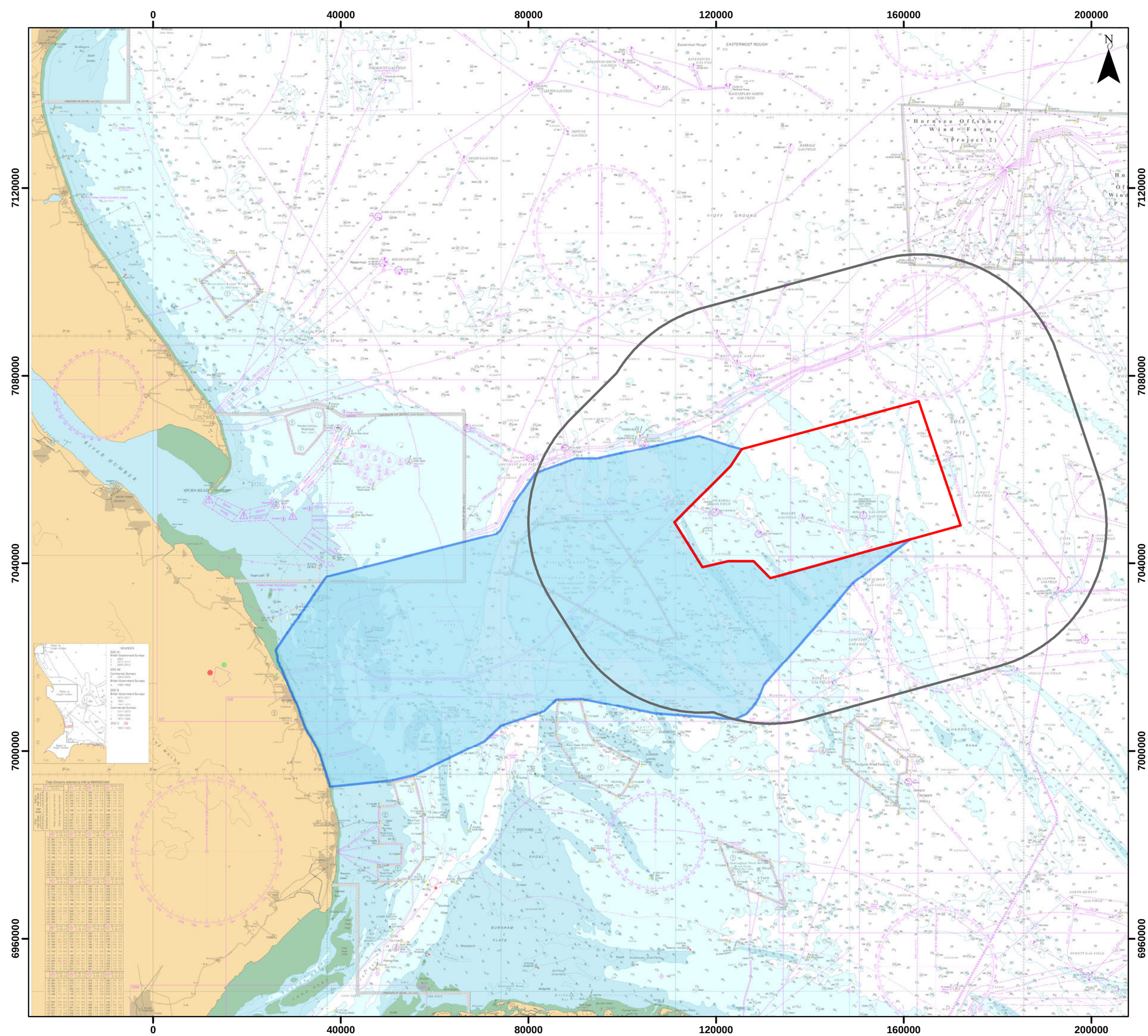
7.9.4 The shipping and navigation assessment at scoping stage has been undertaken within a study area defined by a 10 nautical mile (nm) buffer zone around the array area. This is a standard radius for shipping and navigation assessments as it is large enough to encompass vessel routeing which may be impacted, whilst still remaining site specific to the area being studied.

7.9.5 Preliminary assessment of navigational features has also been undertaken with the current AoS within which the ECC and potential ORP(s) will be installed.

7.9.6 An overview of the study area and ECC AoS is presented in Figure 7.9.1.

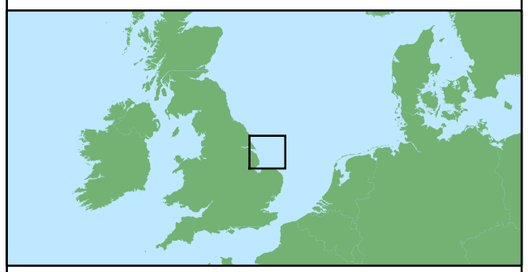
7.9.7 The 10 nm buffer around the array is considered sufficient at the scoping stage, however a wider study area will be necessary at NRA stage in terms of the final offshore ECC and the potential use of ORPs. On this basis it is intended that the NRA will consider the following study areas, noting that this will be confirmed in advance with relevant stakeholders:

- 10nm buffer of the array area;
- 2nm buffer of the final ECC; and
- 10nm buffer of the ORP(s) if applicable.



Legend

- Site Boundary
- Study Area
- Offshore ECC Area of Search



Coordinate System: WGS 1984 World Mercator

0 25 50 km

Scale: 1:750,000

Overview of Study Area and ECR AoS

Figure 7.9.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

7.9.8 The key data sources used to establish the shipping and navigation baseline in this Scoping Report are presented in Table 7.9.1.

Table 7.9.1: Key Sources of Information for Shipping and Navigation

Source	Date	Summary	Spatial coverage of study area
Automatic Identification System (AIS) data	26th of January – 8th of February 2021 and 26th of July – 8th of August 2021	Vessel traffic data covering a 28-day period, collected from onshore receivers covering winter and summer periods.	Entirety of shipping and navigation study area.
Incident data provided by the Marine Accident Investigation Branch (MAIB)	2010 - 2019	Maritime incident data reported to the MAIB including locations, types of incident, and types of vessel involved.	Entirety of shipping and navigation study area.
Incident data provided by the Royal National Lifeboat Institution (RNLI)	2010 - 2019	Maritime incident data of RNLI incident responses including locations, types of incident, and types of vessel involved.	Entirety of shipping and navigation study area.
UK Hydrographic Office (UKHO) Admiralty Charts 1187-0, 1190-0, and 1503-0	2021	Admiralty charts and historic mapping relevant to the defined shipping and navigation study area.	Entirety of shipping and navigation study area and ECC AoS.
UKHO Admiralty Sailing Directions – NP54 (UKHO, 2021)	2021	Pilot book with information on the surrounding area.	Entirety of shipping and navigation study area and ECC AoS.
British Marine Aggregate Producers Association Route data	Published 2009, downloaded 2022.	Characterising marine aggregate dredging areas and routeing to/from.	Entirety of shipping and navigation study area and ECC AoS.

Limitations

7.9.9 AIS carriage and broadcast is not compulsory for fishing vessels less than 15 metres (m) in length or recreational vessels. Certain such vessels may broadcast on a voluntary basis, however it should be considered that such traffic is likely to be underrepresented within characterisation of the scoping stage baseline. It should also be considered that the AIS data was collected from onshore receivers, and as such coverage was observed to reduce towards the offshore extent of the study area.

7.9.10 The AIS data is considered as being sufficient for the purposes of the Scoping Report in terms of characterising traffic patterns at a high level, noting that as per Table 7.9.1, additional data collected on site including account of non AIS vessels will be collected at NRA stage in line with MGN 654 (MCA, 2021) requirements.

Overview of Baseline Environment

7.9.11 This section identifies the baseline environment in terms of navigational features and marine traffic.

Navigational Features

7.9.12 An overview of the relevant navigational features within the study area is presented in Figure 7.9.2.

7.9.13 There are a total of 21 oil and gas platforms within the study area, four of which are within the array area itself (Galahad, Malory, Pickerill A, and Pickerill B[24]). A total of 21 subsea pipelines run between the various platforms in the study area, with nine of these pipelines intersecting the array area.

7.9.14 There are two existing windfarms intersecting the study area. These are Triton Knoll located approximately 4.3nm to the west of the array area, and Hornsea Two, located 9.6nm to the north. The Triton Knoll WTGs were commissioned in January 2022, and Hornsea Two is expected to become operational during 2022. Hornsea Two is adjacent to the operational Hornsea One, which is located outside of the study area approximately 11.6nm to the northeast. The export cables associated with Hornsea Project One and Hornsea Project Two pass through the northern section of the study area. It is noted that any renewables projects that are pre-construction are not captured within the baseline assessment but will be considered on a cumulative basis within the NRA.

7.9.15 A total of 92 charted wrecks were recorded within the study area, five of which were recorded within the array area itself. A total of nine Aids to Navigation (AtoN) are present within the study area, including one within the array area. It is noted that these include two of the temporary construction buoys marking the Hornsea Project Two offshore windfarm during its construction phase[25]. There are also two marine aggregate dredging areas (515/1 and 515/2), one of which lies adjacent to the southern boundary of the array area.

[24] Pickerill A&B – topsides have been removed, no firm date on jacket removal.
[25] Note Triton Knoll construction buoyage removed as of week of 14th March 2022 following commissioning.

7.9.16 A key feature of the area of relevance to shipping and navigation is the shallow banks within the study area, given these dictate how vessels route. Of note is the Outer Dowsing Shoal which intersects the western extent of the array area. The charted 10 m contours associated with the Outer Dowsing Shoal are shown in Figure 7.9.2.

7.9.17 A high-level analysis of navigational features within the current ECC AoS indicated the following charted features of relevance:

- Production agreement (106/1, 106/2, 106/3, 197, 400, 493, 515/1 and 515/2) and exploration and option (1805) marine aggregate dredging areas;
- The Triton Knoll OWF; and
- Subsea cables/ pipelines including the Triton Knoll OWF export cables.

Vessel Traffic

7.9.18 The vessel tracks derived from 28 days of AIS data collected during 2021 is presented in Figure 7.9.3. Vessels deemed as representing temporary traffic (including those involved in the construction of Hornsea Project Two or Triton Knoll and those engaged in surveys) have been removed. It has been assumed that vessels transiting to operational offshore windfarms represent operational traffic, and as such have been retained.

7.9.19 An average of 50 vessels were recorded per day within the study area during the winter survey period, with nine vessels per day intersecting the array area. This increased to an average of 62 vessels per day within the study area during the summer survey period, with 11 vessels per day intersecting the array area. This increase in traffic was observed to be primarily related to a rise in windfarm support vessel and cargo vessel numbers in the summer survey period.

7.9.20 Traffic in the study area during the winter survey period primarily consisted of cargo vessels (52%), tankers (25%), and oil and gas vessels (12%). Composition of traffic in the study area during the summer survey period was similar, primarily consisting of cargo vessels (47%), tankers (20%), and oil and gas vessels (17%). The most frequent vessel types to intersect the array area during both periods were cargo vessels and oil and gas vessels.

7.9.21 The shallow banks/ shoals were observed to be a notable factor in terms of vessel routeing in the study area, with commercial routes identified passing either side of the Outer Dowsing Shoal, noting this included traffic through the array area. Vessel routes associated with Humber ports were also identified, in addition to commercial ferry routing (Stena, DFDS, and P&O Ferries).

7.9.22 Oil and gas vessel traffic in the study area during the survey periods was concentrated around the local gas fields. A large portion of this traffic related to the southern extent of the array area, due to the presence of the installations in the region – in particular the Excalibur EA, Galahad, and Malory platforms.

7.9.23 Fishing and recreational traffic recorded via AIS was observed to be minimal, noting that this is likely to be under representative.

7.9.24 Limited dredging activity was recorded, noting that this included activity within one of the Outer Dowsing extraction areas (515/2) present in the study area.

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Legend

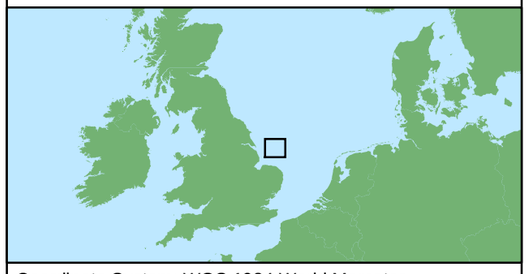
- Site Boundary
- Study Area

Navigational Features

- Aids to Navigation
- Oil and Gas Platforms
- Wrecks and Obstructions
- Cables
- Pipelines
- 10m Contour
- Marine Aggregate Dredging

Other Wind Farms

- Active/In Operation
- Under Construction



Coordinate System: WGS 1984 World Mercator

0 10 20 km

Scale: 1:425,000

Navigational Features

Figure 7.9.2

OUTER DOWSING OFFSHORE WIND

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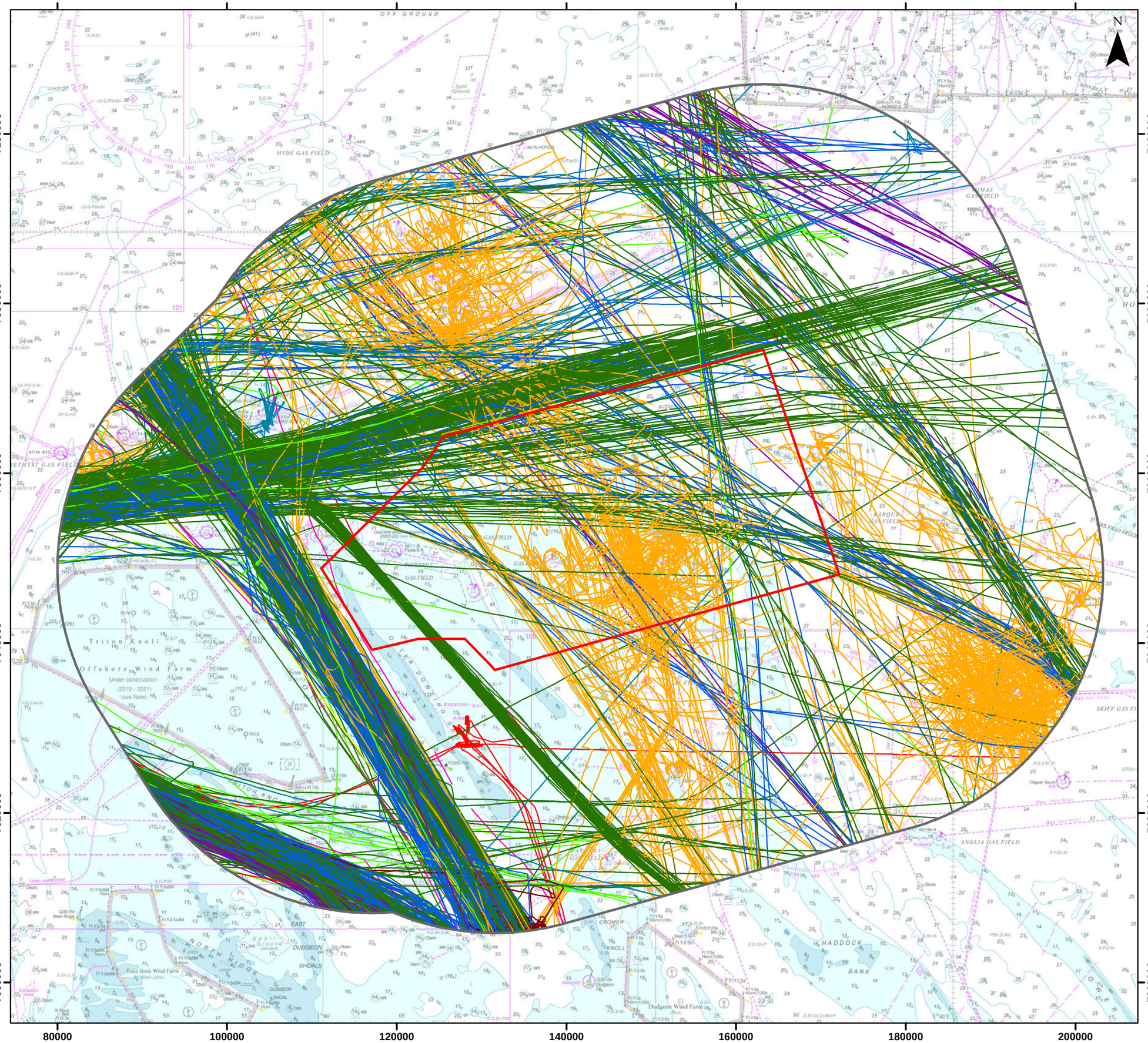
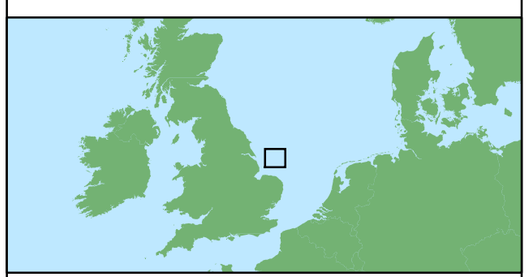


Legend

- Site Boundary
- Study Area

Vessel Type

- Fishing
- Military
- Dredger/Subsea Operations
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm



Coordinate System: WGS 1984 World Mercator

0 10 20 km

Scale: 1:425,000

28 Days Survey Data by Vessel Type (Winter/Summer 2021)

Figure 7.9.3

OUTER DOWSING OFFSHORE WIND

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Marine Incidents

7.9.25 An analysis of MAIB incident data from 2010 to 2019 indicated that nine incidents were recorded within the study area, with none of these occurring in the array area. The most common incident types recorded were accident to person (two instances) and loss of control (two instances), with the most common vessels involved in these incidents being fishing vessels (four instances) and other commercial vessels (four instances).

7.9.26 An analysis of RNLI incident data from 2010 to 2019 indicated that 16 incidents were recorded within the study area, with one incident (of unspecified nature) occurring in the array area. The most common incident types recorded within the study area were machinery failure (four instances), flooding/ foundering (two instances), and person in danger (two instances), with the most common vessel types involved in these incidents being fishing vessels (seven instances) and oil & gas rig/ support vessels (four instances).

Proposed Approach to the Environmental Impact Assessment

Guidance

7.9.27 The key guidance document that will be considered within the shipping and navigation aspect of the EIA is MGN 654 (MCA, 2021). Other key guidance is as follows:

- Revised Guidelines for Formal Safety Assessment (FSA) (International Maritime Organization (IMO), 2018);
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation R139 on the Marking of Man-Made Offshore Structures (IALA, 2021) and IALA Guidance G1162 on the Marking of Man-Made Offshore Structures (IALA, 2021).
- MGN 372 Offshore Renewable Energy Installation (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008); and
- The Royal Yatching Association's (RYA) Position on Offshore Energy Developments: Paper 1 – Wind Energy (Royal Yachting Association (RYA), 2019).

Proposed Assessment Methodology

7.9.28 As required by the MCA under MGN 654 (MCA, 2021) and in line with standard marine risk assessment, the NRA will apply the IMO's FSA approach and terminology to impact assessment. The FSA differs from the EIA methodology used to assess other topics (see Section 5 of this Scoping Report), but is a requirement of the MCA for any NRA.

7.9.29 The FSA methodology is centred on risk control and assesses each impact in terms of its frequency and consequence in order that its significance can be determined as 'broadly acceptable', 'tolerable', or 'unacceptable' via a risk matrix as shown in Table 7.9.2. Should an impact be assessed as 'unacceptable' then additional mitigation measures implemented beyond those considered embedded will be required to bring the impact to 'broadly acceptable' or 'tolerable' significance to ensure the impact is within as As Low As Reasonably Practicable (ALARP) parameters.

7.9.30 As per the MCA methodology (Annex 1 to MGN 654), the NRA will screen the impacts of relevance to shipping and navigation users on a preliminary basis to determine which should be included in the EIA.

Table 7.9.2: Risk-Ranking Matrix

Consequence						
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	Serious	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Moderate	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Extremely Unlikely	Remote	Reasonably Probable	Frequent
		Frequency				

Cumulative Assessment

7.9.31 The FSA will also consider impacts on a cumulative basis, noting this will include assessment of cumulative vessel routeing within the NRA. The cumulative assessment will be informed by a development screening process within the NRA whereby each development will be assigned a tier (or screened out) based on criteria set including but not limited to development status, distance from the array area, and data confidence.

Relevant Embedded Mitigation Measures

7.9.32 The following are considered relevant embedded environmental measures for shipping and navigation, noting that the NRA will include details as to how mitigations are secured:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Appropriate marking on Admiralty charts;
- Promulgation of information as required (e.g., Notice to Mariners, Kingfisher bulletin);
- Buoyed construction area in agreement with Trinity House;
- Application for safety zones during construction and periods of major maintenance;
- Marine Coordination and communication to manage project vessel movements;
- Marking and lighting of the site in agreement with Trinity House and in line with IALA R139/ G1162 (IALA, 2021);
- Blade clearance in excess of RYA (RYA, 2019) and MGN 654 (MCA, 2021) requirements; and
- Guard vessel(s) as required by risk assessment at the time of the specific operation.

Potential Impacts Scoped In

7.9.33 A range of potential impacts on shipping and navigation have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the NRA process are outlined in Table 7.9.3, together with a description of any proposed additional data collection (e.g., site-specific surveys) and/ or supporting analyses (e.g., modelling) to enable an assessment of the impact.

7.9.34 It is noted that specific assessment and data collection may be required in the event that ORPs are utilised, given these will be isolated structures outside of the array area and hence will impact on shipping and navigation users. This will be discussed with the key relevant stakeholders once there is more certainty over their use to agree an appropriate approach to assessment and any additional data collection.

Table 7.9.3: Impacts Proposed to be Scoped into the Assessment for Shipping and Navigation

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Displacement of vessels leading to increased collision risk between third party vessels	Construction activities associated with the installation of structures and cables may displace existing routes/ activity, leading to increased encounters between third party vessels.	The NRA will include a quantitative assessment of main route deviations and associated collision risk. Displacement of and collision risks to non-routed vessels (e.g., fishing, recreation) will be assessed on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Presence of project vessels associated with construction activities may increase encounters and collision risk between project vessels and third-party vessels.	The increase in collision risk associated with new project vessel traffic will be assessed on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased vessel to structure allision risk (powered)	The presence of windfarm structures (WTGs, OSPs, ORPs) will create allision risk to vessels under power.	The NRA will include a quantitative assessment of allision risk to fishing vessels and commercial traffic on main routes. Allision risk to other vessels (including recreational) will be considered on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased vessel to structure allision risk (drifting)	The presence of windfarm structures (WTGs, OSPs, ORPs) will create allision risk to vessels Not Under Command (NUC).	The NRA will include a quantitative assessment of allision risk to fishing vessels and commercial traffic on main routes. Allision risk to other vessels (including recreational) will be considered on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Reduction of emergency response provision including Search and Rescue (SAR) capability	The presence of windfarm structures and increased project vessel activity/ personnel numbers may reduce access to the area for emergency responders and/ or increase incident rates, and therefore reduce emergency response capability for the region as a whole.	The NRA will include assessment of baseline incident rates and SAR resources available. Qualitative assessment will be made of the impact of the Project on incident rates and SAR responder access capability during the construction phase.
Operation & Maintenance		
Displacement of vessels leading to increased collision risk between third party vessels	The windfarm structures (WTGs, OSPs, ORPs) or works associated with O&M may displace existing routes/ activity, leading to increased encounters between third party vessels.	The NRA will include a quantitative assessment of main route deviations and associated collision risk. Displacement of and collision risks to non-routed vessels (e.g., fishing, recreation) will be assessed on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021). *A cumulative assessment of displacement will also be undertaken.
Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Presence of project vessels associated with O&M activities may increase encounters and collision risk between project vessels and third-party vessels.	The increase in collision risk associated with project vessel traffic will be assessed on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased vessel to structure allision risk (powered)	The presence of windfarm structures (WTGs, OSPs, ORPs) will create allision risk to vessels under power.	The NRA will include a quantitative assessment of allision risk to fishing vessels and commercial traffic on main routes. Allision risk to other vessels (including recreational) will be considered on a qualitative basis.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
		Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased vessel to structure allision risk (drifting)	The presence of windfarm structures (WTGs, OSPs, ORPs) will create allision risk to NUC vessels.	The NRA will include a quantitative assessment of allision risk to fishing vessels and commercial traffic on main routes. Allision risk to other vessels (including recreational) will be considered on a qualitative basis. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Reduction of under keel clearance	Presence of export and inter-array cable protection may reduce charted water depths, hence creating an under keel risk to vessels.	The NRA will assess baseline traffic in terms of vessel draughts to determine areas where there may be under keel risk. Qualitative assessment of under keel risk will then be undertaken. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Increased anchor/ gear interaction with subsea cables	Presence of export and inter-array cables may increase the potential for interaction between anchors and subsea cables (including in an emergency anchoring situation).	Baseline anchoring activity will be identified and assessed in terms of proximity to cables, vessel volumes and vessel types/ sizes. The impact will then be assessed on a qualitative basis. Qualitative assessment of the potential for gear snagging[26] will be included based on baseline fishing activity as determined in the NRA. Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Interference with marine navigation, communications, and	Presence of windfarm structures and cables may interfere with equipment used onboard vessels.	Vessel routeing and types will be considered in terms of proximity to windfarm structures and cables and assessed against the relevant guidance/ studies on impact on equipment.

[26] Qualitative assessment of potential gear snag frequency on a general basis, quantitative technical studies of individual gear types will not be undertaken.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
position-fixing equipment		Additional on site marine traffic surveys will be required to establish baseline including account of non AIS traffic as per MGN 654 (MCA, 2021).
Reduction of emergency response provision including SAR capability	The presence of windfarm structures and increased project vessel activity/ personnel numbers may reduce access to the area for emergency responders and/ or increase incident rates, and therefore reduce emergency response capability for the region as a whole.	The NRA will include assessment of baseline incident rates and SAR resources available. Qualitative assessment will be made of the impact of the Project on incident rates and SAR responder access capability post windfarm.
Decommissioning		
The decommissioning phase is considered similar in scenario to the construction phase given there will be increased vessel presence and ongoing works. On this basis impacts to be assessed are as for the construction phase.		
Cumulative		
All “in isolation” impacts will be screened for potential cumulative effect as part of the NRA process. This will include changes to baseline routeing associated with submitted or consented windfarms notably Hornsea 3 and Hornsea 4.		

Impacts Proposed to be Scoped Out

7.9.35 MGN 654 (MCA 2021) as the relevant guidance requires due consideration is given to all relevant impacts within the NRA process, and such no impacts are being scoped out at this stage.

Potential Transboundary Effects

7.9.36 Given the location of the Project in the southern North Sea, there is the potential for transboundary effects upon shipping routes which transit to/ from other EEA countries. Transboundary effects will therefore be considered at EIA stage as part of the NRA process.

Summary of Next Steps

7.9.37 As required under MGN 654 (MCA, 2021), an NRA will be prepared for the Project. This will include a completed MGN 654 checklist to demonstrate that all requirements under MGN 654 have been met.

7.9.38 Prior to the NRA process, an approach to marine traffic survey data collection and general NRA methodology will be discussed and agreed with Trinity House and MCA. The marine traffic data will be collected as per and comply with MGN 654 requirements.

7.9.39 The NRA process will include consultation as required under MGN 654. As a minimum this is anticipated to include the following consultees, however additional parties may be consulted as directed by the NRA process:

- MCA;
- Trinity House;
- Chamber of Shipping;
- RYA;
- Regular users of the area including DFDS Seaways;
- Relevant ports including Associated British Ports – Humber;
- Hazard Workshop; and
- Liaison with relevant fishing users / organisations via the Fishing Liaison Officer.

7.9.40 In addition to MGN 654 compliant marine traffic data, data sources not considered at Scoping stage that will be considered as part of the NRA process include:

- RYA Coastal Atlas (RYA, 2019);
- Long term MAIB incident data (20 years); and
- Relevant outputs of consultation process.

Further Consideration for Consultees

- Do you agree that the data sources identified are sufficient to inform the shipping and navigation baseline for the Project NRA?
- Have all potential impacts resulting from the Project been identified for shipping and navigation users?
- Do you have any concerns in relation to the location or nature of the Project and cumulative routeing within the southern North Sea?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on shipping and navigation users?

7.10 Aviation, Radar and Military

Introduction

7.10.1 This section of the Scoping Report identifies the aviation, radar and military elements of relevance to the array area and offshore ECC AoS. It considers the potential effects from the construction, operation, maintenance and decommissioning of the Project alone and cumulatively, on aviation, radar and military and sets out the proposed scope of the EIA.

7.10.2 WTGs have the potential to cause a variety of adverse effects on aviation, radar and military interests. They can cause issues for the radars used by civilian and military air traffic controllers because the characteristics of moving turbine blades are similar to those of aircraft, leading to spurious returns, or clutter, on radar displays. This can affect the safe provision of air traffic services or interfere with tracking of aircraft by the military. Wind turbines can also present a physical obstruction for aviation activities such as military low flying.

7.10.3 Aviation stakeholders potentially affected include the UK Civil Aviation Authority (CAA), NATS[27], the Ministry of Defence (MoD), regional airports, local aerodromes, and offshore helicopter operators.

Study Area

7.10.4 In considering the spatial coverage of the aviation, radar and military study area, the overriding factor is the potential for WTGs within the array area to have an impact on civil and military radars, taking into account required radar operational ranges. In general, Primary Surveillance Radars (PSRs) installed on civil and military airfields have an operational range of between 40 nautical miles (nm) and 60 nm. All radar-equipped airfields within 60 nm of the array area are therefore included in the study area. En route radars operated by NERL and military Air Defence (AD) radars are required to provide coverage at ranges in excess of 60 nm and so all such radars with potential Radar Line of Sight (RLoS) of WTGs in the array area are also included in the study area.

7.10.5 The aviation, radar and military study area for the Project is defined as:

- The array area and offshore ECC AoS; and
- The airspace between the array area and the UK mainland, extending from the MoD AD radar at Staxton Wold to the north, to Norwich Airport to the south.

7.10.6 The following criteria have been used to identify receptors within the study area:

- Civil aerodromes
    - Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines (CAA, 2016) states the distances from various types of aerodromes where consultation should take place. These distances include:
        - Aerodromes with a surveillance radar – 30 kilometres (km);

[27] NATS is the main Air Navigation Service Provider (ANSP) in the UK that currently comprises NATS (En Route) plc (NERL) and NATS (Services) Limited (NSL).

- Non-radar equipped licensed aerodromes with a runway of more than 1,100 metres (m) – 17 km;
- Licensed aerodromes where the WTGs will lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 m – 4 km;
- Unlicensed aerodromes with runways of less than 800 m – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km.

7.10.7 CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all WTG developments will be approved or within which they will always be objected to. For example, aerodromes may utilise their radars at ranges considerably in excess of 30 km.

7.10.8 As well as examining the technical impact of WTGs on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes (CAA, 2019) to determine whether a proposed development will breach obstacle clearance criteria.

Ministry of Defence

7.10.9 It is necessary to consider the aviation, air defence and other activities of the MoD. This includes:

- MoD airfields, both radar and non-radar equipped;
- MoD AD radars; and
- MoD Practice and Exercise Areas (PEXAs) for both aviation and non-aviation activities.

NERL Facilities

7.10.10 It is necessary to consider the possible effects of WTGs upon NERL radar systems – a network of primary and secondary radar facilities around the country.

Other Aviation Activities

- General military low flying training operations; and
- Military and civilian 'off-route' fixed-wing and helicopter operations, SAR missions and offshore helicopter operations in support of the oil and gas industry.

7.10.11 The study area may be reviewed and amended for future stages (PEIR and subsequently ES) in response to such matters as refinement of the offshore ECC, feedback from consultees, and/ or the identification of additional constraints (environmental and/ or engineering).

7.10.12 Airports and radars within the study area that are under consideration are shown in Figure 7.10.1.

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6000000
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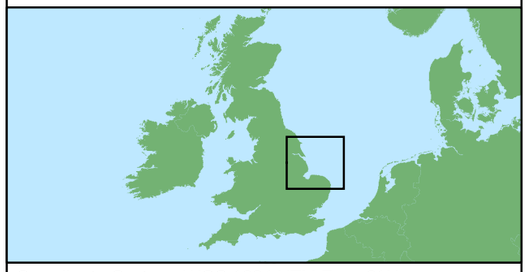
5850000

N

Staxton Wold
Humberside
Claxby
Waddington
Coningsby
Cromer
Trimingham
Marham
Norwich

Legend

- Site Boundary
- Air Defence Radars
- Civil Airports
- Military Airfields
- NERL Radars



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

Airports and radars within the study area

Figure 7.10.1

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

7.10.13 The primary source of aviation related data to be used during desk-based studies in support of the EIA is the UK Aeronautical Information Publication (AIP). The AIP contains details on airspace and en-route procedures as well as charts and other air navigation information. A summary of relevant data sources providing information and guidance that will be considered as part of the EIA process is provided in Table 7.10.1.

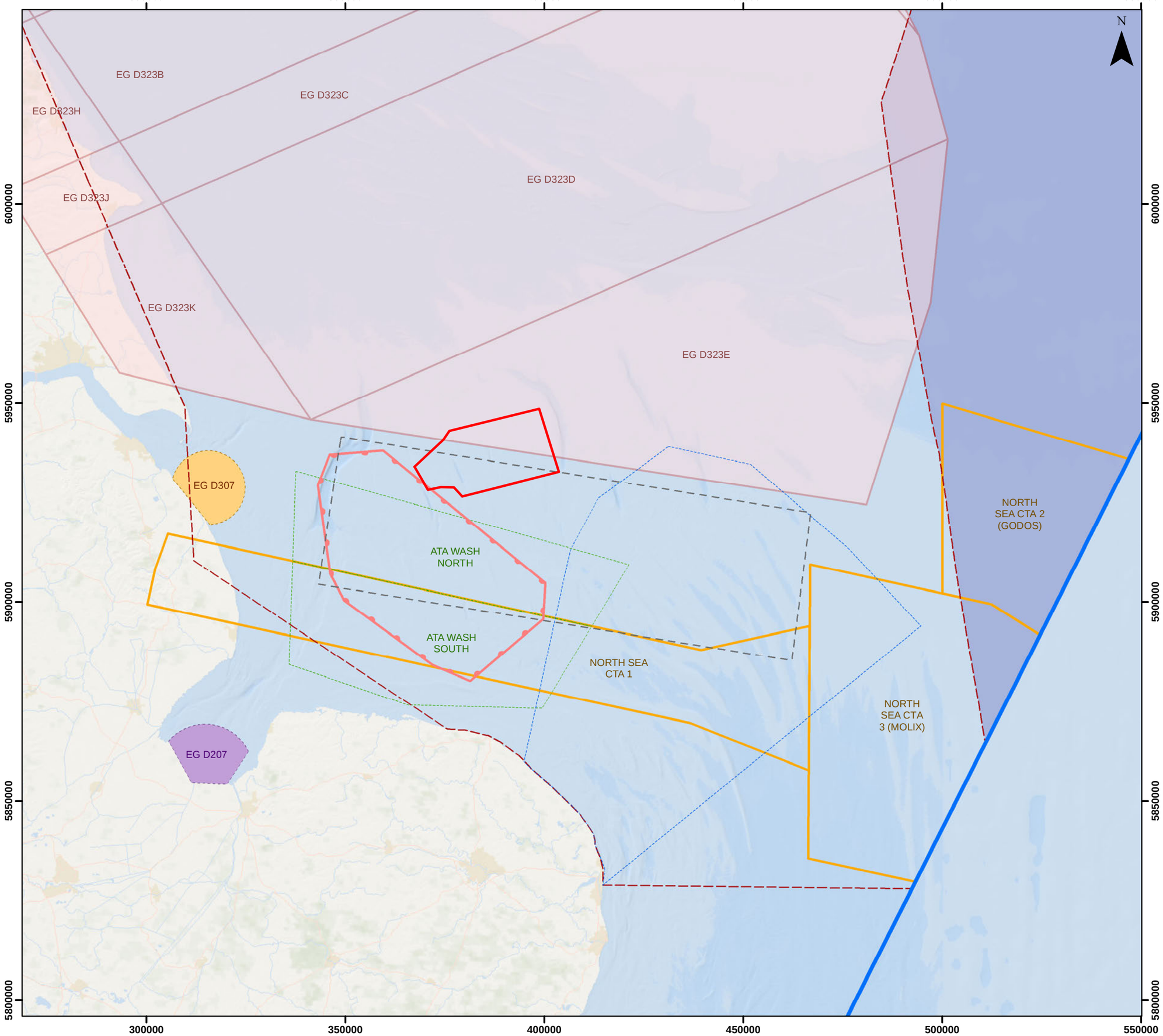
Table 7.10.1: Key sources of information for aviation, radar and military

Source	Summary	Spatial coverage of study area
CAP 032 UK AIP (CAA, 2021)	Contains information on facilities, services, rules, regulations, and restrictions in UK airspace.	Full coverage.
CAP 168 Licensing of Aerodromes (CAA, 2019)	Sets out the standards required at UK licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles, and visual aids.	Full coverage.
CAP 437 Standards for Offshore Helicopter Landing Areas (CAA, 2021)	Provides the criteria applied by the CAA in assessing offshore helicopter landing areas for worldwide use by helicopters registered in the UK, and includes winching area 'best practice' design criteria for wind turbine platforms.	Full coverage.
CAP 670 Air Traffic Services Safety Requirements (CAA, 2019)	Highlights the requirements to be met by providers of civil air traffic services and other services in the UK in order to ensure that those services are safe for use by aircraft.	Full coverage.
CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016)	Details the CAA policy and guidelines associated with wind turbine impacts on aviation that aviation stakeholders and wind energy developers need to consider when assessing a development's viability.	Full coverage.
CAP 1616 Airspace Change (CAA, 2021)	Explains the CAA's regulatory process for changes to airspace.	Full coverage.
CAP 2038A00: Air Navigation Order 2016 (CAA, 2021)	Sets out the Rules of the Air and includes the application of lighting to wind turbines in UK territorial waters (articles 222 and 223).	Full coverage.

Source	Summary	Spatial coverage of study area
UK Military AIP (MoD, 2021)	The main resource for information and flight procedures at all military aerodromes.	Full coverage.
MoD Obstruction Lighting Guidance (Low Flying Operations Flight, 2020)	Includes requirements for the lighting of offshore developments.	Full coverage.
MCA Marine Guidance Note (MGN) 654 Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021)	Highlights issues to consider when assessing navigational safety and emergency response, caused by Offshore Renewable Energy Installation (OREI) developments.	Full coverage.
MCA document Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2021)	Forms part of MGN 654 Annex 5 and includes design, equipment and operational requirements.	Full coverage.
International Civil Aviation Organisation (ICAO) Annex 14 Aerodrome Design and Operations (ICAO, 218)	Includes recommendations for the marking and lighting of wind turbines.	Full coverage.

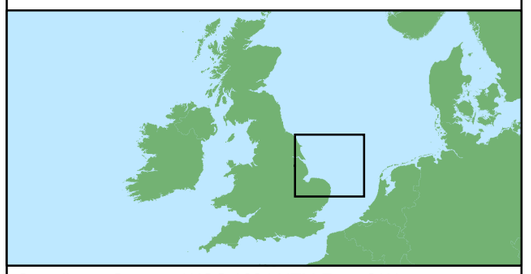
Overview of Baseline Environment

7.10.14 Figure 7.10.2 presents an overview of the existing civil and military airspace environment. The following sections provide further details.



Legend

- Site Boundary
- London Flight Information Region Boundary
- Air to Air Refuelling Area (AARA) Area 08
- Anglia Radar Area of Responsibility
- Anglia Radar Area of Responsibility
- Donna Nook Danger Area
- Greater Wash Transponder Mandatory Zone
- Holbeach Danger Area
- North Sea Control Area (CTA)
- Southern Managed Danger Area
- North Sea Area V
- Wash Aerial Tactics Area (ATA)



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:900,000

Existing airspace environment

Figure 7.10.2

OUTER DOWSING OFFSHORE WIND

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Civil Aviation

7.10.15 The airspace above and adjacent to the array area is used by civil and military aircraft and lies within the London Flight Information Region (FIR) for ATC, the airspace regulated by the UK CAA. The London FIR is adjacent to the Amsterdam FIR, whose boundary is approximately 126 km to the east of the array area and is regulated by the Netherlands Inspectie Leefomgeving en Transport (ILT)

7.10.16 Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of Air Traffic Service (ATS) is provided and under what conditions. In the UK there are five classes of airspace, A, C, D, E and G. The first four are controlled airspace classes while Class G is uncontrolled. Within controlled airspace aircraft are monitored and instructed by ATC, whereas in uncontrolled airspace aircraft are not subject to ATC instruction but rather operate according to a simple set of regulations. ATC may still provide information, if requested, to ensure flight safety.

7.10.17 Aircraft operate under one of two flight rules: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is conducted with visual reference to the natural horizon while IFR flight requires reference solely to aircraft instrumentation.

7.10.18 From sea level to Flight Level (FL) 195, approximately 19,500 feet (ft) or 5,950 m Above MSL, the airspace in the vicinity of the array area is Class G uncontrolled airspace. This airspace is used predominantly by low level flight operations and generally by aircraft flying under VFR. Under VFR flight the pilot is responsible for maintaining a safe distance from terrain, obstacles, and other aircraft.

7.10.19 Immediately west and south of the array area is the Greater Wash Transponder Mandatory Zone (TMZ). Within a TMZ the carriage and operation of aircraft transponder equipment is mandatory. This enables such aircraft to be detected and tracked by Secondary Surveillance Radar (SSR) systems. The Greater Wash TMZ is in the vicinity of a large offshore windfarm complex and is used to mitigate the impact the associated WTGs have on PSRs. The establishment of a TMZ over the array area is one of the potential mitigation measures to be considered during the Project design process.

7.10.20 Above FL 195 is Class C controlled airspace in the form of a Temporary Reserved Area (TRA). This airspace, TRA 006, has an upper vertical limit of FL 245, approximately 24,500 ft AMSL, and is available for use by both military and civil aircraft, though its main use is to accommodate VFR military flying activity. The North Sea Control Area (CTA), which comprises CTA 1, 24 km to the south, and CTAs 2 and 3 to the east of the array area, is Class A controlled airspace from a minimum level of FL 175, approximately 17,500 ft, up to FL 195, and Class C airspace from FL 195 up to FL 245, approximately 24,500 ft AMSL. CTA 2 (GODOS) and CTA 3 (MOLIX) are 96 km and 67 km respectively from the array area and the provision of ATS within them is delegated to Amsterdam Area Control.

7.10.21 The only radar-equipped airports within 60 nm of the array area are Humberside Airport, approximately 90 km (48 nm) to the west, and Norwich Airport, approximately 90 km (48 nm) south of the array area. Controllers at both airports may provide a Lower Airspace Radar Service (LARS) to aircraft operating outside controlled airspace up to FL 100 (approximately 10,000 ft AMSL) within the limits of radio and radar cover. The maximum range for this service provision is typically within 30 nm of the participating Air Traffic Service Unit (ATSU). Preliminary RLoS modelling undertaken for the PSRs at these airports indicates that neither radar will have visibility of the WTGs, and at 48 nm from both these airports the array area is considerably beyond the LARS 30 nm service radius.

7.10.22 RLoS coverage at 405 m AMSL for the Humberside and Norwich PSRs is illustrated in Figure 7.10.3.

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Humberside

Norwich

Legend

- Site Boundary
- Civil Airports
- Humberside 405m RLoS
- Norwich 405m RLoS

Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

RLoS coverage at 405 m amsl for Humberside and Norwich PSRs

Figure 7.10.3

OUTER DOWSING OFFSHORE WIND

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7.10.23 The WTGs will not lie within airspace coincidental with any published IFPs for either Humberside or Norwich Airport.

7.10.24 The nearest major European airport is Schiphol Airport, approximately 250 km south-east of the array area and outside any area of effect.

7.10.25 NERL provides en route civil air traffic services within the London FIR. NERL operates a network of radar facilities which provide en route information for both civil and military aircraft. The closest NERL radars to the array area are based at Cromer, 63km to the south, and Claxby, 87 km to the west.

7.10.26 Preliminary RLoS analysis indicates that all WTGs within the array area will be visible to both the Cromer and Claxby radars, as depicted in Figure 7.10.4. NERL radar facilities are combined PSR and SSR systems. NATS do not consider the impact of WTGs on SSR to be material or relevant for turbines that are beyond 15 nm, approximately 28 km, from their SSR facilities. Furthermore, CAP 764 states that WTG effects on SSR "… are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km." The nearest SSR facility, at Cromer, is 63 km from the array area and therefore it is proposed that SSR will be scoped out from further analysis.

7.10.27 In summary, the civil radars that have been identified as being potentially impacted by WTGs within the array area are the NERL PSR facilities at Cromer and Claxby.

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450000

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5950000
5900000
5850000

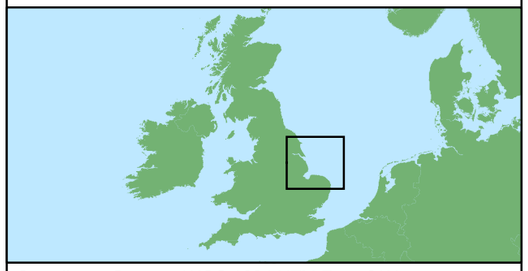
N

Claxby

Cromer

Legend

- Site Boundary
- NERL Radars
- Claxby 405m RLoS
- Cromer 405m RLoS



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

RLoS coverage at 405 m amsl for Claxby and Cromer PSRs

Figure 7.10.4

OUTER DOWSING OFFSHORE WIND

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Military Aviation

7.10.28 The northern half of the array area lies beneath the Southern Managed Danger Area (MDA), one of four MDA complexes in UK airspace that provide segregated airspace for military flying training. Specifically, the array area is beneath danger area EGD323E which, when activated, has vertical limits from FL 50 (approximately 5,000 ft or 1,520 m AMSL) up to FL 660 (approximately 66,000 ft AMSL).

7.10.29 Danger areas associated with Air Weapons Range activities off the Lincolnshire coast at Donna Nook (EGD307) and Holbeach (EGD207) lie approximately 43 km to the west and 78 km to the south-west respectively of the array area. When active, Donna Nook has vertical limits from the surface up to 20,000 ft AMSL (occasionally notified to 23,000 ft AMSL) while Holbeach has vertical limits from the surface up to 23,000 ft AMSL.

7.10.30 There are no known further PEXAs, including PEXAs for non-aviation activities, in the vicinity of the array area.

7.10.31 The southern half of the array area lies beneath an Air to Air Refuelling Area designated Area 8, with vertical limits of FL 70 (approximately 7,000 ft or 2,130 m AMSL) to FL 170 (approximately 17,000 ft AMSL).

7.10.32 Less than 5 km south of the array area are The Wash North and South Aerial Tactics Areas (ATAs). ATAs are defined within the AIP as "an airspace of defined dimensions designated for air combat training, within which high energy manoeuvres are regularly practised by aircraft formations". Both ATAs have a lower limit of FL 50 or approximately 5,000 ft AMSL.

7.10.33 The nearest PSR-equipped military airfields to the array area are Royal Air Force (RAF) Coningsby and RAF Waddington, 91 km (49 nm) and 108 km (58 nm) respectively to the west, and RAF Marham, 99 km (53 nm) to the south. Controllers at these stations offer a LARS service to a range of 30 nm. Preliminary RLoS analysis indicates that the PSRs at these stations will not have visibility of the WTGs.

7.10.34 RLoS coverage at 405 m AMSL for the Coningsby, Marham and Waddington PSRs is illustrated in Figure 7.10.5.

7.10.35 The nearest MoD AD radars to the array area are based at Remote Radar Head (RRH) Staxton Wold, 118 km to the north-west, and at RRH Trimingham, 66 km to the south. Preliminary RLoS modelling indicates that all WTGs in the array area will be visible to Trimingham PSR and WTGs across more than half of the western extent of the array area will be visible to Staxton Wold PSR.

7.10.36 RLoS coverage at 405 m AMSL for the Staxton Wold and Trimingham PSRs is illustrated in Figure 7.10.6.

7.10.37 In summary, the military radars that have been identified as being potentially impacted by WTGs within the array area are the AD PSRs at Staxton Wold and Trimingham.

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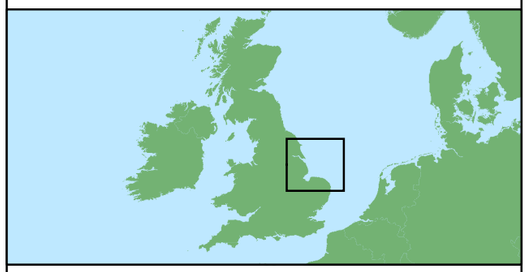
5850000

N

Waddington
Coningsby
Marham

Legend

- Site Boundary
- Military Airfields
- Coningsby 405m RLoS
- Marham 405m RLoS
- Waddington 405m RLoS



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

RLoS coverage at 405 m amsl for Coningsby, Marham and Waddington PSRs

Figure 7.10.5

OUTER DOWSING OFFSHORE WIND

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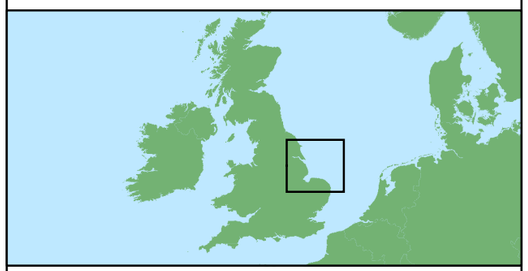
Staxton Wold

Trimingham

Legend

- Site Boundary
- Air Defence Radars
- Staxton 405m RLoS
- Trimingham 405m RLoS



Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

RLoS coverage at 405 m amsl for Staxton Wold and Trimingham PSRs

Figure 7.10.6

OUTER DOWSING OFFSHORE WIND

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Helicopter Main Routing Indicators

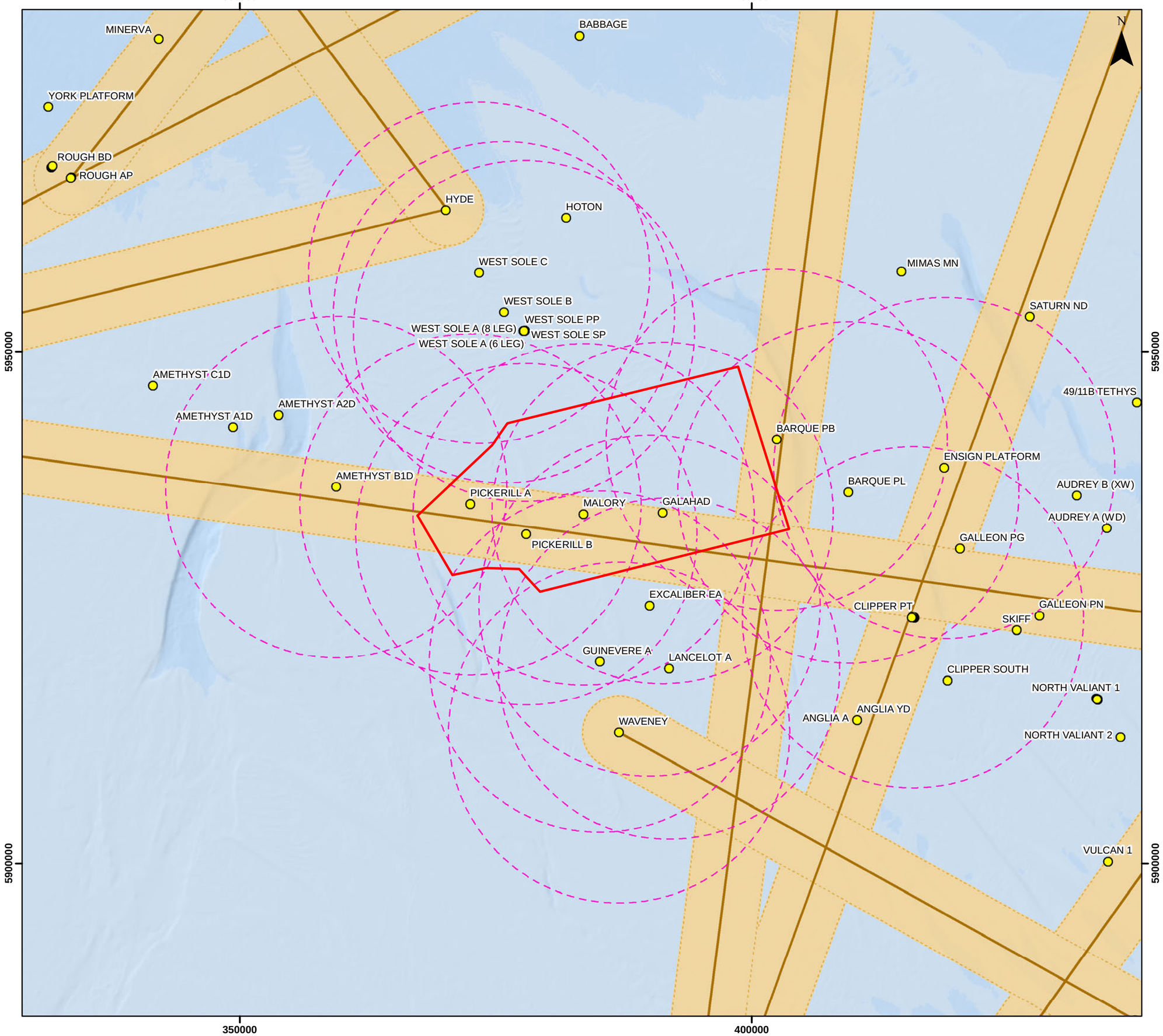
7.10.38 A network of offshore routes over the North Sea are flown by civilian helicopters in support of oil and gas installations and defined as Helicopter Main Routing Indicators (HMRIs). These routes have no lateral dimensions, however there should be no obstacles within 2 nm of the route centreline. Both HMRI 4 and HMRI 8 pass overhead the array area. CAP 764 (CAA, 2016) states that planned obstacles within 2 nm should be consulted upon with helicopter operators and the ANSP.

Offshore Helidecks

7.10.39 Helicopter Traffic Zones (HTZs) are established around individual and groups of offshore helidecks to notify of helicopters engaged in platform approaches, departures and inter-platform transits. The HTZ airspace is from sea level to 2,000 ft AMSL and extends to 1.5 nm from the platform helidecks.

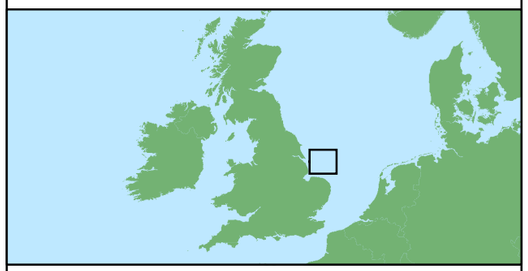
7.10.40 To help achieve a safe operating environment, a 9 nm consultation zone for planned obstacles exists around offshore helicopter destinations. There are sixteen platforms within 9 nm of the array area. Of these, the Pickerill A and B, Malory and Galahad platforms are within the array area. The Pickerill platforms are in the process of being decommissioned, the topsides having already been removed and the substructures due to be removed soon. In addition, it is understood that Galahad is no longer in production and will be decommissioned within circa three years. As stated in CAP 764, this zone does not prohibit development, but is a trigger for consultation with offshore helicopter operators, the operators of existing installations and exploration and development locations to determine a solution that maintains safe offshore helicopter operations alongside proposed developments. A Helicopter Access report will be developed as part of the PEIR which will be consulted on throughout the EIA process.

7.10.41 HMRIs and oil and gas OPs in the vicinity of the Project are depicted in Figure 7.10.7.



Legend

- Site Boundary
- Oil and Gas Platforms
- Offshore Platforms within 9nm
- Helicopter Main Routing Indicators (HMRIs)
- HMRI 2nm Consultation Buffer



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:350,000

HMRIs and oil and gas platforms in the vicinity of the Project

Figure 7.10.7

OUTER DOWSING OFFSHORE WIND

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Search and Rescue

7.10.42 There are ten helicopter SAR bases around the UK with Bristow Helicopters providing helicopters and aircrew. The nearest SAR base is at Humberside Airport. The obstacle environment created by the WTGs has the potential to impact on SAR operations.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.10.43 The EIA process will be supported by further desk-based studies, including RLoS modelling, that will identify and examine in greater detail sensitive aviation and radar receptors. Studies will be undertaken in parallel with consultation with relevant stakeholders to provide a detailed understanding of potential impacts. It is expected that consultation will be an iterative process, allowing for any concerns that are raised to be considered throughout the pre-application phase and in finalising the DCO application.

7.10.44 The approach to the EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of aviation, radar and military will also comply with the guidance documents listed in Table 7.10.1.

7.10.45 An Air Defence and Offshore Wind (AD&OW) Windfarm Mitigation Task Force (the Task Force) has been established as a collaborative initiative between the MoD, Department for Business, Energy and Industrial Strategy, the Offshore Wind Industry Council and TCE. The aim of the Task Force is to enable the co-existence of UK Air Defence and offshore wind, allowing offshore wind to contribute towards meeting the UK Government's Net Zero target without degrading the nation's AD surveillance capability.

7.10.46 The corresponding AD&OW Strategy and Implementation Plan (S&IP) sets the direction for this collaboration through identifying, assessing and deploying solutions that will enable the co-existence of AD&OW operations such that neither is unduly nor excessively compromised. This plan may lead to significant changes to current AD PSR characteristics and capabilities that in turn affect the potential impact that the Project may have.

Relevant Embedded Mitigation Measures

7.10.47 As part of the design process, a number of embedded environmental measures are proposed to reduce the potential for impacts on civil and military aviation. These measures will evolve over the development process as the EIA progresses and in response to consultation. The measures are seen as good or standard practice and include actions that will be undertaken to meet existing legislative requirements.

Information, Notifications and Charting

7.10.48 The Project will create an obstacle environment which can effectively be mitigated by compliance with appropriate international and national requirements for the promulgation of the obstacle locations on charts and in aeronautical documentation, together with the permanent marking and lighting of obstacles.

7.10.49 Measures will be adopted at the commencement of works on the Project to ensure that the aviation sector is made aware of the creation of a further aviation obstacle environment in the southern North Sea, namely the Project. These measures will include issuing Notices to Airmen (NOTAMs) and Aeronautical Information Circulars (AICs), warning of the establishment of obstacles within the array area and publicity in such aviation publications as Safety Sense and the General Aviation Safety Council (GASCo) Flight Safety magazine.

7.10.50 At various points during the Project, details of the position, height AMSL and lighting of each of the completed permanent structures will be forwarded to the CAA Aeronautical Information Service (AIS) for inclusion in the AIP and on relevant aeronautical charts, as notifiable permanent obstructions. This permanent information will replace the short-term NOTAMs that will continue to be issued until construction has been completed.

7.10.51 En route navigation charts will be updated as the site construction proceeds. All obstacles over 300 ft (91 m) above ground level must be notified to the CAA for inclusion in the UK AIP (Section ENR 5.4) and on aeronautical maps and to the Defence Geographic Centre for inclusion in MoD databases.

Marking and Lighting

7.10.52 The international marking and lighting requirement, set out in ICAO Annex 14, specifies that:

- "a wind turbine shall be marked and/ or lighted if it is determined to be an obstacle."; and
- "the rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study."

7.10.53 UK regulations adopt ICAO Annex 14's requirements as to lighting of WTGs but do not require that WTGs follow the ICAO recommendation as to paint colour, although CAP 764 does set out the ICAO recommendation by way of guidance. In terms of marking the WTGs, in keeping with recent practice for offshore windfarms, it is anticipated that Trinity House will require all structures to be painted yellow from the level of Highest Astronomical Tide (HAT) to a height directed by Trinity House, and above the yellow section all WTGs will be painted submarine grey.

7.10.54 The Project will be lit in accordance with the Air Navigation Order (ANO). ANO Article 222 defines an 'en route obstacle' as any building, structure or erection, the height of which is 150 m or more above ground level and requires these to be lit. Article 223 modifies the Article 222 requirement with respect to offshore WTGs, requiring these to be lit where they exceed 60 m above HAT with a medium intensity (2000 candela (cd)) steady red light mounted on the top of each nacelle and requires for limited downward spillage of light. Article 223 allows for the CAA to permit that not all WTGs are so lit. The CAA will require that all WTGs on the periphery of any wind farm need to be equipped with aviation warning lighting and such lighting, where achievable, shall be spaced at longitudinal intervals not exceeding 900 m. There is no current routine requirement for offshore obstacles to be fitted with intermediate vertically spaced aviation lighting.

7.10.55 CAA guidance has been subject to coordination with maritime agencies to avoid confusion with maritime lighting. To that end, the CAA has indicated that the use of a flashing red Morse Code letter 'W' is likely to be approved to resolve potential issues for the maritime community.

7.10.56 The MCA is seeking that WTG blade tips are marked in red, together with markings down the blade, to provide a SAR helicopter pilot with a hover reference point as set out in the OREI SAR Requirements document. The MCA also seeks a lighting scheme comprising 200 cd red/ infra-red lights on the nacelles of non-Article 223 WTGs, to be operated on demand during SAR operations and a WTG shutdown protocol to be applied during rescue situations. An Emergency Response and Cooperation Plan (ERCoP) will be developed and implemented for all phases of the project, based upon the MCA's standard template. Appropriate lighting will be utilised to facilitate heli-hoisting if undertaken within the array area, as outlined in CAP 437.

7.10.57 To satisfy MoD requirements, the WTGs will also be required to be fitted with infra-red lighting in combination with the ANO Article 223 lights. MoD lighting guidance indicates that provided combination infra-red/ 2000 cd visible red lights are used to light the WTGs required to be lit under ANO Article 223, this satisfies the MoD operational requirement.

Regulatory Requirements

7.10.58 When construction is complete, given that the array area will occupy uncontrolled (Class G) airspace (below approximately 19,500 ft AMSL), the responsibility for avoiding other traffic and obstacles rests with captains of civilian and military aircraft. Thus, logically a pilot will avoid the charted areas and individually lit WTGs and any other obstacles, laterally or vertically, by the legislated standard minimum separation distance. This is outlined in CAA Official Record Series 4 No. 1496 (UK) Standardised European Rules of the Air – Exceptions to the Minimum Height Requirements (CAA, 2021), which sets out that to avoid persons, vessels, vehicles and structures, pilots must give clearance of a minimum distance of 500 ft. This applies equally to the avoidance of WTGs and any other structure.

7.10.59 Military operations are subject to separate rules sponsored by the MoD. Pilots of military aircraft will be required to ensure that a Minimum Separation Distance of 250 ft from any person, vessel, vehicle, or structure exists whilst operating in the vicinity of the array area. The charting and lighting of the Project should also be taken into account by MoD low flying units and SAR operators.

7.10.60 It is assumed that aviation stakeholders will adhere to all relevant CAA and MoD safety guidance in the conduct of their specific operations to ensure safe operations for all users of the airspace above the Project.

Potential Impacts Scoped In

7.10.61 A range of potential impacts on aviation, radar and military have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.10.2 together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

7.10.62 WTGs have the potential to affect civil and military aviation (fixed-wing and helicopters), either through their physical dimensions limiting access and affecting safe passage, or through their effects on PSR systems which can impact the safe provision of an ATS.

7.10.63 PSR impacts are caused by the characteristics of rotating WTG blades being similar to aircraft, leading to spurious clutter on ATC radar displays.

7.10.64 The creation of a new obstacle environment increases the risk of collision for military low flying aircraft, helicopters in support of the oil and gas industry, and SAR operations.

7.10.65 Helicopter traffic as a result of planned activities in support of the Project may raise the overall level of air traffic in the area and increase the likelihood of aircraft-to-aircraft collision.

7.10.66 Installation of the offshore export cable may need coordination with the MoD if the proposed route is in the vicinity of the Donna Nook danger area.

Table 7.10.2: Impacts proposed to be scoped into the assessment for aviation, radar and military

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Construction		
Creation of an aviation obstacle environment.	Construction of the windfarm will involve tall crane vessels and the installation of infrastructure above sea level which could pose a physical obstruction to low flying aircraft, increasing the risk of collision or requiring aircraft to fly extended routes to avoid obstacles.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry. Consultation feedback will be used to inform desk-based analysis based on established statutory civil and military aviation regulations. Impacts will be minimised by applying the proposed embedded environmental measures with regards to notification, charting, lighting, marking and regulatory requirements.
Increased air traffic in the area related to windfarm activities.	Helicopter traffic associated with the construction phase could impact on existing traffic in the area, increasing the risk of aircraft collision.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry. Consultation feedback will be used to inform desk-based analysis based on established statutory civil and military aviation regulations.
Potential impact of Donna Nook Air Weapons Range activities during installation of the offshore export cable.	The proposed route for the offshore export cable could potentially be in the vicinity of the Donna Nook danger area which is associated with Air Weapons Range activities. This could endanger vessels and personnel engaged in the cable installation.	Consultation with the MoD will be undertaken should the proposed route be in the vicinity of the Donna Nook danger area. The MoD will advise on the acceptability of the route and what coordination will be required during the construction phase.
Operation & Maintenance		

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Creation of an aviation obstacle environment.	The presence of completed WTGs could pose a physical obstruction to low flying aircraft, increasing the risk of collision or requiring aircraft to fly extended routes to avoid obstructions.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry. Consultation feedback will be used to inform desk-based analysis based on established statutory civil and military aviation regulations. Impacts will be minimised by applying the proposed embedded environmental measures with regards to notification, charting, lighting, marking and regulatory requirements.
Increased air traffic in the area related to windfarm activities.	Helicopter traffic associated with maintenance activities could impact on existing traffic in the area, increasing the risk of aircraft collision.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry. Consultation feedback will be used to inform desk-based analysis based on established statutory civil and military aviation regulations.
Impact on NERL Cromer and Claxby, and MoD Staxton Wold and Trimingham AD PSR systems.	To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. PSRs that can see the rotating blades of WTGs can mistake them for aircraft and so present them on ATC radar displays as clutter. Controllers may not be able to distinguish aircraft from the clutter.	Further RLoS and probability of detection calculations will be used to determine the extent of possible effects on the impacted PSRs and to develop suitable mitigation solutions. Consultation with NERL and the MoD will be undertaken to discuss the mitigation options and agree a scheme to remove all unacceptable PSR impacts.
Decommissioning		
Increased air traffic in the area related to windfarm activities.	Helicopter traffic associated with the decommissioning phase could impact	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
	on existing traffic in the area, increasing the risk of aircraft collision.	of the oil and gas industry. Consultation feedback will be used to inform desk-based analysis based on established statutory civil and military aviation regulations.
Cumulative		
Creation of an aviation obstacle environment.	The cumulative assessment will consider the impact arising from the Project alongside that arising from other offshore infrastructure.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry.
Increased air traffic in the area related to offshore aviation activities.	The cumulative assessment will consider the impact arising from the Project alongside that arising from other offshore developments and associated aviation activities.	Consultation with potentially impacted aviation stakeholders will be undertaken, including the MoD for military low flying operations and offshore helicopter operators involved in SAR operations and in support of the oil and gas industry.
Impact on civil and military PSR systems.	The cumulative assessment will consider the impact arising from the Project alongside that arising from other offshore windfarms.	Consultation with NATS and MoD will determine whether there is mitigation for existing offshore windfarms in the vicinity of the Project. The same mitigation may be available for the Project.

Impacts Proposed to be Scoped Out

7.10.67 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for aviation, radar and military. These impacts are outlined in Table 7.10., together with a justification for scoping them out.

Table 7.10.3: Impacts proposed to be scoped out of assessment for aviation, radar and military

Impact	Justification
Construction	
Impact on civil and military PSR systems.	To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. PSRs that can see the rotating blades of WTGs can mistake them for aircraft and so present them on the radar display as clutter. Until WTG blades in RLoS are allowed to rotate at operational speeds, they will not generate PSR clutter. Similarly, tall construction vessels and cranes that are in RLoS will not be moving fast enough to generate PSR clutter.
Impacts from the offshore export cable.	The offshore export cable will be below sea level and will have no impact on aviation activities. Surface vessels will not generate any PSR clutter.
Operation and Maintenance	
Impacts from the offshore export cable.	The offshore cable will be below sea level and will have no impact on aviation activities.
Impact on civil and military SSR systems.	NATS do not consider the impact of WTGs on SSR to be material or relevant for turbines that are beyond approximately 28 km from their SSR facilities. Furthermore, CAP 764 states that WTG effects on SSR "… are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km." The nearest SSR facility, at Cromer, is 63 km from the array area.
Impact on Humberside Airport PSR.	RLoS modelling indicates that the WTGs will not be visible to Humberside PSR. The WTGs are considerably beyond the Humberside LARS service radius and the airspace in the vicinity of the array area is not considered to be operationally significant to the airport.
Impact on Norwich Airport PSR.	RLoS modelling indicates that the WTGs will not be visible to Norwich PSR. The WTGs are considerably beyond the Norwich LARS service radius and the airspace in the vicinity of the array area is not considered to be operationally significant to the airport.
Impact on RAF Coningsby PSR.	RLoS modelling indicates that the WTGs will not be visible to Coningsby PSR and the WTGs are considerably beyond the Coningsby LARS service radius.
Impact on RAF Marham PSR.	RLoS modelling indicates that the WTGs will not be visible to Marham PSR and the WTGs are considerably beyond the Marham LARS service radius.

Impact	Justification
Impact on RAF Waddington PSR.	RLoS modelling indicates that the WTGs will not be visible to Waddington PSR and the WTGs are considerably beyond the Waddington LARS service radius.
Decommissioning	
Impacts from the offshore export cable.	The offshore cable will be below sea level and will have no impact on aviation activities.
Creation of an aviation obstacle environment.	During the decommissioning phase the existing WTGs will be gradually dismantled and therefore the aviation obstacle environment will be removed. No specific decommissioning impacts are foreseen.
Impact on NERL Cromer and Claxby, and MoD Staxton Wold and Trimingham AD PSR systems.	During the decommissioning phase the blades of WTGs will cease rotating, therefore the impact on PSRs will gradually reduce until the last WTG ceases operation. Any mitigations will remain in place until the blades of the last WTG stop rotating. There will be no other specific impacts on PSRs during decommissioning.

Potential Transboundary Effects

7.10.68 The EIA Methodology section (Section 5) provides a description of how potential transboundary effects will be assessed. The potential impacts of WTGs on aviation are localised and the array area is completely within UK airspace, with the nearest Dutch operated airspace more than 60 km east of the Project. Furthermore, the array area is significantly beyond the expected radar coverage from the nearest major European airport.

7.10.69 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

7.10.70 Consultation will be undertaken with aviation stakeholders, including NATS, the MoD, and offshore helicopter operators to investigate raised concerns and develop possible mitigations.

7.10.71 The Project will engage directly with the AD&OW Windfarm Mitigation Task Force to ensure that all aspects of its construction, operation, maintenance and decommissioning are recognised and to identify any features of the project that may have a material impact upon the corresponding S&IP.

7.10.72 Further RLoS modelling and probability of detection calculations will be used to identify technical solutions that may be available to mitigate PSR impacts, and this will be fed into discussions with affected radar operators.

Further Consideration for Consultees

- Do you agree that the data sources identified are sufficient to inform the offshore and aviation, radar and military baseline for the PEIR and ES?

- Do you agree that all the aviation, radar and military receptors within the defined study area have been identified?
- Have all potential impacts resulting from the Project been identified for aviation, radar and military receptors?
- Do you agree that the impacts described in Table 7.10. can be scoped out?
- For those impacts scoped in Table 7.10.2, do you agree that the methods described are sufficient to inform a robust impact assessment?

7.11 Seascape, Landscape and Visual

Introduction

7.11.1 This section of the Scoping Report identifies the seascape, landscape and visual elements of relevance to the Project, including the Project array area, offshore ECC AoS and an offshore reactive compensation station (RCS) (within the offshore ECC). This section of the Scoping Report considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on seascape, landscape and visual receptors and sets out the proposed scope of the EIA.

7.11.2 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 8.9: Landscape and Visual Impact (onshore) - for interactions with onshore landscape features; and
- Section 8.2: Archaeology and Cultural Heritage - for potential effect to features of historical importance.

Study Area

7.11.3 The site boundary for the Project is located approximately 54 km offshore from the closest land, at Saltfleetby (north of Mablethorpe), East Lincolnshire.

7.11.4 The proposed seascape, landscape and visual assessment (SLVIA) study area for the Project covers a radius of 60 km from the Project array area, as illustrated in Figure 7.11.1.

7.11.5 A precautionary approach is proposed in defining a 60 km radius SLVIA study area for the Project due to the large WTGs of up to 405 m blade tip height (above LAT). Broadly, the SLVIA study area is defined by a large area of the North Sea off the coasts of East Riding of Yorkshire, Lincolnshire and North Norfolk. The SLVIA study area is defined as the outer limit of the area where significant effects could occur, using professional judgement.

7.11.6 The SLVIA study area has been informed by the extent of the likely impacts modelled in the Blade Tip Zone of Theoretical Visibility (ZTV) (Figure 7.11.2), focusing on locations where it may be possible to see the Project array area. The blade tip ZTV (Figure 7.11.2) indicates that areas of higher theoretical visibility primarily occur within 60 km and that beyond this distance, the number of visible WTGs is lower and views of the array area are restricted in geographic extent. At distances over 60 km, the apparent height of the WTGs will be very small, and the lateral (or horizontal) spread of the array area will also occupy a small portion of available views, therefore significant visual effects are unlikely to arise at distances greater than 60 km, even if the WTGs are theoretically visible.

7.11.7 The influence of earth curvature begins to limit the apparent height and visual influence of the WTGs visible at long distances (such as over 60 km), as the lower parts of the turbines would be partially, or wholly, hidden behind the apparent horizon, leaving only the upper parts visible above the skyline.

520000 540000 560000 580000 600000 620000 640000 660000 680000

480000 460000 440000 420000 400000 380000 360000 340000

N

North Yorkshire County
East Riding of Yorkshire
City of Kingston upon Hull (B)
North Lincolnshire (B)
North East Lincolnshire (B)
West Lindsey District
Lincolnshire County
East Lindsey District
North Kesteven District
Boston District (B)
South Kesteven District
South Holland District
King's Lynn and West Norfolk District (B)
Norfolk County
North Norfolk District
Breckland District
Broadland District

Hornsea Project Four
Hornsea Project Two
Hornsea Project 1 - Njord
Hornsea Project 1 - Heron East
Hornsea Project 1 - Heron West
Hornsea Project Three
Westermost Rough
Humber Gateway
Triton Knoll
Dudgeon Extension
Dudgeon
Race Bank
Race Bank Extension
Lincs
Lincs
Inner Dowsing
Lynn
Sheringham Shoal Extension
Sheringham Shoal
Norfolk Vanguard West

Legend

- Site Boundary
- 10km Radi
- 60km Study Area
- Offshore ECC Area of Search
- County Boundary
- District / Unitary Authority Boundary

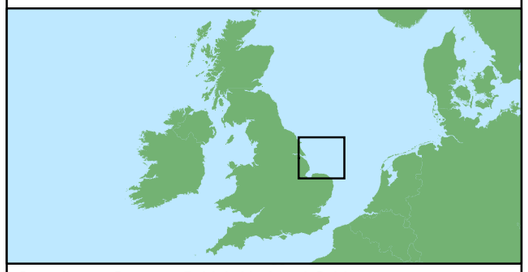
Cumulative Wind Farm Status

- Operational
- Under Construction
- Consented
- Application
- Pre-Application

EMODnet DTM for European Sea Regions (m)

High : 4.23

Low : -98.28



Coordinate System: British National Grid

0 5 10 15 20 km

Scale: 1:600,000

Study Area

Figure 7.11.1

OUTER DOWSING OFFSHORE WIND

Date: 21/07/2022
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Revision: 0.2

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Document Path: P:\2021\211613_OuterDous\GIS\211613_GTR4\SCOPING\OFFSHORE\211613_ODOW_Offshore_Fig7_11_1_SLVIA_StudyArea.mxd

7.11.8 The variation of weather conditions influencing visibility off the English coast has also informed the SLVIA study area. Met Office visibility data from Donna Nook weather station on the East Lincolnshire coast, presented in Table 7.11.2, shows that visibility over 60 km occurred for approximately 0.56% of the time over a 10-year period between 2012 - 2021. This equates to approximately 2 days per year on average, when there could be visibility beyond 60 km. Effectively, visibility beyond 60 km will almost entirely not be possible due to the prevailing weather and atmospheric conditions.

7.11.9 A 30km radius study area from the offshore RCS AoS (to be defined at PEIR, it is currently possible a RCS could be required anywhere within the ECC) is proposed for the assessment of seascape, landscape and visual effects arising from the offshore RCS.

Baseline Environment

Overview of Available Data Sources

7.11.10 This section provides an overview of the existing data that is available for the SLVIA from desk-based review. Data sources used to collate the information for the SLVIA are set out in Table 7.11.1.

Table 7.11.1: Key sources of information for seascape, landscape and visual

Source	Summary	Spatial Coverage of Study Area
Campaign to Protect Rural England (CPRE) (2016)	Interactive maps of the UK's light pollution and dark skies as part of a national mapping project (Land Use Consultants/ CPRE, 2016). Open Source data used to understand and illustrate baseline lighting levels. (Available online: https://www.nightblight.cpre.org.uk/)	Full coverage of SLVIA study area.
English Heritage (2020)	Any specific visitor attractions/ tourist destinations (available online: https://www.english-heritage.org.uk/visit/places	Full coverage of SLVIA study area.
East Riding of Yorkshire Council (2018)	East Riding of Yorkshire Landscape Character Assessment	East Riding of Yorkshire
Google Earth Pro (2020)	Aerial photography.	Full coverage of SLVIA study area.
Historic England (2020)	Registered Parks and Gardens and United Nations Educational, Scientific and Cultural Organization World Heritage Sites (available online: https://historicengland.org.uk/listing/the-list/)	Full coverage of SLVIA study area.
Long Distance Walkers Association (2020)	Overview map for Long Distance Paths and Walks (available online: https://www.ldwa.org.uk/ldp/public/ldp_overview_map.php)	Full coverage of SLVIA study area.
Met Office (2010-2020)	Visibility Data. Visibility bands every 1 km up to 30 km, then every 5 km up to 50 km, then every 10 km up to 70 km, and >70 km.	Weather stations at Donna Nook,

Source	Summary	Spatial Coverage of Study Area
		Saltfleetby, St Clements and Skegness.
MMO (2018)	Seascape character area assessment for the North East Inshore and East Offshore Marine Plan Areas (2018). Available online: https://www.msp-platform.eu/sites/default/files/north_east_-_seascape_character_assessment_report.pdf	North East Inshore and East Offshore Marine Plan Area
MMO (2012)	Seascape character area assessment East Inshore and East Offshore marine plan areas. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312481/east_seascape.pdf	North East Inshore and East Offshore Marine Plan Area
National Trust (2020)	National Trust sites (available online: https://www.nationaltrust.org.uk/days-out	Full coverage of SLVIA study area.
Natural England (2012)	Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study)	Marine Plan Areas 3 and 4 and Part of Area 6.
Natural England (2014)	National Character Area profiles (available online: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles)	Full coverage of SLVIA study area.
Natural England (2019)	Geographic Information System (GIS) datasets for: National Parks (https://data.gov.uk/dataset/334e1b27-e193-4ef5-b14e-696b58bb7e95/national-parks-england). Areas of Outstanding Natural Beauty (AONB) (https://data.gov.uk/dataset/8e3ae3b9-a827-47f1-b025-f08527a4e84e/areas-of-outstanding-natural-beauty-england) County Parks (https://data.gov.uk/dataset/e729abb9-aa6c-42c5-baec-b6673e2b3a62/country-parks-england). Open Access Land (https://data.gov.uk/dataset/05fa192a-06ba-4b2b-b98c-5b6bec5ff638/crow-act-2000-access-layer). Heritage Coasts (https://data.gov.uk/dataset/79b3515f-b00e-419a-9c7e-1d3163555886/heritage-coasts)	Full coverage of SLVIA study area.
Norfolk Coast Partnership (2019 – 2024)	Norfolk Coast AONB Five Year Strategy 2019 – 2024	Norfolk Coast AONB
North Norfolk District Council (2018)	North Norfolk Landscape Character Assessment	North Norfolk

Source	Summary	Spatial Coverage of Study Area
Oceanwise	Marine and coastal mapping data, ferry routes.	Full coverage of SLVIA study area.
OPEN internal dataset (2020)	Public Rights of Way.	Full coverage of SLVIA study area.
Ordnance Survey (OS) (2019)	1:250,000, 1:50,000 and 1:25,000 scale mapping.	Full coverage of SLVIA study area.
OS Open Data (2019)	OS County Region, Local Unitary Authority, Railways, Road and Settlements.	Full coverage of SLVIA study area.
OS (2019)	OS Terrain 50 Digital Terrain Model (DTM) and OS Terrain 5 DTM.	Full coverage of SLVIA study area.
Royal Yachting Association (RYA) (2013)	Cruising routes for recreational yachting.	Full coverage of SLVIA study area.
Sustrans (2020)	National Cycle Network (GIS dataset) (available online: https://www.sustrans.org.uk/)	Full coverage of SLVIA study area.
Triton Knoll Offshore Windfarm Ltd (2012)	Triton Knoll Offshore Wind Environmental Statement (Volume 2: Chapter 9 and Volume 3: Annex J – Seascape and Visual Assessment)	Partial coverage of SLVIA study area.
Kings Lynn and West Norfolk Borough Council (2007)	Kings Lynn and West Norfolk Borough Council Landscape Character Assessment.	Partial coverage of SLVIA study area.

Overview of Baseline Environment

Visual Baseline

Introduction

7.11.11 An initial understanding of the baseline visual resource is provided in the East Inshore and East Offshore Seascape Character Assessment (MMO, 2012), which highlights the differences in views from Holderness where the *'flat topography results in the views of the seascape from land being generally restricted to coastal towns and immediate cliff edges';* compared to the *'extensive linear coastal geometry'* of the East Lincolnshire and North Norfolk coasts *'creating long sweeping views along the coastline and out to sea'.* There are expansive views from the coast across undeveloped North Sea horizons, frequently marked by cargo ships, tankers and fishing vessels, which are *'animated by shipping traffic'* and *'influenced in places by concentrated urban settlements, commercial activities and both on and OWF developments' (MMO, 2012).*

7.11.12 The Project array area is located to the east of Triton Knoll OWF, which is currently under construction and to the north of the operational Dudgeon, Sheringham Shoal and Race Bank OWFs. Westermost Rough and Humber Gateway OWF are also visible off the coast of East Riding of Yorkshire; and Triton Knoll and the Inner Dowsing & Lynn and Lincs OWF cluster are viewed off the Lincolnshire coast. The operational Dudgeon, Sheringham Shoal and Race Bank OWFs are also viewed offshore from the Lincolnshire and North Norfolk coasts in coastal views. The Project array area is located behind these existing OWF groups in views offshore from the coastline.

Visibility

7.11.13 The Met Office defines visibility as 'the greatest distance at which an object can be seen and recognised in daylight, or at night could be seen if the general illumination were raised to a daylight level' (Met Office, 2000).

7.11.14 The MMO seascape assessments note that it is a windswept coast 'with frequent 'haar', or coastal fog, caused by warmer moist air moving over the relatively cooler North Sea' (MMO, 2018), where 'changeable weather creates dynamic and variable experiences' (MMO, 2012).

7.11.15 A quantitative description of the existing visibility is provided using Meterological Aerodrome Report (METAR) visibility data from the closest Met Office weather station at Donna Nook, to highlight potential trends in the visibility conditions of the Study Area. This 'visibility data', presented in Table 7.11.2, shows a 10-year average of the frequency of observations at measured distances from the station between January 2012 to December 2021. The visibility range is shown in bands relating to the Met Office definitions of visibility (very poor to excellent) to show the likely frequency of visibility at different distance ranges.

Table 7.11.2: Frequency of visibility at different ranges as a percentage (Donna Nook weather station)

Visibility (km)	Yearly average visibility frequency (%)	Visibility range and definition	% visibility frequency (over 10 years)	Days per year visibility frequency (10 year average)
<1	1.24	<1 km Very poor	1.24%	4.5
1 to 1.99	1.00	1-4 km Poor	4.18%	15.3
2 to 2.99	1.42			
3 to 3.99	1.75			
4 to 4.99	2.09	4-10 km Moderate	13.63%	49.7
5 to 5.99	2.28			
6 to 6.99	2.22			
7 to 7.99	2.23			
8 to 8.99	2.40			
9 to 9.99	2.41			
10 to 10.99	2.47	10-20 km Good	31.19%	113.8
11 to 11.99	2.59			
12 to 12.99	2.80			
13 to 13.99	3.02			
14 to 14.99	3.14			
15 to 15.99	3.37			
16 to 16.99	3.34			
17 to 17.99	3.49			
18 to 18.99	3.49			
19 to 19.99	3.49			
20 to 20.99	3.53	20-40 km Very good	42.59%	155.5
21 to 21.99	3.33			
22 to 22.99	3.24			
23 to 23.99	3.09			
24 to 24.99	3.04			
25 to 25.99	2.91			
26 to 26.99	2.63			
27 to 27.99	2.45			
28 to 28.99	2.29			
29 to 29.99	2.09			
30 to 34.99	8.50			
35 to 39.99	5.51			
40 to 44.99	3.37	40 - 50 km Excellent	5.18%	18.9
45 to 49.99	1.81			
50 to 59.99	1.44	>50km Excellent	2%	7.3
60 to 69.99	0.36			
>70	0.19			

7.11.16 The visibility frequency data presented in Table 7.11.2 provides an understanding about the amount of time when visibility is experienced at the distances required to see the array area.

7.11.17 The closest sections of the East Riding of Yorkshire, East Lincolnshire and North Norfolk coastlines fall approximately 54-60 km of the array area, where excellent visibility over 50 km would be required to see the array area. The Met Office data shows that such excellent visibility over 50 km occurs for approximately 2% of the time, averaged over a 10-year period. This equates to approximately 7 days per year on average when there may be visibility beyond 50 km with theoretical visibility of the array area at this distance.

Zone of Theoretical Visibility (ZTV)

7.11.18 The visual baseline is largely defined by the ZTV shown in Figure 7.11.2. The ZTV shows the main area in which the array area would theoretically be visible, highlighting the different groups of people who may experience views of WTGs located within the array area and assisting in the identification of viewpoints where they may be affected.

7.11.19 The ZTV is based on WTGs of 405 m blade tip (above LAT) and represents the MDS for the SLVIA considered in the scoping assessment. The ZTV illustrates where there would be no visibility of these WTGs, as well as areas where there will be lower or higher numbers of WTGs theoretically visible.

7.11.20 The ZTV illustrates the 'bare ground' situation based on an OS terrain model and does not take into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility. By using a bare ground elevation model, the results will be an over-representation of maximum visibility, as many could, in reality, be blocked by surface features not included in the model.

7.11.21 The Blade Tip ZTV (Figure 7.11.2) shows where the main areas of higher theoretical visibility of the Project will be from offshore areas of the North Sea. All areas of the UK coastline are located beyond 50 km, at which point, the number of visible WTGs reduces, the amount of the WTGs visible over the horizon will be less and the apparent height of WTGs will be smaller, and will only be viewed in excellent visibility conditions, which are rare.

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N

Hornsea Project Two
Hornsea Project 1 - Heron West
Hornsea Project 1 - Njord
Hornsea Project 1 - Heron East
Westermost Rough
Humber Gateway
Triton Knoll
Race Bank
Dudgeon
Lincs
Lincs
Inner Dowsing
Lynn
Sheringham Shoal

Legend

- Site Boundary
- 10km Radi
- 60km Study Area
- Offshore ECC Area of Search
- Operational Wind Farms
- Wind Farm Under Construction
- National Cycle Network
- Regional Cycle Network
- LINK
- Railway Station
- Railway Track
- A Road
- B Road

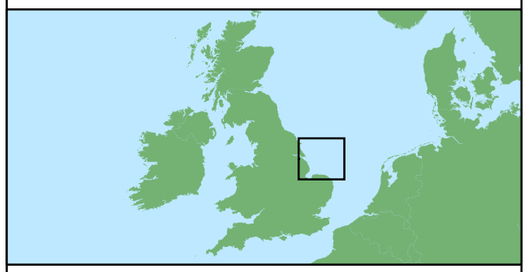
Long Distance Walks

- Aerospace Way
- Greenwich Meridian Trail
- Peddars Way And Norfolk Coast Path
- Trans Pennine Trail
- Wolds Way
- National Nature Reserves

Zone of Theoretical Visibility

- Higher Visibility (75 Turbines)
- Lower Visibility (1 Turbine)

Blade tip:	405m	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included



Coordinate System: British National Grid

0 5 10 15 20 km

Scale: 1:600,000

Blade Tip ZTV with Visual Receptors

Figure 7.11.2

OUTER DOWSING OFFSHORE WIND

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Revision: 0.2

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7.11.22 The Blade Tip ZTV does show that there is theoretical visibility of the array area from the coastal parts of the SLVIA study, at very long distances, including from Spurn Head in East Riding of Yorkshire to the north at 56.7 km; from the East Lincolnshire coast between Donna Nook and Skegness at 52.7 km; and from the North Norfolk coast between Scolt Head and Sheringham at 56.6 km. These are the closest areas of land with theoretical visibility of the array area, all of which are located at very long distance, but may afford views in very infrequent periods of excellent visibility.

7.11.23 The area of theoretical visibility of the array area becomes more fragmented from the hinterland and inland areas of the SLVIA study area, where views of the sea become increasingly screened within the headlands, adjacent rising land or coastal landforms. Areas with lower theoretical visibility are shown in the ZTV and include the Humber Estuary, the low lying coastal outmarshes of East Lincolnshire, and the saltmarshes to the north of The Wash. Actual visibility from these hinterland and inland areas also becomes increasingly screened by vegetation, such as woodland and hedgerows, and/or built development and settlement. Visibility from streets, open spaces and low storey buildings within coastal urban areas will typically be contained within the urban environment by surrounding built form, with most visibility of the array area likely at the coastal edge and sea-front.

Visual Receptors

7.11.24 The principal visual receptors in the study area are likely to be found along the closest sections of coastlines at Spurn Head in East Riding of Yorkshire, the East Lincolnshire coast between Donna Nook and Skegness and from the North Norfolk coast between Scolt Head and Sheringham. Visual receptors include people within settlements, driving on roads, visitors to tourist facilities or historic environment assets, and people engaged in recreational activity such as those using walking and cycle routes, including:

- Coastal settlements - including Easington in East Riding of Yorkshire; North Somercotes, Saltfleet, Mablethorpe, Sutton-on-Sea, Chapel St Leonards, Ingoldmells and Skegness in East Lincolnshire; and Blakeney, Cley-next-the-Sea, Salthouse, Weybourne, Sheringham and West Runton in North Norfolk;
- Recreational routes - including the England Coast Path between Mablethorpe and Skegness; the Norfolk Coast Path between Scolt Island and Sheringham in North Norfolk; and National Cycle Route 1 in North Norfolk;
- Main road routes - including the A1031 and A52 in East Lincolnshire; and the A149 in North Norfolk;
- Visitors to tourist facilities - such as the sea fronts/beaches of the main coastal towns/resorts, holiday villages and nature reserves/visitor centres including Spurn Head NNR (National Nature Reserve) in East Riding of Yorkshire; Donna Nook and Saltfleetby - Theddlethorpe Dunes NNRs in East Lincolnshire; and Scolt Island, Holkham and Blakeney NNRs in North Norfolk; and
- Visitors to historic environment assets such as Spurn Lighthouse and National Trust sites such as Brancaster Estate, Blakeney Point and Sheringham Park.

- Offshore visual receptors – such as recreational sea users and people working in fisheries, oil and gas, or other offshore commercial activities.

Viewpoints

7.11.25 Representative viewpoints for scoping are identified in Table 7.11.3 and mapped in Figure 7.11.4, based on the relevant landscape and visual receptors (identified above), the ZTV and precedents for viewpoints selected for other projects, such as Triton Knoll OWF. These viewpoints have been selected to review the likely impacts of the array area as part of the scoping assessment.

7.11.26 Wireline visualisations showing the array area from each of the viewpoints listed in Table 7.11.3 are presented in Appendix B – Seascape, Landscape and Visual Wirelines, in order to aid understanding of the potential visual effects in the context of other operational OWFs. They illustrate the limited theoretical visibility of the array at such long range and the position of the array area behind other operational OWFs.

7.11.27 Viewpoints listed in Table 7.11.3 will be refined as part of the PEIR to include only those that may be affected by the offshore RCS, in consultation with relevant stakeholders.

Table 7.11.3: Viewpoints considered in scoping assessment

ID	Name	Distance to array area	Landscape Designation	Visual Receptors
East Riding of Yorkshire				
1	Spurn Head	56.9 km	Spurn Head Heritage Coast and Local Landscape Area (LLA)	Visitors to Spurn Head NNR
East Lincolnshire				
2	Donna Nook	56.5 km	No landscape designation	Visitors to Donna Nook NNR
3	Saltfleetby-Theddlethorpe Dunes	54.6 km	No landscape designation	Visitors to Saltfleetby-Theddlethorpe NNR.
4	Mablethorpe	53.4 km	No landscape designation	Residents of Mablethorpe. Visitors to Mablethorpe Beach. Walkers on England Coast Path.
5	Chapel Six Marshes	54.9 km	No landscape designation	Visitors to Chapel Six Marshes. Walkers on England Coast Path.
North Norfolk				
6	Wells-next-to-the-Sea Beach	58.8 km	Norfolk Coast AONB and North Norfolk Heritage Coast	Visitors to Well-next-to-the-Sea Beach.
7	Cley Beach	57.3 km	Norfolk Coast AONB and North Norfolk Heritage Coast	Visitors to Cley Beach.

ID	Name	Distance to array area	Landscape Designation	Visual Receptors
8	Sheringham	58.8 km	Norfolk Coast AONB and North Norfolk Heritage Coast	Residents of Sheringham.

Seascape Baseline

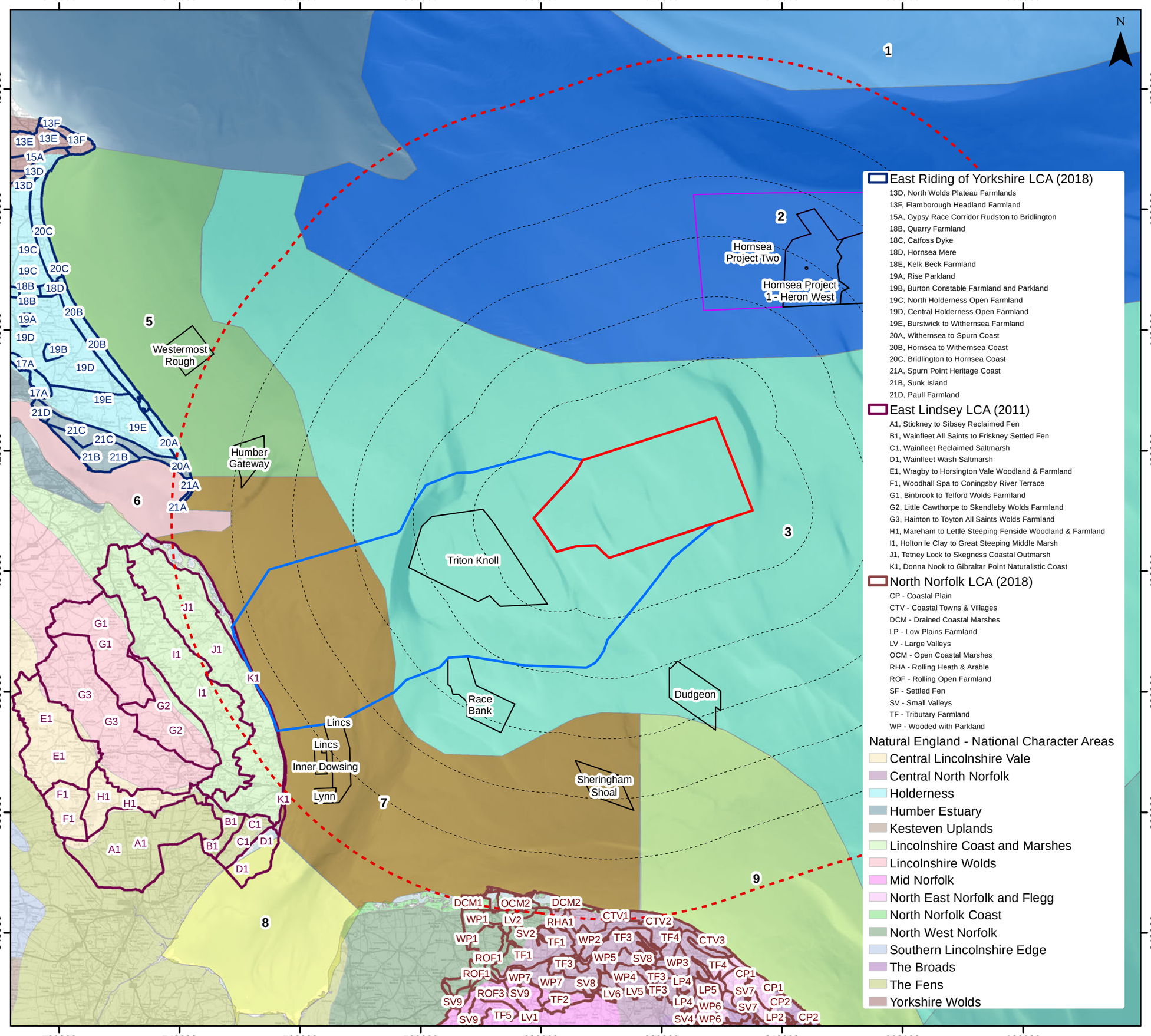
Definition of Seascape

7.11.28 The Marine Policy Statement (MPS) (UK Government, 2011) states the European Landscape Convention (ELC) definition of **landscape** (which includes marine areas) as *"an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".* It adds that *"references to **seascape** should be taken as meaning landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other."*

7.11.29 The seascape impact assessment in the SLVIA will therefore focus particularly on areas of onshore landscape with views of the coast or seas and marine environment, as perceived by people, on the premise that the most important effect of OWFs is on the perception of seascape character from the coast.

Seascape Character

7.11.30 The seascape character of the SLVIA study area is defined at a national scale in the seascape assessments published by the MMO for the East and North East Inshore and Offshore Marine Plan Areas (MMO, 2012 and 2018). These studies produce a combined national seascape character map for all England's inshore and offshore areas, comprising a spatial framework of individual Marine Character Areas (MCAs) which 'flow across' marine plan area and administrative boundaries. The Marine Character Areas (MCAs) identified within these MMO seascape assessments will form the baseline for the SLVIA study area as shown in Figure 7.11.3.



Legend

- Site Boundary
- 10km Radi
- 60km Study Area
- Offshore ECC Area of Search
- Operational Wind Farms
- Wind Farm Under Construction

MMO Seascape Character Areas (2012)

- 1, Dogger Bank
- 2, Dogger Deep Water Channel
- 3, East Midlands Offshore Gas Fields
- 4, East Anglian Shipping Waters
- 5, Holderness Coastal Waters
- 6, Humber Waters
- 7, East Midlands Coastal Waters
- 8, The Wash
- 9, Norfolk Coastal Waters

East Riding of Yorkshire LCA (2018)

- 13D, North Wolds Plateau Farmlands
- 13F, Flamborough Headland Farmland
- 15A, Gypsy Race Corridor Rudston to Bridlington
- 18B, Quarry Farmland
- 18C, Catfoss Dyke
- 18D, Hornsea Mere
- 18E, Kelk Beck Farmland
- 19A, Rise Parkland
- 19B, Burton Constable Farmland and Parkland
- 19C, North Holderness Open Farmland
- 19D, Central Holderness Open Farmland
- 19E, Burstwick to Withernsea Farmland
- 20A, Withernsea to Spurn Coast
- 20B, Hornsea to Withernsea Coast
- 20C, Bridlington to Hornsea Coast
- 21A, Spurn Point Heritage Coast
- 21B, Sunk Island
- 21D, Paull Farmland

East Lindsey LCA (2011)

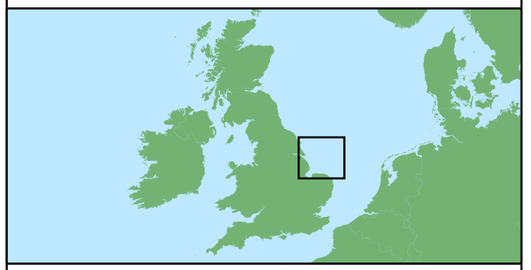
- A1, Stickney to Sibsey Reclaimed Fen
- B1, Wainfleet All Saints to Friskney Settled Fen
- C1, Wainfleet Reclaimed Saltmarsh
- D1, Wainfleet Wash Saltmarsh
- E1, Wragby to Horsington Vale Woodland & Farmland
- F1, Woodhall Spa to Coningsby River Terrace
- G1, Binbrook to Telford Wolds Farmland
- G2, Little Cawthorpe to Skendleby Wolds Farmland
- G3, Hainton to Toyton All Saints Wolds Farmland
- H1, Mareham to Lettle Steeping Fenside Woodland & Farmland
- I1, Holton le Clay to Great Steeping Middle Marsh
- J1, Tetney Lock to Skegness Coastal Outmarsh
- K1, Donna Nook to Gibraltar Point Naturalistic Coast

North Norfolk LCA (2018)

- CP - Coastal Plain
- CTV - Coastal Towns & Villages
- DCM - Drained Coastal Marshes
- LP - Low Plains Farmland
- LV - Large Valleys
- OCM - Open Coastal Marshes
- RHA - Rolling Heath & Arable
- ROF - Rolling Open Farmland
- SF - Settled Fen
- SV - Small Valleys
- TF - Tributary Farmland
- WP - Wooded with Parkland

Natural England - National Character Areas

- Central Lincolnshire Vale
- Central North Norfolk
- Holderness
- Humber Estuary
- Kesteven Uplands
- Lincolnshire Coast and Marshes
- Lincolnshire Wolds
- Mid Norfolk
- North East Norfolk and Flegg
- North Norfolk Coast
- North West Norfolk
- Southern Lincolnshire Edge
- The Broads
- The Fens
- Yorkshire Wolds



Coordinate System: British National Grid

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Scale: 1:600,000

Landscape & Seascape Character

Figure 7.11.3

OUTER DOWSING OFFSHORE WIND

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7.11.31 The seascape within which the array area is located is defined by the East Midlands Offshore Gas Fields MCA (Figure 7.11.3). Situated at long distance from the coastline and extending to the seaward extents of the SLVIA study area, the East Midlands Offshore Gas Fields MCA is formed by an open expanse of sea with extensive shallow offshore waters generally below 30 metres, with sand banks and tidal sand ridges. The seascape is visually unified, with an expansive open character, but the character is influenced by concentrations of offshore gas and aggregate extraction activities, and commercial offshore activities such as dredging, aggregate extraction and fishing within the significant fisheries areas.

7.11.32 The existing Dudgeon, Race Bank and Triton Knoll OWFs are all located within this MCA, and the Hornsea Project One and Hornsea Project Two OWFs are located just to the north, so that OWFs form a key characteristic in the baseline character of the MCA.

Landscape Baseline

Landscape Character

7.11.33 At the National level, the SLVIA study area is characterised, from north to south, by the following National Character Areas (NCAs):

- Holderness (NCA 40) is a rural, low-lying, undulating plain with the broad, shallow valley of the River Hull flowing southwards through the centre.
- Humber Estuary (NCA 41) focuses on the open and expansive waters of the Humber where it flows into the North Sea and the adjacent low-lying land.
- Lincolnshire Coast and Marshes (NCA 42) is a wide coastal plain which extends from Barton-upon-Humber in the north, across to Grimsby at the mouth of the Humber and south to Skegness.
- North Norfolk Coast (NCA 77) is the flat, low-lying, open and remote coastal plain that dominates the North Norfolk Coast landscape, consisting of salt marsh, marram grass, sand dunes and shallow channels of mudflats.

7.11.34 The landscape of the onshore parts of the study area will be informed by these NCAs, however it will be described and assessed in relation to the published County Council and District Council Landscape Character Assessments that describe the associated coastal landscapes within the SLVIA study area shown in Figure 7.11.3, as follows:

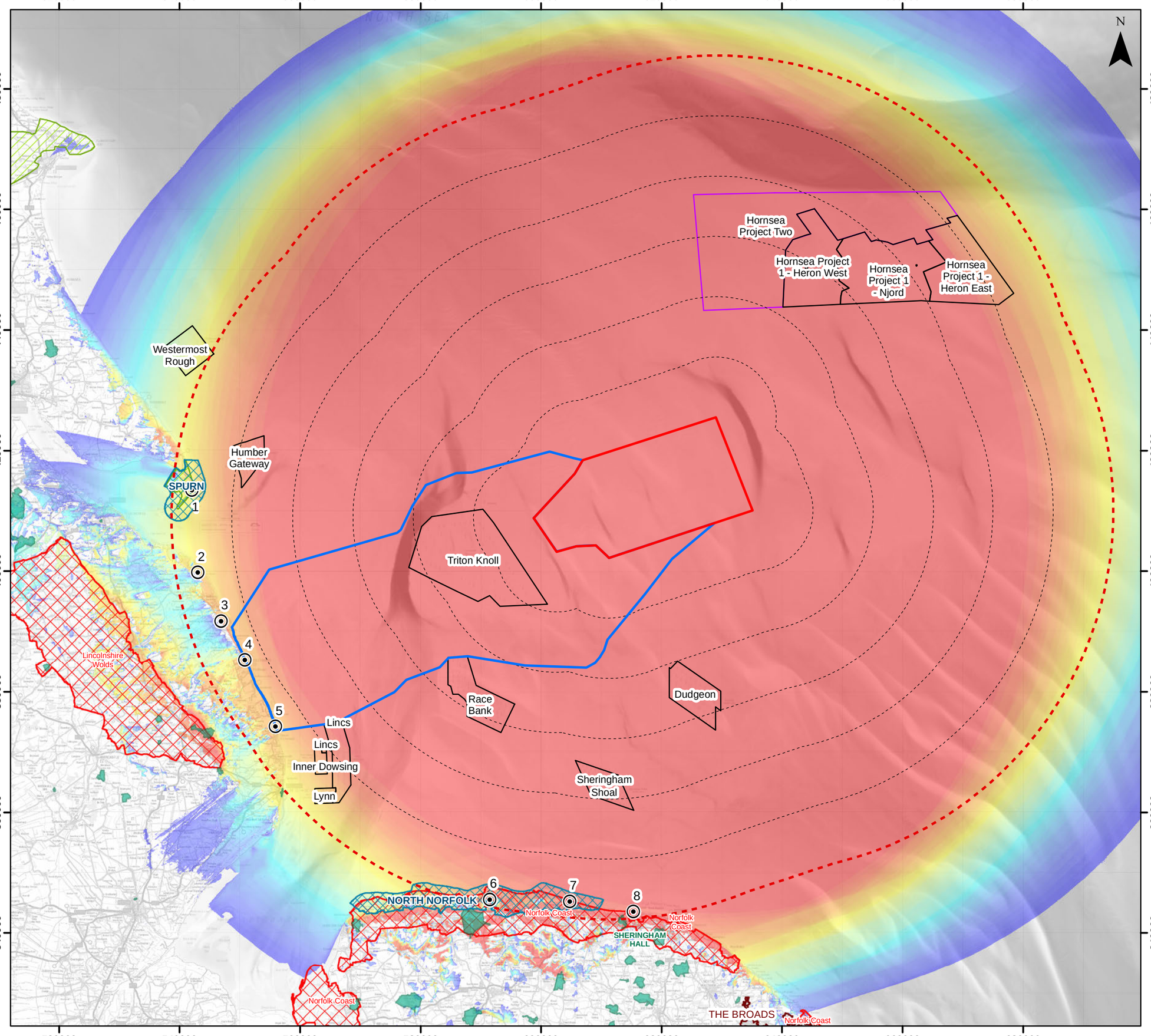
- East Riding of Yorkshire Landscape Character Assessment 2018.
- East Lindsey District Landscape Character Assessment 2009.
- North Norfolk Landscape Assessment 2018.

7.11.35 The Project may influence the visual aspects of perceived character experienced in sea views from several landscape types forming a narrow strip of the immediate coastal Landscape Character Types (LCTs) forming the closest parts of the coastline. These are relatively long stretches of coastline which are varied in character, with geographic extents likely to be concentrated on the narrow strip of immediate coastal landscape, including the following coastal LCTs in the SLVIA study area:

- East Riding of Yorkshire – Withernsea to Spurn Coast (20A) and Spurn Point Heritage Coast (21A).
- East Lindsey – Donna Nook to Gibraltar Point Naturalistic Coast (K1) and Tetney Lock to Skegness Coastal Outmarsh (J1).
- North Norfolk – Drained Coastal Marshes (DCM1 and DCM2), Open Coastal Marshes (OCM1), Coastal Shelf (CS1).

Landscape Designations and Defined Areas

7.11.36 The offshore areas of the site boundary are located beyond the boundaries of any areas subject to international, national or regional landscape designation intended to protect landscape quality, as shown in Figure 7.11.4.



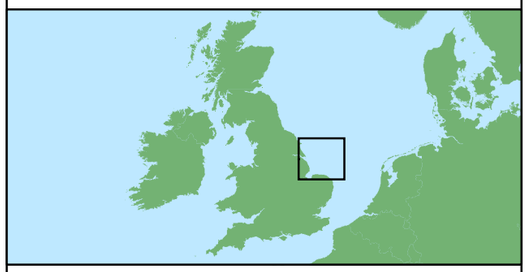
Legend

- Viewpoints
  - 1. Spurn Head
  - 2. Donna Nook
  - 4. Mablethorpe
  - 5. Chapel Six Marshes
  - 7. Cley Beach
  - 8. Sheringham
- Site Boundary
- 10km Radi
- 60km Study Area
- Offshore ECC Area of Search
- Operational Wind Farms
- Wind Farm Under Construction
- National Parks
- Heritage Coast
- Parks and Gardens
- Areas of Outstanding Natural Beauty
- Important Landscape Area ENV2 (East Riding of Yorkshire)

Zone of Theoretical Visibility

- Higher Visibility (75 Turbines)
- Lower Visibility (1 Turbine)

Blade tip:	405m	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included



Coordinate System: British National Grid

0 5 10 15 20 km

Scale: 1:600,000

Blade Tip ZTV
with Landscape Designations

Figure 7.11.4

OUTER DOWSING OFFSHORE WIND

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7.11.37 Certain nationally designated landscapes or defined areas found within the study area have been designated or defined due to their scenic qualities or historic landscape qualities and are of relevance to the SLVIA as shown on Figure 7.11.4 and set out in Table 7.11.4.

7.11.38 The Lincolnshire Wolds AONB is located outside the study area at over 63.9 km from the array area at its nearest point. It is considered that there would be no significant effects on this designation and it is scoped out of the SLVIA.

Table 7.11.4: Landscape designations with relevance to the SLVIA and the Project

Designation	Closest distance to the Project	Feature or Description
Norfolk Coast AONB	55.0 km	The Norfolk Coast AONB is a protected National Landscape that sweeps around most of the coast of Norfolk. Comprising 451 square kilometres of intertidal, coastal and agricultural land that stretches across the territory of three different local authorities and one county council, the AONB is characterised by natural landscapes, and renowned as one of the few lowland areas in the UK to have 'wildness' quality. It is physically split into three separate zones, with the central zone falling partially within the SLVIA study area between Scolt Head and Sheringham (with a stretch forming the North Norfolk Heritage Coast). The special qualities that underpin the designation of the Norfolk Coast AONB are derived from its natural environment, sense of tranquillity, wildness and remoteness, richness of the built environment and connections between local communities and the landscape, and are described in full in the Norfolk Coast AONB Five Year Strategy 2019-2024.
North Norfolk Heritage Coast	55.0 km	In managing the Norfolk Coast AONB, the Norfolk Coast Partnership also has a non-statutory responsibility to protect the North Norfolk Heritage Coast, a stretch running from Holme-next-the-Sea to Weybourne that is an officially defined landscape in its own right, and which is recognised as a stretch of undeveloped coast.
Spurn Head Heritage Coast and LLA	54.7 km	Spurn Heritage Coast is defined by the peninsula of Spurn Point which forms a curving hook of shingle and sand arcing into the mouth of the Humber River, between the North Sea and the Humber Estuary. At over three miles long but as little as 50 metres wide, this landscape is unique and ever-changing. Spurn has an extensive human history, leaving a legacy of derelict buildings and hidden structures. The area is a designated NNR and is part of the Humber Flats, Marshes and Coast SPA.
Sheringham Hall Registered Park and Garden (RPG)	59.3 km	Sheringham Hall is a RPG and National Trust property with public access, affording views of the North Norfolk coast through Sheringham Park. Viewing platforms and the Temple which stands above Sheringham Hall provide vantage points from which to look over the surrounding countryside and the coast to the north.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.11.39 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of seascape, landscape and visual receptors will also comply with the following guidance documents where they are specific to this topic:

- The Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment. Third Edition;
- Landscape Institute (2019). Visual Representation of Development Proposals.
- Landscape Institute (2021). Assessing Landscape Value Outside National Designations.
- Natural England and the Defra (2014). Landscape and Seascape Character Assessments.
- Planning Inspectorate (2018) Advice Note Nine: Rochdale Envelope https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf.
- Planning Inspectorate (2019). Advice Note Seventeen: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/
- Natural England (2012). An Approach to Seascape Character Assessment.
- Natural England (2014). An Approach to Landscape Character Assessment.
- Scottish Natural Heritage (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments; and
- Scottish Natural Heritage (2017). Visual Representation of Windfarms: Version 2.2.

7.11.40 The objective of the assessment of the Project will be to predict the significant effects on the seascape, landscape and visual resource. In accordance with the EIA Regulations 2017, the SLVIA effects will be assessed to be either significant or not significant. The methodology to undertake the SLVIA will reflect the 'Guidelines for Landscape and Visual Impact Assessment: Third Edition' (Landscape Institute, 2013).

7.11.41 The SLVIA will assess the effects of changes resulting from the Project on seascape/ landscape as a resource, the views available to people and their visual amenity. The SLVIA is undertaken using the following steps:

- The features of the Project that may result in seascape, landscape and visual effects are described. The overall scope of the assessment will be defined, including the study area and range of possible seascape, landscape and visual effects.
- The seascape / landscape baseline will be established using seascape/ landscape character assessment and the ZTV, to identify seascape and landscape receptors that may be affected and their key characteristics and value.

- The visual baseline will be established by identifying the extent of possible visibility (ZTV), identifying the people who may be affected and identifying visual receptors and selecting viewpoints.
- A preliminary assessment will be undertaken of landscape and visual receptors using ZTV analysis, to identify which landscape and visual receptors are unlikely to be significantly affected and those that are more likely to be significantly affected, which require to be assessed in full.
- Interactions are identified between the Project and seascape, landscape and visual receptors, to predict likely significant effects arising and measures are proposed to mitigate effects.
- An assessment of the susceptibility of seascape, landscape and visual receptors to specific change and the value attached to landscape receptors and views will be undertaken, combining these judgements to assess the sensitivity of the landscape and visual receptors.
- An assessment of the size/ scale of seascape/ landscape impact, the degree to which seascape/landscape elements are altered and the extent to which the impacts change the key characteristics of the landscape will be undertaken, combining these judgements to assess the magnitude of change on each seascape/ landscape receptor.
- An assessment of the size/ scale of visual impact, the extent to which the change would affect views, whether this is unique or representative of a wider area, and the position of the array area in relation to the principal orientation of the view and activity of the receptor. These judgements are combined to assess the magnitude of change on the visual receptor.
- The assessments of sensitivity to change and magnitude of change will be combined to assess the significance of seascape, landscape and visual effects.

7.11.42 The significance of effects will be assessed through a combination of two considerations – the sensitivity of the landscape or visual receptor/ view and the magnitude of change that will result. In accordance with the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment third edition (GLVIA3), the SLVIA methodology requires the application of professional judgement, but generally, the higher the sensitivity and the higher the magnitude of change the more likely that a significant effect will arise.

7.11.43 The objective of the cumulative SLVIA is to describe, visually represent and assess the ways in which the Project will have additional effects when considered in addition to other existing, consented or application stage developments and to identify related significant cumulative effects arising. The guiding principle in preparing the cumulative SLVIA will be to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process. It is important to note that the operational OWFs are part of the baseline so that the main assessment will include the addition of the Project to that environment.

Relevant Embedded Mitigation Measures

7.11.44 As part of the design process for the Project a number of designed-in measures are proposed to reduce the potential for impacts on seascape, landscape and visual receptors. These are presented below. It is expected that these may evolve over the development process as the EIA progresses and in response to consultation.

7.11.45 The Applicant is committed to implementing these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design and hence have been considered in the judgments as to which impacts can be scoped in/ out presented in Table 7.11.5 and Table 7.11.6 respectively.

7.11.46 Measures adopted as part of the Project will include:

- The site selection and location being approximately 54 km offshore from the nearest section of the UK coastline.
- The number of WTGs installed will not exceed 100 WTGs.
- WTGs will have a maximum blade tip height of 405 m above LAT and the rotor diameter will not exceed 340 m.
- A lighting scheme will be agreed for the aviation lighting of structures (turbines and offshore support platforms) above 60m in height with the relevant authorities.

7.11.47 The requirement and feasibility of any mitigation measures will be subject to consultation with statutory consultees throughout the pre-application phase.

Potential Impacts Scoped In

7.11.48 Potential impacts on seascape, landscape and visual receptors have been identified that may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into EIA are outlined in Table 7.11.5, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

7.11.49 For all impacts and receptors identified as scoped in to the SLVIA in Table 7.11.5, a preliminary assessment of the potential effects will be undertaken initially using desk-based information and ZTV analysis, with a detailed assessment focusing on those that are identified as requiring further assessment. Detailed assessment will include using published documents and primary baseline data collection (for example through site surveys), quantitative and qualitative assessment methodologies to determine likely significance, and modelling such as ZTV analysis and wireline/photomontage visualisations.

7.11.50 The wireline visualisations in Appendix B – Seascape, Landscape and Visual Wirelines indicate that the majority of the array area will not be visible due to its distance offshore (over 54 km) and the screening effect that occurs over distance from the curvature of the earth. The amount of the array area that is visible from the coast will be limited, in theory, to just the turbine blade tips at long range, and that from the majority of coastal locations, the turbine towers will not be visible due to the distance offshore and the screening effect of the intervening horizon. In views from the closest areas of the East Lincolnshire coast (that are still over 54 km) the turbine nacelles may theoretically be visible, however they will be located behind the operational Triton Knoll OWF, which further reduces their potential visual influence as they are subsumed within and behind the operational wind farm.

7.11.51 The wireline visualisations indicate that the construction, O&M of the array area is unlikely to have significant effects on seascape, landscape and visual receptors, due to its very long distance offshore, the limited amount of the turbine blade tips that are theoretically visible and the position of the array area subsumed behind operational OWFs.

7.11.52 Furthermore, the visibility frequency data presented in Table 7.11.2 shows that excellent visibility over 50 km occurs for approximately 2% of the time over the 10-year period, equating to approximately 7 days per year on average. The effects of the Project are therefore likely to be not significant under very good, moderate, poor and very poor visibility conditions, for the large majority of time when the atmospheric conditions are likely to inhibit clear views, rendering the array area as either invisible or unrecognisable in the majority of prevailing conditions.

7.11.53 It is on this basis that it is proposed to scope out assessment of seascape, landscape and visual effects of the construction, O&M of the array area.

7.11.54 The scope of the SLVIA will therefore focus on the seascape, landscape and visual effects of the proposed offshore RCS located within the offshore ECC, and landfall works in the intertidal area, with assessment of the potential effects of these aspects of the Project to be considered and assessed as part of the PEIR.

7.11.55 The impacts that have been scoped into EIA are outlined in Table 7.11.5.

Table 7.11.5: Impacts proposed to be scoped in to the SLVIA

Impact	Description	Proposed Approach to Assessment
Construction and Decommissioning		
Impact (day-time) of the construction and decommissioning of the offshore RCS and landfall works in the intertidal area on seascape character.	Potential for short-term, temporary impacts on perceived seascape character, arising as a result of the construction and decommissioning of the offshore RCS within the offshore ECC and landfall works in the intertidal area, which may alter the seascape character.	**Scoped in (MCAs)**: East Midlands Offshore Gas Fields (3) Holderness Coastal Waters (5) East Midlands Coastal Waters (7) Norfolk Coastal Waters (9) **Scoped out (MCAs):** Dogger Bank (1) Dogger Deep Water Channel (2) East Anglian Shipping Waters (4) Humber Waters (6) The Wash (8) All MCAs located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Impact (day-time) of the construction and decommissioning of the offshore RCS on perceived landscape character.	Potential for short-term, temporary impacts on perceived landscape character, arising as a result of the offshore RCS within the offshore ECC and landfall works in the intertidal area, which may be visible from the coast and may therefore affect the perceived character of the landscape.	**Scoped in** East Riding of Yorkshire: Withernsea to Spurn Coast (20A) Spurn Point Heritage Coast (21A) East Lincolnshire / East Lindsey: Donna Nook to Gibraltar Point (K1) Tetney Lock to Skegness Coastal Outmarsh (J1) Norfolk: LCTs/LCAs forming the North Norfolk coast, to include: OCM DCM LCTs/LCAs forming the West Norfolk coast, to include:

Impact	Description	Proposed Approach to Assessment
		A – OCM C – Coastal Slopes **Scoped out:** <u>East Lindsey:</u> Holton le Clay to Great Steeping Middle Marsh (I1) <u>Norfolk:</u> LCTs/LCAs set back from the North Norfolk coast, to include: Coastal Shelf Rolling Heath and Arable River Valleys Wooded Glacial Ridge LCTs/LCAs set back from the West Norfolk coast, to include: I – Rolling Open Farmland J – Plateau Farmland All LCTs/LCAs located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Impact (day-time) of the construction and decommissioning of the offshore RCS on perceived landscape character / special qualities of designated landscapes.	Potential for short-term, temporary impacts on perceived landscape character and special qualities of designated landscapes, arising as a result of the, the offshore RCS within the offshore ECC and landfall works in the intertidal area, which may be visible from the coast and may therefore affect the perceived character and qualities of the landscape.	**Scoped in:** Norfolk Coast AONB North Norfolk Coast Heritage Coast Spurn Head Heritage Coast Sheringham Hall RPG **Scoped out:** All landscape designations outside ZTV and/or SLVIA study area, including Lincolnshire Wolds AONB.
Impact (day-time) of the construction and	Potential for short-term, temporary impacts on views and visual amenity	**Scoped in:**

Impact	Description	Proposed Approach to Assessment
decommissioning of the offshore elements of the offshore RCS on visual receptors / views.	experienced by people from principal visual receptors and representative viewpoints, arising as a result of the offshore RCS within the offshore ECC and landfall works in the intertidal area, which may be visible from the coast and may therefore affect views and visual amenity.	Principal visual receptors at coastal settlements, recreational routes (including England Coast Path), main road routes, visitors to tourist/visitor facilities, nature reserves and historic environment assets in coastal areas within ZTV. Receptors at representative viewpoints in East Riding of Yorkshire, East Lindsey and potentially Norfolk, at viewpoint locations to be identified/refined from those listed in Table 7.11.3in consultation with stakeholders as relevant to impacts arising from the offshore RCS. **Scoped out:** Visual receptors located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Operation and Maintenance		
Impact (day-time) of the O&M of the offshore RCS on seascape character.	Potential for long-term, reversible impacts on perceived seascape character, arising as a result of the offshore RCS within the offshore ECC, which may alter the seascape character.	**Scoped in (MCAs):** East Midlands Offshore Gas Fields (3) Holderness Coastal Waters (5) East Midlands Coastal Waters (7) Norfolk Coastal Waters (9) **Scoped out (MCAs):** Dogger Bank (1) Dogger Deep Water Channel (2) East Anglian Shipping Waters (4) Humber Waters (6) The Wash (8) All MCAs located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Impact (day-time) of the O&M of the	Potential for long-term, reversible impacts on perceived landscape	**Scoped in** <u>East Riding of Yorkshire:</u>

Impact	Description	Proposed Approach to Assessment
offshore RCS on perceived landscape character.	character of LCAs/LCTs and qualities of designated landscapes, arising as a result of the offshore RCS within the offshore ECC, which may be visible from the coast and may therefore affect the perceived character and qualities of the landscape.	Withernsea to Spurn Coast (20A) Spurn Point Heritage Coast (21A) <u>East Lincolnshire / East Lindsey:</u> Donna Nook to Gibraltar Point (K1) Tetney Lock to Skegness Coastal Outmarsh (J1) <u>Norfolk:</u> LCTs/LCAs forming the North Norfolk coast, to include: OCM DCM LCTs/LCAs forming the West Norfolk coast, to include: A – OCM C – Coastal Slopes **Scoped out:** <u>East Lindsey:</u> Holton le Clay to Great Steeping Middle Marsh (I1) <u>Norfolk:</u> LCTs/LCAs set back from the North Norfolk coast, to include: Coastal Shelf Rolling Heath and Arable River Valleys Wooded Glacial Ridge LCTs/LCAs set back from the West Norfolk coast, to include: I – Rolling Open Farmland J – Plateau Farmland All LCTs/LCAs located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Impact (day-time) of the O&M of the	Potential for long-term, reversible impacts on perceived landscape	**Scoped in:** Norfolk Coast AONB

Impact	Description	Proposed Approach to Assessment
offshore RCS on perceived landscape character / special qualities of designated landscapes.	character and special qualities of designated landscapes, arising as a result of the offshore RCS within the offshore ECC, which may be visible from the coast and may therefore affect the perceived character and qualities of the landscape.	North Norfolk Heritage Coast Spurn Head Heritage Coast Sheringham Hall RPG **Scoped out:** All landscape designations located outside ZTV and/or located outside SLVIA study area including Lincolnshire Wolds AONB.
Impact (day-time) of the O&M of the offshore RCS on visual receptors / views.	Potential for long-term, reversible impacts on views and visual amenity experienced by people as principal visual receptors and representative viewpoints, arising as a result of the offshore RCS within the offshore ECC when visible from the coast.	**Scoped in:** Principal visual receptors at coastal settlements, recreational routes (including England Coast Path), main road/rail routes, visitors to tourist/visitor facilities and visitors to historic environment assets in coastal areas within the ZTV. Receptors at representative viewpoints in East Riding of Yorkshire, East Lindsey and potentially Norfolk, at viewpoint locations to be identified/refined from those listed in Table in consultation with stakeholders as relevant to impacts arising from the offshore RCS. **Scoped out:** All visual receptors located outside ZTV and/or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Impact (night-time) of the O&M of the offshore RCS on visual receptors/ views at night.	Potential for long-term, reversible impacts on views and visual amenity experienced by people at night, arising as a result of lighting of the offshore RCS being visible in views from the coast.	**Scoped in:** Principal visual receptors at coastal settlements, recreational routes (including England Coast Path), main road/ rail routes, visitors to tourist/ visitor facilities and visitors to historic environment assets in coastal areas within ZTV. Receptors at representative viewpoints in East Riding of Yorkshire, East Lindsey and potentially Norfolk, at viewpoint locations to be

Impact	Description	Proposed Approach to Assessment
		identified/refined from those listed in Table 7.11.3 in consultation with stakeholders as relevant to impacts arising from the offshore RCS. **Scoped out:** All visual receptors located outside ZTV and/ or outside SLVIA study area for offshore RCS (30km radius from the offshore RCS search area).
Cumulative		
Cumulative effect (daytime) of the construction, O&M, and decommissioning of the offshore reactor station of the Project on seascape character, landscape character and views/ visual receptors.	Potential for cumulative short-term and long-term, reversible impacts on perceived seascape character, landscape character of LCAs/ LCTs and qualities of designated landscapes, and views/ visual amenity experienced by people arising as a result of visibility of the offshore reactor station of the Project cumulatively with other projects located within the study area.	**Scoped in:** Cumulative seascape, landscape and visual receptors scoped in as identified above. Operational and pre-application stage OWFs within the SLVIA study area as shown in Figure 7.12.2 consisting the operational Westermost Rough, Humber Gateway, Triton Knoll, Inner Dowsing & Lynn, Lincs, Race Bank, Sheringham Shoal and Dudgeon OWFs which will be considered as part of the baseline; and the application stage Hornsea Four, Dudgeon and Sheringham Extension OWFs, which will be assessed as part of an 'application stage' scenario. A preliminary assessment of the potential cumulative effects of the offshore reactor station on seascape, landscape and visual receptors will be undertaken initially using desk-based information and ZTV analysis, with a detailed cumulative assessment focusing on those that are identified as requiring further assessment. Detailed cumulative assessment to include desk-based publications and primary baseline data collection (for example through site surveys), quantitative and qualitative assessment methodologies to determine likely significance, and modelling such as cumulative ZTV analysis and cumulative wireline/photomontage visualisations.

Impacts Proposed to be Scoped out

7.11.56 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the SLVIA. These impacts are outlined in Table 7.11.6, together with a justification for scoping them out.

7.11.57 In particular, the wireline visualisations from representative viewpoints at the closest coastal areas of East Lincolnshire and North Norfolk (Appendix B – Seascape, Landscape and Visual Wirelines) indicate that the construction, O&M of the array area is unlikely to have significant effects on seascape, landscape and visual receptors, due to its very long distance offshore, the limited amount of the turbine blade tips that are theoretically visible and the position of the array area subsumed behind operational OWFs, such that it is likely to result in low or negligible levels of change to the baseline environment, which would only be experienced very infrequently.

7.11.58 The potential seascape, landscape and visual effects of the array area are therefore proposed be scoped out of the EIA, with the focus being on the effects of the offshore RCS.

Table 7.11.6: Impacts to be scoped out of SLVIA

Impact	Justification for Scoping Out
Construction and Decommissioning	
Construction and decommissioning phase seascape, landscape and visual effects as a result of the array area.	At distances beyond approximately 54km from the coastline, the construction and decommissioning of the array area is unlikely to have significant effects on seascape, landscape and visual receptors, due to its very long distance offshore, the limited amount of the turbine blade tips that are theoretically visible and the position of the array area subsumed behind operational OWFs, such that it is likely to result in low or negligible levels of change to the baseline environment. Potential changes would only be experienced very infrequently. During the large majority of time, the atmospheric conditions are likely to inhibit views beyond 50 km, rendering the construction and decommissioning of the array area as either invisible or unrecognisable in the prevailing conditions.
Construction and decommissioning phase seascape, landscape and visual impacts of the Project outside the 60km radius SLVIA study area (Figure 7.11.1).	The 60km radius SLVIA study area is defined to an outer limit within which significant effects could occur. Significant effects will not occur beyond 60km due to the limited changes to views arising from the Project at distances of over 60 km, particularly since the array area is located largely behind Triton Knoll OWF and other operational OWFs such as Humber Gateway, the Inner Dowsing & Lynn and Lincs OWF cluster, Race Bank, Sheringham Shoal and Dudgeon OWFs.
Construction and decommissioning phase landscape impacts of the Project on the character of landscapes (LCTs) located	Landscapes (LCTs) inland from the coast, where the land is unlikely to have a strong visual relationship with the sea or intervisibility of the Project, will be scoped out of the assessment. These inland LCTs located away from the coastal edge and outside the main visual envelope of the sea and the Project, are considered unlikely to

Impact	Justification for Scoping Out
outside the ZTV and/or inland from the coast, where the land is unlikely to have a strong visual relationship with the sea or intervisibility of the Project.	experience significant effects because these landscapes do not have a strong visual relationship with the sea and their character is fundamentally defined by other landscape characteristics.
Impacts of the construction and decommissioning of the array area on physical aspects of landscape character.	Due to the location of the array area at considerable distance offshore it will only impact on the perception of character and qualities – which is considered as an indirect effect in Landscape Visual Impact Assessment (LVIA). No physical attributes that define landscape character or special qualities of designated landscapes will be changed.
The seascape, landscape and visual impacts of the offshore cable route construction.	Limited influence on seascape, landscape and visual receptors due to sporadic, temporary nature of above sea construction processes. The activities mainly occur from vessels, which are already an apparent component of the baseline seascape and views. Effects of construction of the cable landfall will be assessed as part of the onshore LVIA.
Impact of the array area lighting on seascape, landscape and visual receptors at night during construction and decommissioning.	Navigational lights associated with construction buoyage and construction vessels within the site boundary are unlikely to be visible from the coast at night due to the very long distances involved (>approximately 54km at the closest point of the coast). Aviation marking lights may be required on top of cranes associated with heavy lift vessels or jack up vessels, however, these will be temporary in nature and will largely be behind existing OWFs.
Operation and Maintenance	
Operation and maintenance phase seascape, landscape and visual effects as a result of the array area.	At distances beyond approximately 54km from the coastline, the O&M of the array area is unlikely to have significant effects on seascape, landscape and visual receptors, due to its very long distance offshore, the limited amount of the turbine blade tips that are theoretically visible and the position of the array area subsumed behind operational OWFs, such that it is likely to result in low or negligible levels of change to the baseline environment. Potential changes would only be experienced very infrequently. During the large majority of time, the atmospheric conditions are likely to inhibit views beyond 50 km, rendering the O&M of the array area as either invisible or unrecognisable in the prevailing conditions.
Operation and maintenance phase seascape, landscape and visual impacts of the Project outside the 60km radius SLVIA study area (Figure 7.11.1).	The 60km radius SLVIA study area is defined to an outer limit within which significant effects could occur. Significant effects will not occur beyond 60km due to the limited changes to views arising from the array area at distances of over 60 km, particularly since the array area is located largely behind Triton Knoll OWF and other operational OWFs such as Humber Gateway, the Inner Dowsing & Lynn and Lincs OWF cluster, Race Bank, Sheringham Shoal and Dudgeon OWFs.

Impact	Justification for Scoping Out
The seascape, landscape and visual effects of the operation of the offshore cable route.	Cable is located below the sea surface so would not be visible as part of the seascape or views once operational and would therefore have very limited operational effect on seascape, landscape and visual receptors, limited to just cable repairs and maintenance vessels.
Impact of the array area aviation and marine navigation lighting on seascape, landscape and visual receptors at night during O&M i.e. night-time effects.	The matter of visible aviation lighting assessment is considered wholly a visual matter, as it is considered that the proposed aviation lighting will not affect the perception of landscape or seascape character, which is not readily perceived at night in darkness. No attributes of seascape or landscape character will be changed as a result of the lighting of the Project. Although there may be potential for some effects on views experienced by people at night as a result of the aviation lights, these are considered unlikely to be significant due to the very long distance of the lights offshore at distances over approximately 54 km from the closest coastline, which may only be viewed in rare periods of excellent visibility and likely to be at the limit of visual acuity of the eye to perceive medium-intensity red aviation lights at such distance. Marine navigation lights will not be visible within the array area at all at such long distances, over approximately 54 km, due the screening of effect of the horizon that occurs due to the earth's curvature and the limited range of marine navigational lighting. The night-time seascape, landscape and visual effects of the O&M of the Project are scoped out of the SLVIA.
Impact of the O&M of the Project array area on the views experienced by offshore visual receptors.	Whilst there may be some increase in the density and spread of WTGs within this area and in views from vessels, offshore visual receptors such as people working in fisheries, oil and gas, or other commercial activities, are not of high sensitivity and are unlikely to experience significant effects as a result of the Project. The array area is located in the immediate vicinity of several other large-scale operational and under-construction OWFs in the open sea at a considerable distance from the coast and therefore effects of the array area on recreational sea users in the vicinity of the coast are likely to be of low magnitude. The array area is unlikely to give rise to significant visual effect experienced by offshore visual receptors.
Cumulative	
Cumulative effect (daytime) of the construction, O&M, and decommissioning of the offshore reactor station of the Project on seascape character, landscape character and views / visual receptors.	Cumulative seascape, landscape and visual receptors identified above as identified above. The operational Hornsea Projects One and Two OWFs, and the consented Hornsea Three OWF, will be scoped out of the SLVIA due to their long distance offshore and lack of visibility from the coastline.

Potential Transboundary Effects

7.11.59 A description of how potential transboundary effects will be assessed is outlined in Section 5. The SLVIA study area is located entirely outside EU territorial waters and the coastline of the Netherlands, Belgium and France are all located over 200 km from the array area.

7.11.60 Due to the long distance of these respective coastlines, the position of EU territorial waters outside the SLVIA study area and the concentrated nature of any potential impacts on the seascape, landscape and visual resource to the UK coastline within the SLVIA study area, transboundary impacts will not occur on seascape, landscape or visual receptors and therefore transboundary impacts will be scoped out from further consideration within the SLVIA.

Summary of Next Steps

SLVIA Contents

7.11.61 The SLVIA will provide a summary of the significance of changes resulting from the construction, O&M, and decommissioning of the Project to seascape, landscape and visual receptors, focusing on effects arising from the offshore RCS. Full technical assessments of the seascape, landscape and visual impacts will be contained within technical appendices. The SLVIA will be supported by plan figures and visual representations (photomontages).

Desk-based and Site Survey Work

7.11.62 The SLVIA will be informed by desk-based studies and field survey work undertaken within the SLVIA study area. The landscape, seascape and visual baseline will be informed by desk-based review of landscape and seascape character assessments, and the ZTV, to identify receptors that may be affected by the Project and produce written descriptions of their key characteristics and value.

7.11.63 A preliminary desk-based assessment will be undertaken of seascape, landscape and visual receptors using ZTV analysis, to identify which landscape and visual receptors are unlikely to be significantly affected, which will be subject to a preliminary assessment, and those that are more likely to be significantly affected by the Project, which require a detailed assessment.

7.11.64 Interactions will be identified between the Project and seascape, landscape and visual receptors, to predict potentially significant effects arising and measures may be proposed to mitigate effects.

7.11.65 For those receptors where a detailed assessment is required, primary data acquisition will be undertaken through a series of surveys. These surveys will include field survey verification of the ZTV from terrestrial LCAs/LCTs, micro-siting of viewpoint locations, panoramic baseline photography and visual assessment surveys from representative viewpoints.

7.11.66 Sea-based offshore surveys are not proposed to be undertaken as part of the SLVIA. Illustrative wirelines (without baseline photography) will be prepared for offshore viewpoints if required.

7.11.67 Detailed assessment methods will be based on quantifying impacts through modelling to enable prediction of seascape, landscape and visual effects. Assessment of the sensitivity of seascape, landscape and visual receptors will be undertaken, together with an assessment of the magnitude of change arising as a result of the Project. Judgements on sensitivity and magnitude will be combined to arrive at an overall assessment as to whether the Project will have an effect that is significant or not significant on each seascape, landscape and visual receptor.

Study Area Refinements

7.11.68 The 60km radius SLVIA study area (Figure 7.11.1) and ZTV (Figure 7.11.2), and 30km radius study area for the offshore RCS (to be defined at PEIR, it is currently possible a RCS could be required anywhere within the ECC), may be further refined if the array area turbine layout or offshore RCS AoS changes from that assumed at the Scoping stage, or to address any ongoing design changes, or changes in the design envelope, for example in response to embedded mitigation measures that may influence the MDS for the SLVIA.

Stakeholder Engagement

7.11.69 Consultation will be a key feature of the SLVIA process throughout the pre-application stage with relevant statutory and non-statutory organisations, the public and Interested Parties (IPs).

7.11.70 Early engagement with consultees will be used to gain input and local knowledge on the key seascape, landscape and visual constraints / sensitivities and discuss potential future environmental measures, as appropriate. This is considered important to ensure all seascape, landscape and visual aspect matters are considered appropriately and proportionately with the relevant statutory consultees.

7.11.71 Formal pre-application consultations with regards to SLVIA will be undertaken primarily through specialist consultation via an ETG as part of the EPP, along with wider formal statutory consultations. Numerous ETG meetings and site visits will be organised with representatives from Natural England, Historic England, East Riding of Yorkshire Council, Lincolnshire County Council, East Lindsey District Council, Norfolk County Council and North Norfolk District Council. In line with the consultation strategy, public consultation with be conducted primarily through a series of Public Information Days (PIDs) and public meetings.

7.11.72 Feedback received through this consultation process will be considered in preparing the SLVIA where appropriate.

7.11.73 All consultation feedback pertaining to the SLVIA will be presented in a Consultation Report, to be provided as part of the DCO Application, and will be summarised in the SLVIA section (Section 7.11) together with information on how feedback from consultation has been addressed.

Further Consideration for Consultees

7.11.74 The following specific questions are provided for to help frame the consultees Scoping Opinion opinion for the seascape, landscape and visual:

- Do you agree that the data sources identified in Table 7.11.1 are sufficient to inform the baseline for the Project SLVIA?

- Do you agree that the seascape, landscape and visual impact of the array area (located approximately 54 km from the closest point of coast) can be scoped out of the EIA?
- Do you agree that the focus of the SLVIA should be on the potential impacts arising from the offshore RCS within the offshore ECC and landfall works in the intertidal area?
- Do you agree a 30 km radius study area should be used for the SLVIA of the offshore RCS?
- Do you agree that all the designated areas within the ZTV have been identified?
- Do you have any comments on the viewpoints listed in Table 7.11.3 or have any proposed additions or alternatives, particularly in relation to the assessment of the offshore RCS?
- Have all potential impacts resulting from the Project been identified for seascape, landscape and visual receptors?
- Do you agree that the impacts described in Table 7.11.6 can be scoped out?
- For those impacts scoped in (Table 7.11.5), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you have any specific requirements for the SLVIA methodology and/ or visual representations (photomontages/ ZTVs) to be included in the SLVIA?

7.12 Infrastructure and Other Marine Users (IOMU)

Introduction

7.12.1 This section of the Scoping Report identifies the Infrastructure and Other Marine Users (IOMU) elements of relevance to the array area and offshore ECC AoS. This section considers the potential effects from the construction, O&M and decommissioning of the Project, alone and cumulatively on IOMU receptors and sets out the proposed scope of the EIA.

7.12.2 Activities and infrastructure considered in this section include users of the marine and intertidal environment and operators of marine infrastructure which are not otherwise considered in other sections of this Scoping Report, and specifically:

- Offshore wind farms (OWFs)(existing and proposed);
- Wave and tidal renewable energy projects;
- Oil and gas infrastructure and licensing (including indirect effects on safety systems such as Radar Early Warning Systems (REWS), line of sight links such as microwave links, and allision risk for platform assets);
- Gas and hydrogen storage projects;
- Carbon capture utilisation and storage (CCUS) projects;
- Nuclear energy facilities;
- Existing or proposed subsea cables and pipelines;
- Coastal and marine waste water assets;
- Marine disposal sites; and
- Aggregate dredging licensed areas.

7.12.3 This section of this Scoping Report has links and interfaces with several other aspects and as such, should be read alongside the following sections of this Scoping Report:

- Section 7.1: Marine Physical Processes;
- Section 7.7: Marine and Intertidal Archaeology;
- Section 7.8: Commercial Fisheries;
- Section 7.9: Shipping and Navigation (includes recreational sailing and boating);
- Section 7.10: Aviation, Radar, Military and Communication (includes all military activities and impacts on helicopter access to oil and gas platforms);
- Section 8.5: Hydrology and Flood Risk (coastal flood defence); and
- Section 9.3: Socio-Economic Characteristics (includes marine and coastal recreation and amenity use, including recreational fishing, sailing and boating activities).

Study Area

7.12.4 For the purpose of this scoping assessment, the IOMU study area is defined by i) the area within which the offshore infrastructure will be installed and operated (i.e. the offshore areas array and ECC AoS) which may directly interact with third party Infrastructure and Other Marine Users; together with ii) the relevant impact-specific Zones of Influence (ZoIs).

7.12.5 With exception of oil and gas operations, the maximum ZoI is defined by the area over which suspended sediments may be detected following disturbance as a result of construction activities, or the area within which significant underwater noise may be detectable as a result of foundation piling events which is defined at this scoping stage (and subject to refinement as site specific modelling is undertaken) as being approximately 15km.

7.12.6 The study area therefore contains the array area and the offshore ECC AoS with an approximate 15km buffer, as shown in Figure 7.12.1.

7.12.7 Activities in the wider region have also been reviewed where relevant, e.g. if no activities from a particular sector take place within the study area, to provide a regional context and for consideration of the potential for indirect impacts on IOMU.

7.12.8 The specific oil and gas infrastructure study area is informed by a 9 nautical mile (nm) radius around the array area, this being based on Civil Aviation Authority (CAA) guidance as the area within which consultation with the relevant operator should be undertaken where gas platform assets are supported by helicopter operations take place (CAP764, CAA, 2016); and the AoS.

7.12.9 The study area will be reviewed and amended for future stages (e.g. in preparing the PEIR and subsequently ES) in response to such matters such as the refinement of the offshore ECC AoS, feedback from consultees, and/ or refinements to the project design.

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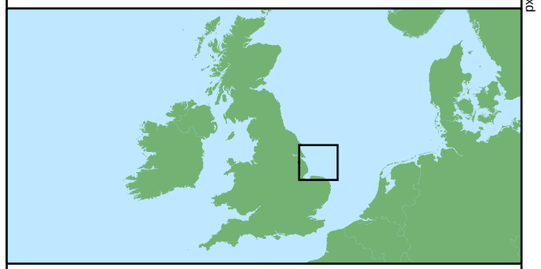
Legend

- Site Boundary
- Offshore ECC Area of Search
- Infrastructure and Other Users Study Area
- Oil and Gas Study Area (9nm)



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

IIOMU study area

Figure 7.12.1

OUTER DOWSING OFFSHORE WIND

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Revision: 0.1

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Document Path: G:\GIS\GIS_Projects\0152 Outer Dowsing EIA\GIS\Figures\Scoping\Infrastructure Other Marine Users\ODOW_0152_IOMU_Fig1_Study_Area.mxd

Baseline Environment

Overview of Available Data Sources

7.12.10 An initial desk-based review of the data sources was undertaken to identify existing and proposed IOMU that may potentially be directly and indirectly affected. The key data sources identified are provided in Table . As part of the EIA process, the Applicant will undertake consultation with relevant developers, operators and marine users within the study area to ascertain any other planned developments and concerns relating to the Project, as well as to gather further information on operations.

7.12.11 In addition, consultation with TCE as well as other licensing authorities will be undertaken to identify any other future developments within the study area. Figure to Figure 7.12.5 and Table 7.12.1 present the spatial data collated and their spatial interactions with the Project scoping boundary.

Table 7.12.1: Key sources of information for Infrastructure and Other Marine Users

Source	Summary	Spatial Coverage Of Study Area
TCE offshore wind leasing sites – Rounds 1-4 (September 2021).	Includes OWF array sites and ECC	This is a national dataset providing full coverage of the study area.
TCE offshore tidal stream and wave site agreements and cable agreements (July 2021)	Includes tidal and wave power sites and ECC	This is a national dataset providing full coverage of the study area.
Oil and Gas Authority interactive map of all offshore oil and gas activity including license blocks (surface and sub-surface) (November 2021); and Admiralty Charts 1187, 1190 and 1503.	Oil and gas infrastructure and licence blocks	This is a national dataset providing full coverage of the study area.
TCE offshore natural gas storage site agreements (March 2021)	Includes sites licensed for hydrogen and gas storage	This is a national dataset providing full coverage of the study area.
TCE (March 2021); and The UK Storage Appraisal Project strategic study of the potential for UK carbon dioxide (CO2) storage (2016).	Includes CCUS sites	These are both national datasets providing full coverage of the study area.
World Nuclear Association: nuclear power in the UK (November 2021)	Includes Nuclear power station sites	This is a national dataset providing full coverage of the study area.
Kingfisher Information Service – Cable Awareness (KIS-ORCA) displays used and abandoned cables (May 2021); and Ocean	Includes offshore subsea electricity inter-connector and telecoms cables and gas pipelines	This is a national dataset providing full coverage of the study area.

Source	Summary	Spatial Coverage Of Study Area
Wise Marne Themes (December 2021).		
EC Waste Water Treatment Works (UWWTD, UK) (accessed November 2021, data not provided with date); Ocean Wise Marine Themes storm overflows (December 2021); and Rivers Trust storm overflows (March 2021).	Includes coastal waste water assets including waste water treatment works and storm overflows	These are both national datasets providing full coverage of the study area.
Cefas – GIS Shapefile of Disposal Sites (September 2021).	Includes disposal sites	This is a national dataset providing full coverage of the study area.
TCE Aggregate licence area and current working areas (September 2021); and TCE and BMAPA dredge reports (2021).	Includes marine aggregate extraction licensed areas	These are both national datasets providing full coverage of the study area.
Marine Management Organisation - Marine Case Management System Public Register	Public register of marine licence applications in the vicinity of the IOMU study area.	This is a national dataset providing full coverage of the study area.

Offshore Wind Farms

7.12.12 There are 11 existing or proposed OWFs (other than the Project) within the IOMU study area, as shown in Figure and detailed in Table 7.12.2 (TCE 2021a,b). Those marked with an asterisk in Table 7.12.2 only have ECC within the study area (no array).

7.12.13 Of these, nine of the OWFs are either under construction or in operation; and two are in planning: Dudgeon and Sheringham Shoal Extensions.

Table 7.12.2: OWFs and/ or OWF export cables in the IOMU study area

OWF	Operator	Status
Dudgeon	Dudgeon Offshore Wind Limited	Active/ in operation
Dudgeon Extension	Dudgeon Extension Ltd	In planning
Hornsea Project One*	Diamond Transmission Partners Hornsea One Limited	Active/ in operation
Hornsea Project Two*	Optimus Wind Ltd	Under construction
Hornsea Project Four	Ørsted	In planning
Humber Gateway	E.ON Climate ad Renewables UK Humber Wind Ltd	Active/ in operation
Inner Dowsing	Inner Dowsing Wind Farm Ltd	Active/ in operation
Lincs	Lincs Wind Farm Limited	Active/ in operation
Lynn	Lynn Wind Farm Ltd	Active/ in operation

OWF	Operator	Status
Race Bank	Race Bank Wind Farm Ltd	Active/ in operation
Sheringham Shoal Extension	SCIRA Extension Ltd	In planning
Triton Knoll	Triton Knoll OWF Ltd	Under construction

7.12.14 During the EIA, the Applicant will seek to consult with those OWF operators where the potential for an interaction between the Project infrastructure (array and final confirmed ECC) and the existing or proposed projects exists.

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Hornsea Project Four
Hornsea Project Two
Hornsea Project One
Westermost Rough
Humber Gateway
Triton Knoll
Dudgeon Extension
Sheringham Shoal Extension
Dudgeon
Race Bank
Inner Dowsing
Lincs
Lynn
Sheringham Shoal
Dudgeon Extension

Legend

- Site Boundary
- Offshore ECC Area of Search
- Infrastructure and Other Users Study Area
- Offshore Wind Farm Sites
- Offshore Wind Farm Cable Agreements

Coordinate System: WGS 1984 UTM Zone 31N

0 25 50 km

Scale: 1:750,000

Offshore Wind Farms in and adjacent to the IOMU study area

Figure 7.12.2

OUTER DOWSING OFFSHORE WIND

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Wave and Tidal

7.12.15 There are no wave or tidal energy development sites, existing or planned, within the IOMU study area (TCE 2021c,d,e,f). Therefore, no further consideration of wave or tidal developments is proposed in the EIA.

Oil and Gas Activity including Pipelines

Oil & Gas Licence Blocks

7.12.16 The License Blocks intersecting the relevant study areas are shown in Figure 7.12.3 colour coded by license status and further details are provided in Table 7.12.3. In summary:

- 67 License Blocks intersect the ECC AoS, 9nm study area and array, 32 of which are currently licensed;
- 46 License Blocks intersect the 9nm study area and array, 28 of which are currently licensed; and
- 15 License Blocks intersect the array area, 9 of which are currently licensed.

Table 7.12.3: Licence Blocks intersecting the 9nm Study Area and array area

Licence Block	Licensed	Operator
47/10d	Yes	No operator
48/11c	Yes	IOG North Sea Limited
48/12b	Yes	IOG North Sea Limited
48/12c	Yes	Perenco Gas (Uk) Limited
48/12d	Yes	Perenco Gas (Uk) Limited
48/12f	Yes	Perenco Gas (Uk) Limited
48/13a	Yes	Shell U.K. Limited
48/13c	Yes	Tangram Energy Ltd
48/14a	Yes	Shell U.K. Limited
48/14b	Yes	Tangram Energy Ltd
48/14c	Yes	Tangram Energy Ltd
48/17a	Yes	Perenco UK Limited
48/17b	Yes	Perenco UK Limited
48/17c	Yes	Perenco UK Limited
48/18a	Yes	Perenco UK Limited
48/18e	Yes	Tangram Energy Ltd
48/19a	Yes	Shell U.K. Limited
48/19c	Yes	Shell U.K. Limited
48/19d	Yes	Tangram Energy Ltd
48/6a	Yes	Tangram Energy Ltd
48/6c	Yes	Parkmead (E & P) Limited
48/7a	Yes	Perenco UK Limited
48/7b	Yes	Perenco Uk Limited
48/7c	Yes	Spirit Energy Resources Limited

Licence Block	Licensed	Operator
48/7g	Yes	Spirit Energy Resources Limited
48/8a	Yes	Spirit Energy Resources Limited
48/8b	Yes	Deltic Energy Plc
48/9	Yes	Tangram Energy Ltd

Oil and Gas Infrastructure

7.12.17 Oil and gas infrastructure (including both surface and sub surface assets) within the AoS and 9nm study area are shown in Figure . In terms of surface assets within the ECC AoS, 9nm study area and array area, there are 27 oil and gas permanent structures all of which are platforms and with 500m safety zones.

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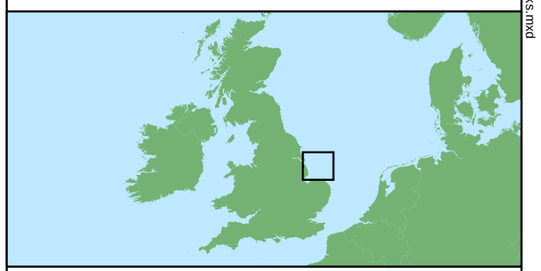
Legend

- Site Boundary
- Offshore ECC Area of Search
- Infrastructure and Other Users Study Area
- Oil and Gas Study Area (9nm)
- Licensed Block
- Unlicensed Block



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:400,000

Oil and Gas Licence Blocks

Figure 7.12.3

OUTER DOWSING OFFSHORE WIND

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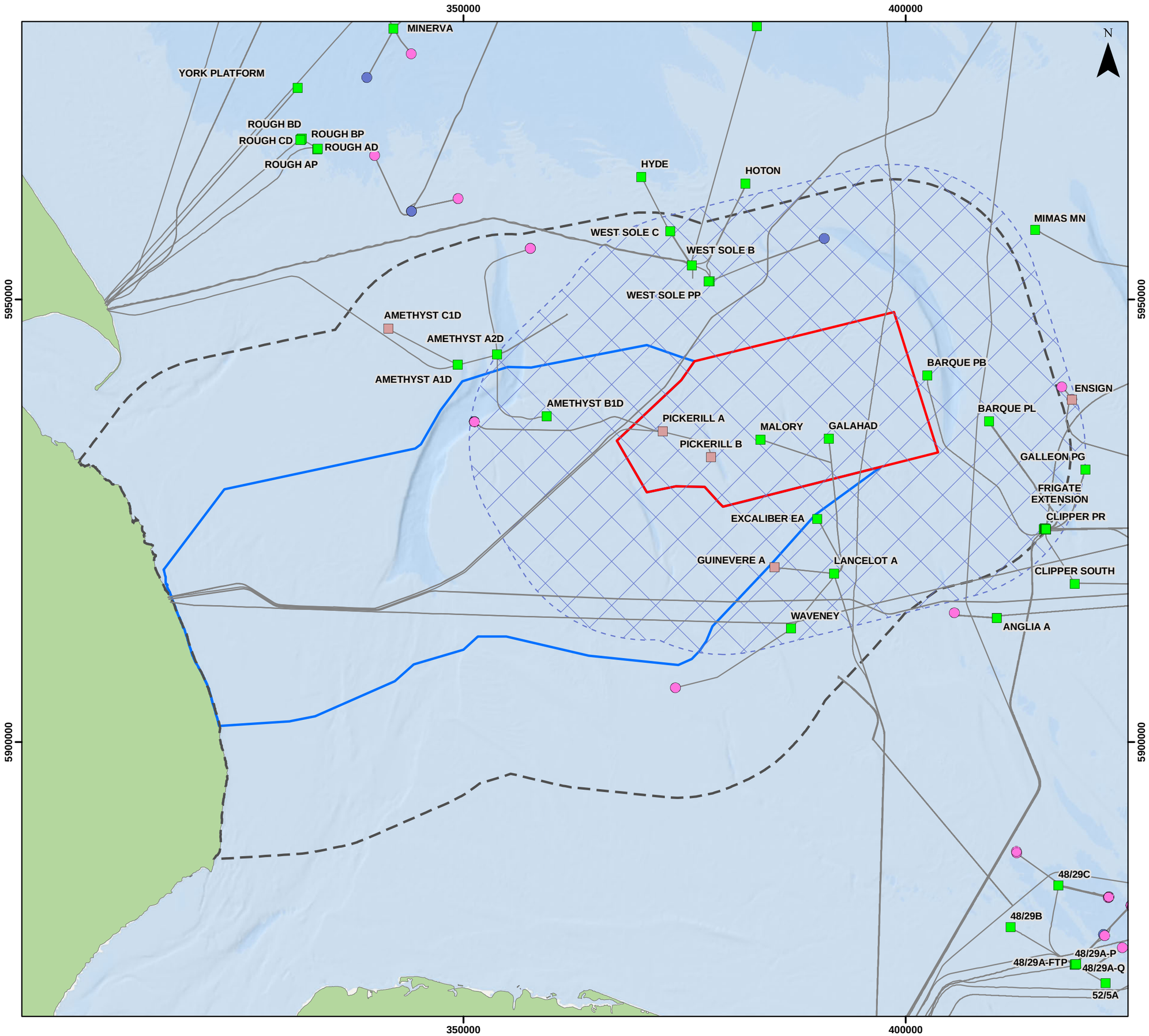


Legend

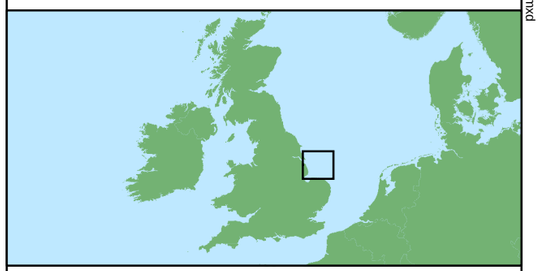
- Site Boundary
- Offshore ECC Area of Search
- Infrastructure and Other Users Study Area
- Oil and Gas Study Area (9nm)

Platforms (Status)

- Active
- Abandoned / Not In Use / Removed

Subsea Assets

- Wellhead
- Manifold



Coordinate System: WGS 1984 UTM Zone 31N

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Scale: 1:400,000

Oil and Gas Infrastructure

Figure 7.12.4

OUTER DOWSING OFFSHORE WIND

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7.12.18 The platforms intersecting the relevant study areas are shown in Figure and summarised in Table 7.12.4. The current status of each platform indicated in Table 7.12.4 is based on either publicly available information or data provided by the relevant operator during consultation held to date.

7.12.19 The status of each asset will be reviewed and updated throughout the pre-application period and through consultation with each of the relevant operators. In summary:

- 27 platforms intersect the AoS, 9nm study area and array;
- 24 platforms intersect the 9nm study area and array; and
- 4 platforms intersect the array area.

Table 7.12.4: Details of Oil and Gas platforms intersecting 9nm study area and array

Installation Name	Type	Operator	Status	Distance from Array Area Boundary
Galahad	Wellhead Steel	Perenco	Decommission Approved (Partway Through)	0.00
Malory	Wellhead Steel	Perenco	Active	0.00
Pickerill A	Wellhead Steel	Perenco	Decommission Approved	0.00
Pickerill B	Wellhead Steel	Perenco	Decommission Approved (Partway Through)	0.00
Barque Pb	Wellhead Accommodation Steel	Shell	Active	1.44
Excaliber Ea	Wellhead Steel	Perenco	Active	3.93
Barque Pl	Wellhead Steel	Shell	Active	6.56
Guinevere A	Wellhead Steel	Perenco	Decommission Approved	8.06
West Sole A (6 Leg)	Wellhead Steel	Perenco	Active	8.35
West Sole A (8 Leg)	Production & Accommodation Steel	Perenco	Active	8.35
West Sole Pp	Production Steel	Perenco	Active	8.35
West Sole Sp	Wellhead Steel	Perenco	Decommission Approved	8.36
Amethyst B1d	Wellhead Steel	Perenco	Active	8.39
Lancelot A	Wellhead Steel	Perenco	Active	10.37

Installation Name	Type	Operator	Status	Distance from Array Area Boundary
West Sole B	Production & Accommodation Steel	Perenco	Active	10.59
Clipper Ph	Clipper Ph	Shell	Active	14.78
Clipper Pw	Wellhead Steel	Shell	Active	14.79
Clipper Pt	Production & Accommodation Steel	Shell	Active	14.87
Clipper Pc	Compression Steel	Shell	Active	14.91
West Sole C	Production & Accommodation Steel	Perenco	Active	14.92
Clipper Pm	Production Manifold Steel	Shell	Active	14.96
Clipper Pr		Shell	Active	15.12
Waveney	Production Steel	Perenco	Active	15.22
Ensign Platform	Ensign Npai Platform	Spirit Energy	Decommission Approved	16.24

7.12.20 There are a total of ten charted pipelines from offshore subsea assets to shore within the ECC AoS, six of which also intersect the 9nm study area (including pipeline bundles), noting that pipelines between assets are also present. These include i) active pipes: West Sole to Easington, Lancelot to Bacton, Shearwater to Bacton Seal Line, Esmond to Bacton, Glycol to Bacton – Clipper; ii) pipes with decommissioning approved: Amethyst A2D to Easington, Pickeril A to Theddlethorpe, Loggs PP to Theddlethorpe Meoh Line, Viking AR to Theddlethorpe gas line; and iii) pipes with decommissioning under consideration: Theddlethorpe to Murdock MD.

7.12.21 Subsea infrastructure locations were also identified within the 9nm study area and ECC AoS as shown in Figure . There are a total of four wellheads (of which one is precommissioned and two are not in use), out of a total of 52 subsurface assets (of which 48 are active in total), and it should be considered that these assets could have oil and gas activity in the future for inspections, maintenance and decommissioning.

7.12.22 The use of active REWS and other systems including microwave links on the relevant platforms will be identified in consultation with the relevant operators as part of the EIA process. It should be considered that additional operations (e.g., seismic surveys) may occur and as such any known/ planned operations will be identified in consultation with the relevant operators and considered as appropriate in the EIA.

Hydrogen and Gas Storage

7.12.23 There are no hydrogen and gas storage sites licensed in England, with there only being two in the whole of the UK, these being located in Northern Ireland (TCE 2021g). However this is an evolving sector and Neptune Energy have proposed Project DelpHYnus, with 1.8 GW of blue hydrogen production, in combination with CCUS from the Theddlethorpe site on the coast, situated halfway between the mouth of the Humber and Skegness to the south. Further developments may be proposed in the near future.

Carbon Capture Utilisation and Storage (CCUS)

7.12.24 As part of the UK's Storage Appraisal Project (UKSAP), a strategic study of the potential for UK CO2 storage provided the top 20 sites greater than 50MT capacity, that fit a certain set of criteria suitable to CCUS focused on geology, engineering, contaminant and cost. The sites are predominantly located in the North Sea, comprising of eight sites in the Southern North Sea, accounting for 3,255 MT capacity (Energy Technology Institute, 2016). One such CCUS storage option is the 'Endurance' site, an underground "saline aquifer" storage reservoir, which lies approximately 20km north of the IOMU study area for the Project (Figure 7.12.5) (TCE 2021h).

7.12.25 The Northern Endurance Partnership (NEP, 2021) (a partnership between bp, National Grid, Equinor, Shell, Total and ENI) was formed in 2020, to provide the infrastructure to transport CO2 from multiple sites in the Humber and Teesside regions to the Endurance site (working together with the East Coast Cluster and Net Zero Teesside). NEP submitted a bid in July 2021 to BEIS for CCUS deployment and a DCO application for the Net Zero Teesside component of the project.

7.12.26 Although the main Endurance site lies outside of the IOMU study area, it is understood that some infrastructure to connect to the Humber region may be required and could therefore interact with the study area.

7.12.27 There are now four areas licensed for CCUS surrounding, but not within the study area, mostly dated 2022 but one from 2019 (North Sea Transition Authority, 2022a).

7.12.28 The UK's North Sea Transition Authority (NSTA) has since launched the UK's first carbon storage licensing round (June 2022), including 13 areas across UK, two of which are within the 9nm array buffer and ECC AoS (but not within the array itself). These include areas SNS Areas 3 and 6. A further six areas within the leasing round are to the south and north of the 9mn array buffer and ECC AoS study areas. Applications are open until 13 September 2022 with awards expected in early 2023 and becoming operational potentially 2027-2029 (NSTA 2022b).

Nuclear Facilities

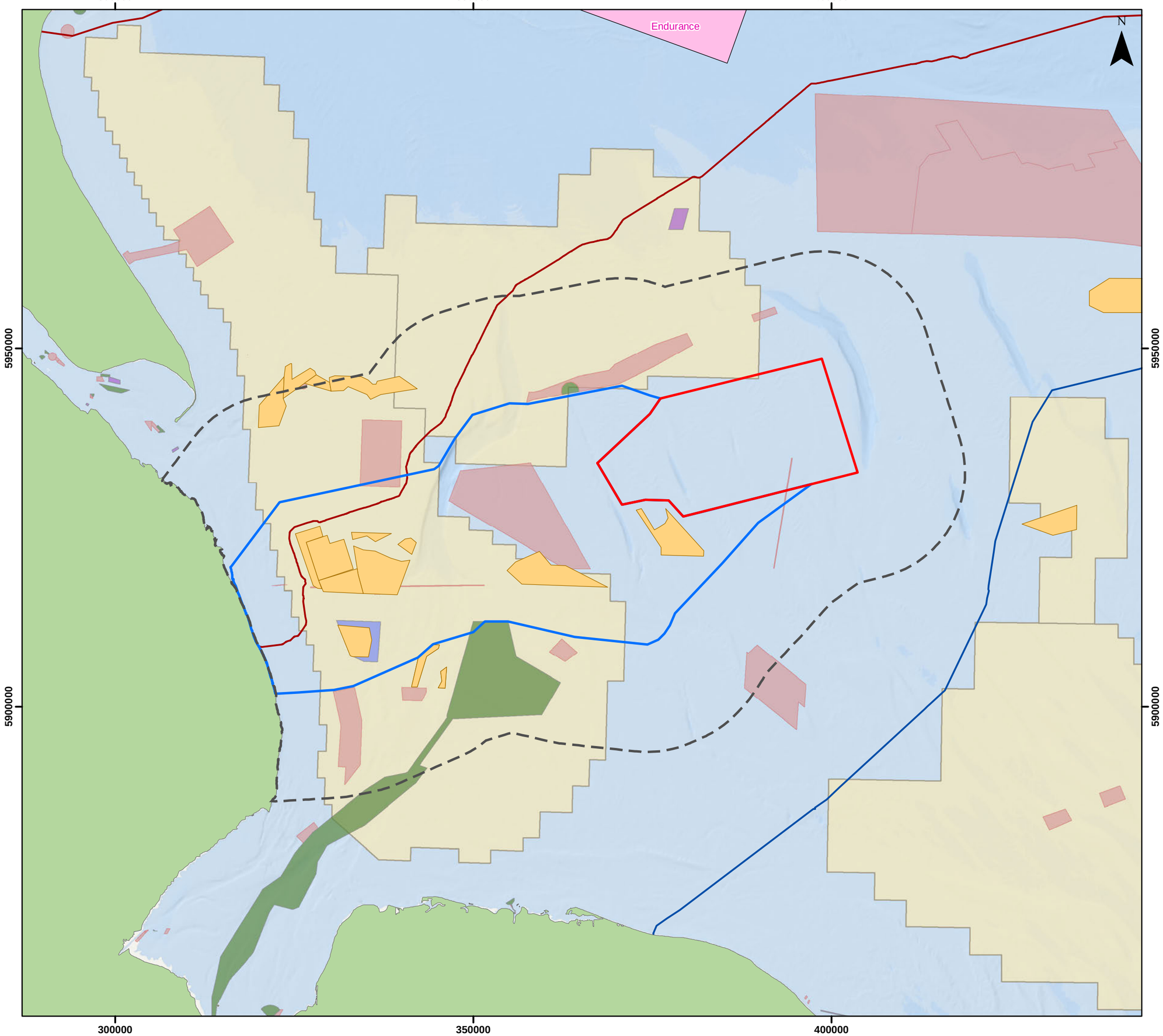
7.12.29 EDF's Sizewell nuclear facilities (Sizewell A, B and C) are located on the Suffolk coast approximately 143 km to the south of the array area at the closest point. Both Sizewell A (which is in the process of being decommissioned) and Sizewell B have cooling water outfall and intake infrastructure that extends into the marine environment. EDF Energy have submitted an application for Sizewell C power station to be located immediately to the north of the existing Sizewell B power station. Development comprises the delivery of a new nuclear power station and onsite associated facilities. Installation of offshore infrastructure for the development will require temporary safety zones to be applied surrounding working construction vessels (World Nuclear Power, 2021).

7.12.30 Given that these nuclear facilities are located a considerable distance beyond the study area, no direct or indirect interaction with them is anticipated, and as a result no further consideration of nuclear projects is proposed in the EIA.

Subsea Electricity Interconnector and Telecommunication Cables

7.12.31 There are a number of planned and operational electricity interconnector and telecommunication cables within the IOMU study area and the wider region, as shown in Figure 7.12.5 (Kiscora 2019, Ocean Wise 2021).

7.12.32 The Viking Link cable (marine application license EXE/2016/00062), currently under construction and expected in service by the end of 2023, passes through the nearshore part of the study area. It is a HVDC electricity interconnector, being developed jointly by National Grid and Energinet, and is approximately 765 km long, between Bicker Fen in Lincolnshire and the substation at Revsing in southern Jutland, Denmark.

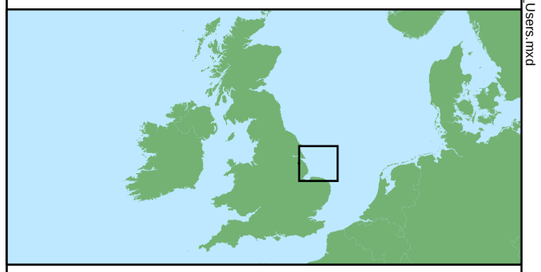


Legend

- Site Boundary
- Offshore ECC Area of Search
- Infrastructure and Other Users Study Area
- Power Cables
- Telecom Cables
- Carbon Capture and Storage Areas (TCE)
- Aggregate Areas
- Carbon Storage Licensing Round Areas

Disposal Areas Status (CEFAS)

- Open
- Closed
- Disused
- Not for waste disposal



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:500,000

Electricity Interconnector and Telecommunication Cables, CCUS, Aggregate and Disposal Areas

Figure 7.12.5

OUTER DOWSING OFFSHORE WIND

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7.12.33 A number of other planned and operational cables are in the wider area, but outside of the study area, including Stratos 1, 2 and 3, Norsea Coms, UK-Denmark 4 (Seg 1 and 2), UK-Germany 6, VSNL North Europe and Tampnet MCCS. Also power cables associated with offshore wind infrastructure and pipelines associated with CCUS are include in the relevant sections above.

7.12.34 In addition, the OTNR process has identified a number of possible future cables that may be developed and pass through the study area to make landfall on the Lincolnshire coast. In addition, National Grid are proposing two 'bootstrap' subsea transmission cables from Scotland which are also expected to make landfall in Lincolnshire. The status and details of these additional subsea cable developments will be considered in the EIA process as details become available.

Waste Water Assets

7.12.35 The Applicant has undertaken a preliminary review of all waste water assets within the IOMU study area. Within the coastal part of the study area, there are outfalls associated with the Ingoldmells Sewage Treatment Works (The Rivers Trust, 2021; EC, 2021). Where the final ECC has the potential to interact with this, it will be considered in the EIA with consultation with the relevant asset operator.

Marine Disposal

7.12.36 There are two open/ active sites in the study area permitted for disposal of material from various activities, predominantly construction works (Cefas, 2021) as shown in Figure 7.12.5, including:

- Hornsea Disposal Area 1 (offshore); and
- Race Bank OWF (offshore).

7.12.37 These are both associated with OWFs and were active during the construction phase. However, as construction has been completed, they will not be in use in the future and as the Project proceeds.

7.12.38 There is also one application for dredge disposal at Lincs windfarm (marine licence application 34966/101006).

7.12.39 There are a further 28 historic disposal sites that are either closed, disused or not for waste disposal within the study area as shown in Figure 7.12.5.

7.12.40 During the EIA, the Applicant will seek to consult with the operators of any active disposal sites where there may be an interaction between the final ECC and the relevant disposal sites.

Aggregates Sites

7.12.41 Within the study area, there are 15 production licences for aggregate extraction, all of which are located to the west and south of the array (Figure 7.12.5), as listed below (TCE, 2021i):

- Areas 514/1, 2, 3, 4 (Humber 1, 2, 3, 4), operated by CEMEX UK Marine Ltd;
- Areas 106/1, 2, 3 and 400 (Humber Estuary), operated by Hanson Aggregates Marine Ltd;

- Area 493 (Humber Overfalls), operated by Tarmac Marine Ltd;
- Areas 481, 2 (Inner Dowsing), operated by Van Oord Ltd and Tarmac Marine Ltd;
- Area 197 (Off Saltfleet), operated by Tarmac Marine Ltd; and
- Areas 515/1, 2 (Outer Dowsing), operated by Westminster Gravels Ltd.

7.12.42 All of the above listed aggregates areas are licensed to 2029 or beyond with exception of the Inner Dowsing areas, which are licensed until 2024.

7.12.43 The closest site to the array area is Area 515/1, 2 which lies just to the south-west of the array area.

7.12.44 Also within the study area is an exploration and option area, Area 1805 (Inner Dowsing), operated by Hanson Aggregates Marine Ltd.

7.12.45 The sites listed above are a subset of the wider Humber Region aggregates area within which the Project is located (Figure 7.12.5). During 2020, 3.52 million tonnes of construction aggregate were dredged within the Humber Region, from a permitted licensed tonnage of 6.88 million. In addition, 0.67 million tonnes were dredged for beach replenishment - the total area available to dredge was 312.21 km^2 and 196.69 km^2 respectively (TCE and BMAPA, 2021).

7.12.46 During the EIA, the Applicant will seek to consult with those aggregate dredging licence holders where there is the potential for an interaction with the Project, and subject to confirmation of the final ECC.

7.12.47 In addition, aggregate is regularly dredged to provide material for the beach nourishment along the Lincolnshire coast under a long term scheme operated and managed by the Environment Agency. The scheme pumps sand from offshore aggregate production sites onto beaches between Saltfleet and Gibraltar Point.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

7.12.48 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of IOMU will also comply with the following guidance documents where they are specific to this topic:

- Department for Levelling Up, Housing and Communities (DLUHC) guidance notes “Building safety Programme”; and
- NPS for Renewable Energy (NPS EN-3).

7.12.49 As part of the assessment of IOMU within the EIA, a comprehensive desk study will be undertaken and consultation with relevant operators and licensing bodies will be conducted to establish the current status of known and planned IOMU within the array area, offshore ECC and wider study area. Existing and planned licenced activity will be identified and a timeline for future activities associated with existing or planned infrastructure will be established.

Relevant Embedded Mitigation Measures

7.12.50 The assessment of IOMU will adopt the principles outlined in Section 5. As part of the design process for the Project the following embedded mitigation measures will be adopted:

- Where possible avoidance of interaction with existing or proposed infrastructure and other marine user receptors through project design and specifically siting of the Project infrastructure and design of the offshore ECC;
- Where potential interaction between the Project and other infrastructure or marine users are identified, owners and operators will be consulted, and standard legal agreements, for example crossing or proximity agreements, will be put in place;
- The required Notices to Mariners and Kingfisher Bulletin notices will also be published prior to, and updated during, any relevant construction, maintenance or decommissioning activities;
- All Project infrastructure will marked and lit according to the requirements of Trinity House, CAA and MOD;
- In accordance with the Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations, 2007 (SI No 2007/1948), Safety Zones will be applied for around relevant construction activities; and
- Following a risk assessment, if required, guard vessels may be used for relevant construction, maintenance and decommissioning activities.

7.12.51 The Applicant will seek to implement these measures, and also various standard sectoral practices and procedures including notifying relevant stakeholders and developing appropriate construction management plans.

7.12.52 It is therefore considered that these measures are inherently part of the design of the Project and hence have been considered in the judgments as to which impacts can be scoped in/ out presented in Table 7.12.5 and Table 7.12.6.

Potential Impacts Scoped In

7.12.53 A range of potential impacts on IOMU have been identified which may occur during the construction, O&M, and/ or decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 7.12.5, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 7.12.5: Impacts proposed to be scoped in to the assessment for IOMU

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Construction		
Direct disturbance and damage to existing or proposed IOMU assets resulting from increased vessel movements.	Increased vessel movements associated with the construction and installation of WTGs, platforms and export cables has the potential to cause vessel allision for activities associated with all IOMU types scoped in, i.e. ▪ OWF and cables; ▪ Oil and gas development or decommissioning activity; ▪ CCUS development activity and associated pipelines; ▪ Coastal wastewater assets; ▪ Active disposal sites; ▪ Licenced aggregate dredging activity; and ▪ Subsea electricity interconnector and/or telecoms cables.	This assessment will be informed by the maximum number of return trips and types of vessels associated with the construction of the Project. The sensitivity of and impact on each of the potential receptors will be assessed by characterising vessel movement for each IOMU both spatially and temporally. This assessment will also be partially informed by and draw on, the conclusions of the Shipping and Navigation PEIR (and ES) chapter and the Navigation Risk Assessment (NRA).
Direct disturbance and increased allision risk to existing or proposed IOMU assets and infrastructure from construction and installation of WTGs, platforms and export cables	Direct interaction with other assets which could result in direct damage or alteration in operation of the asset, including; ▪ OWF and cables; ▪ Oil and gas development or decommissioning activity; ▪ CCUS development activity and associated pipelines;	This assessment will consider the mitigation measures and will determine the sensitivity of and impact on receptors with these measures in place. The impact on receptors will then be assessed by the degree of spatial and temporal overlap with such activities, both directly and with a buffer.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
	▪ Coastal wastewater assets; and ▪ Subsea electricity interconnector and/or telecoms cables.	
Displacement of or restricted access to existing or proposed IOMU activity from the presence of the structures, including operational and vessel access	Displacement of existing or proposed activities or restricted access due to the construction activities, potentially affecting all IOMU types scoped in.	This assessment will consider the presence of construction activity, such as e.g. foundation installation, OSP installation, WTG installation, cable installation, and the associated effects on existing or proposed IOMU receptors. The sensitivity of and impact on each of the potential receptors will be considered for such activities by assessing degree of spatial and temporal overlap, both directly and with a buffer.
Operation and Maintenance		
Direct disturbance and increased allision risk to existing or proposed IOMU assets resulting from increased vessel movements.	Increased vessel movements associated with O&M of the Project may cause vessel allision for activities associated with all IOMU types scoped in.	The same approach will be adopted as impact 'Construction: Increased vessel movements associated with the construction and installation of WTGs, platforms and export cables' (see row above), but considering the proposed operations and maintenance activity for the Project.
Displacement of or restricted access to existing or proposed IOMU activity from the presence of the structures, from O&M and vessel access	Displacement of existing or proposed activities or restricted access due to operational and maintenance activities, potentially affecting all IOMU types scoped in.	The same approach will be adopted as impact 'Construction: Activity or access displacement', but considering the proposed operations and maintenance activity for the Project.
Physical presence of the Project infrastructure and impacts on IOMU receptors	The physical presence of the Project infrastructure could interfere with the activity of IOMU receptors during the operations and	This assessment will consider the mitigation measures and will determine the sensitivity of receptors to the physical presence of infrastructure. The impact on receptors will then be assessed by the degree of

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
	maintenance phase of the project, including all IOMU types scoped in.	spatial and temporal overlap with such activities, both directly and with a buffer.
Interference with communications and detection systems	Presence of Project structures in previously open sea areas may impact on existing communications and / or detection systems (e.g., REWS, microwave link) used by local oil and gas platforms.	Further consultation will be required to identify relevant systems within the study area. If active systems are identified, further assessment work is required to determine sensitivity.
Decommissioning		
Direct disturbance and damage to existing or proposed IOMU assets resulting from increased vessel movements	Increased vessel movements associated with the decommissioning of WTGs, platforms and export cables, etc. may have an impact on all IOMU types scoped in through allision.	The same approach will be adopted as impact 'Construction: Increased vessel movements associated with the construction and installation of WTGs, platforms and export cables'.
Direct disturbance and damage to existing or proposed IOMU assets and infrastructure from decommissioning activities	Direct interaction during decommissioning with assets could result in direct damage or alteration in operation of the IOMU asset where there is a spatial overlap between Project activities and IOMU receptors including; ▪ OWF and cables; ▪ Oil and gas development or decommissioning activity; ▪ CCUS development activity and associated pipelines; ▪ Coastal wastewater assets; and ▪ Subsea electricity interconnector and/or telecoms cables.	The same approach will be adopted as impact 'Construction: Activity or access displacement'

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Displacement of or restricted access to existing or proposed IOMU activity, from O&M and vessel access	Displacement of activities or access due to the Project decommissioning activities for all IOMU types scoped in.	The same approach will be adopted as impact 'Construction: Activity or access displacement'
Cumulative		
Displacement of IOMU activity	Displacement of activities due to the presence of multiple IOMU receptors and activities within the study area, where there is a spatial overlap between Project activities and IOMU receptors.	All impacts considered for the Project alone have the potential to act cumulatively with other plans and projects within the study area. Cumulative effects occur when there is both a temporal overlap, and a spatial overlap (or overlap of the ZoI) of activities from projects not part of the baseline environment (i.e. planned) or existing activities that have ongoing effects. Therefore, at PEIR, all impacts considered for the Project alone will also be considered cumulatively with other plans and projects. A list of developments requiring assessment will be provided at PEIR. Cumulative effects on IOMU aspects resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in Section 5 and considering the other developments that have been screened in as part of the CEA screening exercise. The main source of potential for cumulative effects is with the construction of Triton Knoll OWF and cable, Hornsea Project Two OWF array and cable, Viking Link cable and other associated offshore infrastructure.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		The timelines and scope of these projects will require further consideration within the EIA. This assessment will consider the presence of the Project and the associated effects on existing or proposed IOMU receptors. The sensitivity of and impact on each of the potential receptors will be considered for such activities by assessing degree of spatial and temporal overlap, both directly and with a buffer.

Impacts Proposed to be Scoped Out

7.12.54 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for IOMU. These impacts are outlined in Table 7.12.6, together with a justification for scoping them out.

Table 7.12.6: Impacts proposed to be scoped out of assessment for IOMU

Impact	Justification for Scoping Out
Construction, Operation and Maintenance and Decommissioning	
Effects on OWF	Scoped out on the basis that there will be no overlap with the various existing OWF and export cables following refinement of the offshore ECC.
Effects on wave and tidal energy sites.	There is no spatial overlap with existing or proposed wave or tidal energy sites and so a pathway for a likely significant effect in EIA terms has not been identified.
Effects on oil and gas assets subject to decommissioning	No impacts are scoped in for any baseline Oil &Gas platforms that are decommissioned (and fully removed) prior to commencement of construction of the Project.
Effects on oil and gas assets or activity from Project offshore export cable installation and operation	Scoped out on the basis that there will be no overlap with the various existing oil and gas activity following refinement of the ECC.
Effects on CCUS	Scoped out on the basis that there will be no overlap with the NEP planned CCUS connecting infrastructure following refinement of the ECC (and no interaction with any CCUS scheme).
Effects on nuclear facilities	There is no spatial overlap with existing or proposed nuclear facilities and so a pathway for a likely significant effect in EIA terms has not been identified.
Effects on waste water assets	Scoped out on the basis that there will be no overlap with the various existing waste water assets following refinement of the ECC.
Effects on marine disposal	Scoped out on the basis that there will be no overlap with the various existing marine disposal sites following refinement of the ECC.
Effects on aggregate dredging	Scoped out on the basis that there will be no overlap with the various existing aggregate licenses following refinement of the ECC.
Cumulative	
N/A	

Potential Transboundary Effects

7.12.55 A description of how potential transboundary effects will be assessed is outlined in Section 5.

7.12.56 The Dutch, Belgian and French EEZs are located approximately 95 km (east), 196 km (south east) and 225 km (south) respectively from the Project array area.

7.12.57 Due to the localised nature of any potential impacts on IOMU receptors, all of which lie wholly within the UK EEZ, together with and the mitigation options available, transboundary impacts will not occur on IOMU and therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

7.12.58 The key steps for the assessment for IOMU section are summarised as follows:

- Refine the study area for the final Project (specifically the final offshore ECC);
- Undertake a further desk study to confirm existing and potential IOMU receptors within the revised study area;
- Undertake consultation with relevant IOMU operators and asset owners to confirm details of current and proposed activity, asset details, decommissioning plans, etc, key issues and to agree the proposed approach to the details assessment for each IOMU receptor;
- Undertake any necessary supporting technical studies to support the IOMU assessment process (e.g. oil and gas platform allision risk assessments);
- Develop preliminary assessments as part of the PEIR to support the statutory consultation with interested parties; and
- Refine the IOMU assessments in light of the consultation for inclusion in the ES, to support the DCO application, including the development of appropriate mitigation and management measures as necessary.

Further Consideration for Consultees

- Do you agree that the data sources identified are sufficient to inform the offshore IOMU baseline for the PEIR and ES?
- Do you agree that all planned and proposed infrastructure in the current study area have been identified?
- Have all potential impacts resulting from the Project been identified for IOMU receptors?
- For those impacts scoped in Table 7.12.5, do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on fixed IOMU receptors?

8 Onshore Environment

8.1 Air Quality

Introduction

8.1.1 This section of the Scoping Report identifies the Air Quality elements of relevance to the Project's onshore cable corridor AoS. This section of the Scoping Report considers the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on Air Quality and sets out the proposed scope of the EIA.

8.1.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.

8.1.3 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 8.3 – Terrestrial Ecology and Ornithology;
- Section 8.6 – Land Use; and
- Section 8.8 – Traffic and Transport.

Study Area

8.1.4 The Study Area is located along and adjacent to the east coast of England between the Humber Estuary, in the north, and the town of Spalding, in the south. It extends along approximately 65 km of the coastline, including the Lincolnshire coast of the Wash and Gibraltar Point. It extends inland up to approximately 13 km from the coast.

8.1.5 The AoS extends into three local authority areas – East Lindsey District Council, Boston Borough Council and South Holland District Council.

8.1.6 In conjunction with Table 8.1.1, a high-level summary of the receiving baseline environment for the AoS is provided below.

Air Quality Management Areas

8.1.7 The AoS has been reviewed for the presence of Air Quality Management Area's (AQMA) within or in proximity to the AoS. AQMAs are areas designated for exceedances of the Air Quality Strategy (AQS) objectives at locations of relevant public exposure in terms of human health. Their presence can therefore give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work.

8.1.8 There are two AQMAs located within the AoS, both in Boston Borough Council's administrative area. The AQMAs, known as 'Haven Bridge AQMA' and 'Bargate Bridge AQMA', are both declared for exceedances of the annual mean nitrogen dioxide (NO_2) AQS objective (40µg/m^3) and were declared in 2001 and 2005, respectively. However, it is noted that Boston Borough Council are presently considering revocation of the Bargate Bridge AQMA, as monitored annual mean NO_2 concentrations within the AQMA have been below the AQS objective since 2018.

8.1.9 Beyond the AoS, there are no AQMAs located within 20 km of the boundary. The closest AQMAs beyond the AoS are located within Wisbech, approximately 21 km from the AoS in Fenland District Council's administrative area. Given the separation distance between the AQMAs and the AoS, impacts on the AQMAs would be considered unlikely.

8.1.10 The AQMAs located within the AoS are presented in Figure 8.1.1.

Baseline Environment

Overview of Available Data Sources

8.1.11 The characterisation of the existing onshore environment will be undertaken using the latest publicly available data sources. At present, this will include the sources displayed in Table 8.1.1, however will be reviewed throughout the EIA lifecycle.

Table 8.1.1: Key Sources of Information for Air Quality

Source	Summary	Spatial coverage
Defra Background Mapping data (2018 reference year).	Defra background mapping data provides semi-empirical annual mean pollutant concentration estimates for the years 2018 to 2030, calibrated within 2018 monitoring data.	Mapping data covers the whole AoS, at a 1km grid square resolution.
Automatic Urban and Rural Network (AURN) of monitors.	Monitoring data from the automatic monitors affiliated with AURN network – operated on behalf of Defra.	The AURN monitors are located at discrete points and are generally considered to represent the locale surrounding the monitor.
Declared AQMAs.	AQMAs are areas designated for present or likely future exceedances of the AQS objectives.	Distinct, designated areas within or adjacent to the AoS.
Air Quality Annual Status Report (ASR) and monitoring locations for each respective Local Authority.	As part of statutory Review and Assessment duties, i.e. Local Air Quality Management (LAQM), local authorities are required to produce an ASR, which summarises the current air quality situation within the authority	The ASR for the local authorities contained within the AoS would be reviewed.

Source	Summary	Spatial coverage
	area and the monitoring undertaken for the preceding year.	
Defra's Pollution Climate Mapping (PCM) model.	The PCM model is a collection of models which provides base and future projections of annual mean pollutant concentrations across the UK. The model was designed for the UK's reporting requirements under the EU Directive (2008/50/EC).	Covers specific road links within the AoS.

8.1.12 Given the presence of national and local monitoring networks within the AoS, it is not presently proposed to undertake any project specific air quality surveys. It is considered that baseline air quality would be obtained from publicly available source (such as those detailed in Table 8.1.1), and this will be sufficient for the purposes of characterising the onshore receiving environment. This is also considered proportionate to the nature of the proposed screening assessment, discussed in further detail below.

8.1.13 However, the suitability of these publicly available datasets will be reviewed and confirmed with statutory consultees throughout the design phase and refinement of the AoS, and upon identification of relevant sensitive receptors to determine if supplementary surveys are required.

Overview of Baseline Environment

AURN Monitors

8.1.14 From an initial review of available baseline datasets, there are no AURN monitors located within or in proximity to the AoS. The closest AURN to the AoS is located approximately 37.5 km away in Lincoln, and is therefore unlikely to be representative of baseline conditions within the AoS, given the separation distance.

PCM Model

8.1.15 There are several road links included within the UK's PCM model, located within the AoS. In the northern extent of the AoS, these are located in the town of Mablethorpe and villages of Trusthorpe and Sutton-on-Sea. In the southern extent of the AoS, these are located in the town of Boston.

8.1.16 Further PCM model road links are located within 10 km of the AoS, within the towns of Skegness and Spalding.

8.1.17 The latest PCM model dataset includes semi-empirical roadside annual average concentration estimates for NO_2 using a reference year of 2018 (the year in which comparisons between modelled and monitoring are made). The 2018 annual mean NO_2 concentrations predicted on all the PCM model road links within and up to 10 km from the AoS are below the annual mean AQAL (40µg/m^3).

Local Monitoring

8.1.18 In fulfilment of statutory requirements, local authorities undergo a process to review and assess air quality within their administrative areas; which is typically informed by local air quality monitoring.

8.1.19 An initial review of the ASRs for East Lindsey District Council, Boston Borough Council, and South Holland District Council was undertaken (where publicly available). This was limited to the ASR published most recently, prior to the COVID-19 pandemic i.e. not impacted by the pandemic, given its implications on monitoring data.

8.1.20 During 2019, Boston Borough Council undertook monitoring of NO_2 at sixteen locations using passive diffusion tube monitors only[28]. The monitors were primarily located in the town centre of Boston, a large number of which were concentrated within the Haven Bridge and Bargate Bridge AQMAs; therefore within the AoS.

8.1.21 During 2019, South Holland District Council undertook monitoring using automatic and non-automatic methods; automatic (continuous) monitoring of NO_2 and PM_{10} at two locations, and non-automatic (passive) monitoring of NO_2 at fifteen locations using diffusion tubes[29]. None of these monitors are located within the AoS, however some of the locations are within 5 km of the AoS.

8.1.22 Recent ASR for East Lindsey District Council have not been made publicly available (although requested), and their monitoring network has therefore not been reviewed at this stage. The network may be of relevance when characterising the baseline environment, given that the AoS covers part of East Lindsey District Council's administrative area.

8.1.23 The monitoring networks and data will be reviewed in further detail upon refinement of the onshore areas.

Sensitive Human Receptors

8.1.24 The presence and locations of sensitive human receptor locations will be determined upon refinement of the onshore areas. Furthermore, the potential inclusion of these receptor locations within the assessment will be determined by application of screening criteria presented in relevant guidance, as detailed in this section.

[28] Boston Borough Council, 2020 Air Quality ASR, July 2020.
[29] South Holland District Council, 2020 Air Quality ASR, August 2020.

520000 540000 560000

380000 360000 340000

N

Haven Bridge AQMA

Bargate Bridge AQMA

Legend

- Air Quality Management Area (AQMA)

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Weston Marsh
- Onshore Scoping Boundary

Sources:
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Coordinate System: British National Grid

0 8 16 km

Scale: 1:250,000

AoS and Air Quality Management Areas

Figure 8.1.1

OUTER DOWSING OFFSHORE WIND

Date: 10/06/2022
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Revision: 0.1

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Designated Sites and Protected Species

8.1.25 There are several declared ecological designations located within and adjacent to the onshore AoS, as displayed in Figure 8.3.1, Figure 8.3.2 and Figure 8.3.3 in Section 8.3. These consist of the following statutory designations:

- SAC;
- SPA;
- Ramsar;
- Site of Special Scientific Interest (SSSI);
- National Nature Reserve (NNR); and
- Local Nature Reserve (LNR).

8.1.26 Further non-statutory designations are also present, such as Ancient Woodland (AW), and would be given due consideration within the assessments, where relevant. However, from initial review, there are no AW within the AoS.

8.1.27 A summary of these designations is provided in Table 8.1.2, however this does not represent a complete nor exhaustive list of designations. Furthermore, the quoted distances should be treated as indicative.

Table 8.1.2: Ecological Designations of Relevance to Air Quality

Site	Closest Distance to AoS (km)	Designation
International		
Humber Estuary	Within	SPA / Ramsar
Gibraltar Point	1.5	SPA / Ramsar
The Wash	Within	SPA / Ramsar
Greater Wash	Adjacent	SPA
The Wash & North Norfolk Coast	Within	SAC
Saltfleetby – Theddlethorpe Dunes & Gibraltar Point	Within	SAC
Inner Dowsing, Race Bank and North Ridge	2.8	SAC
National		
Saltfleetby – Theddlethorpe Dunes	Within	SSSI / NNR
Gibraltar Point	1.5	SSSI / NNR
The Wash	Within	SSSI / NNR
Sea Bank Clay Pits	Within	SSSI
Chapel Point to Wolla Bank	Adjacent	SSSI
Bratoft Meadows	Within	SSSI
Local		
Willoughby Branch Line	0.4	LNR
Havenside	Within	LNR

8.1.28 The presence and locations of sensitive ecological receptor locations will be determined upon refinement of the onshore construction working areas. Furthermore, the potential inclusion of these receptor locations within the assessment will be determined by application of screening criteria presented in relevant guidance, as detailed in this section.

8.1.29 In relation to this, a separate HRA screening report is being produced which will cover European designations in more detail.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.1.30 The approach to the EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of Air Quality will also comply with the following guidance documents where they are specific to this topic:

- Defra: Local Air Quality Management Technical Guidance, LAQM.TG(16);
- Defra: COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021;
- Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM): Land-Use Planning and Development Control: Planning for Air Quality;
- IAQM: Guidance on the Assessment Dust from Demolition and Construction;
- IAQM: A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites; and
- National Highways, Transport Scotland, Welsh Government, and Department for Infrastructure: Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality.

8.1.31 An outline of the proposed construction phase assessment methodology, constituting the main elements of the assessment, is described in the following sections.

Construction Dust Assessment

8.1.32 Potential air quality impacts arising from dust generated from onshore construction activities will be assessed qualitatively in accordance with IAQM guidance (IAQM, 2016).

8.1.33 The IAQM construction dust assessment methodology provides a framework to establish the unmitigated risk of construction dust impacts associated with a development at both human and ecological receptors.

8.1.34 In line with the screening criteria set out within the IAQM guidance, the following sensitive receptors would be considered:

- Human receptors within 350 m of any proposed onshore construction works, and within 50 m of routes used by construction vehicles on the public highway, up to 500 m from the site exits; and
- Ecological receptors within 50 m of any proposed onshore construction works, and within 50 m of routes used by construction vehicles on the public highway, up to 500 m from the site exits.

8.1.35 The likely unmitigated dust emission magnitude associated with four activities (demolition, earthworks, construction and trackout) is initially defined and used in conjunction with the sensitivity of the surrounding area to determine the risk of impact for each activity. These sensitivities are:

- Dust soiling effects on people and property;
- The risk of human health effects due to an increase in exposure to PM_{10}; and
- Ecological impacts.

8.1.36 Following determination of these risks, proportionate mitigation is recommended, with the aim of rendering residual effects as not significant.

8.1.37 Recommended mitigation will form inclusion of the Code of Construction Practice (CoCP) to secure anticipated mitigated effects. The CoCP is embedded into the Project design which will be developed for the proposed onshore construction activities and adhere to construction industry good practice guidance for control measures and dust management.

8.1.38 Where the design includes optionality for the onshore elements of the Project, the maximum design parameters/extents of any proposed construction area will be used for the purposes of defining potential dust sources, where not finalised. This is likely to provide a conservative assessment, and give confidence that all potential impacts are understood in lieu of finalised working areas.

Construction Road Traffic Emissions Screening Assessment

8.1.39 The proposed screening assessment of construction phase generated road traffic vehicles will consider both human and ecological receptors, where relevant.

8.1.40 Traffic data used to inform this screening assessment will be consistent with the analysis undertaken and presented as part of the Traffic and Transport assessment. The screening assessment will consider all proposed construction scenarios where relevant.

Human Receptors

8.1.41 Potential road traffic impacts associated with onshore construction works on sensitive human receptors will initially be screened, in accordance with EPUK and IAQM (EPUK & IAQM, 2017) and DMRB (National Highways, 2019) guidance.

8.1.42 This comprises a two-staged screening procedure to identify whether further assessment with respect to onshore construction traffic flows is required. If none of the criteria are met, then a detailed impact assessment (via the use of dispersion modelling) is consequently not required, and effects on human receptors are considered to be insignificant and can be screened out of further consideration.

8.1.43 The proposed screening procedure is as follows:

- Stage 1: Comparison of onshore construction traffic flows with reference to EPUK and IAQM thresholds to determine the extent of the affected road network:
    - within or adjacent to an AQMA:
        - a change of Light-Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT); and/or

        - a change of Heavy-Duty Vehicle (HDV) flows of more than 25 AADT.
    - outside of an AQMA:
        - a change of LDV flows of more than 500 AADT; and/or
        - a change of HDV flows of more than 100 AADT.
- Stage 2: Spatial review with use of satellite imagery to determine whether relevant exposure exists within 200m of an affected road (as per the DMRB LA 105).

8.1.44 Dispersion modelling is therefore not proposed presently, as initial preference is to undertake a screening assessment to determine the extent of affected areas (if applicable). If required, the technicalities of the dispersion modelling assessment will be agreed with the relevant statutory consultees.

Ecological Receptors

8.1.45 Potential road traffic impacts associated with onshore construction works on sensitive ecological habitats will initially be screened in accordance with IAQM guidance (IAQM, 2020).

8.1.46 This initially comprises a screening assessment to indicate whether onshore construction activities are likely to generate either >1,000 (and/or >200 HDV) AADT movements on a road link within 200 m of a sensitive qualifying ecological feature or result in >1% of a Critical Level and/or Critical Load.

8.1.47 In line with the Habitats Regulations, for the purposes of assessing impacts on sensitive qualifying internationally designated ecological sites (e.g. SAC, SPA and Ramsar), screening will be undertaken in-combination with other projects and plans. This follows the judicial outcomes of the Wealden Judgement[30]. However, when assessing impacts on national and/or local ecological designations, developmental trips will be assessed in isolation (i.e. project alone). This is reflective of the level of protection afforded to these sites within legislation.

8.1.48 The outcomes of the above will determine whether impacts could result in a likely significant effect on the assessed ecological feature (either alone, or in-combination in the context of international sites), and indicate where further detailed assessment is required via use of dispersion modelling.

8.1.49 If the above conditions are not met, then impacts on ecological designations are likely to be imperceptible, whereby resultant effects can be classed as insignificant and further consideration is not needed.

8.1.50 Dispersion modelling is therefore not proposed presently, as initial preference is to undertake a screening assessment to determine the extent of affected areas (if applicable). If required, the technicalities of the dispersion modelling assessment will be agreed with the relevant statutory consultees.

[30] The implication of the Wealden Judgement means that it is no longer appropriate to scope out the need for a detailed assessment of an individual project or plan without first considering the in-combination impact with other projects and plans. Judgment in Wealden District Council v Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority. 2017.

Relevant Embedded Mitigation Measures

8.1.51 The construction dust mitigation measures recommended as part of the construction dust assessment will be included as part of the CoCP, to effectively control the release of dust emissions during the construction phase.

8.1.52 The IAQM construction dust assessment methodology does not include the consideration of embedded mitigation measures when determining the potential risk of dust impacts. Therefore, whilst it is noted that the measures identified within the assessment will be included within the CoCP, they cannot be accounted for in the assessment prior to determination.

8.1.53 The CoCP will include measures relating to the control of emissions from non-road mobile machinery (NRMM), including the type, quantity and use of the NRMM.

Potential Impacts Scoped In

8.1.54 A range of potential impacts on Air Quality have been identified which may occur during the construction phase of the Project. The impacts that have been scoped into the EIA are outlined in Table 8.1.3, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

8.1.55 As detailed earlier, no baseline monitoring surveys are presently proposed given the likely presence of publicly available data sources. However, this position will be reviewed as the onshore working area is refined, allowing for exact definition of the final study area and subsequent availability of data.

Table 8.1.3: Impacts proposed to be scoped in to the assessment for Air Quality

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Construction		
Dust and PM_{10} generated from temporary construction activities on both human and ecological receptors.	The generation of fugitive dust and PM_{10} emissions from anticipated construction activities can impact human receptors (in terms of dust soiling and health impacts) as well as impacts on ecological receptors.	A qualitative assessment of the potential dust impacts arising from onshore construction activities will be undertaken in accordance with IAQM guidance (IAQM, 2016). The IAQM construction dust assessment methodology does not include the consideration of embedded mitigation measures when determining the potential risk of dust impacts. Therefore, the outcomes of this assessment will determine the unmitigated level of risk on both human and ecological receptors (if applicable), and inform proportionate mitigation and controls to render residual effects as not significant. Any proposed mitigation will form inclusion to the CoCP. Where optionality in terms of the design of the onshore elements of the Project exists, the maximum design parameters/extents of any proposed construction area will be used for the purposes of defining potential dust sources where not finalised. This will allow for a wider range of impacts to be understood, allowing for greater flexibility for further design refinements.
Temporary construction-generated road traffic volumes on human receptors.	Temporary increases in road traffic volumes on the public road network generated by construction activities can impact human receptors through a deterioration of local air	Projected road traffic volumes on the public road network will be screened initially with reference to criteria provided by the EPUK and IAQM (EPUK & IAQM, 2017) to determine whether further assessment in relation to human receptors is required via use of dispersion modelling. If required, the technicalities

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
	quality via increased exposure to vehicle emissions.	of the dispersion modelling assessment will be agreed with the relevant statutory consultees. Where optionality in terms of the design of the onshore elements of the Project exists, this optionality (in terms of consequential traffic generation and distribution) will be included in the assessment.
Temporary construction-generated road traffic volumes on ecological receptors.	Temporary increases in road traffic volumes on the public road network generated by construction activities can impact sensitive ecological receptors through a deterioration of local air quality via increased exposure to vehicle emissions.	Projected road traffic volumes on the public road network will be screened initially with reference to criteria provided by the IAQM (IAQM, 2020) to determine whether further assessment in relation to ecological receptors is required via use of dispersion modelling. If required, the technicalities of the dispersion modelling assessment will be agreed with the relevant statutory consultees. Where optionality in terms of the design of the onshore elements of the Project exists, this optionality (in terms of consequential traffic generation and distribution) will be included in the assessment.
Operation and Maintenance		
N/A	N/A	N/A
Decommissioning		
N/A	N/A	N/A
Cumulative		

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Temporary construction-generated road traffic volumes on international designated ecological receptors only.	Cumulative effects from temporary increases in road traffic volumes on the public road network generated by construction activities can impact sensitive ecological receptors through a deterioration of local air quality via increased exposure to vehicle emissions.	Consideration will be given to cumulative impacts for the purposes of the road traffic screening assessment, where necessary and required by guidance. At present, this will be limited to the assessment of international ecological designations for the purposes of facilitating an in-combination assessment prior to screening out effects in isolation, as required by IAQM guidance (IAQM, 2020). This will involve the consideration of committed development trips along the extent of the affected road network for screening. Datasets used to fulfil this in-combination screening assessment will be consistent with analysis undertaken as part of the Traffic and Transport assessment.

Impacts Proposed to be Scoped Out

8.1.56 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Air Quality. These impacts are outlined in Table 8.1.4, together with a justification for scoping them out.

Table 8.1.4: Impacts proposed to be scoped out of assessment for Air Quality

Impact	Justification for scoping out
Construction	
Emissions generated from operation of NRMM during the construction phase.	An assessment of NRMM is scoped out from assessment, as following Defra technical guidance (Defra, 2021), providing suitable controls are applied, emissions generated from NRMM are unlikely to contribute to a significant impact upon local air quality. Appropriate measures, as documented within Defra's technical guidance, will form inclusion of the CoCP. Examples are presented below: • all NRMM should use fuel equivalent to ultralow sulphur diesel; • all NRMM should comply with either the current or previous EU Directive Staged Emission Standards; • all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting); • the on-going conformity of plant retrofitted with DPF, to a defined performance standard; and • implementation of fuel conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, require that equipment is properly maintained to support efficient fuel consumption. Further details, including the type, quantity and use of the NRMM are likely to become available throughout the detailed design stages. In consideration of this, and for transparency, the decision to scope out NRMM will be reviewed and documented within the PEIR and ESwith supporting justifications, in conjunction with statutory consultees.
Emissions generated from offshore vessel movements during the construction phase.	The specific port locations to be utilised by vessels during offshore construction works are yet to be determined, however this will be in accordance with the port's capacity analysis.

Impact	Justification for scoping out
	It is considered that offshore vessel movements associated with construction activities of the Project would represent a small number of overall vessel traffic, therefore accounting for a small proportion of emissions. Furthermore, the North Sea is an Emission Control Area (ECA), whereby strict controls to minimise emissions from shipping are implemented in line with The International Convention for the Prevention of Pollution from Ships (MARPOL), specifically Annex VI Prevention of Air Pollution from Ships. Given the above, potential impacts on onshore receptors are considered negligible and have therefore been scoped out of the assessment.
Operation and Maintenance	
Operational phase traffic movements	Operational phase onshore activities will be limited to maintenance activities, expected to be intermittent/infrequent in comparison to construction activities (which will be assessed in full). Recent involvement in similar wind farm projects indicates approximately 4 to 8 operational traffic movements per day, during an annual testing period. Given the low number of movements, air quality effects arising as a result of anticipated operational activities are believed to be negligible. The decision to scope out operational phase traffic movements will be reviewed and documented within the PEIR and ES, in conjunction with statutory consultees once further details become available.
Emissions generated from offshore vessel movements during the operational phase.	Operational phase offshore vessel movements will be limited to maintenance activities, expected to be intermittent/infrequent in comparison to construction activities. Given this, potential impacts on onshore receptors are considered negligible and have therefore been scoped out of the assessment.
Decommissioning	
Decommissioning phase traffic movements and other works	Details surrounding the decommissioning phase are yet to be fully clarified. Despite this, decommissioning impacts are not considered to be greater than construction effects, given anticipated improvements in local air quality in future years, and the potential for cables to remain in situ reducing the volume of works in comparison. In addition, it is also recognised that policy, legislation, and local sensitivities constantly evolve; which will limit the relevance of undertaking an assessment at this stage.

Impact	Justification for scoping out
	Furthermore, a Decommissioning Plan would be developed and agreed with the relevant authorities and statutory consultees prior to commencement of decommissioning works, to be in line with current guidance, policy, and legislation. It is therefore proposed to scope out an assessment of decommissioning activities at this stage, and undertake this as part of the Decommissioning Plan at a more appropriate time.
Cumulative	
Dust and PM_{10} generated from temporary construction activities on both human and ecological receptors.	Consideration will be given to cumulative impacts arising from the generation of dust from other construction activities occurring locally and concurrently. However, all schemes which are considered to pose a risk of cumulative effects will have had to undertake a construction dust assessment separately relating to their own site activities and associated risks. This would take into account the recommendation to use best practice mitigation to assess residual effects as not significant. IAQM guidance (IAQM, 2016) states that, with the implementation of the recommended mitigation, effects will be not significant. As such, it is not anticipated at this stage that there would be significant cumulative effects associated with construction phase dust emissions. However, this will be reviewed for the purposes of PEIR and ES upon clarification of the extent of cumulative developments to consider, in conjunction with statutory consultees.

Potential Transboundary Effects

8.1.57 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

8.1.58 Potential air quality impacts and effects are predicted to be localised; restricted to the onshore areas where activities are occurring. Therefore, in terms of air quality and transboundary effects, these are considered unlikely to occur and have therefore been scoped out from the EIA.

Summary of Next Steps

8.1.59 The next steps for Air Quality will be as follows:

- Review feedback from stakeholders obtained as part of the scoping process;
- Gather baseline air quality data from publicly available sources (as detailed in Table 8.1.1) and through direct contact with relevant local authorities;

- Determine onshore working areas for the purposes of informing the PEIR;
- Identify sensitive receptors following refinements to the onshore working areas;
- Collate information to inform the PEIR, such as road traffic volumes for the purposes of screening;
- Evaluate whether further assessment is needed in relation to the proposed road traffic screening assessment for both human and ecological receptors, in conjunction with statutory consultees;
- Review suitability of existing baseline air quality monitoring data in the public domain, and determine if supplementary surveys are required, in conjunction with statutory consultees; and
- Undertake the assessment as outlined above.

The data requirements to inform the PEIR include:

- Construction phase road traffic volumes, and associated distribution to allow for initial screening in line with relevant EPUK and IAQM (EPUK & IAQM, 2017) and IAQM (IAQM, 2020) thresholds; and
- Details of the construction areas, methods, and equipment to inform the construction dust assessment in line with IAQM guidance (IAQM, 2016).

Further Consideration for Consultees

8.1.60 The following specific questions are provided to help frame the consultees Scoping Opinion for Air Quality:

- Do you agree that the data sources identified are sufficient to inform the onshore air quality baseline for the PEIR and ES, pending refinement of onshore working areas?
- Do you agree that the methodology for identifying potentially sensitive receptors with respect to the scoped in impacts is sufficient?
- For those impacts scoped in (Table 8.1.3), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you have any specific requirements for the assessment methodology?
- Do you agree that in-combination screening for the purposes of the proposed road traffic screening assessment will only be undertaken in relation to international designations?
- Do you agree that the impacts described in Table 8.1.4 can be scoped out?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on sensitive air quality receptors?

8.2 Archaeology and Cultural Heritage

Introduction

8.2.1 This section of the Scoping Report identifies the Archaeology and Cultural Heritage elements of relevance to the Project's onshore cable corridor AoS. This section of the Scoping Report considers the potential effects from the construction, operation, and maintenance, and decommissioning of the Project, alone and cumulatively on Archaeology and Cultural Heritage and sets out the proposed scope of the EIA.

8.2.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.

8.2.3 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.7: Marine and Intertidal Archaeology;
- Section 7.11: Seascape, Landscape and Visual Impact; and
- Section 8.9: Landscape and Visual Impact Assessment.

Study Area

8.2.4 The Study Area is located along and adjacent to the east coast of England between the Humber Estuary, in the north, and the town of Spalding, in the south. It extends along approximately 65 km of the coastline, including the Lincolnshire coast of the Wash and Gibraltar Point. It extends inland up to approximately 13 km from the coast.

Baseline Environment

Overview of Available Data Sources

8.2.5 For the purposes of the Scoping Report, the Archaeology and Cultural Heritage baseline will reference designated heritage assets as set out in the Table 8.2.1 below. Non-designated heritage assets provided by Lincolnshire County Council will also be referenced albeit the dataset presented has been filtered to present assets of an archaeological nature, the use of this particular dataset in this exercise being used to discuss archaeological potential only, pertinent assets only being selected for the purposes of high level scoping.

Table 8.2.1: Key Sources of Information for Archaeology & Heritage

Source	Summary	Spatial coverage of study area
Historic England	World Heritage Sites (WHS)	These designations are provided as a national data set and cover the AoS in its entirety.
	Listed Buildings (LB)	
	Scheduled Monuments	
	Registered Parks and Gardens (RPG)	
	Registered Battlefields (RB)	
	Conservation Areas	
Lincolnshire County Council	HER entries	These assets are provided as a county level data set and cover the AoS in its entirety. As stated above they have been filtered to reference archaeological potential only, with pertinent assets referenced only.

8.2.6 Table 8.2.2 below, shows the results of baseline collection for each AoS; three areas are identified:

- Onshore ECC;
- Lincs Node OnSS; and
- Weston Marsh OnSS.

8.2.7 It is noted that there is some overlap between the search areas. The designated heritage assets specified below are listed in full within Appendix C – Archaeology and Cultural Heritage Gazetteer of Archaeological AssetsAppendix D – Onshore Ecology Designated Sites. Selected non -designated HER entries are also listed.

Table 8.2.2: Archaeology and Cultural Heritage Assets (as per Landscape and Visual Impact Assessment) within the AoS

AoS	WHS	SM	Grade I LB	Grade II* LB	Grade II LB	CA	RPG	RB	HER
ECC	0	29	28	34	534	10	1	0	1,019
Lincs Node OnSS	0	6	3	5	46	0	0	0	146
Weston Marsh OnSS	0	1	0	0	13	0	0	0	6

Overview of Baseline Environment

Onshore Export Cable Corridor (ECC)

8.2.8 The underground cable works would be anticipated to have the potential to disturb buried archaeological remains and the potential to temporarily affect the significance of designated heritage assets through setting change during the construction period.

8.2.9 A brief overview of the designated heritage assets and pertinent non-designated heritage assets of an archaeological nature within the ECC is provided below. Please note this is an indicative overview for broad scoping purposes only and is not exhaustive. The baseline collection in respect to any defined route would need to consider the baseline in greater detail.

Designated Assets

8.2.10 The designated heritage assets within the ECC are shown on Figure 8.2.1 and Figure 8.2.2 and detailed within Appendix C – Archaeology and Cultural Heritage Gazetteer of Archaeological Assets which also includes reference to pertinent non-designated heritage assets of an archaeological nature.

8.2.11 There are 29 Scheduled Monuments generally indicative of medieval activity including numerous medieval moated sites, medieval religious establishments and castle sites. In general, the known remains of national significance indicate a strong likelihood for medieval activity within other potential moated sites within the search area. The footprints of Scheduled Monuments should be avoided, and the setting of Scheduled Monuments considered albeit it is accepted that any setting change would be temporary.

8.2.12 The highly graded Listed Buildings also reflect medieval activity with the vast majority of the Grade I and II* Listed Buildings being ecclesiastical in nature; churches of medieval or potential medieval origin. Landmark buildings such as churches may be particularly sensitive to setting change, albeit it is accepted that any setting change would be temporary.

8.2.13 Other highly graded Listed Buildings reference residential properties, including three at Grade II* located in rural areas to the south of Boston. The rural backdrop to these assets may contribute towards their overall significance. Outside of the rural areas, the majority of the Listed Building stock is located within the Conservation Areas at Burgh Le Marsh, Wrangle, Boston, Boston (Spilsby Road), Skirbeck, Kirton and Wainfleet, the Conservation Areas generally providing for important elements of setting, albeit setting may not necessarily be confined to the Conservation Area footprints.

Non-Designated Assets

8.2.14 ***Prehistoric***: The earliest evidence of activity is in the northern half of the AoS near Addlethorpe. At this location a palaeolithic worked flint has been recorded (HER reference MLI41804). Further south at Burgh le Marsh a temporary Mesolithic hunting camp has been recorded (MLI81410). At the other end of the AoS, at Fishtoft, a Mesolithic worked flint has also been recorded (HER reference MLI12736). Other worked flint of various prehistoric date is referenced across the AoS indicating widespread transient activity. Evidence for prehistoric funerary activity is restricted to four possible burial mounds. These include three recorded in the northern part of the AoS; one at Markby, another near Saleby and one at Hogsthorpe (HER references MLI42523, MLI41469 & MLI97718). The remaining possible burial mound is at Fishtoft in the south of the area (HER reference MLI12759). Neolithic/Bronze Age pottery sherds are sparse, restricted to Burgh le Marsh (MLI89860 & MLI80565), Wrangle (HER reference MLI13196/MLI13192) and Boston (MLI88193). A whetstone of potential Early Bronze Age to Late Iron Age date has been retrieved at Fishtoft (HER reference MLI12740). The location of any known foci of prehistoric settlement activity is unknown albeit potential cropmark sites of prehistoric or Roman date are recorded in the north and south of the area (HER references MLI90836 and MLI90821 respectively) and there are a number of undated cropmark sites which could be associated with settlement of this date also. A single Iron Age ditch is recorded in the north of the area (HER reference MLI82497). South of Skegness there is a notable absence of prehistoric evidence in the vicinity of the modern coastline indicating that the prehistoric coastline within much of the AoS was inland to that which is present today.

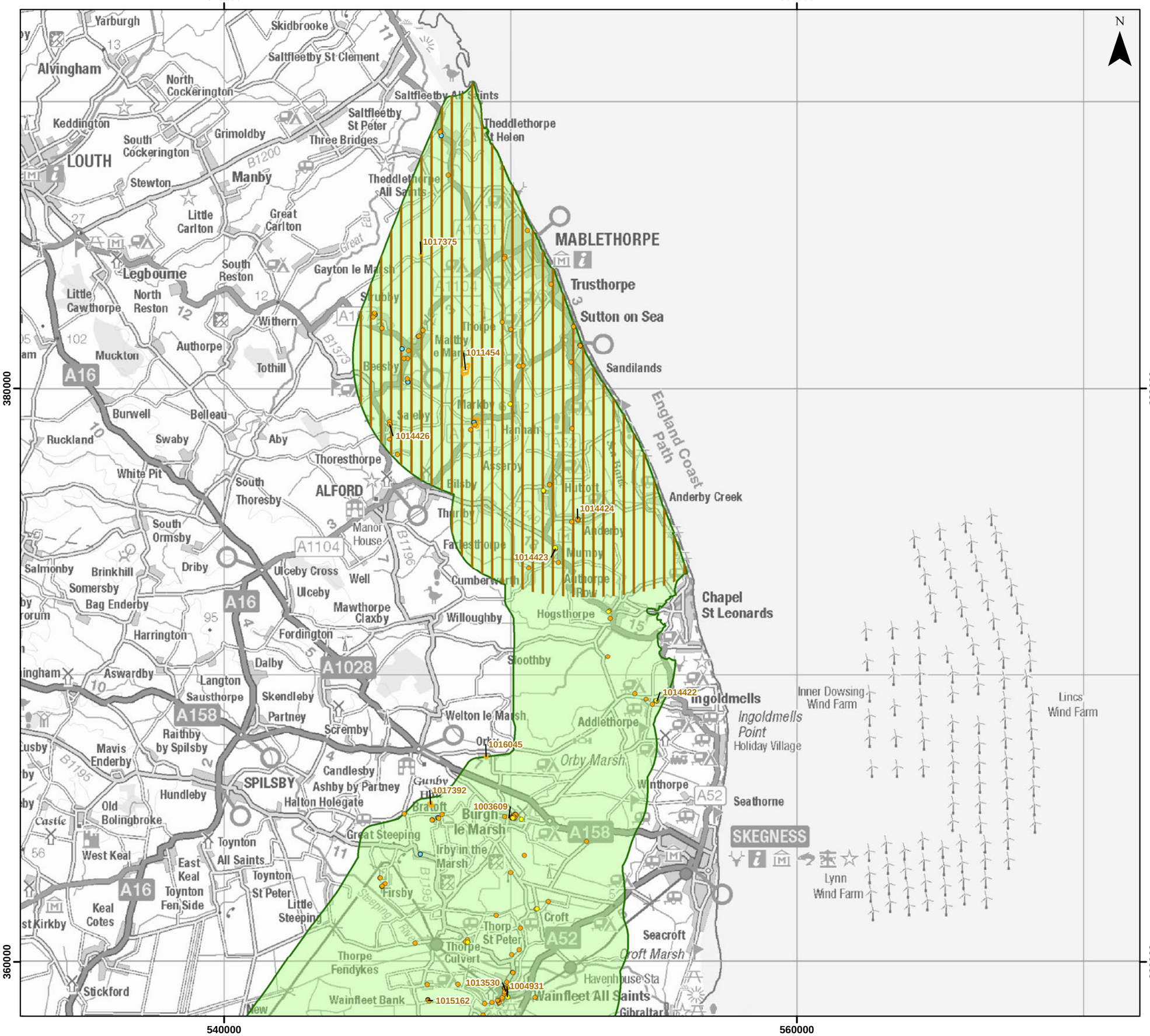
8.2.15 ***Roman***: A potential settlement and cremations of Romano-British date are recorded in the north of the area at Thoresthorpe (HER references MLI42526 & MLI90875). Also in the northern part of the AoS are a Roman road and late Iron Age/Romano-British settlement activity recorded at Burgh le Marsh (HER references MLI42944 & MLI99129). In the vicinity and perhaps more notable is the possible site of the Roman town of Vainona (HER reference MLI41912). A Roman aqueduct is recorded at Friskney (MLI41780). In the central area of the AoS a large number of Iron Age/Romano-British salterns are recorded indicating periods of inundation across the entirety of the central part of the AoS. Associated settlement in this part of the AoS is recorded at Wrangle (HER references MLI13128, MLI13220 & MLI13140) where localised areas of higher ground may have been present. Moving south, further areas of settlement are evident at Fishtoft (HER reference MLI12728) and in and around Boston (HER references MLI88847, MLI 12624 & MLI12605).

8.2.16 ***Saxon***: Evidence for Saxon settlement is recorded at Cumberworth, Beesby in Marsh, Maltby le Marsh, Huttoft and Mumby in the north of the area (HER references MLI81930, MLI115894, MLI98561, MLI43299 & MLI82080) and also at Burgh le Marsh slightly further south (HER reference MLI80563). In the centre of the area it is recorded at Friskney, Wrangle, Wolmersley, Old Leake and Leverton (HER references MLI41788, MLI13145, MLI81190 MLI13146, MLI13159, MLI13170, MLI13195, MLI8874 & MLI13272), a Saxon saltern being referenced at Wrangle also (HER reference MLI13230). Saxon settlement is also refenced at Boston and Kirton in the south of the AoS (HER reference MLI81656) and Fishtoft (MLI13362). Saxon/medieval seabanks to the east of Boston indicate periods of inundation/coastal flooding in the eastern part of the AoS (HER references MLI97710, MLI12783 & MLI12777).

8.2.17 ***Medieval:*** The A52 extending north-south within the central part of the area is recorded as a medieval route and may potentially indicate the edge of permanent 'dry' land in this region during this period. A notable section between Wainsfle*et al*l Saints Dunscroft Farm (TF 445 521 – TF 502 582) is recorded as a medieval saltern (MLI82744) indicating that seawater came up to the line of the A52 at this location. Further medieval salterns are recorded in the present-day land between the A52 and the coast indicating continued periodical inundation (HER references MLI13174, MLI13208 & MLI13190). Further seabanks are recorded in the south of the AoS at 'Moulton-Seas-End' (HER references MLI98445-6). The stand-off from the current coastline is reflected by a distinct lack of ridge and furrow, enclosures and house platforms of medieval date in the vicinity of the eastern part of the AoS, certainly the coastal strip south of Skegness is devoid of such activity apart from a possible medieval hall site at Hall Farm (TF 512570) (HER reference MLI41733). North of Chapel St Leonards in the north of the AoS, the medieval sea wall was in much closer proximity to the modern coastline (HER references MLI88781, MLI88782 & MLI88784). Overall, concentrations of medieval village settlement are scattered across the area, greatly reflecting the modern day settlement pattern

8.2.18 ***Post Medieval/Modern***: Later activity includes WWII activity in the form of a number of pillboxes, a search light battery and anti-glider ditches.

8.2.19 ***Summary***: In summary there is a potential for activity dating to all periods from the prehistoric, Roman-British, Saxon and medieval periods albeit the eastern parts of the AoS (south of the Skegness region) are lacking in recorded remains. This is likely due to the coastline being further west before post-medieval drainage works. The eastern part of the AoS (south of Skegness) has a lower archaeological potential.



Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node

Listed Building (Grade)

- I
- II
- II*
- Scheduled Monument

Note:
Listed Buildings ID labels removed from figure to aid legibility for the reader

Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Designated Heritage Assets within the AoS and the Lincs Node OnSS Search Area

Figure 8.2.1

OUTER DOWSING OFFSHORE WIND

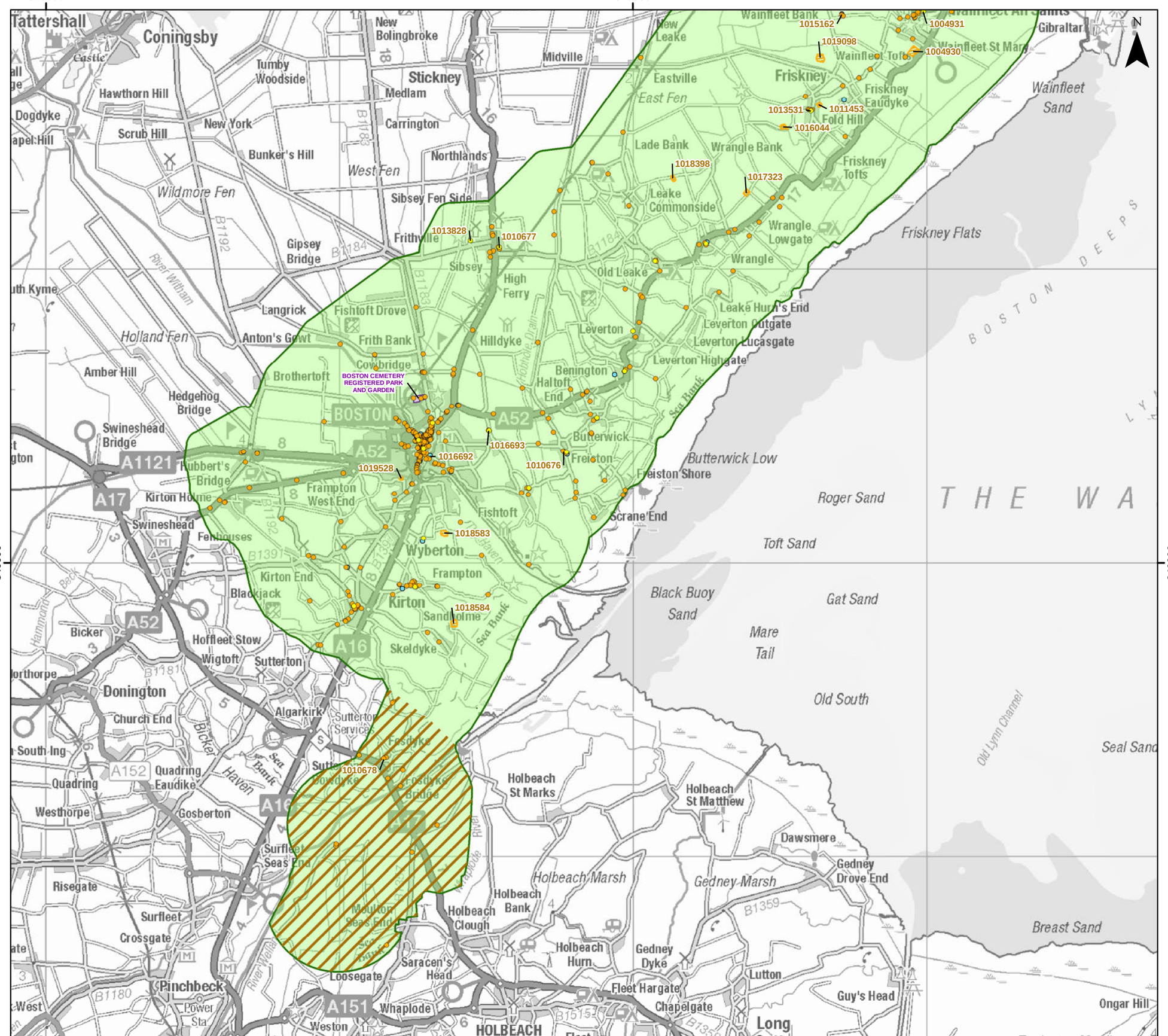
Date: 15/06/2022
Produced By: JRS
Revision: 0.1

SLR

520000

540000

340000



Legend

- Onshore Scoping Boundary

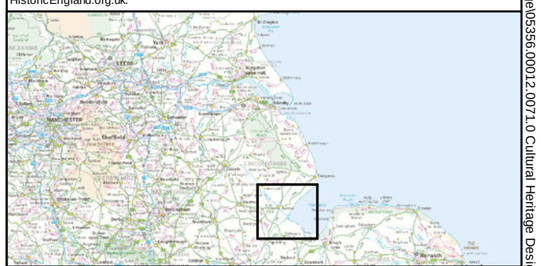
Indicative Grid Connection Search Areas

- Weston Marsh

Listed Building (Grade)

- I
- II
- II*
- Scheduled Monument
- Registered Park and Garden

Note:
Listed Buildings ID labels removed from figure to aid legibility for the reader



Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Designated Heritage Assets within the AoS and the Weston Marsh OnSS Search Area

Figure 8.2.2

OUTER DOWSING OFFSHORE WIND

Date: 15/06/2022
Produced By: JRS
Revision: 0.1

SLR

Onshore Substation

8.2.20 The general potential for below ground remains within the footprint of the OnSS(s) would be similar to that cited above for the ECC, a broad potential for medieval in the first instance followed by a prehistoric and Roman potential.

8.2.21 In contrast to the onshore cable route which may cause temporary change within the setting of a designated heritage asset, the OnSS would be considered to have the potential to cause permanent change within the setting of designated heritage assets.

8.2.22 Designated heritage assets are shown on Figure 8.2.2 and Figure 8.3.1.

8.2.23 The baseline collection in respect to the OnSS would need to consider the presence/absence of designated heritage assets which may be sensitive to changes within setting. The search area deployed to assess the potential for impacts to designated assets through setting change would be dependent upon the height and bulk of the proposed OnSS. On current information it is anticipated that the search area(s) would be no greater than 2km and would sit within one the AoS detailed in Table 8.2.2 which references the number of each asset type in each AoS. It should be noted, however, that the sensitivity of each AoS in respect to this type of impact should not be gauged on the number of assets, as not all assets are sensitive to setting change. However, assets of particularly high significance such as Scheduled Monuments and Grade I and II* Listed Buildings are generally more sensitive to setting change.

Designated Assets

8.2.24 The scoping area for the Lincs Node OnSS includes six Scheduled Monuments, all medieval in date and eight highly grade Listed Buildings, all churches. As referenced above the landmark status of many churches can make them particularly susceptible to setting change which in this case would be permanent. A further 46 Grade II Listed Buildings are present predominantly located within coastal settlements and inland hamlets. The inland Grade II Listed Buildings include some farmsteads which may be sensitive to change in respect to rural backdrops.

8.2.25 The scoping area for the Weston Marsh OnSS includes one Scheduled Monument, medieval in date. A further 13 Grade II Listed Buildings are present which include a number of farmhouses which may be sensitive to change within a rural backdrop.

Non- Designated Assets

8.2.26 ***Lincs Node OnSS***: Two possible prehistoric burial mounds are recorded; one in the central part of the area at Markby and another mid-way along the area's western boundary near Saleby (HER references MLI42523 & MLI41469). Other records of this date comprise worked flint indicative of wider transient activity. The location of any known foci of settlement is unknown albeit a single Iron Age ditch is recorded in the south of the area (HER reference MLI82497). Evidence for activity into the Roman period is attested to on the western boundary of the AoS at Thoresthorpe where Romano-British cremations and a possible cropmark enclosure are recorded (MLI42526 & MLI90878). Other evidence of Romano-British date is restricted to findspots including coins and pottery which are recorded sporadically across the area. Anglo Saxon settlement is recorded at Cumberworth, Beesby in Marsh, Maltby le Marsh, Huttoft and Mumby (HER references MLI81930, MLI115894, MLI98561, MLI43299 & MLI82080). The medieval sea wall appears to have been constructed close to the modern coastline (HER references MLI88781, MLI88782 & MLI88784). Numerous areas of agricultural activity and deserted settlements of medieval date are recorded to the rear of the sea wall and across the area. Later activity includes WWII activity in the form of RAF Strubby (HER reference MLI88710) and a number of aircraft obstructions and pillboxes. An aircraft crash site is also recorded in the north of the area (HER reference MLI124924).

8.2.27 In summary the area has the potential for remains of prehistoric, Romano-British, Anglo Saxon and medieval date.

8.2.28 ***Weston Marsh OnSS:*** No archaeological remains of prehistoric or Roman date are recorded in the AoS. The earliest evidence of activity are the remains of a medieval sea wall (HER reference MLI98446 & MKI998445) and a medieval saltern (HER reference MLI20378). This may indicate that prior to the medieval period the land north of the River Welland was inundated. A possible moated site is recorded to the south of the medieval sea wall. Of unknown date, this could be medieval in origin (HER reference MLI20329) and reference the earliest occupation of the area prior to receding sea levels. A post medieval windmill is recorded to the north of the River (HER reference 13009). Later activity includes WWII activity in the form of pillboxes.

8.2.29 In summary archaeological potential is relatively lacking and likely restricted to remains from the medieval period onwards.

Offshore Infrastructure

8.2.30 Potential setting impacts to the terrestrial designated heritage assets listed in Table 8.2.2 from the WTGs, located approximately 54km offshore, are not anticipated, albeit anomalous impacts would be highlighted during baseline collection and/or through consultee responses and assessed. Likewise, the anticipated distance between terrestrial heritage assets listed in Table 8.2.2 and any OSP located within proximity to the turbine array would likely negate the necessity for any assessment of potential impacts to designated heritage assets through setting change. Again, if this is not the case, baseline studies and/or consultee responses would trigger assessment.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.2.31 The Archaeology and Heritage chapter of the PEIR and subsequent ES would be supported by technical appendices prepared in accordance with guidance referenced below. The technical appendices would include an Archaeological Desk Based Assessment (DBA) prepared to assess the potential direct impact to the buried archaeological resource. Supporting archaeological information would also be provided through reports referencing the results of evaluation fieldwork should this be undertaken prior to the completion of the assessment. A further technical appendix would comprise a Heritage Statement prepared specifically with regard to potential in-direct effects as a consequence of changes within the setting of designated heritage assets.

8.2.32 The study area referenced by the technical appendices (and referred to within the ES chapter) will be refined as necessary in each technical appendix. The study area for the DBA will be restricted to an overall search area of up to 500m from the route. This search area will be used for consultation with the Lincolnshire, Humber and Nottinghamshire Historic Environment Records and is expected to represent the archaeological character of the route. A targeted review of historic mapping and a targeted walkover survey within this study area would further inform on archaeological potential.

8.2.33 The study area for the Heritage Statement will include an area of 2km around any above ground terrestrial installations, namely the OnSS. This will capture any designated heritage assets potentially sensitive to permanent change within their setting. The study area for assessing potential impact through temporary setting change associated with the installation of the onshore export cable will be restricted to a 500m corridor either side of the route. This reflects the short-term nature of setting impacts associated with the construction of the cable route.

8.2.34 In all instances, however, the search area for baseline collection/consideration could be extended under the professional judgement of the heritage consultant and/or in response to stakeholder comments specifying particular assets where necessary.

8.2.35 The datasets interrogated for the specified search areas would include:

- National GIS datasets for designations held by Historic England;
- the National Heritage List;
- Nottinghamshire, Humber and Lincolnshire Historic Environment Records for non-designated heritage assets and Conservation Areas (if available);
- the Environment Agency's library of open access LiDAR data (Digital Surface Model (DSM), Digital Terrain Model (DTM) and point cloud);
- the Ordnance Survey open-source library, for topographic and cartographic data, including elevation point cloud, contour and hydrological data;
- Nottinghamshire, East Riding of Yorkshire, and Lincolnshire Archives (archives), for relevant historic mapping and documentary sources not obtainable online; and Reports relating to archaeological excavations within, and within proximity to, the Site.

8.2.36 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of Archaeology and Cultural Heritage will also comply with the following guidance documents where they are specific to this topic:

- The Setting of Heritage Assets Historic Environment Good Practice Advice in Planning Note 3 (second edition) (2017);
- Commercial Renewable Energy Development and the Historic Environment Historic England Advice Note 15 (2021);
- Statements of Heritage Significance Analysing Significance in Heritage Assets Historic England Advice Note 12 (2019);
- Principles of Cultural Heritage Impact Assessment in the UK (Institute of Environmental Management and Assessment (IEMA)/ Institute of Historic Building Conservation (IHBC)/ Chartered Institute for Archaeologists (CIfA) 2021);
- Standard and guidance for historic environment desk-based assessment (CIfA 2020a);
- Standard and guidance for archaeological field evaluation (CIfA 2020b) where applicable; and
- Standard and guidance for archaeological geophysical survey (CIfA 2020c) where applicable.

8.2.37 Historic England's Good Practice Advice in Planning Note 3 'The setting of Heritage Assets' (Historic England, 2017) will be essential in the Heritage Statement in respect to identifying designated heritage assets which may be sensitive to setting change. As 'step 1' assets will be filtered for subsequent assessment. Filtering will consider themes such as asset type, physical surroundings and sense of enclosure and other considerations as set out within the guidance.

8.2.38 A ZTV may also be utilised in respect to the OnSS albeit the flat nature of the landscape would likely render this an ineffectual tool. A ZTV may also be utilised in respect to the offshore WTG array albeit it is anticipated that the location of the WTGs which will be present at least approximately 54km offshore will negate the assessment of indirect effects caused by offshore elements, albeit this would be confirmed through the professional experience of the heritage consultant and with due regard to any stakeholders who may wish to include specific assets for consideration here.

8.2.39 Within the technical appendices designated heritage assets which are considered to be sensitive to change and archaeological remains which could be affected by ground disturbance would be subject to the preparation of statements of significance. In all instances a description of the significance of an asset would be provided in proportion to the asset's importance/likely importance and with due regard to the anticipated level of potential impact, the level of information provided be enough to understand the effect of any impact. Impacts to designated heritage assets will be referenced in accordance with the terminology of the National Planning Policy Framework (NPPF) alongside standard EIA terms i.e., any impact to a designated heritage asset would be described as 'less than substantial harm' or 'substantial harm'.

Relevant Embedded Mitigation Measures

8.2.40 Any potential harm to archaeological remains of national importance could be avoided by the careful routing of the onshore export cable around particularly sensitive locations, such as Scheduled Monuments or other areas containing remains of national importance identified through baseline data collection. The potential necessity for/consideration of this could arise during initial baseline collection for the selected route but may not arise until the undertaking of archaeological fieldwork.

8.2.41 Any potential harm to the setting of a designated heritage asset could be minimised (reduced) through sympathetic massing and locating of above ground infrastructure (the OnSS) such that any identified important views are protected where possible. Screening to the OnSS could also be strengthened or introduced as part of any landscaping proposals to minimise any harm to a designated heritage asset through visual change within setting. Lighting proposals could also be designed to prevent light spillage should this be identified as a potential impact to a designated heritage asset through setting change.

Potential Impacts Scoped In

8.2.42 A range of potential impacts on Archaeology and Heritage have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the Project EIA are outlined in Table 8.2.3, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 8.2.3: Impacts proposed to be scoped into the assessment for Archaeology & Cultural Heritage

Impact	Description	Proposed Approach to Assessment Including Description of any New Data Collation Required and any Analyses (Such as Modelling)
Construction		
Direct Effects	Ground disturbance causing the removal/truncation of buried archaeological remains. This could be related to activities within the landfall zone, soil stripping for the site compounds, and access routes, soil stripping and excavation along the export cable easement, and the excavation of foundations associated with the OnSS. This is not presented as an exclusive list.	Potential impact to the buried archaeological resource would be assessed through standard desk-based research including re-consultation with the Lincolnshire Historic Environment Records (if this is necessary), historic map analysis and a targeted site walkover survey. Evaluative techniques such as geophysical survey and trial trenching would also be utilised where necessary to inform on archaeological potential and significance. *Standard and guidance for historic environment desk-based assessment (CIfA 2020a)* *Statements of Heritage Significance Analysing Significance in Heritage Assets Historic England Advice Note 12 (Historic England 2019)* *Principles of Cultural Heritage Impact Assessment in the UK (IEMA/IHBC/CIFA 2021);* *Standard and guidance for archaeological field evaluation (CIfA 2020b) where applicable; and* *Standard and guidance for archaeological geophysical survey (CIfA 2020c) where applicable.*
	Loss of Important hedgerows qualifying under the historic criteria.	Hedgerows identified by the ecology baseline will be reviewed for importance under the five historic criteria presented in the Hedgerow Regulations (1997).
In-direct Effects	Short term change within the setting of designated heritage assets could affect the appreciation of their cultural significance. This could occur during construction and be associated	Utilisation of Historic England's guidance on assessing setting impacts to first determine which assets are potentially sensitive to change and then which assets of this subgroup would experience an effect upon their cultural significance.

Impact	Description	Proposed Approach to Assessment Including Description of any New Data Collation Required and any Analyses (Such as Modelling)
	with visual and audible changes associated with heavy plant (presence and movements) and earthworks associated with haul roads and the pipeline cut.	*The Setting of Heritage Assets Historic Environment Good Practice Advice in Planning Note 3 (second edition) (2017)*
Operation and Maintenance		
In-direct Effects	The presence of above-ground infrastructure could cause change within the setting of a designated heritage asset which may affect an appreciation of its cultural significance. These impacts are most likely to occur in the setting of heritage assets within the vicinity of the OnSS. Effects caused by the permanent offshore structures (the turbine array and OSP are considered to be unlikely given their location 54km offshore. However, effects cannot be discounted and would be considered for isolated assets should they be identified by the heritage consultant or identified within stakeholder responses.	Utilisation of Historic England's guidance on assessing setting impacts to first determine which assets are potentially sensitive to change and then which assets of this subgroup would experience an effect upon their cultural significance. *The Setting of Heritage Assets Historic Environment Good Practice Advice in Planning Note 3 (second edition) (2017)*
Decommissioning		
Direct Effects	None. It is anticipated that decommissioning would not necessitate the removal of terrestrial components associated with the buried cable nor any ground disturbance at the OnSS which would necessitate new ground disturbance.	

Impact	Description	Proposed Approach to Assessment Including Description of any New Data Collation Required and any Analyses (Such as Modelling)
In-direct Effects	Decommissioning of the OnSS could cause short term change within the setting of designated heritage assets which could affect the appreciation of their cultural significance. This would be associated with visual and audible changes and would be considered to be short term.	Utilisation of Historic England's guidance on assessing setting impacts to first determine which assets are potentially sensitive to change and then which assets of this subgroup would experience an effect upon their cultural significance. *The Setting of Heritage Assets Historic Environment Good Practice Advice in Planning Note 3 (second edition) (2017).*
Cumulative		
Direct Effects	Ground disturbance affecting archaeological remains would add to the cumulative disturbance of remains in general.	The PEIR / ES chapter will consider the potential cumulative effect of consented (not built out) schemes and pending schemes.
In-direct Effects	Cumulative impact through setting change caused by consented (but not built out) schemes and pending schemes could combine with any effects identified to cause a greater cumulative effect.	The PEIR / ES chapter will consider the potential cumulative effect of consented (not built out) schemes and pending schemes.

Impacts Proposed to be Scoped Out

8.2.43 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Archaeology and Cultural Heritage. These impacts are outlined in Table 8.2.4, together with a justification for scoping them out.

Table 8.2.4: Impacts proposed to be scoped out of assessment for Archaeology & Cultural Heritage

Impact	Justification for scoping out
Construction	
The consideration of indirect (setting) effects caused by the construction of the onshore export cable on designated heritage assets located in excess of 500m from the route.	Any change within the setting of a designated heritage asset experienced during the laydown of the export cable would be short term. In recognition of this, the baseline assessment would only consider change within the setting of designated heritage assets within 500m of the landfall and cable route. Only highly graded landmark assets outside of this would be considered at the discretion of the heritage consultant and in accordance with any stakeholder comments.
Operation and Maintenance	
The consideration of indirect (setting) effects caused by the presence of the OnSS on designated heritage assets in excess of 2km from the installations.	The OnSS buildings are anticipated to extend to a height of c.25m-30m. As such, change within the setting of designated heritage assets located in excess of 2km from the OnSS which could affect their cultural significance is not anticipated. In recognition of this the baseline assessment for indirect effects would only consider designated heritage assets within 2km of the OnSS. Only highly graded landmark assets outside of this study area would be considered at the discretion of the heritage consultant and in accordance with any stakeholder comments.
The consideration of indirect (setting) effects caused by the offshore turbines and OSP on terrestrial designated heritage assets not highlighted by stakeholders or identified as being potentially sensitive by the heritage consultant.	The turbines are to be located at least 54km offshore. Despite a potential maximum height of c.405m this distance is likely to prevent any tangible effect on the cultural significance of terrestrial heritage assets. Unless directed by the professional judgement of the heritage consultant or stakeholder comments in reference to specific assets, it is anticipated that the effect of the turbines on the cultural significance of terrestrial designated assets in general can be scoped out.
Decommissioning	
N/A	N/A
Cumulative	
N/A	N/A

Potential Transboundary Effects

8.2.44 Section 5 provides a description of how potential transboundary effects will be assessed. Due to the localized nature of any onshore Archaeology and Cultural Heritage impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

8.2.45 It is anticipated that the PEIR chapter will reference a baseline in respect to a preferred onshore route corridor and OnSS location. The baseline may be presented with supporting technical appendices including an Archaeological DBA and a Heritage Statement if these have been prepared at this stage. It is anticipated that supporting archaeological fieldwork reports (if fieldwork is required at the predetermination stage) may not be available for the PEIR.

8.2.46 The study area referenced to assess archaeological potential would be set at up to 500m from the preferred route corridor. This search area will be used for consultation with the Lincolnshire, Historic Environment Records and is expected to represent the archaeological character of the preferred route corridor. Targeted walkover surveys of the route and OnSS footprints may have been undertaken at this stage. Likewise, targeted map regression may have been undertaken. If not undertaken, these elements would be presented within the final ES submission.

8.2.47 The study area referenced to assess setting impacts would be set at 2km around any above ground terrestrial installations, namely the OnSS. This will capture any designated heritage assets potentially sensitive to permanent change within their setting. A ZTV may be useful at this stage. Full statements of significance and conclusions on setting impact may be delayed until the provision of the ES chapter and a full Heritage Statement. The study area for assessing potential impact through temporary setting change associated with the installation of the onshore export cable will be restricted to a 500m corridor either side of the route. This reflects the short-term nature of setting impacts associated with the construction of the cable route.

8.2.48 In all instances, however, the search area for baseline collection/consideration could be extended under the professional judgement of the heritage consultant and/or in response to stakeholder comments specifying particular assets.

8.2.49 A ZTV may be required to assist in the assessment of setting impacts in relation to the OnSS. A ZTV may also be utilised in respect to the offshore WTG array albeit it is anticipated that the location of the WTGs which will be present at least 54km offshore will negate the assessment of indirect effects caused by offshore elements, albeit this would be confirmed through the professional experience of the heritage consultant and with due regard to any stakeholders who may wish to include specific assets for consideration here.

8.2.50 In respect to the potential for archaeological fieldwork, it is anticipated that the footprint of disturbance associated with the OnSS, the cable easement and any disturbance associated with compounds and access tracks may require an archaeological response. The timing/potential targeting of this response would depend on initial baseline collection and consultee responses from the LPA archaeologists and (where relevant) Historic England. It is anticipated that predetermination field evaluation could be limited to geophysical survey and (where necessary) targeted trial trenches.

Further Consideration for Consultees

8.2.51 The following specific questions are provided for to help frame the consultees Scoping Opinion for Archaeology and Cultural Heritage:

- Do you agree that the data sources identified are sufficient to inform the onshore archaeology and heritage baseline for the Project PEIR and ES?
- Do you agree with the search areas identified?
- Have all potential impacts resulting from the Project been identified for archaeology and heritage receptors?
- Do you agree that the impacts described in Table 8.2.4 can be scoped out?
- For those impacts scoped in (Table 8.2.3), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects on archaeology and heritage receptors?
- Do you have any specific requirements for the archaeology and heritage methodology?
- At this stage do you have any comment on the necessity for predetermination field evaluation.

8.3 Onshore Ecology

Introduction

8.3.1 This section of the Scoping Report identifies the onshore ecology elements of relevance to the Project's onshore cable corridor AoS. It considers the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on onshore ecology and sets out the proposed scope of the EIA.

8.3.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location. This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 7.1 Marine Physical Processes;
- Section 7.3 Benthic and Intertidal Ecology;
- Section 7.6 Offshore and Intertidal Ornithology;
- Section 8.1 Onshore Air Quality;
- Section 8.5 Hydrology and Flood Risk; and
- Section 8.7 Noise and Vibration.

Study Area

8.3.3 The Study Area is located along and adjacent to the east coast of England between the Humber Estuary, in the north, and the town of Spalding, in the south. It extends along approximately 65 km of the coastline, including the Lincolnshire coast of the Wash and Gibraltar Point. It extends inland up to approximately 13 km from the coast.

Baseline Environment

Overview of Available Data Sources

8.3.4 An initial desk-based study has been undertaken to identify sources of existing ecological data and to collect some of that data to inform this Scoping Report.

8.3.5 The initial desk-based study included a search for internationally important sites (Special Areas of Conservation (SACs), SPAs and Ramsar Sites); nationally important sites (SSSIs) and National Nature Reserves (NNRs)) and locally important sites designated (Local Nature Reserves (LNRs)). Also included are priority habitats and ancient woodland. Some consideration is also given to local wildlife sites and protected and priority species although more detail will be required for these at later stages of the assessment.

8.3.6 The initial desk-based study comprised a review of standard online and published sources. Table 8.3.1 lists the data sources that have been used to inform this Scoping Report (giving the date that data were obtained where applicable), and data that will be obtained to inform the EIA, and their spatial coverage (where known).

Table 8.3.1: Key sources of information for Onshore Ecology and Ornithology

Source	Summary	Spatial coverage of AoS	Included in initial desk study?
Joint Nature Conservation Committee (JNCC) jncc.gov.uk website (27th May 2022)	SAC and SPA details including qualifying interest features, conservation objectives, standard data forms.	AoS plus 15 km buffer.	✓
Multi-agency Geographic Information Centre (MAGIC) website Magic.gov.uk/ Natural England's Designated Sites Viewer designatedsites.naturalengland.org.uk/ and Ramsar Site Information Service https://rsis.ramsar.org/ (27th May 2022)	SACs and possible SACs and Impact Risk Zones, spatial extent, and citation.	AoS plus 15 km buffer.	✓
	SPAs and potential SPAs and Impact Risk Zones, spatial extent, and citation.	AoS plus 15 km buffer.	✓
	Ramsar Sites and proposed Ramsar Sites, spatial extent, and citation.	AoS plus 15 km buffer.	✓
	SSSIs and NNR and Impact Risk Zones, spatial extent, and citation.	AoS plus 2 km buffer.	✓
	LNR, spatial extent.	AoS plus 2 km buffer.	✓
	Ancient Woodland Inventory, spatial extent.	AoS plus 2 km buffer.	✓

Source	Summary	Spatial coverage of AoS	Included in initial desk study?
	Priority Habitat Inventory for grasslands, heathlands, wetland, woodland and other habitats, type and spatial extent.	AoS plus 2 km buffer.	✓
	Great Crested Newt (GCN) Pond Surveys 2017 – 2019, location of GCN breeding ponds. GCN Survey Licence Returns, location of GCN breeding ponds.	AoS plus 2 km buffer.	✓
	Granted European Protected Species Licences, location and species.	AoS plus 2 km buffer.	✓
	Important plant areas (Plantlife GB)	AoS plus 2km buffer.	✓
	Priority species layers	AoS plus 2km buffer.	✓
RSPB (12 November 2021)	RSPB reserve details, including qualifying interest features, and conservation objectives.	AoS plus 2km buffer.	✓
Greater Lincolnshire Nature Partnership, biological records	Data on Local Wildlife Sites	AoS plus 2km buffer	High level review undertaken to be revised for PEIR
North Lincolnshire Council (25 November 2021)	LNR and LWS sites and site information.	AoS plus 2km buffer	

Source	Summary	Spatial coverage of AoS	Included in initial desk study?
East Lindsey District Council Local Plan	LNR and LWS sites and site information.	AoS plus 2km buffer	when route of ECC is better defined
South East Lincolnshire Local Plan	LNR and LWS sites and site information.	AoS plus 2km buffer	
Woodland Trust (24 November 2021)	Access to veteran tree records within and surrounding the AoS.	AoS plus 2km buffer.	
Bat Conservation Trust (BCT) (16 November 2021)	Bat distribution map and records.	AoS plus 2km buffer.	✓
John Russ – Bat Calls of Britain and Europe (16 November 2021)	Bat distributions within the UK.	AoS plus 2km buffer.	✓
Record Pool https://www.recordpool.org.uk/ (16 November 2021)	Access to public records of reptiles and amphibians within the AoS.	AoS plus 2km buffer.	✓
Online Atlas of the British and Irish flora https://plantatlas.brc.ac.uk/	All plant species; reviewed for certain species of rare arable weeds only.	AoS plus 2km buffer.	Selected species only (Rare arable weeds)
British Trust for Ornithology Bird Atlas (online version) https://app.bto.org/mapstore/StoreServlet	All bird species; reviewed for certain species of conservation concern only.	AoS plus 2km buffer.	Selected species only (Wetland and Farmland Birds)
Greater Lincolnshire Nature Partnership, biological records	Data on Protected and Priority Species	AoS plus 2km buffer	No
Wetland Bird Survey Data held by the British Trust for Ornithology	Wetland and coastal bird data from specific count areas, species and counts.	None obtained from this source to date, however data are available for wetland SSSI, SPA and Ramsar sites within/ near	No

Source	Summary	Spatial coverage of AoS	Included in initial desk study?
		the AoS. Data from count sectors within and adjacent to the AoS will be obtained.	

*AoS refers to the Outer Dowsing Onshore Scoping Boundary

Overview of Baseline Environment

Designated Sites

8.3.7 Figure 8.3.1, Figure 8.3.2 and Figure 8.3.3 show the international and nationally designated sites within and in proximity to the AoS.

8.3.8 The Humber Estuary has four overlapping statutory designations; the Humber Estuary SPA, the Humber Estuary Ramsar, the Humber Estuary SAC and the Humber Estuary SSSI. The designated area for the SPA and Ramsar extends southwards from the Humber Estuary along the coastline to Mablethorpe, while the southern boundary of the SAC and SSSI is further north at Saltfleet. However, southwards from here, the coastline is included in the northern part of Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and Saltfleetby-Theddlethorpe Dunes SSSI, which extends southwards long the coastline as far as the southern boundaries of the Humber Estuary SPA and Humber Estuary Ramsar, at Mablethorpe. The Humber Estuary SPA is designated for its breeding and wintering birds, the Humber Estuary Ramsar for its wintering birds and sand dunes, the Humber Estuary SAC for its marine and costal habitats, and the Humber estuary SSSI for all of these features. Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC is designated for its sand dunes and Saltfleetby-Theddlethorpe SSSI is designated for its costal habitats and population of natterjack toads. The SSSI is also a NNR.

8.3.9 The Wash also has four overlapping statutory designations; the Wash SPA, the Wash Ramsar, the Wash and North Norfolk Coast SAC and the Wash SSSI. The SPA is designated for its wintering waterbirds and breeding terns, the Ramsar for its marine and coastal habitats, assemblage of waterfowl and certain species of birds, the SAC for its marine and coastal habitats and the SSSI for a combination of these features.

8.3.10 Beyond the seaward boundary of the Wash SPA and seawards from the coastline between Gibraltar Point and Mablethorpe is the Greater Wash SPA. The Greater Wash SPA is designated for its seabirds including breeding terns which nest along the coast. Much smaller but overlapping with the Greater Wash SPA is Chapel Point to Wolla Bank SSSI; a geological SSSI.

8.3.11 Gibraltar Point has five overlapping statutory designations; Gibraltar Point SPA, Gibraltar Point Ramsar, the southern part of Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC, Gibraltar Point SSSI and Gibraltar Point NNR. The SPA is designated for wintering birds and breeding tern, the Ramsar for wintering waterfowl, invertebrates, plants and marine and costal habitats and the SSSI for a combination of these features.

8.3.12 In the north, the AoS overlaps (217ha) with the Humber Estuary SPA and the Humber Estuary Ramsar, and about half (199ha) of the northern part of Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and Saltfleetby-Theddlethorpe Dunes SSSI.

8.3.13 In the south, the AoS overlaps slightly (187 ha) with the Wash SPA, the Wash Ramsar, the Wash and North Norfolk Coast SAC and the Wash SSSI along the Lincolnshire coast of the Wash, between the Rivers Welland and Witham.

8.3.14 The AoS is also immediately adjacent to the Greater Wash SPA where the AoS meets the coastline between Chapel St Leonards and Sandilands. Gibraltar Point and therefore the southern part of Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and Gibraltar Point SSSI are outside but within 1.6km of the AoS.

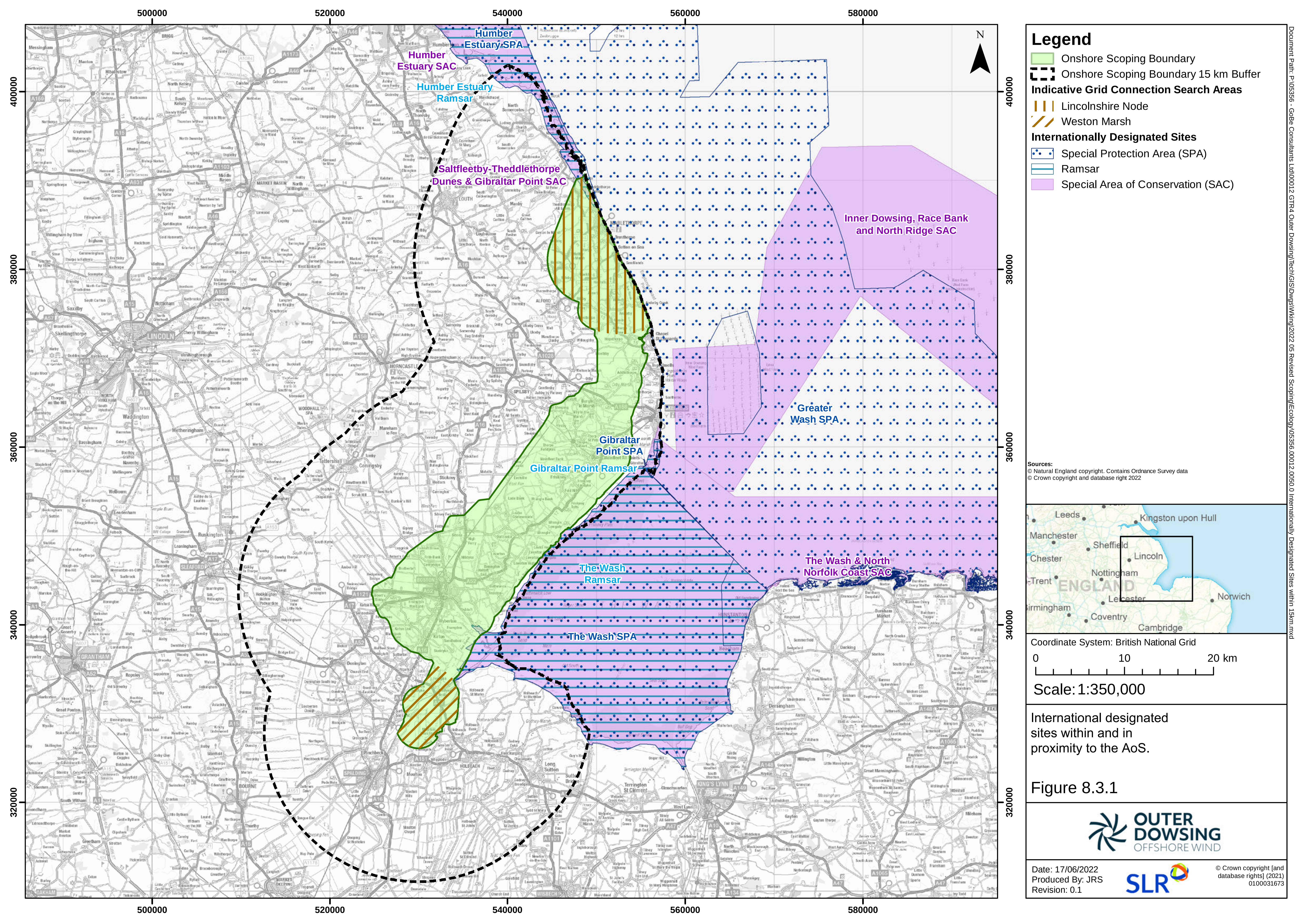
8.3.15 Within the AoS are also Sea Bank Clay Pits SSSI, designated for its wetland plants, invertebrates and birds, and Bratoft Meadows SSSI, which is designated for its species rich grassland. There is also one small LNR inside the AoS and another within 2 km. There are no other SSSIs within the AoS or within 2 km of the AoS, meaning that, away from the coast, very little of the AoS (38 ha) has a statutory designation for nature conservation.

8.3.16 The tables below present a summary of all the international, national, and local designated sites within the AoS, and those within 15 km or 2 km beyond the boundary as appropriate. Details of these designated sites are presented in Appendix D – Onshore Ecology Designated Sites.

8.3.17 A separate HRA Screening report is being produced which will cover in more detail matters associated with European and Ramsar sites.

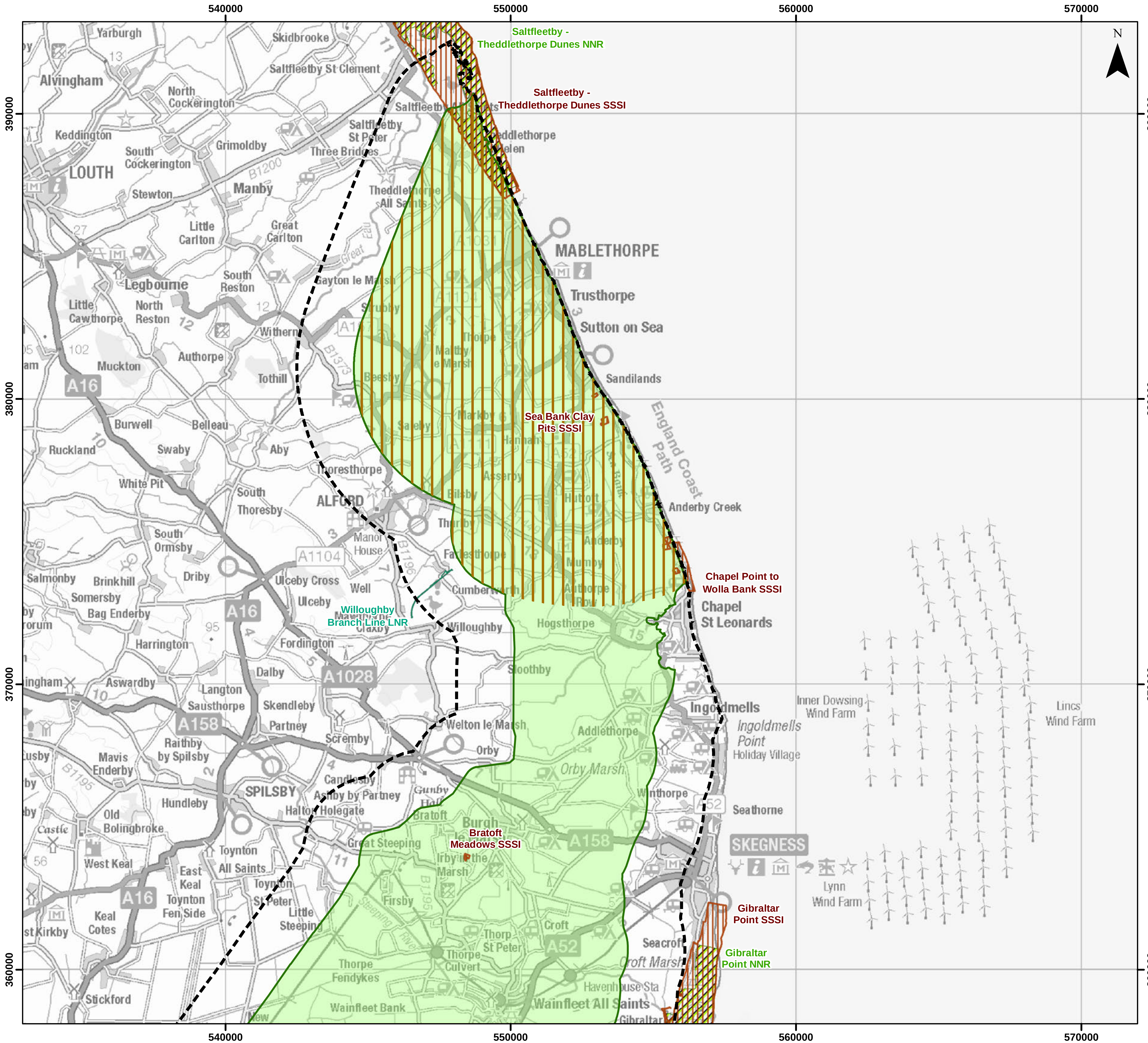
Table 8.3.2: International, national, and locally designated sites within and near the AoS (excluding Local Wildlife Sites and wholly marine sites)

Designated Site	Location
International (within 15 km of the AoS)	
Gibraltar Point Ramsar (UK11027)	1.5km E of the AoS
Gibraltar Point SPA (UK9008022)	1.5km E of the AoS
Greater Wash SPA (UK9020329)	0km E of the AoS, adjacent
Humber Estuary Ramsar (UK11031)	0km, overlaps with AoS
Humber Estuary SAC (UK0030170)	2.7km NNW of AoS
Humber Estuary SPA (UK9006111)	0km, overlaps with AoS
Inner Dowsing, Race Bank and North Ridge SAC (UK0030370)	2.85km E of the AoS
Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC (UK0030270)	0km, overlaps with AoS
The Wash & North Norfolk Coast SAC (UK0017075)	0km, overlaps with AoS
The Wash Ramsar (UK11072)	0km, overlaps with AoS
The Wash SPA (UK9008021)	0km, overlaps with AoS
National (within 2 km of the AoS)	
Bratoft Meadows SSSI (TF484639)	0km, wholly within AoS
Chapel Point to Wolla Bank SSSI (TF560741)	0km E of the AoS, adjacent
Gibraltar Point NNR (TF564586)	1.6km E of the AoS
Gibraltar Point SSSI (TF565592)	1.5km E of the AoS
Humber Estuary Ramsar (UK11031)	0km, overlaps with AoS
Humber Estuary SPA (UK9006111)	0km, overlaps with AoS
Saltfleetby - Theddlethorpe Dunes NNR (TF491891)	0km, overlaps with AoS
Saltfleetby - Theddlethorpe Dunes SSSI (TF481908)	0km, overlaps with AoS
Sea Bank Clay Pits SSSI (TF532792)	0km, overlaps with AoS
The Wash NNR (TF555298)	0km, overlaps with AoS
The Wash SSSI (TF537402)	0km, overlaps with AoS
Local nature reserves (within 2 km of the AoS)	
Havenside LNR (TF34714195)	0km, wholly within AoS
Willoughby Branch Line LNR (TF472734)	0.37km W of the AoS



International designated sites within and in proximity to the AoS.

Figure 8.3.1



Legend

- Onshore Scoping Boundary
- Onshore Scoping Boundary 2 km Buffer

Indicative Grid Connection Search

- Lincolnshire Node
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- Local Nature Reserve (LNR)

Sources:
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Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Nationally designated sites within and in proximity to the AoS and Lincs Node grid connection search area.

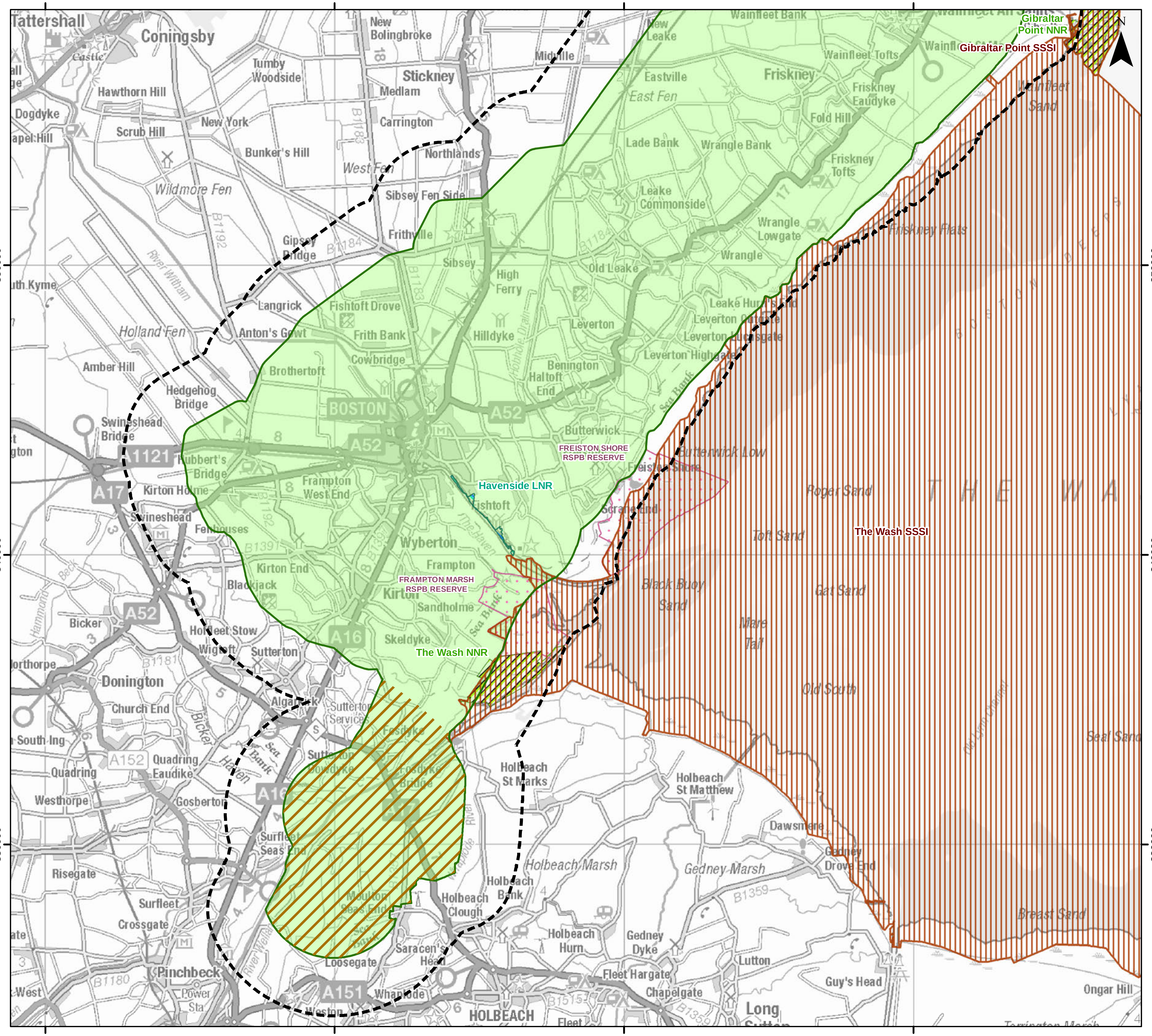
Figure 8.3.2

OUTER DOWSING OFFSHORE WIND

Date: 17/06/2022
Produced By: JRS
Revision: 0.1

SLR

Document Path: P:\05356 - GoBe Consultants Ltd\00012 GTR4 Outer Dowsing\Tech\GIS\Dwgs\Wking\2022 05 Revised Scoping\Ecology\05356.00012.0066.0 Nationally Designated Sites within 2 km.mxd



Legend

- Onshore Scoping Boundary
- Onshore Scoping Boundary 2 km Buffer

Indicative Grid Connection Search Areas

- Weston Marsh
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- Local Nature Reserve (LNR)
- RSPB Reserve

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Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Nationally designated sites within and in proximity to the AoS and Weston Marsh grid connection search area.

Figure 8.3.3

OUTER DOWSING OFFSHORE WIND

Date: 17/06/2022
Produced By: JRS
Revision: 0.1

SLR

Document Path: P:\05356 - GoBe Consultants Ltd\00012 GTR4 Outer Dowsing\Tech\GIS\Dwgs\Wking\2022 05 Revised Scoping\Ecology\05356.00012.0066.0 Nationally Designated Sites within 2 km.mxd

Important Plant Areas (IPA's)

8.3.18 A search on accessible online databases identified Important Plant Areas (Great Britain) lining the coast to the south-east of the AoS which forms part of the North Norfolk Coast and the Wash IPA.

RSPB Reserves

8.3.19 Freiston shore and Frampton Marsh RSPB Reserves fall partly within the AoS to the north and south of The Haven, southeast of Boston.

Local Wildlife Sites

8.3.20 The majority of the AoS is within East Lindsey District. East Lindsey as a whole has 410 Local Wildlife Sites and other sites which could potentially be designated as LWS in the future. The remainder of the AoS is within Boston and South Holland which have a further 26 and 56 LWS, respectively. Specific details on LWS within the AoS were not obtained as part of the scoping study however these will be obtained during later stages of the assessment.

Habitats and Ancient Woodland

8.3.21 The AoS is dominated by intensive arable land however it also contains a number of priority habitats. These are listed in Table 8.3.3. The most widespread and extensive is Coastal and Floodplain Grazing Marsh, with the others making up only very small proportion of the AoS. Many of the parcels of priority habitat are likely to be included in the designated sites described above.

Table 8.3.3: Priority Habitats within the AoS

Habitat Type	Total Area	No. of Parcels	% of AoS
Coastal and Floodplain Grazing Marsh	1363.72	703	2.41
Coastal Saltmarsh	188.41	140	0.33
Coastal Sand Dunes	113.01	53	0.20
Good Quality Semi-improved Grassland	40.66	23	0.07
Lowland Calcareous Grassland	5.68	4	0.01
Lowland Mixed Deciduous Woodland	163.50	340	0.29
Lowland Meadows	11.72	6	0.02
Mudflats	50.83	42	0.09
Reedbeds	4.56	4	0.01
Saline Lagoons	8.56	18	0.02
Traditional Orchard	14.24	20	0.03

8.3.22 There is no ancient woodland within the AoS and just two ancient woodlands within 2 km. These are Within Wood and Hornby/Mother Woods.

Flora

8.3.23 Most of the uncommon species of plant present within the AoS can be expected to occur within the designated sites and priority habitats identified above. However, there is potential for rare arable weeds to occur outside the designated sites. Species recorded in the AoS previously include corncockle *Agrostemma githago*, corn marigold Chrysanthemum segetum, common cudweed Filago vulgaris, cut-leaved dead nettle *Lamium hybridum*, field gromwell *Lithospermum arvense*, rough poppy Papaver hybridum, corn parsley *Petroselinum segetum*, lamb's lettuce *Valerianella locusta,* and green field-speedwell *Veronica agrestis*.

Invertebrates

8.3.24 Numerous notable, scarce and rare invertebrate species have been recorded from within and around the AoS, strongly associated with priority habitats and designated sites, especially around coastal sites. Saltfleetby-Theddlethorpe Dunes NNR, SSSI is known for its butterfly, bee, and dragonfly populations. A number of international and national sites are known to be of importance for their invertebrate assemblages. The majority of the AoS is, however, intensely farmed arable land which is not of importance for invertebrate populations.

Amphibians

8.3.25 The following amphibian species have recorded distributions within the AoS:

- Natterjack toad *Epidalea calamita* (localised records located at Saltfleetby-Theddlethorpe Dunes);
- Common toad *Bufo bufo* (localised and dispersed populations);
- Common frog *Rana temporaria* (localised populations);
- Great crested newt *Triturus cristatus* (localised and dispersed);
- Smooth newt *Lissotriton vulgaris* (localised populations);
- Palmate newt *Lissotriton helveticus* (localised populations);

8.3.26 Both GCN and natterjack toad are afforded full protection through legislation and are priority species in England, whilst common toad has less protection but is also a priority species. Smooth newt, palmate newt, and common frog have more limited protection.

8.3.27 Natterjack toad is confined to sand dunes at the coast while the other species can occur wherever there is suitable breeding habitat, such as ponds, including areas dominated by arable farming.

Reptiles

8.3.28 The following species have localised population across the AoS:

- Common lizard *Zootoca vivipara;*
- Slow worm *Anguis fragilis*; and
- Grass snake *Natrix helvetica.*

8.3.29 Small, localised populations of adder *Vipera berus* have also been recorded within the south of the AoS. All four are protected and priority species.

8.3.30 These species do not generally occur in arable habitats and are most likely confined to areas of less intensively managed grassland and scrub, including that along roads, railways, rivers and the coast.

Birds

8.3.31 A large number of bird species have been recorded within and around the AoS.

8.3.32 The records include most of the wildfowl and wader species that are part of the qualifying interest species for the SPAs and Ramsar sites, plus their component SSSIs, that are listed in Table .

8.3.33 Breeding species listed as qualifying interest species known as qualifying features for internationally designated sites within the AoS and surrounding 15km of the AoS include the following:

- Common tern *Sterna hirundo;*
- Eurasian curlew *Numenius arquata;*
- Eurasian marsh harrier *Circus aeruginosus;*
- Great bittern *Botaurus stellaris;*
- Little tern *Sternula albifrons;*
- Pied avocet *Recurvirostra avosetta;* and
- Sandwich tern *Sterna sandvicensis.*

8.3.34 These species are strongly associated with the coast and wetland habitats although marsh harrier also nest in arable farmland and curlew may nest win areas of floodplain grazing marsh which occurs widely but thinly in the AoS.

8.3.35 Non-breeding species listed as qualifying interest species known as qualifying features for internationally designated sites within the AoS and surrounding 15km include the following:

- Bar-tailed godwit *Limosa lapponica*;
- Bewick's swan *Cygnus columbianus bewickii*;
- Black scoter *Melanitta americana*;
- Black-tailed godwit *Limosa limosa*;
- Common goldeye *Bucephala clangula*;
- Common redshank *Tringa totanus*;
- Common scoter *Melanitta nigra*;
- Common shelduck *Tadorna tadorna*;
- Dark-bellied brent goose *Branta bernicla*;
- Dunlin *Calidris alpina;*

- Eurasian curlew *Numenius arquata*;
- Eurasian oystercatcher *Haematopus ostralegus*;
- Eurasian teal *Anas crecca*;
- Eurasian wigeon *Mareca penelope*;
- European golden plover *Pluvialis apricaria*.
- Gadwall *Mareca strepera*;
- Great bittern *Botaurus stellaris*;
- Grey plover *Pluvialis squatarola*;
- Hen harrier *Circus cyaneus*;
- Little gull *Hydrocoloeus minutus*;
- Northern pintail *Anas acuta*;
- Pied avocet *Recurvirostra avosetta*;
- Pink-footed goose *Anser brachyrhynchus*;
- Red knot *Calidris canutus*;
- Red-throated diver *Gavia stellata*;
- Ruddy turnstone *Arenaria interpres;*
- Ruff *Philomachus pugnax*; and
- Sanderling *Calidris alba*.

8.3.36 These species are strongly associated with the designated sites and coastal areas with some, such as the goose species, also likely to forage on farmland in proximity to these areas. Of those listed above, only golden plover is likely to occur on farmland away from the coast and wetland sites.

8.3.37 A search on accessible databases identified several protected and priority farmland bird species across the AoS and surrounding 2 km buffer including:

- Barn owl *Tyto alba*;
- Corn bunting Emberiza calandra;
- Grey partridge Perdix perdix;
- Lapwing *Vanellus vanellus*;
- Tree sparrow Passer montanus;
- Turtle dove *Streptopelia turtur*; and
- Yellow wagtail *Motacilla flava*

8.3.38 These species breed in or near arable farmland and are generally widespread throughout the AoS.

8.3.39 Parts of the coastline are also classed as important bird areas.

Bats

8.3.40 The following bat species have distributions recorded within and around the AoS:

- Barbastelle *Barbastella barbastellus;*
- Brown long-eared *Plecotus auritus;*
- Common pipistrelle *Pipistrellus pipistrellus ;*
- Daubenton's bat *Myotis daubentoniid;*
- Leisler's bat *Nyctalus leisleri;*
- Nathusius' pipistrelle *Pipistrellus nathusii;*
- Natterer's bat *Myotis nattereri;*
- Noctule bat *Nyctalus noctula;*
- Soprano pipistrelle *Pipistrellus pygmaeus;* and
- Whiskered bat Myotis mystacinus.

8.3.41 All bat species are protected and several are also priority species. Arable farmland is generally poor habitat for bats, which are likely to be associated strongly with woodland and hedgerows.

Other Mammals

8.3.42 The following mammal species have been recorded within and around the AoS:

- Badger *Meles meles ;*
- Brown hare *Lepus europaeus;*
- Water vole *Arvicola amphibius;*
- Otter *Lutra lutra;*
- Hedgehog *Erinaceaus europaeus*; and
- Harvest mouse *Micromys minutus.*

8.3.43 These are all priority species with varying levels of protection. Brown hare and harvest mouse are found in arable farmland, while water vole occurs in association with rivers, streams and ditches, and otter in association with rivers and the coast. Nowadays, hedgehog is more likely found in suburban than rural habitats, while badger is likely to be widespread across the AoS.

Invasive non-native plant species

8.3.44 A number of invasive non-native plant species have been recorded within and around the AoS, including Japanese knotweed *Fallopia japonica*, giant hogweed *Heracleum mantegazzianum* and Indian balsam *Impatiens glandulifera*.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.3.45 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of Onshore Ecology and Ornithology will also comply with the CIEEM guidelines on Ecological Impact Assessment.

Embedded Mitigation Measures

8.3.46 As part of the design process for the Project, a number of measures are proposed to reduce the potential for impacts on terrestrial and freshwater receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

8.3.47 The Project is committed to implement these measures, and various standard sectoral practices and procedures. It is therefore considered that these measures will form part of the design of the Project and hence have been considered in the judgments as to which impacts can be scoped in presented in Table .

8.3.48 Measures incorporated into the design of the Project (embedded mitigation) will include:

- Avoidance of impact through cable route selection (e.g. avoiding designated sites or areas of important habitat, woodland areas, water bodies and streams as far as possible) where practicable;
- The onshore cable will be buried underground and, therefore, pose no collision risk to birds;
- Unnecessary land-take will be avoided to reduce habitat loss and fragmentation; and
- Habitats removed during cable route construction will be reinstated upon completion of works.

Relevant Mitigation Measures

8.3.49 Further relevant (additional) mitigation will also be considered, including:

- Seasonal constraints in relation to specific species will be adhered to where possible (e.g. undertaking vegetation clearance outside the bird nesting season);
- Species-specific mitigation will be developed based on the findings of ecological surveys;
- Chemical/fuel storage and handling procedures will be developed and implemented;
- A Code of Construction Practice (CoCP) will be developed and implemented;
- An Ecological Management Plan (EcoMP) will be developed and implemented; and
- A Decommissioning Plan will be developed and implemented.

8.3.50 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Biodiversity Enhancements and Net Gain

8.3.51 In addition to the mitigation measures outlined above, biodiversity enhancements and net gain will be implemented in accordance with the legal and policy requirements in place at the time an application is made, as a minimum.

Potential Impacts Scoped In

8.3.52 A range of potential impacts on onshore ecology have been identified which may occur during the construction, O&M, and decommissioning phases. The impacts that have been scoped into the EIA are outlined in Table 8.3.4, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/ or supporting analyses (e.g. modelling) to enable an assessment of the impact.

8.3.53 At this stage, no potential impacts or important ecological receptors have been scoped out of the assessment as not enough is yet known about the layout of the onshore infrastructure. However, it is expected that as the design progresses some potential impacts and many of the ecological receptors within the current AoS can be scoped out of further assessment.

8.3.54 The same potential impacts will be considered cumulatively with other projects which could affect the same ecological features.

Table 8.3.4: Impacts proposed to be scoped in for Onshore Ecology & Ornithology

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Damage[31] to international and national designated sites, local nature reserves local wildlife sites, and nature reserves within and surrounding the AoS known for including scarce and protected species.	Wherever the AoS meets the coast it either adjoins or, more rarely, overlaps with a statutory designated site, many with multiple designations, as detailed in paragraphs 1.3.7 to 1.3.9. Therefore, there is potential for direct and indirect effects on these designated sites. In reality, direct effects on these sites within the onshore AoS are likely to be avoided by design. Inland, the area of AoS occupied by statutory designated sites and nature reserves is very small and, again, direct effects on these sites are likely to be avoided by design. Non-statutory LWS are more widespread but still occupy only a small area of the AoS. It is therefore expected that direct effects on all designated sites and nature reserves can be avoided during the route selection process and the siting of temporary and permanent infrastructure however, depending on the location of the cable route and OnSS, there is a risk of indirect effects, permanent and temporary, arising from changes in hydrology, pollution, disturbance of species, spread of	Habitat survey and expanded desk study to gather more information on designated sites and nature reserves, plus discussion with consultees and engineers on methods to avoid or minimise impacts on designated sites and nature reserves and their interest features (such as the use of trenchless technologies (e.g. HDD)).

[31] Damage here means any form of impact such as loss of habitat, soil compaction, changes in hydrology, nutrient enrichment, pollution, disturbance of species, spread of invasive species, etc. Each impact will be considered separately in the full Environmental Impact Assessment.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	invasive species, and damage to interconnecting habitats between designated sites	
Damage to areas of priority habitat, ancient woodland and veteran trees outside designated sites.	As with designated sites, it is expected that damage to most types of priority habitat can be avoided however some damage to hedgerows may occur and depending on the location of the cable route and OnSS, there is also a risk of indirect effects to other priority habitats, especially floodplain grazing marsh which is widespread within the AoS and therefore harder to avoid. There is no recorded ancient woodland within the AoS and veteran trees are likely to be scarce and easily avoided by design.	As for designated sites, followed by surveys to inform assessment of impacts and mitigation requirements once the preferred OnSS location and cable route corridor(s) have been determined. This will include surveys for veteran trees.
Permanent habitat loss, including veteran trees.	The construction of the OnSS(s) will result in the permanent loss of habitat, most likely arable land of low ecological value, however, it is not known whether other habitats may also be affected at this stage.	Habitat survey of the preferred OnSS location(s) including surveys for veteran trees.
Temporary habitat loss.	The installation of the cable and other temporary infrastructure, such as site compounds, will result in temporary habitat loss, mostly arable land but also ditches and hedgerows and potentially other habitats depending on the route selected.	Habitat survey of the preferred cable route corridor(s). The surveys will locate or confirm areas of priority and another semi-natural habitat.
Damage to populations of rare arable weeds.	Populations of arable weeds, if present in affected areas, may be vulnerable if site clearance resulted in plants being removed before setting seed, however, ground disturbance and construction	Survey of suitable areas within the preferred landfall, cable route corridor and OnSS location once known, using existing records and habitat

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	activity can also create or maintain suitable habitat for these species, which rely on periodic disturbance of the soil.	survey information to target the most likely locations.
Pollution of waterbodies and watercourses, especially via suspended solids.	Construction activity will involve removal of vegetation, soil stripping and temporary stockpiling of excavated soils. Soil exposed in this way is more vulnerable to being washed into watercourses and can cause damage to aquatic ecosystems.	Desk-based assessment of affected watercourses and their water quality, followed by surveys should the potential for significant effects be identified when the preferred landfall, cable route corridor option and OnSS locations are known.
Killing, injury and disturbance of protected and priority species.	Protected and priority species including amphibians, reptiles, nesting birds, bats and other mammals may be impacted during site clearance which may result in an offence under wildlife legislation and could have significant impacts on populations of scarce and rare species.	Appropriate surveys to determine the location of protected and priority species once the preferred landfall, cable route corridor and OnSS location are known.
Disruption of the movement of protected and priority species.	The cable route will form a linear construction corridor potentially extending for many kilometres, which has the potential to disrupt the movement of some species especially amphibians and mammals, including bats. This could prevent animals from reaching breeding, foraging or hibernation sites and affect the survival of vulnerable populations.	As above.
Loss and damage of habitat for protected and priority species.	The installation of below ground and above ground infrastructure may result in the permanent or temporary loss of habitat for protected and priority species, including breeding birds.	As above.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Disturbance and displacement of wintering waterbirds.	Wintering birds associated with coastal and wetland sites, including the designated sites, may also roost and forage on nearby farmland. Construction activity in proximity to the coast and wetlands and areas used by the birds outside of these areas may result in temporary disturbance and displacement. Location of above ground infrastructure in areas used by foraging birds outside the designated sites would result in permanent displacement.	Appropriate surveys to determine the location of land used by wintering waterbirds at the coast and in selected locations inland.
Spread of INNS.	INNS (both plant and animal) can be spread inadvertently in soil which is moved around the construction site and on machinery, etc. which is moved between construction sites, which may result in an offence under wildlife legislation and negative impacts on the ecosystems to which the species are transferred.	Appropriate surveys to determine the location of INNS to determine their type and location.
Air quality impacts on all ecological receptors.	Construction traffic and machinery will result in emissions to air with very limited potential to affect ecological receptors when considering the project alone, but which could contribute to cumulative impacts on sensitive species and habitats.	An air quality assessment will be undertaken, which will include consideration of ecological receptors, and potential effects from changes in air quality will be considered in the cumulative impact assessment. (See Section 8.1)
Damage to watercourse and aquatic life resulting from spillage of vehicle fluids from construction machinery.	Construction traffic and machinery will use and contain fuel, oils and other fluids which, if spilled, could damage terrestrial and aquatic ecosystems. This is unlikely to be significant for the project	The habitat survey will identify sensitive receptors and the potential for cumulative impacts will be considered in the assessment.

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
	alone but could combine with existing pollution and other projects and therefore have a cumulative impact.	
Operation and Maintenance		
Disturbance of protected and priority species during planned and unplanned maintenance works when the proposed development is operational.	The presence of site staff could result in the disturbance of species during maintenance which may not be significant on its own but could be when considered cumulatively with other human activity. The risk of an impact is generally low however the level of risk depends on the siting of the sub-station, etc. relative to sensitive ecological receptors.	Sensitive receptors will be identified through the desk study and surveys, and the risk will be considered as part of the cumulative impact assessment.
Decommissioning		
Impacts likely to be similar to construction, but more limited in geographical extent and timescale and there would be no permanent habitat loss.	As described above.	Prediction of the future baseline conditions at the time of de-commissioning to describe and evaluate the likely impacts and their significance.
Cumulative		
As above, see Section 8.3.54.		

Impacts Proposed to be Scoped Out

8.3.55 Based on the ecological information currently available and the project description, impacts on ancient woodland can be scoped out from the assessment, as the nearest site is approximately 1.47 km from the AoS, beyond the distance at which direct and indirect effects could occur.

Potential Transboundary Effects

8.3.56 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

8.3.57 The only scope for transboundary impacts with respect to onshore ecology would be in the event of major impacts on the populations of migratory species which breed or winter overseas. It is expected that impacts at this level will be avoided through appropriate siting of infrastructure and the implementation of mitigation measures however transboundary affects will be considered until it is confirmed that major impacts on the populations migratory species will be avoided.

Summary of Next Steps

8.3.58 Survey information will be obtained to identify the potential impacts upon onshore ecology, the detailed methodologies for which will be consulted upon through the EPP.

8.3.59 As already described, the AoS is under review and will be refined as the design progresses. The next phases of surveys and data gathering will be based on a revised AoS, as available at the time of the study or survey. References to AoS in this summary of next steps means the AoS in place at the time of the assessment,

8.3.60 The next steps for the onshore ecology assessment are to:

- Obtain more detailed biological records and local wildlife site data for the AoS plus the surrounding area, as indicated in Table 8.3.4Table ;
- Prepare an initial habitat map of the AoS and a 100m buffer using remotely sensed data: aerial imagery, satellite photography, drones (if necessary) and the UKHab classification system (https://ukhab.org/) to the highest resolution possible (most likely level 3, broad habitats), with minimum mapping units (MMU) of 400 m^2 and 20 m length;
- Preparation of a Preliminary Ecological Appraisal (PEA), which will include a summary of the desk study information, an audit of the habitats found within the AoS, a map of known ecological constraints, the requirements for further survey and recommendations for avoidance and mitigation of ecological impacts based on what is known at that time. Survey to inform the PEA is in progress and it is anticipated that the PEA will be completed in 2022.

8.3.61 The information derived from the PEA will be used to further develop the route options for the onshore cable route and the siting of above ground infrastructure, with the objective of minimising the overall environmental impact of the Project, including ecological impacts.

8.3.62 It is expected that the information derived from the PEA will include all major ecological constraints and enable these to be considered in the overall layout and design of the Project. However, some priority habitats, such as hedgerows, and some widespread protected and priority species, which occur in farmland, are likely to be affected in any event.

8.3.63 Therefore, as a preferred onshore cable route corridor and OnSS are identified, targeted surveys of these habitats and species will be undertaken within the preferred locations and an appropriate buffer. These surveys will be confirmed as part of the PEA however they are likely to include the following, all to be carried out in accordance with published good practice guidelines:

- Updated habitat mapping in the field for the preferred onshore cable route corridor and OnSS plus 100 m buffer, using all levels of the UKHab classification hierarchy as appropriate;
- Updated PEA report for the preferred cable route corridor and OnSS incorporating a desk study, updated habitat mapping, and areas where evidence of protected species is found, or where habitat is suitable, such that specific follow up surveys can be scoped and undertaken thereafter;
- Detailed surveys of habitats with potential to support important populations of protected or otherwise notable plant species, or important vegetation communities, as part of the updated habitat mapping with additional visits if needed to deliver surveys in the correct season;
- Recording and mapping of both rare arable weeds and invasive non-native plant species as part of the updated habitat mapping, ensuring that surveys are undertaken at a time when these species are in evidence and with additional visits if needed to make sure surveys are undertaken in the correct season;
- A survey of hedgerows, to determine whether they are considered important under the Hedgerow Regulations 1997 within the preferred cable route corridor and OnSS plus 50 m;
- A survey for veteran trees within the preferred cable route corridor and OnSS plus 50 m;
- Targeted surveys for protected and notable invertebrates in suitable habitats if these would be affected directly or indirectly by construction activity;
- Habitat Suitability Index assessments for all ponds and other suitable water bodies within 250 m, with eDNA surveys undertaken for all waterbodies with 'Average' or above suitability (Biggs *et al*., 2014). Population size class assessments (English Nature, 2001) for ponds with great crested newts (or inconclusive results) within 250 m of permanent or 100 m of temporary habitat loss also undertaken, where such data does not already exist;
- An assessment of habitats for their suitability for common reptile species, followed by presence/ absence surveys (Sewell, 2013; Froglife 1999; Gent & Gibson,1998) for areas of moderate or high suitability habitat with potential to be subject to moderate or large-scale impacts;

- Targeted surveys for breeding birds (Gilbert, Gibbons & Evans,1998) within a minimum of 100 m of the preferred cable route corridor and OnSS in areas where (i) specially protected species could occur i.e. those listed on Schedule 1 of the Wildlife and Countryside Act, as amended, and those listed in Annex 1 of the EC Birds Directive; (ii) wetland, scrub and woodland habitats potentially supporting sensitive and declining species, such as breeding waders or notable wildfowl, and turtle dove could occur; and (iii) permanent above ground infrastructure will be built;
- Evaluation of Wetland Bird Survey data, obtained for key areas identified in the PEA. The data will be used to help focus the wintering bird survey requirements;
- Targeted surveys for wintering waterbirds however other notable species, including priority species, will also be recorded. The wintering bird survey will encompass (i) intertidal habitats where the preferred cable route meets the coast; (ii) agricultural fields known to support, or have the potential to support, wild geese within preferred cable route corridor and OnSS plus 250 m; and (iii) agricultural fields potentially suitable for flocks of waterbirds such as lapwing, golden plover and curlew and/ or subject to regular flooding, where located within the preferred cable route corridor and OnSS plus 400 m. The surveys will take place twice per month from September to March inclusive (i.e. 14 surveys in total), except for (iii) which will be once per month. All surveys will take place during daylight hours, with intertidal surveys covering low to high tide (or vice versa) on each visit;
- A badger survey within the preferred cable route corridor and OnSS plus a minimum buffer of 30 m (Neal & Cheeseman,1996);
- Surveys for roosting bats, comprising (i) preliminary roost inspections from the ground, (ii) close inspections at height of trees/ structures initially assessed as having moderate or high suitability for roosting bats and that could be removed or damaged; and (iii) emergence surveys of all trees/ structures that could be removed or damaged which are confirmed as having moderate or high suitability on close inspection or which could not be closely inspected at height and/ or surveys in winter for potential hibernation roosts. These surveys will follow the latest BCT guidelines, currentlyCollins J. (ed.), 2016;Surveys for foraging and commuting bats by undertaking walked transects and/or point counts and deployment of static bat detectors to record bat activity within the preferred cable route corridor and OnSS, with multiple transects and a minimum of two static bat detectors per transect or placed individually at point count locations (Collins J. (ed.), 2016):
- An assessment of watercourses for their potential to support otter, followed by a survey for otter signs on all suitable water courses crossing or within the preferred cable route corridor and OnSS plus 250 m up and downstream (Chanin, 2003a, 2003b); and
- An assessment of watercourses for their potential to support water vole, followed by a survey for water vole signs on all suitable water courses crossing or within the preferred cable route corridor and OnSS plus 200 m up and downstream (Strachan, 2011).

Further Consideration for Consultees

8.3.64 For the Scoping Opinion, it would be helpful if you can include consideration of the following questions:

- Subject to the findings of the PEA, do you agree that the data sources and surveys identified are likely to be sufficient to inform the onshore baseline for the Project PEIR and ES?
- Do you agree that all the statutory and non-statutory designated sites within the potential ZoI have been identified?
- Do you agree, on the basis that impacts will be temporary, the surveys along the preferred cable route corridor for priority farmland bird species are not required?
- Do you have any comments on proposed scope and extent of the further surveys for protected, priority and notable species?
- Do you agree that all potential impacts have been identified for important onshore ecological features in Table ?
- Do you agree that the proposed mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on important onshore ecological features (insofar as it is possible to identify relevant mitigation requirements at this early stage)?

8.4 Geology, Ground Conditions and Land Quality

Introduction

8.4.1 This section of the Scoping Report identifies the geology, ground conditions and land quality receptors of relevance to the Project's onshore cable corridor. This section of the Scoping Report considers the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on the geology, ground conditions and land quality receptors and sets out the proposed scope of the EIA.

8.4.2 The location for OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.

8.4.3 This section of this Scoping Report should be read alongside the following of this Scoping Report:

- Section 8.5: Hydrology, Hydrogeology and Flood Risk; and
- Section 8.6: Land Use.

Study Area

8.4.4 The Study Area is located along and adjacent to the east coast of England between the Humber Estuary, in the north, and the town of Spalding, in the south. It extends along approximately 65 km of the coastline, including the Lincolnshire coast of the Wash and Gibraltar Point. It extends inland up to approximately 13 km from the coast.

Baseline Environment

Overview of Available Data Sources

8.4.5 To describe the geological and land quality baseline across the AoS this Scoping Report section, as a minimum, makes use of the following freely available data sources. These sources will also be used to inform the PEIR and ES.

8.4.6 The data review will identify sites across the AoS benefitting from protection (e.g., geological sites of special scientific interest (SSSI)) and those that have been subject to potentially contaminative activity and, therefore, have a greater likelihood of representing significant sources of ground contamination.

8.4.7 Once the proposed location of the preferred onshore cable corridor and substation has been selected there may be a requirement to source additional third-party data (e.g., Groundsure environmental database reports, historical Ordnance Survey maps) for individual parcels of land identified as higher risk through the desktop review. This requirement would be reviewed upon completion of the desktop review of data listed below in this Table .

Table 8.4.1: Key sources of information for Geology and Ground Conditions

Source	Summary	Spatial coverage of AoS
Old-maps.co.uk for historical Ordnance Survey maps (where available)	Historical ordnance survey maps for the AoS.	Partial coverage of the AoS.
BGS mapping	Mapping for: Solid and superficial geology; Borehole logs; and Historic mining areas.	This is a national dataset providing full coverage of the AoS.
Google Earth	Mapping for details of current, and where available former, land use.	This is a national dataset providing full coverage of the AoS.
The Coal Authority website	Service to check whether any historic coal mining would impede development, including subsidence damage claims.	This is a national dataset providing full coverage of the AoS.
Data.gov.uk	Historic landfill records	This is a national dataset providing full coverage of the AoS.
Natural England website	Historic and active landfill sites; Groundwater Source Protection Zones (SPZ); and Permitted industrial and commercial facilities.	This is a national dataset providing full coverage of the AoS.
Defra MAGIC website	Statutory and non-statutory environmental designations.	This is a national dataset providing full coverage of the AoS.
North Lincolnshire County Council	Waste, Minerals and Contaminated Land	Partial coverage of the AoS.
Lincolnshire County Council	Waste, Minerals and Contaminated Land	Partial coverage of the AoS.
North East Lincolnshire	Waste, Minerals and Contaminated Land	Partial coverage of the AoS.
Nottinghamshire	Waste, Minerals and Contaminated Land	Partial coverage of the AoS.

Overview of Baseline Environment

8.4.8 This section gives a general overview of baseline conditions across the AoS highlighting areas with a history of development (particularly for commercial and industrial use), former military installations, areas of quarrying that have subsequently been subject for landfilling and areas with an increased risk of UXO.

Designated Sites

8.4.9 Table 8.4.2 below present the spatial information obtained from the Defra MAGIC website32 which identifies limited designations, such as SSSI, Special Areas of Conservation (SAC) and RAMSAR sites, within the AoS.

Table 8.4.2: Environmental designations relevant to geology, ground conditions and land quality receptors

Site	Features or description
SAC: Saltfleetby – Theddlethorpe Dunes & Gibraltar Point	Geological
Site of Special Scientific Interest: Chapel Point to Wolla Bank	Geological
Site of Special Scientific Interest: Harrington Hall Sandpit	Geological
Site of Special Scientific Interest: Hundleby Clay Pit	Geological
Site of Special Scientific Interest: Gibraltar Point	Mixed

Geological Setting – Bedrock Geology

8.4.10 Bedrock geology is relatively consistent across the AoS (see Table 8.4.3); with the entire region being underlain by chalks, sandstones, and marls dating from the Cretaceous to Triassic in age. The Cretaceous Group will comprise predominantly permeable sedimentary rocks. Bedrock Geology for each search area is detailed in Table 8.4.3 below.

Table 8.4.3: Bedrock Geology for AoS

Group	Age	Lithology
White Chalk Subgroup	Cretaceous	Chalk
Kimmeridge Clay Formation	Jurassic	Mudstone
Wealden Group	Cretaceous	Mudstone, siltstone and sandstone
Lower Greensand Group	Cretaceous	Sandstone and mudstone
Grey Chalk Group	Cretaceous	Chalk
White Chalk Subgroup	Cretaceous	Chalk
Kellaways Formation and Oxford Clay Formation (undifferentiated)	Jurassic	Mudstone, siltstone and sandstone
West Walton, Ampthill Clay and Kimmeridge Clay (undifferentiated)	Jurassic	Mudstone, siltstone and sandstone

[32] https://magic.defra.gov.uk/MagicMap.aspx

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380000 360000 340000

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Legend

Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Weston Marsh

Bedrock Geology (Within Study Area)

Cretaceous
- White Chalk Subgroup
- Grey Chalk Subgroup
- Wealden Group
- Lower Greensand Group

Jurassic
- West Walton Formation, Ampthill Clay Formation and Kimmeridge Clay Formation (Undifferentiated)
- Kellaways Formation and Oxford Clay Formation (Undifferentiated)
- Great Oolite Group
- Inferior Oolite Group

Lias Group

Coordinate System: British National Grid

0 8 16 km

Scale: 1:250,000

Onshore Scoping
Bedrock Geology

Figure 8.4.1

OUTER DOWSING OFFSHORE WIND

Date: 10/06/2022
Produced By: JRS
Revision: 0.1

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Geological Setting – Superficial Geology

8.4.11 Superficial deposits comprise three main groups across the AoS. The vast majority of strata identified comprise quaternary age Alluvium of clays silts and sands. To the west of the Lincs Node OnSS grid connection search area, there are small areas of glacial diamicton (Till) and glacial sands and gravels. The superficial deposits are of low sensitivity, comprising Secondary (A) and Secondary (B) Aquifers and Unproductive Strata. Superficial Geology for each search area is shown on Figure 8.4.2 and detailed in Table below.

Table 8.4.4: Superficial Geology for AoS

Group	Age	Lithology
Alluvium	Quaternary	Clay, silt and sand
Beach and tidal flat deposits	Quaternary	Clay, silt and sand
Blown sand	Quaternary	Sand
Glacial sand and gravel	Quaternary	Sand and gravel
Peat	Quaternary	Peat
River terrace deposits	Quaternary	Sand and gravel
Storm beach deposits	Quaternary	Sand
Tidal Flat Deposits	Quaternary	Clay and silt
Till	Quaternary	Granular rock material

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Legend

RevisedScopingBoundary

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Weston Marsh

Superficial Geology

- Alluvium (Clay, Silt and Sand)
- Blown Sand
- Glacial Sand and Gravel
- Peat
- River Terrace Deposits
- Till

Sources:
Contains British Geological Survey materials © UKRI 2021

Coordinate System: British National Grid

0 5 10 km

Scale: 1:250,000

Onshore Scoping Superficial Geology within the AoS

Figure 8.4.2

OUTER DOWSING OFFSHORE WIND

Date: 10/06/2022
Produced By: JRS
Revision: 0.1

SLR

Document Path: \\gis\s1\GIProjects\05356 - GoBe Consultants Ltd\00012 GTR4 Outer Dowsing\Tech\GIS\Dwgs\Wking\2022 05 Revised Scoping\Geology and Ground Conditions\05356.00012.0064.0 Superficial Geology.mxd

Commercial/Industrial Activities

8.4.12 Sites with a history of Industrial/commercial use located in the vicinity of urban settlements including Boston have the greatest potential to be impacted by contamination. Activities that are likely to be present in the AoS could potentially comprise the following:

- Ports;
- Former Gasworks;
- Landfills;
- Industrial Landfills; and
- Waste Facilities.

8.4.13 Notwithstanding the above, it is considered that the final ECC is likely to be positioned to avoid significantly developed urban areas and as such the ECC is more likely to traverse agricultural land that is less likely to be impacted by contamination. The types of sites more likely to be encountered across rural land will be former quarries and historic landfills.

Waste Recycling & Disposal Facilities

8.4.14 Historical landfill facilities within the AoS are shown on Figure 8.4.3 and listed in Table 8.4.5.

8.4.15 Other waste facilities that may be located within the AoS include the following:

- Yet unidentified current and historical landfill sites;
- Waste recycling, transfer and treatment sites, probably located in main urban centres;
- End of life vehicle processing facilities (i.e., scrapyards); and
- Sewage works.

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380000 360000 340000

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Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Weston Marsh
- Historic Landfill Site (Centroid)
- Historic Landfill Site (Boundary)

Coordinate System: British National Grid

0 5 10 km

Scale: 1:250,000

Onshore Scoping Historic Landfill Sites within the AoS

Figure 8.4.3

OUTER DOWSING OFFSHORE WIND

Date: 10/06/2022
Produced By: JRS
Revision: 0.1

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Document Path: P:\05356 - GoBe Consultants Ltd\00012 GTR4 Outer Dowsing\Tech\GIS\Dwgs\Wking\2022 05 Revised Scoping\Geology and Ground Conditions\05356.00012.0065.0 Historic Landfill Sites.mxd

Table 8.4.5: Details of historic landfill sites across the AoS

Site ID	Site	NGR Reference	Dates of Operation	Waste Accepted
1	Meers Bank Drain	TF4720084600	Unknown	Inert
2	Brickyard Tip	TF5000084400	1952 - 1987	Inert, Industrial, Commercial and Household.
3	Land At Bilsby	TF4680076900	Unknown	Household
4	Lowgate Farm	TF5340073300	Unknown	Unknown
5	Lowgate Road	TF5340073000	Unknown	Household
6	Field Farm	TF5280072200	1984 - 1994	Commercial and Household
7	Hogsthorpe Landfill Site	TF5400071100	1984 - 1994	Inert, Industrial, Commercial and Household.
8	Rear of Claremont Road	TF5030065200	Unknown	Inert
9	Gravel Pit	TF4840065100	Unknown	Inert
10	Former Gravel Pit adjacent to Gravel Pits Farm	TF4840065100	Unknown	Inert
11	Field south of A52	TF5190061000	Unknown	Household
12	Green Hill	TF5000059300	Unknown	Household
13	Chainbridge Farm	TF5030058600	Unknown	Unknown
14	O.S. Field No.4900	TF4750057900	Unknown	Inert
15	Old Fen Road	TF4670056600	Unknown	Household
16	Pet Crematorium	TF4210055500	1988 - 1994	Special
17	Land to East of Main Road	TF4760054700	1986 - 1994	Inert
18	Hall Lane	TF3920046500	Unknown	Household
19	35 Langrick Road	TF3120044600	Unknown	Inert
20	Richmond House and former Council Depot	TF3340044200	Unknown	Household
21	Railway Pit	TF3210044200	Unknown	Unknown
22	Burgess Pit	TF3350044200	Unknown	Household
23	Rear of 26-38 Hessle Avenue	TF3150043500	Unknown	Inert
24	Bath Garden Area	TF3280043200	Unknown	Inert
25	Former Salvage Depot	TF3460042200	Unknown	Inert

Site ID	Site	NGR Reference	Dates of Operation	Waste Accepted
26	Old Golf Course	TF3460042000	1953 - Unknown	Industrial, Commercial Household and Liquid Sludge
27	Boston Landfill Site	SE3480041300	1993 - Unknown	Special
28	Boston Landfill Site	TF3440041500	1966 - Unknown	Inert, Industrial, Commercial, Household, Special, Liquid Sludge
29	Lincolnshire Pet Crematorium	TF2850038700	1989 - Unknown	Special
30	Main Drain	TF3410032900	Unknown	Household

Mining/Quarrying Areas

8.4.16 Spatial data provided by the Coal Authority website does not identify any areas that have been impacted by mining within the AoS, although quarry operations are common on sands and gravels, and chalk.

Unexploded Ordnance (UXO)

8.4.17 Historical industrial/commercial areas located in coastal towns were common targets during war time and thus may have been subject to bombing during World War Two and could be impacted by UXO. Lincolnshire was also home to a large number of military airfields during World War Two which can also be affected by UXO. Former airfields within the AoS include, Theddlethorpe, Strubby, Ingomells, Skendleby, Spilsby, Wainfleet, Freiston and Boston. However, much of the area is classified as Low Risk. There are also a number of World War Two defences located along the coast which could also have been subject to bombing.

Proposed Approach to the Environmental Impact Assessment

8.4.18 A range of potential impacts on geology, land quality, and ground conditions have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table , together with a description of any proposed additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) to enable an assessment of the impact.

8.4.19 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a few impacts are proposed to be scoped out of the EIA for geology, land quality and ground conditions.

8.4.20 The following guidance documents have been referenced when devising the assessment methodology:

- The Environment Agency's Model Procedures; Land Contamination Risk Management (LCRM), states that a Conceptual Site Model (CSM) should identify those contamination sources, pathways and receptors which are “likely” to represent an “unacceptable” risk either to human health or the surrounding environment;
- Contaminated Land Statutory Guidance 2012 (ref: PB13735) is intended to explain how Local Authorities should implement the regime as detailed by EPA 1990, including how they should go about deciding whether land is contaminated land in the legal sense of the term;
- Construction Industry Research and Information Association (CIRIA) C552 (Contaminated Land Risk Assessment. A guide to good practice) examines the risk assessment of contaminated land and explains the key elements of risk assessment practices and procedures; and
- Environmental impact assessment guidance produced by CIRIA and the Highways Agency.

Policy and Regulatory Context

8.4.21 The following policy and regulations will be considered, in relation to land use, in the development of the PEIR and subsequent ES chapters:

- Elements of NPS EN-1 and NPS EN-5 that are relevant to this section;

- The Construction Design and Management Regulations 2015 (CDM 2015) are also relevant as they govern the way construction projects are planned to consider overall health, safety and welfare of all parties;
- The National Planning Policy Framework (NPPF) of February 2019:
  - Has a core aim to encourage the effective use of land by reusing land that has been previously developed (brownfield land) if it is not of high environmental value.
  - The NPPF states that local planning authorities should consider the benefits of the "best and most versatile agricultural land" when considering whether significant development of agricultural land is necessary. The best and most versatile agricultural land is defined as Grades 1, 2 and 3a by policy guidance (see Annex 2 of NPPF).
- The Agricultural Land Classification system used to perform the grading is supported by Natural England, and Schedule 4 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 requires consultation with Natural England when planning applications are made for either non-agricultural development, inconsistent with the provisions of a development plan.

8.4.22 As part of the Government's 'Safeguarding our Soils' strategy, Defra published a code of practice on the sustainable use of soils on construction sites which was intended to be helpful in development design and setting planning conditions[33].

8.4.23 Specific UK legislation and guidance on the assessment of contaminated land is principally provided under:

- Part 2A of the Environmental Protection Act (EPA) 1990, as inserted by Section 57 of the Environment Act 1995; and
- The Contaminated Land (England) Regulations 2006 (2006/1380) make provision for the identification and remediation of contaminated land under Part 2A of the Environmental Protection Act 1990.

8.4.24 Overall, the regime advocates a precautionary approach to dealing with contaminated land, there is clear direction to avoid the "excessive cost burdens" of "wastefully expensive remediation".

Methodology – Land Quality Assessment

8.4.25 The best practice procedure for assessing land dictates that potential contaminant Sources, Pathways, and Receptors should be considered within the context of potential contaminant linkages (PCLs) and that an evaluation of the risks associated with each linkage should drive decisions regarding the status of the land as contaminated, unaffected by contamination, or requiring further investigation.

8.4.26 The first assessment, a land quality assessment, takes account of the development proposals which introduces humans and property to this site. The individual risk assessments consider the potential for existing ground conditions to harm site users, damage property/buildings and pollute the wider environment.

33 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra, 2009

8.4.27 The methods to be followed in the assessment of land quality are detailed in various guidance documents. The overarching guidance document is Land Contamination Risk Management (LCRM) intended to assist all those involved in dealing with land contamination, including landowners, developers, professional advisors, regulatory bodies and financial providers.

8.4.28 The LCRM Model Procedures are split into three stages: risk assessment, options appraisal and remediation.

8.4.29 The first stage, Stage 1 Risk Assessment, is an essential component in achieving effective management of the risks from land contamination. The ES will rely on information and risk assessments presented as appendices, and these are likely to comprise detailed desk studies supported, where necessary, by targeted ground investigations and quantitative risk assessments.

8.4.30 If needed, mitigatory measures will form part of a remediation strategy and implementation plan.

Unexploded Ordnance (UXO)

8.4.31 It should be noted that for the purposes of the geology and ground conditions section of this Scoping Report, UXO will be assessed alongside other geohazards such as ground-based contaminants, hazardous gases, etc. In effect, UXO will be treated as a "Source" of hazard in a risk-based approach. This is judged appropriate as, whilst there is no legislation specifically dealing with UXO, health and safety legislation, such as the CDM Regulations and the Health and Safety at Work Act, effectively place obligations on developers to undertake appropriate assessment and mitigation measures, as required.

Methodology – Development Impact Assessment

8.4.32 The second assessment, the Development Impact Assessment, will discuss the potential impacts of the proposed development on soils and near surface geological deposits via physical-movement and pollution. The assessment will consider impacts during construction, operation and decommissioning of the development. Appropriate mitigation measures will be identified where predicted impacts during construction and operation are significant. It will not be possible to quantify these effects, and so qualitative assessments will be carried out based on available knowledge and professional judgement.

8.4.33 The methodology to be used draws on environmental impact assessment guidance produced by CIRIA, IEMA and in the Standards for Highways 'Sustainability & Environment Appraisal. LA 109 Geology and Soils, Rev 0 (2019)'.

8.4.34 The ES will also likely rely on an Agricultural Land Classification and Soil Resources report., included as part of the Land Use section in the ES.

Relevant Embedded Mitigation Measures

8.4.35 As part of the design process for the Project a few designed-in measures are proposed to reduce the potential for impacts on ground conditions and the resulting impacts upon potentially sensitive human, environmental and built receptors. These are presented below, and these will continue to evolve over the development process as the EIA progresses and in response to consultation.

8.4.36 The Project will seek to implement these measures, and various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of the Project and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 8.4.6 and Table 8.4.7. Measures adopted as part of the Project that will be considered include:

- Construction and maintenance workers should develop task specific method statements and risk assessments that specifically reference any potentially significant sources of ground contamination identified by the desk and site-based assessments carried out to support the preparation of the final ES chapter;
- Selection and use of appropriate robust personal protective equipment (PPE) by all site workers;
- Use of appropriate dust suppression measures, particularly during periods of dry weather when dust generation is most likely;
- Provision of appropriate spill kits on all site plant and in areas where fuels or other potentially contaminative liquids/chemicals are both used and stored;
- Management of stockpiles, including placement on impermeable surfaces and the provision of covering, to avoid leaching of any contaminants;
- Management of plant and vehicles including the use of covered wagons to transport soils and provision of wheel wash facilities;
- Management of plant and vehicle movements to prevent significant compaction of soils and a reduction in their structural properties essential for plant growth;
- Prevent long term exposure of soils during construction, particularly within any sloping areas, to reduce the risk of wind and water erosion and the resulting impacts upon soil quality;
- Adopt appropriate safe working practices that consider the potential for hazardous ground gases ingress and accumulation in confined spaces. The use of gas protection measures, such as impermeable membranes and ventilation, may be required if any permanent structures are to be in proximity to identified sources of ground gases such as a landfill site; and
- Development of, and adherence to, a Decommissioning Plan.

8.4.37 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential Impacts Scoped In

8.4.38 A range of potential impacts on ground conditions, human, environmental and built receptors have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table , together with a description of any proposed additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) to enable an assessment of the impact.

8.4.39 Following the method laid out above, the Applicant will present various risk assessments and consider the potential for existing ground conditions and UXO to harm future site users, damage future buildings, pollute water or the wider environment, including plants. In this case, it is expected that the risk assessments will show that baseline conditions across most of the site will comprise undeveloped agricultural land and that the site can be made suitable for its new use.

8.4.40 An initial assessment of risk and associated impacts is presented in Table 8.4.6. It should be noted however that this initial assessment is based upon identified land uses and contaminative activities across the wider AoS, and with subsequent project refinement, it may be possible to discount their presence and therefore the associated potential impacts.

8.4.41 Based on the information currently available, the supplied AoS and the Project description, a few impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in, Table 8.4.7 together with a justification for scoping them out.

Table 8.4.6: Impacts proposed to be scoped into the assessment for onshore geology and ground conditions

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Construction		
Short term risks to construction workers during development of onshore ECC and associated infrastructure, including the substation.	Site workers could be exposed to contaminated soils and groundwater during the construction phase via the direct contact, ingestion and dust inhalation exposure pathways.	The presence of significant contamination along the large majority of the onshore ECC is deemed unlikely as the final route is most likely to avoid significantly developed areas and traverse open farmland. However, the presence of localised sources of contamination cannot be ruled out at this initial stage. Once the onshore ECC is finalised it would be necessary to carry out a detailed desk-based assessment supported by purchased environmental database and historical map information. In accordance with current guidance, this information would then be used to prepare a CSM that would explore the relationships between sources, pathways and receptors of contamination. Any complete pollutant linkages identified by the CSM would represent a potential risk that may warrant further investigation. This could include site investigation, the recovery of soil and water samples for chemical analysis and the provision of an interpretative quantitative risk assessment. These findings would be used to establish the likely magnitude of potential effects (i.e., whether they are long, medium or short-term; or whether the effect is temporary/reversible or permanent) as well as the sensitivity of the receptor that could be impacted. The receptor importance/sensitivity and subsequent magnitude of change would be assessed as a function of one another to determine the significance of each effect. Any identified sources of contamination that could pose a risk to human receptors via the dust inhalation pathway, such as soils
Risks to offsite human receptors, such as occupants of residential properties bordering the onshore ECC.	Dusts generated during the construction phase could pose a risk to offsite human receptors via the inhalation exposure pathway. Such risks would be particularly pertinent if asbestos were identified in soils.	
Risks posed to sensitive surface water and groundwater resources.	Ground disturbance or the removal of hardstanding could increase the potential for leaching and the mobilisation of soluble contaminants.	

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
		potentially impacted by asbestos, will be used to inform the Air Quality assessment and the mitigation measures required.
	Leaks and/or spills of contaminants, such as fuels and oils, used and stored during the construction phase.	Bulk storage of potential contaminants judged to be unlikely during construction phase. Risks would be ameliorated by adopting good working procedures and control measures i.e., appropriate storage facilities, spill response plans, etc.
Construction phase impacts upon soil/land quality.	Compaction, erosion and reduction of structural properties due to disaggregation. Localised excavation and loss of soil resources.	Potential impacts could arise if poor working practices are adopted during the construction phase. Plant and vehicle movements should be carefully managed to protect the structural properties of soils, and their effectiveness as a growth medium for plants, reducing the risk of significant impacts on this important receptor". Exposure of soils after vegetation clearance, particularly on any sloping areas, should be avoided to prevent significant erosion. The complete loss of soil resources along limited sections of the onshore ECC where intrusive construction works are more prominent cannot be completely ruled out. The receptor importance/sensitivity and subsequent magnitude of change would be assessed as a function of one another to determine the significance of each effect.
Sterilisation of mineral deposits.	Construction of the onshore ECC upon deposits of minerals safeguarded by local policy	Where possible, the onshore ECC should be positioned to avoid potentially sensitive mineral deposits as detailed by the local authority minerals plan.
Operation and Maintenance		
Ingress and accumulation of hazardous ground gases.	Ground gases generated by deposits of fill could accumulate in confined spaces, such as structures and deep excavations, resulting in the accumulation of poor air	Risks would only be applicable if the onshore ECC was located on or near significant deposits of fill with the potential to generate ground gases such as methane and carbon dioxide. Such sources could be identified via detailed desk-based research of purchased environmental database information.

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
	quality and a risk of asphyxiation and explosion.	The risks would only be applicable if any structures of infrastructure associated with the onshore ECC included confined spaces in which ground gases could accumulate, such as joint bays and ducts.
Structures and services laid in direct contact with contaminated soils and groundwater	Certain contaminants can have a long-term impact on the integrity of subsurface materials such as buried concrete and plastic service pipes.	Potential sources for contamination will be referenced during the design phase ensuring selection of appropriate materials that provide adequate protection from contaminated soils and/or groundwater.
Decommissioning		
Short term risks to construction workers during decommissioning of onshore ECC and associated infrastructure.	Site workers could be exposed to contaminated soils and groundwater during the decommissioning phase via the direct contact, ingestion and dust inhalation exposure pathways.	Any significant risks posed by contaminated soils or groundwater are likely to be established during the construction phase and as such appropriate control measures could be implemented during decommissioning. Any identified sources of contamination that could pose a risk to human receptors via the dust inhalation pathway, such as soils potentially impacted by asbestos, will be used to inform the Air Quality section (see Section 8.1) and the mitigation measures required.
Risks to offsite human receptors, such as occupants of residential properties bordering the onshore ECC.	Dusts generated during the decommissioning phase could pose a risk to offsite human receptors via the inhalation exposure pathway.	
Risks posed to sensitive surface water and groundwater resources.	Leaks and/or spills of contaminants, such as fuels and oils, during the decommissioning phase.	Bulk storage of potential contaminants judged to be unlikely during decommissioning phase. Risks would be ameliorated by adopting good working procedures and control measures i.e., appropriate storage facilities, spill response plans, etc.
Cumulative		
Risks to offsite human receptors, such as occupants of residential	Dusts generated during the decommissioning phase could pose a risk to offsite human	The risks posed to human receptors, including site workers and occupants/users of adjacent sites, could potentially be exacerbated

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
properties bordering the onshore ECC.	receptors via the inhalation exposure pathway.	if the landfall, cable corridor or substation were to border any other significant proposed developments.
Risks posed to sensitive surface water and groundwater resources.	Leaks and/or spills of contaminants, such as fuels and oils, during the decommissioning phase.	Risks to sensitive water receptors could be increased if significant works adjoining the development areas also resulted in activities such as soil stockpiling and the removal of hardstanding, as this could have a cumulative impact upon the leaching of soluble contaminants. A concentration of plant and machinery could also increase the risk of an escape from fuel and chemical storage facilities.
Risks posed to sensitive surface water and groundwater resources.	Leaks and/or spills of contaminants, such as fuels and oils.	

Impacts Proposed to be Scoped Out

8.4.42 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Geology, Ground Conditions and Land Quality. These impacts are outlined in Table 8.4.7 together with a justification for scoping them out.

Table 8.4.7: Impacts Proposed to be scoped out of the assessment for onshore geology and ground conditions

Impact	Justification for scoping out
Construction	
N/A	N/A
Operation and Maintenance	
Operational impacts on geology/ground conditions and associated longer term risks to human and environmental receptors.	Significant ground disturbance is considered unlikely during the operation phase. Furthermore, contractors appointed to carry out repair/maintenance activities would be informed of any issues relating to ground contamination identified during the construction phase and would therefore adopt appropriate working methods and control measures to ameliorate any potential risks and associated impacts.
Loss of agricultural land from operation of underground cables	The construction of the onshore ECC would be carried out in a controlled and considered manor so as not have any long-term impact upon agricultural land.
Routine maintenance effects on sterilisation of minerals and loss of agricultural land.	Large scale maintenance works are judged to be unlikely during the operation phase. Localised activities would be subject to control measures to ameliorate small-scale risks and impacts.
Decommissioning	
N/A	N/A
Cumulative	
N/A	N/A

Potential Transboundary Effects

8.4.43 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

8.4.44 Based upon the nature of the site, and the anticipated baseline ground conditions as identified by this initial assessment, it is considered that any impacts, if present, will be localised. It is therefore judged that there will not be any transboundary impacts relating to geology and ground conditions.

8.4.45 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

8.4.46 In accordance with current guidance and best practice, the assessment of potentially contaminated sites should commence with a desk-based assessment.

8.4.47 Once the onshore ECC is refined, the initial stage of assessment would comprise a review of available desktop information. This assessment would highlight any potentially contaminative sites that would warrant further, more robust assessment. The distance of the assessment from the onshore ECC will be devised based upon the significance of the identified sources of contamination, the sensitivity of the identified receptor and the likelihood of an exposure pathway existing that could link the two.

8.4.48 Appropriate consultation will be undertaken, primarily with Local Authorities and the Environment Agency appropriate to the identified corridor route.

8.4.49 Areas identified as being more likely to be impacted by contamination could subsequently be subject to a more detailed desk-based assessment akin to a Phase I Primary Land Quality Risk Assessment (PLQRA). These assessments would be based upon a review of purchased environmental database and historical map records and, where necessary, site walkover surveys. The purpose of any such targeted qualitative risk assessments would be to provide a more comprehensive understanding of potential sources, pathways and receptors of contamination and their likely relationships. These would be presented in a CSM that would identify potential pollutant linkages by which a sensitive receptor could be linked to source of contamination by an exposure pathway.

8.4.50 If or where potentially significant pollutant linkages are established this is likely to trigger further phases of assessment that could comprise intrusive ground investigation, the recovery of soil and water samples for laboratory chemical analysis and the provision of a quantitative risk assessment.

8.4.51 The findings of qualitative and quantitative risk assessments would be used to establish the likely magnitude of potential effects (i.e., whether they are long, medium or short-term; or whether the effect is temporary/reversible or permanent) as well as the sensitivity of the receptor that could be impacted. The receptor importance/sensitivity and subsequent magnitude of change would be assessed as a function of one another to determine the significance of each effect.

8.4.52 The size of the area(s) requiring investigation will be devised with reference to the likely significance of the identified sources of contamination and the sensitivity of the construction works and environmental setting of each defined AoS.

8.4.53 The findings of the initial phases of assessment, and the nature and extent of any identified contamination, could then be used to inform working practices and the design of the final onshore ECC. Where the risks cannot be ameliorated through the adoption of control measures consideration may need to be given to localised remediation.

Further Consideration for Consultees

8.4.54 The further consideration for consultees regarding potential impacts upon geology and ground conditions are as follows:

- Do you agree that the risks and impacts associated with contaminated land are unlikely to be significant across the large majority of any onshore ECC, and that any subsequent, more detailed assessments are most likely to target localised impacts?
- Do you agree that the proposed phased approach to the assessment of risk and associated impacts are sufficient to inform the onshore baseline ground conditions for the PEIR and ES?
- Are there any potentially significant sources of ground contamination/contaminative activities within the AoS that have not been identified by the initial data review?
- Have all potentially sensitive receptors within the wider AoS been identified?
- Do you agree that the impacts described in Table 8.4.7 can be scoped out?
- For those impacts scoped in (Table 8.4.6), do you agree that the methods described are sufficient to inform a robust impact assessment?

8.5 Hydrology, Hydrogeology and Flood Risk

Introduction

8.5.1 This section of the Scoping Report identifies the Hydrology, Hydrogeology and Flood Risk elements of relevance to the Project's onshore cable corridor AoS. This section of the Scoping Report considers the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on Hydrology, Hydrogeology and Flood Risk, and sets out the proposed scope and assessment methodology of the EIA.

8.5.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.This section of this Scoping Report should be read alongside the following onshore assessment sections of this Scoping Report:

- Section 8.3: Onshore Ecology and Ornithology; and
- Section 8.4: Geology and Ground Conditions

8.5.3 The water environment includes watercourses and surface water drainage, groundwater below the onshore element of the Project and onshore flood risk. Offshore aspects of the water environment are covered separately at Section 7.2.

Study Area

8.5.4 The study area for Hydrology, Hydrogeology and Flood Risk includes land onshore from MHWS and is defined based on the AoS shown in Figure 8.5.2. For the purpose of scoping, the whole of the AoS has been taken into consideration: Areas outside but with potential hydraulic connectivity to the AoS have also been taken into consideration up to a distance of 2 km. The AoS is situated on the east coast of England and spans from Theddlethorpe St Helen in the north to Spalding in the south.

8.5.5 For the purpose of scoping, the whole of the search area has been taken into consideration, however it is noted that this area will be refined and amended for the PEIR following identification of constraints, selection of routing for the onshore cable routing and OnSS location(s), as well as feedback received within the Scoping Opinion and through the EPP. This is expected to result in a significant reduction in the size of the study area.

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South Dike

Louth Canal

Long Eau

Great Eau

River Lymn

Steeping River

West Fen Catchwater Drain

Willoughby High Drain

Saltfleetby St Clement

Saltfleetby St Peter

Theddlethorpe St Helen

MABLETHORPE

Trusthorpe

Sutton on Sea

Sandilands

England Coast Path

Anderby Creek

Chapel St Leonards

Ingoldmells

Ingoldmells Point Holiday Village

Inner Dowsing Wind Farm

Lincs Wind Farm

Lynn Wind Farm

Seathorne

SKEGNESS

LOUTH

SPILSBY

ALFORD

Louth

Alvingham

Keddington

Stewton

Cockerington

Burwell

Ruckland

Swaby

White Pit

Mavis Enderby

Huttoft

Croft

Thorpe Fendykes

Wainfleet Bank

Wainfleet All Saints

A52

Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Statutory Main River
- Ordinary Water Course
- Source Protection Zone (SPZ)

Flood Map for Planning Rivers and Sea

- Flood Zone 2
- Flood Zone 3

Risk of Flooding from Surface Water Flooding Depth 0.1 % Annual Chance

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Watercourses and Flood Zones within AoS and Lincs Node OnSS Study Area

Figure 8.5.1

OUTER DOWSING OFFSHORE WIND

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Revision: 0.1

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Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Weston Marsh
- Statutory Main River
- Ordinary Water Course
- Source Protection Zone (SPZ)

Flood Map for Planning Rivers and Sea

- Flood Zone 2
- Flood Zone 3
- Environment Agency Areas Benefiting from Flood Defences

Risk of Flooding from Surface Water Flooding Depth 0.1 % Annual Chance

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Coordinate System: British National Grid

0 4 8 km

Scale: 1:125,000

Watercourses and Flood Zones within AoS and Weston Marsh OnSS Study Area

Figure 8.5.2

OUTER DOWSING OFFSHORE WIND

Date: 12/06/2022
Produced By: JRS
Revision: 0.1

SLR

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Baseline Environment

Overview of Available Data Sources

8.5.6 Baseline data to inform scoping for Hydrology, Hydrogeology and Flood Risk has been taken from publicly available information and opensource data from a range of sources. The key sources of information are summarised in Table 8.5.1.

8.5.7 Once the proposed location of the preferred onshore ECC has been selected there may be a requirement to source additional third-party data for areas identified as higher risk through the initial desktop review.

Table 8.5.1: Key sources of information for Hydrology, Hydrogeology and Flood Risk

Source	Summary	Spatial coverage of study area
Environment Agency and data.gov.uk website	Flood zone mapping; spatial flood defence data and mapping; flood warning and flood alert areas; main rivers; ordinary watercourses; groundwater SPZ; WFD surface water and groundwater classification data.	These are national datasets providing full coverage of the hydrology, hydrogeology and flood risk study area.
BGS mapping	Geology (artificial ground, superficial deposits, bedrock); borehole/ well data; aquifer designation and groundwater vulnerability.	These are national datasets providing full coverage of the hydrology, hydrogeology and flood risk study area.
Defra's magic website/ Natural England	Statutory and non-statutory environmental designations.	These are national datasets providing full coverage of the hydrology, hydrogeology and flood risk study area.
Cranfield Soil and Agrifood Institute Soilscapes map viewer	Soil type and character.	This is a national dataset providing full coverage of the hydrology, hydrogeology and flood risk study area.
East Lindsey District Council, Boston Borough Council, South Holland District Council and Lincolnshire County Council	Local flood risk management strategy; SMP (smp3 and smp4); strategic flood risk assessments	Full coverage of the hydrology, hydrogeology and flood risk study area.

8.5.8 Preparation of the Scoping Report and work to prepare the PEIR/ ES will also include targeted data requests and consultation with a number of stakeholders and regulatory bodies. The information and data to be requested will include:

- Environment Agency:
  - Flood modelling and mapping, flood defence asset information and flood event history;
  - Catchment data for the operational surface water catchments relating to water quality and WFD classification;
  - Catchment data for the Anglian groundwater catchments relating to water quality and WFD classification;
  - Coastal management data; and
  - Licensed abstractions or water users including data supporting groundwater SPZ designations.
- East Lindsey District Council, Boston Borough Council, South Holland District Council and Lincolnshire County Council:
  - Registered private water supplies;
  - Shoreline monitoring data;
  - Sustainable drainage guidance to meet Lead Local Flood Authority (LLFA) requirements; and
  - Local flood event history.
- Internal Drainage Boards (IDB):
  - Details of all assets managed by respective IDBs (drainage channels, sluices, pumping stations);
  - Operational practices; and
  - Flood modelling and mapping and flood event history.

8.5.9 Review and survey of any public or private water supply abstraction may be required depending on the location and type of supply registered. This could include liaison with water supply companies such as Anglian Water.

Overview of Baseline Environment

8.5.10 Land within the onshore AoS is drained by a number of significant watercourses, taking runoff from the land to the coast. The north of the AoS is drained by the Steeping and Eaus operational catchment (containing main rivers Great Eaus, Wolf Grift Drain, Willoughby High drain and the Lymn / Steeping), the central section of the AoS is drained by the Fens East and West operational catchment (containing main rivers of the East and West Fen Drains) and the south drained by the South Forty Foot Drain operational catchment and the Welland Lower operational catchment (containing main rivers of South Forty Foot Drain and the Welland, respectively).

8.5.11 Groundwater beneath the AoS is present within Principal bedrock aquifers of the White Chalk Subgroup and Grey Chalk Subgroup extending south from the northern most point of the AoS, to Skegness. Secondary A and Secondary B aquifers are present south of Skegness, around the Wainflee*t al*l Saints area which are present within the Lower Greensand Group and Wealden Group bedrock. The remaining area to the south is underlain by Wealden Group mudstone, siltstone and sandstone and West Walton Formation, Ampthill Clay Formation and Kimmeridge Clay Formation mudstone, siltstone and sandstone. Where present, superficial deposits underlying the AoS comprise mainly of Alluvium, Glacial Sand and Gravel, and Glacial Diamicton (Till). Groundwater SPZs are noted within the northern part of the AoS, extending from inland of Mablethorpe to slightly south of Skegness.

8.5.12 Fluvial and tidal flood risk mapping shows a significant proportion of land within the search area to be at risk of inundation during extreme flood events. Risks are identified along the east coastline and extend inland. Whilst there are flood defences along the coastline, the AoS is not defined as benefitting from flood defences.

8.5.13 Surface water flood risk mapping produced by the Environment Agency indicates some land in the study area at potential risk of inundation from extreme rainfall. Consultation with the Lead Local Flood Authorities and Environment Agency will seek to clarify further any notable surface water flood risk hotspots.

Designated Sites

8.5.14 Table 8.5.2 below details the statutory environmentally designated sites within the AoS or within areas close to and in hydraulic continuity with the AoS. These sites are detailed in Figure 8.5.1 and Figure 8.5.2.

Table 8.5.2: Environmental Designations with relevance to the AoS

Site	Closest Distance to the Project
International	
Saltfleetby – Theddlethorpe Dunes & Gibraltar Point SAC	0 km, adjacent north and 1.5km east
Humber Estuary SPA	0 km, adjacent north
Humber Estuary Ramsar	0 km, adjacent north
Greater Wash SPA	0 km, adjacent east
The Wash & North Norfolk Coast SAC	0 km, adjacent east and southeast
The Wash SPA	0 km, adjacent southeast
The Wash Ramsar	0 km, adjacent southeast
Gibraltar Point SPA	1.5 km east
Gibraltar Point Ramsar	1.5 km east
National	
Saltfleetby – Theddlethorpe Dunes NNR	0 km, adjacent north
Saltfleetby – Theddlethorpe Dunes SSSI	0 km, adjacent north
Sea Bank Clay Pits SSSI	0 km northeast (various locations)
Chapel Point to Wolla Bank SSSI	0 km, adjacent northeast
Bratoft Meadows SSSI	0 km central
Gibraltar Point SSSI	1.5 km east
Gibraltar Point NNR	1.5 km east

Site	Closest Distance to the Project
Willoughby Branch Line LNR	0.4 km northwest
Havenside LNR	0 km south
The Wash NNR	0 km, adjacent southeast
The Wash SSSI	0 km, adjacent southeast

8.5.15 Further non-statutory designations are also noted locally, such as local wildlife trust sites and AW, and would be given due consideration within the assessments, where relevant. Full details of environmentally designated site are contained in Section 8.3.

8.5.16 The presence and locations of sensitive ecological receptor locations will be determined upon refinement of the onshore ECC options and OnSS location. Furthermore, the potential inclusion of these receptor locations within the assessment will be determined by application of screening criteria presented in relevant guidance.

8.5.17 In relation to this, a separate HRA screening report is being produced which will cover European designations in more detail.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.5.18 There are no published guidelines or criteria for assessing and evaluating effects on hydrology or flood risk within the context of an EIA. The proposed assessment will be based on a methodology derived from the Institute of Environmental Management and Assessment (IEMA) guidance (IEMA, 2016). The methodology sets out a list of criteria for evaluating the environmental effects and is outlined in Section 5 of this Scoping Report.

8.5.19 Professional judgement and a qualitative risk assessment methodology will be used to assess the findings in relation to sensitivity of identified receptors and magnitude of potential impact, to give an assessment of significance for each impact.

8.5.20 Once the impact significance and likelihood of occurrence have been assessed these will then be combined to determine the likelihood of each potential effect occurring. Effects assessed as minor or less would be considered not significant in terms of the EIA regulations. If the assessment results in moderate or major effect, then this effect would be considered to be significant.

8.5.21 This approach provides a mechanism for identifying the areas where site specific mitigation measures will be required and for identifying mitigation measures appropriate to the risk presented by the Project. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

8.5.22 The approach to assessment and data gathering would be agreed through liaison with relevant bodies prior to commencement and consultation will be undertaken at key stages throughout the EIA process.

8.5.23 In addition to the general approach and guidance outlined in Section 5, the assessment of Hydrology, Hydrogeology and Flood Risk will also comply with the following guidance documents where they are specific to this topic.

Legislation and Planning Policy Guidance

8.5.24 Regard will be given to technical guidance and other codes of best practice during the design phase of the development in order to limit:

- The potential for contamination of ground and surface waters;
- The potential for flooding to be caused to the existing water environment and surrounding sensitive users;
- Potential for change to groundwater or surface water hydrology; and
- Other potential impacts on the water environment.

8.5.25 The onshore cabling and OnSS connection to National Grid will therefore be developed in accordance with the following European legislation, National legislation, National and Local Planning Policy and Strategy and other relevant guidance.

European Legislation

8.5.26 The WFD (2000/60/EC) which provides the foundation for the protection of the UK's water environment. The WFD seeks to protect all elements of the water cycle and to enhance the quality of groundwater, surface waters, estuaries, and coastal waters. The Directive is transposed and implemented within England through the Water Environment (WFD) (England and Wales) Regulations 2017. Section 7.2 also makes reference to the WFD in relation to assessment of the offshore water environment.

8.5.27 The Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under Directive 2014/80/EU) (the GWD) is designed to combat groundwater pollution and sets out procedures for assessing quality of groundwater. Aspects of the GWD are transposed and implemented through the Water Environment (WFD (England and Wales) Regulations 2017, the Environmental Permitting (England and Wales) Regulations 2016 and the Groundwater (England and Wales) Regulations 2009.

8.5.28 The Floods Directive (2007/60/EC) requires assessment of all watercourses and coastlines to determine risk of flooding and action to take adequate and coordinated measures to reduce this flood risk. The Flood Risk Regulations 2009 transpose the EU Floods Directive into law in England and Wales.

National Legislation

8.5.29 The objectives of the directives discussed above that are relevant to this assessment are met through the following UK legislation, relevant to the protection of the water environment:

- The Water Environment (WFD) (England and Wales) Regulations 2017 transposes the WFD and aspects of the GWD into UK legislation;
- The Groundwater (England and Wales) Regulations 2009 implements in England and Wales Article 6 of the GWD which details measures to prevent or limit inputs of pollutants into groundwater;

- The Environmental Permitting (England and Wales) Regulations 2016 consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010, which have been amended 15 times to date. The 2010 Regulations are still in force and are the main implementing regulations for the environmental permitting regime;
- The Flood Risk Regulations 2009 transposes the EU Floods Directive into UK legislation and sets out requirements of the Environment Agency and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;
- Flood and Water Management Act 2010 includes provisions for the management of risk in connection with flooding and sets out requirements for Lead Local Flood Authorities (LLFA) in preparing strategies for local flood risk management;
- The Water Resources Act 1991 and amendment (England and Wales) Regulations 2009. The Water Resources Act 1991 regulates water resources, water quality and flood defence. The amendment Regulations make changes to the powers for carrying out anti-pollution works and serving notices;
- The Land Drainage Act 1991 and 1994 sets out requirements for maintenance of watercourses by riparian owners;
- The Environment Act 1995 sets out roles and responsibilities for the Environment Agency;
- The Private Water Supplies (England) Regulations 2016 and The Private Water Supplies (England) (amendment) Regulations 2018 transpose requirements of European Law on the quality of water intended for human consumption from private abstractions; and
- Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017 set out the key stages in the assessment process, including review and monitoring.

National and Local Planning Policy

8.5.30 The following national and local policy and guidance is considered relevant for the EIA in relation to Hydrology, Hydrogeology and Flood Risk:

- **National Planning Policy Framework:** The National Planning Policy Framework (NPPF), prepared by the Department for Communities and Local Government was published in March 2012 and revised in July 2021. Chapter 14 of the NPPF, Meeting the challenge of climate change, flooding and coastal change, along with the National Planning Practice Guidance (PPG) which expands on policies contained in the NPPF, recommends a proactive strategy to mitigate and adapt to climate change and requires that flood risk, sustainability and water quality are considered. In addition, the NPPF requires that account is taken of the potential for pollution arising from previous use of the land when determining suitability for a proposed use. NPPF informs Section 5.7 Flood Risk of the Overarching National Planning Policy Statement for Energy (NPS EN-1).
    - Chapter 15 of the NPPF, Conserving and enhancing the natural environment, along with guidance contained within PPG requires that account is taken of the potential for impact on water quality (in relation to water supply and the natural environment) and local hydrological regimes. NPPF informs Section 5.15 Water Quality and Resources of the Overarching National Planning Policy Statement for Energy (NPS EN-1).

- **Local Planning Policy:** Planning policies of relevance in terms of Hydrology, Hydrogeology and Flood Risk are listed below:
    - East Lindsey District Council Core Strategy (adopted July 2018);
    - Strategic Policy 16 (SP16): Inland Flood Risk;
    - Strategic Policy 17 (SP17): Coastal East Lindsey;
    - South East Lincolnshire Local Plan (adopted March 2019); and
    - Policy 4: Approach to Flood Risk.

Shoreline Management Plans

8.5.31 SMP's outline strategy for managing flood and erosion risk along the coastline, over short, medium and long-term periods. SMP3 has been prepared by the Humber Estuary Coastal Authorities Group and covers the east coast of England from Flamborough Head to Gibraltar Point. SMP4 has been prepared by the East Anglia Coastal Group and covers the coastline from Gibraltar Point to Old Hunstanton.

Other Relevant Guidance

8.5.32 Relevant UK guidance on good practice for construction projects that will be referenced during assessment is detailed in the following documents:

- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association, (CIRIA) 2001;
- Environmental Good Practice on Site (C741), CIRIA 2015;
- Control of water pollution from linear construction projects, CIRIA 2006;
- The Environment Agency's approach to groundwater protection, version 1.2, February 2018; and
- The SuDS Manual (C753), CIRIA 2015.

8.5.33 The CIRIA guidance provides help on environmental good practice for the control of water pollution arising from construction activities. It focuses on the potential sources of water pollution from within construction sites and the effective methods of preventing its occurrence.

8.5.34 The Environment Agency guidance is part of a wider suite of documents and guidance relating to groundwater protection which sets out principles for assessing risk, protecting groundwater, and permitting of abstractions and discharges from groundwater. The full suite of documents relating to groundwater can be found on the GOV.UK website.

8.5.35 The SuDS Manual incorporates the latest research, industry practice, and guidance for design, delivery, and maintenance of Sustainable Drainage Systems (SuDS).

Relevant Embedded Mitigation Measures

8.5.36 A number of designed-in measures are proposed to reduce the potential for impacts on hydrological and flood risk receptors. These are presented below. These measures will evolve over the development process as the EIA progresses and in response to consultation.

8.5.37 The Project will seek to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design and hence have been considered in the judgments as to which impacts can be scoped in/ out presented in Table and Table 8.5.4.

8.5.38 Measures to be considered as part of the Project include:

- Avoidance of impact through design by selecting an onshore cable route option that avoids, where possible, areas sensitive to the water environment (e.g., environmentally designated sites, sources of water use/ abstraction) and minimizes watercourse crossing points;
- Avoidance of impact through cable installation methodology (e.g., HDD at sensitive points, in particular flood defenses or significant watercourse crossings);
- Development of, and adherence to, a CoCP which would set out principles for storage and handling of oils, fuel or any other potentially polluting substance, management of surface water and soil management;
- During the construction phase, any onshore piling operations would require a Piling Risk Assessment; and
- Development of, and adherence to, a Decommissioning Plan.

8.5.39 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential Impacts Scoped In

8.5.40 A range of potential impacts on Hydrology, Hydrogeology and Flood Risk have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the EIA are outlined in Table 8.5.3, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 8.5.3: Impacts proposed to be scoped in to the assessment for Hydrology, Hydrogeology and Flood Risk

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Construction		
Generation of turbid runoff which could enter the water environment (Direct, Temporary)	Construction activities will include clearance of surface vegetation and topsoil along the onshore cable route; stockpiling of removed materials; excavation for cable trenches; management of spoil from directional drilling; dewatering of excavations; and reinstatement of land following works.	Existing data from the BGS for superficial and bedrock geology and soil information from Cranfield Soil and Agrifood Institute will be used to describe the baseline geological environment (this is detailed further under Section 8.4 of this Scoping Report). Site visits will be undertaken of key points along the onshore cable route (landfall point, OnSS location, watercourse crossing points, etc.), once the location for the onshore cable route and associated OnSS are known, to review any particular sensitivities with respect to the water environment. Typical sensitivities would include: ▪ Surface watercourses; ▪ Water abstraction points; ▪ Water dependent habitat; and ▪ Coastal environment. Measures described in Environment Agency pollution prevention guidance, and CIRIA guidance will be formalised within the draft CoCP. This will define principles for management of surface water runoff on areas of construction, handling and stockpiling of soils and stripped surface cover and control of vehicle movements. Existing water quality as documented by the Environment Agency will be reviewed in order to develop an understanding of baseline characteristics for surface water and groundwater catchments. The anticipated potential for turbid runoff to enter the water environment will be localised and short term only.

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Changes to surface water runoff patterns which could affect flood risk. (Direct and Indirect, Permanent)	The following construction phase activities have the potential to affect flood risk: Removal of surface vegetation; Compacting of soils through vehicle movement; Development of temporary compounds; Cable trenching excavations; and Dewatering of excavations.	Environment Agency flood map zoning will be used to inform a Flood Risk Assessment (FRA) for proposed activities on site. Site topographical data will be used to define catchment watersheds and overland flowpaths. The NPPF requires that all developments should undertake a sequential test as part of the site selection process to move development away from flood prone areas. As the location of the proposed grid connection will be largely dictated by the OTNR process being undertaken by National Grid. As Essential Infrastructure, the flood risk assessment with focus on demonstrating the Project can meet the requirements of the exception test.
Potential for damage to flood defence or surface water drainage infrastructure. (Direct, Permanent)	Onshore cable route may cross existing flood defence or surface water drainage infrastructure and construction could alter the operation effectiveness or structural integrity.	Environment Agency opensource data will be reviewed to determine the location of formal flood defence infrastructure. Consultation with stakeholders will be undertaken to confirm the location of key infrastructure once the onshore cable route is known. This data may include, raised earth embankments, hard engineered flood defence walls, sluices and surface water pumping stations. Design of the onshore cable route will include the option of HDD crossings of key sensitive infrastructure and larger watercourse crossings where practical.
Pollution or disruption of flow to groundwater through ground excavations or piling. (Direct, Permanent)	Any piling or deep excavation works have the potential for impacting groundwater resources and creating a pathway for pollutants.	Existing data from the BGS for superficial and bedrock geology and soil information from Cranfield Soil and Agrifood Institute will be used to describe the baseline geological environment. The location of infrastructure in the emerging design solutions will inform intrusive site investigations which will determine the need for any piling or deep excavations. If a risk is identified at this point, a Piling Risk Assessment and/ or Groundwater Risk Assessment may be required.
Operation and Maintenance		

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
Changes to surface water drainage at the OnSS location. (Direct, Permanent)	Development of the OnSS will alter the nature of land cover at the site of development and is likely to increase surface water runoff to the local surface water environment or drainage network.	Engagement with the LLFA will determine the level of detail required in regard to design of the surface water drainage strategy to support the DCO application. An outline drainage strategy would be prepared as an appendix to the FRA which would set out the strategy for management of surface water runoff at the site of the OnSS. The drainage strategy would follow SuDS principles.
Decommissioning		
Generation of turbid runoff which could enter the water environment (Direct, Temporary)	Earthworks will be required to demolish and remove from site all surface structures related to the onshore cable route.	The risks identified and mitigation recommendations made with regard to construction earthworks would apply however it is noted that works would likely be limited to removal of surface features only (i.e. underground cables would not be removed at decommissioning).
Cumulative		
Generation of turbid runoff which could enter the water environment (Direct, Temporary)	As outlined Construction above, these activities will include clearance of surface vegetation and topsoil along the onshore cable route; stockpiling of removed materials; excavation for cable trenches; management of spoil from directional drilling; dewatering of excavations; and reinstatement of land following works.	Cumulative impacts will be considered as part of the EIA process (refer to Section 5 for details), adapted to make it applicable to onshore Hydrology, Hydrogeology and Flood Risk. This will include a desk-top exercise and consultation with stakeholders to identify relevant potential projects with which there could be interactions. The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Inspectorate (Planning Inspectorate, 2019) and from the renewables industry (RenewableUK, 2013 and TCE, 2019).
Changes to surface water runoff patterns which could affect flood risk.	The following construction phase activities have the potential to affect flood risk: Removal of surface vegetation;	

Impact	Description	Proposed approach to assessment including description of any new data collation required and any analyses (such as modelling)
(Direct and Indirect, Permanent)	Compacting of soils through vehicle movement; Development of temporary compounds; Cable trenching excavations; and Dewatering of excavations.	The impacts proposed to be scoped into the cumulative impact assessment are construction and decommissioning impacts. Any potential for cumulative impact would be dependent on phasing of the other major developments considered. Plans and programmes for other developments are unlikely to generate additional significant adverse cumulative effects, unless they: ▪ Impact Main Rivers or Ordinary watercourses; ▪ Significantly impact groundwaters in the vicinity of the onshore cable route, landfall or OnSS; or ▪ Adversely impact catchments within the AoS.
Potential for damage to flood defence or surface water drainage infrastructure. (Direct, Permanent)	Onshore cable route may cross existing flood defence or surface water drainage infrastructure and construction could alter the operation effectiveness or structural integrity.	
Pollution or disruption of flow to groundwater through ground excavations or piling. (Direct, Permanent)	Any piling or deep excavation works have the potential for impacting groundwater resources and creating a pathway for pollutants.	

Impacts Proposed to be Scoped Out

8.5.41 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Hydrology, Hydrogeology and Flood Risk. These impacts are outlined in Table 8.5.4, together with a justification for scoping them out.

Table 8.5.4: Impacts proposed to be scoped out of assessment for Hydrology, Hydrogeology and Flood Risk

Impact	Justification for scoping out
Construction	
Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment.	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure may lead to direct impact to the receiving water environment. Measures described in CIRIA guidance will be formalised within the draft CoCP. This will define principles for management of surface water runoff on areas of construction, handling and stockpiling of soils and stripped surface cover and control of vehicle movements. Implementation of principles within the draft CoCP will reduce the risk that potential spills or leaks would not be identified early and contained at source with limited potential for mobilisation of any significant pollution to the water environment. Subject to consultation with stakeholders and feedback received on this Scoping Report, the Project intends to scope this impact out of further consideration within the EIA.
Operation and Maintenance	
Any impact on WFD status for assessed surface water or groundwater bodies.	Land within the onshore cable route corridor will be fully reinstated following cable trenching and/ or HDD operations. There will be no significant change to surface land use, runoff regimes, hydrogeological recharge and no potential for entrainment of pollutants to the surface water or groundwater environment. Subject to agreement with stakeholders and feedback from the same on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment.	The impact of pollution including accidental spills and contaminant releases associated with the operation of infrastructure may lead to direct impact to the receiving water environment. Implementation of measures set out in the EIA and principles within the draft CoCP will reduce the risk that potential spills or leaks would not be identified early and contained at source with limited potential for mobilisation of any significant pollution to the water environment.

Impact	Justification for scoping out
	Subject to consultation with stakeholders and feedback received on this Scoping Report, the Project intends to scope this impact out of further consideration within the EIA.
Decommissioning	
Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment.	The impact of pollution including accidental spills and contaminant releases associated with the decommissioning of infrastructure may lead to direct impact to the receiving water environment. Implementation of principles within the EIA will reduce the risk that potential spills or leaks would not be identified early and contained at source with limited potential for mobilisation of any significant pollution to the water environment. Subject to consultation with stakeholders and feedback received on this Scoping Report, the Project intends to scope this impact out of further consideration within the EIA.
Potential for damage to flood defence or surface water drainage infrastructure. (Direct, Permanent)	Onshore cables would be left in situ and therefor no affects would result from decommissioning.
Pollution or disruption of flow to groundwater through ground excavations or piling. (Direct, Permanent)	Any piling or deep excavation works would be left in situ and therefor no affects would result from decommissioning.
Cumulative	
Changes to surface water drainage at the OnSS location.	The proposed surface water management scheme will reduce the potential for significant impacts from the Project in this regard. There would be no potential for cumulative impact anticipated during the operational phase.

Potential Transboundary Effects

8.5.42 Section 5 provides a description of how potential transboundary effects will be assessed. Due to the localised nature of any onshore Hydrology, Hydrogeology and Flood Risk potential impacts, transboundary impacts are highly unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

8.5.43 This scoping assessment has been undertaken based on desk-based information. Further information and data will be required to identify the potential impacts upon the water environment in relation to the onshore study area. This will include a detailed review and assessment of the onshore ECC and OnSS site. The assessment will be refined following the selection of the preferred cable route and OnSS location.

8.5.44 Once the onshore ECC and OnSS location are refined we propose to undertake a comprehensive assessment of the potential impact of the scheme on local hydrological and hydrogeological receptors. A full walkover survey of the onshore ECC and OnSS location, including all adjacent watercourses will be carried out to support this assessment. Findings of the assessment will be set out in the Hydrology, Hydrogeology and Flood Risk ES chapter. The assessment will highlight any sites at high risk of flooding that would warrant further, more detailed assessment. Where potential adverse effects are identified, either during the construction phase or the operation of the scheme, the proposed measures for controlling these will be discussed. The assessment will then set out the level of residual risk posed to local hydrological and hydrogeological receptors.

8.5.45 An FRA and Surface Water Drainage Strategy will also be undertaken for the proposed onshore ECC and OnSS. This will assess the risk of flooding posed to the development and detail how storm water runoff from the site will be managed providing technical details of the key mitigation proposed to protect both the Project and the water environment.

8.5.46 A WFD compliance assessment for the Project will be provided as a standalone document to accompany the PEIR, and the subsequent ES and final DCO application. This assessment will be prepared in accordance with the 'WFD assessment: estuarine and coastal waters' guidance. The purpose of the WFD compliance assessment will be to demonstrate that the proposed activities associated with the Project will not result in the deterioration of relevant water bodies and will not jeopardise potential future objectives under the WFD (i.e., the achievement of overall good status through good ecological and chemical status/ potential). The WFD assessment will be informed by relevant topic specific assessments in the PEIR and ES.

Further Consideration for Consultees

8.5.47 The following specific questions are provided to help frame the consultees Scoping Opinion for Hydrology, Hydrogeology and Flood Risk:

- Do you agree that the data sources identified above are sufficient to inform the onshore hydrology, hydrogeology, and flood risk baseline for the PEIR and ES?
- Have all potential impacts resulting from development of the onshore ECC been identified for water environment receptors?
- Do you agree that the impacts described in Table 8.5.4can be scoped out?
- For those impacts scoped in (Table 8.5.3), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the onshore ECC on hydrology, hydrogeology, and flood risk for onshore receptors?

8.6 Land Use

Introduction

8.6.1 This section of the Scoping Report identifies the Land Use elements of relevance to the Project's onshore cable corridor AoS. It considers the potential effects on Land Use from the construction, O&M, and decommissioning of the Project, alone and cumulatively and sets out the proposed scope of the EIA.

8.6.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.

8.6.3 This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Landscape and Visual (see Section 8.9) - the impacts on the landscape, landscape designations such as an Area of Outstanding Natural Beauty (AONB), and subsequent impact on land use/tourism and recreation may be referred to by the Land Use section;
- Geology and Ground Conditions (see Section 8.4) – potential for land to be contaminated or used as a landfill site.
- Socio-Economic (see Section 9.3) – economic impact of a reduction of tourism and/or tourism-related facilities.
- Terrestrial Ecology and Ornithology (see Section 8.3) - statutory designations and the subsequent potential impacts from the proposed development on this land use will be assessed in this section; and
- Traffic and Transport (see Section 8.8) - the impact that the proposed development could have in restricting agricultural vehicles and/or other modes of transport through the severance of highway linkages.

Study Area

8.6.4 The Study Area is located along and adjacent to the east coast of England between the Humber Estuary, in the north, and the town of Spalding, in the south. It extends along approximately 65 km of the coastline, including the Lincolnshire coast of the Wash and Gibraltar Point. It extends inland up to approximately 13 km from the coast.

Baseline Environment

Overview of Available Data Sources

8.6.5 Characterising the Land Use baseline environment for the AoS involves gathering data from publicly available, desk-based sources, often provided by Natural England and/or the Defra, with these sources also being integral in the latter PEIR and Environmental Statement (ES).Characterising the Land Use baseline environment for the AoS involves gathering data from publicly available, desk-based sources, often provided by Natural England and/or the Defra, with these sources also being integral in the latter PEIR and ES.

8.6.6 To establish the scope of the land use assessment, the following sources displayed on Table 8.6.1 have been used. These sources are likely to be added to as the EIA process progresses.

Table 8.6.1: Key sources of information for Land Use

Source	Summary	Spatial coverage of AoS
Natural England Open Data Publication.	Conservation and Enhancement Scheme Agreements (England) - Agreements entered into by Natural England with owners and occupiers of SSSIs.	No coverage throughout the AoS
Natural England Open Data Publication.	Provisional Agricultural Land Classification Grade. Agricultural land classified into five grades. Grade one is best quality and grade five is poorest quality. A number of consistent criteria used for assessment which include climate (temperature, rainfall, aspect, exposure, frost risk), site (gradient, micro-relief, flood risk) and soil (depth, structure, texture, chemicals, stoniness) for England only.	Digitised from the published 1:250,000 map which was in turn compiled from the 1 inch to the mile maps. Coverage throughout AoS.
Local Authority.	Local Plan allocations and policies which may impact directly or cumulatively with a major development	Throughout the AoS.

Overview of Baseline Environment

8.6.7 It is proposed that the baseline environment for the Land Use within the AoS be assessed through publicly available sources. The primary focus of the Land Use section will be on Agricultural Land Classification (ALC) Grades, with particular emphasis on Best and Most Versatile (BMV) land. BMV land comprises Grades 1, 2, and 3a and national planning policy34 requires that account is taken of the economic and other benefits of BMV agricultural land. ALCs help to determine the quality and utility of the land, especially regarding their range of use, yield, output and consistency. At this strategic stage, the 1:250,000 scale of the maps cannot be used to accurately determine the distinction and variations of the grades at a field level, which means the borders between ALC Grades may not be exact, however, at latter stages of the Project a smaller scale of 1:10,000 may be more appropriate for obtaining more accurate results.

8.6.8 The mapping grades used for Scoping, which are based on the 1:250,000 scale, do not differentiate between the 2 possible Grades within Grade 3; Grade 3a and Grade 3b. As such, some land identified as Grade 3 could possibly be BMV land, however, it could also be land of a lesser agricultural value. For some parts of the AoS, the overall context within which the land is surrounded, has allowed for an interpretation to be given of whether the Grade 3 land is BMV or not, however, at the PEIR stage the usage of smaller scale mapping would allow for clearer results.

Summary of ALC across the AoS

8.6.9 As shown in Figure 8.6.1, the majority of the land to the north of the AoS in the location of the Lincs Node grid connection search area is Grade 3 land, with smaller pockets of Grade 1 & 2 located in the west of the search area predominant areas of Grade 2 land located west towards Beesby, Markby and Asserby ,Trusthorpe and Saleby. There is also a small area of Non-Agricultural land extending into the AoS from Stubby Airfield on the west side on the Lincs Node grid connection search area.

8.6.10 The majority of the land use along the north eastern coast of the Lincs Node grid connection search area is Urban, which includes the settlements of; Mablethorpe; Sutton-on-Sea; and Sandilands.

8.6.11 South of the Lincs Node grid connection search area, the AoS is made up of three dominant Land Use categories comprising ALC Grades 1 – 3. Between the southern edge of the Lincs Node grid connection search area and Skegness, the ALC is Grade 3. As the AoS extended along the coastal plan to the south west, the ALC improves to Grades 1 and 2. The land furthest inland is predominantly Grade 2 whilst there is a band of Grade 1 land running all the way along the coast from Skegness to the mouth of River Welland and beyond. All of the agricultural land within and immediately around the Weston Marsh grid connection search area is made of agricultural land within ALC grade 1.

[34] Para. 174, National Planning Policy Framework 2021

520000 540000 560000

380000

360000

340000

N

Legend

Onshore Scoping Boundary

Indicative Grid Connection Search Areas

Lincolnshire Node

Weston Marsh

Agricultural Land Classification (Grade)

Grade 1

Grade 2

Grade 3

Grade 4

Non Agricultural

Urban

Coordinate System: British National Grid

0 8 16 km

Scale: 1:250,000

Onshore Scoping
Agricultural Land Classification

Figure 8.6.1

OUTER DOWSING OFFSHORE WIND

Date: 12/06/2022
Produced By: JRS
Revision: 0.1

SLR

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.6.12 The approach to EIA would follow the general approach outlined in Section 5, where the focus of the study would be desk-based and data gathering through geographical mapping software and datasets. In addition to the general approach and guidance outlined in Section 5, the assessment of Land Use would also comply with the following guidance documents where they are specific to this topic:

- DMRB LA 112 Population and human health (Highways England).

8.6.13 The 'Population and Human Health' section of the DMRB supersedes the previous 'Land Use' section. The DMRB sets out 5 aspects to be covered for land use to be used when assessing the impacts on the environment:

- Private property and housing;
- Community land and assets;
- Development land and business;
- Agricultural land holdings; and
- Walkers, cyclists and horse-riders (WCH).

8.6.14 However, due to the strategic nature of this Scoping Report and the large AoS, some of the aspects would be more appropriately assessed at latter stages, when the AoS is more refined. The impacts on private property and housing and development land and businesses would involve a detailed analysis of the induvial properties present, which would possibly become an impact at a later stage, however, the impacts on the built environment in terms of land use would be negligible for this type of development.

8.6.15 The impacts on WCH, including Public Rights of Way (PRoW), are scoped in for further assessment at later stages of the Project, as the AoS is large, the detail required at this stage may not be necessary until further AoS refinement and progress on establishing potential OnSS sites and route corridors.

8.6.16 Large areas of community land and assets have been included in the ALC as 'Non-Agricultural' grades, as they are not suitable for agricultural development, however, as the Project proceeds, these may be further assessed in greater detail, as the route of the cable corridor is further refined.

8.6.17 Agricultural land holdings have been assessed at this stage through the ALC grades, giving an indication of the quality of the agricultural land present in the AoS. It may be possible to further refine this at later stages to gauge what the land is currently used for which would be impacted by the grid connection site selection and cable route corridors.

8.6.18 Further impacts have been scoped into the assessment, however, we do not have this information yet, although, this data will be collected and assessed once the AoS becomes more refined. The data which would be used to facilitate this assessment would be:

- Drainage plans;

- PRoW definitive maps;
- Plans of outdoor recreational sites;
- Tourism Sites; and
- Utilities plans.

Relevant Embedded Mitigation Measures

8.6.19 Most impacts on land use are experienced during the construction stage. Following the construction stage the majority of the land would be reinstated to its previous condition and can be used as it was prior to construction, therefore, it is not anticipated that there would be any further impacts on land use from the operational stage. Limited areas of land associated with the OnSS and cable joint bays would not be able to be reinstated. The embedded measures to mitigate impacts of the Project on Land Use would include:

- Robust study and determination so far as reasonably practicable of optimised routes/sites;
- Reinstatement of temporarily impacted land to its previous use/quality so far as reasonably practicable, excluding OnSS and cable joint bays, to minimise the impact to soil/agricultural quality these would be restored to previous levels following best practice as per the CoCP;
- Development of best practice management measures during construction would be incorporated through the CoCP as far as reasonably practicable, in consultation with relevant stakeholders; and
- Mitigation by design would be implemented, as well as best practice measures, to reduce the potential impacts on utilities. A GIS database would be developed to aid the design of the cable route in conjunction with existing utilities.

8.6.20 Further measures would come as a result of consultation with statutory consultees as part of the EIA process and would be adopted based on the significance of the potential impact and the feasibility of the proposed mitigation measures.

Potential Impacts Scoped In

8.6.21 A range of potential impacts on Land Use have been identified which may occur during the construction, O&M, and decommissioning phases of The Project. The impacts that have been scoped into the EIA are outlined in Table 8.6.2, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 8.6.2: Impacts and categories proposed to be scoped into the assessment for Land Use

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
Construction		
Agricultural Productivity	There is potential to reduce the total yield gained from agriculture in areas affected by the construction through the reduction of agricultural land.	Desktop review of ALC grades in refined AoS consultation with stakeholders.
Drainage	Temporarily impacting field drainage and irrigation systems, which can lead to a reduction in productivity and other farming practices.	Desktop review of land, potentially consulting with relevant stakeholders (e.g. National Farmers Union (NFU)).
PRoW	The temporary closure or diversion of PRoW during the construction of the cable route.	Desktop review of current PRoW, Access Management Plan.
Outdoor Recreational Land	Closure, whether temporary or permanent, of outdoor spaces used for public recreation or supporting public recreation such as car parks.	Desktop review of Open Space/Green Space, review of usage, consultation with stakeholders, refine AoS.
Tourism	Temporary closure of sites/facilities/attractions such as camping or caravan sites.	Desktop review of tourism facilities in the AoS access management plan, economic assessment of tourism facilities, completed by other sections such as Traffic and Transport (see Section 8.8) and Socio-Economics (see Section 9.3).
Utilities	Construction of OnSS and laying cables may impact local utilities.	Desktop review of utilities and iterative design by engineering team through the production of GIS maps.
Operation and Maintenance		
Loss of Agricultural Land	Presence of OnSS(s) and joint bays may lead to the permanent loss of a small area of agricultural land	Desktop review of ALC grades in refined AoS, consultation with stakeholders.
Decommissioning		

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses (Such as Modelling)
The impacts experienced during decommissioning would be, broadly, similar to those experienced during construction, however, they may be on a lesser scale – as such, the agreed methods of assessment would also remain beneficial.		
Cumulative		
As with construction and operation.	The impact of the development on land use may be heightened by the cumulative impacts of other major developments such as: Onshore/offshore windfarms ▪ Major allocations in Local Plan ▪ Major housing developments ▪ Business/retail estate development ▪ Road/rail projects ▪ Quarrying/mining projects	Information would be gathered by the Project team as a whole, after which the potential land use impacts would be assessed. If other projects are present, the following information could be used to conduct an assessment: ▪ Project timescales; ▪ Scoping Report/response; ▪ PEIR; ▪ Draft ES of the Project; and ▪ Potential survey data that could be used.

Impacts Proposed to be Scoped Out

8.6.22 Some Land Use impacts, which overlap with other environmental aspects and have been covered within the appropriate section, have been detailed in the introduction above.

8.6.23 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Land Use. These impacts are outlined in Table 8.6.3, together with a justification for scoping them out.

Table 8.6.3: Impacts proposed to be scoped out of assessment for Land Use

Impact	Justification for scoping out
Construction	
Highway infrastructure	The impact that the proposed development could have in regard to the severance of highway infrastructure, these would be temporary restrictions and assessed by the Traffic and Transport section (see Section 8.8).
Operation and Maintenance	
Agricultural Productivity from Underground Works	Loss of agricultural yield and BMV land from the laying of underground cables in farmland would be mitigated by the reinstatement of land in line with the CoCP.
Drainage	The potential impacts on agricultural drainage systems, which could lead to a loss of agricultural productivity, would only occur at the construction stage, however, these impacts would be mitigated by the reinstatement of the land and ancillary drainage systems.
Outdoor Recreation Land	The impact on outdoor recreational land and associated land such as car parks would mainly occur during construction and likely to be insignificant if impacted, however, the land would be reinstated as per the CoCP.
PRoW	There is potential for the construction of the underground cables and OnSS(s) to have impacts on PRoW. Once installed, the underground cables would remain in situ and there would be no anticipated maintenance that would require them to be re-excavated. In the event of a cable failure, all reasonable efforts will be made to undertake repairs without affecting PRoW. The ECC will be designed to avoid the placement of joint bays near PRoW where potential maintenance activities could result in future impact to the PRoW.
Tourism	Further potential temporary closures of tourism land use facilities, such as caravan/camping sites, would not be required for the operation or maintenance stage of the proposed development, therefore, impacts on these receptors are not anticipated.
Decommissioning	
As per construction impacts.	
Cumulative	

Impact	Justification for scoping out
Cumulative Effects	It is not expected that any significant cumulative effects would arise from other development projects that do not have an overlapping footprint on the proposed development. Projects which do not have an overlapping footprint on the proposed development would be scoped out of the assessment.

Potential Transboundary Effects

8.6.24 The methodology in assessing the transboundary effects from the Project have been described in Section 5. The impacts on onshore land use are not anticipated to have any transboundary effects, being a localised topic regarding the direct use of the land within the AoS.

8.6.25 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact would be scoped out from further consideration within the EIA.

Summary of Next Steps

8.6.26 The desktop review of the potential impacts will be ongoing throughout the consultation with relevant stakeholders, whilst the AoS continues to be refined during the site selection process in determining the potential OnSS location and cable routing.

8.6.27 Field surveys, such as ground-truthing, site surveys, soil surveys and other land surveying exercises, may be necessary for understanding the land use of the AoS, however, this information could be appropriately assessed using available remote sensing data and GIS software. A two-day reconnaissance of the route is proposed to 'ground-truth' the desktop data and familiarise the assessment team with the Project, work, scope and understanding of the land. Following this and ongoing consultation with stakeholders, this position may be reviewed.

8.6.28 For the PEIR, the focus of the land use section would be based on the four key objectives:

- to establish/verify the baseline conditions;
- to confirm that all potentially significant effects have been identified;
- to confirm agreement with the assessment of significance of potential impacts; and
- to obtain consultee views on the adequacy of proposed mitigation measures.

8.6.29 This would be accomplished through the regular communication, feedback and consultation with relevant stakeholders throughout the Project. This would be accompanied with a preliminary report which comprises data and data sources identified from the desktop review and other online material which may be relevant to the completion and submission of the PEIR. The data would include, but not be limited to, the following:

- local authority published reports;
- agricultural land classification mapping; and

- local plans.

8.6.30 This baseline data and report would be used to provide a preliminary assessment of the land use and potential impacts thereon which would establish the likelihood of these impacts being of significance as a result of the development's construction, O&M and decommissioning.

8.6.31 The PEIR would work to establish the level of sensitivity of the receptors, the magnitude of the impacts, provide a preliminary assessment of the significance of the likely effects before informing and evaluating any relevant measures that can be adopted to avoid or mitigate the potential impacts that have been assessed.

Further Consideration for Consultees

8.6.32 The following specific questions are provided for to help frame the consultees Scoping Opinion for Land Use:

- Do you agree that analysis of high-resolution aerial imagery together with ground-truthing is sufficient to develop a land use map and identify the type and sensitivity of land present in the AoS?
- Do you agree that the impacts described in Table 8.6.3 can be scoped out?
- For those impacts scoped in Table 8.6.2, do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the impacts scoped in in Table 8.6.2 are able to be assessed at the PEIR stage?
- Do you have any specific requirements for the land use assessment methodology?

8.7 Noise and Vibration

Introduction

8.7.1 This section of the Scoping Report identifies the noise and vibration elements of relevance to the Project's AoS. This section of the Scoping Report considers the potential effects from the construction, O&M, and decommissioning of the Project, alone and cumulatively on noise and vibration and sets out the proposed scope of the EIA.

8.7.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location. This section of this Scoping Report should be read alongside the following sections of this Scoping Report:

- Section 8.3 – Onshore Ecology and Ornithology

Study Area

8.7.3 At this stage, whilst the final landfall and grid connection locations are still to be defined, the AoS remains high level. Two OnSS connections are being considered which are divided into two search areas, namely:

- The Lincs Node OnSS search area to the north of Skegness and incorporating the town of Maplethorpe; and
- The Weston Marsh OnSS search area to the north-east of Spalding and to the north-west of Holbeach.

8.7.4 Based on the above, a scoping boundary has been derived and it is understood that the ECC could be routed from the chosen landfall area to either of the two OnSS connection locations anywhere within the scoping boundary.

8.7.5 The two OnSS connection locations and the scoping boundary are shown in Figure 8.7.1.

Baseline Environment

Overview of Available Data Sources

8.7.6 No baseline sound monitoring has been undertaken to date. The survey locations will be identified from a review of the AoS, and the locations will be representative of the closest Noise-Sensitive Receptors (NSRs). The survey locations for these baseline surveys will be agreed with Environmental Health Officers (EHO) of the relevant local authorities as appropriate.

8.7.7 Further to the above, a review of any potential baseline noise data sources has been undertaken and any potential sources of data are listed in Table 8.7.1 below.

Table 8.7.1: Key sources of information for Noise and Vibration

Source	Summary	Spatial Coverage Of Aos
Triton Knoll Electrical System, Volume 3 Chapter 11, April 2015	Measured baseline sound data for the onshore landfall, OnSS and cable route associated with the relevant ES chapter.	South-east Lincolnshire – Mablethorpe to Boston. This potential source of baseline data correlates very well with the AoS for the Project as described below. ▪ the landfall associated with the Triton Knoll project is located within the Lincs Node OnSS search area. ▪ The ECC associated with the Triton Knoll project runs in a south-western direction from the landfall towards Boston, which is located within the Project scoping boundary. ▪ The OnSS associated with the Triton Knoll project is located approximately 12km to the north-west of the Weston Marsh OnSS. Further details of the location of the Project are provided in Section 3.

520000 540000 560000

380000

360000

340000

N

Legend

Onshore Scoping Boundary

Indicative Grid Connection Search Areas

Lincolnshire Node

Weston Marsh

Coordinate System: British National Grid

0 8 16 km

Scale: 1:250,000

Noise and Vibration AoS

Figure 8.7.1

OUTER DOWSING OFFSHORE WIND

Date: 13/06/2022
Produced By: JRS
Revision: 0.1

SLR

Factors Influencing the Receiving Baseline Sound Climate

8.7.8 From a baseline perspective it is considered that the following factors have the potential to influence the existing baseline sound levels within the AoS:

- The proximity of the relevant areas to the coastline, as it is considered that baseline levels would be higher at the coast due to noise the from the sea, sea breezes, and general climatic conditions;
- The number of significant centres of human population within each area, i.e., towns or cities;
- The number and extent of significant transportation links within each area, i.e., major roads, railways, and airports; and
- The amount of commercial or industrial developments within each area.

8.7.9 Each of the two proposed OnSS connection points and the AoS have been described in conjunction with the factors outlined above.

8.7.10 It must be noted that for the purposes of this Scoping Report the scoping boundary has been defined as the area between and including the proposed OnSS connection points.

8.7.11 It must be noted that the transportation links have been assessed with reference to the *Extrium England Noise and Air Quality Viewer* website www.extrium.co.uk/noiseviewer.html (Accessed December 2021). The viewer shows road and railway noise level maps and the associated noise Important Areas (IAs) - 'hotspot' locations identified by Defra as requiring further investigation.

8.7.12 For the purposes of this Scoping Report the following noise indices and time periods have been utilised:

- Road and Rail Noise Daytime - Lday $L_{Aeq,16\text{-}hour}$ from 07:00 to 23:00; and
- Road and Rail Noise Night-time – Lnight $L_{Aeq,8\text{-}hour}$ from 23:00 to 07:00.

8.7.13 Further to the above, any roads or rail links generating a daytime level of 55dB $L_{Aeq,16\text{-}hour}$ or more and a night-time level of 50dB $L_{Aeq,8\text{-}hour}$ or more are significant.

8.7.14 Table 8.7.2 describes the AoS regarding potential baseline sound climate.

Table 8.7.2: Description of the AoS regarding Potential Baseline Sound Climate

AoS	Proximity to Coastline	Centres of Human Population	Transportation Links	Commercial/Industrial Developments	Further Considerations
Lincs Node substation search area	Approximately 12 miles of coastline on the eastern boundary of the search area.	Only area of significant population is Mablethorpe. Other smaller areas of population include Alford, Trusthorpe, Sutton-on-Sea and Sandilands. Chapel St. Leonards is also located directly to the south-east of the search area.	No significant road or rail networks.	No significant commercial industrial developments.	The whole search area can be described as a predominately rural environment with only a relatively small number of areas of population and no significant road or rail networks. Therefore, it is considered that baseline sound levels are likely to be low, especially away from the coast. This could lead to potential impacts from operational substation noise, especially the potential low frequency element.
Weston Marsh substation search area	Landlocked, no coastline.	No significant areas of population within the search area; however, Spalding is located approximately 1.7 miles to the south-	Approximately 3.5 miles of significant roads network. In addition, approximately 17 miles of significant road network are	No significant commercial industrial developments within the search area, however, significant commercial area located on the north-	Though once again the search area is in a rural environment, the A17 which runs through the search area and the A18 and A151 which surround the search

AoS	Proximity to Coastline	Centres of Human Population	Transportation Links	Commercial/Industrial Developments	Further Considerations
		west of the AoS and Holbeach approximately 2.3 miles to the south-east of the AoS.	located in relatively close proximity to the west, south and south-west of the search area.	east boundary of Spalding approximately 1.5 miles to the south-west of the search area.	area are likely to influence the background sound climate. The increased road traffic and commercial activities associated with the towns of Spalding and Holbeach is also likely to increase the baseline sound levels.
Scoping Boundary	Approximately 3.5 miles of direct coastline on the eastern boundary of the search area. In addition, approximately 10 miles of the eastern scoping boundary is within 1 mile of the coast.	Main significant area of population is Boston in the southern area of the scoping boundary. No other significant areas of population; however, Skegness is located approximately 1.4 miles to the east of the scoping boundary.	Approximately 17 miles of significant roads network, the majority located in and around Boston. The A158 Skegness Road in the northern area of the scoping boundary is also significant. It also should be noted that the A52 runs in a north/south direction through the majority of the scoping boundary.	Considerable industrial/ commercial developments to the south-east of Boston. In addition, commercial areas located on the western edge of Skegness approximately 0.8 miles to the east of the scoping boundary.	Vast majority of the scoping boundary located on a rural environment, with the exception of the town of Boston. This may lead to lower baseline sound levels; however, it is considered that any noise impacts would be from construction noise and therefore temporary in nature.

AoS	Proximity to Coastline	Centres of Human Population	Transportation Links	Commercial/Industrial Developments	Further Considerations
			Though this road is not considered significant in conjunction with the *Extrium England Noise and Air Quality Viewer* website, it is considered that it would still be a significant noise source.		

Existing Environment and Key Receptors

8.7.15 In addition to the existing baseline sound levels, in the AoS the number and type of key/sensitive receptors also needs to be considered.

8.7.16 With regards to noise and vibration the key receptors and their associated sensitivity are defined in Table 8.7.3 below.

Table 8.7.3: Key Receptors and Associated Sensitivity

Receptor Description	Sensitvity
Residential properties (night-time), schools and healthcare buildings (daytime).	High
Residential properties (daytime), SAC, SPAs Site of Special Scientific Interest (SSSI) (or similar areas of special interest and designated sites).	Medium
Offices and other non-noise producing employment areas.	Low
Industrial areas.	Negligible

8.7.17 In conjunction with Table 8.7.3, the identified AoS have been described with reference to the number/prevalence of sensitive receptors in each area. The descriptions are shown in Table 8.7.4.

Table 8.7.4: Description of AoS regarding Sensitive Receptors

AoS	Prevalence of Human Receptors - Residential	Prevalence of Ecological Receptors
Lincs Node grid connection search area	Only area of significant population is Mablethorpe. Other smaller areas of population include, Alford, Trusthorpe, Sutton-on-Sea and Sandilands. Chapel St. Leonards is also located directly to the south-east of the search area.	Coastal areas are heavily designated and are likely to encounter noise sensitive ecological receptors. Further inland the area very few designated sites where ecological receptors are likely to be encountered. Further details can be found in Table 8.3.2 in Section 8.3.
Weston Marsh grid connection search area	No significant areas of population within search area; however, Spalding is located approximately 1.7 miles to the south-west of the AoS and Holbeach approximately 2.3 miles to the south-east of the AoS.	
Scoping Boundary	Main significant area of population Boston in the southern area of the scoping boundary. No other significant areas of population; however, Skegness is located approximately 1.4 miles to the east of the scoping boundary.	

Overview of the Baseline Environment

8.7.18 With reference to Table 8.7.3 and Table 8.7.4, it can be considered that in general the areas which have the potential to have the higher baseline sound climate also have more human receptors; however, the higher baseline sound levels in these areas may mean that the potential for noise impacts are reduced.

8.7.19 Conversely the areas which have fewer human receptors, in general, have the potential to have lower baseline levels; therefore, though there may be less receptors impacted, the significance of the noise impacts may be greater.

8.7.20 With regards to the sensitive receptors, it can be seen that there is a mix of human and ecological receptors within the AoS and within close proximity of the AoS, including the Lincolnshire Wolds AONB (Area of Outstanding Natural Beauty) and the Gibraltar Point Nature Reserve. The largest concentrations of residential receptors within the areas considered include Maplethorpe and Boston. However, there are a number of other significant areas of population located close to the AoS such as Skegness, Spalding and Holbeach will have the potential to contribute to the baseline sound climate.

8.7.21 The noise assessment for the ecological receptors will be undertaken in conjunction with Air Quality Technical Advisory Group 09 (AQTAG09) 2005, *Guidance on the effects of industrial noise on wildlife* which sets absolute noise limits within each; consequently, the assessment is not based on baseline sound levels.

8.7.22 Considering the main three aspects of the Project, the landfall, the onshore ECC and the OnSS, the following will also be taken into account regarding the chosen area and the baseline noise environment.

Landfall

8.7.23 The receptors close to the chosen landfall location will potentially be subject to higher baseline sound levels due the coastal location.

8.7.24 It also should be noted that any noise and vibration impacts associated with the landfall would only occur during construction i.e., there would be no operational noise and vibration impacts, and therefore such impacts and associated effects would be temporary in nature.

Onshore Electrical Connection Corridor

8.7.25 Similar to the landfall, noise and vibration impacts associated with the onshore ECC would be construction related only and temporary in nature.

Onshore Substation

8.7.26 The potential noise and vibration impact from the OnSS would relate to both the construction and operation of the facility.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.7.27 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of Noise and Vibration will also comply with the following National Planning policies and guidance documents where they are specific to this topic:

- NPS EN-1 'Overarching National Policy Statement for Energy' DECC, 2011a) and NPS EN-3 'National Policy Statement for Renewable Energy Infrastructure' (DECC, 2011b) and 'National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (2011c).
- The Guidelines for Environmental Noise Impact Assessment, produced by the Institute of Environmental Management and Assessment (IEMA), and published in October 2014;
- BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise;
- BS5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration;
- The Design Manual for Roads and Bridges - Note LA111 Noise and Vibration;
- BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound;
- NANR45 Procedure for the assessment of low frequency noise complaints; and
- AQTAG09 (Air Quality Technical Advisory Group 09), Guidance on the effects of industrial noise on wildlife.

Relevant Embedded Mitigation Measures

8.7.28 As part of the design process for the Project, several designed-in measures are proposed to reduce the potential for impacts on receptors sensitive to noise and vibration. These are presented below and will evolve over the development process as the EIA progresses and in response to consultation.

8.7.29 The Project will seek to implement these measures, and adhere to various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of the Project and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 8.7.5 and Table 8.7.6.

8.7.30 The adoption of Best Practicable Means (BPM) is usually the most effective means of controlling noise from construction sites and measures may include:

- Consideration will be given to the recommendations set out in Annex B of BS5228-1:2009+A1:2014 with respect to noise sources, remedies and their effectiveness;
- Plant and materials will be operated and handled in a proper manner with respect to minimising noise emissions, e.g. no unnecessary revving of engines, minimising drop heights, etc.; and

- Plant will be subject to regular maintenance and kept in good working order in meet manufacturers' noise emission levels.

8.7.31 BPM will also be implemented to minimise the effects of vibration from construction activities. Measures provided to illustrate the range of techniques available may include:

- Where practicable, stationary plant will be isolated using resilient mountings, e.g. for generators, pumps, etc.;
- Plant will be operated in a proper manner with respect to minimising vibrations, e.g. low vibration working methods will be employed;
- Consideration will be given to the most suitable plant and hours of working for the operations which may give rise to perceptible vibrations and where practicable, these will be replaced by less intrusive plant and/or working methods; and
- Control of vibration at sources, where practicable, by reducing the speed of plant, e.g. limiting the rotational speed or progress rate of any rotary drill rigs.

8.7.32 With regards to the operational noise of the Project, the requirement and feasibility of any mitigation measures will be dependent on the significance of the effects of noise and vibration. The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential Impacts Scoped In

8.7.33 A range of potential impacts on Noise and Vibration have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the Project EIA are outlined in Table 8.7.5 together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 8.7.5: Impacts proposed to be scoped into the assessment for Noise and Vibration

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Construction		
Temporary increase in noise and vibration due to onshore ECC construction.	The impact of noise and vibration from construction activities due to the onshore ECC construction phase. The main noise sources from construction activities to include HDD (Horizontal Direction Drilling) at railway and major road crossings, operational mobile plant for trenching / excavation and associated Heavy Goods Vehicle (HGV) movements. This is applicable for the selected landfall location and the associated onshore ECC where underground cable installation passes close to NSRs.	A desk-based study to identify noise and vibration sensitive receptors will be undertaken and where appropriate baseline measurements will be made at representative NSR locations agreed with the relevant EHO as appropriate. The noise levels associated with construction will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology outlined in BS5228:2009+A1:2014. The predicted noise levels will then be assessed in accordance with BS5228:2009+A1:2014 Part 1 – Noise. The vibration levels associated with each construction phase will be predicted and assessed in accordance with BS5228:2009+A1:2014 Part 2 – Vibration. The significance of effects will be determined with reference to the Institute of Environmental Management and Assessment (IEMA) *Guidelines for Environmental Noise Impact Assessment 2014*. The results of the modelling and prediction work will be assessed in accordance with the relevant criteria to identify the significance of construction noise and vibration impacts. In conjunction with paragraph 5.11.9 of NPS EN-1, where appropriate, specific mitigation measures will be detailed to mitigate adverse impacts on health and quality of life from noise and if possible, contribute to improvements in the above.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Temporary increase in noise and vibration due to OnSS and landfall construction.	The impact of noise and vibration from construction activities due to the OnSS and landfall construction (including HDD) phase on the nearest noise and vibration sensitive receptors.	As above for construction noise and vibration impact 1.
Temporary increase in noise levels due to construction traffic.	The impact of noise due to the increase in the number of construction related vehicles at the nearest NSRs during the onshore ECC, OnSS construction and landfall construction phases.	A desk-based study to identify noise sensitive receptors along the construction haul routes will be undertaken. The specific sound levels generated by construction traffic movements travelling to and from the site will be predicted at the properties using CadnaA® and the calculation methodologies contained in BS5228:2009+A1:2014. The predicted noise levels will then be compared to baseline noise levels and assessed in accordance with magnitude of change criteria provided within the Design Manual for Roads and Bridges - Note LA111 *Noise and Vibration 2020.* The significance of effects will be determined with reference to the IEMA *Guidelines for Environmental Noise Impact Assessment 2014*. The results of the modelling and prediction work will be assessed in accordance with the relevant criteria to identify the significance of construction traffic impacts. In conjunction with paragraph 5.11.9 of NPS EN-1, where appropriate, specific mitigation measures will be detailed to mitigate adverse impacts on health and quality of life from noise and if possible, contribute to improvements in the above.
Temporary increase in noise and vibration due	The impact of noise and vibration from construction activities due to	For onshore receptors, as above for construction noise and vibration impact number 1.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
to offshore construction activities along the nearshore ECC	the offshore construction phase on the nearest noise and vibration sensitive receptors. Offshore construction noise may arise from; vessel movements and cable laying, but not from construction of the array as its considered that the boundaries of the array are at a distance away from the coast where construction noise would not be audible (see Table 8.7.6).	For offshore receptors, assessments will be in accordance with The Merchant Shipping and Fishing Vessels Control of Noise at Work Regulations for occupational receptors and the Offshore Technology Report for offshore accommodation receptors.
Temporary increase in noise due to construction activities on wildlife.	The impact of construction noise on the nearest ecological receptors.	A desk-based study to identify ecological receptors and cross reference with Section 8.3 for data relating to designated nature conservation areas and sensitive species from publicly available sources. The specific sound levels generated by construction activities will be predicted at the ecological receptors using CadnaA® and the calculation methodologies contained in BS5228:2009+A1:2014. The predicted noise level will be assessed at the nearest ecological receptors in conjunction with AQTAG09 2005, *Guidance on the effects of industrial noise on wildlife* and Paragraph 5.11.7 of NPS EN-1 which relates to the effects of noise on protected species. In accordance with the IEMA *Guidelines for Environmental Noise Impact Assessment 2014,* noise impact may be determined by comparing the predicted noise level with an absolute noise limit. The significance of any effects will be determined and if necessary, mitigation measures proposed.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Operation and Maintenance		
Operation of the OnSS on the nearest noise sensitive receptors	The impact of noise due to the operational OnSS on the nearest NSRs	A desk-based study to identify noise sensitive receptors will be undertaken and where appropriate baseline noise measurements will be made. Noise sources associated with operation of the OnSS are likely to include plant such as transformers, shunt reactors, statcoms and coolers. The noise levels associated with the operation of the OnSS will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology in this instance the calculation algorithms contained in ISO 9613-2:1996-2 will be utilised. The predicted noise levels will be assessed at the nearest noise-sensitive receptors in conjunction with BS4142:2014+A1:2019. With reference to the above, operational 1/3 octave band data for the OnSS would need to be provided so the assessment can consider any potential Low Frequency Noise (LFN) being generated by the OnSS. On the basis that this is provided, then it should be possible to design out any potential LFN constraints, as per the requirements of NPS EN-1. If not, then penalties for tonality would need to be added to the predicted specific noise levels in conjunction with BS4142:2014+A1:2019. In conjunction with the policies contained within paragraph 5.11.8 of NPS EN-1 the assessment would also consider good design through the selection of the quietest plant available. Measures would also be taken to minimise noise, such as landscaping, bunds or noise barriers.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		The significance of effects will be determined with reference to the IEMA *Guidelines for Environmental Noise Impact Assessment 2014*. Predicted noise levels will be assessed in accordance with the relevant criteria to identify the significance of operational impacts. In conjunction with paragraph 5.11.9 of NPS EN-1, where appropriate, specific mitigation measures will be detailed to mitigate adverse impacts on health and quality of life from noise and if possible, contribute to improvements in the above.
Operation of the OnSS on wildlife.	The impact of noise due to the operational OnSS on the nearest ecological receptors.	A desk-based study to identify ecological receptors will be undertaken and where appropriate baseline noise measurements will be made. The noise levels associated with the operation of the OnSS will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology in this instance the calculation algorithms contained in ISO 9613-2:1996-2 will be utilised. The predicted noise level will be assessed at the nearest ecological receptors in conjunction with AQTAG09 2005, *Guidance on the effects of industrial noise on wildlife* and Paragraph 5.11.7 of NPS EN-1 which relates to the effects of noise on protected species. The significance of effects will be determined with reference to the IEMA *Guidelines for Environmental Noise Impact Assessment 2014*. Predicted noise levels will be assessed in accordance with the relevant criteria to identify the significance of operational impacts on ecological receptors. Where

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		appropriate, specific mitigation measures may be incorporated to reduce residual effects to an acceptable level, where reasonably practicable. Further details related to potential impacts on sensitive ecological receptors is presented in Section 8.3.
Decommissioning		
Temporary increase in noise and vibration as a result of cable decommissioning.	The decommissioning of the Project onshore ECC could directly affect sensitive receptors, though it must be noted that it is considered unlikely that the cables will be removed.	As above for construction noise and vibration impact number 1. It is assumed that the potential impacts associated with the decommissioning phase will be similar to, and no worse than, those presented for the construction phases.
Temporary increase in noise and vibration as a result of the decommissioning of the OnSS.	The decommissioning of the OnSS could directly affect sensitive receptors.	As above for construction noise and vibration impact number 1. It is assumed that the potential impacts associated with the decommissioning phase will be similar to, and no worse than, those presented for the construction phases.
Cumulative		
Increase in noise and vibration as a result of other projects in the area.	Cumulative construction and operational noise with other projects in the area impacting on the sensitive receptors.	The predicted effects of construction and operation from the Project on noise and vibration are considered to be localised to within the final noise and vibration AoS. However, there is the potential for cumulative effects to occur from other projects or activities within the Project noise and vibration AoS where projects or plans could act collectively with the Project to affect sensitive receptors.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		The cumulative assessment will consider projects that are likely to produce levels of construction and operational noise within 10 dB of that from the Project at the same time at the considered receptor location. Other projects, where noise is generated at a lower level or during a period that does not coincide with the Project will not be included in the cumulative assessment.

Impacts Proposed to be Scoped Out

8.7.34 Based on the baseline environment information currently available and the Project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Noise and Vibration. These impacts are outlined in Table 8.7.6, together with a justification for scoping them out.

Table 8.7.6: Impacts proposed to be scoped out of assessment for noise and vibration

Impact	Justification For Scoping Out
Construction	
Construction and decommissioning of the offshore extent of the ECC and the Project array areas on the nearest onshore NSRs.	The array area boundary is located approximately 54 km off the east coast of Lincolnshire. Noise from the construction of the offshore ECC and array is therefore not anticipated to be audible to onshore NSRs. As such, the noise from offshore array construction and decommissioning, on onshore NSRs is scoped out of further assessment.
Operation and Maintenance	
Vibration effects arising from the operation of the OnSS.	Operation may result in enclosures and accessories to vibrate, and result in magnetostriction. These vibrations would be of a very low magnitude and do not result from impactful sources. It is therefore considered unlikely that the operation of the OnSS will lead to any significant vibration effects. Therefore, subject to consultation with the EHO and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
Noise and vibration effects associated with the operation of the underground cable.	Buried cables, even when energised, would not produce perceptible levels of noise or vibration. The operation of the underground cable will therefore not lead to any significant noise and vibration effects. Therefore, subject to consultation with the EHO and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
Operation of the Project array area on the nearest onshore NSRs.	The array area boundary is located approximately 54 km off the east coast of Lincolnshire. Noise for the operation of the array is therefore not anticipated to be audible to onshore NSRs. As such, the noise from the Project array, on onshore NSRs is scoped out of further assessment.
Decommissioning	
N/A	N/A
Cumulative	
N/A	N/A

Potential Transboundary Effects

8.7.35 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

8.7.36 Due to the localised nature of any potential impacts, transboundary impacts will not occur and therefore this impact will be scoped out from further consideration within the EIA.

Summary of Next Steps

8.7.37 Once the noise and vibration AoS has been refined following selection of the preferred landfall, onshore ECC and OnSS location, baseline conditions will be established by undertaking baseline noise surveys. The survey locations will be identified from a review of the proposed ECC and locations of the OnSS, landfall works and the closest NSRs to the development area. Survey locations will be agreed with the relevant EHO(s), through ongoing engagement.

8.7.38 Following the completion of the baseline sound surveys the results will be analysed and suitable noise threshold and/or noise limits will be specified at the identified receptors around the final landfall location, onshore ECC, and OnSS locations. The EHO(S) would then be consulted to clarify that the specified limits are acceptable to the local authorities.

8.7.39 Once details of construction methods and associated construction plant are provided then initial predictions of the construction noise and vibration levels generated by the construction works at the nearest sensitive receptors would be undertaken and compared to the specified threshold limits, any significant adverse impacts would be highlighted to the Project team and EHO(s), and indicative mitigation measures identified, if required.

8.7.40 Similarly once the layout of the OnSS is provided, including associated operational noise levels then predictions would be undertaken and compared to the measured background sound levels at the nearest NSR's to the OnSS. Any significant adverse impacts would be highlighted to the Project team and EHO(s), and indicative mitigation measures identified, if required.

Further Consideration for Consultees

- Do you agree that the proposed baseline surveys will be sufficient to inform the onshore noise baseline for the Project and the associated EIA, subject to further consultation on locations once the landfall, onshore ECC and OnSS location has been identified?
- Have all potential impacts resulting from the Project been identified for the noise and vibration sensitive receptors?
- Do you agree that the impacts described in Table 8.7.6 can be scoped out?
- For those impacts scoped in Table 8.7.5 do you agree that the methods described are sufficient to inform a robust impact assessment?

- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on noise and vibration sensitive receptors?
- Do you have any specific requirements for the noise and vibration modelling methodology?

8.8 Traffic and Transport

Introduction

8.8.1 This section of the Scoping Report will consider the potential environmental onshore traffic and transportation effects associated with the construction and operation of the Project's onshore cable corridor AoS, including effects on communities along access routes, users of Public Rights of Way (PRoW), disruption to the railway and users of the local and strategic road network (here after SRN). Cumulative effects will also be considered. The effects of noise from vehicular traffic resulting from the construction of the onshore components of the Project is considered in Section 8.7.

8.8.2 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options considering any location specific sensitive receptors or designations. This approach is considered appropriate as the OnRCS would be located within the AoS and the impacts would not likely be greater than those estimated for the OnSS due to its smaller scale. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the OnRCS may not be at the same location.

8.8.3 This section should be read alongside the following sections of this Scoping Report:

- Section 8.1 Air Quality;
- Section 8.7 Noise and Vibration; and
- Section 9.3 Socio-Economic Characteristics.

Study Area

Highway Network

8.8.4 The main vehicular access routes serving the onshore AoS are:

- A1104 / A1058 - vehicle movements to and from the west and north (A16, A15 and the SRN (A46 and M180));
- A52 – vehicle movements through the onshore scoping boundary and access to and from the southwest (A17 and the SRN (A1(M));
- A16 – vehicle movements to and from the south (Spalding, Peterborough, the A47 and the SRN (A1)); and
- A17
    - Southeast - vehicle movements to and from the A151, A1101, A47 and King's Lynn); and
    - Northwest - vehicle movements to and from the A16 (for access to and from the ECC and Lincs Node grid connection search areas), A17, A52, A15 and the SRN (A46).

Public Transport

8.8.5 There is a rural bus network (InterConnect) serving much of the onshore AoS.

8.8.6 There is a railway line (the Spalding to Lincoln Line operated by East Midlands Railway); through a large section of the onshore AoS.

8.8.7 The railway stations within the onshore AoS are Boston, Havenhouse, Wainfleet and Thorpe Culvert.

Public Rights of Way

8.8.8 There is an extensive network of PRoW throughout the onshore AoS. An online map is available on the Lincolnshire County Council (LCC) website[35]. It should be noted that these maps are not the Definitive Map (legal record) and are for general purposes only.

Lincs Node Grid Connection Search Area

Highway Network

8.8.9 The main vehicular access routes serving the Lincs Node Grid Connection Search Area are:

- A1104 - vehicle movements to and from the west and north (A16, A1058, A15 and the SRN (A46 and M180)); and
- A52 – vehicle movements to and from the south (Skegness and the ECC and Weston Marsh grid connection search area).

Public Transport

8.8.10 Mablethorpe is connected to Louth, Grimsby and Skegness by direct bus services.

8.8.11 There is no railway station or railway line in the Lincs Node Grid Connection Search Area.

Public Rights of Way

8.8.12 There is an extensive network of PRoW in the Lincs Node Grid Connection Search Area, the majority of which are footpaths (only one bridleway).

Weston Marsh Grid Connection Search Area

Highway Network

8.8.13 The main vehicular access routes serving the Weston Marsh grid connection search area are:

- A17
  - Southeast - vehicle movements to and from the A151, A1101, A47 and King's Lynn); and
  - Northwest - vehicle movements to and from the A16 (for access to and from the ECC and Lincs Node grid connection search areas), A17, A52, A15 and the SRN (A46)

[35] http://lincs.locationcentre.co.uk/internet/internet.aspx?articleid=L4h7HM4AmHM~&preview=true

Public Transport

8.8.14 Mablethorpe is connected to Boston and Spalding by direct bus services.

8.8.15 There is no railway station or railway line in the Weston Marsh grid connection search area.

Public Rights of Way

8.8.16 There is a network of PRoW (footpaths, bridleways and byways) in the Weston Marsh grid connection search area including the Macmillan Way; a long-distance path which runs from Boston on the Lincolnshire coast to the Dorset Coast.

Baseline Environment

Overview Of Available Data Sources

8.8.17 The elements of the onshore scoping boundary of relevance to traffic and transport includes the Local Road Network (LRN), the railway network and a PRoW network The onshore AoS and key transport infrastructure are indicated in Figure 8.8.1which identifies the main 'A' roads and the railway network and how the AoS is connected to the SRN (the traffic and transport AoS).

8.8.18 The onshore traffic and transport AoS will be reviewed and amended following further refinement of the onshore ECC and the identification of additional constraints (environmental and/ or engineering) which may arise in responses for the PEIR.

8.8.19 The AoS will be refined to follow the route of the preferred onshore ECC more closely, and preferred locations for the landfall and onshore OnSS. These will be defined during the EIAprocess. As the project progresses, and the onshore AoS is refined, the implications for the traffic and transport assessment will be discussed with relevant stakeholders through the EPP.

8.8.20 Existing sources of data that could inform the assessment within PEIR and the ES to support the DCO application are set out in Table 8.8.1.

Table 8.8.1: Key sources of information for Traffic and Transport

Source	Summary	Spatial Coverage Of Aos
Department for Transport (DfT)	Traffic flow data on the LRN	These are national datasets providing full coverage of the AoS.
Lincolnshire County Council (LCC)	Details of the existing bus networks. Personal Injury Accident (PIA) data. Definitive maps of PRoW. LCC may also hold baseline traffic data.	Full coverage of the AoS. (PRoW data only required for the onshore AoS)
Crashmap[36]	Online database for PIA data.	

[36] www.crashmap.co.uk

Source	Summary	Spatial Coverage Of Aos
National Rail	Details of the railway network and services.	This is a national dataset providing full coverage of the AoS.

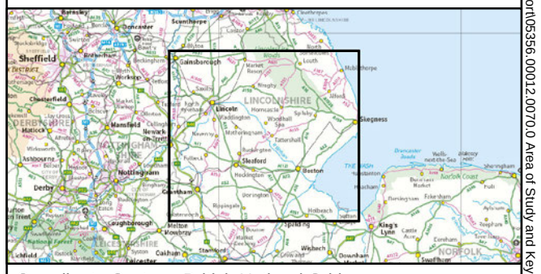
500000
525000
550000
375000
350000
325000
N

Legend

- Onshore Scoping Boundary

Indicative Grid Connection Search Areas

- Lincolnshire Node
- Weston Marsh
- Railway Station
- Railway Lines
- A Road



Coordinate System: British National Grid

0 8 16 km

Scale: 1:250,000

Onshore Scoping
Study Area and Key Transport Infrastructure

Figure 8.8.1

OUTER DOWSING OFFSHORE WIND

Date: 15/06/2022
Produced By: BPHB
Revision: 0.1

SLR

8.8.21 The following additional existing data are available and will be used to inform the PEIR and ES assessment once the has been refined:

- Details of extant permissions (committed development) and associated traffic flows on the LRN in the AoS; and
- Details of sensitive receptors (such as junctions operating over capacity, district centres, hospitals, schools, leisure facilities, etc.).

8.8.22 Additional new data will be obtained to inform the PEIR and ES assessment:

- Automatic Traffic Count (AuTC) data on highway links (Classified, 24-hour, seven-day counts, including speeds); and
- Classified Turning Count data and queue lengths at junctions (07:00 to 10:00 and 16:00 to 19:00, weekday counts), if any sensitive junctions that are likely to see an increase of more than 30 two-way vehicle movements on any arm of the junction in the peak hours are identified.

8.8.23 The potential implications of seasonality in terms of any new traffic data collection and assessment will be discussed and agreed with ETG members through the EPP. It is likely that traffic surveys may be required in a neutral month (the recommended periods for traffic data collection - April, May, June, September and October) and the peak (highest traffic flows) summer month.

Overview of Baseline Environment

8.8.24 This section provides a high level summary of the traffic and transport baseline environment in the AoS, including:

- Highway network;
- Public transport network; and
- PRoW network.

8.8.25 A summary of the overall onshore AoS and the specific baseline environment for the Lincs Node grid connection search area and Weston Marsh grid connection search area is provided.

8.8.26 A detailed review of the traffic and transport baseline environment will be undertaken once the AoS, the onshore ECC and OnSS locations have been defined as The project progresses.

8.8.27 This will identify:

- The preferred vehicular access routes between the SRN and the construction site accesses for the ECC and OnSS;
- The roads that are likely to be crossed by the ECC using open trenching methods or using HDD or another trenchless technique;
- The public transport services serving construction sites;
- Any sections of railway that would be crossed by the ECC using HDD or another trenchless technique; and

- Any PRoW that will be affected (directly and indirectly) by construction activity.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.8.28 The assessment of potential traffic impacts will be undertaken with reference to the following key guidance documents:

- Department for Levelling Up, Housing and Communities (DLUHC) Planning Practice Guidance - Overarching principles on Travel Plans, Transport Assessments and Statements. This contains overarching principles on Travel Plans, Transport Assessments and Statements;
- Guidance for Environmental Assessment of Road Traffic (GEART). This contains the principal guidelines for the assessment of the environmental impacts of road traffic associated with new developments. GEART was published by the Institute of Environmental Assessment in January 1993. The guidance provides a framework for the assessment of traffic borne environmental impacts, such as pedestrian severance and amenity, driver delay, accidents and safety; and noise, vibration and air quality; and
- Design Manual for Roads and Bridges (DMRB) LA112 Population and Human Health, National Highways (2019) gives guidance on assessing a scheme's impact on the journeys which people make in its locality. It considers journeys made by people as pedestrians (including ramblers), cyclists and equestrians.

8.8.29 The Department for Community and Local Government (DCLG) guidance sets out how the transport impacts of a proposed development on the highway and public transport networks should be assessed within a Transport Assessment and, should include measures to promote sustainable travel through the preparation of a Travel Plan and identify mitigation measures to address any impacts. These are the requirements for assessment as set out in the Overarching NPS for Energy (NPS EN-1) and therefore the assessment will take account of this guidance and any emerging NPS at the time of assessment may also be considered.

8.8.30 In terms of the assessment of the associated environmental impacts of a proposed development, GEART states that to determine the scale and extent of the assessment, and the level of effect a proposed development will have on the surrounding road network, the following two 'rules' should be followed:

- Rule 1 - Include road links where flows are predicted to increase by more than 30% or where the number of HGVs is predicted to increase by more than 30%; and
- Rule 2 - Include any other specifically sensitive areas where total traffic flows are predicted to increase by 10% or more.

8.8.31 Rules 1 and 2 are used as a screening tool to determine whether or not a full assessment of effects on routes within the AoS is required as a result of intensification of road traffic. Where anticipated construction traffic volumes are not greater than 30% (or 10% at sensitive locations), a detailed assessment of effects is not necessary, as set out in Table 8.8.2.

8.8.32 The significance of likely effects will then be determined by the consideration of the sensitivity of receptors to change, taking account of the specific issues relating to the AoS, and then the magnitude of that change, as set out in Table 8.8.2.

Relevant Embedded Mitigation Measures

8.8.33 As part of the design process for the Project a number of designed-in measures are proposed to reduce the potential for traffic and transport impacts. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

8.8.34 The Project is committed to implementing these measures, in addition to standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of the Project and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 8.8.2and Table 8.8.3.

8.8.35 Measures adopted as part of the Project that will be considered include:

- A series of construction compounds with direct access onto the LRN. The majority of HGV and LGV movements would be to and from these sites. The location of these is to be determined upon selection of the preferred route and the OnSS;
- Haul routes along the LRN would be identified and agreed with stakeholders between these compounds and the SRN;
- Optimising the length of haul roads, to minimise construction vehicles on the highway network;
- HDD or thrust boring will be used underneath the railway (if required) and key roads (this will be assessed based on the importance of the road and the impacts on driver delay and the feasibility of using open trenching with single lane closures);
- Development of, and adherence to, a Construction Traffic Management Plan (CTMP). An Outline CTMP (OCTMP) will be prepared at PEIR and ES stages as part of the DCO application;
- Development of, and adherence to a PRoW Management Plan. An Outline PRoW Management Plan will be prepared at PEIR and ES stages as part of the DCO application; and
- Development of, and adherence to a Travel Plan to endeavour to minimise the impact of vehicle movements associated with construction workers, including the promotion of public transport and car sharing. An Outline Travel Plan (OTP) will be prepared at PEIR and ES stages as part of the DCO application.

8.8.36 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process, based on the findings of the detailed assessments.

Potential Impacts Scoped In

8.8.37 A range of potential impacts on Traffic and Transport have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the Project EIA are outlined in Table 8.8.2, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

Table 8.8.2: Impacts proposed to be scoped into the assessment for Traffic and Transport

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Construction		
Driver severance and delay.	The potential delays to existing drivers and their potential severance from other areas.	The expected vehicle movements (LGVs and HGVs) associated with the construction phase of the onshore elements of the Project will be established (for each construction site and corresponding route from the SRN (or core A road) or settlement), using detailed project description information provided by the Project and where necessary using previous project experience to inform the assessment using a range of assumptions, such as timing, frequency and distribution of movements. The peak period in terms of anticipated vehicle movements for each construction site, will be used as a worst-case scenario, for a robust assessment, which will be identified using an indicative construction programme. The forecast vehicle movements to and from each construction site will be agreed with ETG members prior to assessment and predicted profile across the day will be established. Where predicted construction traffic volumes are greater than the Rule 1 and 2 thresholds, the significance of the effects on receptors adjacent to highway links and junctions that form the haul routes from the SRN (or core A Road) and routes used by vehicles associated with the construction workforce, will be evaluated using GEART. Existing traffic data will be reviewed, and new traffic counts (and queue length surveys where appropriate) will be commissioned where required, following a review of the highway links / junctions to be included in the assessment. This will be undertaken upon confirmation of the preferred onshore ECC and OnSS location and establishment of the proposed routeing within the AoS. Percentage impacts (total traffic and HGV) of the proposed development on AADT at the identified links will be established and based on the identification of GEART Rule 1 or Rule 2 for each link, the magnitude of impact will be established.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		GEART indicates that traffic flows would have to increase by more than 30% in order for a 'slight' change in severance to occur, 60% for a 'moderate' change to occur and 90% for a 'substantial' change to occur. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement. GEART notes that the driver delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. Junction capacity assessments will be undertaken at any sensitive locations on the LRN and SRN (to be agreed with ETG members) as part of the Transport Assessment element of the ES. The assessment of junction capacity and delay will be undertaken through the use of standard practice analytical tools and junction analysis programs. For the potential delay to users of the highway links that may require a temporary closure to enable open trenching technology to be utilised for the onshore ECC the assessment would be based on the relative importance of each link (including whether it is a public transport route or a primary access route to a hospital for example) and the availability of an alternative route, using professional judgement.
Community severance.	The potential severance to communities.	The AADT percentage impacts identified for driver severance and delay will be used to assess against GEART, which indicates that traffic flows would have to increase by more than 30% in order for a 'slight' change in severance to occur, 60% for a 'moderate' change to occur and 90% for a 'substantial' change to occur. In addition to the GEART guidance, DMRB LA 112 provides guidance to both the direct effects of a new scheme, and to effects caused by increases in traffic levels on existing roads. The guidance provides example definitions of the sensitivity to severance for WCH

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
		at grade; a 'low' sensitivity with less than 4,000 AADT, a 'medium' sensitivity with 4,000 to 8,000 AADT, a 'high' sensitivity with over 8,000 to 16,000 AADT and a 'very high' sensitivity with over 16,000 AADT. The significance of effect will be determined based on the magnitude of impact (as per GEART), receptor sensitivity and professional judgement.
Road safety / vulnerable road users.	The potential effect on users of the road, particularly. pedestrians/cyclists.	An examination of the existing collisions occurring on the haul routes for construction over the previous three-year period will be undertaken to identify any areas of the highway with concentrations of collisions with similar patterns, or roads with collision rates that are higher than national averages (Road Casualties Great Britain, DfT, for the most recent year available). This will be undertaken upon confirmation of the preferred onshore ECC and OnSS location and establishment of the proposed routeing within the AoS. These sites will be considered sensitive to changes in traffic flows (sensitive receptors) and therefore a more detailed analysis of significance will be undertaken in the context of the proposals. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement. The OCTMP will set out a range of management measures that would be implemented (to be developed in detail post consent) to mitigate any road safety issues identified.
Dust and dirt.	The potential effect of dust, dirt and other detritus being brought onto the road.	The AADT percentage impacts identified will be used to assess against GEART which indicates that traffic flows would have to increase by more than 30% in order for a 'minor' change to occur and 60% for a 'moderate' or 'major' change. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement.
Abnormal Indivisible Loads (AIL).	The potential effect on existing road users and local residents caused by	A qualitative assessment of the proposed AIL will be undertaken. Once the haul route for any AIL has been identified, swept path analyses (and structural assessments if required) will be undertaken as part of an Abnormal Load Assessment Report (ALAR) to identify any

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
	the movement of abnormal loads.	sections of the route that might require improvements (which may be temporary) to allow the safe movement of the AIL to the construction site. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement.
Users of PRoW.	The potential effect of users of PRoW.	Upon confirmation of the preferred onshore ECC and OnSS location, all PRoW directly affected will be identified using the definitive map. This would take account of access roads and haul roads where these cross PRoW, and any that connect to those and therefore indirectly impacted. The qualitative assessment of the impacts of construction works affecting the PRoW will be undertaken using the criteria in DMRB LA112 and professional judgement. The assessment will be cross referenced with the assessment within Section 9.3. Mitigation measures for each PRoW will be identified, which may include managed crossing, temporary diversions or temporary closures in some cases. The mitigation will be agreed with consultees and incorporated into an Outline PRoW Management Plan.
Operation and Maintenance		
N/A		
Decommissioning		
Impacts during decommissioning.	Decommissioning impacts: similar in nature to those during construction but would be more limited in geographical extent and timescale.	At this stage the future baseline conditions cannot be predicted accurately and both the proposals for decommissioning and the future regulatory context are unknown. It is proposed to assume that impacts from decommissioning would be similar to those for construction (albeit over a reduced timescale and affecting a smaller area since the assets will already be in situ) and that a similar range of embedded mitigation measures would be implemented, which will be set out in the Project decommissioning plan.

Impact	Description	Proposed Approach To Assessment Including Description Of Any New Data Collation Required And Any Analyses (Such As Modelling)
Cumulative		
As per the potential impacts set out above		The construction vehicle movements forecast within the AoS associated with any other NSIPs that may coincide with the construction phase of the Project will also be considered. These will be identified at the PEIR stage. The relevant vehicle flows of identified in-combination projects will be added to the forecast vehicular flows for the Project and the same approach for assessing each of the impacts identified above will be undertaken to identify the likely cumulative impact.

Impacts Proposed to be Scoped Out

8.8.38 Based on the baseline environment information currently available and the project description (outlined in Section 3) a number of impacts are proposed to be scoped out of the EIA for Traffic and Transport. These impacts are outlined in Table 8.8.3, together with a justification for scoping them out.

Table 8.8.3: Impacts proposed to be scoped out of assessment for Traffic and Transport

Impact	Justification For Scoping Out
Construction	
Noise	Whilst the potential impact of traffic and transport on noise will be appropriately assessed within the ES, being partly based on information and assessments presented within the traffic and transport section will be used, this aspect will be considered in detail within Section 8.7 and is thus scoped out of this section (but not out of the EIA entirely).
Disruption to the railway	If the final onshore ECC passes under a railway, it is proposed to use trenchless construction techniques such as HDD or thrust boring. Notwithstanding the appropriate investigations for the feasibility of using this method at the required location (see Section 8.4), and the necessary consultation with Network Rail on any approvals required, the operation of rail services should not be affected and therefore no specific traffic and transportation impacts associated with the railway will be considered in this section.
Operation And Maintenance	
Any impacts during operation	The operation of the onshore components of the proposed development (including the OnSS) will not require any permanent personnel and maintenance and repairs will only be required infrequently. It is anticipated that at a maximum, there would be approximately 4 to 8 traffic movements per day – however limited to a 2 week period for annual testing. Outside of this period, there are likely to be approximately 4 to 8 traffic movements per week. In addition, there is expected to be 1 visit to each cable joint pit per year. Therefore, there will be a negligible number of associated vehicles on the highway network, with none for the majority of the time. Impacts on traffic and transportation during operation are therefore proposed to be scoped out. The anticipated vehicle movements associated with the O&M will be provided in PEIR and the ES chapter, for context.
Decommissioning	

Impact	Justification For Scoping Out
Impacts during decommissioning	At this stage the future baseline conditions cannot be predicted accurately and both the proposals for decommissioning and the future regulatory context are unknown. A detailed assessment of decommissioning impacts is therefore not proposed to be undertaken.
Cumulative	
Noise	Whilst the potential cumulative impact of traffic and transport on noise will be appropriately assessed within the ES, being partly based on information and assessments presented within the traffic and transport section will be used, this aspect will be considered in detail within Section 8.7 and is thus scoped out of this section (but not out of the EIA entirely).
Disruption to the railway	If the final onshore ECC passes under a railway, it is proposed to use trenchless construction techniques such as HDD or thrust boring. Notwithstanding the appropriate investigations for the feasibility of using this method at the required location (see Section 8.4), and the necessary consultation with Network Rail on any approvals required, the operation of rail services should not be affected and therefore no specific cumulative traffic and transportation impacts associated with the railway will be considered in this section.

Potential Transboundary Effects

8.8.39 Section 5 provides details of the approach that will be taken for assessing the transboundary impacts, which is not expected to be relevant to traffic and transport for the onshore elements of the Project and is therefore proposed to be scoped out of the traffic and transport assessment.

Summary of Next Steps

8.8.40 The next steps will be as follows:

- Refinement of the traffic and transport AoS following selection of the preferred landfall onshore ECC and OnSS location (supported by construction traffic route appraisals including AIL investigations);
- Undertake a comprehensive review of baseline data supplemented by direct communication with stakeholders through the ETG process;
- Agree locations and timing of AuTCs and any classified turning counts at junctions;
- Assemble project specific data and / or assumptions regarding anticipated traffic generation once the length of onshore ECC known and site for the OnSS is identified;
- Engage with other specialist EIA teams such as socio-economic to understand likely impacts on tourism and community receptors; and

- Finalise methodology accounting for the above and agree with ETG.

Further Consideration for Consultees

8.8.41 The following specific questions are provided for to help frame the consultees Scoping Opinion for traffic and transport:

- Do you agree that the data sources identified are sufficient to inform the onshore traffic and transport baseline for the Project PEIR and ES?
- Have all potential impacts resulting from the Project been identified for traffic and transport receptors?
- Do you agree that the impacts described in Table 8.8.2 can be scoped out?
- For those impacts scoped in Table 8.8.2, do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on traffic and transport receptors?
- Do you have any specific requirements for the traffic and transport modelling methodology?

8.9 Landscape and Visual Impact Assessment

Introduction

8.9.1 This section of the Scoping Report identifies the landscape and visual elements of relevance to the Project, the AoS for the onshore components including the onshore ECC and onshore substation. This section of the Scoping Report considers the potential effects from the construction, O&M, and decommissioning of the onshore infrastructure of the Project, alone and cumulatively on landscape character and visual amenity and sets out the proposed scope of the EIA.

8.9.2 While the Landscape and Visual Impact Assessment (LVIA) will assess the effects arising from the impacts associated with the onshore infrastructure, the Seascape, Landscape Visual Impact Assessment (SLVIA) will assess the effects arising from the impacts associated with the offshore infrastructure. The SLVIA will consider the potential effects on landscape and visual receptors on land, although the focus will be on the offshore infrastructure out at sea. Where LVIA and SLVIA receptors coincide, consideration will be given to the potential cumulative effects. The dividing line between the onshore and offshore infrastructure will be the foreshore where the offshore export cables transition to the onshore export cables at the export cable landfall.

8.9.3 The location for the OnRCS (if required) has not yet been identified. Should the need for a reactive compensation station be confirmed, the assessment for this infrastructure will follow the same process as described for the Onshore Substation (OnSS) options, as it is assumed due to the smaller scale that the impacts would not be greater than those estimated for the OnSS. When referring to OnSS, this should be interpreted as the OnSS and the OnRCS (if required). The OnSS and the reactive compensation station may not be at the same location.

Study Area

8.9.4 The boundaries of the LVIA study areas generally define a limit beyond which professional judgement considers it would be unlikely for significant landscape and visual impacts to arise. This judgement is based on previous working knowledge of assessing similar onshore infrastructure components, a broad understanding of the character and sensitivity of the local landscape and visual receptors, and consideration of the scale of the construction and the onshore components of the Project.

8.9.5 This Scoping Report is based on an AoS which covers the Lincolnshire coast of England, as shown in Figure 8.9.1. The AoS covers all of the onshore components, including the export cable landfall, onshore ECC and the onshore substation (OnSS). The OnSS will be located in one of two locations, either in the Lincs Node Substation Search Area in the north of the LVIA study area; or in the Weston Marsh Substation Search Area in the south. The OnSS and the reactive compensation station may not be at the same location.

8.9.6 For the purposes of this report a 3 km buffer has been applied around the AoS where it covers the OnSS search areas, and a 1 km buffer has been applied around the AoS where it covers the export cable landfall and onshore ECC search areas. Where compounds occur along the onshore ECC, the 1 km buffer will be applied to the outer extent of these areas.

8.9.7 This is to cover the possibility that the OnSS onshore components could be located close to the boundary of the AoS and, therefore, potential landscape and visual impacts could extend beyond the AoS boundary. The larger buffer applied to the OnSS reflects the larger scale of the construction works and the operational development, while the smaller buffer applied to the export cable landfall and onshore ECC reflects the smaller scale of the construction works and the concealed nature of these components during the operational phase.

8.9.8 The LVIA study area is shown in the following figures;

- Figure 8.9.1: LVIA Study Area;
- Figure 8.9.2: Landscape Character Areas;
- Figure 8.9.3: Landscape Designations; and
- Figure 8.9.4: Visual Receptors.

8.9.9 The study areas for the onshore components will be refined once the locations of the export cable landfall, onshore ECC and OnSS have been fixed, which will occur once the grid connection point has been confirmed.

8.9.10 This Scoping Report seeks the agreement of consultees to the proposed extent of the LVIA study area for the onshore components.

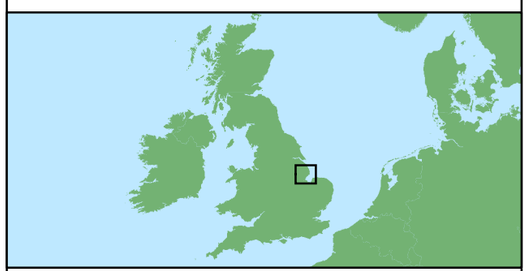
520000 540000 560000 580000

380000 360000 340000

N

Legend

- Area of Search (AoS)
- LVIA Study Area
- Lincolnshire Node Grid Connection Search Area
- Weston Marsh Grid Connection Search Area
- Onshore Export Cable Route Search Area
- Offshore Scoping Boundary



Coordinate System: British National Grid

0 5 10 km

Scale: 1:260,000

Study Area

Figure 8.9.1

OUTER DOWSING OFFSHORE WIND

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380000 360000 340000

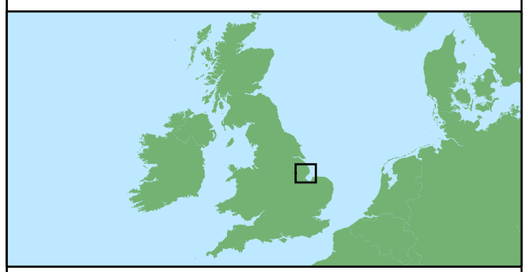
N

Legend

- Area of Search (AoS)
- LVIA Study Area
- Lincolnshire Node Grid Connection Search Area
- Weston Marsh Grid Connection Search Area
- Onshore Export Cable Route Search Area
- Offshore Scoping Boundary

Natural England - National Character Areas

- Central Lincolnshire Vale
- Kesteven Uplands
- Lincolnshire Coast and Marshes
- Lincolnshire Wolds
- North Norfolk Coast
- North West Norfolk
- Northern Lincolnshire Edge with Coversands
- Southern Lincolnshire Edge
- The Fens



Coordinate System: British National Grid

0 5 10 km

Scale: 1:260,000

Landscape Character Assessment

Figure 8.9.2

OUTER DOWSING OFFSHORE WIND

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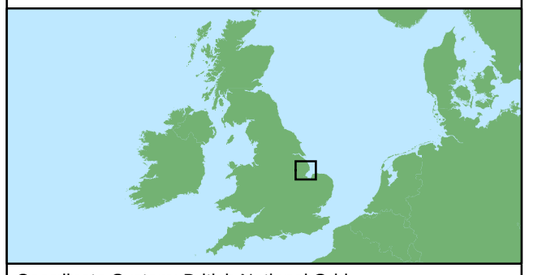
North East Lincolnshire (B)
West Lindsey District
Lincolnshire Wolds
East Lindsey District
North Kesteven District
Boston District (B)
South Kesteven District
South Holland District
Norfolk Coast
King's Lynn and West Norfolk District (B)
Breckland District

N

Legend

- Area of Search (AoS)
- LVIA Study Area
- Lincolnshire Node Grid Connection Search Area
- Weston Marsh Grid Connection Search Area
- Onshore Export Cable Route Search Area
- Offshore Scoping Boundary
- Heritage Coast
- Areas of Outstanding Natural Beauty
- Parks and Gardens
- District / Unitary Authority Boundary



Coordinate System: British National Grid

0 5 10 km

Scale: 1:260,000

Landscape Designations

Figure 8.9.3

OUTER DOWSING OFFSHORE WIND

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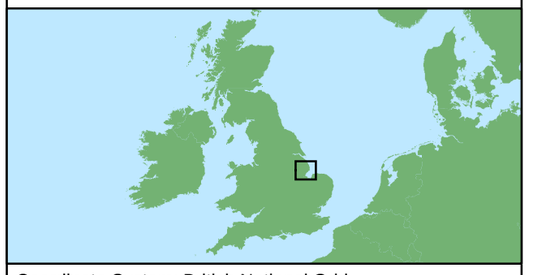
Legend

- Area of Search (AoS)
- LVIA Study Area
- Lincolnshire Node Grid Connection Search Area
- Weston Marsh Grid Connection Search Area
- Onshore Export Cable Route Search Area
- Offshore Scoping Boundary
- Railway Station
- Railway Track
- Greenwich Meridian Trail
- Peddars Way And Norfolk Coast Path
- National Cycle Network
- A Road
- B Road



Coordinate System: British National Grid

0 5 10 km

Scale: 1:260,000

Visual Receptors

Figure 8.9.4

OUTER DOWSING OFFSHORE WIND

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Baseline Environment

Overview of Available Data Sources

8.9.11 The assessment will be initiated through a desk study of the LVIA study area of the onshore components. The LVIA will identify all aspects of the landscape and visual resource that will need to be considered in the LVIA including landscape-related planning designations, landscape character typologies, settlements, and routes including roads, National Cycle Routes and long-distance walking routes. It will also consider cumulative effects relating to all relevant cumulative developments. Data to inform the LVIA will be collected using both desk-based study and analysis and field work within the study area. Key sources that will inform the LVIA are presented in Table 8.9.1 below.

Table 8.9.1: Key sources of information for LVIA

Source	Summary	Spatial Coverage of Study Area
Ordnance Survey 1:50K Mapping	Map information showing all key features.	UK
Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2018-2023	Management plan available at: https://www.lincswolds.org.uk/our-work/management-plan	England
Registered Parks and Gardens Descriptions - Historic England	Descriptions of national level RPG designations available at: https://historicengland.org.uk/listing/what-is-designation/registered-parks-and-gardens/	England
National Character Area Classification - Natural England	National level classification of landscape character available at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles	England
East Lindsey Landscape Character Assessment 2011	County level classification of landscape character available at: https://www.e-lindsey.gov.uk/article/6163/Landscape-Character-Assessment	East Lindsey of Lincolnshire
East Lindsey Local Development Plan 2018	County policy on landscape designations and protection available at: https://www.e-lindsey.gov.uk/article/8934/Adopted-Local-Plan-2018	East Lindsey of Lincolnshire

Overview of Baseline Environment

8.9.12 The LVIA study area occupies the coastal area of Lincolnshire extending from the coastal town of Mablethorpe in the north, to Weston Marsh in the south (Figure 8.9.1). It covers the search areas for the onshore export cable landfall and the onshore ECC, as well as the Lincs Node Substation Search Area and Weston Marsh Substation Search Area. The LVIA study area follows the broadly north to south orientation of the Lincolnshire coast, extending inland to form a band varying between 3 to 14 km.

8.9.13 In terms of Natural England's National LCAs, the northern part of this LVIA study area lies within the Lincolnshire Coast and Marshes LCA while the central and southern parts lie within The Fens LCA (Figure 8.9.2). The general character of these LCAs is described below.

Lincolnshire Coast and Marshes LCA

8.9.14 The Lincolnshire Coasts and Marshes LCA forms a broad coastal plain, extending from Barton-upon-Humber in the north to Skegness in the south and bounded by the Lincolnshire Wolds to the west and the North Sea to the east (Figure 8.9.2). This LCA can be further subdivided into three distinct bands; the Middle Marsh forming the western band and characterised by gently undulating arable farmland with a relatively good covering of hedgerows and trees; the Outermarsh forming the central band and characterised by reclaimed arable and pastoral farmland with an extensive network of dykes and drains; and the Coast forming the eastern band and characterised by salt marshes, coastal dunes and wetlands with areas of extensive mudflats and some sandy beaches. Natural rivers and man-made drains flow slowly eastwards to meet the North Sea, with farmland extending up to the coastal edge.

8.9.15 The LVIA study area coincides mostly with the Outermarsh and the Coast, such that the landscape is characterised by a flat and low-lying coastal landform set below the 10 m contour. The land is drained by a network of man-made drains and occasional natural rivers, which flow slowly eastwards to meet the North Sea. This is a cultivated and settled landscape. There is predominance of arable and pastoral farmland set within large fields where the land has been reclaimed close to the coast, and medium to small fields, further inland. Tree cover is restricted to very small blocks of coniferous and occasional rows along field boundaries, and this creates a landscape that is especially open and exposed, especially closer to the coast.

8.9.16 There is a hierarchy of settlement in this LCA, with larger coastal towns such as Mablethorpe, Ingoldmells and Skegness to the east, and smaller rural towns such as Burgh le Marsh set inland (Figure 8.9.2). The coastal towns attract holidaymakers and there is a number of caravan and camping sites around these towns and along the coast. There is also a series of villages and hamlets dispersed along the coast and across the rural hinterland, with smaller clusters and farmsteads set between. These settlements are accessed by the road hierarchy, with the A52 forming the main coastal route, while other main roads typically extend from the coast inland. A section of the long-distance England Coastal Path extends along the coastline between Mablethorpe and Skegness, with Public Rights of Way (PRoWs) covering much of the wider rural area.

8.9.17 In terms of larger scale developments, there is a small onshore windfarm to the south-west of Mablethorpe, and a group of larger offshore windfarms including Lynn, Lincs and Inner Dowsing off the coast of this LCA, to the east of Skegness.

The Fens LCA

8.9.18 The Fens LCA is a unique landscape in that much of the area has been progressively reclaimed from wetlands and marshlands from the 17th Century onwards. The reclamation has relied on an extensive network of dykes and ditches to drain the land for agricultural use and has produced a very flat and low-lying landscape, with elevation seldom rising above 10 m and often falling below sea level (Figure 8.9.2). The rivers flow slowly towards The Wash, and most are canalised with high banks containing them amidst the lower-lying farmland. There is a strongly modified and exposed character to this landscape, with its geometric field pattern and lack of tree cover or other natural vegetation.

8.9.19 The predominant land use in this LCA is arable farming, with medium to large fields used for crop growing, but also with a growing number of cloches and glasshouses associated with more intensive types of farming and market gardening. Large farmsteads are dispersed across the landscape creating notable features amidst an open and flat landscape. While much of the rural settlement is contained within nucleated settlements, there is also dispersed pattern evident with properties extending along the fine network of rural roads.

8.9.20 Spalding and Boston are the main towns in this LCA, connected by the A16 and with a concentration of smaller settlements occurring in the area between them (Figure 8.9.4). There are also a number of main roads, crossing the LVIA study area in a broadly east-west directions and with small settlements accessed by these roads and the fine network of 'B' class and minor roads that cover the area. There is also an influence on some coastal parts of this LVIA study area from the offshore cluster of windfarms including Lynn, Lincs and Inner Dowsing situated off the east coast to the north-east.

Onshore Components

8.9.21 The search area for the export cable landfall occupies the section of coast between the villages of Theddlethorpe St Helen, in the north, and Chapel St. Leonards, in the south and with the towns of Mablethorpe and Sutton-on-Sea *set al*ong the coastline between. This area forms part of the Lincolnshire Coasts and Marshes LCA, although a large part of the coastline is built-up. To the north of Mablethorpe, while the coast is characterised by sandy beach and coastal dunes backed by arable farming, there is also a holiday camp and caravan parks and the disused Theddlethorpe Gas Terminal. To the south of Sutton-on-Sea, the coast comprises sandy beaches backed by low dunes and a narrow unfarmed strip containing a mix of coastal marsh, woodland, scrub and coastal grasslands. The susceptibility of this coast to erosion is evident through the presence of groynes on the beach and two tiers of sea walls or embankments. The sea wall / embankment adjacent to the beach forms the route for the England Coast Path, while the sea wall / embankment further inland marks the transition between the unfarmed coastal edge and the farmed hinterland. While there is a concentration of settlement at Anderby Creek and Chapel St. Leonards, there are only dispersed farmsteads and rural properties between, accessed by the minor road that runs close and parallel to the coast.

8.9.22 The search area for the onshore export cable extends from Mablethorpe in the north down to Weston Marsh in the south. This area forms part of the Lincolnshire Coasts and Marshes LCA and The Fens LCA. These landscapes are extensively cultivated such that they are highly modified and with very few natural areas. There is very little tree cover, and this creates an open and exposed landscape, although in the more historic parts of both the Lincolnshire Coasts and Marshes LCA and the Fens LCA, hedgerows and hedgetrees along field boundaries do occur and these add enclosure and character to the landscape.

8.9.23 The Lincs Node Substation Search Area occupies the area to the west and south-west of the town of Mablethorpe. This area forms part of the Lincolnshire Coasts and Marshes LCA. This area is flat and low-lying and while the predominant land use is arable farming it is also a well settled landscape. Three main roads cross this area to access the adjacent coastal towns of Mablethorpe and Sutton on Sea and there is a finer network of minor roads connecting the intermediate rural areas. While settlement is typically rural and dispersed there are a few small, nucleated villages, such as Huttoft and Bilsby, and the linear settlement of Maltby-le-Marsh, along the A1104. Larger scale human influences include an onshore wind farm to the south-west of Mablethorpe and masts west of Sutton on Sea.

8.9.24 The Weston Marsh Substation Search Area occupies the area to the north-east of the town of Spalding. This area forms part of The Fens LCA. Weston Marsh is an area of reclaimed land used for arable farming. It is low-lying and flat, and owing to the absence of tree cover, open and exposed. The key features in this area are the straight canalised course of the River Welland to the western side and the electricity transmission lines crossing over the eastern side. Settlement is typically sparse, comprising farmsteads and other rural properties, with access provided by a network of minor roads and tracks.

Designated Sites

8.9.25 The AoS does not coincide with any national or county level landscape designations which would otherwise denote a special landscape or scenic value (Figure 8.9.3).

8.9.26 The LVIA study area partly overlaps with the Gunby Hall Registered Park and Garden (RPG) which is a national level landscape designation. This means that, while there will be no direct effects on the RPG, there is the potential for the onshore ECC, which is the closest onshore component, to have indirect effects through its visibility from this RPG. These potential effects will be assessed fully in the LVIA.

8.9.27 The Lincolnshire Wolds AONB lies outside of the AoS and LVIA study area and, therefore, there will be no direct or indirect effects as a result of the onshore ECC, which is the closest onshore component to this designated area. The limited potential for the AONB to be affected relates to the relatively small scale of the construction works associated with the onshore ECC, the short-term and temporary nature of these works and the fact that this onshore component will be concealed underground during the operational phase.

Proposed Approach to the Environmental Impact Assessment

Proposed Assessment Methodology

8.9.28 The approach to EIA will follow the general approach outlined in Section 5 of this Scoping Report. In addition to the general approach and guidance outlined in Section 5, the assessment of landscape and visual effects will also comply with 'Guidelines for Landscape and Visual Impact Assessment' Third Edition (2013) where they are specific to this topic.

8.9.29 The approach to impact assessment will be undertaken in accordance with the methods outlined in the following good practice documents:

- The Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for the Assessment of Landscape and Visual Impacts. Third Edition (GLVIA 3);
- Landscape Institute (2019) Visual Representation of Development Proposals, Technical Guidance Note 06/19 (TGN 06/19);
- Landscape Institute (2021) Assessing landscape value outside national designations (TGN 02/21);
- The Inspectorate (2018) Advice Note Nine: Rochdale Envelope;
- The Inspectorate (2019). Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects;
- Natural England (2014) An Approach to Landscape Character Assessment; and
- Natural England (2019) An approach to landscape sensitivity assessment – to inform spatial planning and land management.

8.9.30 The LVIA will include an assessment of the effects of the Project on all RPGs that are open to the public. Section 8.2 will assess the effects on the cultural and historical aspects of these and other relevant RPGs.

8.9.31 The LVIA is intended to determine the effects that the Project would have on the landscape and visual resource. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into four categories.

- **Physical effects:** physical effects are restricted to the area within the site and are the direct effects on the existing fabric of the site. This category of effects is made up of landscape elements, which are the components of the landscape such as rough grassland and moorland that may be directly and physically affected by the Project.
- **Effects on landscape character:** landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and the way that this pattern is perceived. Effects on landscape character arise either through the introduction of new elements that physically alter this pattern of elements or through visibility of the Project that may alter the way in which the pattern of elements is perceived. This category of effects is made up of landscape character receptors, which fall into three groups; landscape character areas, coastal character areas and landscape-related designated areas.

- **Effects on views:** the assessment of the effects on views is an assessment of how the introduction of the Project would affect views throughout the study area. The assessment of effects on views is carried out in relation to representative viewpoints and principal visual receptors.
- **Cumulative effects:** cumulative effects arise where the study areas for two or more large-scale developments overlap so that both of the large-scale developments are experienced at a proximity where they may have a greater incremental effect, or where large-scale developments may combine to have a sequential effect. In accordance with guidance, the LVIA assesses the effect arising from the addition of the Project to the cumulative situation.

8.9.32 The objective of the LVIA is to predict the likely significant effects on the landscape and visual resource. In line with the EIA regulations, the LVIA effects are assessed to be either significant or not significant.

8.9.33 The significance of effects is assessed through a combination of two considerations: the sensitivity of the landscape or visual receptor and the magnitude of change that would result from the addition of the Project.

8.9.34 The geographic extent over which the landscape and visual effects would be experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude but instead is used in determining the extent in which a particular magnitude of change is experienced and the extent of the significant and non-significant effects. The extent of the effects would vary depending on the specific nature of the Project and is principally assessed through analysis of the geographical extent of visibility of the Project across the landscape or principal visual receptor.

8.9.35 The duration and reversibility of effects on views are based on the period over which the Project is likely to exist, and the extent to which the Project will be removed, and its effects reversed at the end of that period. Duration and reversibility are not incorporated into the overall magnitude of change and may be stated separately in relation to the assessed effects.

8.9.36 The 'nature of effects' relates to whether the effects of the Project are adverse, neutral or beneficial. Guidance provided in GLVIA3[37] states that "thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity" but does not provide an indication as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and reasoned professional opinion.

8.9.37 A precautionary approach will be taken which assumes that significant landscape and visual effects will be weighed on the negative side of the planning balance, although positive or neutral effects may arise in certain situations.

[37] The Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for the Assessment of Landscape and Visual Impacts. Third Edition (GLVIA 3)

8.9.38 Residual effects are those effects which remain after mitigation. The residual effects that the Project will have on landscape and visual receptors will be assessed in the LVIA. These are categorised into effects on landscape and visual receptors, as well as cumulative effects, and are considered at the three main stages of the project, namely, construction, O&M, and decommissioning.

8.9.39 Replacement planting will be proposed in respect of losses incurred in relation to the construction of the onshore components, either in-situ or in agreed alternative locations. Opportunities to mitigate landscape and visual effects beyond the scope of standard mitigation measures undertaken in the iterative design process will be considered. Mitigation landscape planting will be designed to enhance local landscape character, increase local biodiversity and maximise the screening effect in respect of key visual receptors. Opportunities for advanced planting will also be considered.

Relevant Embedded Mitigation Measures

8.9.40 Embedded mitigation relevant to the LVIA relates to site selection and the iterative design of the layout for each of the onshore components. The site selection process will involve input from the LVIA in order to provide guidance and advice on the potential sites assessed for the export cable landfall, onshore ECC and OnSS. Site selection can notably reduce the potential for significant effects to arise, for example, by locating the onshore infrastructure in areas where there are few close-range visual receptors or where the baseline landscape offers natural screening.

8.9.41 The site selection process for the OnSS and other onshore infrastructure will take into consideration the following key criteria:

- The influence of the surrounding landform on the visibility of the site i.e., whether it is exposed or enclosed in the local and wider landscape;
- The ability of the site landform to accommodate a large-scale level platform and associated earthworks that can be integrated within surrounding landform;
- The influence of existing mature vegetation on the visibility of the site i.e. whether it fully or partly screens the site within the local and wider area;
- The potential opportunities to use mitigation planting and earthworks to reduce potential visual effects;
- The sensitivity of surrounding landscape and visual receptors to the potential impacts of the Project, especially designated landscapes and residential receptors; and
- The avoidance of sensitive landscape elements, for example woodlands and mature trees and hedgerows, where possible.

8.9.42 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential Impacts Scoped In

8.9.43 A range of potential impacts on landscape and visual receptors have been identified which may occur during the construction, O&M, and decommissioning phases of the Project. The impacts that have been scoped into the Project's EIA are outlined in Table 8.9.2 together with a description of any proposed additional data collection and/or supporting analyses to enable an assessment of the impact. It should be noted that impacts are not necessarily relevant to all project stages.

Table 8.9.2: Impacts proposed to be scoped into the assessment for LVIA

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses
Construction		
Excavation and removal of vegetation at the export cable landfall, onshore ECC and OnSS including open-cut trenching for cable laying.	Physical effects through loss of agricultural land, hedgerows and other vegetation. Effects on landscape character and visual amenity arising from small to large scale groundwork excavations.	Use of maps and aerial photography to broadly ascertain potential losses to vegetation and land uses. Desk study to identify sensitive landscape and visual receptors to be avoided. Site study to assess potential landscape and visual effects.
Horizontal Direction Drilling (HDD) and cable pulling operations	Effects on landscape character and visual amenity arising from presence of plant and associated activities.	Desk study to identify sensitive landscape and visual receptors to be avoided. Site study to assess potential landscape and visual effects.
OnSS construction	Effects on landscape character and visual amenity arising from construction of large-scale OnSS and associated presence and activity of plant, materials, compounds and ancillary buildings.	Desk study of local landscape character and to identify presence of visual receptors. Site study to locate representative viewpoints and assess potential landscape and visual effects.
Use of temporary lighting	Effects on visual amenity from use of construction lighting during hours of darkness.	Site study to understand baseline levels of lighting and to assess potential effects of additional lighting.
Reinstatement of vegetation around the export cable landfall, onshore ECC and OnSS	Effects on landscape character and visual amenity arising from potential gaps in the existing landscape pattern of field enclosures, shelterbelts or woodland copses.	Desk and site study to understand native species suited to the specific conditions in each local landscape and establish good practice for re-instatement planting.
Operation and Maintenance		

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses
Presence of OnSS	Effects on landscape character and visual amenity arising from introduction of large-scale OnSS.	Production of visualisations to illustrate the maximum design parameters of the OnSS. Site study to assess potential effects on landscape character and visual amenity using the visualisations.
Use of operational lighting	Effects on visual amenity from use of lighting during hours of darkness.	Site study to understand baseline levels of lighting and to assess potential effects of additional lighting.
Establishment of mitigation planting around OnSS	Effects on landscape character and visual amenity arising from the ongoing establishment and growth of mitigation planting.	Production of visualisations to illustrate the screening effect of the mitigation planting relative to the OnSS. Site study to assess potential effects of mitigation planting using the visualisations.
Decommissioning		
Dismantling and removal of OnSS including removal of areas of hardstanding	Effects on landscape character and visual amenity arising from decommissioning of large-scale OnSS and associated presence and activity of plant, materials, compounds and ancillary buildings.	Desk study of local landscape character and to identify presence of visual receptors. Site study to locate representative viewpoints and assess potential landscape and visual effects.
Reinstatement of ground cover and other vegetation	Effects on landscape character and visual amenity arising from potential gaps in the existing landscape pattern of field enclosures, shelterbelts or woodland copses.	Desk and site study to understand native species suited to the specific conditions in each local landscape and establish good practice for re-instatement planting.
Potential removal of cables from ducts	Effects on landscape character and visual amenity arising from presence of plant and associated activities.	Site study to assess potential landscape and visual effects.
Use of temporary and permanent lighting	Effects on visual amenity from use of construction lighting during hours of darkness.	Site study to understand baseline levels of lighting and to assess potential effects of additional lighting.
Cumulative		
Intra-project effects	Cumulative effects that may arise between the different onshore and offshore components.	Desk study to ascertain all potential intra-project effects and identify those with potential to

Impact	Description	Proposed Approach to Assessment Including Description of Any New Data Collation Required and Any Analyses
		contribute to significant cumulative effects.
Inter-project effects	Cumulative effects that may arise between the proposed development and other large scale energy infrastructure projects / other large-scale developments.	Desk study to ascertain all potential inter-project effects and identify those with potential to contribute to significant cumulative effects.

Impacts Proposed to be Scoped Out of the Assessment

8.9.44 Based on the baseline environment information currently available and the project description, outlined in Section 3, a number of impacts are proposed to be scoped out of the EIA for LVIA. These impacts are outlined in Table , together with a justification for scoping them out.

Table 8.9.3: Impacts proposed to be scoped out of assessment for LVIA

Impact	Justification for Scoping Out
Operation and Maintenance	
Effect of export cable landfall	The operational impacts of the export cable landfall will be limited owing to its location underground and the reinstatement and revegetation of the ground over them. There will be no residual landscape or visual effects, relating to the export cable landfall during the O&M phase.
Effect of onshore ECC	The operational impacts of the onshore ECC will be limited owing to its location underground and the reinstatement and revegetation of the ground over them. There will be no significant residual landscape or visual effects, relating to the onshore ECC during the O&M phase.

Potential Transboundary Effects

8.9.45 The approach to assessment of potential transboundary effects is described in Section 5 of this Scoping Report.

8.9.46 In respect of LVIA, the scope of this section focusses on the onshore components of the Project with only localised effects likely to arise, and so there is no pathway for transboundary effects to occur. Therefore, it is suggested that transboundary effects be scoped out from further consideration within the LVIA of the EIA.

Summary of Next Steps

8.9.47 The assessment will be initiated through a desk study of the export cable landfall, onshore ECC and OnSS, and associated study areas of these onshore components. The LVIA will identify all aspects of the landscape and visual resource that will need to be considered in the LVIA including landscape-related planning designations, landscape character typologies, settlements, and routes including roads, National Cycle Routes and long-distance walking routes. It will also consider cumulative effects relating to all relevant cumulative developments.

8.9.48 The desk study will utilise GIS and Visual Nature Studio software to explore the potential visibility of the Project. The resultant ZTV diagrams and photomontages will provide an indication of which landscape and visual receptors are likely to be important in the assessment.

8.9.49 Field surveys will be carried out throughout the study areas, with the focus on the area that covers the site and those areas that are shown on ZTVs to gain theoretical visibility of the

Project. The field surveys will identify relevant landscape and visual receptors and an assessment will be carried out regarding their sensitivity to the Project. Representative viewpoints will be selected in consultation with statutory consultees. Photography will be undertaken at these viewpoints to present the baseline character and form the basis for preparing photomontages of the OnSS. Field surveys will assist the iterative process of site selection by highlighting the extents of actual visibility, the prominence of the sites and the relative sensitivity of surrounding landscape and visual receptors.

8.9.50 The emerging project description of the OnSS will allow for the MDS to be established, and this will be used as the basis of the LVIA. Through discussions with the statutory consultees, the best approach to visually representing the MDS will be discussed with the intention of creating a realistic impression, whilst also ensuring the maximum effects are being assessed. The development of mitigation measures in respect of the OnSS and other onshore infrastructure will be developed, with the aim of reducing the potential effects as far as is practically possible, considering other technical and environmental constraints, as well as the functional requirements of each site. Mitigation planting will be shown in the photomontages after 15 years growth.

8.9.51 Consultation with statutory consultees and key stakeholders will play an important part in refining the approach, scope and content of the LVIA, in particular with respect to the selection of the representative viewpoints and landscape receptors, to be assessed in detail. Consultation will also be sought in respect of the cumulative developments to be included and the cumulative scenarios to be assessed. Consultation will inform the EPP, which will determine the information the applicant needs to supply to The Inspectorate as part of the DCO application.

Further Consideration for Consultees

8.9.52 The following specific questions are provided to help frame the consultees Scoping Opinion for LVIA:

- Do you agree that the data sources identified are sufficient to inform the onshore LVIA baseline for the Project's PEIR and ES?
- Do you agree that all the designated landscapes within the LVIA study area have been identified?
- Do you agree that desk-based analysis combined with extensive on-site survey is sufficient to assist in site selection and identify appropriate landscape and visual receptors?
- Have all potential impacts resulting from the Project been identified for LVIA receptors?
- Do you agree that the impacts described in Table 9.1.2 can be scoped out?
- For those impacts scoped in (Table 9.1.1), do you agree that the methods described are sufficient to inform a robust impact assessment?
- Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Project on landscape and visual receptors?

- Do you have any specific requirements in respect of representing the MDS and mitigation measures associated with the OnSS?