NORTH FALLS

Offshore Wind Farm

Environmental Impact Assessment Scoping Report

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Glossary of Acronyms

ADBA	Archaeological Desk-Based Assessment
AfL	Agreement for Lease
AIS	Automatic Identification System
ALARP	As low as reasonable possible
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
APIS	Air Pollution Information System
AQMA	Air Quality Management Areas
ATSU	Air Traffic Services Units
BEIS	Business, Energy and Industrial Strategy
BGS	British Geological Survey
BMV	Best and Most Versatile
BNL	Basic Noise Level
BoCC4	Birds of Conservation Concern 4
BPM	Best Practice Measures
BS	British Standard
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CBRA	Cable Burial Risk Assessment
CDM	Construction & Design Management
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEH	Centre for Ecology and Hydrology
CfD	Contracts for Difference
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CION	Connection and Infrastructure Options Note
CIRIA	Construction Industry Research and Information Association
CITiZAN	Coastal and Intertidal Zone Archaeological Network
CMACS	Centre Marine and Coastal Studies
CPT	Cone Penetrometer Test
CRTN	Calculation of Road Traffic Noise
CSEMP	Clean Seas Environment Monitoring Programme
CSM	Conceptual Site Model
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DIO	Defence Infrastructure Organisation
DMRB	Design Manual for Roads and Bridges
DoE	Department of the Environment
DTM	Digital Terrain Model

EcIA	Ecological Impact Assessment
EHER	Essex Historic Environment Record
EIA	Environmental Impact Assessment
EEZ	Economic Exclusion Zone
EJHWS	Essex Joint Health and Wellbeing Strategy
EMF	Electromagnetic Fields
EMODnet	European Marine Observation and Data Network
EMP	Ecological Management Plan
EPOA	Essex Planning Officers Association
EPP	Evidence Plan Process
EPS	European Protected Species
EPUK	Environmental Protection UK
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
EUNIS	European Nature Information System
FEPA	Food and Environment Protection Act
FIR	Flight Information Region
FSA	Formal Safety Assessment
GBS	Gravity Base Structures
GES	Good Environmental Status
GEART	Guidelines for the Environmental Assessment of Road Traffic
GGOW	Greater Gabbard Offshore Wind Farm
GIS	Geographic Information System
GLVIA3	Guidelines for Landscape and Visual Impact Assessment
GT	Gross tonnage
GWF	Galloper Offshore Wind Farm
GW	Gigawatt
HDD	Horizontal Directional Drilling
HGVs	Heavy Goods Vehicles
HM Government	Her Majesty's Government
HPMA	Highly Protected Marine Areas
HIA	Health Impact Assessment
HRA	Habitats Regulations Assessment
HSC	Historic Seascape Character
HVAC	High Voltage Alternating Current
IALA	International Association of Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
IAQM	Institute of Air Quality Management
IBTS	International Bottom Trawl Survey
IEMA	Institute of Environmental Management & Assessment

IFCA	Inshore Fisheries and Conservation Authority
IMARES	Institute for Marine Resources and Ecosystem Studies
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
IROPI	imperative reasons of overriding public interest
IUCN	International Union for Conservation of Nature
JNAPC	Joint Nautical Archaeology Policy Committee
JNCC	Joint Nature Conservancy Committee
km	Kilometre
kV	Kilovolt
LAQM.TG	Local Air Quality Management Technical Guidance
LAT	Lowest Astronomical Tide
LLFA	Lead Local Flood Authority
LLSOA	Lower Layer Super Output Areas
LNR	Local Nature Reserve
LoWS	Local Wildlife Sites
LTP	Local Transport Plan
m	metre
MAGIC	Multi Agency Government Information for the Countryside
MAIB	Marine Accident Investigation Branch
MALSF	Marine Aggregate Levy Sustainability Fund
MarESA	Marine Evidence-based Sensitivity Assessment
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MFLF	Ministeriet for Fødevarer, Landbrug og Fiskeri
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MMO	Marine Management Organisation
MoD	Ministry of Defence
MPA	Marine Protected Areas
MPS	Marine Policy Statement
MW	Megawatt
NAR	National Archaeological Record
NATS	National Air Traffic Services
NBR	National Buildings Record
NCA	National Character Area
NCN	National Cycle Network
NERC	Natural Environment and Rural Communities
NFOW	North Falls Offshore Wind Limited
NGO	Non-governmental Organisation

NHLE	National Heritage List for England
nm	Nautical Miles
NNR	National Nature Reserve
NOx	Nitrogen oxides
NPS	National Policy Statement
NPPF	National Planning Policy Framework
NRA	Navigation Risk Assessment
NRHE	National Record for the Historic Environment
NRMM	Non-Road Mobile Machinery
NSIP	Nationally Significant Infrastructure Project
NVZ	Nitrate Vulnerable Zones
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Areas
PHE	Public Health England
PRA	Preliminary Risk Assessment
OESEA	Offshore Energy Strategic Environmental Assessment
OFTO	Offshore Transmission Owner
ONS	Office of National Statistics
OREI	Offshore Renewable Energy Installations
OS	Ordnance Survey
OSP	Offshore Substation Platform
PRoW	Public Right of Way
RBMP	River Basin Management Plan
REC	Regional Environmental Classification
RIAA	Report to Inform an Appropriate Assessment
RIGS	Regionally Important Geological and Geomorphological Sites
RLoS	Radar Line of Sight
RNLI	Royal National Lifeboat Institution
ROV	Remote Operated Vehicles
RSPB	Royal Society for the Protection of Birds
RWE	RWE Renewables UK Ltd
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SCADA	System Control and Data Acquisition
SCI	Site of Community Importance
SCZ	Seascape character zones
SI/GI	Site/ground investigation
SLVIA	Seascape and Landscape Visual Impact Assessment
SNCB	Statutory Nature Conservation Body
SO2	Sulphur dioxide

SPA	Special Protection Area
S-P-R	Source-Pathway-Receptor
SPT	Standard Penetration Test
SPZ	Source Protection Zones
SSER	Scottish and Southern Energy Renewables Ltd
SSSI	Sites of Specific Scientific Interest
TCPA	Town and Country Planning Association
TJB	Transition Joint Bay
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
VMS	Vessel Monitoring System
WeBS	Wetland Bird Survey
WFD	Water Framework Directive
WHO	World Health Organisation
WTG	Wind Turbine Generators
ZSL	Zoological Society London
ZTV	Zone of Theoretical Visibility

Glossary of Terminology

Array areas	The two distinct offshore wind farm areas which together comprise the North Falls Offshore Wind Farm.
Array cables	Cables which link the wind turbine generators and the offshore substation platform.
Cable construction compound	Area set aside to facilitate construction of the onshore cable route. It will be located adjacent to the onshore cable route, with access to the highway (location not yet defined).
Haul road	The track alongside the onshore cable route used by construction traffic to access different sections of the onshore cable route.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall
Provisional offshore export cable corridor	The corridor of seabed from array areas to the landfall within which the offshore export cables will be located.
Interconnector cable	Cable between the northern and southern array areas
Jointing bay	Underground structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The location where the offshore cables come ashore.
Landfall compound	Compound at landfall within which HDD drilling would take place
Landfall search area	Locations being considered for the landfall, comprising the Essex coast between Clacton-on-Sea and Frinton-on-Sea.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.

National Grid connection point	The grid connection location for the project (not yet defined).
National Grid substation connection works	Infrastructure required to connect to National Grid's proposed substation connection point (location not yet defined).
Offshore export cables	The cables which bring electricity from the offshore substation platform to the landfall.
Offshore project area	The overall area of the array areas and the offshore export cable corridor.
Offshore substation platform	A fixed structure located within the array areas, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Onshore cable route(s)	Onshore route(s) within which the buried onshore electrical cables and associated infrastructure would be located (these have not yet been defined).
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore scoping area	The boundary in which all onshore infrastructure required for the project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and National Grid substation extension).
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the project so that it can be connected to the National Grid.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation (location not yet defined).
Safety zones	An area around a vessel which should be avoided during offshore construction.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Trenchless crossing compound	Areas within the cable route which will house trenchless crossing (e.g. HDD) entry or exit points (location not yet defined).

1 Part One: Introduction

1.1 Project background

1. Greater Gabbard Offshore Wind Farm (GGOW) is located off the coast of Suffolk, England and was commissioned in 2012. In February 2017, The Crown Estate launched an opportunity for existing wind farms to apply for project extensions and North Falls Offshore Wind Ltd (NFOW)) applied for a lease to develop an extension located immediately adjacent to the western boundary of the existing GGOW array areas. In August 2019, The Crown Estate consulted on and then concluded a plan-level Habitats Regulations Assessment (HRA) for the proposed extension projects and confirmed that Greater Gabbard Extension, now named North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the project') would be among seven that would be awarded an Agreement for Lease (AfL).

2. Since award of the AfL, North Falls has been undertaking offshore desktop constraint mapping exercises, offshore aerial bird surveys, onshore ecological surveys, and offshore geophysical and benthic sampling whilst engaging in an offshore cable corridor site selection process regarding the offshore cable corridor to landfall. The offshore elements of North Falls are now well defined. Onshore, North Falls has engaged in consultation with National Grid and separately with key onshore statutory stakeholders. The site selection process for the onshore elements of the project is at an early stage, with an onshore transmission substation location for North Falls yet to be confirmed by National Grid. However, to progress with the development of the project, North Falls has defined an onshore geographical broad area (herein the 'onshore scoping area'), on which North Falls is seeking a scoping opinion. The current status of onshore site selection and the proposed approach for ongoing onshore cable route and North Falls onshore substation site selection is described in Section 1.6.

1.2 Co-operation with other projects

3. North Falls and the nearby Five Estuaries Offshore Wind Farm are currently being developed as two distinct projects with separate ownership/shareholders. However, co-ordination of stakeholder engagement, construction, infrastructure and operations plans will be explored during the project development phase where this is considered practicable and feasible. Progress on these aspects will be updated throughout the development process.

4. NFOW is aware of wider implications for future co-operation between projects (not just offshore wind farms) for example through the current review of the existing energy National Policy Statements (NPS). However, no details were available at the time of writing this Scoping Report. Opportunities for co-operation will continue to be explored throughout the project development phase, taking into account the relevant policy requirements that are available at the time.

1.3 Purpose of this document

5. As the project is an offshore generating station over 100MW, it is classified as a Nationally Significant Infrastructure Project (NSIP) and as such a Development Consent Order (DCO) is required under the Planning Act 2008. In order to support the DCO application, an Environmental Impact Assessment (EIA) is required.

6. This document supports a request for an EIA scoping opinion from the Planning Inspectorate for North Falls, in accordance with Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter the 'EIA Regulations'). The EIA Regulations enable an applicant to request a scoping opinion from the Secretary of State on the information to be included in an EIA.

7. This scoping report outlines the receptors that will be considered during the EIA, the proposed data gathering and assessment methodology in order to characterise the existing environment; assess potential impacts; and develop mitigation measures. This scoping report provides high level information which will be expanded during a programme of consultation (the Evidence Plan Process (EPP)) with technical stakeholders throughout the EIA process.

8. A Preliminary Environmental Information Report (PEIR) will provide further detail on the interim findings of the site characterisation and impact assessment. The Environmental Statement (ES) will be submitted with the DCO application.

9. Receptors and impacts have been scoped in or out on the basis of lessons learned from a wide range of previous scoping opinions for offshore wind farms, recognising that a number of items cannot be scoped out until further information is known about the project and the existing environment. Any further refinement of the impacts scoped out would be justified and agreed with the relevant stakeholders (see Section 1.7).

1.4 The developer

10. NFOW is a consortium between Scottish and Southern Energy Renewables (SSER) Ltd and RWE Renewables UK Ltd (RWE), both of which are highly experienced developers. Both organisations are committed to developing renewable energy in the UK.

11. SSER is a partner in the following UK offshore wind farms:

- Beatrice – operational in north Scotland (588MW);
- Greater Gabbard – operational off the cost of Suffolk (504MW);
- Dogger Bank A, B and C offshore wind farms (formerly known as Creyke Beck A and B, and Teesside A) – preconstruction, consent granted in 2015. Located off north east England (up to 3.6GW total); and
- Seagreen – preconstruction, consent granted 2014. Located off east of Scotland (up to 1,500MW).

12. RWE is a partner in the following UK offshore wind farms:

- Greater Gabbard (as above);
- Galloper – operational off the coast of Suffolk (353MW);
- Gwynt y Môr – operational in North Wales (576MW);
- Humber Gateway - operational off the coast of East Yorkshire (219MW);
- London Array - operational off the coast of Kent/Essex (630MW);
- Rampion - operational off the coast of Sussex (400MW);
- Rhyl Flats – operational in North Wales (90MW);
- Robin Rigg - operational in the Solway Firth (180MW);
- Scroby Sands - operational off the coast of Norfolk (60MW);
- Sofia – under construction, financial investment decision in 2021. Located off the coast of North East England (1400MW); and
- Triton Knoll – under construction off the coast of Lincolnshire (857MW).

13. Lessons learned and experiences from previously consenting and operating this extensive portfolio of offshore wind farms will inform the design of North Falls, as well as providing an understanding of the potential impacts of the project by drawing on available monitoring data.

1.5 Project description

14. At this early stage in the development of North Falls, the project description is indicative based on the consortium's experience of consenting, constructing and operating offshore wind farms.

15. The North Falls EIA will be based on a design envelope approach in accordance with National Policy Statement (NPS EN-3 (paragraph 2.6.42)) which recognises that: *"Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:*

- *"Precise number, location and configuration of turbines and associated development;*
- *Foundation type;*
- *Exact turbine tip height (and rotor diameter);*
- *Cable type, number of cables and cable route; and*
- *Exact number and locations of offshore and onshore substations."*

16. NPS EN-3 (paragraph 2.6.43) 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 [Design] Envelope)". (DECC, 2011b).

17. The design envelope will therefore provide maximum and minimum parameters where appropriate to ensure the worst case scenario can be quantified and assessed in the EIA. This approach has been widely successful in the consenting of offshore wind farms and is consistent with the Planning Inspectorate Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2018) which states that: "*The Rochdale Envelope assessment approach is an acknowledged way of assessing a Proposed Development comprising EIA development where uncertainty exists and necessary flexibility is sought".*

18. The project description, including the design envelope will be detailed in the ES and the following sections provide an overview of the current understanding of the project infrastructure. This will be developed by North Falls, taking into account the scoping opinion and other technical and consultation work undertaken prior to submission of the DCO application.

19. The key components of the project are described in Table 1.1 and illustrated in Plate 1.1. In accordance with the Rochdale Envelope approach, the parameters in Table 1.1 represent the limits of the envelope and should not be combined (i.e. the maximum tip height would not occur with the minimum clearance above sea level).

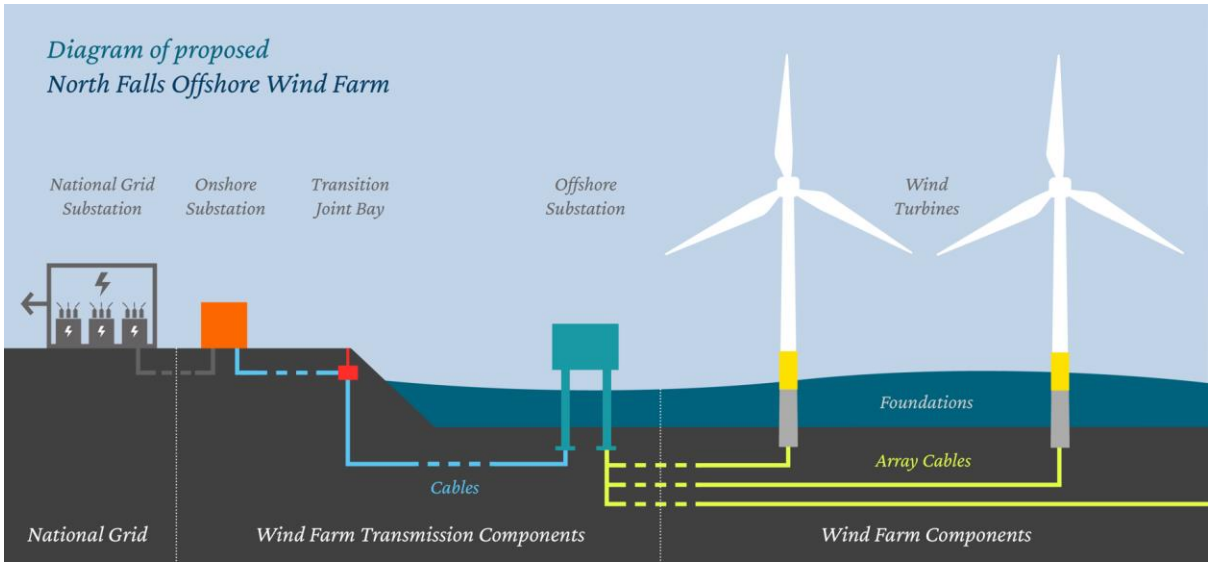

Plate 1.1 Overview of North Falls infrastructure (not to scale)

Table 1.1 Indicative project characteristics

Feature	Indicative Parameters
OFFSHORE	
Number of wind turbine generators (WTGs)	Up to 71
Array areas	150km^2
Distance to shore (closest distance)	22.5km
Provisional offshore cable route length	55km
Maximum number of offshore export circuits	Up to 4
Target minimum cable burial depth where buried	0.5-3m

Feature	Indicative Parameters
Maximum WTG rotor diameter	337m
Maximum rotor tip height	397m above Mean High Water Springs (MHWS)
Minimum clearance above sea level	22m above MHWS
Indicative minimum separation between WTGs	1150m downwind; 820m cross wind
Water depth in the North Falls array areas	5-59m LAT
Maximum no. of offshore substation platforms (OSP)	2
Maximum estimated array cable length	228m
LANDFALL	
Maximum number of export circuits	4
Maximum number of transition pits	4
Approximate transition pit permanent footprint (per pit)	16 x 25m
Approximate transition pit construction footprint (per pit)	40 x 45m
Proposed landfall installation method	Horizontal Directional Drilling (HDD)
Drill exit location	Either beach exit (above MLWS) OR seabed exit (up to 8m depth).
ONSHORE	
Electrical connection type	High Voltage Alternating Current (HVAC)
Expected grid connection location	Within Tendring District Council boundary (exact location to be determined)
Maximum number of onshore circuits	Up to 4 circuits, comprising 3 power cables, 3 comms cables and 1 earth cable in each circuit
Proposed onshore cable route construction width	Up to 70m
Proposed cable installation method	Trenching and HDD in sensitive locations.
Maximum onshore substation footprint	200 x 250m
Maximum onshore construction compound footprint	150 x 250m
Estimated number of primary (main) construction compounds	3
Maximum onshore substation equipment height	18m

1.5.1 Offshore

1.5.1.1 Description of the offshore project area

20. The offshore project area lies within the Outer Thames Estuary. Like GGOW, the North Falls array area is split into two boundaries to facilitate a shipping route. Within these boundaries, WTGs, array cables and offshore platforms (substations) will be installed.

21. The northern and southern array boundaries cover areas of approximately 6.1nm^2 (20.9km^2) and 37.5nm^2 (128.6km^2), respectively. The northern array boundary lies approximately 12.0nm from shore, and the southern boundary approximately 20.3nm from shore

22. The electricity will be connected to the shore by export cables which will be located within an offshore export cable corridor which is currently proposed to run from the southern WTG array area and is proposed to make landfall between Clacton-on-Sea and Frinton-on-Sea. The precise landfall location between these two settlements will be subject to further site selection, considering relevant consultation feedback and initial EIA and engineering survey data. The offshore export cable corridor will also include an interconnector cable between the northern and southern array areas.

23. The North Falls array areas and offshore export cable corridor are collectively referred to as the 'offshore project area'. This offshore project area is shown in Figure 1.1

24. The seabed in the offshore array areas is between 5m and 59m below sea level and the substrate is predominantly sand and gravel.

25. Further information on the characteristics of the site and existing use of the offshore project area is provided in Part 2 of this Scoping Report.

26. The proposed offshore export cable corridor passes to the north of the Margate and Long Sands Special Area of Conservation (SAC) and Kentish Knock East Marine Conservation Zone (MCZ), with a small overlap with the Outer Thames Estuary Special Protection Area (SPA) as it approaches landfall (see Figure 1.2). The range of constraints considered in the routing of the provisional offshore export cable corridor are discussed in Section 1.6.2.2.

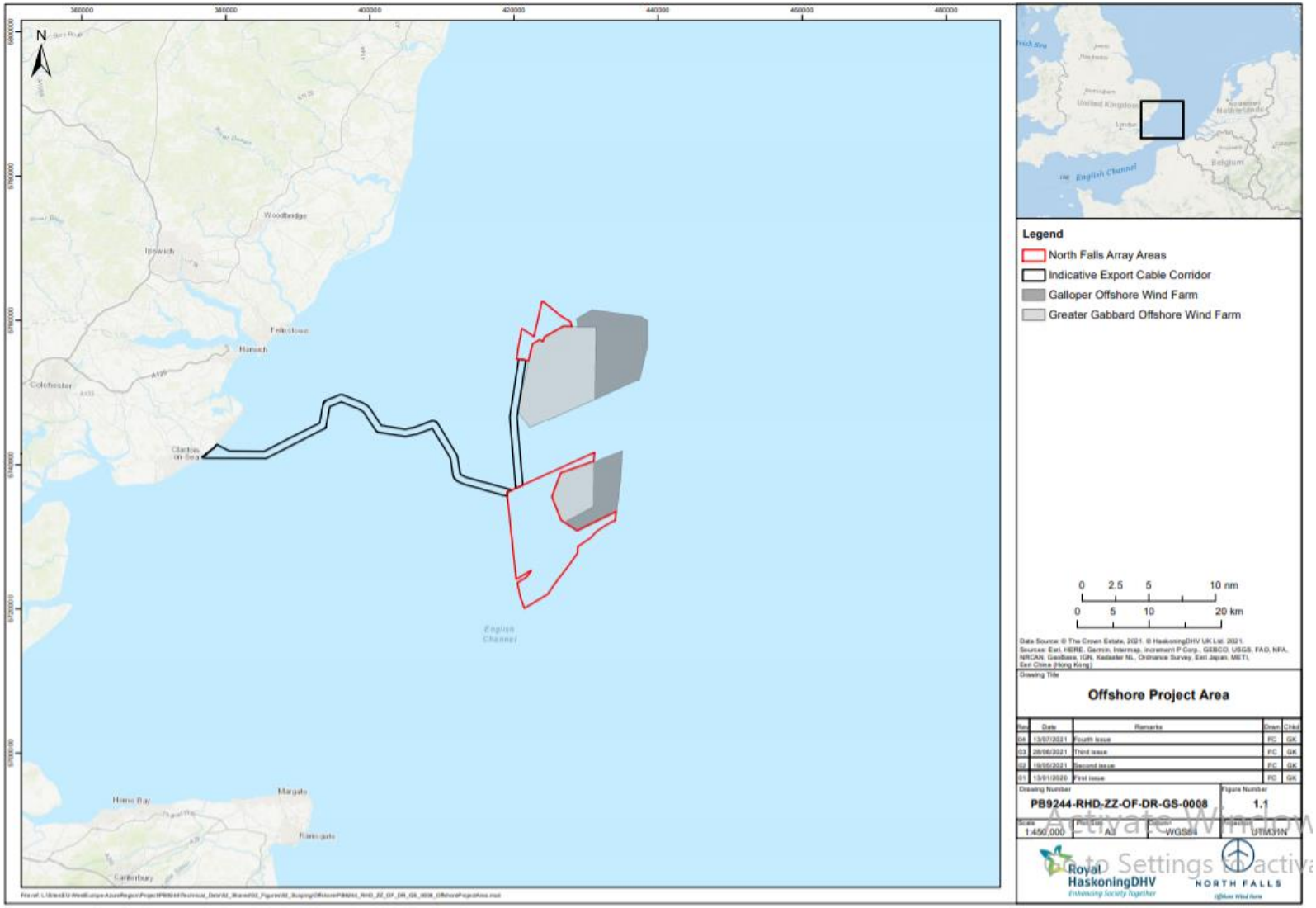

Figure 1.1 Offshore project area

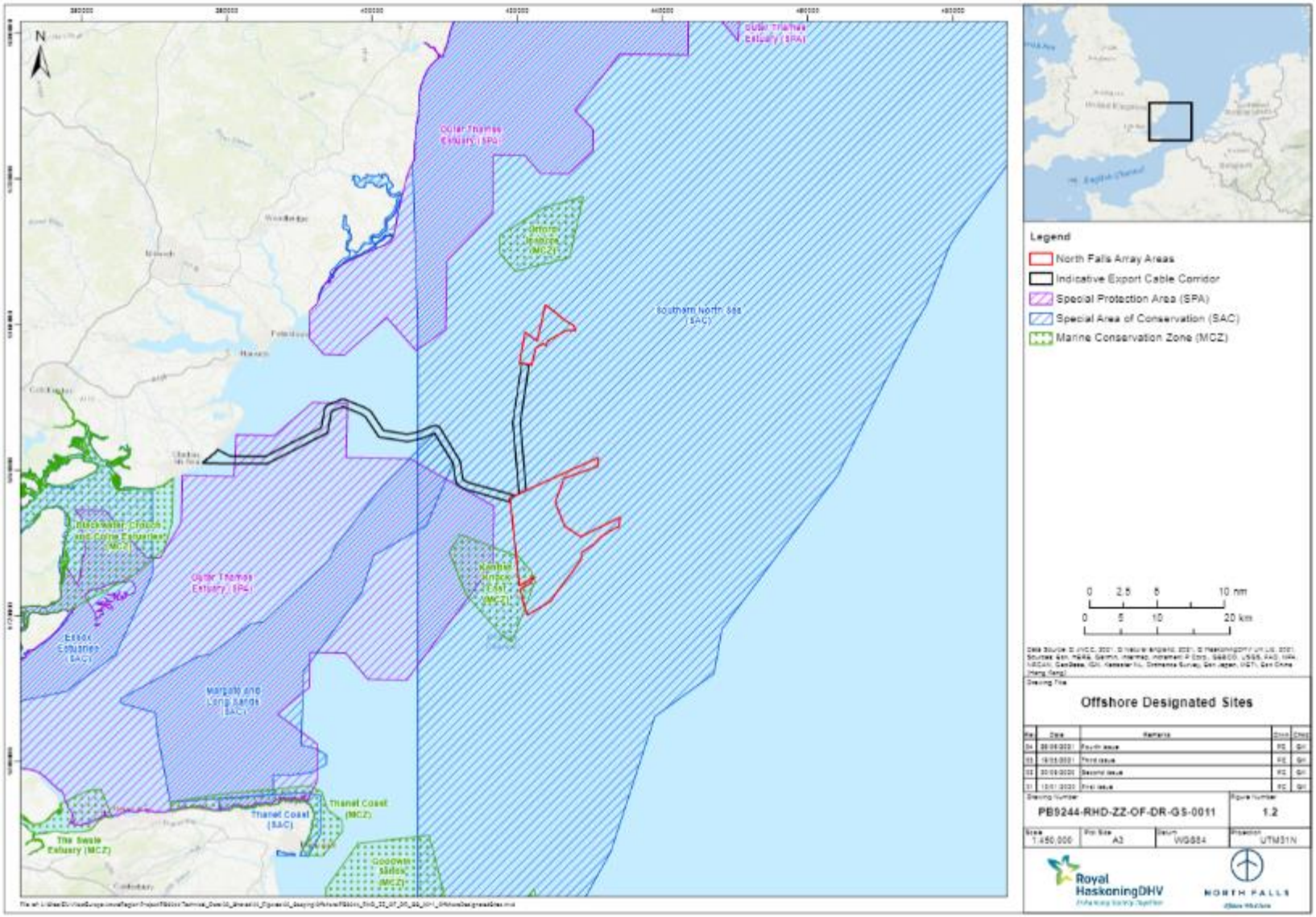

Figure 1.2 Offshore designated sites

1.5.1.2 Wind turbine generators

27. Based on industry developments to date, WTGs are likely to increase in size from those currently available and therefore the EIA will be undertaken on a range of number of WTGs installed and size (dimensions) of WTG in order to future proof the EIA and DCO. The project has the potential to consist of up to 71 WTGs and it is possible that more than one WTG model will be used across the site. The WTGs will incorporate tapered tubular towers and three blades attached to a nacelle housing mechanical and electrical generating equipment. It is estimated that the maximum rotor diameter would be 337m, with a maximum rotor tip height of 397m (above MHWS). The minimum air gap between the sea surface and the rotor tip would be 22m above MHWS.

28. The division of WTGs across the two array boundaries and the overall layout will be informed by site investigation works post consent.

1.5.1.3 Foundations

29. The design of foundations for the WTGs and platforms will be informed by site investigation and procurement, post consent. A number of factors will influence the choice of foundation and the parameters of each foundation option (e.g. the type and size of WTG selected, the nature of the ground conditions, the water depth, metocean characteristics and supply chain constraints). It is possible that more than one type of foundation will be used across the project area. The following foundation design options are currently being considered:

- Monopiles;
- Jackets on pin piles (on 3 or 4 legs);
- Jackets on suction caissons (on 3 or 4 legs); and
- Gravity Base Structures (GBS).

30. The design options will be defined for the EIA based on initial geophysical and geotechnical survey results and ongoing engineering feasibility studies. Indicative dimensions and construction materials are outlined in Table 1.2 below.

31. A number of options will be considered to protect the foundations from scour[1] if required, including rock dumping and mattressing.

Table 1.2 Foundation descriptions

Foundation Type	Description
Monopile	Cylindrical steel pile with conical transitions - up to 17m diameter. Average penetration expected to be approximately 38 to 42m depth below seabed level.
Jackets on pin piles (3 or 4 legs)	Typically, single large diameter vertical columns supported by braces and fixed to the seabed via three or four pin piles. Steel pin piles - diameter approximately 5.5m Spacing between legs is a maximum of approximately 60m at the seabed and 50m at water surface

[1] Scour: sediment eroded away from the base of the foundations as a result of the flow of water.

Foundation Type	Description
Jackets on suction caisson (3 or 4 legs)	Steel suction caisson – maximum diameter is approximately 38m each. Spacing between legs is a maximum of approximately 60m at the seabed and 50m at water surface
GBS	Typically a conical shape with reinforced or pre-stressed concrete shell with ballast fill. Maximum diameter is approximately 65m.

1.5.1.4 Offshore electrical infrastructure

32. Offshore electrical infrastructure will include the following components:

- Array cabling;
- OSP; and
- Export cabling to bring the electricity from the array areas to landfall.

33. Array cables will be used to connect the WTGs to the OSP. Array cables will be 33 to 132kV, 3-core HVAC cables with a diameter of approximately 220mm. The maximum length of array cabling for the project is estimated to be 228km. The location and length of the array cabling will be determined post consent, subject to the final layout of the WTGs.

34. The export circuits will be up to four 3-core HVAC cables operating at 400kV, with a diameter of approximately 310mm. Up to two OSP may be required.

35. Fibre optic communications cables (either inside the electrical transmission cables or laid alongside) will be required to allow for System Control and Data Acquisition (SCADA).

36. The offshore and onshore electrical infrastructure will be sold to an offshore transmission owner (OFTO). This is expected to be after the project has been built and commissioned.

1.5.2 Landfall

1.5.2.1 Landfall search area

37. The project proposes to bring the export cables onshore between Clacton-on-Sea and Frinton-on-Sea within the Tendring peninsula. The distance between these two coastal settlements is approximately 3km. Also running along the coast at this location is Holland Haven Marshes Site of Special Scientific interest (SSSI) and Holland Haven Local Nature Reserve (LNR) and Country Park (see Figure 1.3). On the southern outskirts of Frinton-on-Sea is Frinton Golf Club. Within this zone, a preferred landfall location will be selected during the EIA process.

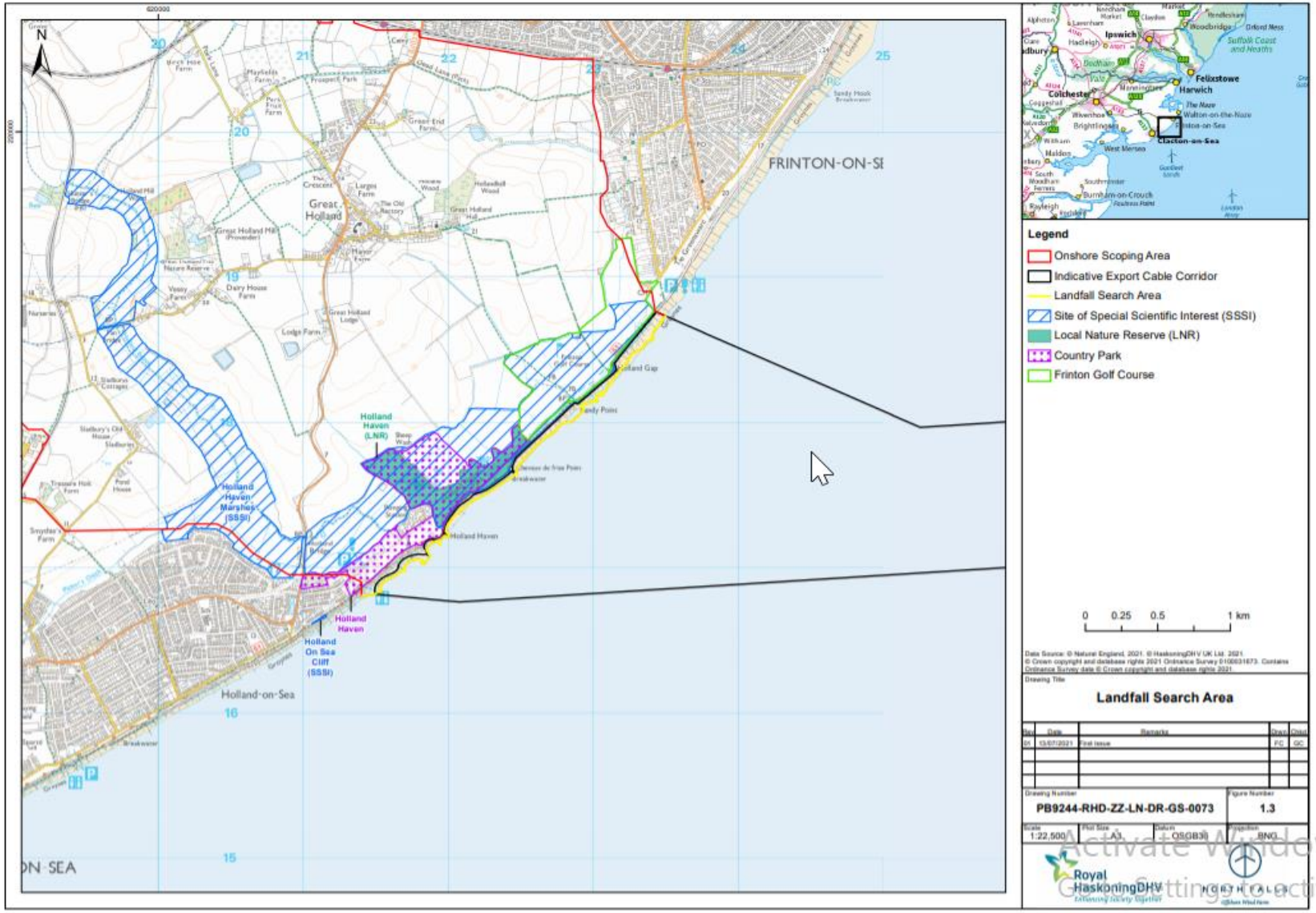

Figure 1.3 Landfall search area

1.5.2.2 Cable landfall

38. Cables will be installed at the landfall using HDD. Each circuit will require one HDD i.e. up to four in total. A spare HDD will also be included in the design presented in the ES, to account for HDD failure. The HDD will be drilled from an onshore construction compound. The onshore construction compound will be temporary in nature and reinstated after completion of the project. The location of the drill exit, either on the beach or below MLWS, will be determined during the EIA process. The offshore and onshore cables will be jointed within Transition Joint Bays (TJB) onshore. There will be between one and four TJB's. The onshore TJB(s) will be located underground. A pit will be dug out and refilled once the TJB(s) have been installed. The length of the HDD will depend upon factors such as water depth, seabed topography, shallow geology/soil conditions and local environmental constraints.

39. The key landfall construction parameters known at this stage are set out in Table 1.1.

1.5.3 Onshore scoping area

40. National Grid has not yet identified its location for a new onshore transmission substation (see Section 1.6.4). Therefore, North Falls has applied a series of electrical design parameters and consenting constraints in order to define an onshore scoping area. These principles are:

- All land within 20km of the landfall search area;
- All land within 4km of the existing 132kV electrical transmission line between Ardleigh Road substation and Little Clacton substation;
- Excluding all population centres of over 5,000 inhabitants;
- Excluding all international designated sites for nature conservation (Ramsar sites) and sites on the UK National Sites Network (SAC/SPAs); and
- Excluding all national landscape designations (Areas of Outstanding Natural Beauty (AONB)).

41. This approach is aligned with the Planning Inspectorate (2018) Advice Note 9, which states (Paragraph 4.5):

42. *"At the **time of the Scoping Request**, it may be necessary to leave certain matters open. For example, details of the Proposed Development may not have been finalised and, indeed, may not be finalised for some time. For example, in relation to offshore wind farms, detailed information that may not be available at the time of making the request for a Scoping Opinion could include:*

- *type and number of turbines;*
- *foundation type (this may depend upon the height and type of turbine and the seabed conditions);*
- *location of the export cable route (whether this is buried or on the seabed);*
- *location of the landfall point;*
- ***the definitive location of any onshore substation**;*

- ***location of the grid connection point****;*
- *construction methods and timing; or*
- *re-powering".*

43. These principles have been used to generate the onshore scoping area shown on Figure 1.4. The onshore scoping area comprises approximately 150km^2 of land located within the Tendring district of Essex. The area is bounded on the coast by the settlements of Clacton-on-Sea and Frinton-on-Sea. The Dedham Vale and Suffolk Coast and Heaths AONB are located to the north of the scoping area and Hamford Water SPA/SAC/Ramsar site is situated to the east (see Figure 1.5).

44. Ongoing site selection activity will subsequently work within the broad onshore scoping area to identify specific locations for all elements of the onshore electrical infrastructure required to for the project (see Section 1.6.4 below).

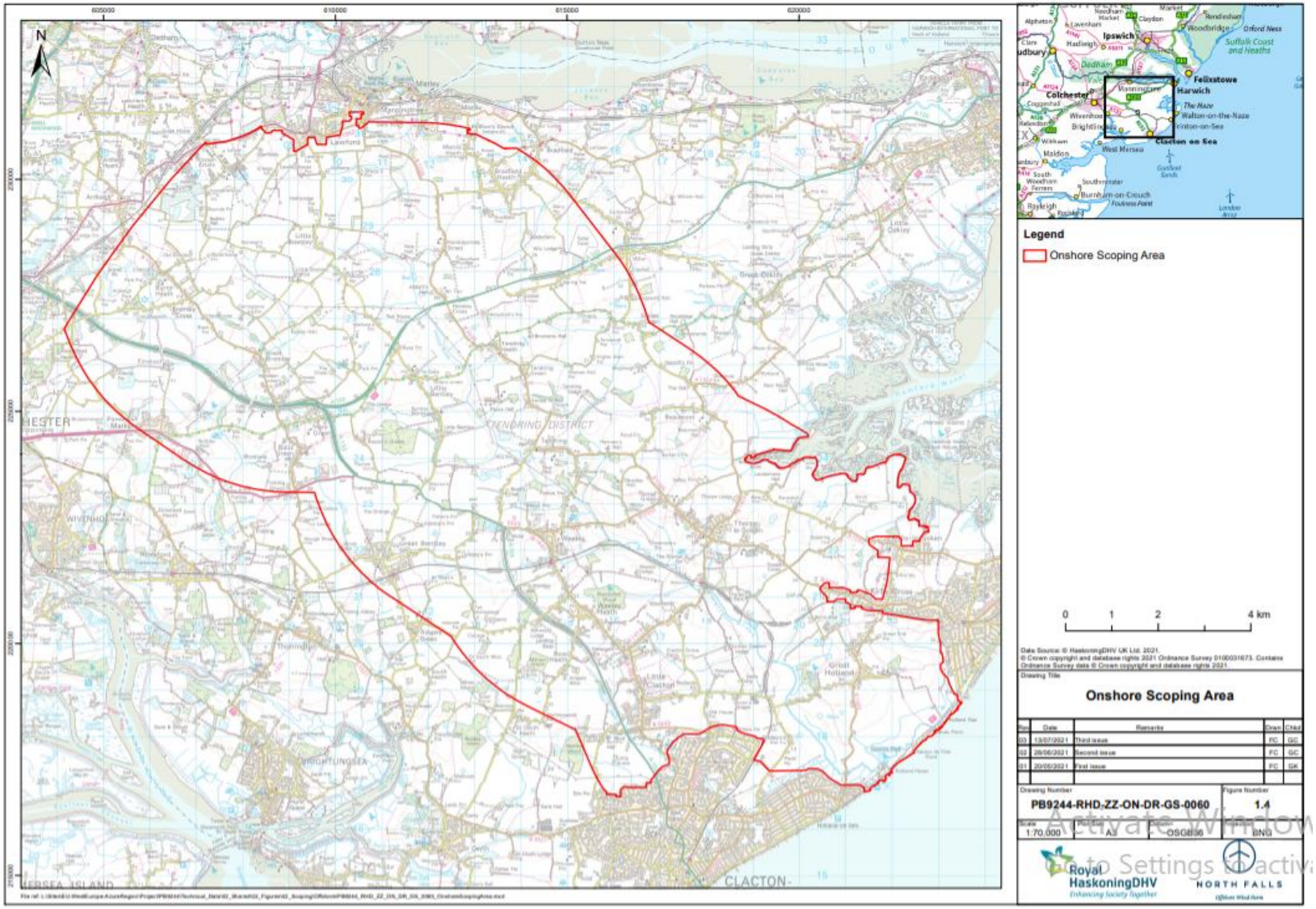

Figure 1.4 Onshore scoping area

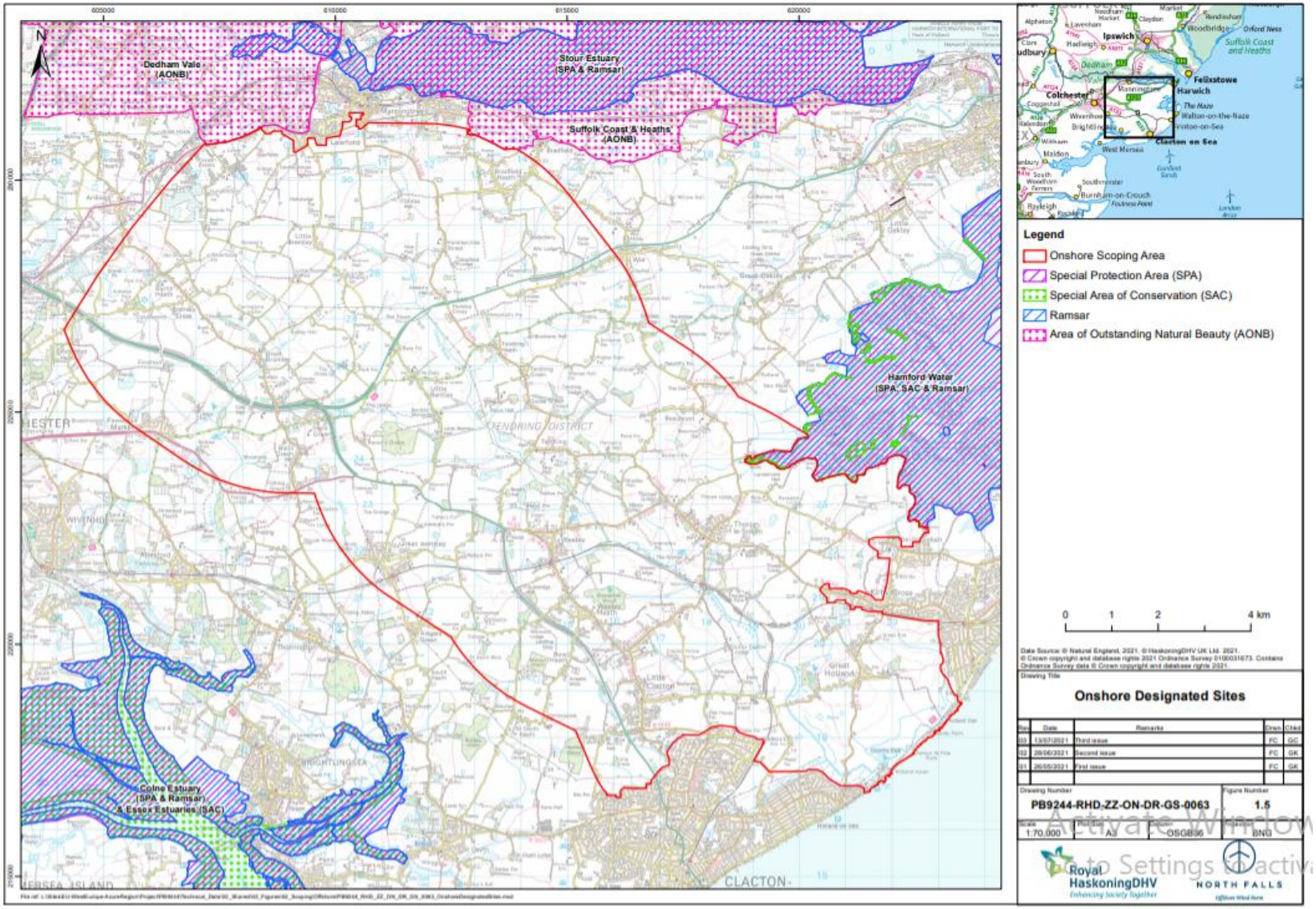

Figure 1.5 Onshore designated sites

1.5.3.1 Onshore export cables

45. The onshore export cables will connect from the landfall to the onshore substation and will be installed underground. At this early stage and with no defined National Grid transmission substation connection point, preferred cable routes have not been identified for this scoping report. However, a brief description of the key engineering and construction parameters that will be used to identify cable routes within the onshore scoping area is provided.

46. The onshore cable route working width required to install the four export circuits will be up to 70m wide. This width accounts for the required construction footprint, including cable trenches, haul road, topsoil storage, drainage etc. The onshore export cables will be installed in trenches which are then backfilled (except where trenchless techniques are used). Each circuit consists of three high voltage cables, three fibre optical cables and one earth cable.

47. Jointing bays will be used to pull the cables into the ducts and/or to join the cable lengths to each other. Link boxes are used for earthing cables and will be installed inside a protective concrete chamber. The jointing bays are subsurface structures, while the link boxes will require access (for inspections) from the surface during operations and will therefore be located at or above ground level. At the jointing location there will be one link box per circuit. The frequency of jointing bays and link boxes will be approximately every 500m.The key construction parameters for the onshore export cables known at this stage are set out in Table 1.1.

1.5.3.2 National Grid connection point

48. National Grid is responsible for operating the electricity transmission network in England and Wales. The Connection and Infrastructure Options Note (CION) Process is the mechanism used by National Grid to evaluate potential options to identify the substation connection point in line with their obligation to develop and maintain an efficient, coordinated and economical system of the electricity transmission network.

49. With respect to North Falls, National Grid commenced its CION process in January 2019 with this process concluding in 2020 that North Falls would connect at a new location, known as East Anglia Coastal. National Grid have as yet, not provided a geographic location as to where this transmission substation will be located.

50. The North Falls onshore substation will need to connect (see Plate 1.1) to the new and separate East Anglia Coastal National Grid transmission substation. However, any site selection process or consents required to construct the transmission substation will be the responsibility of National Grid and is not, in any way, informed by the North Falls site selection process, nor is it the responsibility or influence of NFOW.

1.5.3.3 North Falls Onshore substation

51. An HVAC onshore substation will be constructed to accommodate the connection of North Falls to the transmission substation. The North Falls onshore substation will be located in proximity to a National Grid connection point, once their location has been identified by National Grid. The North Falls onshore substation will contain the necessary electrical and auxiliary equipment and components for transforming the power from the wind farm to

400kV and is required to meet the UK Grid Code for connection to the transmission network. The worst case scenario will be set out in the ES (e.g. maximum height, footprint, number and type of buildings). The key construction parameters for the onshore export cables known at this stage are set out in Table 1.1. The 400kV export cable will run underground from the North Falls substation to the National Grid substation. The extent and location of landscaping around the North Falls substation will be identified and agreed with relevant stakeholders during the EIA process.

1.5.4 Port Facilities

52. The port facilities required for construction and operations and maintenance are unknown at this stage and agreements with ports are typically finalised post DCO consent. It is likely that the port will be located on the east coast of England.

53. Any onshore works required within a port are beyond the scope of the North Falls EIA and would be anticipated to be within the port's permitted development rights. NFOW will work with the relevant port authority once the project, North Falls has secured funding.

54. Where relevant, the offshore impact assessments will consider vessel movements to and from port, based on a realistic worst case scenario port location.

1.5.5 Indicative programme

55. The following key milestones are expected for the project:

- Submission of Scoping Report to the Planning Inspectorate – July 2021;
- Scoping consultation phase - 42 days from submission;
- Informal introductory consultation (virtual) – autumn 2021 (discussed further in Section 1.7);
- Pre-application consultation 1: consultation prior to PEIR - spring/summer 2022;
- PEIR submission - summer 2022;
- Pre-application consultation 2: formal consultation on PEIR - autumn/winter 2022 (a minimum of 28 days);
- DCO application submission - summer 2023;
- Consent decision - 2024;
- Onshore construction - 2026;
- Offshore construction - 2028; and
- Operational - 2030.

1.6 Site selection

1.6.1 Site selection process overview and current status

56. The offshore export cable corridor site selection process began with an extensive offshore constraints mapping exercise, involving consultation with key port, maritime and statutory and non-statutory nature conservation stakeholders throughout 2020. Through this consultation, North Falls identified a preferred offshore export cable corridor from the turbine array to an onshore landfall search area.

57. The landfall search area selection was undertaken alongside the offshore constraints mapping exercise in order to identify an area along the coast where landfall could be made (further details in Section 1.6.3 below).

58. Following this exercise, a broad onshore scoping area has been defined based on a number of high level design and consenting principles (as set out in Section 1.5.3) to identify possible locations for the onshore cable route and substation locations.

59. Feedback from the scoping consultation will help to inform the ongoing site selection work, as well as informing the EIA.

1.6.2 Defining the offshore area

1.6.2.1 Array areas

60. As one of the Crown Estate's 2017 extension projects, NFOW has been granted seabed rights to be part of the renewable energy generating facilities coming on stream before the end of 2030 to help contribute to the UK's emissions reduction and offshore wind generation capacity targets (The Crown Estate, 2021). The offshore array areas was defined during the Crown Estate process.

61. In alignment with the application criteria for 2017 the eastern extent of the array areas were defined by the existing GGOW and GWF boundaries. Consultation with marine stakeholders led to the refinement and reduction of the array areas due to the proximity of the north/south lanes of the Sunk Traffic Separation Scheme (TSS) and alignment with MGN 543 for both the northern and southern array areas. Wind data was obtained from the neighbouring operational sites to determine the wind regimen. The northern array area was also further reduced in response to an active aggregate licensed area, with the southern array area reduced in response to a proximity check, identifying an area of leased seabed for an interconnector.

62. The Crown Estate launched an external environmental constraint consultation in November 2018 with statutory nature conservation bodies to obtain feedback on the array areas, which then fed The Crown Estate's plan level HRA. This subsequently resulted in NFOW being granted seabed rights for the array areas in the Summer of 2020.

1.6.2.2 Export cable corridor

63. In parallel with the landfall assessment, offshore constraints mapping was undertaken to identify options for export cable corridors from the array areas to the Tendring peninsula.

64. Offshore constraints included in this exercise were:

- Engineering feasibility;

- Nature conservation designations;
- Other offshore wind farms;
- Shipping and navigation, including anchorage areas;
- Dredging areas;
- Disposal sites;
- Cables;
- Oil and gas infrastructure including platforms and pipelines;
- Military Practice and Exercise Areas (PEXAs); and
- Wrecks.

65. Following consultation (with statutory nature conservation bodies, shipping consultees the Marine and Coastguard Agency (MCA) and Trinity House, the MoD and Port consultees), the offshore export cable corridor option that minimised impacts on environmentally designated sites was selected. Further refinements were subsequently made to this route, to further minimise impacts on dredging, shipping and navigation, taking into account maritime stakeholder feedback received during consultation.

1.6.3 Defining the landfall search area

66. The landfall search area has been defined through a process of engineering and environmental review and assessment. To date, the process has sought to identify a landfall search area, i.e. a section of coastline at which the offshore cable come ashore.

67. The process of identifying a landfall search area began with the identification of the array areas offshore, and the National Grid connection location area (i.e. Tendring district) onshore.

68. Broad environmental, design and technical constraints were then identified to the coastline between these two locations, i.e. the coastline within Tendring district (from the Colne Estuary in the south to the Stour Estuary in the north), in order to identify suitable landfall search area options. These constraints include:

- International designated sites for nature conservation and the UK's National Sites network sites; and
- Settlements.

69. Once these constraints were applied, seven options for a landfall search area were identified as gaps between these constraints.

70. These seven options have subsequently been subject to an assessment of the following offshore and onshore engineering, human and environmental constraints in order to identify a preferred search area:

- Designated sites for nature conservation (MCZ, SPA, SAC, Ramsar sites, SSSIs, National Nature Reserves (NNRs), LNRs);
- AONB and Heritage Coast designations;

- National Parks;
- Country Parks / Registered Parks and Gardens;
- Ancient woodland;
- Areas of important habitat (e.g. trees, hedgerows, ponds and agricultural ditches);
- Royal Society for the Protection of Birds (RSPB) reserves;
- Local landscape designations;
- Geological Conservation Review sites;
- Regionally Important Geological and Geomorphological Sites (RIGS);
- Bathing waters;
- Main rivers;
- Flood Zones 2 & 3;
- Source Protection Zones (SPZs);
- Conservation areas;
- Listed buildings and scheduled monuments;
- Historic landfill sites;
- Key settlements and residential properties;
- Traffic constraints;
- Crossing arrangements, e.g. road, river and rail crossings.
- Sensitive land uses, e.g. schools and hospitals;
- Tourist attractions (e.g. golf course, caravan parks);
- Public Rights of Way (PRoW) and National Cycle Network (NCN) routes; and
- Utilities.

71. Once these constraints were applied and options compared through a qualitative assessment, a preferred landfall search area was identified between Clacton-on-Sea and Frinton-on-Sea (see Figure 1.3).

72. Future site selection activity during 2021 will subsequently refine this search area down to a preferred option for the project's landfall.

73. The process to select a preferred landfall option is ongoing and will reported on in full within the ES included within the DCO submission.

1.6.4 Defining the onshore infrastructure

74. As set out in Section 1.5.3 the onshore scoping area is large enough to capture all site selection optioneering work for the project. Throughout 2021 and 2022, an ongoing process of site selection will take place to identify North Falls preferred locations for the different elements of onshore infrastructure, which includes the following:

- landfall location where the offshore cables come ashore;
- onshore cable route for underground cables; and
- onshore project substation (subject to ongoing consultation and proximity with National Grid).

75. This process will refine the onshore scoping area down into distinct options, which will be used as the basis of data gathering to inform the project design, EIA and DCO Application.

76. The detailed site selection for the project's onshore substation will follow the principles set out in the National Grid's Guidelines on Substation Siting and Design ('The Horlock Rules') (National Grid Company, 2006), which document National Grid's best practice for the consideration of relevant constraints associated with the siting of onshore substations. The detailed site selection for all elements of the project's onshore infrastructure will aim to avoid and minimise impacts as far as possible and will take account the following human and environmental constraints, as well as engineering requirements:

- Location of National Grid's grid transmission substation connection point (See 1.5.2.5);
- Designated sites for nature conservation (SPA, SAC, Ramsar sites, SSSIs, NNRs, LNRs);
- AONB and Heritage Coast designations;
- National Parks;
- Country Parks / Registered Parks and Gardens;
- Ancient woodland;
- Areas of important habitat (e.g. trees, hedgerows, ponds and agricultural ditches);
- RSPB reserves;
- Local landscape designations;
- Geological Conservation Review sites;
- RIGS;
- Main rivers;
- Flood zones 2 & 3;
- SPZs;
- Conservation areas;
- Listed buildings and scheduled monuments;
- Historic landfill sites;
- Key settlements and residential properties;
- Traffic constraints;
- Crossing arrangements, e.g. road, river and rail crossings;

- Sensitive land uses, e.g. schools and hospitals;
- Tourist attractions (e.g. golf course, caravan parks);
- PRoW and NCN routes; and
- Utilities.

1.7 Consultation

1.7.1 Pre-scoping consultation

77. NFOW has proactively engaged with key stakeholders from an early stage in the project. Table 1.3 provides an overview of stakeholder consultation undertaken to date.

Table 1.3 Consultation to date

Dates	Activity	Detail	Organisation(s) Consulted
September 2018	External workshop	A consultation event held with marine consultees around the initial array boundary, facilitated by Anatec Ltd	MCA Trinity House
November 2018	Environmental constraint consultation	A consultation event (led by The Crown Estate) appraising constraints around the area sought for the array areas from North Falls	MoD Civil Aviation Authority (CAA) National Federation of Fishermen's Organisations Natural England Suffolk Coast and Heath AONB The Wildlife Trusts Chamber of Shipping Historic England Whale and Dolphin Conservation Suffolk County Council RSPB
September 2020 – February 2021	Presentation	An introductory session to North Falls was provided the County Council and District Council	Essex County Council Tendring District Council
September 2020 – February 2021	External workshop	National Grid outlining the technical basis of the East Anglia substation	National Grid
December 2020	Written consultation	Consultation on onshore overwintering bird survey methodologies	Natural England
February – March 2021	Written consultation	Consultation on five shortlisted offshore export cable corridor options. Offered opportunity for a collective workshop/ or	Harwich Haven Authority Historic England Natural England MCA Marine Management Organisation (MMO) MoD (Defence Infrastructure Organisation (DIO)) Port of Felixstowe

Dates	Activity	Detail	Organisation(s) Consulted
		individual presentations to selected stakeholders	Port of London Authority RSPB Royal Yachting Association (RYA) Trinity House The Wildlife Trusts
February 2021	Presentation	An introductory session to North Falls	Historic England
February 2021	Online meeting	Progress meeting	Natural England
February 2021	Presentation	A session was held regarding cable landfall options on the Tendring peninsula	Essex County Council
February 2021	Presentation/workshop	Presentation on background to offshore export cable corridor site selection and shortlist options (provided individually)	MCA (17 February 2021) Trinity House (22 February 2021) Natural England (25 February 2021)
February 2021	Written consultation	Consultation on Extended Phase 1 Habitat Survey Methodology	Essex County Council Natural England RSPB Tendring District Council The Wildlife Trusts
March 2021	Consultation update	Updated shipping and navigation consultees on route refinements based on consultation responses received and selection of final corridor for survey	Harwich Haven Authority MCA Port of Felixstowe Port of London Authority Trinity House
March 2021	Presentation/workshop	Workshop meeting to discuss specific aspects of the preferred offshore export cable corridor	Harwich Haven Authority (15 March 2021)
March 2021	Written consultation	Consultation on Phase 2 surveys of Holland Haven Marshes SSSI	Essex County Council Natural England RSPB Tendring District Council The Wildlife Trusts
April 2021	Presentation	An update meeting was held to inform the Council of project progress	Essex County Council
April 2021	Presentation	An introductory session to North Falls	The Wildlife Trusts Essex Wildlife Trust
April 2021	Online meeting	Progress meeting	Natural England
April – May 2021	Written consultation	Consultation on terms for the	Affinity Water Anglian Water

Dates	Activity	Detail	Organisation(s) Consulted
		North Falls EIA/HRA EPP	East Suffolk Council Environment Agency Essex Coast Organisation Essex County Council Highways England Historic England Kent & Essex Inshore Fisheries and Conservation Authority (IFCA) MMO/Centre for Environment, Fisheries and Aquaculture Science (Cefas) Natural England RSPB Suffolk County Council Tendring District Council Whale and Dolphin Conservation The Wildlife Trusts
April – June 2021	Workshop	Meetings to discuss project proposals for benthic ecology site characterisation and associated survey licensing requirements	The Crown Estate Natural England Marine Management Organisation
June 2021	Online meeting	Progress meeting	Natural England
June 2021	Presentation	An introductory session to North Falls	East Suffolk Council Suffolk County Council
June – July 2021	Workshops (Expert Topic Group meetings)	Pre-scoping Expert Topic Group meetings undertaken in accordance with the North Falls EPP	East Suffolk Council Environment Agency Essex County Council Highways England Historic England Kent & Essex IFCA MMO/Cefas Natural England RSPB Suffolk County Council Tendring District Council The Wildlife Trusts

1.7.2 Technical consultation

78. Consultation is a key element of the EIA process and consultation with technical consultees will be crucial to the development of the assessments. The detailed methodologies for data collection and undertaking the impact assessments will be agreed with the relevant stakeholders.

79. As additional data and project information, including mitigation measures develop, further impacts may be able to be scoped out. If so, this would be documented through agreement logs with stakeholders.

80. Table 1.4 provides an overview of the likely stakeholders that will be engaged throughout the EIA and the environmental topic areas to be discussed.

Table 1.4 Consultation groups

Consultation	Purpose and topics included	Stakeholders

The EPP	This process is a voluntary mechanism to help agree the information required by the Planning Inspectorate as part of a DCO application to help to ensure compliance with the EIA Regulations and Habitat Regulations.
	The following Expert Topic Groups (ETG) will be established:
	• Seabed
	  ○ Marine Geology, Oceanography and Physical Processes;
	  ○ Marine Water and Sediment Quality;
	  ○ Benthic and Intertidal Ecology;
	  ○ Fish and Shellfish Ecology;
	• Ornithology;
	• Marine mammal ecology;
	• Onshore ecology (including onshore ornithology);
	• Onshore Water Resources and Flood Risk (including Water Framework Directive (WFD)) and Land Quality and Geology;
	• Traffic and Transport, Air Quality, Climate Change), and Noise and Vibration;
	• Seascape and Landscape and Visual Impact, Land Use, Health Impact Assessment; Socio-Economics, and Tourism and Recreation; and
	• Cultural Heritage (offshore and onshore).
	
	Where there is sufficient overlap in technical expertise, topics may be combined to provide efficiency for all parties.
	
	The EPP aims to give greater certainty to all parties on the amount and range of evidence the applicant should collect and present to support the DCO application. The EPP for North Falls commenced in 2021, although some prior consultation was undertaken, e.g. regarding survey methodologies
		The following stakeholders will be invited to join the ETGs where relevant:
		• MMO;
		• Cefas (where invited by the MMO);
		• Natural England;
		• Historic England;
		• IFCA;
		• Local Authorities;
		• Environment Agency;
		• Anglian Water;
		• Highways England;
		• Affinity Water;
		• Non-governmental organisations (NGOs) e.g.:
		  ○ RSPB
		  ○ The Wildlife Trusts
		• Essex Coast Organisation
		• Specialist Interest Groups, if applicable (to be identified through the ongoing EPP)

Fisheries	This topic typically sits outside the framework of the EPP. Local fisheries organisations and individual fishermen will be contacted at an early stage in the EIA process to provide information about the project and to seek information on fishing activity in order to inform the assessment.	• UK fisheries • Foreign fisheries
Aviation and Radar	This topic typically sits outside the framework of the EPP. Consultation with aviation stakeholders will be undertaken at an early stage in the EIA process to provide information about the project and to seek information on potential issues with regards to Aviation and Radar in order to inform the assessment.	• CAA • MoD • National Air Traffic Services (NATS) En Route
Shipping and Navigation	This topic typically sits outside the framework of the EPP. Consultation with shipping and navigation stakeholders will be undertaken at an early stage in the EIA process to provide information about the project and to seek information on potential issues with regards to Aviation and Radar in order to inform the Navigation Risk Assessment	• MCA • Trinity House • RYA • Chamber of Shipping • Port Authorities • Shipping companies

1.7.3 Public engagement

81. Pre-application consultation will be the main opportunity for stakeholders to review the plans, provide comments, submit feedback and to have an influence on elements of the process and shape the development.

82. The project will ensure that stakeholders who are most affected by the proposals are engaged in the development of the wind farm from the start to finish and have the opportunity to comment on the proposals at key decision making points.

83. The development of North Falls will be an iterative process with opportunity for the public to input at any time, however there will be specific consultation periods where North Falls will ask for comments related to defined elements on its proposals.

84. These will incorporate: an initial (virtual) consultation to introduce the project followed by at least two consultation stages (one formal) and a final targeted stage that will be shaped as needed, to ensure that consultation is thorough and timed to ensure that North Falls is able to effectively gather and incorporate opinions and feedback.

85. North Falls will utilise both traditional and online consultation methodologies including:

- Virtual exhibitions via the project website;
- Digital consultation;
- Community/public events;
- Newsletters (online and hard copy);
- Direct mail (letters, invitations and information materials) to those within the consultation area;
- Advertising in local newspapers;
- Establishment of community liaison groups as applicable;
- Meetings with local representatives including parish, district and county councillors;
- Project specific website;
- Social media including @northfalls Instagram; and
- Direct 24-hour line and project-specific email address.

1.8 Environmental impact assessment methodology

1.8.1 Characterisation of the existing environment

86. The characterisation (description) of the existing environment will be undertaken in order to determine the baseline conditions in the area with potential to be affected by the project. This will require the following steps:

- Study areas defined for each receptor based on the zone of influence and relevant characteristics of the receptor (e.g. mobility/range);

- Review available information;
- Review likely or potential impacts that might be expected to arise from the project;
- Determine if sufficient data to make the EIA judgements with sufficient confidence;
- If further data required, ensure data gathered are targeted and directed at answering the key question and filling key data gaps; and
- Review information gathered to ensure the environment can be sufficiently characterised in sufficient detail.

87. A significant amount of existing data has been collated for GGOW and Galloper Wind Farm (GWF) that is of relevance to North Falls. In addition, wider information sources and proposed data collection will also be used. The existing and proposed data and information sources are outlined in each of the relevant existing environment subsections within Parts 2, 3 and 4 of this scoping report.

88. Where appropriate, detailed method statements will be provided to the relevant technical stakeholders in order to agree the relevant approach.

1.8.1.1 Climate change

89. In addition to characterising the existing environment, anticipated trends in baseline conditions will be identified in order to incorporate the potential effects of climate change in the impact assessments, in accordance with the requirements of the 2017 EIA Regulations.

1.8.2 Assessment of impacts

90. The approach the EIA team will take to making balanced assessments will be guided by EIA and technical specialists using available data, new data, experience and expert judgement. In order to provide a consistent framework and system of common tools and terms, where appropriate, a matrix approach will be used to frame and present the judgements made. However, it should be noted that for each topic of the EIA the latest guidance or best practice will be used and therefore definitions of sensitivity and magnitude of impact will be tailored to each receptor. The impact assessment will consider the potential for impacts during the construction, operation and decommissioning of North Falls.

1.8.2.1 Determining receptor sensitivity and value

91. The ability of a receptor to adapt to change, tolerate, and / or recover from potential impacts will be key in assessing its sensitivity to the impact under consideration. For ecological receptors tolerance could relate to short-term changes in the physical environment, for human environment receptors tolerance could relate to displacement effects and therefore impacts upon economics or safety. It also follows that the times required for recovery will be key considerations in determining receptor sensitivity.

92. Receptor value considers whether, for example, the receptor is rare, has protected or threatened status, importance at local, regional, national or international scale, and in the case of biological receptors whether the receptor has a key role in the ecosystem function.

93. The overall receptor sensitivity is determined therefore by considering a combination of value, adaptability, tolerance and recoverability as well as applying professional judgement and / or past experience. Expert judgement is particularly important when determining the sensitivity of receptors. For instance, an Annex II species (under the Habitats Directive) would have a high value, but if it was highly tolerant of an effect or had high recoverability it would follow that the sensitivity in this instance should reflect this.

1.8.2.2 Predicting the magnitude of impacts

94. In order to predict the significance of an impact it is fundamental to establish the magnitude and probability of impact occurring through a consideration of:

- Scale or spatial extent (small scale to large scale or most of the population or a few individuals);
- Duration (short term to long term);
- Frequency; and
- Nature of change relative to the baseline.

1.8.2.3 Evaluation of significance

95. Subsequent to establishing the receptor sensitivity and magnitude of effect, the impact significance will be predicted by using quantitative or qualitative criteria, as appropriate to ensure a robust assessment. Where possible a matrix such as the one presented in Table 1.5 will be used to aid assessment of impact significance based on expert judgement, latest guidance and any specific input from consultation. A description of the approach to impact assessment and the interpretation of significance levels will be provided within each section of the ES. This approach will ensure that the definition of impacts is transparent and relevant to each topic under consideration

96. For the purposes of the EIA, major and moderate adverse impacts are deemed to be significant, and, as such, may require mitigation. Whilst minor impacts are not significant in their own right, these may contribute to significant impacts cumulatively or through interactions.

Table 1.5 Significance of an impact - resulting from each combination of receptor sensitivity and the magnitude of the effect upon it

		NEGATIVE MAGNITUDE				BENEFICIAL MAGNITUDE			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
SENSITIVITY	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

1.8.2.4 Embedded and additional mitigation, impact significance and residual impact

97. The EIA Regulations require a description of the measures envisaged to avoid, prevent, reduce or (where possible) offset any significant adverse effects on the environment. Where possible, embedded mitigation, i.e. mitigation

identified at an early stage (often using experience from operational projects), can include:

- The design elements aimed at reducing impacts;
- Commitment to specific best practice;
- Commitment to pre-construction surveys; and
- Commitment to consultation.

98. Embedded mitigation will be incorporated into the project design and listed where relevant for each topic. Impacts will then be assessed with this mitigation in place. Where impacts are significant and additional mitigation is required, impacts may be reassessed and the post-mitigation or 'residual impact' identified. If the impact does not require mitigation (or none is possible) the residual impact will remain the same.

99. In some circumstances it may be necessary to detail monitoring requirements as part of the mitigation measures identified. Monitoring may be required to confirm the assumptions that the assessment is reliant upon (i.e. continue to monitor baseline conditions) and / or to confirm the efficacy of mitigation measures implemented. Monitoring should be proportionate and directly relevant to the findings of the impact assessment, i.e. it should not be monitoring for the sake of monitoring.

1.8.2.5 Confidence

100. Once an assessment of a potential impact has been made, it is necessary to assign a confidence value to the assessment to assist in the understanding of the judgment. This is undertaken on a simple scale of high-medium-low, where high confidence assessments are made on the basis of robust evidence, with lower confidence assessments being based, for example on extrapolation and use of proxies.

1.8.2.6 Inter-relationships

101. The impact assessment will consider the inter-relationship of impacts on individual receptors. The objective will be to identify where the accumulation of residual impacts on a single receptor, and the relationship between those impacts, gives rise to a need for additional mitigation. When considering the potential for impacts to inter-relate it is assumed that any residual effect determined as having no impact will not result in a significant inter-relationship when combined with other effects on receptors. However, where a series of negligible or greater residual impacts are identified, they will be considered further.

1.8.2.7 Cumulative and transboundary impacts

102. Cumulative impact assessment (CIA) forms part of the EIA process. The Planning Inspectorate advice notes nine and seventeen provide guidance on plans and projects that should be considered in the CIA including:

- Projects that are under construction;
- Permitted applications not yet implemented;
- Submitted applications not yet determined;
- Projects on the Planning Inspectorate's Programme of Projects;

- Development identified in relevant Development Plans, (and emerging Development Plans - with weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- Sites identified in other policy documents as development reasonably likely to come forward.

103. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment will be included in the CIA. Projects which are sufficiently implemented during the site characterisation for North Falls will be considered as part of the baseline for the EIA. Where possible NFOW will seek to agree with stakeholders the use of as-built project parameter information (if available) as opposed to consented parameters to reduce over-precaution in the cumulative assessment.

104. For some topics (where for example the receptors include highly mobile or migratory species, fishing or shipping) the CIA will have a large geographic scale and involve in many plans and projects, for others where receptors (or impact ranges) are more spatially fixed the CIA will be narrower. The scope of the CIA will therefore be established on a topic by topic basis with the relevant consultees as the EIA progresses.

105. Offshore cumulative impacts may come from interactions with the following activities and industries:

- Other wind farms;
- Aggregate extraction and dredging;
- Licensed disposal sites;
- Navigation and shipping;
- Commercial fisheries;
- Sub-sea cables and pipelines;
- Potential port and harbour development;
- Oil and gas activities; and
- Unexploded ordnance (UXO) clearance.

106. Onshore plans or projects that may be considered include (but are not limited to):

- Other offshore wind farm infrastructure;
- Other energy generation infrastructure;
- Building and / or housing developments;
- Installation or upgrade of roads;
- Installation or upgrade of cables and pipelines; and
- Coastal protection works.

107. Regulation 32 of the EIA Regulations sets procedures to address issues associated with a development that might have a significant impact on the environment in another European member state.

108. The procedures involve providing information to the member state and for the Planning Inspectorate to enter into consultation with that state regarding the significant impacts of the development and the associated mitigation measures. Further advice on transboundary issues, in particular with regard to consultation is given in the Planning Inspectorate advice note twelve (Planning Inspectorate, 2018b).

109. Transboundary impacts, like cumulative impacts are considered on a topic by topic basis for offshore topics and are not relevant to onshore topics.

110. It is intended that screening of plans and projects to include in the CIA and Transboundary assessment will be undertaken for North Falls in 2021/22 and will be consulted upon with the relevant stakeholders through the EPP (Section 1.7).

1.9 Policy and legislative context

1.9.1 Need for the project

111. The Government and the offshore wind sector adopted the Offshore Wind Sector Deal in 2019 to build on the United Kingdom's global leadership in offshore wind, maximising the advantages for UK industry from the global shift to clean growth. The Sector deal provided a target of delivering 30GW of energy from offshore wind by 2030. Subsequently, the Energy White Paper (HM Government, 2020b) commits to increase this target to 40GW.

112. Building up to 40GW of offshore wind by 2030 could account for over £50 billion of infrastructure spending in the next decade.

113. There are four drivers for the development of offshore wind energy:

- Reduce greenhouse gas emissions;
- Energy security;
- Maximise economic opportunities from energy infrastructure investment for the UK; and
- Produce affordable energy.

1.9.1.1 The need to reduce greenhouse gas emissions

114. Global temperature rise as a result of greenhouse gas emissions in the atmosphere is associated with potential impacts on weather, ecosystems and human health and welfare. The UK has made commitments internationally to limit global temperature increases, most recently through the 21st Conference of Parties in Paris in 2015. This commitment has been ratified and has been implemented in 2020 through the sixth UK Carbon Budget which recommends the UK commits to a 78% reduction in carbon emissions by 2035, compared to emission levels in 1990 (Climate Change Committee, 2020).

115. In the longer term, the UK Government has committed to net zero (reduction in greenhouse gas emissions by 100% relative to 1990 levels) by 2050. The

Climate Change Committee (2020) recommends that "*Offshore wind becomes the backbone of the whole UK energy system, growing from the Prime Minister's promised 40GW in 2030 to 100GW or more by 2050*".

1.9.1.2 The need for energy security

116. With existing fossil fuels and nuclear-powered electricity generation coming to the end of their operational lives, there is a need for replacement generation as old infrastructure is decommissioned. Net import of electricity to the UK in 2019 was 35% of electricity used. Electricity generation in the UK has fallen by 2.4% between 2018 and 2019 and by 15% between 2010 and 2019, highlighting the need for new infrastructure to deliver a secure national energy supply as part of a long-term sustainable energy policy. However, renewables' share of electricity generation was a record 54.4% in 2019, up from 23% in 2010. Between 2018 and 2019, offshore wind generation rose by 20%. (BEIS, 2020).

1.9.1.3 The need to maximise economic opportunities from energy infrastructure investment for the UK

117. A key commitment within the UK's Low Carbon Transition Plan (HM Government, 2009) was to assist in making the UK a green industry centre by supporting the development and use of clean energy technologies, a commitment updated by the Green Paper: *Building our Industrial Strategy* (HM Government, 2017). This Industrial Strategy consultation sets out the Government's vision for the energy industry whereby Industry and Government work together to build a competitive and innovative UK supply chain that delivers and sustains jobs, exports and generates economic benefits for the UK, supporting offshore wind as a core and cost-effective part of the UK's long-term electricity mix. The Offshore Wind Sector Deal (BEIS, 2020) estimates that by 2030, offshore wind could support 60,000 jobs.

1.9.1.4 The need to produce affordable energy

118. As offshore wind technology has matured and developers have innovated there has been a significant reduction in the cost of energy produced by offshore wind in recent years, with a 32% reduction between 2012 and 2016 (ORE Catapult, 2017). The latest allocation round of the UK Government's Contracts for Difference (CfD) scheme was notable for the greatly reduced cost of offshore wind projects to as low as £40/MWh, compared with the first CfD round in 2015 of which resulted in costs of £150/MWh (HM Government, 2020b). This demonstrates the progress being made, with, a reduction in costs by 73% in five years.

1.9.2 Summary of climate change and renewable energy policy and legislation

119. Climate change policy has been established at an international and national level. Key aspects are presented in Table 1.6.

Table 1.6 Summary of relevant climate change policies

Policy	Summary
United Nations Framework Convention on Climate Change (Paris climate agreement)	Limit global temperature increase to below 2°C, while pursuing efforts to limit the increase to 1.5°C; Commitments by all parties to prepare, communicate and maintain a Nationally Determined Contribution; and

Policy	Summary
	In 2023 and every five years thereafter, a global stocktake will assess collective progress toward meeting the purpose of the Agreement.
The UK Climate Change Act 2008	A reduction of 34% in greenhouse gases by 2020 (below 1990 levels); and A reduction of 80% in greenhouse gases by 2050 (below 1990 levels).
The UK Energy Act 2013	Introduction of provisions to enable a statutory 2030 decarbonisation target range for the GB electricity sector; and Electricity Market Reform including introduction of the CfDs support mechanism.
Climate Change Act 2008 (2050 Target Amendment) Order 2019	Introduces a target for at least a 100% reduction of greenhouse gas emissions (compared to 1990 levels) in the UK by 2050. Supersedes the Climate Change Act 80% target

1.9.3 Planning policy and legislation

120. The Planning Act 2008 (as amended) is the primary legislation that established the legal framework for applying for, examining, and determining applications for NSIPs.

1.9.3.1 National Policy Statements (NPS)

121. NPSs are produced by the UK Government and set out national policy against which proposals for NSIPs are determined. NPSs include the Government's objectives for the development of nationally significant infrastructure. The three NPSs of relevance to North Falls are:

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

122. The Energy White Paper (December 2020) announced a review of the existing energy NPS, with the aim of designating updated versions by the end of 2021. A consultation on the NPS review is anticipated for July 2021, however no details were available at the time of writing this Scoping Report. The ES submitted with the DCO application will describe the relevant policy requirements in respect of the environmental assessment that are available at the time.

123. In addition, the Marine Policy Statement (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.

1.9.3.2 The EIA Directive

124. EIA was introduced under the European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC). The EIA Directive was transposed into English law for NSIPs by the Infrastructure

Planning (Environmental Impact Assessment) Regulations 2009. In 2011, the original EIA Directive and amendments were codified by EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU).

125. Amendments were made by EIA Directive 2014/52/EU and have been transposed into English law for NSIPs by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) 2017. These are the relevant EIA regulations for the project.

1.9.4 Environmental legislation

126. Table 1.7 provides an overview of the key environmental legislation that will be of relevance to North Falls.

Table 1.7 Key relevant environmental legislation

Level	Legislation	Summary
International	The OSPAR Convention	• Establishes a network of Marine Protected Areas (MPAs).
	The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)	• Establishes Ramsar sites to protect important areas for waterfowl
UK Legislation	The Wildlife and Countryside Act 1981	• Enables the designation of SSSI to provide protection for flora, fauna, geological and physio-geological features. • Enables designation of sites which are considered to be of national importance as NNRs. • Makes it an offence to intentionally: kill, injure, or take wild birds and to take, damage or destroy the nest of any wild bird while that nest is in use or being built. • Makes it an offence to intentionally kill, injure or take any animal listed in Schedule 5 of the Act and protects occupied and unoccupied places used for shelter or protection. • Makes it an offence to intentionally pick, uproot or destroy any wild plant listed in Schedule 8 and to plant or otherwise cause to grow any non-native, invasive species listed under Schedule 9 of the Act.
	Countryside and Rights of Way Act 2000	• Gives Natural England the power to designate AONBs.
	Water Environment (WFD) (England and Wales) Regulations 2003	• Ensures a 'good ecological status' of inland, estuarine and groundwater bodies including coastal surface waters up to one nautical mile offshore.
	Natural Environment and Rural Communities Act 2006 (NERC)	• Requires the relevant Secretary of State to compile a list of habitats and species of principal importance for the conservation of biodiversity.

Level	Legislation	Summary
	The Commons Act 2006	• Protects areas of common land, in a sustainable manner delivering benefits for farming, public access and biodiversity.
	Marine Coastal and Access Act 2009	• Enables the designation of MPAs in England, Wales and UK offshore waters, including MCZs and Highly Protected Marine Areas (HPMA). • Introduced measures including a streamlined marine licensing system and the introduction of a marine planning system and decision-making to enable sustainable development in accordance with the MPS.
	Marine Strategy Regulations 2010	• Establishes measures to maintain or achieve 'good environmental status' (GES) in the marine environment.
	Conservation of Habitats and Species Regulations 2017 and Conservation of Offshore Marine Habitats and Species Regulations 2017 (together the 'Habitats Regulations'	• Provides a framework for the conservation and management of wild fauna and flora, including protection for specific habitats listed in Annex I and species listed in Annex II of the Directive. • Provides for the establishment of a Europe wide network of protected sites, known as Natura 2000 (the definition of which includes SAC and SPA). Makes it an offence to kill, injure, capture or disturb European Protected Species (EPS). • Note that these two sets of regulations are currently being consolidated by the Government; however, there will be no policy changes as a result of this exercise.

1.9.4.1.1 Habitat Regulations Assessment

127. Under the Habitats Regulations the Secretary of State must consider whether a plan or project has the potential to have an adverse effect on the integrity and features of a European site (i.e. a SAC, SPA, candidate SAC or Site of Community Importance (SCI)). This process is known as a HRA. Under the Habitats Regulations, Appropriate Assessment is required for a plan or project, which either alone or in combination with other plans or projects, is likely to have a significant effect on a European site and is not directly connected with or necessary for the management of the site.

128. HRA can be described as a four-stage process (Planning Inspectorate, 2017a):

- **Stage 1**: Screening is the process which initially identifies the likely impacts upon the interest features of a European site of a project or plan, either alone or in combination with other projects or plans and considers whether these impacts may be significant. It is important to note that the burden of evidence is to show, on the basis of objective information, that there will be no significant effect; if the effect may be significant, or is not known, that would trigger the need for an appropriate assessment.
- **Stage 2**: Appropriate assessment is the detailed consideration of the impact on the integrity of the European site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's conservation objectives and its structure and function. This is to determine whether there is objective evidence that adverse effects on the integrity of the site can be excluded. This stage also includes the development of mitigation measures to avoid or reduce any possible impacts;

- **Stage 3**: Assessment of alternative solutions is the process which examines alternative ways of achieving the objectives of the project or plan that would avoid adverse impacts on the integrity of the European site, should avoidance or mitigation measures be unable to prevent adverse effects; and
- **Stage 4**: Where no alternative solutions exist and where adverse impacts remain, an assessment is made as to whether or not the development is necessary for imperative reasons of overriding public interest (IROPI) and, if so, compensatory measures are required to maintain the overall coherence of the Natura 2000 network.

129. It is intended that the Offshore HRA Screening will be undertaken for North Falls in 2021 and will be consulted upon with the relevant stakeholders through the EPP (Section 1.7). Onshore HRA Screening will be undertaken in 2022, following the final site selection (once onshore grid connection substation location is identified by National Grid).

130. Further assessment will be undertaken as required and presented with the DCO application in the Report to Inform an Appropriate Assessment (RIAA). The RIAA will contain sufficient information to enable the competent authority to carry out an appropriate assessment. A draft RIAA will be provided for consultation.

131. The requirement for Stage 3 and 4 will be subject to the findings of the RIAA and consultation through the EPP. Any outputs from these stages will be reported in the DCO application as required.

2 Part Two: Offshore

2.1 Marine geology, oceanography and physical processes

2.1.1 Existing environment

2.1.1.1 Bathymetry and seabed sediments

132. The minimum and maximum depths at the array areas are 9m and 50m, respectively (see Figure 2.1).

133. A range of studies undertaken for GGOW in 2005 provide a baseline for the area, with the seabed sediments likely to be broadly similar to those in the North Falls array areas. The Inner Gabbard and The Galloper sandbanks are composed of medium sand with some gravel content. The surrounding deeper seabed is characterised by sand and gravel in differing proportions (GGOW, 2005). Mapping of sediment types completed by the British Geological Survey (BGS) is shown in Figure 2.2. The data shows that North Falls array areas are dominated by sandy gravel with gravelly sand in the south.

2.1.1.2 Current and wave regimes

134. Tidal currents across the southern North Sea vary temporally as a function of tidal range, spatially interacting with changes in bathymetry including sandbanks and associated channels. Metocean surveys undertaken for the GGOW assessment recorded an average tidal range of 4m. Peak surface current speeds were approximately 1.8m/s, with seabed current speeds between 0.7 and 1.7m/s. The currents tend to align with the local seabed

bathymetry (GGOW, 2005). Typical and maximum significant wave heights of 3.6m and 6.2m, respectively, were recorded. The larger waves tended to originate from the north-east.

2.1.1.3 Coastal processes

135. The exposed frontage of the Tendring peninsula, where the landfall search area is located (Frinton-on-Sea to Clacton-on-Sea), is shaped by waves approaching from the north-east. The peninsula is protected by seawalls and rock groynes, with mobile sediments between the coastal defence structures. The seawall occupies the full length of the landfall search area with large areas of additional rock placement. The Essex and South Suffolk Shoreline Management Plan (2010) reported that some of the defences were under pressure. However, Tendring District Council has since undertaken works to stabilise the area.

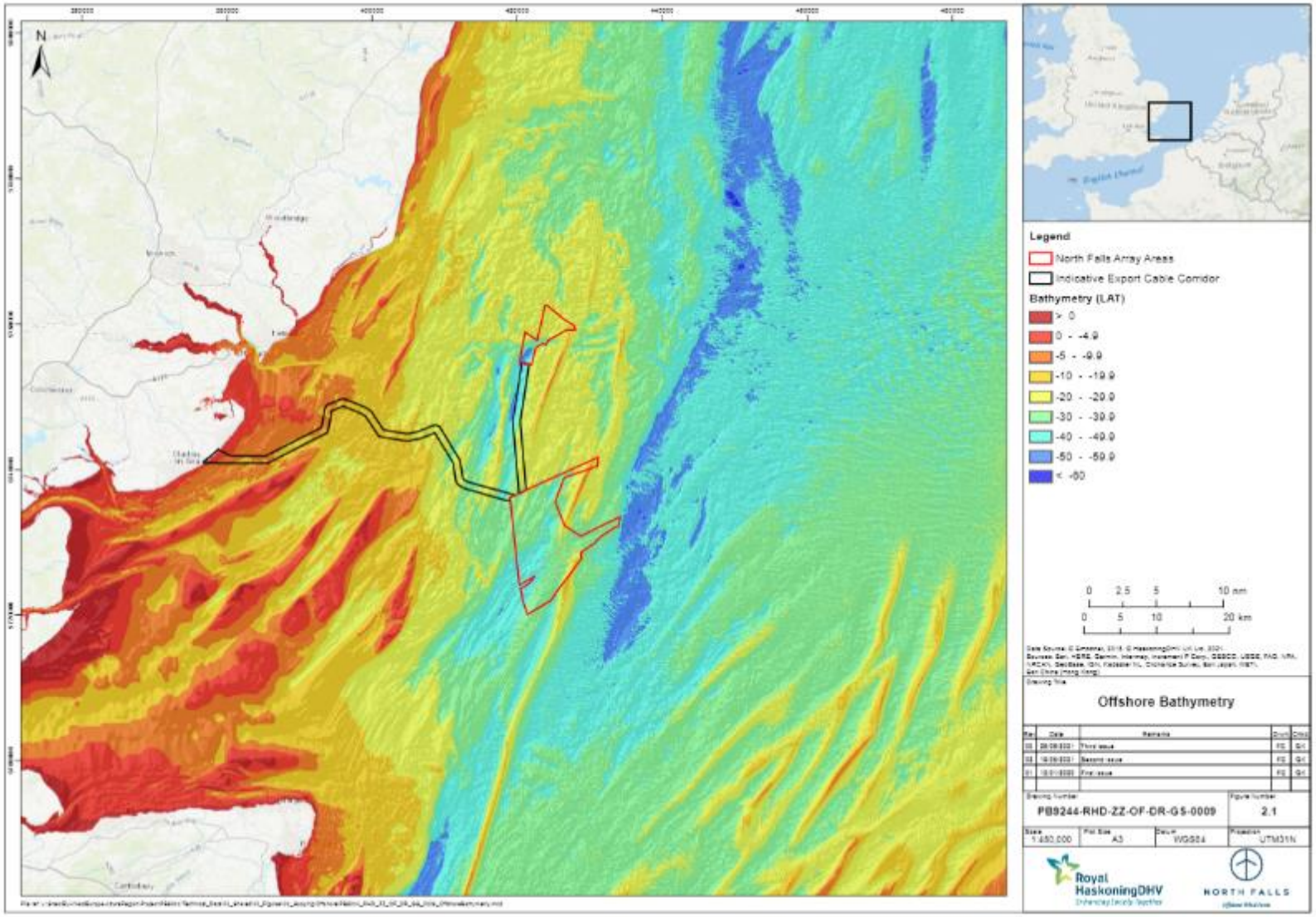

Figure 2.1 Offshore bathymetry

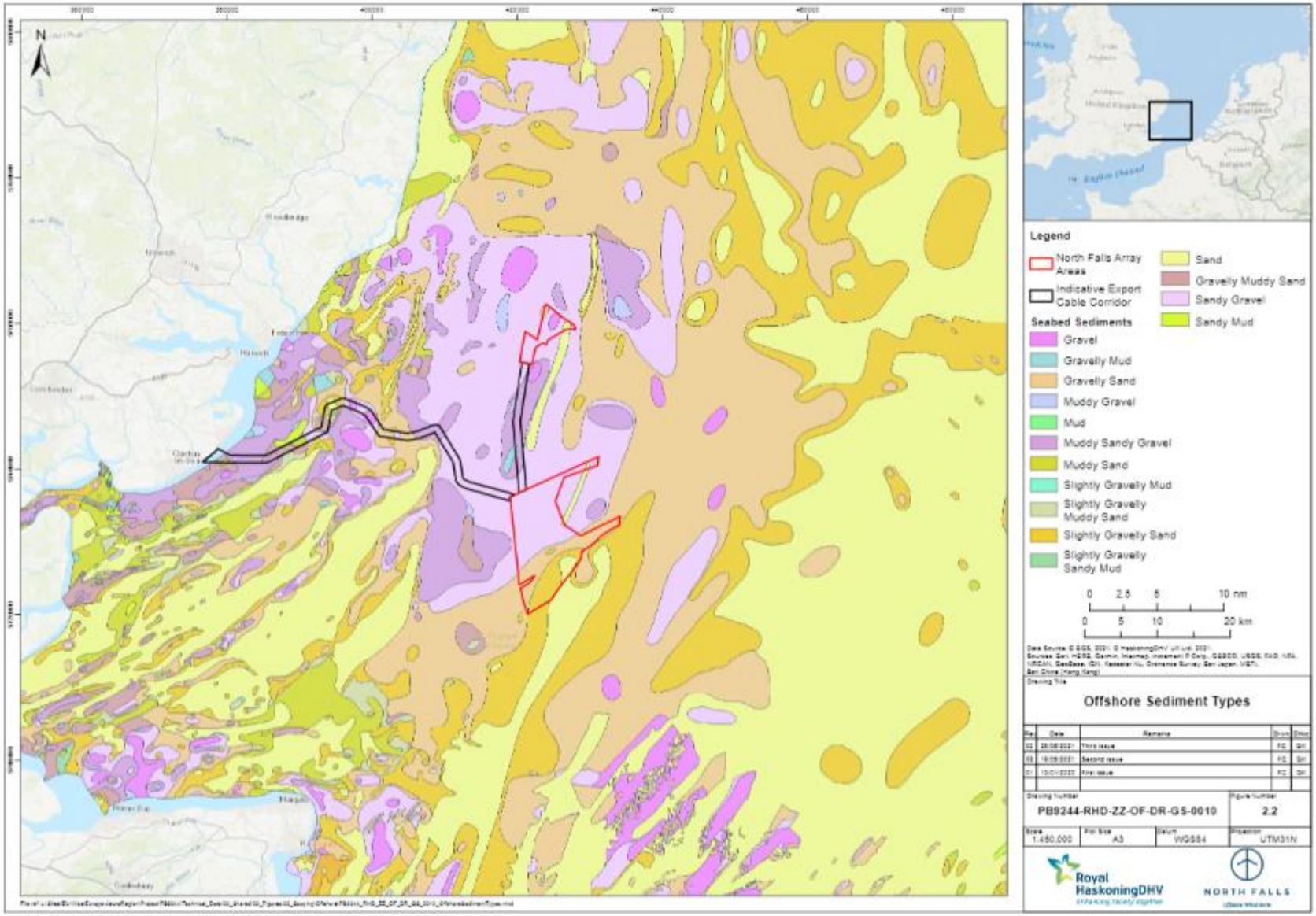

Figure 2.2 Offshore sediment types

2.1.2 Approach to data collection

136. Table 2.1 outlines existing primary data that has been used to inform this section and will also be used to inform the EIA.

Table 2.1 Existing datasets

Dataset	Spatial Coverage	Survey Year/Timings
Geophysical survey - bathymetry, seabed features and shallow geology (Titan)	GGOW array area and offshore cable route	June to July 2004
Geophysical survey - bathymetry, seabed features and shallow geology (EMU)	GGOW array area extra seabed after a boundary change	May 2005
Geotechnical survey - sample boreholes, Standard Penetration Tests (SPT) and Cone Penetrometer Test (CPT) at each location (Hydro Soil Services)	GGOW array area - two locations on the Inner Gabbard and two on The Galloper sand banks.	September 2004
Benthic survey – grab samples and particle size analysis (Centre for Marine and Coastal Studies (CMACS))	GGOW array area and offshore cable route	November 2004 and April 2005
Metocean survey - waves, water levels, currents and suspended sediment concentrations (EMU)	GGOW array area	November 2004 to March 2005
Coastal processes assessment (ABPmer)	GGOW array area	2005
Geophysical survey - bathymetry, seabed features and shallow geology (Osiris)	GWF array area and offshore cable route	August to December 2009
Benthic survey – grab samples and particle size analysis (CMACS)	GWF array area and offshore cable route	December 2009
Coastal processes assessments (ABPmer)	GWF array area which includes an area overlapping the North Falls array area	2011

137. In addition to the data in Table 2.1, Table 2.2 describes the surveys that will be undertaken to support the assessment:

Table 2.2 Site-specific data

Dataset	Spatial Coverage	Survey Year/Timings
Geophysical Survey	North Falls array areas and offshore export cable corridor	To be completed in 2021
Grab sampling and particle size analysis	North Falls array areas and offshore export cable corridor	To be completed in 2021

138. The methods of data collection and the required survey licence exemptions have been discussed with the MMO and Natural England.

139. Other data and information available to inform the EIA include:

- Marine Renewable Atlas (ABPmer, 2017);
- Wavenet (Cefas, 2021);

- National Tide and Sea Level Forecasting Service;
- Extreme sea levels database (Environment Agency, 2021);
- United Kingdom Hydrographic Office (UKHO) tidal diamonds and historical charts;
- British Oceanographic Data Centre;
- National Oceanographic Laboratory Class A tide gauges;
- Numerical modelling studies undertaken by HR Wallingford (2010) for the Outer Thames MAREA;
- United Kingdom Climate Projections 2018 (UKCP18) (Palmer *et al.,* 2018);
- British Geological Survey 1:250,000 seabed sediment mapping;
- British Geological Survey bathymetric contours and paper maps;
- Admiralty Charts and United Kingdom Hydrographic Office survey data;
- Marine Aggregate Levy Sustainability Fund (MALSF);
- Regional Environmental Characterisation (REC) study for the Outer Thames Estuary (MALSF, 2009);
- SeaZone seabed bathymetry data. This data can be used to inform the far-field model domain and to provide base mapping;
- Wavenet Data. On behalf of Defra, Cefas operates a strategic wave monitoring network for England and Wales that provides a single source of real time wave data from a network of wave buoys located offshore from areas at risk from flooding. One of the buoys is located offshore at West Gabbard;
- TotalTide tidal level data. The TotalTide numerical modelling package can be used to synthetically generate astronomical tidal level data and current speed so that measured data from the metocean surveys can be compared against the model data for an assessment of consistency; and
- Met Office data. Wind and wave time series to provide details on the longer-term offshore wave climate.

2.1.3 Potential impacts

2.1.3.1 Potential impacts during construction

140. Potential effects during construction include temporary disturbance of the seabed due to the installation activities for cables and foundations (including seabed preparation such as sandwave clearance and boulder removal, if required) which releases sediment into the water column resulting in increased suspended sediments and changes to seabed levels. The effects will be considered separately for the array areas and for the provisional offshore export cable corridor, and potential interactions considered. Nearshore cable installation could result in changes to shoreline levels due to deposition or erosion.

141. The EIA will also include an assessment of the effects of disposal of dredged or drilled material. A licence application for disposal of dredged material within the wind farm boundary will be included within the DCO application, if required.

2.1.3.2 Potential impacts during operation and maintenance

142. Potential effects during operation could occur due to the physical presence of infrastructure (i.e. foundations and any cable protection above the seabed), which may result in changes to waves and tidal currents due to physical blockage effects. These changes could potentially affect the sediment transport regime and/or seabed morphology. In addition, there is potential for the temporary presence of engineering equipment (e.g. jack-up barges or anchored vessels) to have local effects on the hydrodynamic and sediment regimes during maintenance activities.

2.1.3.3 Potential impacts during decommissioning

143. Decommissioning impacts on marine geology, oceanography and physical processes are likely to be similar to that of construction.

2.1.3.4 Potential cumulative impacts

144. The CIA will be based on the zone of influence identified during the project alone impact assessment. Recognising that the North Falls array areas are adjacent to GGOW and GWF and the provisional offshore export cable corridor is adjacent to dredging areas, the CIA will consider cumulative impacts with the existing wind farms and any other projects and marine users within the North Falls zone of influence.

2.1.3.5 Potential transboundary effects

145. Based on the findings of GWF transboundary assessment (GWF, 2011) which found no potential for significant transboundary effects, it is proposed to scope out transboundary effects on marine geology, oceanography and physical processes, recognising that North Falls is further from the Economic Exclusion Zone (EEZ) boundary than GWF and the zone of influence from North Falls is likely to be similar to GWF.

2.1.3.6 Summary of potential impacts

146. Table 2.3 outlines the effects which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available. The impact assessments for both GGOW and GWF predicted no significant impacts on the wave, tidal, and sediment regimes for all issues with a potential for impact. Given the likely similar impacts of the North Falls project, it is assumed that similar conclusion will be reached.

Table 2.3 Summary of impacts relating to marine geology, oceanography and physical processes. Topics to be scoped in (✓) and out (X)

Potential Impact	Construction	Operation	Decommissioning
Effects to hydrodynamic regime (waves and tidal currents)	x The effect arises as a result of the presence of large foundations on the seabed, therefore this is assessed in the Operational phase.	✓	x The effect arises as a result of the presence of large foundations on the seabed, therefore this is assessed in the Operational phase.
Effects on suspended sediment concentrations and transport	✓	✓	✓
Effects on seabed level due to deposition of suspended sediment, and seabed preparation and/or drill arisings (if required)	✓	x Effect is related to construction activities	x Effect is related to construction activities
Changes to seabed morphology due to the presence of foundation structures and cable protection	x The effect arises as a result of the presence of large foundations on the seabed, therefore this is assessed in the Operational phase.	✓	x The effect arises as a result of the presence of large foundations on the seabed, therefore this is assessed in the Operational phase.
Indentations on the seabed due to installation vessels	✓	x Effect is related to construction activities	x Effect is related to construction activities
Effects on bedload sediment transport	✓	✓	✓
Cumulative impacts	✓	✓	✓
Transboundary impacts	x North Falls is located 20km from the EEZ boundary therefore there is no pathway for transboundary impacts.		

2.1.4 Approach to impact assessment

147. A conceptual evidence-based assessment will draw from the results of the studies outlined above, including modelling undertaken for the GWF, which overlaps with the southern array of North Falls. The physical basis for using the modelling results is that the GWF design and marine geology, oceanography and physical processes (water depths, tidal currents, waves, seabed sediments, and suspended sediment) operating at the site are like North Falls and therefore provides suitable evidence (and is a suitable analogue) to support the assessment of effects or impacts at North Falls.

148. The assessment of effects on the marine physical processes will be based on a Source-Pathway-Receptor (S-P-R) conceptual model, whereby the source is the initiator event, the pathway is the link between the source and the receptor impacted by the effect, and the receptor is the receiving entity. The use of numerical modelling is considered to be disproportionate to the potential effect that would occur. The S-P-R conceptual model is proportionate.

149. The approach to the marine geology, oceanography and physical processes will be two-fold:

- The impact significance on marine geology, oceanography and physical processes receptors (Table 2.4) will be assessed based on the magnitude of effect and the receptor sensitivity (as discussed in Section 1.8); and
- The magnitude of near-field and far-field effects associated with marine geology, oceanography and physical processes will be identified, for which the impact receptors are addressed in another chapter (e.g. marine water and sediment quality and benthic ecology).

Table 2.4 Marine geology, oceanography and physical processes receptors

Receptor group	Receptor	Closest distance from North Falls array areas	Closest distance from provisional offshore export cable corridor
Suffolk Coast	Lowestoft to Felixstowe	22.3km	11.1km
Essex Coast (Landfall location	Coast between Clacton-on-Sea and Frinton-on-Sea, Essex	40.8km	0km
Designated sites and features	Annex 1 Sandbank (Annex 1 Reef will be addressed in the benthic ecology section)	0km (overlapping array areas)	0km (adjacent)
	Margate and Long Sands SAC	9.1km	0km (adjacent)
	Kentish Knock East MCZ	0km (overlapping)	6.2km
	Orford Inshore MCZ	5.6km	12.7km

2.2 Marine water and sediment quality

2.2.1 Existing environment

2.2.1.1 Sediment quality

150. Studies undertaken as part of the GGOW investigations revealed low levels of contamination in the water and sediments. Levels of Arsenic were elevated in some samples across the GGOW site, however this was attributed to geological inputs and seabed rock weathering in the area (GGOW, 2005), rather than any anthropogenic source of contamination. Norfolk Vanguard, East Anglia TWO and East Anglia THREE, all in the southern North Sea, had similar findings in their surveys (Norfolk Vanguard, 2012, East Anglia THREE, 2016, East Anglia TWO, 2019).

2.2.1.2 Water quality

151. Suspended sediment concentrations were measured at four locations within the southern North Sea, as part of the metocean studies for GGOW. The maximum concentration of suspended material was recorded during the GGOW metocean study was 85mg/l, with a mean suspended load of approximately 20mg/l (GGOW, 2005). Regional suspended sediment concentration published by HR

Wallingford *et al.* (2002), reported summer concentrations ranging from 1-10mg/l and winter concentrations from 1-20mg/l.

2.2.1.3 Designations

152. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended by The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 continues to enforce the Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for community action in the field of water policy (generally known as the WFD) following implementation of the European Union (Withdrawal) Act 2018. The WFD needs to be considered at all stages of the coastal planning and development process. The effects of the project on the designated WFD water bodies (shown in Table 2.5) will be considered during the early stages of the WFD compliance assessment and the water quality elements used to inform the marine water quality assessment.

Table 2.5 WFD water bodies to be considered (source: Environment Agency, 2020)

WFD water body	Designation	Physio-chemical status (latest data from 2019)	Chemical Status (latest data from 2019)
Essex - GB650503520001	Coastal Water Body	Moderate (dissolved inorganic nitrogen)	Fail (Polybrominated diphenyl ethers (PBDE) and Mercury and Its Compounds)

2.2.1.3.1 Bathing Water Directive

153. The following bathing waters are located on the coast in proximity to landfall search area:

- Walton;
- Frinton;
- Holland;
- Clacton;
- Clacton Beach Martello Tower; and
- Jaywick.

154. These bathing waters are all classified as having excellent or good water quality. There is permanent advice against bathing at Clacton Groyne 41 to the south west of the landfall search area.

2.2.2 Approach to data collection

155. The assessment is closely linked to the Marine Geology, Oceanography and Physical Processes chapter, therefore relevant information in Section 2.1 will be used to inform impacts on Marine Sediment and Water Quality.

156. Table 2.6 outlines existing primary data that have been used to inform this section and will also be used to inform the EIA.

Table 2.6 Existing datasets

Dataset	Spatial Coverage	Survey Year/Timings
Benthic studies included 14 benthic grab samples obtained from across the wind farm development area that were analysed for contaminants (CMACS)	From the Suffolk Coast to the Kent Coast out to the east of the GGOW array area	November 2004 and April to May 2005
Coastal processes studies (ABPmer)	GWF array area	2011
Benthic survey campaign undertaken to characterise the physical, biological and chemical nature of the seabed around the proposed GWF site and offshore export cable corridor (CMACS)	GWF array area	2010

157. In addition to the data in Table 2.6, the following data in Table 2.7 will be collected for the assessment:

Table 2.7 Site specific survey data

Dataset	Spatial Coverage	Survey Year/Timings
Grab sampling and contaminants analysis	North Falls array areas and provisional offshore export cable corridor	To be completed in 2021

158. Other data and information available to inform the EIA include:

- The Clean Seas Environment Monitoring Programme (CSEMP, 2018)
- Bathing water profiles (Updated by the Environment Agency on an annual basis);
- Catchment Data Explorer – Water Quality information for WFD water bodies (Updated by the Environment Agency)
- OSPAR Commission Quality Status Report 2010 (OSPAR, 2010); and
- OSPAR Intermediate Assessment 2017 (OSPAR, 2017).

2.2.3 Potential impacts

2.2.3.1 Potential impacts during construction

159. Potential impacts during construction will result from disturbance of the seabed due to the presence and movements of plant on the seabed as well as installation activities for cables and foundations (including seabed preparation). These have potential to cause:

- Localised increases in suspended sediments;
- Remobilisation of existing contaminated sediments; and
- Potential for spills and leaks from vessels.

2.2.3.2 Potential impacts during operation and maintenance

160. There is the potential for impacts to arise during routine maintenance activities from the use of plant and vessels. Potential impacts during operation will be similar to those of construction, although are likely to be lower in magnitude.

2.2.3.3 Potential impacts during decommissioning

161. As discussed in Section 2.1, decommissioning impacts on marine water and sediment quality are likely to be similar to that of construction, with the potential to be of lower magnitude. For example, where construction may require drilling of foundations which would result in drill arisings, decommissioning would likely require the cutting of foundations to seabed level and therefore result in less seabed disturbance than construction.

2.2.3.4 Potential cumulative impacts

162. As with Marine Geology, Oceanography and Physical Processes described above, consideration will be given to cumulative impacts with other plans and projects which have potential to interact with the impacts of North Falls.

2.2.3.5 Potential transboundary impacts

163. Based on the findings of the GWF transboundary assessment (GWF, 2011) which found no potential for significant transboundary effects, it is proposed to scope out transboundary effects on marine water and sediment quality, recognising that North Falls is further from the EEZ boundary than GWF and the zone of influence from North Falls is likely to be similar to GWF.

2.2.3.6 Summary of potential impacts

164. Table 2.8 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available. The GWF assessment found that the maximum impact on marine and coastal water quality was minor adverse, and after mitigation measures were put in place the maximum residual impact was negligible or no impact. The maximum impact for GGOW was minor significance. It is expected NFOW will adopt comparable mitigation measures and therefore it is assumed that a similar conclusion will be reached for North Falls.

Table 2.8 Summary of impacts relating to marine water and sediment quality.

Potential Impact	Construction	Operation	Decommissioning
Localised increases in suspended sediments;	✓	✓	✓
Remobilisation of existing contaminated sediments	✓	✓	✓
Potential for spills and leaks from vessels	✓	✓	✓
Cumulative impacts	✓	✓	✓
Transboundary impacts	x North Falls is located 20km from the Economic Exclusion Zone boundary therefore there is no pathway for transboundary impacts		

2.2.4 Approach to assessment

165. The impact assessment will be informed by the data described above and the findings of the Marine Geology, Oceanography and Physical Processes assessment.

166. Assessment of sediment quality and the potential risk to water quality is based on the use of recognised sediment quality guidelines; the Cefas Action Levels.

Where concentrations are at, or below, action level 1, no additional assessment is considered necessary as the risk to water quality is considered to be low. Where concentrations fall close to, or above action level 2, then more quantitative assessment might be required.

167. The impact significance on Marine Water and Sediment Quality is assessed based on the magnitude of effect and the receptor sensitivity (as discussed in Section 1.8). In addition, the magnitude of effect on water quality will be considered for other receptors such as marine mammals.

168. The findings of the impact assessment for Marine Water and Sediment Quality will be used to inform the WFD Compliance Assessment.

2.3 Offshore air quality

2.3.1 Existing environment

169. The main source of offshore atmospheric emissions is likely to be from vessels emitting nitrogen oxides (NOx), particulate matter (PM) and sulphur dioxide (SO_2).

170. The International Maritime Organisation (IMO) has enacted regulations to reduce vessel emissions under Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL). The North Sea is a designated Emission Control Area under MARPOL, and the sulphur content of fuel oil is limited to 0.5%. Furthermore, as of 1 January 2021, vessels operating within the North Sea must comply with the most stringent NOx emission limits to comply with the Emission Control Area requirements.

171. Pollutant concentrations should only be compared to the relevant air quality objectives where there is representative exposure. There are no offshore human receptors which are sensitive to air quality, and marine-based ecological designations are unlikely to be sensitive to air pollution impacts (Centre for Ecology and Hydrology, 2021a). Receptors may only be affected where there are isolated locations of relevant human exposure (e.g. residences) close to the shoreline, and land-based designated ecological sites.

2.3.2 Potential impacts

2.3.2.1 Potential impacts during construction, operation and decommissioning

172. Vessels utilised by the project during construction, operation and decommissioning may contribute to emissions offshore; however, in the context of the existing vessel traffic within the North Sea the project contribution would be small. Most construction and operation and maintenance works would be carried out at a distance from the shore and therefore would be unlikely to impact upon landside human or ecological receptors.

173. Given that there would be a relatively low number of vessels utilised as part of the project, the distance to sensitive receptors and the MARPOL emissions regulations, it is considered that impacts would not be significant. As such, it is proposed to scope offshore air quality impacts out of the EIA.

2.3.2.2 Potential cumulative impacts

174. As described above, most offshore works would be undertaken at a significant distance from any sensitive receptors. As such, it is considered unlikely that any significant cumulative effects would occur with other offshore emission sources (i.e. vessels) used for any other plans or projects within the area.

2.3.2.3 Summary of potential impacts

175. A summary of the potential impacts of offshore air quality are summarised in Table 2.9.

Table 2.9 Summary of impacts relating to offshore air quality

Potential Impact	Construction	Operation	Decommissioning
Impacts of emissions from vessels on human receptors	x	x	x
Impacts of emissions from vessels on ecological receptors	x	x	x

2.4 Offshore airborne noise

2.4.1 Existing environment

176. Existing offshore airborne noise is likely to be generated by a mix of anthropogenic and natural sources. Noise emitted by vessel traffic is expected to be the main source of anthropogenic noise in the study area.

177. Wind, wave and precipitation activity offshore would be the primary sources of natural airborne noise.

2.4.2 Potential impacts

2.4.2.1 Potential impacts during construction

178. Construction activities have the potential to increase airborne noise within the array areas and offshore export cable corridor. The main sources of noise would be from increased vessel activity and from pile driving.

179. The North Falls wind farm is 22.5km from shore at its nearest point. It is therefore highly unlikely that onshore receptors (i.e. coastal recreation users, coastal ecological designated sites and coastal settlements) will be affected by increases in noise in the array areas, in the context of the existing noise sources outlined above.

180. Nearshore construction activities that will generate airborne noise will be limited to installation of the export cable, which will require ploughing, trenching or jetting the cable. The impact of nearshore works on onshore receptors will be assessed in the onshore noise and vibration assessment (see Section 3.8.3).

2.4.2.2 Potential impacts during operation

181. During operation, movement of the turbines would be expected to cause low levels of airborne noise; however, given the distance between array areas and the shore it is not considered turbine noise will be audible to onshore receptors.

Potential impacts to offshore receptors (i.e. commercial or recreational vessels) are unlikely to be significantly greater than baseline offshore noise levels. Disturbance to biological receptors (including fish and marine mammals) from underwater noise will be considered within the relevant sections for these topics. Therefore, it is considered that operational airborne noise from offshore infrastructure is scoped out of further assessment.

2.4.2.3 Potential impacts during decommissioning

182. During decommissioning, there is the potential for some offshore decommissioning activities to create airborne noise, although it is expected that this would be lower than during the construction phase and would not include piling.

183. Due to the limited pathway for offshore airborne noise to impact receptors it is proposed that offshore airborne noise is scoped out of the EIA for further consideration. This is in line with previous EIA scoping opinions such as for East Anglia THREE and Norfolk Vanguard (Planning Inspectorate 2012b, 2016b).

2.5 Benthic and intertidal ecology

2.5.1 Existing environment

2.5.1.1 Intertidal

184. As discussed in Section 2.1, the intertidal zone within the landfall search area is predominantly comprised of mobile sediment and man-made coastal defence structures.

185. The abundance and diversity of flora and fauna in the intertidal zone is likely to be low due to sediment movement and scour on the hard structures. An intertidal survey is proposed to be undertaken in 2021 to allow characterisation of the intertidal ecology.

2.5.1.2 Provisional offshore export cable corridor

186. Figure 2.2 shows the North Falls provisional offshore export cable corridor passes through substrates ranging from sandy gravel to muddy sand.

187. The corridor has been routed to avoid the Margate and Long Sands SAC and runs adjacent to the northern edge of the designated site. The SAC contains a number of Annex I Sandbanks slightly covered by seawater at all times, the largest of which is Long Sands. The site also contains the reef-forming ross worm *Sabellaria spinulosa,* although not a primary reason for the designation of the site. Joint Nature Conservancy Committee (JNCC) (undated) states that the available data indicate that the distribution of *S. spinulosa* is patchy, or that the aggregations form crusts rather than reefs.

2.5.1.3 North Falls array and surrounding areas

188. The North Falls southern array area overlaps, in minor part only, the Kentish Knock East MCZ (see Figure 1.2).

189. Figure 2.2 shows the North Falls array areas have a predominantly gravelly sand/sandy gravel substrate.

190. Site specific studies for offshore wind farms have been undertaken in this region including Gunfleet Sands, Kentish Flats and London Array, GGOW and GWF

(GREP, 2002; GE Wind Energy, 2002; LAL, 2005; GGOW, 2005; GWF, 2010). These have found that the offshore communities in the Outer Thames Estuary region are very much dependent on the substrate, with species composition varying from finer to coarse sediments. Mobile sand dominated habitats are generally considered to be species poor and are characterised by robust species such as annelid worms and fast burrowing bivalves (Barne *et al.*, 1998; Jones *et al.*, 2004; GGOW, 2005; GWF, 2010). Epibenthic flora and fauna normally occur on mixed substrata with significant coarse components, where a range of microhabitats allow colonisation by a wide array of species (Jones *et al.*, 2004).

191. MAREA (2008) and the MALSF Regional Environmental Classification (REC) (MALSF, 2009) carried out studies in the outer Thames and found broadly the same communities. Two broad infaunal groups were recorded (MALSF, 2009):

192. The first associated with coarse mixed muddy, sandy gravels and gravelly sands; conspicuous species included the polychaetes, *S. spinulosa*, *Lumbrineris gracilis*, *Notomastus* spp., the amphipod *Ampelisca spinipes*, brittlestars Ophiuroidea and sea anemones Actiniaria. Species richness, diversity and biomass were relatively high.

193. The second associated with sand and slightly gravelly sand sediments (MALSF, 2009) was characterised by a range of typical sand and gravelly sand species such as the polychaetes *Nephtys cirrosa*, *Ophelia borealis* and *Glycera oxycephala*, the amphipods *Bathyporeia elegans* and *Urothoe brevicornis*, the mysid shrimp *Gastrosaccus spinifer* and Ophiuroidea (MALSF, 2009).

194. Assessment of the post construction surveys carried out at GGOW in 2013 (CMACS, 2014) found that sediment types and faunal communities within and around the wind farm were found to have remained reasonably similar to pre-construction. These findings indicate that the benthos in this area are not sensitive and are relatively robust.

2.5.1.4 Rare and protected species and habitats (offshore)

195. *S. spinulosa* is not a protected species but is on the list of species designated as being of 'principal importance for the purpose of conserving biodiversity' under the NERC Act 2006. *S. spinulosa* is a common species; however, some aggregations may form reefs in the right conditions. *S. spinulosa* reefs represent a priority habitat (biogenic reefs) under the EU Habitats Directive (see Section 2.5.1.5 below).

196. The following species recorded in surveys undertaken for GGOW are protected under the 1981 Wildlife and Countryside Act: *Gammarus insensibilis* (lagoon sand shrimp), the starlet anemone *Nematostella vectensis*, and the tentacled lagoon worm *Alkmaria romijni*.

2.5.1.5 Designations

197. As outlined above, the North Falls southern array area overlaps, in minor part only, the Kentish Knock East MCZ (see Figure 1.2). Protected features are subtidal sand, subtidal coarse sediment, and subtidal mixed sediments. 9km west of the North Falls array area is the Margate and Long Sands SAC, which is designated for Annex I Sandbanks which are slightly covered by sea water all the time.

198. The offshore project area also overlaps areas which have been identified as Annex I reefs previously (see Figure 2.3). These habitats contain two biotopes comprising potential biogenic *S. spinulosa* reef (discussed above) and potential geogenic reef. The geogenic reef habitat was noted in the vicinity of the seabed features referred to as the Inner Gabbard Deeps.

199. The nearest designated sites to the North Falls array areas are listed in Table 2.10 and these will be considered further through the HRA and MCZ Screening.

Table 2.10 Designated sites for benthic ecology features

Designated Site	Closest distance from North Falls area areas (km)	Closest distance from provisional offshore export cable corridor (km)
Kentish Knock East MCZ	0 (overlapping)	6
Orford Inshore MCZ	4.5	30
Margate and Long Sands SAC	9	0 (adjacent)

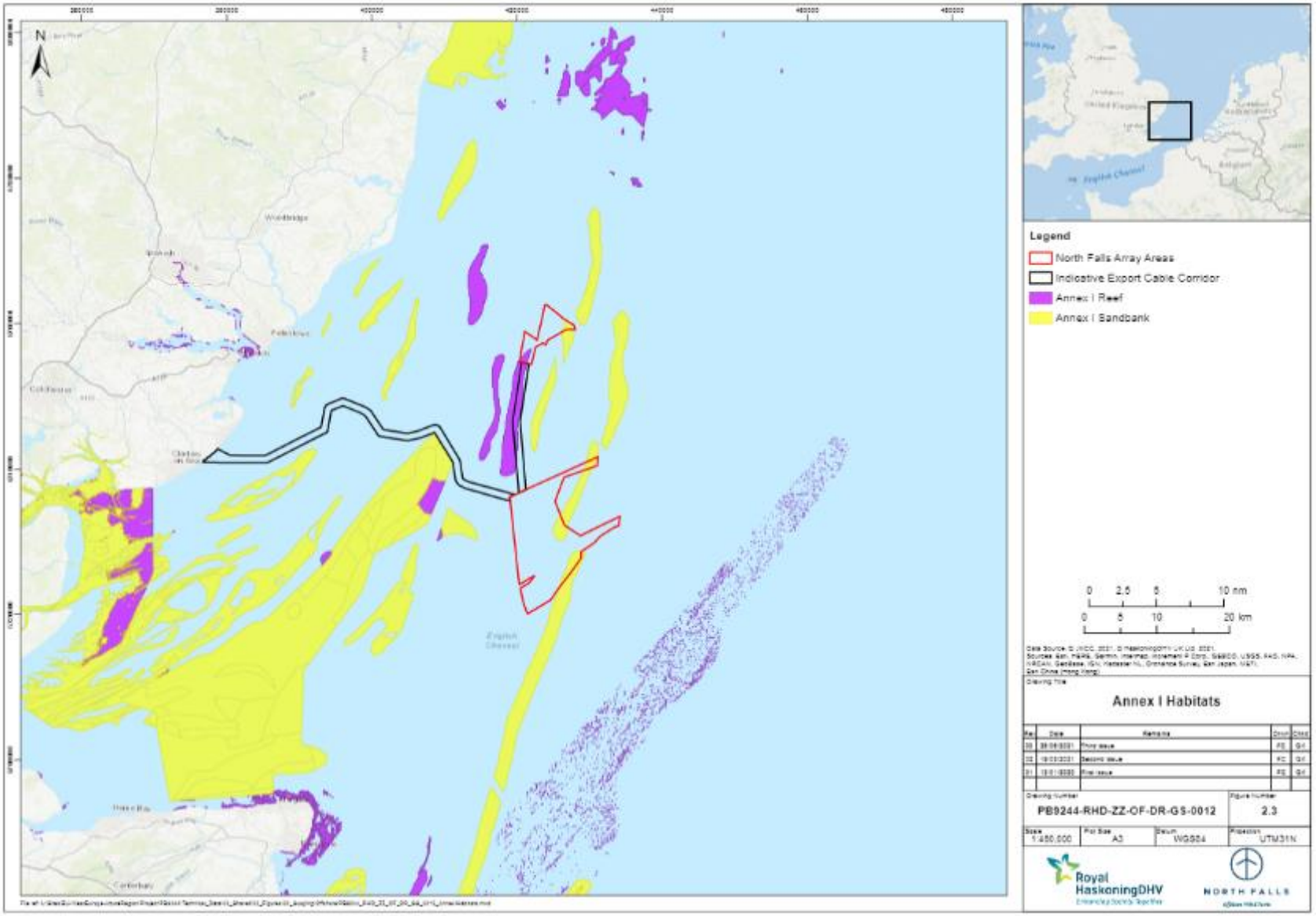

Figure 2.3 Annex I habitats

2.5.2 Approach to data collection

200. Table 2.11 outlines existing primary data that has been used to inform this section and will also be used to inform the EIA.

Table 2.11 Existing datasets

Dataset	Spatial Coverage	Survey Year
CMACS benthic survey report	GGOW array area	November 2004 and April 2005
GGOW Baseline (Gardline)	GGOW array area	2009
CMACS benthic survey report. Three site specific surveys were undertaken to characterise the epibenthic faunal communities	GGOW/GWF array area	Autumn 2008, spring 2009 and summer 2010
OSIRIS geophysical survey report	GWF array area	2010
Fish Resource Surveys - Beam trawl	GWF array area (which originally overlapped with North Falls), offshore export cable corridor and immediate environment	October 2008 and April 2009
GGOW post-construction monitoring (CMACS)	GGOW array area	2014
MAREA surveys and MALSF Outer Thames Estuary Regional Environmental Characterisation	Outer Thames Estuary	August 2008 and September 2007

201. In addition to the data in Table 2.11 and listed above, the following data in Table 2.12 will be collected for the assessment:

Table 2.12 Site specific survey data

Dataset	Spatial Coverage	Survey year
Geophysical survey	North Falls array areas and offshore export cable corridor	To be completed in 2021
Grab sampling and drop-down video	North Falls array areas and offshore export cable corridor	To be completed in 2021

2.5.3 Potential impacts

2.5.3.1 Potential impacts during construction

202. Potential impacts during construction will come from disturbance to seabed communities from installation activities for cables and foundations (including seabed preparation) which result in temporary habitat loss, increased suspended sediment concentrations and disturbance from noise and vibration. Vessel traffic may cause the introduction of marine non-native species.

203. Impacts which span the life of the project (e.g. habitat loss) will be considered as part of the operation phase assessment and are therefore not considered in the construction phase assessment to avoid duplication.

2.5.3.2 Potential impacts during operation and maintenance

204. Potential impacts during operation will mostly result from the physical presence of infrastructure (i.e. foundations and any cable protection above the seabed) which will result in long term habitat loss. Maintenance activities also have the potential to result in temporary impacts, similar to those seen during construction, but lower in magnitude.

205. Potential impacts from Electromagnetic Fields (EMF) from operational cables will also be considered. NPS EN-3 states that where cables are buried to "*a depth of at least 1.5m below the seabed, the applicant should not have to assess the effect of the cables on intertidal habitat during the operational phase of the offshore wind farm*". It is currently expected that where cables can be buried, the depth would be between 0.5 to 3m. There is also the potential that it is not possible to bury cables at all locations (e.g. at crossings or in hard substrate) and therefore there may be sections of surface laid cables with cable protection. The assessment will consider a worst case scenario based on the extent of cables with potential to be buried at less than 1.5m depth.

2.5.3.3 Potential impacts during decommissioning

206. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase.

2.5.3.4 Potential cumulative impacts

207. The CIA will consider habitat loss and disturbance in conjunction with adjacent projects and cumulative changes to seabed habitat caused by changes in physical processes based on the results of the physical processes assessment. It is anticipated that impacts will be localised and restricted to the zone of influence defined within the physical processes assessment.

2.5.3.5 Transboundary impacts

208. Given that the likely impacts of the project will be localised and small scale, transboundary impacts are unlikely to occur or are unlikely to be significant. It is therefore proposed, in line with the approach agreed for previous projects in the vicinity of the offshore site (e.g. Norfolk Vanguard and East Anglia TWO (Planning Inspectorate 2016, 2017d)), that transboundary effects are scoped out.

2.5.3.6 Summary of potential impacts

209. Table 2.13 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available. The impact assessments for both GGOW and GWF predicted no significant impacts during the construction, operation or decommissioning phases of the projects either alone or cumulatively with other activities, plans or projects on the intertidal or subtidal environment. Given the likely similar impacts of the project, the findings from the post construction surveys, and the sensitivity of the benthos, it is assumed that similar conclusion will be reached for North Falls.

Table 2.13 Summary of impacts relating to benthic and intertidal ecology.

Potential Impact	Construction	Operation	Decommissioning
Temporary physical disturbance	✓	✓	✓

Potential Impact	Construction	Operation	Decommissioning
Long term habitat loss	X Assessed under operation	✓	x Assessed under operation
Increased suspended sediment concentrations	✓	✓	✓
Remobilisation of contaminated sediments	✓	✓	✓
Underwater noise and vibration	✓	✓	✓
Interactions of EMF	x	✓	x
Colonisation of introduced substrate, including non-native species	x Assessed under operation	✓	x Assessed under operation
Cumulative	✓	✓	✓
Transboundary	x	x	x

2.5.4 Approach to assessment

210. The assessment of the potential impacts upon the benthos will be cross-referenced where relevant to the assessments of Marine Geology, Oceanography and Physical Processes and Marine Water and Sediment Quality. Impact assessment, in common with other receptors will consider the following:

- Magnitude/extent: the size or amount of impact – e.g. area of seabed directly or indirectly impacted;
- Duration: time for recovery (may vary with receptor sensitivity) and duration of activity causing an impact;
- Reversibility of the impact; and
- Timing and frequency.

211. Sensitivity of features based upon the Marine Evidence-based Sensitivity Assessment (MarESA) framework where possible (MarLIN, 2021).

2.6 Fish and shellfish ecology

2.6.1 Existing environment

2.6.1.1 Fish

212. The Outer Thames Estuary is important for a number of commercially important species. The offshore project area overlaps, or is in close proximity to a number of fish spawning and nursery grounds including; herring *Clupea harengus*, cod *Gadus morhua*, whiting *Merlangius merlangus*, sprat *Sprattus*, sandeel *Ammodytidae sp*, sole *Solea*, and plaice *Pleuronectes platessa* (see Figure 2.4, Figure 2.5, Figure 2.6 and Figure 2.7 and Table 2.14). The wider Thames estuary also supports sea bass *Dicentrarchus labrax* and populations of elasmobranchs (sharks, skates and rays), including thornback ray *Raja clavata*

which are of national significance (GGOW, 2005; GWF, 2011) and migrate from deeper waters into the Thames Estuary to spawn in the summer (Natural England, 2010).

Table 2.14 Spawning and nursery areas

Species	Areas Overlapping North Falls offshore project area		Commercial Importance	Conservation Designation
	Spawning	Nursery		
Sandeel sp.	Y (low intensity)	Y	Low	The lesser sandeel is a Priority Species under the UK Post-2010 Biodiversity Framework.
Sole	Y (high intensity)	Y (high intensity)	High	International Union for Conservation of Nature (IUCN): data deficient
Plaice	Y (high intensity)	Y (low intensity)	High	IUCN (least concern)
Herring	Y (slight overlap)	Y (slight low intensity overlap)	Low	IUCN (least concern)
Cod	Y (low intensity)	Y (high intensity)	Medium	IUCN Status Global: VU (Vulnerable) Europe: LC (Least Concern)
Whiting	Y (slight low intensity overlap)	Y (low intensity)	Medium	IUCN (least concern)
Sprat	Y	Y	High	IUCN: data deficient

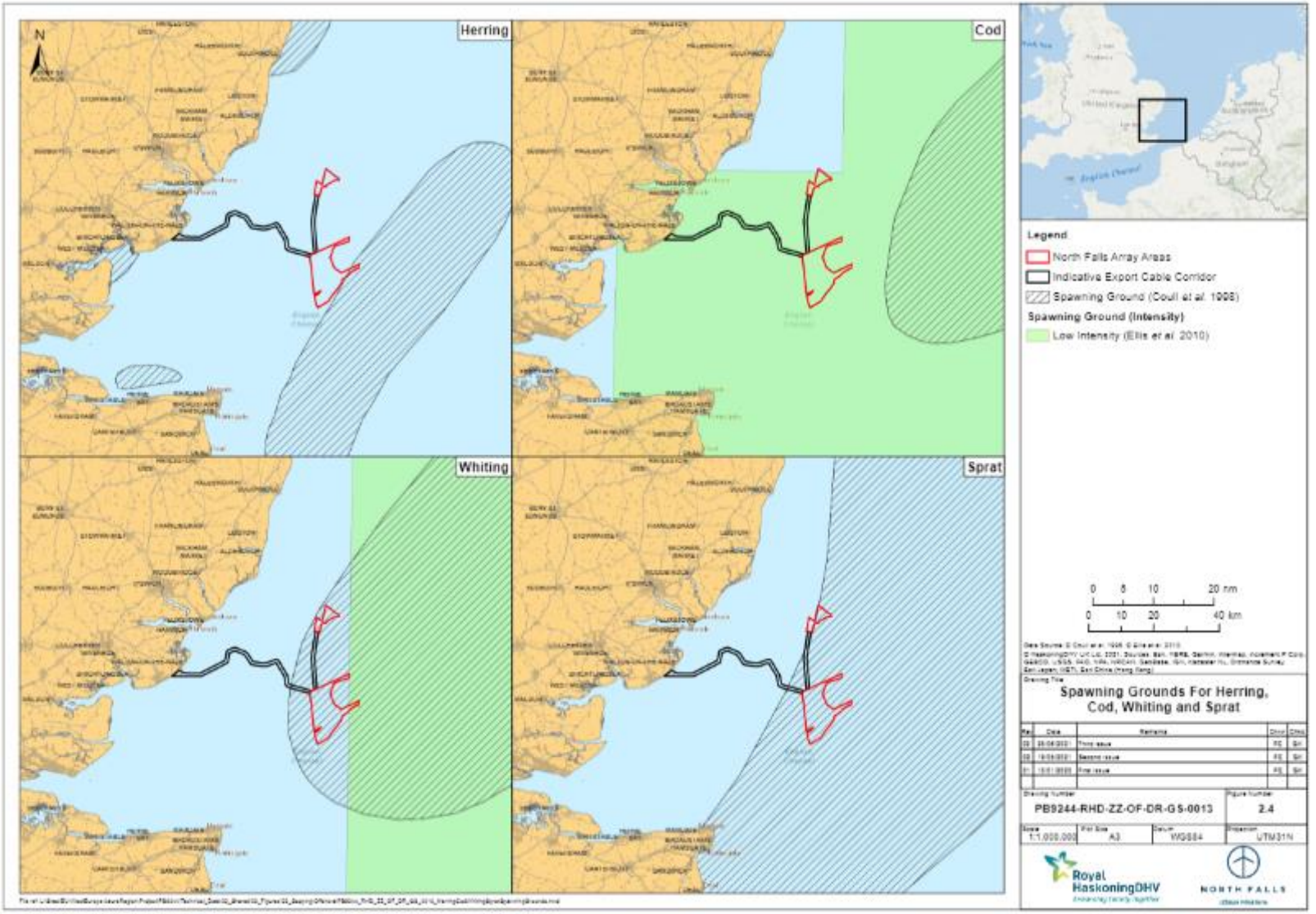

Figure 2.4 Herring, cod, whiting and sprat spawning grounds

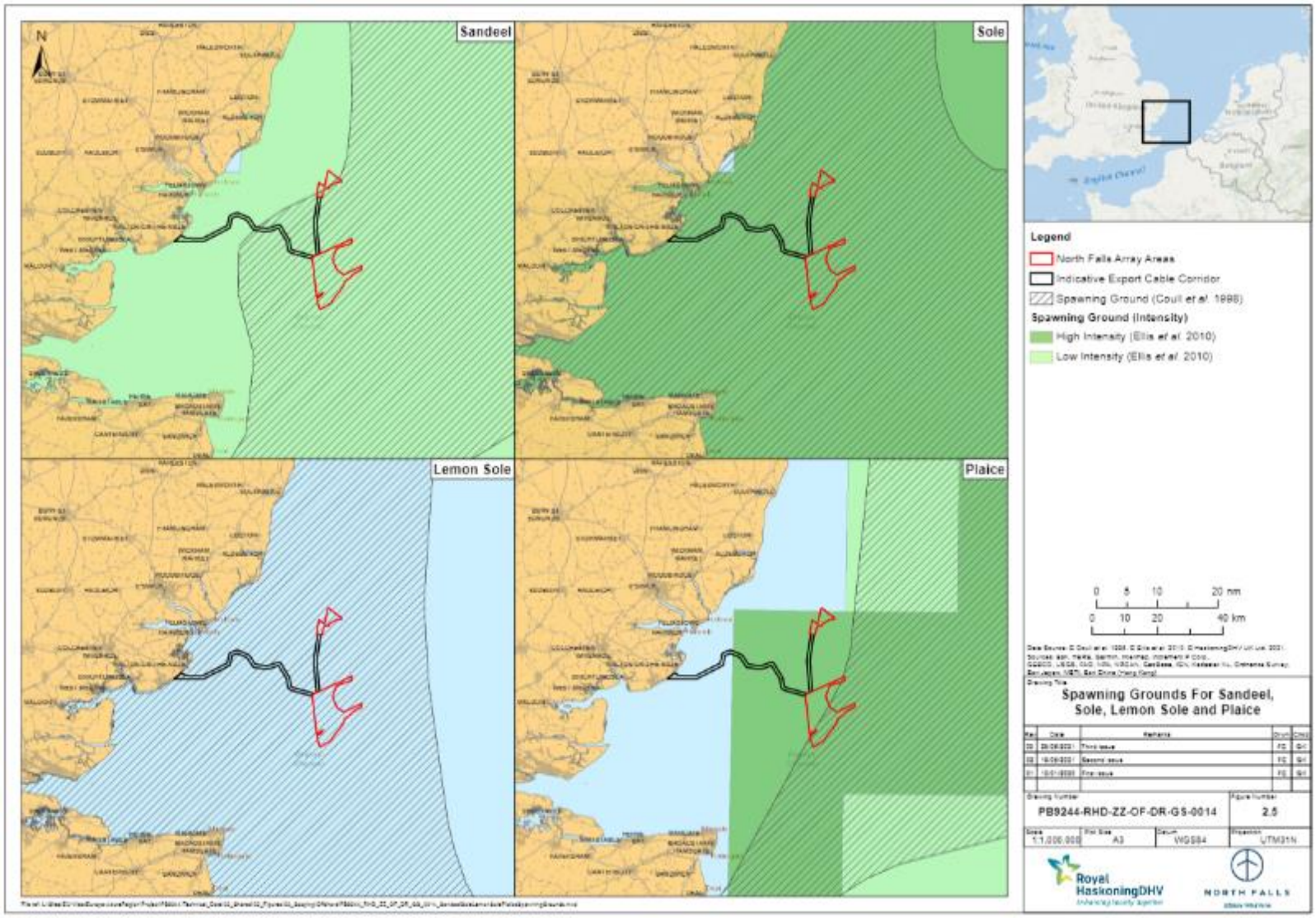

Figure 2.5 Sandeel, sole, lemon, sole and plaice spawning grounds

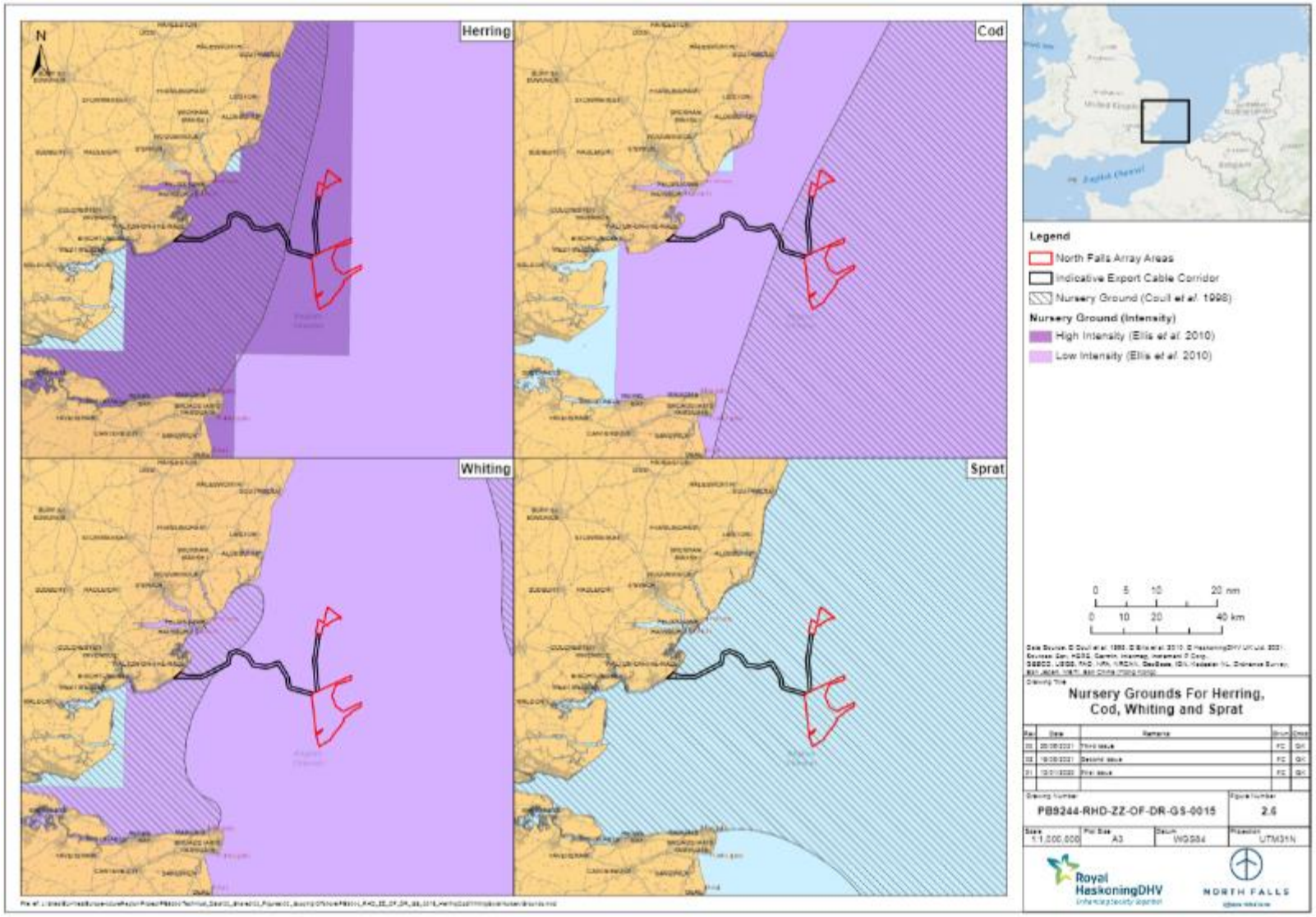

Figure 2.6 Herring, cod, whiting and sprat nursery grounds

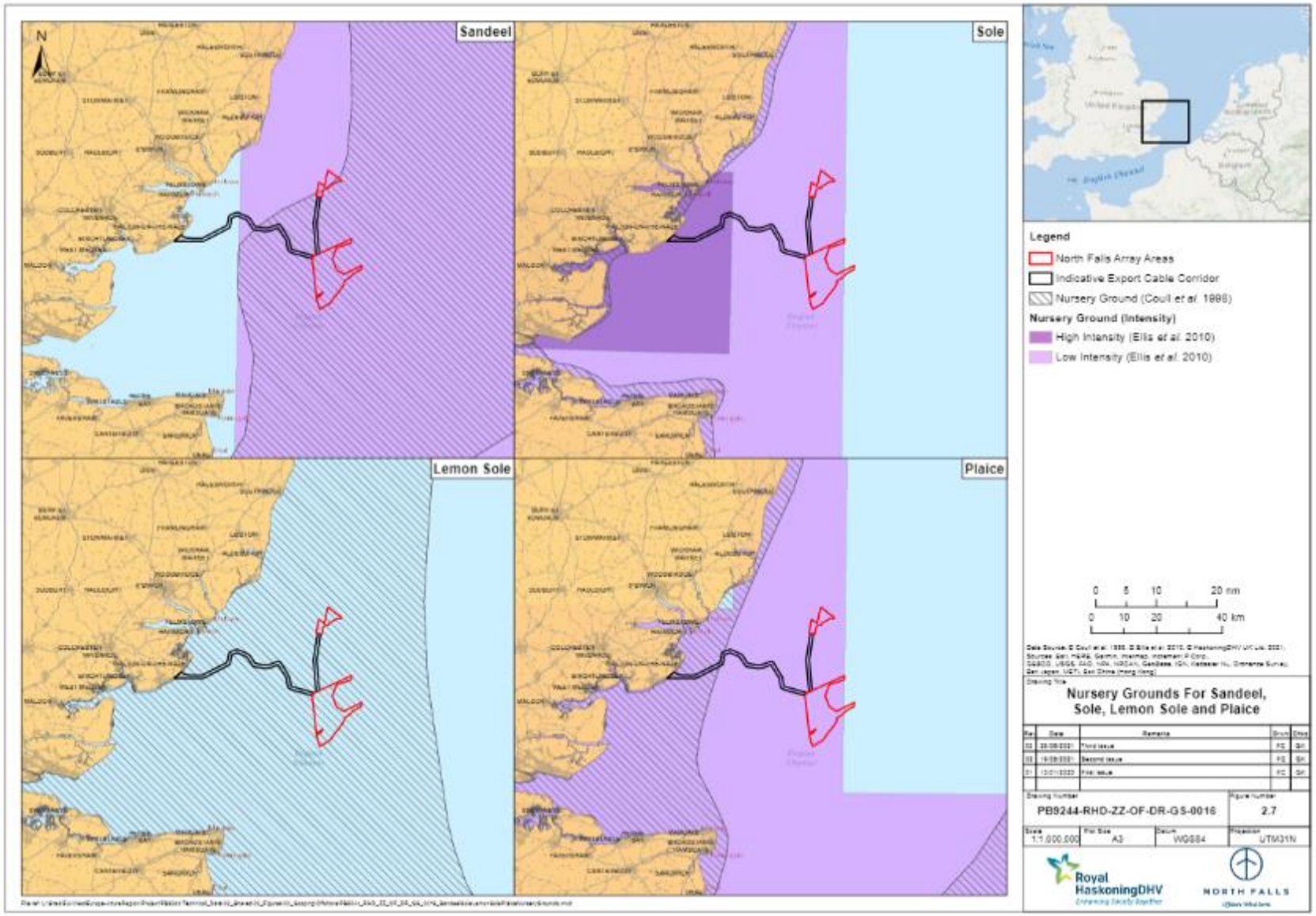

Figure 2.7 Sandeel, sole, lemon sole and plaice nursery grounds

2.6.1.2 Shellfish

213. The offshore project area is within ICES rectangle 32F1. This area is commercially important for crab and lobster species. Whelks are also very common in the seabed type in the offshore project area. GWF found the most abundant shellfish species during the otter trawl survey were velvet crab *Necora puber*, squid *Loligo spp*., European lobster *Homarus gammarus* and Edible crab *Cancer pagurus*.

2.6.1.3 Rare and protected species

214. A number of Annex II migratory fish species such as Atlantic salmon *Salmo salar*, shad, and lamprey may pass through the offshore project area, although only twaite shad *Alosa fallax* were recorded during the site-specific surveys at GWF (GWF, 2011). Other migratory species such as the sea trout (*Salmo trutta*), European eel *Anguilla anguilla* and smelt *Osmerus eperlanus* are also known to use the Estuary.

215. As stated above, thornback rays have potential to be present in the offshore project area. These are listed as near-threatened under the IUCN Red List of Threatened Species (Ellis & Walker, 2000) owing to declines caused by fishing and exacerbated by their life history parameters (late maturation and low fecundity) (GGOW, 2013).

2.6.1.4 Designated sites

216. As previously discussed, the array areas overlap the Kentish Knock East MCZ. The protected features are subtidal sand, subtidal coarse sediment, and subtidal mixed sediments. This habitat is important for a range of fish species, including commercially important flatfish such as sole and plaice.

217. 5km north of the North Falls array areas is the Orford Inshore MCZ which is protected for subtidal mixed sediments. These sediments contain a mixture of different sized material from pebbles to finer silts and finer mud sediments that are important as nursery and spawning grounds for many fish species, including Dover sole, lemon sole *Microstomus kitt* and sandeels.

2.6.2 Approach to data collection

218. Table 2.15 outlines existing primary data that has been used to inform this section and will also be used to inform the EIA.

Table 2.15 Existing datasets

Dataset	Spatial Coverage	Survey Year
Beam and Otter Trawl Surveys carried out in 2004 and then again in 2005	GGOW array area	December 2004 and April 2005
Fish Resource Surveys - Beam and Otter Trawl	GWF array area (which originally overlapped with North Falls), offshore export cable corridor and immediate environment	October 2008 and April 2009
Long line survey	GGOW array area (which originally overlapped with North Falls) and GGOW offshore export cable corridor	2014
MMO Landings Data (weight and value) by species	Southern North Sea – Landings from ICES rectangles 33F1, 32F1 and 32F2	2009 - 2019

Dataset	Spatial Coverage	Survey Year
Outer Thames Estuary REC	Outer Thames Estuary	2009
Moriarty and Greenstreet (2020) Greater North Sea International Quarter 3 Otter Trawl Groundfish Survey Monitoring and Assessment Data North Sea	North Sea	1998 – 2019
North Sea International Bottom Trawl Survey (IBTS)	North Sea	2010 - 2021
ICES International Herring Larvae Survey (IHLS) data Eastern and northern North Sea	North Sea	2005 – 2021
ICES Working Group 2 on North Sea Cod and Plaice Egg Surveys in the North Sea (WGEGGS2) North Sea	North Sea	2004, 2009,
Cefas (2019) Young Fish Survey	North Sea, North East Atlantic, Irish and Celtic sea and Channel	1981-2010
Distribution of Spawning and Nursery Grounds as defined in Coull *et al.* (1998) and in Ellis *et al.* (2012)	North Sea, North East Atlantic, Irish and Celtic sea and Channel	1998 and 2010
Shortlist Master plan Wind Monitoring fish eggs and larvae in the Southern North Sea (van Damme *et al.*, 2011)	Southern North Sea	2011

219. Other data and information available to inform the EIA include:

- Predictive European Nature Information System (EUNIS) seabed habitats, European Marine Observation and Data Network (EMODnet) (2021);
- Database containing information on the predicted seabed habitats present across Europe, mapped in accordance with the EUNIS habitat classification system, 2009 – 2013, 2013 – 2016 and 2017 – 2019; and
- East Marine Plan documents (HM Government, 2014).

220. Site specific data are available from both GWF and GGOW. In addition, given that fish are highly mobile, other datasets with large-scale coverage are equally relevant for characterising the natural fish and shellfish resource. A key source of information used are fisheries landings data; these provide both large spatial coverage and effort, although the data has some limitations (i.e. they are skewed towards commercial species with many non-commercial species being discarded at sea).

221. It is therefore proposed that given the volume of existing data and the low value of site-specific data collection, no site-specific survey is undertaken for North Falls.

2.6.3 Potential impacts

2.6.3.1 Potential impacts during construction

222. Potential impacts during construction will come from physical disturbance of the seabed habitats, suspension of sediment during cable and foundation installation work (including seabed preparation).

223. Underwater noise generated by pile driving and other construction activities may result in disturbance and displacement of fish species and affect spawning and nursery areas; and migration patterns. The impacts of wind farm construction will be considered separately from the provisional offshore export cable corridor, and potential interactions considered.

224. Potential impacts related to the resuspension of contaminants are currently scoped in for assessment; however, studies carried out by GGOW and GWF have demonstrated low levels of contamination, therefore we would seek to scope these out of further assessment through the EPP following data collection for North Falls discussed in Section 2.2.2.

225. Impacts which span the life of the project (e.g. long term habitat loss) will be considered as part of the operation phase assessment (see below) and are therefore not considered in the construction phase assessment to avoid duplication.

2.6.3.2 Potential impacts during operation and maintenance

226. Potential impacts during operation will mostly result from loss of habitat and changes to seabed substrata from the physical presence of infrastructure (i.e. foundations and any cable protection above the seabed). Maintenance activities may result in disturbance to seabed habitats, these would be similar to those during construction but at a lower magnitude.

227. Potential impacts from EMF from operational cables will also be considered. As discussed in Section 2.5.3.2, NPS EN-3 states that where cables are buried to "*a depth of at least 1.5m below the seabed, the applicant should not have to assess the effect of the cables on intertidal habitat during the operational phase of the offshore wind farm*". It is currently expected that where cables can be buried, the depth would be between 0.5 to 3m. There is also the potential that it is not possible to bury cables at all location (e.g. at crossings or in hard substrate) and therefore there may be sections of surface laid cables with cable protection. The assessment will consider a worst case scenario based on the extent of cables with potential to be buried at less than 1.5m depth.

2.6.3.3 Potential impacts during decommissioning

228. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase although on a smaller scale, for example noise impacts will be lower (as there will be no piling) and if the cables are left *in situ*, there will be less seabed disturbance.

2.6.3.4 Potential cumulative impacts

229. The cumulative assessment will consider cumulative noise impacts, habitat loss and changes to seabed habitat.

2.6.3.5 Transboundary impacts

230. The distribution of fish and shellfish species is independent of national geographical boundaries. The North Falls impact assessment will be undertaken taking account of the distribution of fish stocks and populations irrespective of national jurisdictions. As a result, it is considered that a specific assessment of transboundary effects is unnecessary. This approach was adopted and accepted for several previous projects (e.g. East Anglia THREE (

East Anglia THREE Ltd, 2015), East Anglia ONE North (East Anglia ONE North Ltd, 2019).

2.6.3.6 Summary of potential impacts

231. Table 2.16 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 2.16 Summary of impacts relating to fish and shellfish ecology.

Potential Impact	Construction	Operation	Decommissioning
Temporary habitat loss / physical disturbance	✓	✓	✓
Long term habitat loss	x Assessed under operation	✓	x Assessed under operation
Increased suspended sediments and sediment re-deposition	✓	✓	✓
Re-mobilisation of contaminated sediments	✓	✓	✓
Underwater Noise and Vibration.	✓	✓	✓
Electromagnetic fields.	x	✓	x
Introduction of hard substrate	✓	✓	✓
Changes in fishing activity	✓	✓	✓
Cumulative	✓	✓	✓
Transboundary	x	x	x

2.6.4 Approach to assessment

232. A key source of information will be fisheries landings data (see Section 2.6.2); these provide both large spatial coverage and effort. The data does have some limitations however, this will be made more robust with existing site-specific data available from previous projects (listed in Table 2.15); additionally, numerous studies that have been undertaken in the region on this topic (see Section 2.6.2).

233. In addition, it is envisioned that the impact assessment will use existing and additional noise survey data (ambient noise) combined with appropriate guidance such as Popper *et al.* 2014; and the Environment Agency Informed Approach. This approach uses a combination of Popper *et al.* 2014; and Hawkins & Popper 2014, Hawkins 2014, to assess the level of potential noise impacts upon fish, including migratory fish and shellfish.

234. The assessment of impacts on fish and shellfish ecology will be further informed by physical processes; and geophysical and benthic data from the existing projects; benthic ecology assessments (and benthic survey reports).

2.7 Marine mammal ecology

2.7.1 Existing environment

235. A large scale survey of the presence and abundance of cetacean species around the north-east Atlantic undertaken in the summer of 2016 (the SCANS-III survey; Hammond et al., 2017) shows harbour porpoise to be the only cetacean species present in the relevant survey block (Block L). The Joint Cetacean Protocol Phase III report (Paxton et al., 2016) shows similar results, with only harbour porpoise present off the south-east coast of England.

236. Distribution maps of cetacean species within the north-east Atlantic (Waggitt *et al.,* 2019) also indicate that harbour porpoise would be the most likely species to be present within the offshore project area (short-beaked common dolphin, white-beaked dolphin, and minke whale may also be present, but in much lower numbers). This is further supported by DECC (now BEIS) (2016), which states that within the southern North Sea area, only harbour porpoise is considered to be common in the area, with white-beaked dolphin and minke whale are more commonly sighted further north, and both bottlenose dolphin and Atlantic white-sided dolphin are noted as uncommon for the area.

237. Other occasional visitors to the southern North Sea include sperm whale *Physeter macrocephalus*, and long-finned pilot whale *Globicephala melas*. However, sightings of these species are rare.

238. Both grey seal and harbour seal are present in the southern North Sea, with a number of haul-out sites for species off the coasts of Essex and Kent (Thompson, 2012; Barker *et al.,* 2014). For both species, densities of seals within the North Falls array areas are low, with relatively high densities closer to the coastlines, and within the outer Thames Estuary (Russell *et al.*, 2017).

239. Two years of offshore aerial surveys for North Falls has been undertaken (March 2019-February 2021) which have recorded low numbers of minke whale (one in Year 1 only) and grey seal (six in Year 1 and 17 in Year 2). Harbour porpoise was the most frequently recorded marine mammal, recorded every month, with a total of 330 in Year 1 and 406 in Year 2.

240. In addition, GGOW carried out surveys between 2004 and 2006 (GGOW, 2005) and GWF carried out surveys between June 2008 and May 2011 (GWF, 2011). In the GGOW surveys marine mammals were recorded in 14 out of the 16 surveys. A total of 176 marine mammals were recorded, comprising: 2 harbour seal; 6 grey seal; 1 unidentified seal species; 1 unidentified dolphin species and 166 harbour porpoise. Harbour porpoise was therefore by far the most commonly encountered marine mammal (GGOW, 2005). Harbour porpoise was again the most commonly sighted marine mammals in the GWF surveys. White beaked dolphin was the only other cetacean species encountered within the GWF study area during the 2008 - 2011 study period. There were only six individual grey seals recorded within the GWF study area over the entire survey period (GWF, 2011).

241. It is proposed that the following marine mammal species, found to be present in the area, are taken forward for assessment:

- Harbour porpoise;
- Minke whale;
- Grey seal; and
- Harbour seal.

242. All other species are expected to be absent or infrequent visitors and are therefore proposed to be scoped out of the EIA.

243. As highly mobile marine predators, the status and activity of marine mammals known to occur within or adjacent to the offshore project area would be considered in the context of their Management Unit (MU) population.

2.7.1.1 Designations

244. The array areas and part of the provisional offshore export cable corridor is within the winter area of the Southern North Sea SAC (see Figure 1.2) which is designated for harbour porpoise. For other marine mammal species, tagging studies and information on species' movements will be reviewed to determine the potential for connectivity of marine mammal from designated sites and the offshore project area as part of the HRA screening.

2.7.2 Approach to data collection

245. Table 2.17 outlines existing primary data that has been used to inform this section and will also be used to inform the EIA.

Table 2.17 Existing datasets

Dataset	Spatial Coverage	Survey Year/Timing
Marine Mammal and Bird Survey - Each boat-based survey covered approximately 238km and followed standard transects set at 1.8nm intervals running approximately perpendicular to the coast.	238km perpendicular to coast adjacent to GG array area	Monthly April 2004 – April 2006
GWF site characterisation alongside the GGOW pre-construction monitoring required under the project's Food and Environment Protection Act (FEPA) licence – boat-based surveys.	GWF and GGOW array area	2008 - 2011

246. In addition to the data in Table 2.17, the following data will be collected to inform the assessment.

Table 2.18 Site-specific physical environment datasets

Dataset	Spatial Coverage	Survey Year/Timing
Aerial survey	North Falls array areas + 4km buffer	March 2019 – February 2021

247. Other data and information available to inform the EIA include:

- Small Cetaceans in the European Atlantic and North Sea (SCANS-III): Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys (Hammond *et al.,* 2017);
- Management Units for cetaceans in UK waters (Inter-Agency Marine Mammal Working Group (IAMMWG), 2015);

- Offshore Energy Strategic Environmental Assessment (including relevant appendices and technical reports) (DECC, now BEIS), 2016);
- The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area (Heinänen and Skov, 2015);
- Revised Phase III data analysis of Joint Cetacean Protocol (JCP) data resources (Paxton *et al.,* 2016);
- Distributions of Cetaceans, Seals, Turtles, Sharks and Ocean Sunfish recorded from Aerial Surveys 2001-2008 (WWT, 2009);
- Distribution maps of cetacean and seabird populations in the North-East Atlantic (Waggitt *et al.*, 2019);
- MARINElife surveys from ferry routes across the southern North Sea area (MARINElife, 2021);
- Sea Watch Foundation volunteer sightings off eastern England (Sea Watch Foundation, 2021);
- UK seal at sea density estimates and usage maps (Russell *et al.,* 2017);
- Seal telemetry data (e.g. Sharples *et al.,* 2008; Russel and McConnell 2014; Barker *et al.,* 2014; Vincent *et al.,* 2017);
- Other southern North Sea wind farm EIA data;
- SCOS annual reporting of scientific advice on matters related to the management of seal populations (e.g. SCOS, 2020);
- Trilateral surveys of Harbour Seals in the Wadden Sea and Helgoland in 2020 (Galatius *et al.*, 2020);
- EG-Seals grey seal surveys in the Wadden Sea and Helgoland in 2019-2020 (Brasseur *et al.*, 2020);
- Thames Marine Mammal Sightings Survey - Data held by Zoological Society London (ZSL) and provided in Tickell & Barker (2015) are shore based 'non-expert' opportunistic sightings;
- Barker, J. (2015) Greater Thames Estuary Seal Surveys Report. UK & Europe Conservation Programme, Zoological Society of London; and
- Cucknell et al. (2020) Confirmation of the presence of harbour porpoise (*Phocoena phocoena*) within the tidal Thames and Thames Estuary. Mammal Communications 6: 21-28, London.

2.7.3 Potential impacts

2.7.3.1 Potential impacts during construction

248. The key potential impacts during construction for marine mammals are expected to be those from underwater noise, principally from piling activities, and UXO clearance. Potential impacts of underwater noise are auditory injury and disturbance. Underwater noise during piling, as well as disturbance associated with underwater noise from other construction activities (such as UXO clearance and cable installation activities), as well as the presence of

vessels offshore will be considered, with site specific underwater noise modelling. The potential for a barrier effect as a result of disturbance and displacement (due to underwater noise) will also be considered.

249. The post construction surveys for GGOW found a low number of sightings, which were widespread across the study area with no clear patterns in distribution or seasonal abundance discernible from monitoring (GGOW, 2013). Across the study area, incidental sightings appeared to decrease during periods of piling, although animals were sighted within the Inner Galloper area during periods of successive piling in January 2010. Therefore, while it is difficult to disentangle cause and effect from monopile installation activities at GGOW, it is apparent that harbour porpoise were not displaced from the GGOW study area entirely over the first- or second-year construction phase and were still present in the third year of construction (GGOW, 2013).

250. Other impacts to be considered during the construction phase would for the potential for interactions / an increase in collision risk with construction vessels. The assessment will consider potential for disturbance to seals at haul-out sites, and for any disturbance of marine mammals from foraging at sea, as well as the potential for indirect impacts as a result of changes in availability of prey species.

251. Potential impacts related to changes in water quality are currently scoped in for assessment; however, studies carried out by GGOW and GWF have demonstrated low levels of contamination, therefore we would seek to scope these out of further assessment through the EPP, following the data collection for North Falls discussed in Section 2.2.2.

2.7.3.2 Potential impacts during operation and maintenance

252. Potential impacts during operation will mostly result from the presence of routine vessels within the offshore project area (leading to an increase in vessel interactions / collision risk), underwater noise (including operational turbines) and the impacts on prey species during any maintenance activities. These will be similar to impacts assessed for construction, but lower in magnitude due to the absence of pile driving and fewer vessels required for maintenance than construction.

253. As for construction, other impacts to be considered during the operations phase would for the potential for disturbance to seals at haul-out sites, and for the disruption of marine mammals from foraging would be assessed, as well as the potential for indirect impacts on prey species.

254. The potential for impacts from both EMF and physical barrier effects during operation have been scoped out. This is consistent with other recent projects (including for Norfolk Vanguard and Norfolk Boreas (Planning Inspectorate 2016, 2017b), East Anglia ONE North and East Anglia TWO (Planning Inspectorate 2017c, 2017d), and both the Dudgeon Extension and Sheringham Shoal Extension Projects (Planning Inspectorate, 2019)) as there is no evidence of any impact. It is therefore proposed that these impacts are scoped out for North Falls.

2.7.3.3 Potential impacts during decommissioning

255. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase although on a smaller scale, for example underwater noise impacts will be lower as there will be no piling.

2.7.3.4 Potential cumulative impacts

256. The CIA will consider displacement due to cumulative underwater noise and impacts on prey species. The assessment will also consider displacement due to the presence of offshore vessels and maintenance activities during the operational phase.

2.7.3.5 Transboundary impacts

257. There is a significant level of marine development being undertaken or planned by EU Member States (i.e. Belgium, the Netherlands, Germany and Denmark) in the southern North Sea. Populations of marine mammals are highly mobile and there is potential for transboundary impacts especially when considering noise impacts. Transboundary impacts will be assessed, as with the other cumulative impacts.

2.7.3.6 Summary of potential impacts

258. Table 2.19 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 2.19 Summary of impacts relating to marine mammal ecology.

Potential Impact	Construction	Operation	Decommissioning
Physical and auditory injury resulting from underwater noise	✓	✓	✓
Behavioural impacts resulting from underwater noise	✓	✓	✓
Disturbance from vessels due to underwater noise	✓	✓	✓
Barrier effects from underwater noise	✓	x	x
Disturbance at seal haul-out sites	✓	✓	✓
Disturbance to foraging at sea.	✓	✓	✓
Vessel interaction (increase in risk of collision)	✓	✓	✓
Changes to prey resource	✓	✓	✓
Changes to water quality	✓	✓	✓
Barrier effects from the physical presence of the wind farm once constructed	x	x	x
Effects from EMFs	x	x	x

Potential Impact	Construction	Operation	Decommissioning
Cumulative	✓	✓	✓
Transboundary	✓	✓	✓

2.7.4 Approach to assessment

259. Underwater noise modelling will be undertaken to inform the marine mammal assessment. Spatial noise impacts will be considered in the context of the site characterisation data in order to quantify the potential impact on the reference populations for marine mammals.

260. Where possible, the magnitude of effect will be quantified. The impact significance will be determined by a matrix approach supported by expert judgement, taking into account the value and sensitivity of the receptor (as discussed in Section 1.8).

261. Consultation with key marine mammal stakeholders will be ongoing during the EIA through the EPP and will include discussion of the best available information to use, for example, to determine species density estimates and define reference populations for the assessment.

2.8 Offshore ornithology

2.8.1 Existing environment

262. During winter, the southern and eastern North Sea is recorded as being the most important area in north-west European waters for divers, grebes and seaduck. Gulls are common throughout the year, with kittiwake and herring gull present throughout the year, common gull and great black-backed gull most abundant in winter, and lesser black-backed gull in summer. The area is also important for terns in summer and auks in winter, and gannets are present throughout the year (Stone *et al.,* 1995).

263. The southernmost part of the North Sea is an important corridor for seabird migration. The great majority (40-100%) of the flyway population of great skua *Catharacta skua* use the strait of Dover to leave the North Sea, as do 30-70% of the lesser black-backed gull population (Stienen *et al.,* 2007). The narrow entrance to the strait may act as a funnel for seabirds to become temporarily concentrated when they leave or enter the southern North Sea.

264. Two years of offshore aerial surveys for North Falls have been undertaken (March 2019-February 2021). Considering the numbers of each species recorded and sensitivity to adverse effects of offshore wind farms, the key species for the EIA are (in order of decreasing abundance in the survey area):

- Guillemot *Uria aalge*;
- Razorbill *Alca torda*;
- Kittiwake *Rissa tridactyla*;
- Lesser black-backed gull *Larus fuscus;*
- Gannet *Morus bassanus*;

- Red-throated diver *Gavia stellata*
- Great black-backed gull *Larus marinus*;
- Herring gull *Larus argentatus;*
- Little gull *Hydrocoeleus minutus*;
- Common tern *Sterna hirundo*; and
- Sandwich tern *Thalasseus sandvicensis*.

265. Other species recorded in smaller numbers and/or less sensitive to effects of offshore wind farms, which may nevertheless require consideration in EIA are:

- Fulmar *Fulmarus glacialis*;
- Common gull *Larus canus*;
- Black headed gull *Chroicocephalus ridibundus*; and
- Great skua *Stercorarius skua*.

266. Analysis of the second year of offshore aerial survey data is ongoing. This is unlikely to result in any changes to the bird species listed above, but any changes will be updated and included in the PEIR.

2.8.1.1 Designated sites

267. A full list of SPAs and Ramsar sites relevant to North Falls will be presented in the HRA screening report, however three sites are highlighted here which will be of particular relevance to the assessment.

2.8.1.1.1 The Outer Thames Estuary SPA

268. The Outer Thames Estuary SPA boundary is approximately 2.5km inshore from the array areas at the closest point. There is also a small area of overlap between the provisional offshore export cable corridor and the SPA.

269. The qualifying feature of the Outer Thames Estuary SPA which is of most relevance to North Falls is the non-breeding red-throated diver, a diving seabird which overwinters in large numbers within the southern North Sea, feeding predominately on fish. The other qualifying features of the site are breeding common and little tern.

2.8.1.1.2 Alde Ore Estuary SPA

270. The Alde Ore Estuary SPA is 22km to the west of the array areas at the nearest point, and within mean maximum foraging range (Woodward *et al.*, 2019) of breeding lesser black-backed gulls which are a qualifying feature of the SPA. Other SPA qualifying features which may occur on or pass through the site include breeding Sandwich tern and migratory wetland birds.

2.8.1.1.3 Flamborough and Filey Coast SPA

271. At 266km from the SPA at the nearest point, North Falls is beyond the mean maximum breeding season foraging ranges (Woodward *et al.*, 2019) of all seabird qualifying features except gannet; and is outside the foraging area of gannets based on the modelled distribution of tracked birds breeding at Bempton Cliffs (Wakefield *et al.*, 2013). Nevertheless, birds from this SPA may pass through North Falls during the non-breeding season (for example on

passage). Thus, non-breeding season effects of collision and displacement on the SPA populations will be considered.

2.8.2 Approach to data collection

2.8.2.1 Baseline digital aerial surveys

272. The baseline data described in Table 2.20 have been collected and will form the primary source of data for the EIA and HRA. This gives details of the total numbers of bird species recorded during each monthly survey, and preliminary population estimates for the survey area.

Table 2.20 Baseline data collection

Dataset	Spatial Coverage	Survey Year/Timings
Aerial survey	North Falls array areas + 4km buffer;	March 2019 – Feb 2021

2.8.2.2 Other data sources

273. Table 2.21 outlines existing data for the North Falls area that will be used as background to inform the EIA (and HRA).

Table 2.21 Existing datasets

Dataset	Spatial Coverage	Survey Year/Timings
Boat Based Surveys	GGOW array area	2004, 2005, 2006
Boat Based Surveys	GG and GWF array areas	2008 to 2015
Aerial Survey	GWF array area (focussed on lesser black backed gull)	2014/15
Aerial Survey	GGOW array area	June 2012 – May 2013

2.8.2.3 Other data and information available to inform the EIA (and HRA) include:

- Potential impacts of wind farms (Bowgen and Cook 2018; Cook *et al.* 2014; Garthe and Hüppop 2004; Drewitt and Langston 2006; Stienen *et al.,* 2007; Speakman *et al.,* 2009; Langston 2010; Band 2012; Cook *et al.* 2012; Furness and Wade 2012; Wright *et al.,* 2012; Furness *et al.,* 2013; Johnston *et al.,* 2014a and b; SNCBs 2014; SNCBs 2017; MacGregor *et al.*, 2018);
- Bird population estimates (SPA citations / departmental briefs / conservation advice from the websites of SNCBs; JNCC seabird monitoring programme database; Mitchell *et al.* 2004; Furness 2015; Frost *et al.*, 2019; Waggit *et al.*, 2019; Woodward *et al.*, 2020);
- Bird distribution (Stone *et al.* 1995; Brown and Grice 2005; Kober *et al.,* 2010; Balmer *et al.,* 2013; Wakefield *et al.*, 2013; Cleasby *et al.*, 2018, 2020);
- Bird migration and foraging movements (Wernham *et al.,* 2002; Thaxter *et al.,* 2012; Wright *et al.*, 2012; Furness 2015; Woodward *et al.*, 2019);
- Red-throated diver densities in the Outer Thames Estuary SPA (JNCC, 2013);
- Digital video aerial surveys of red-throated diver in the Outer Thames Estuary SPA 2018 (Irwin *et al.,* 2019);

- Relevant documents from marine licence applications for other offshore wind farms in the North Sea and Channel; and
- Relevant ecological studies for species included in EIA and HRA, including peer reviewed scientific papers and 'grey' literature.

274. Any new industry standard guidance which becomes available for EIA/HRA of offshore wind farms and birds will be taken into account as appropriate.

2.8.3 Potential impacts

2.8.3.1 Potential impacts during construction

275. Potential impacts during construction will come from displacement and disturbance of birds due to construction activities and vessel movement during the installation of offshore infrastructure. Indirect impacts on birds through changes in prey or habitat availability will also be considered.

2.8.3.2 Potential impacts during operation and maintenance

276. Potential impacts during operation will result from the presence of WTGs and offshore infrastructure. Collision risk, displacement and barrier effects associated with the presence of WTGs will be considered. Displacement and disturbance associated with vessels and maintenance activity and indirect impacts on prey and habitats will also be considered.

2.8.3.3 Potential impacts during decommissioning

277. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase.

2.8.3.4 Potential cumulative impacts

278. The cumulative assessment will consider cumulative displacement / barrier effects and collision risk due to the presence of offshore infrastructure when considered alongside other projects.

2.8.3.5 Transboundary impacts

279. Given the level of development in the southern North Sea by EU Member States (i.e. Belgium, the Netherlands, Germany and Denmark) and that birds are highly mobile and migratory there is potential for transboundary impacts especially with regard to displacement/barrier effects and collision risk. Transboundary impacts will be assessed as with the other cumulative impacts.

2.8.3.6 Summary of potential impacts

280. Table 2.22 outlines the effects which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 2.22 Summary of impacts relating to offshore ornithology.

Potential Impact	Construction	Operation	Decommissioning
Direct disturbance and displacement due to work activity (presence and movements of vessels and other plant, lighting)	✓	✓	✓

Potential Impact	Construction	Operation	Decommissioning
Disturbance / displacement / barrier effect due to presence of turbines and other infrastructure	x	✓	x
Indirect effects through effects on prey species / habitats of prey species	✓	✓	✓
Collision Risk	x	✓	x
Cumulative	✓	✓	✓
Transboundary	✓	✓	✓

2.8.4 Approach to assessment

281. Detailed analysis will include seasonal abundance and density estimates (with associated confidence intervals and levels of precision). Collision risk modelling will be undertaken using generic flight data (Johnston *et al.,* 2014a, 2014b) and, where possible, site specific flight height data (from flying bird images captured in aerial surveys, where images allow), subject to discussion with stakeholders.

282. Reference populations for each species and population sizes will be based on the best available information at the time of undertaking the assessment and will be agreed with key stakeholders during the EPP.

283. The sensitivity of each species will be determined based on the size of its population, its conservation status and its known sensitivity to offshore wind farms. Definitions for sensitivity, value and magnitude will be included in a method statement and agreed through the EPP. Species identified as sensitive receptors will be subject to assessment against the impacts listed above as appropriate (for example some species may be sensitive to collision and not displacement and vice versa). The impact assessment will be undertaken in line with guidance by the Planning Inspectorate, Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) and expert opinion. The methodology will be discussed throughout the pre-application period through the EPP.

2.9 Commercial fisheries

2.9.1 Existing environment

284. The offshore area is within the 32F1 and has a slight overlap with 32F2 and 33F1, see Figure 2.8.

285. In terms of tonnage of catch, most of the fish stocks harvested from the North Sea are being fished at levels consistent with achieving ‘GES’ under the EU’s Marine Strategy Framework Directive; however, the reproductive capacity of the stocks has not generally reached this level. The greatest physical disturbance of the seabed in the North Sea occurs by mobile bottom-contacting gear during fishery in the eastern English Channel, in nearshore areas in the south-eastern North Sea.

286. The southern North Sea forms an important focus for fishing activity. The region is an important area for populations of a number of commercial fish species, providing spawning grounds and nursery and feeding areas for such fish species as herring, cod, whiting, sprat, sandeel, sole, plaice, mackerel *Trachurus trachurus*, haddock *Melanogrammus aeglefinus* and sandeel. Consequently, it is an area of considerable importance for fishing activity. Pelagic fish landings are greater than demersal fish landings. Herring and mackerel, caught using pelagic trawls and seines, account for the largest portion of the pelagic landings, while sandeel and haddock, caught using otter trawls/seines, account for the largest fraction of the demersal landings (ICES, 2020). However, the majority of landings values are predominately for sole, followed by plaice. The offshore project area is commercially important for crab and lobster species. Whelks are also very common in the seabed type in the North Falls array areas. GWF found the most abundant shellfish species during the otter trawl survey were velvet crab, squid, European lobster and edible crab.

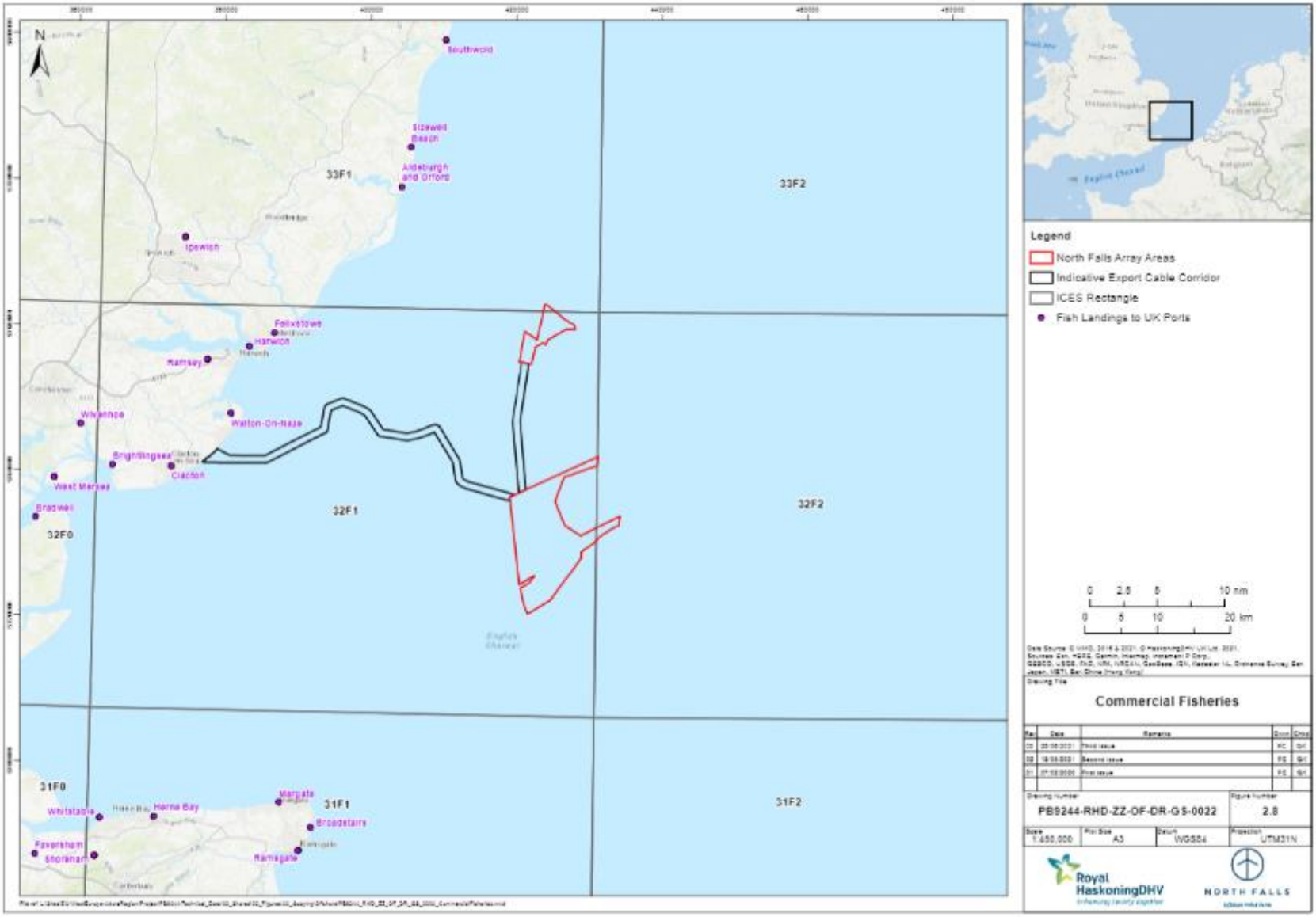

Figure 2.8 Commercial fisheries

2.9.2 Approach to data collection

2.9.2.1 Data sources

287. There is no single dataset that can be used to accurately depict current fishing activity (given the limitations within the individual datasets). Data and information available to inform the EIA include:

- Fisheries Statistics (landings values and fishing effort) (MMO, 2015 to 2019);
- Vessel Monitoring System (VMS) Data (MMO, 2013 to 2017);
- Fisheries Statistics (landings value and effort data) (MMO, 2020b);
- Belgian Institute for Agricultural and Fisheries Research (ILVO, 2010 to 2014);
- VMS Data Belgian (ILVO, 2010 to 2014);
- VMS and Integrated Landings Data Netherlands, Institute for Marine Resources and Ecosystem Studies ((IMARES) and LEI 2014 to 2018);
- Fisheries Statistics (landings value and effort data) (IMARES 2014 to 2018);
- VMS data (German Federation of Agriculture and Food, 2011 to 2015); and
- VMS data (Danish Ministeriet for Fødevarer, Landbrug og Fiskeri (MFLF), 2011 to 2015).

2.9.3 Potential impacts

2.9.3.1 Potential impacts during construction

288. Potential impacts during construction will be associated with behavioural disturbance of fish and shellfish; declines in abundance which could indirectly affect the productivity of the fishery; restricted access to fishing areas during periods of construction activities (i.e. for construction safety zones); increased steaming times to fishing grounds and obstacles on the seabed post-construction.

289. Impacts to be assessed will include for example, loss or restricted access to fishing areas; disturbance or displacement of commercial species; and increased collision risk or risk of gear loss.

2.9.3.2 Potential impacts during operation and maintenance

290. Potential impacts during operation will focus on the long term presence of offshore structures; operations and maintenance activities; and any safety zones for vessels).

291. The assessment will include for example, impacts to commercial species stocks; loss of fishing ground; effects associated with displacement of fishing activity; and increased collision risk and risk of gear loss.

2.9.3.3 Potential impacts during decommissioning

292. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase although on a smaller scale.

2.9.3.4 Potential cumulative impacts

293. The cumulative assessment for commercial fishing will consider impacts to commercial fishing activity, stocks and loss of access to fishing grounds and displacement of fishing activity. Cumulative impacts from the development of the offshore wind farm, other wind farms and activities will be considered as part of the EIA where consultation with the fishing industry confirms that such interactions are a concern.

2.9.3.5 Transboundary impacts

294. Given the prevalence of vessels from other countries, transboundary impacts will be assessed for each impact as part of the construction, operation, decommissioning and CIA. Transboundary consultation with stakeholders in other Member States will be undertaken and the most up to date information on European projects and fisheries data will be used to inform the assessment.

2.9.3.6 Summary of potential impacts

295. Table 2.23 outlines the effects which are proposed to be scoped into the EIA.

Table 2.23 Summary of impacts relating to commercial fisheries.

Potential Impact	Construction	Operation	Decommissioning
Potential impacts on commercially exploited fish and shellfish species.	✓	✓	✓
Temporary loss or restricted access to fishing grounds.	✓	✓	✓
Displacement of fishing activity into other areas.	✓	✓	✓
Increased steaming times.	✓	✓	✓
Interference with fishing activities (navigational conflict).	✓	✓	✓
Safety issues for fishing vessels.	✓	✓	✓
Behavioural disturbance of fish.	✓	✓	✓
Loss of fishing ground.	✓	✓	✓
Cumulative	✓	✓	✓
Transboundary	✓	✓	✓

2.9.4 Approach to assessment

296. In accordance with Cefas guidance (Cefas, 2004) the EIA will consider both direct and indirect impacts on commercial fishing activity. Direct impacts relate to potential physical obstruction as a result of the construction and operation of the project. Indirect impacts relate to the potential for the offshore project area to have adverse effects on commercially important fish and shellfish populations. The potential impacts of the wind farm on commercial fisheries

receptors taken forward for assessment are as specified in the Cefas and MCEU (2004) guidelines for offshore wind developments.

297. A key source of information will be fisheries landings data; these provide both large spatial coverage and effort. In addition, direct consultation will be undertaken with relevant fishing communities both nationally and internationally.

2.10 Shipping and navigation

2.10.1 Existing environment

2.10.1.1 Navigational features

298. The main navigational features in proximity to North Falls are presented in Figure 2.9.

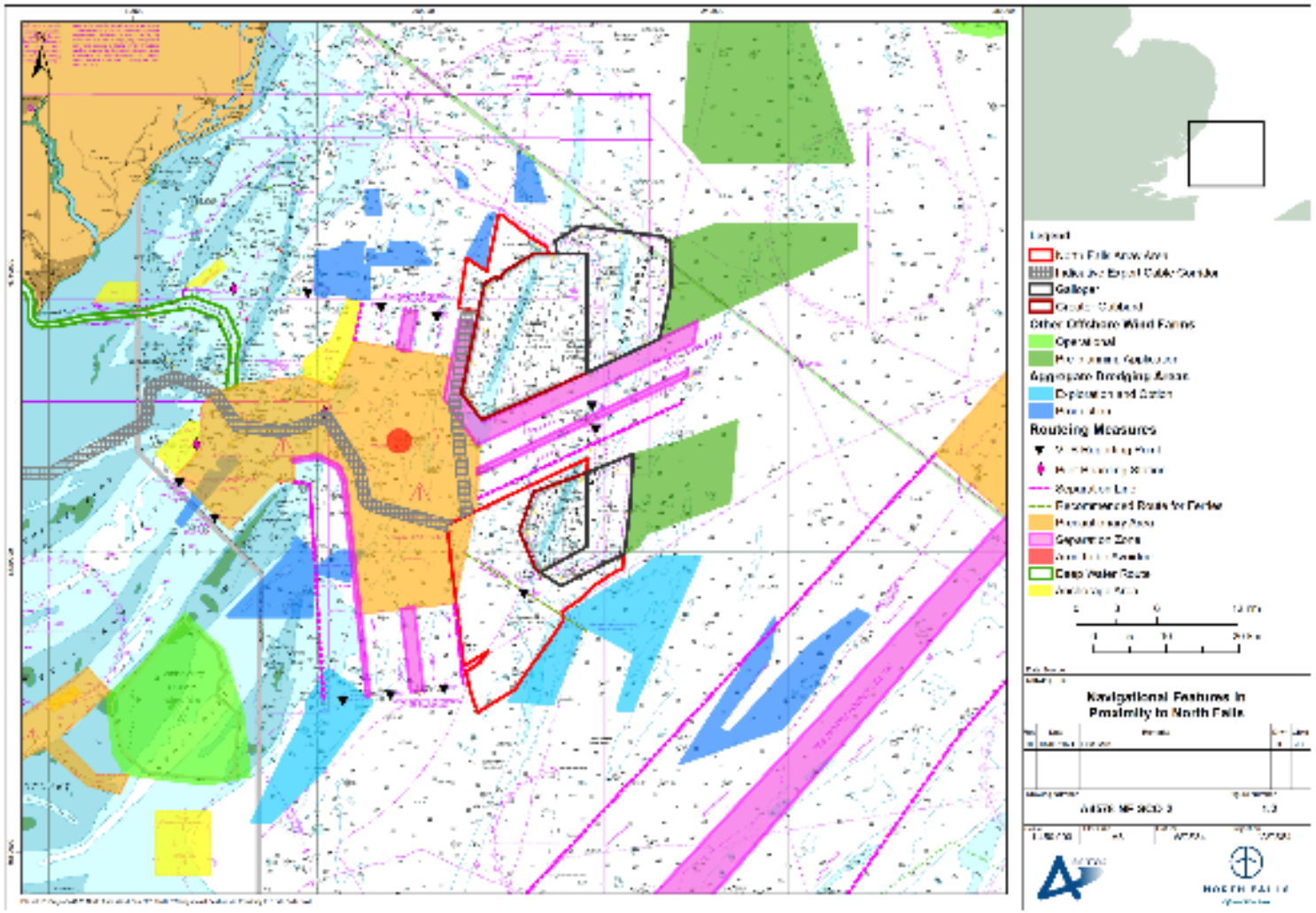

Figure 2.9 Navigational features in proximity to North Falls

299. The TSS comprises North, South and East sets of lanes which join with the Sunk Precautionary Area. The different elements of the Sunk routeing measure are summarised in Table 2.24. It is noted that the southern array boundary overlaps part of the Sunk Precautionary Area and a Recommended Route. The North Hinder TSS is located farther east.

300. As discussed in Section 1.5, the project is adjacent to the operational GWF and GGOW which are also separated into northern and southern arrays.

301. Other operational offshore wind farms in the area include London Array (16nm southwest), Gunfleet Sands (22nm west), Thanet (25nm southwest) and East Anglia ONE (16nm north east). East Anglia TWO is currently in the consenting process and will be located approximately 8nm north-east of North Falls northern array area if consent is granted. Five Estuaries Offshore Wind Farm (the proposed extension to the existing GWF) will extend to the east of the GWF site (The Crown Estate, 2020). The northern array of North Falls is 5.6nm to the west of Five Estuaries and the southern array is 0nm from Five Estuaries, at its closest point.

302. There is a marine aggregate dredging exploration and option area ("Thames D") operated by DEME Building Materials which borders the southern array area and covers an area of approximately 23nm^2. A production area ("Shipwash 507/6") operated by CEMEX UK Marine borders the northern array boundary and another production area ("North Inner Gabbard") operated by Volker Dredging and Britannia Aggregates is located approximately 0.75nm north of the northern array boundary. Other sections of the "Shipwash" marine aggregate dredging area are located west of the northern array area.

303. There are several UK ports located to the west of the North Falls array areas including Harwich, Felixstowe and London.

Table 2.24 Elements of the Sunk TSS

Routeing measure element	Description	Within the Sunk TSS
Traffic Separation Scheme	A routeing measure designed to separate opposing streams of traffic by establishment of traffic lanes.	Includes three TSSs to the north, east and south of the precautionary area.
Separation zones and lines	A zone or line separating traffic lanes: • In which vessels are proceeding in opposite or nearly opposite directions; or • Separating a traffic lane from the adjacent sea area; or • Separating traffic lanes designated for particular classes of vessel proceeding in the same direction.	Includes zones as part of each TSS and along selected TSS boundaries. Includes lines where there are not zones along TSS boundaries.
Roundabout	A separation point or circular separation zone and a circular traffic lane within defined limits.	Includes a roundabout designated as an Area to Be Avoided (ATBA) located at the centre of the Outer Precautionary Area (approximately 6.2nm southwest of the northern array area) with vessels required to navigate anticlockwise around this area which is marked by a floating light carrying

Routeing measure element	Description	Within the Sunk TSS
		Automatic Identification System (AIS) and a Racon.
Precautionary areas	An area within defined limits where vessels must navigate with particular caution and within which the direction of flow of traffic may be recommended.	Includes two precautionary areas; the Outer Sunk Precautionary Area serves as the junction for the three TSSs and the Inner Sunk Precautionary Area shares a border with the western boundary of the Outer Sunk Precautionary Area. Vessels entering these areas are advised to navigate with extreme caution as vessels embarking and disembarking pilots may be encountered, some of which may be constrained by their draught.
Recommended route	A route of undefined width for the convenience of vessels in transit.	Includes the Galloper Recommended Route which crosses the southern array area and is designated for regular ferry traffic to and from the Port of Ostend .
Area to Be Avoided	An area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all vessels, or by certain classes of vessel.	The roundabout located at the centre of the Outer Precautionary Area is designated as an ATBA.
VTS Reporting Point	A point at which vessels transiting the Sunk Outer and Inner Precautionary Areas must report to Sunk VTS (operated by Dover MRCC) via VHF upon entry/exit. A continuous listening watch should be maintained until transfer to London VTS.	Points are located on the five routes originating from the area to be avoided, including the recommended route for ferries.

304. The offshore export cable corridor between the landfall and southern array boundary crosses the Sunk Precautionary Area. The offshore export cable corridor between the north and south array boundaries also crosses this area, as well as overlapping the separation zone between Sunk TSS north and the existing GGOW array.

305. The closest aggregate dredging production area is located 1.1nm from the main offshore export cable corridor. Sunk Inner Anchorage is located 1.0nm from the offshore export cable corridor, and the Sunk pilot boarding area lies within the offshore export cable corridor. The deep water channel from Harwich ends approximately 500m from the offshore export cable corridor.

2.10.1.2 Marine traffic

306. A study area of 10 nautical miles (nm) around the array areas has been considered in this section in order to characterise maritime activity that may potentially be affected by North Falls. Four weeks of AIS data were analysed to identify shipping patterns in the area, two weeks from summer (July 2019) and two weeks from winter (February 2020). These periods were chosen to include seasonal variation but exclude potential Covid-19 effects on normal traffic patterns.

307. It should be noted that not all vessels are required to carry an AIS transceiver; AIS carriage is mandatory for all vessels of 300GT and upwards engaged on

international voyages, cargo vessels of 500GT and upwards not engaged on international voyages and all passenger vessels irrespective of size. In addition, fishing vessels of 15m length and greater must carry AIS. Smaller fishing vessels, recreational vessels and military vessels are not required to broadcast on AIS but may do so voluntarily.

308. Plots of the vessel tracks recorded on AIS colour-coded by type during the summer and winter fortnights are presented in Figure 2.10 and Figure 2.11, respectively. It is noted that vessels operating at GWF and GGOW have been excluded. A survey vessel and a vessel carrying out guard work were also excluded on the basis these were temporary operations.

309. An average of 150 unique vessels per day were recorded within the 10nm study area during summer 2019 compared to 136 per day in winter.

310. The majority of vessels within the study area were cargo vessels (60%) and tankers (22%), mainly using the Sunk TSS. Dredgers (4%) were recorded in both periods operating to and from marine aggregate areas. Passenger vessels (2%) were observed using both the Sunk TSS and a route passing north of the northern array boundary between Harwich and Hook of Holland. Recreational vessels (8%) were mostly recorded in summer while fishing vessels (3%) were observed more in winter.

311. The vessel tracks during the combined 28 days are presented in Figure 2.12, colour-coded by average course. It can be seen that vessels strictly followed the rules of the TSS, which has been confirmed in consultation with Sunk VTS, Dover, who manage the Vessel Traffic Service. Fewer than one contravention per month was recorded during 2020, including vessels proceeding against the traffic flow.

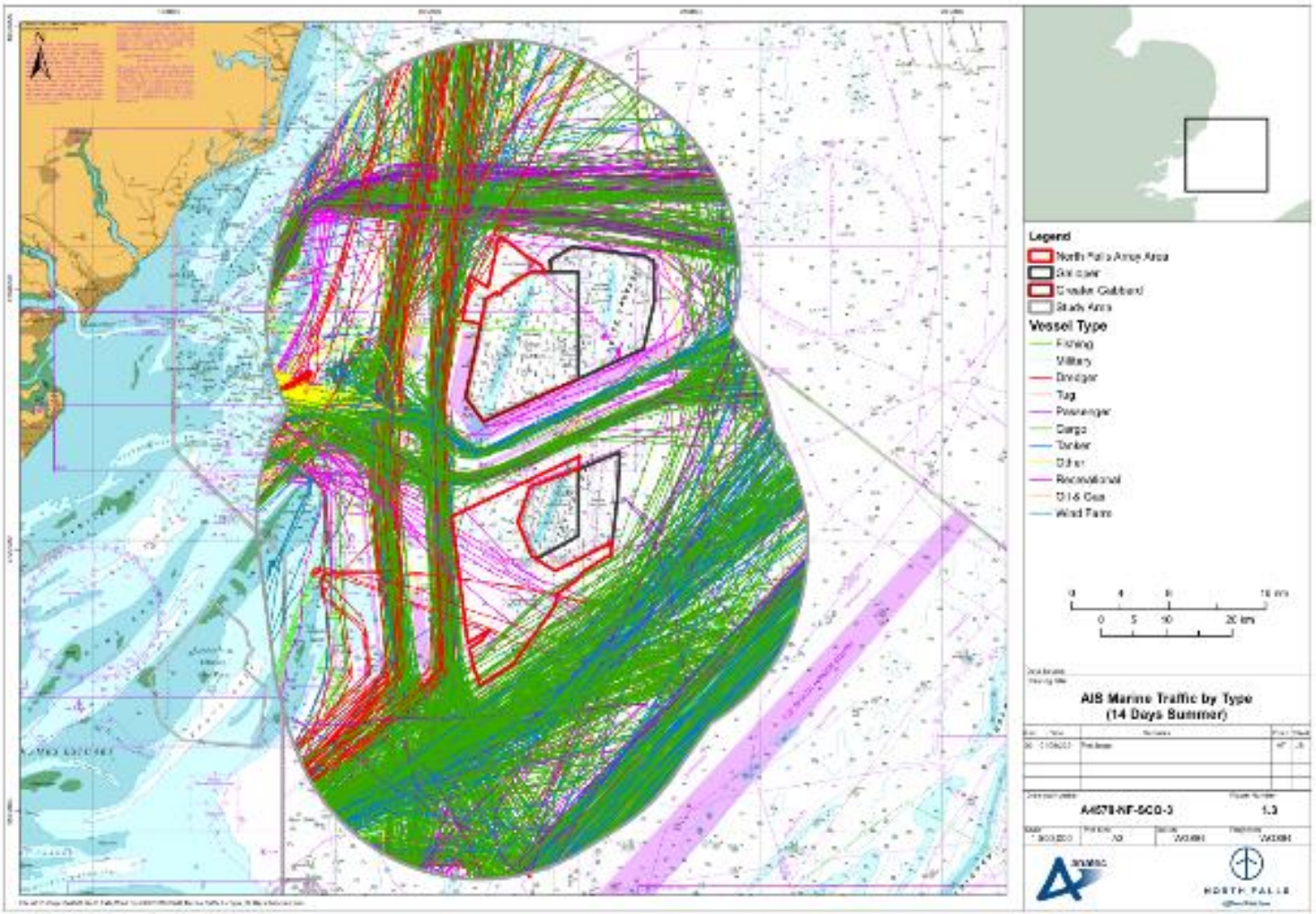

Figure 2.10 AIS marine traffic by type (14 days summer)

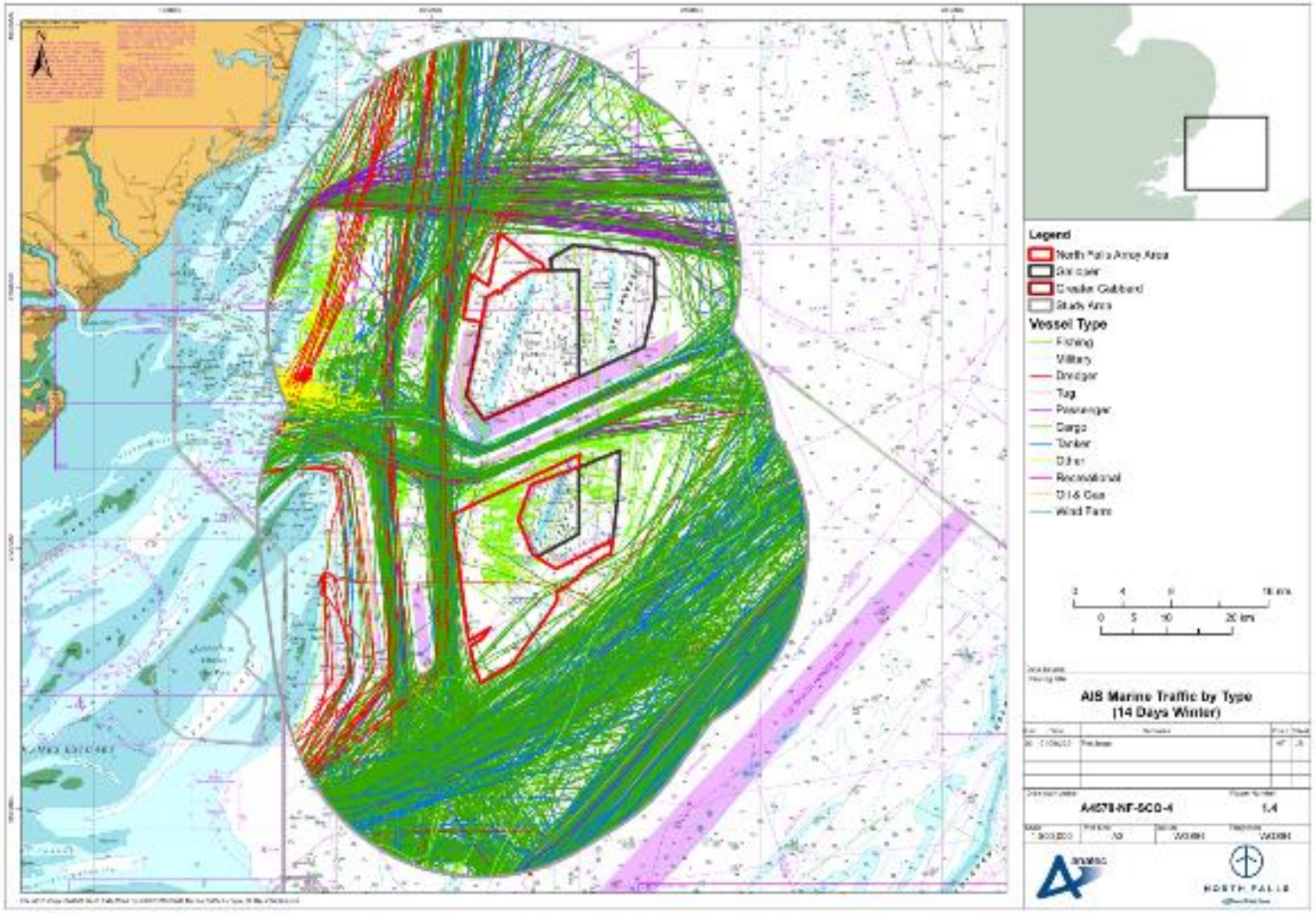

Figure 2.11 AIS marine traffic by type (14 days winter)

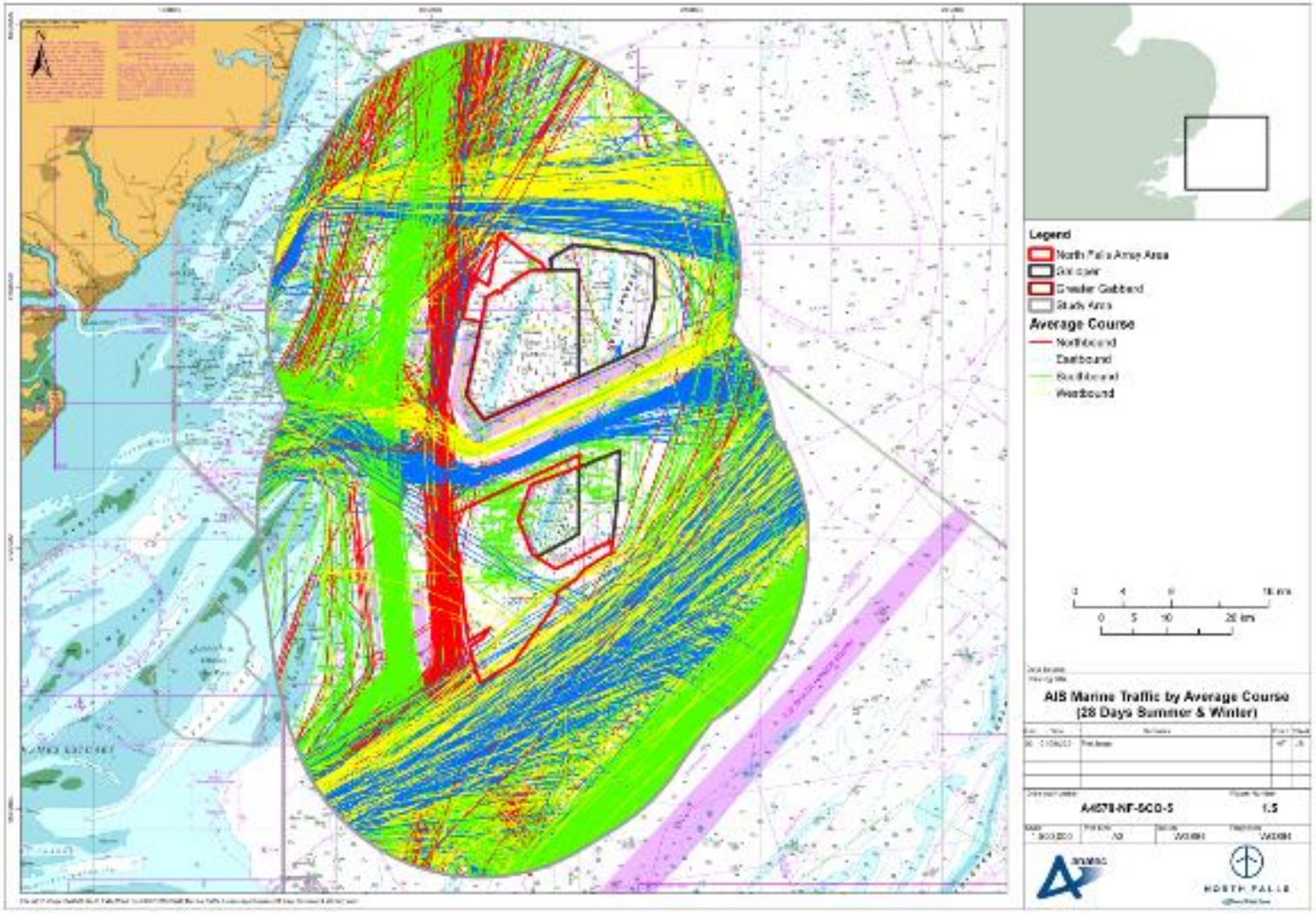

Figure 2.12 AIS marine traffic by average course (28 days summer & winter)

312. The numbers of vessels by type crossing the north and south array boundaries over the combined summer and winter periods are presented in Figure 2.13. An average of approximately one unique vessel every two days intersected the northern array area and three per day intersected the southern array area.

313. Cargo vessels were the most frequently recorded vessel type crossing the north array boundary followed by marine aggregate dredgers and recreational vessels (21%). The majority clipped the western edge of the boundary after exiting the northbound lane of the Sunk TSS North.

314. The south array boundary was also most frequently intersected by cargo vessels followed by recreational vessels and fishing vessels. The majority of cargo vessels crossed the southern part of the boundary in a NE/SW direction. It is noted that no ferries were observed using the Recommended Route within the south array boundary.

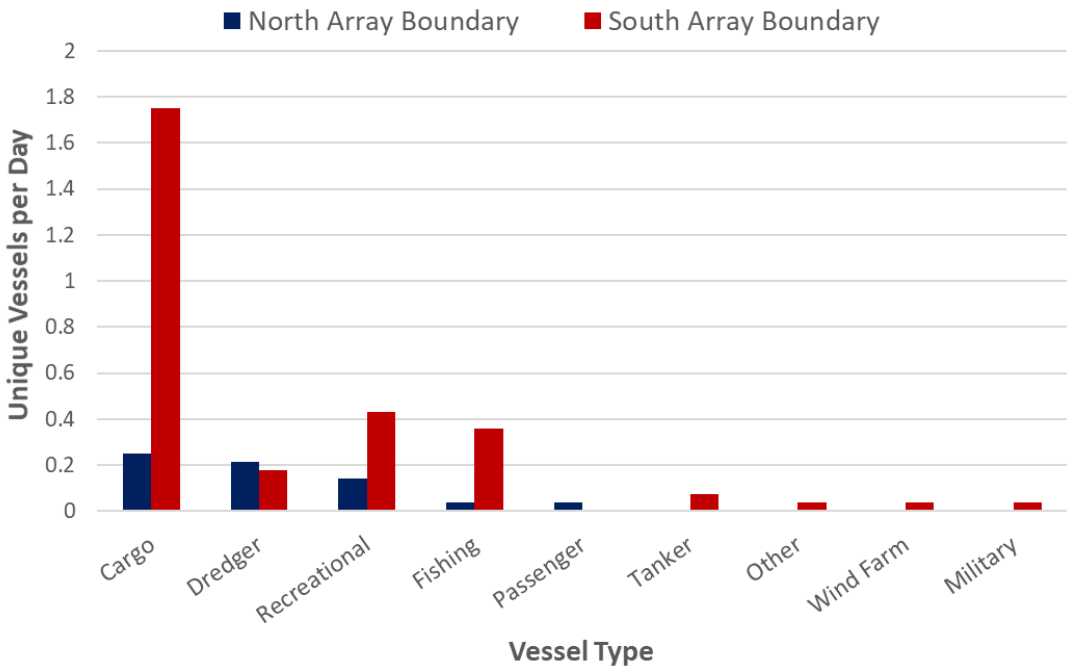

Figure 2.13 Vessel types crossing the array areas (28 days)

2.10.1.3 Historical maritime incidents

2.10.1.3.1 Marine Accident Investigation Branch

315. An analysis of the Marine Accident Investigation Branch (MAIB) incident data from 2010 to 2019 indicated that a total of 36 incidents were reported within the study area. The most common causes were hazardous incident and machinery failure. The main vessel types involved were cargo and fishing vessels. One incident categorised as an 'accident to person' onboard a commercial vessel was reported within the south array boundary.

316. A total of six incidents were reported within the provisional offshore export cable corridor, with hazardous incident the most common cause. The main vessel types were cargo and other commercial vessels.

2.10.1.3.2 Royal National Lifeboat Institution

317. An analysis of the Royal National Lifeboat Institution (RNLI) incident data from 2010 to 2019 indicated that a total of 139 lifeboat launches to 122 incidents were reported within the array areas. The most common cause was machinery failure. The main vessel type involved was recreational vessels. Two of the incidents involved machinery failure, one involving a commercial vessel within the north array boundary and one a recreational vessel within the south array boundary. There was one 'other' incident within the north array boundary involving a recreational vessel.

318. A total of 26 incidents were reported within the offshore export cable corridor, with machinery failure the most common cause and recreational vessel the main type involved.

2.10.2 Approach to data collection

2.10.2.1 Data sources

319. A minimum of 28 days (14 days in summer and 14 days in winter) of marine traffic survey data will be used to inform the Navigational Risk Assessment (NRA) and ES. This is expected to be collected in winter 2021/22 and summer 2022. The surveys will include AIS, radar and visual observations collected from vessel(s) stationed within or near the array areas.

320. The survey will be supplemented by 12 months of AIS data to ensure the baseline assessment presented as part of the NRA is robust and considers wider seasonal variations and weather routeing.

321. In addition to the marine traffic survey data, the data sources listed below will also be used to inform the baseline:

- UKHO Admiralty Charts and Sailing Directions;
- UK Coastal Atlas (RYA, 2019);
- Marine Aggregates Dredging Areas (The Crown Estate, 2021); and
- BMAPA Routes (2009, downloaded 2020).

322. Consultation with navigational stakeholders will be included in both the NRA and ES. The list of consultees will include (non-exhaustive):

- MCA;
- Trinity House;
- Chamber of Shipping;
- RLNI;
- RYA;
- Harwich Haven Authority and individual ports;
- Port of London Authority;
- Cruising Association;
- Sunk User Group;

- Regular operators identified as part of the survey, e.g. dredging companies and ferry operators;
- Local stakeholders such as yacht clubs and marinas;
- National Federation of Fishermen's Organisation; and
- Transboundary and/or cumulative receptors identified as part of the assessment.

323. Other data, information and consultation on fishing will be available via the Commercial Fisheries assessment carried out as part of the EIA.

324. Pre-Scoping consultation has already been held by the project with regard to planned routeing options for the offshore export cable corridor, including with the MCA, Trinity House and local ports.

325. In addition, an initial consultation meeting on the array boundary was held with the MCA (Navigation Safety Branch, Sunk VTS Manager and Chair of Sunk User Group) and Trinity House in April 2021.

2.10.3 Potential impacts

326. This section reviews the potential impacts of the project per phase. Prior to this, it is firstly recognised that the array boundary may require refinement relative to the Sunk Area routeing measures based on the following points raised during the initial stakeholder consultation:-

- The overlap of the south array boundary with the Sunk precautionary area;
- The lack of a buffer between the south array boundary and the Sunk TSS South;
- The proximity of the north array boundary to the northbound traffic lane existing the Sunk TSS North; and
- The recommended route for ferries within the south array boundary, which appears to no longer be used for its intended purpose but will require an application to the IMO to be amended.

327. Further discussion of these issues will be held with the Sunk User Group and other stakeholders as part of the array boundary refinement process prior to the detailed impact assessment.

2.10.3.1 Potential impacts during construction

328. Potential impacts during the construction phase will arise from the presence of construction vessels and any safety zones present during the construction works. The NRA / EIA will consider disruption and displacement of other marine users as well as the potential for increased navigational risk and impacts on search and rescue (SAR) resources. Interference with marine navigation, communications and position fixing equipment due to the project will also be assessed. The proximity of the array areas to the Sunk precautionary area and TSSs will also be considered, as well as nearby marine aggregate and port operations.

2.10.3.2 Potential impacts during operations

329. Potential impacts will also arise from the long-term presence of offshore structures and operations and maintenance activities for the duration of the operational phase. Disruption and disturbance to other users due to re-routeing, increased collision and allision risk as well as impacts on SAR resources will therefore be assessed for the operational phase. An increased vessel to structure allision risk will arise when the new structures are in place, both from powered and drifting scenarios, which will also be assessed. Finally, effects on nearby marine aggregate operations and port operations will be considered.

2.10.3.3 Potential impacts during decommissioning

330. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase. The impacts would be re-assessed prior to decommissioning.

2.10.3.4 Potential impacts – offshore export cable corridor

331. A high-level review of the impacts pertaining particularly to the offshore export cable corridor will be assessed within the NRA, including the potential for interaction with fishing gear and/or anchors, port access issues, and potential reduction in under-keel clearance due to cable protection where burial is not practicable. The effect on magnetic compasses will also be considered. All impacts relating to the subsea cables will be assessed in more detail as part of a separate Cable Burial Risk Assessment (CBRA).

2.10.3.5 Cumulative impacts

332. The cumulative assessment will consider the offshore project area in combination with the presence of and construction of future offshore wind farms in the region, including Five Estuaries and East Anglia TWO.

333. Interactions with other cumulative activities will also be considered for shipping and navigation receptors, including other offshore developments and marine operations. Existing activities such as fishing and marine aggregate dredging would be considered as part of the baseline assessment.

2.10.3.6 Transboundary impacts

334. The areas around North Falls offshore area, in particular shipping routes, are used by a variety of international users including transport, cargo, fishing and recreational users. The impact assessment will not differentiate between impacts on UK vessels and international vessels using the area and therefore these will be addressed through the main assessment and not included in a separate transboundary assessment.

2.10.3.7 Summary of potential impacts

335. Table 2.25 outlines the effects which are proposed to be scoped into the EIA.

Table 2.25 Summary of impacts relating to shipping and navigation.

Potential Impact	Construction	Operation	Decommissioning
Vessel to structure allision risk due to the presence of new structures associated with the project	✓	✓	✓

Potential Impact	Construction	Operation	Decommissioning
Increased vessel to vessel collision risk between third party vessels due to vessel displacement	✓	✓	✓
Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels	✓	✓	✓
Vessel displacement due to activities associated with the project	✓	✓	✓
Impact on vessels involved in marine aggregate operations	✓	✓	✓
Impact on vessels transiting to/from local ports in the area, including use of approach channels, port operations and pilotage	✓	✓	✓
Reduction of under keel clearance due to the presence of cable protection	✓	✓	✓
Reduction of emergency response capability due to increased incident rates and/or reduced access for SAR responders	✓	✓	✓
Interference with marine navigation, communications and position fixing equipment due to the project	✓	✓	✓
Cumulative Impacts	✓	✓	✓
Transboundary Impacts	✓	✓	✓

2.10.4 Approach to assessment

336. The assessment methodology would principally be based on the following:

- MGN 654 Offshore Renewable Energy Installations Guidance on UK Navigational Practice, Safety and Emergency Response Issues;
- MGN 654 Annex 1: Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (April 2021); and
- Annex 5 to MGN 654. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (April 2021).

337. Other guidance used within the assessment includes:

- IMO Revised Guidelines for Formal Safety Assessment (IMO, 2018);

- MGN 372 (M+F) (MGN 372 M+F) Offshore Renewable Energy Installations (OREIs) Guidance to Mariners Operating in the Vicinity of UK OREIs;
- DECC Guidance Notes on Safety Zones (DECC, 2007 as updated);
- RYA – The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy (RYA, 2019); and
- International Association of Lighthouse Authorities (IALA) – O-139 the Marking of Man-Made Offshore Structures (IALA, 2013).

338. Potential shipping and navigation impacts will be assessed for significance using the Formal Safety Assessment (FSA) process detailed by the IMO (2018) and as required by the MCA (2017). The FSA assigns each impact a "frequency" and "severity" ranking which are then used to assess the overall significance as either broadly acceptable, tolerable (with mitigation), or unacceptable, assuming embedded mitigation is in place. Where appropriate, additional mitigation is then introduced to reduce any impacts to tolerable (ALARP) levels as necessary. Rankings will be informed by quantitative modelling results, stakeholder consultation feedback (including Hazard Review workshop), and expert opinion.

339. The key input to the FSA will be the NRA (undertaken as per MGN 654), which will establish the shipping and navigation baseline in detail. The NRA will use the data sources listed above and include a completed MGN 654 Checklist to demonstrate that all relevant impacts have been assessed.

2.11 Offshore archaeology and cultural heritage

2.11.1 Existing environment

340. The marine archaeology and cultural heritage assessment will include all receptors seawards of MHWS. All receptors landwards of MHWS will be included within terrestrial archaeology and cultural heritage assessment (see Section 3.7).

341. In recent years, the archaeological assessment of marine geophysical and geotechnical data acquired for constructed and planned projects within the southern North Sea has led to a much greater understanding of the potential for prehistoric, maritime and aviation archaeology. Combined with targeted archaeological investigations, such as the use of Remote Operated Vehicles (ROVs) to ground truth geophysical anomalies, this data has led to the identification of multiple new sites and finds within offshore contexts.

342. Specifically, and immediately adjacent to the North Falls array areas, data from the GGOW and GWF (e.g. GGOW, 2005; GWF, 2011) has demonstrated the presence of palaeolandscape features and sub-seabed deposits of palaeoenvironmental interest, as well as wrecks and seabed features of

potential archaeological interest within the boundaries of both offshore wind farms. The potential for similar features to be present within the offshore project area is considered to be high. Figure 2.14 shows UKHO wreck data in proximity to the North Falls offshore project area.

343. Similarly, at the landfall, the Tendring peninsula hosts various known archaeological features. To the south west of the landfall search area, the foreshore and cliff exposures, and excavations to the south west of Clacton-on-Sea (Clacton Cliffs and Foreshore SSSI), have provided opportunities for the study of one of the most important Pleistocene interglacial deposits in Britain. Within the landfall search area, the reclaimed Holland Haven marshes have potential to contain well preserved palaeoenvironmental deposits and internationally important Palaeolithic remains comparable to the findings at Clacton Cliffs and Foreshore SSSI. Additionally, a number of finds of Red Hills (salt making sites) have been recorded on the coast which date from the late Iron Age/Roman period. Post medieval oyster pits, industrial features, duck decoys and extant and relict sea defences reflect the strong coastal/maritime nature of the historic environment of the area and fragments of historic grazing marsh survive in places.

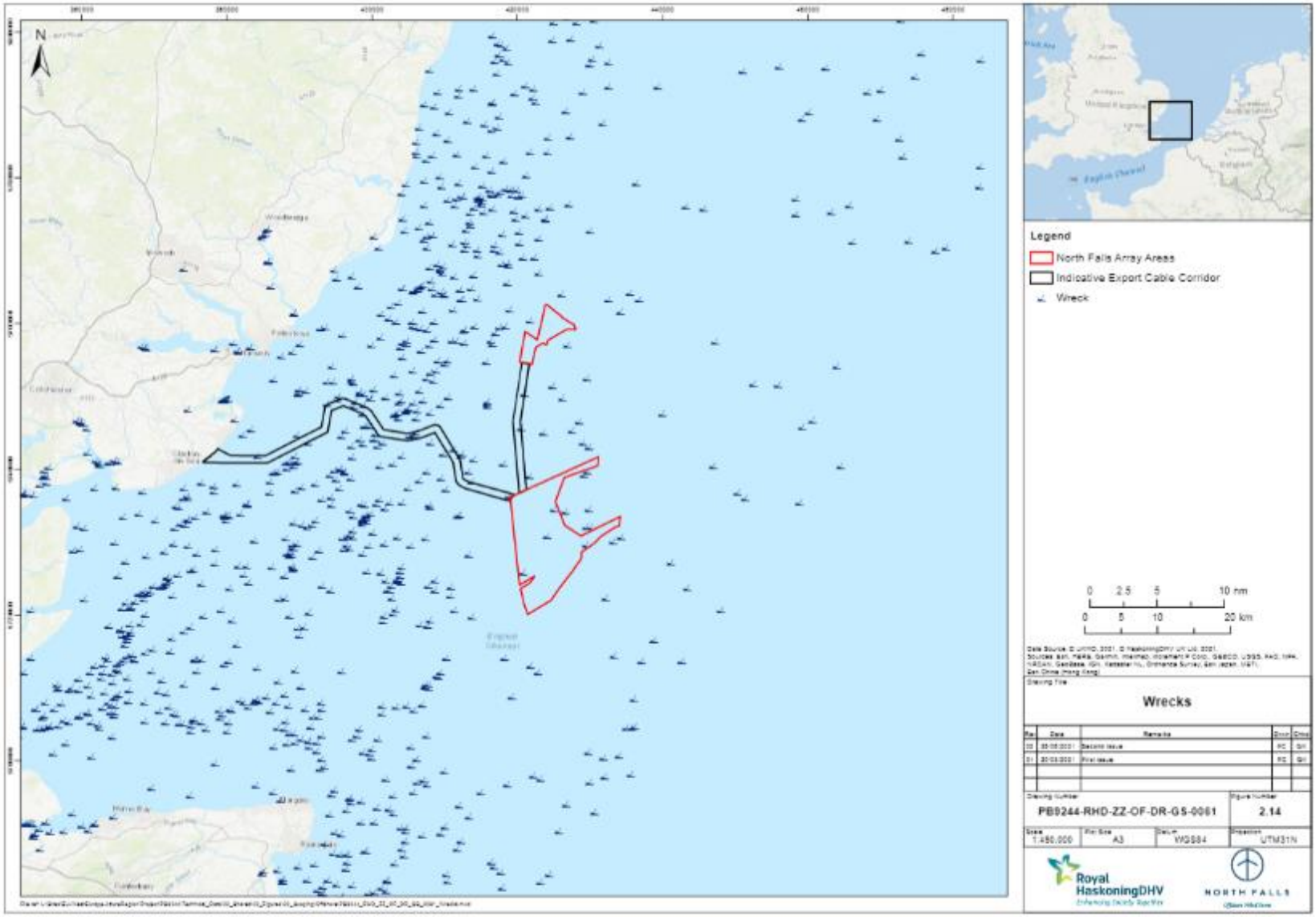

Figure 2.14 Wrecks

2.11.2 Approach to data collection

2.11.2.1 Data sources

344. Table 2.26 identifies the desk-based sources that will be accessed to inform the characterisation of the existing environment with respect to offshore archaeology and cultural heritage.

Table 2.26 Existing datasets

Data source	Data contents
UKHO	Records of wrecks and obstructions data including 'dead' and salvaged wrecks that are no longer charted as navigational hazards.
National Record of the Historic Environment (NRHE)	Maritime records, including documented losses of vessels, and records of terrestrial monuments and findspots, including the archaeological excavation index.
National Heritage List of England (NHLE)	Records of designated heritage assets within England, maintained by Historic England. Geographic Information System (GIS) data for all Protected Wrecks, Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields.
Essex Historic Environment Record (EHER)	Contains data on all recorded non-designated heritage assets, maintained by Place Services on behalf of Essex County Council. The data includes archaeological, historic landscape and historic building information. Information on previous events (archaeological surveys and investigations) will also be obtained.
BGS	Historic borehole logs and the wider geological background for the region.
National Historic Seascape Characterisation	GIS data and character texts for the Historic Seascape Character (HSC) of coastal and marine areas around England, mapped through a series of projects funded by Historic England and consolidated into a single national database.
Existing archaeological studies and published sources	Background information on the archaeology of the Southern North Sea and Essex region, including the results of archaeological assessments carried out for the GGOW and GWF and recent work undertaken in the wider North Sea and Thames Estuary.
Coastal and Intertidal Zone Archaeological Network (CITiZAN)	Interactive mapping of intertidal heritage in England
Bynoe (2017)	Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton

345. In addition to the data in Table 2.26 and listed above, the following data in Table 2.27 will be collected for the assessment:

Table 2.27 Site-specific data

Dataset	Source	Year Survey/Timings
Geophysical Survey	North Falls array areas and offshore export cable corridor	To be completed in 2021

346. The marine geophysical survey data which will be acquired to inform the EIA during 2021 will be subject to archaeological assessment by a qualified and experienced archaeological contractor in accordance with industry good practice as set out in available guidance such as Marine Geophysics Data Acquisition, Processing and Interpretation (Historic England, 2013). In addition, if any geotechnical investigations are completed the samples will be made available for geoarchaeological assessment.

In addition to the marine geophysical survey, a targeted archaeological walkover may be required to identify any potential unrecorded non-designated heritage assets, as well as ground truthing of certain previously recorded assets. The need for this walkover will be determined by the findings of marine archaeological desk-based assessment (see below).

2.11.3 Potential impacts

347. Heritage assets may be affected by direct physical change or by change in their setting (Historic England – GPA 2, 2015b).

348. Potential impacts to heritage assets include both direct and indirect impacts, as well as changes in the setting of heritage assets, which could affect heritage significance.

349. Direct impacts to heritage assets, either present on the seafloor or buried within seabed deposits, may result in damage to, or total destruction of, archaeological material or the relationships between that material and the wider environment (stratigraphic context or setting). These relationships are crucial to developing a full understanding of an asset. Such impacts may occur if heritage assets are present within the footprint of elements of the project (i.e. foundations or cables) or within the footprint of activities such as seabed clearance, anchoring or the placement of jack up barges.

350. The project also has the potential to directly and indirectly change the hydrodynamic and sedimentary process regimes, both locally and regionally. Changes in coastal processes can lead to re-distribution of erosion and accretion patterns, while changes in tidal currents, for example, may affect the stability of nearby morphological and archaeological features. Indirect impacts to heritage assets may occur if buried heritage assets become exposed to marine processes, due to increased wave/tidal action for example, as these will deteriorate faster than those protected by sediment cover. Conversely, if increased sedimentation results in an exposed site becoming buried this may be considered a beneficial impact.

351. Impacts to the significance of a heritage asset may also occur if a development changes the surroundings in which a heritage asset is located, experienced and appreciated (i.e. its setting). Similarly, historic character may also be affected if the project results in a change to the prevailing character of the area and/or alters perceptions of the seascape.

2.11.3.1 Potential impacts during construction

352. Direct impacts may occur if archaeological material is present within the footprint of the development associated with the following activities:

- Seabed preparation (including UXO and boulder clearance);
- Installation of wind turbine foundations;
- Installation of ancillary infrastructure;
- Installation of offshore cabling;
- Seabed contact by legs of jack-up vessels and / or anchors; and

- Cable installation at the landfall.

353. Indirect impacts to heritage assets may occur if the physical presence of construction plant and offshore infrastructure impacts the hydrodynamic regime, or if seabed preparation associated with foundation and cable installation leads to localised effects upon sedimentary processes.

354. There would also be potential for temporary impacts to the setting of heritage assets and to the HSC from the presence of vessels associated with the installation of offshore infrastructure and activities at the landfall.

2.11.3.2 Potential impacts during operation and maintenance

355. Direct impacts may occur if archaeological material is present within the footprint of works required for routine maintenance activities which disturb the seabed (for example, seabed contact by legs of jack-up vessels and / or anchors) or in exceptional circumstances such that cabling would need replacing, for example. However, given that much of the areas within which such activities would take place would already have been disturbed during construction there would be limited scope for further impact.

356. Indirect impacts to heritage assets may occur if the physical presence of the installed infrastructure impact the hydrodynamic or sedimentary regime including the potential for increased scour around foundations.

357. There would also be potential for impacts to the setting of heritage assets and to the HSC from the presence of the installed infrastructure and ongoing maintenance activities.

2.11.3.3 Potential impacts during decommissioning

358. If cables and foundations are left in place there would be no potential for direct impact. Direct impacts to heritage assets may occur if the accessible infrastructure is removed, although the anticipated effect on archaeological material would be limited as any remains at the locations of the installed infrastructure will already have been impacted/mitigated during the construction phase. If archaeological material is present within the footprint of jack-ups or vessel anchors deployed during decommissioning activities, direct impacts may also occur.

2.11.3.4 Potential cumulative impacts

359. Individual heritage assets would not be subject to cumulative direct impacts from other known plans or projects as they are discrete and there would be no physical overlap of different infrastructure. However, although individual assets are discrete, taken together they could have collective heritage significance, therefore multiple impacts upon similar assets could occur cumulatively. In addition, there is potential for multiple developments to affect the larger-scale archaeological features such as palaeolandscapes and to affect the setting of heritage assets and the HSC of the North Sea. There is also the potential for cumulative indirect impacts associated with changes to marine physical processes.

360. There is, therefore, the potential for cumulative impact associated with the construction, operation and decommission of other plans or projects.

2.11.3.5 Transboundary impacts

361. Direct transboundary impacts may occur during construction if wrecks or aircraft of non-British nationality are subject to impact from development. Such wrecks may fall within the jurisdiction of another country, and may include, for example, foreign warships lost in UK waters. Similarly, where palaeolandscapes within the North Sea cross international boundaries, direct transboundary impacts may occur.

362. Indirect transboundary impacts, associated with changes to marine physical processes, where those changes cross an international boundary, are not expected to occur. As discussed in Section 2.1.3.5 above, based on the findings of the GWF transboundary assessment (GWF, 2011) which found no potential for significant transboundary effects, it is proposed to scope out transboundary effects on marine geology, oceanography and physical processes, recognising that the GWF is located closer to the EEZ boundary than North Falls.

2.11.3.6 Summary of potential impacts

363. Table 2.28 outlines the effects which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 2.28 Summary of impacts relating to offshore archaeology and cultural heritage.

Potential Impact	Construction	Operation	Decommissioning
Direct impacts to heritage assets.	✓	✓	✓
Indirect impacts to heritage assets associated with changes to marine physical processes.	✓	✓	✓
Change to the setting of heritage assets, which could affect their heritage significance.	✓	✓	✓
Change to character which could affect perceptions of the HSC.	✓	✓	✓
Cumulative Impacts	✓	✓	✓
Transboundary Impacts	✓	x	x

2.11.4 Approach to assessment

364. The marine archaeology assessment will be informed by the interpretation of the geophysical survey data (namely the bathymetry and side scan sonar data to identify seabed features, such as wrecks, magnetometry data to identify magnetic anomalies and sub-bottom profile data to identify palaeolandscape features).

365. A marine archaeological desk-based assessment (ADBA) will be undertaken to establish the baseline for both known and potential heritage assets within the offshore project area based upon the desk-based sources listed in Table 2.26.

Dependent upon the results, a walkover survey at the landfall may be carried out to ground truth existing records of heritage assets and identify any potential unrecorded heritage assets. This may also be required to inform an assessment of potential setting impacts upon heritage assets below MHWS within the intertidal zone.

366. The ADBA and assessment of geophysical data will be used to identify a strategy for mitigation including the avoidance of identified heritage assets through the application of Archaeological Exclusion Zones where appropriate.

367. The methodology of the assessment will also take account of guidance including:

- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (JNAPC and The Crown Estate, 2006);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008); and
- Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-Based Assessments (2014a) and Code of Conduct (2014b).

2.12 Aviation and radar

2.12.1 Existing environment

368. The airspace above and adjacent to the array areas is used by civil and military aircraft. Aircraft operating within this airspace may be provided with a radar service by Air Traffic Services Units (ATSUs) using radar systems operated by NATS and the Ministry of Defence (MoD). The nearest NATS radar systems are based in Cromer and Debden with the nearest MoD radar based at Trimingham, near Cromer. In addition to these systems, London Southend Airport also has a radar installation. All of these, with the possible exception of Debden, would in all probability have Radar Line of Sight (RLoS) of the project.

369. The nearest UK airport to the array areas is Southend, which is approximately 80km away and the second nearest is Norwich International Airport, which is approximately 85km at its nearest point. The nearest European airports are Calais-Dunkerque Airport at 74km, Koksijde Air Base at 81km, and Ostend-Bruges Airport at 83km. The nearest major European airport is Schiphol Airport, which is approximately 196km from the North Falls array areas.

370. The project lies within the London Flight Information Region (FIR), the controlling authority of which is the UK CAA. The project is situated within uncontrolled airspace with overlying controlled airspace, however indicative WTG tip heights show no penetration of any controlled airspace in the extant environment.

2.12.2 Potential impacts

371. WTGs have the potential to affect military and civil aviation (fixed-wing and helicopters), either through their physical dimensions limiting access and affecting safeguarding or safe passage, or through their effects on primary or secondary radar systems.

2.12.2.1 Potential impacts during construction

372. Potential impacts on military and civil aviation and radar during construction are associated with the presence of high crane vessels and partially completed structures increasing collision risk.

2.12.2.2 Potential impacts during operation and maintenance

373. Potential impacts during operation will focus on the presence of offshore structures. The assessment will include the effect on civil and military aviation and radar.

2.12.2.3 Potential impacts during decommissioning

374. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase.

2.12.2.4 Potential cumulative impacts

375. The cumulative assessment will consider the impacts in combination with other wind farms including increased collision risk and cumulative impacts on radar.

2.12.2.5 Transboundary impacts

376. The airspace around the array areas is used by international civil aviation and is adjacent to the Amsterdam FIR. The potential impacts on international use of the airspace will therefore be considered.

2.12.2.6 Summary of potential impacts

377. *Table 2.29* outlines the effects which are proposed to be scoped into the EIA.

Table 2.29 Summary of impacts relating to aviation and radar

Potential Impact	Construction	Operation	Decommissioning
Impacts on military and civil radar system due to high construction and maintenance vessel/cranes and partially complete structures	✓	✓	✓
Creation of an aviation obstacle environment for military and civil aircraft due to high construction vessel/cranes and WTG	✓	✓	✓
Impacts on military and civil radar system due to permanent structures during operational phase.	x	✓	x
Cumulative impacts on military and civil radar systems	✓	✓	✓
Cumulative creation of an aviation obstacle	✓	✓	✓

Potential Impact	Construction	Operation	Decommissioning
environment to civil and military aircraft.			
Transboundary impacts	✓	✓	✓

2.12.3 Approach to assessment

378. The EIA process will be supported by desk-based studies that will identify and examine in detail, sensitive aviation and MoD receptors. Studies will be undertaken in parallel with consultation with relevant stakeholders in order 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 in the wind farm design optimisation process.

2.13 Infrastructure and other users

2.13.1 Existing environment

379. This section considers other interactions with industries not already covered as EIA topics in their own right, such as Commercial fisheries (Section 2.9) and Shipping and Navigation (Section 2.10).

2.13.1.1 Offshore wind infrastructure

380. Offshore wind developments in the vicinity (50km buffer) of the array areas are summarised in Table 2.30 and shown on Figure 2.15.

Table 2.30 Offshore wind farm projects within 50km and distance to the array areas

Offshore Wind farm	Distance from North Falls array areas (km)	Distance from North provisional offshore export cable corridor (km)
Greater Gabbard	0	0
Galloper	0	8
Gunfleet Sands I	40	6
Gunfleet Sands II	37	7
Gunfleet Sands III (Demo)	43	10
Thanet	24	36
London Array	19	16
East Anglia ONE	38	46
East Anglia TWO	15	23
East Anglia ONE North	45	53

2.13.1.2 Oil and gas pipelines and platforms

381. There are no pipelines in proximity to the North Falls offshore project area, with the Bacton-Zeebrugge interconnector running approximately 30km to the east of the North Falls array areas (see Figure 2.16).

382. There are no oil and gas platforms in or around the North Falls offshore project area.

2.13.1.3 Oil and gas licensing exploration

383. No oil and gas licensed blocks overlap the North Falls offshore project area.

2.13.1.4 Sub-sea cables

384. The southern North Sea has a significant number of cables, primarily telecommunication connections between the UK and continental Europe. The following cables overlap the southern array area:

- GGOW export cable;
- Atlantic crossing-1 (AC-1); and
- BritNed.

385. There are no existing cables in the northern array area, however the GGOW and GWF export cables run to the north of the northern array area boundary.

386. NFOW is aware of proposed cables in the study area and will consider these in the CIA.

2.13.1.5 Dumping and disposal sites

387. The North Falls array areas and offshore export cable corridor overlaps closed disposal sites, including a disposal site for the GWF and the Warren Spring disposal site (see Figure 2.16).

388. The interconnector between the northern and southern array areas has a small area of overlap (approximately 0.4km^2) with the Inner Gabbard East (TH056) disposal site (see Figure 2.16).

2.13.1.6 Ministry of defence activities

389. The following PEXAs overlap or are in proximity to the North Falls project area:

- Kentish Knock – X5119;
- North Galloper – X5121;
- Outer Gabbard – X5117;
- South Galloper – X5120; and
- Gunfleet – X5118.

390. There is also potential for wartime UXO within the southern North Sea (EAOW, 2012). Locations of any UXO would be determined post-consent and mitigation agreed in consultation with Natural England and MMO.

2.13.1.7 Other users

391. A mineral aggregate production area (“Shipwash 507/6”) owned by CEMEX UK Ltd borders the northern array boundary and another production area (“North

Inner Gabbard") operated by Volker Dredging and Britannia Aggregates is located approximately 0.75nm north of the northern array boundary.

392. The offshore export cable corridor has been designed to route around other users as far as possible, including minimising overlap with the planned dredging area for the Harwich Approach Channel.

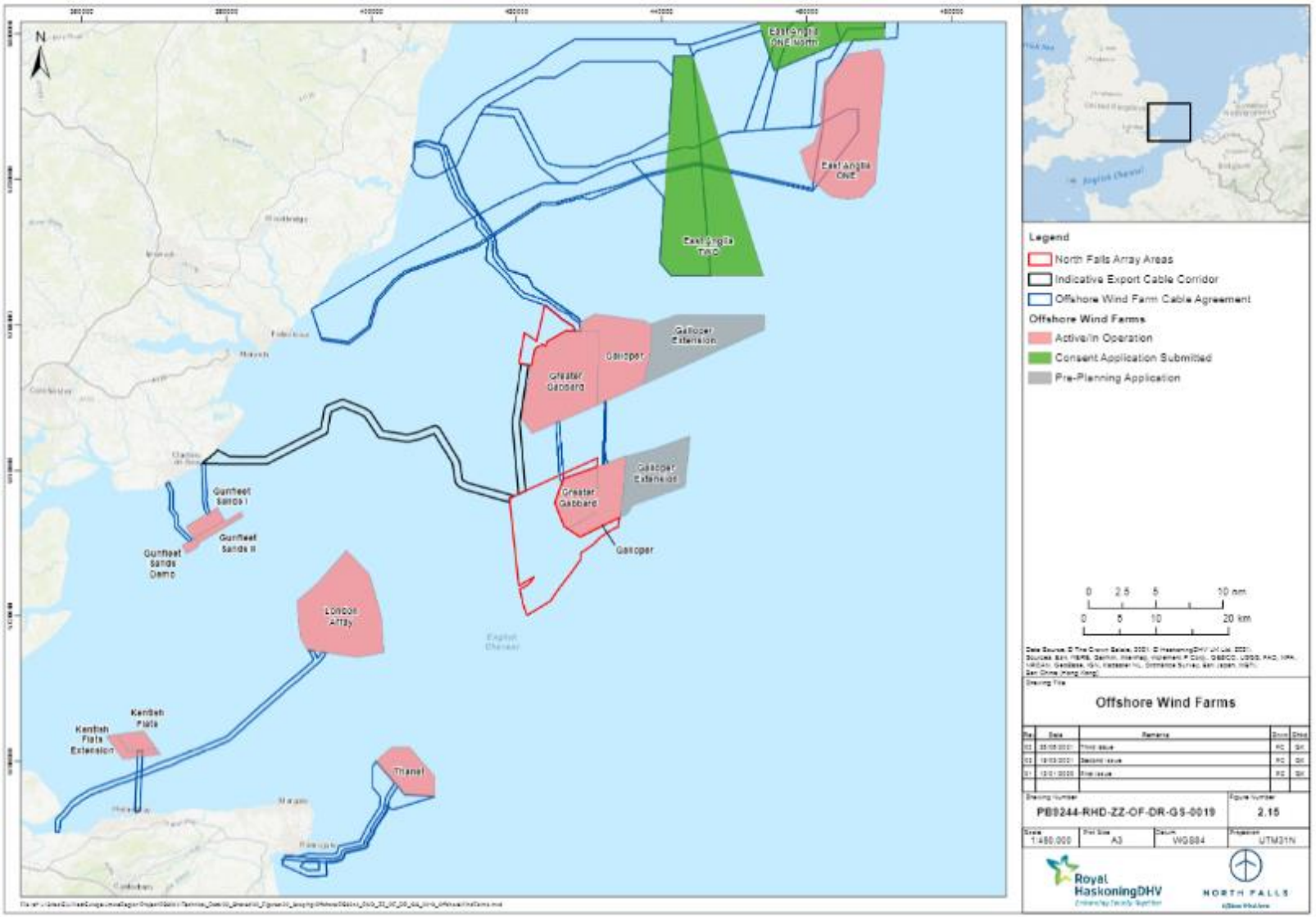

Figure 2.15 Offshore wind farms

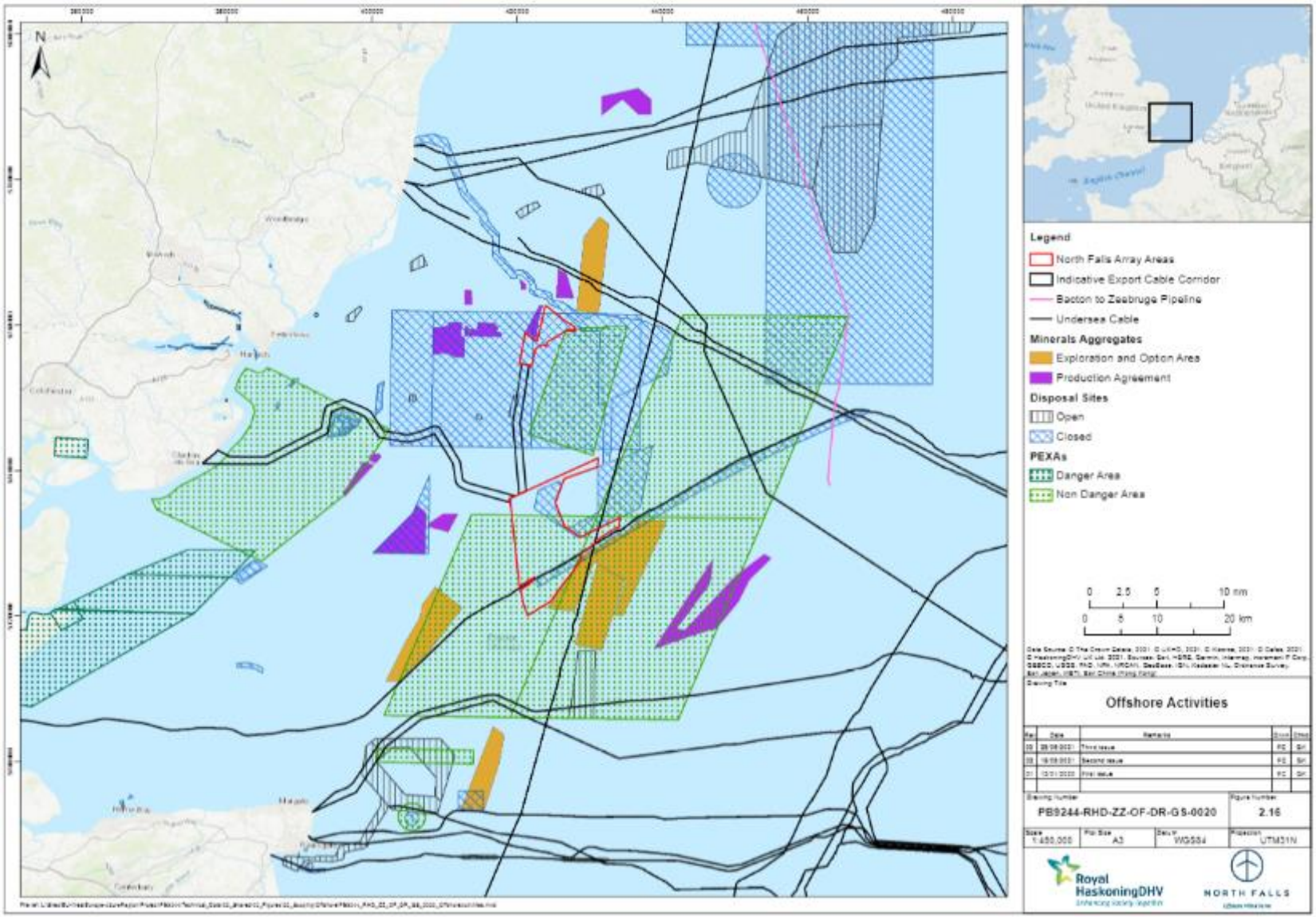

Figure 2.16 Offshore activities

2.13.2 Approach to data collection

393. The Infrastructures and Other Users assessment will be informed by the latest GIS datasets such as those shown in the Figures above. Where there is potential for interactions with other users, NFOW will liaise with the relevant infrastructure owners/operators.

2.13.3 Potential impacts

2.13.3.1 Potential impacts during construction

394. Construction works such as the installation of cables or WTG foundations have the potential to impact on other marine infrastructure and users if within the construction footprint or adjacent. The presence of increased vessel numbers during construction may also impact on other marine users. Cable crossings will also be required.

2.13.3.2 Potential impacts during operation and maintenance

395. The presence of permanent offshore infrastructure has the potential to impact projects either within or adjacent to the offshore project area. Also, vessel movements during operation and maintenance may also affect neighbouring activities.

2.13.3.3 Potential impacts during decommissioning

396. During decommissioning the potential impacts are anticipated to be similar to those described above for the construction phase although on a smaller scale.

2.13.3.4 Potential cumulative impacts

397. The potential impacts of the project site on infrastructure and other users are expected to be non-significant or able to be fully mitigated after consultation with the relevant parties (i.e. through the development of crossing agreements or similar). All other parties (i.e. another wind farm operator) that interact with the same receptor will also need to demonstrate no impact or agree mitigation. Therefore, it is not anticipated that there will be pathways for cumulative impacts. It is therefore proposed that these impacts are scoped out.

2.13.3.5 Transboundary impacts

398. The only potential transboundary receptors are cables owned by international operators, these will be covered in the assessments outlined above, and therefore there will be no separate transboundary assessment.

2.13.3.6 Summary of potential impacts

399. Table 2.31 outlines the effects which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 2.31 Summary of impacts infrastructures on other users

Potential Impact	Construction	Operation	Decommissioning
Potential interference with other wind farms	✓	✓	✓
Physical impacts on subsea cables	✓	✓	✓

Potential Impact	Construction	Operation	Decommissioning
Impacts on disposal sites	✓	✓	✓
Impacts on MoD activities	✓	✓	✓
Cumulative impacts	x	x	x
Transboundary impacts	x	x	x

2.13.4 Approach to assessment

400. NFOW will undertake consultation with all relevant developers, operators and marine users within the vicinity of the North Falls project area to ascertain any concerns relating to the project. Any areas of concern will be identified and considered within the EIA. However, it is likely that any impacts will either be non-significant or able to be fully mitigated after consultation with the relevant parties as discussed above.

401. The EIA will be based on existing data and information gathered through consultation. The EIA will focus on the North Falls project area and consider infrastructure or users that overlap with those boundaries. The assessment will consider agreed or best practice mitigation.

2.14 Offshore inter-relationships

402. The EIA will identify inter-relationships which are likely to result from the construction, operation and decommissioning of North Falls. The inter-relationships relevant to the offshore environment are outlined in Table 2.32.

Table 2.32 Offshore inter-relationships

Offshore topic	Inter-relationships
Marine geology, oceanography and physical processes	Will have effects on: • Benthic and intertidal ecology • Marine water and sediment quality
Marine water and sediment quality	Is affected by: • Marine geology, oceanography and physical processes Will have effects on: • Benthic and intertidal ecology • Fish and shellfish ecology • Marine mammals
Offshore air quality	N/A
Offshore airborne noise	N/A
Benthic and intertidal ecology	Is affected by: • Marine geology, oceanography and physical processes • Marine water and sediment quality Will have effects on: • Fish and shellfish ecology
Fish and shellfish ecology	Is affected by: • Marine water and sediment quality • Benthic and intertidal ecology Will have effects on:

Offshore topic	Inter-relationships
	• Commercial fisheries • Marine mammals • Offshore ornithology
Marine mammals	Is affected by: • Marine water and sediment quality • Fish and shellfish ecology • Shipping and navigation
Offshore ornithology	Is affected by: • Fish and shellfish ecology
Commercial fisheries	Is affected by: • Fish and shellfish ecology • Shipping and navigation Will have effects on: • Socio-economics
Shipping and navigation	Will have effects on: • Marine mammals • Commercial fisheries Will have effects on: • Socio-economics • Tourism and recreation
Offshore archaeology and cultural heritage	Is affected by: • Marine geology, oceanography and physical processes
Aviation and radar	N/A
Infrastructure and other users	N/A

403. The inter-relationships between receptors (shown in Table 2.32) are incorporated within the impacts identified in Sections 2.1 to 2.13, for example:

- Deterioration in water quality due to changes in physical processes (i.e. increased suspended sediment concentrations) (Section 2.2);
- Impacts on benthic ecology as a result of increase suspended sediments (Section 2.5);
- Impacts on fish ecology as a result of increase suspended sediments and smothering (Section 2.6);
- Impacts on marine mammals as a result of impacts on prey species (i.e. fish, Section 2.7);
- Impacts on marine mammals as a result of changes to water quality (Section 2.7);
- Vessel interactions with marine mammals as a result of changes to shipping and navigation (Section 2.7);
- Impacts on commercial fisheries as a result of changes to fish and shellfish ecology (Section 2.9); and
- Increased collision risk for commercial fisheries as a result of changes to shipping and navigation (Section 2.9).

404. The inter-relationship in terms of the combination of all potential impacts on each receptor will also be considered where appropriate. This will not necessarily result in an increase in impact significance, particularly where an impact may counteract another. For example, with regard to marine mammal collision, an animal cannot be struck by a vessel in the offshore project area if it has been displaced by underwater noise.

3 Part Three: Onshore

3.1 Ground conditions and contamination

3.1.1 Existing environment

3.1.1.1 Geology and hydrogeology

405. A review of the published geological mapping available on the BGS Geoindex website (BGS, 2021) indicates the onshore scoping area is underlain by a number of different superficial and bedrock deposits as summarised below in Table 3.1 and shown on Figure 3.1 (superficial deposits) and Figure 3.2 (bedrock geology). It is also considered possible that localised areas of Made Ground associated with, for example, previously developed or infilled land may underly parts of the onshore scoping area.

406. Essex County Council's 'Essex Minerals Local Plan' and 'Polices Map' (Essex County Council, 2021) indicates that the onshore scoping area is located within Mineral Safeguarding Areas protective of sand and gravel resources. A Minerals Consultation Area is also located within the onshore scoping area to the north of Great Holland, it is anticipated that the area is associated with sand and gravel deposits due to the presence of Mineral Safeguarding Areas protective of these resources surrounding the Consultation Area. There are no recorded active mines or quarries within the onshore scoping area.

407. The Environment Agency's groundwater vulnerability map (Environment Agency, undated) indicates that the geology underlying the onshore scoping area has a groundwater vulnerability range from 'low' to 'high'. A low groundwater vulnerability classification indicates that these areas provide the greatest protection to groundwater from pollution, whereas a high groundwater vulnerability indicates that the area can easily transmit pollution to groundwater. Parts of the onshore scoping area are classified as being underlain by unproductive strata and therefore have not been assigned a vulnerability rating.

408. The geology underlying the onshore scoping area is designated to reflect the importance of the aquifers present and the groundwater resource they provide. The Environment Agency designation maps (Environment Agency, undated) show that the majority of the onshore scoping area is fed by superficial deposits which are designated as Secondary A and B Aquifers. The superficial deposits are underlain by bedrock including the Thames Group, which is classified as unproductive strata, and isolated areas of the Crag Formation, designated as a Principal Aquifer. The aquifers supported by the geology within the onshore scoping area are detailed in Table 3.1.

Table 3.1 Summary of geology and aquifer designations

Stratum	Unit	Aquifer Designation
Superficial deposits	Kesgrave Catchment Subgroup – sand and gravel	Secondary A Aquifer
	Alluvium – clay and silt	Secondary A Aquifer
	Cover Sand – clay, silt and sand	Secondary B Aquifer
	Head – gravel, sand and clay	Secondary A Aquifer

Stratum	Unit	Aquifer Designation
Bedrock	Thames Group – clay, silt and sand	Unproductive
	Crag Formation - sand	Principal Aquifer

409. The north-western half of the onshore scoping area is located within a Zone III Total Catchment SPZ. Part of the onshore scoping area located between Lawford and Manningtree is located within a SPZ II with a SPZ I located approximately 100m north of the onshore scoping area boundary.

410. A review of the Environment Agency Water Resources viewer (Environment Agency, undated) indicates that there are approximately 53 groundwater abstractions licence locations within the onshore scoping area.

3.1.1.2 Hydrology

411. A number of inland rivers are located either wholly or partially within the onshore scoping area, including:

- Holland Brook;
- Sixpenny Brook;
- Weeley Brook;
- Tendering Brook;
- Bentley Brook; and
- Bromley Brook.

412. Numerous smaller streams and ponds/lakes are also located within the onshore scoping area. Some of the smaller streams may be tributaries of the larger named watercourses listed above.

413. A review of the Environment Agency Water Resources viewer (Environment Agency, undated) indicates that there are in excess of 50 surface water abstraction licence locations within the onshore scoping area.

414. Hydrology is considered in further detail in Section 3.3.

3.1.1.3 Designated sites

415. There is one geological SSSI located within the onshore scoping area (see Figure 3.3):

- Ardleigh Gravel Pit SSSI.

416. A further two ecological SSSIs are located within the onshore scoping area:

- Weeleyhall Wood SSSI; and
- Holland Haven Marshes SSSI and LNR.

417. There are also 28 areas of ancient woodland located within the onshore scoping area.

418. Further information on ecological designated sites can be found in Section 3.5.

419. The onshore scoping area is also located within the following Nitrate Vulnerable Zones (NVZ):

- Sandlings and Chelmsford NVZ (groundwater);
- Holland Brook NVZ (surface water);
- Tenpenny Brook NVZ (surface water); and
- Salary Brook NVZ (surface water).

3.1.1.4 Land quality

420. The onshore scoping area is largely agricultural in nature, which represents the potential for both diffuse and point sources of ground contamination to be present in relation to historical and current agricultural activities. Settlements within the onshore scoping area including, but not limited to, Great Holland, Little Clacton, Weeley, Mill Green, Great Bromley and Bromley Cross, also have the potential to contain historical sources of ground contamination due to past industrial use.

421. Twelve historical landfill sites have been identified within the onshore scoping area (Figure 3.4). The permitted wastes at these sites include inert, industrial, commercial, household and liquid sludge, however each site was not permitted to receive all of the waste types listed. Three authorised landfill sites are also located within the onshore scoping area, located to the west of Burnt Heath (Figure 3.4). The sites are permitted to accept household, commercial and industrial waste.

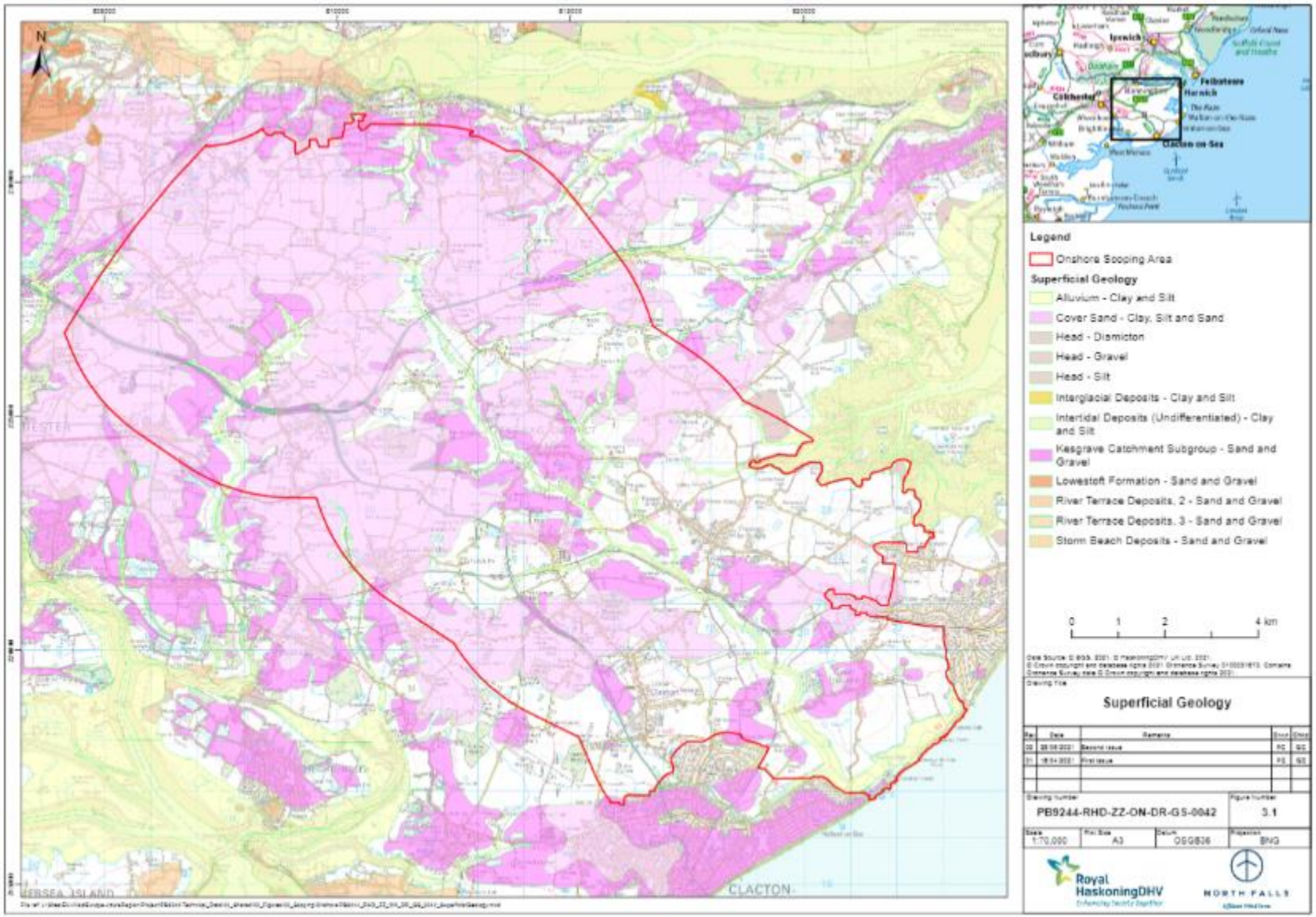

Figure 3.1 Superficial geology

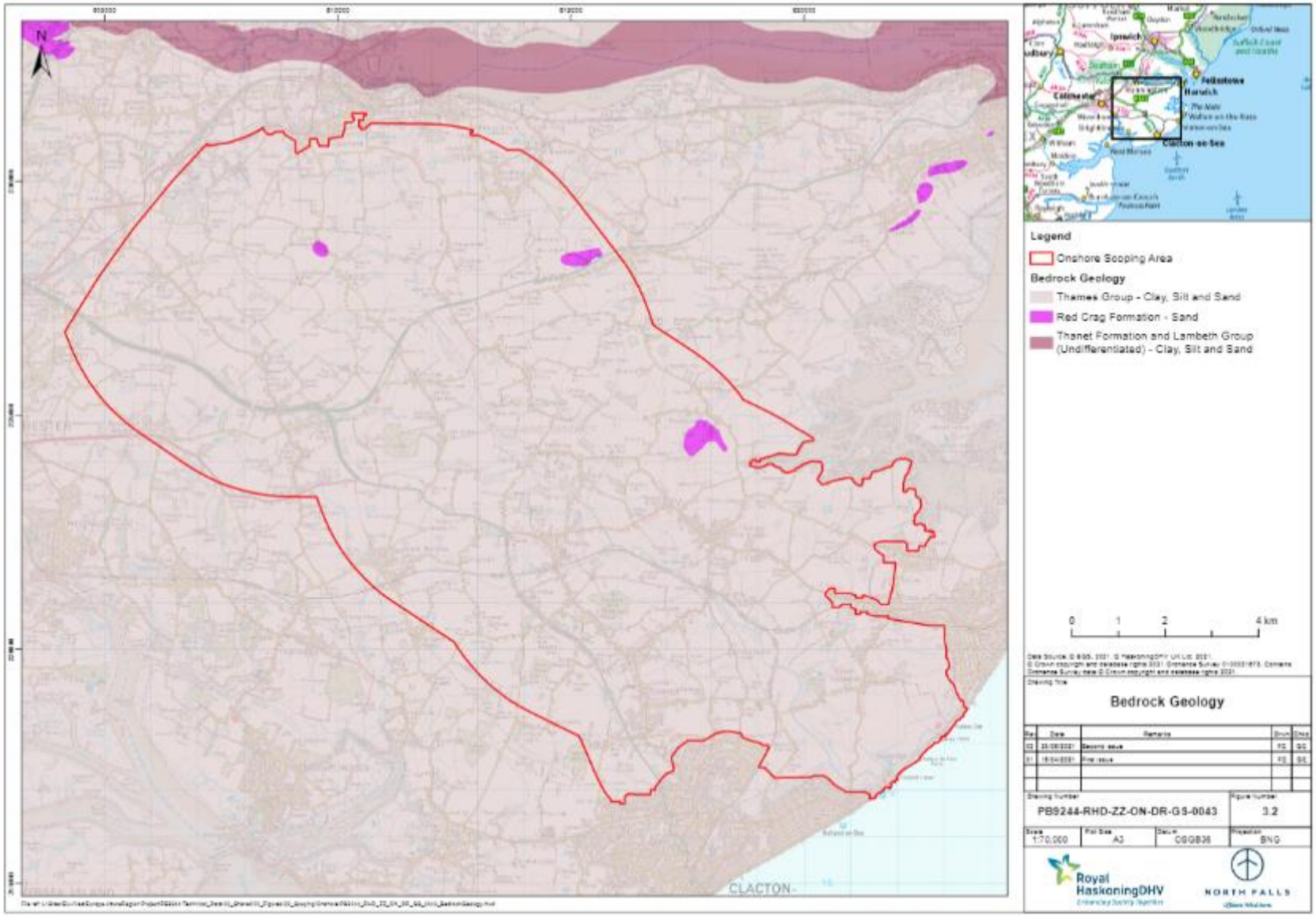

Figure 3.2 Bedrock geology

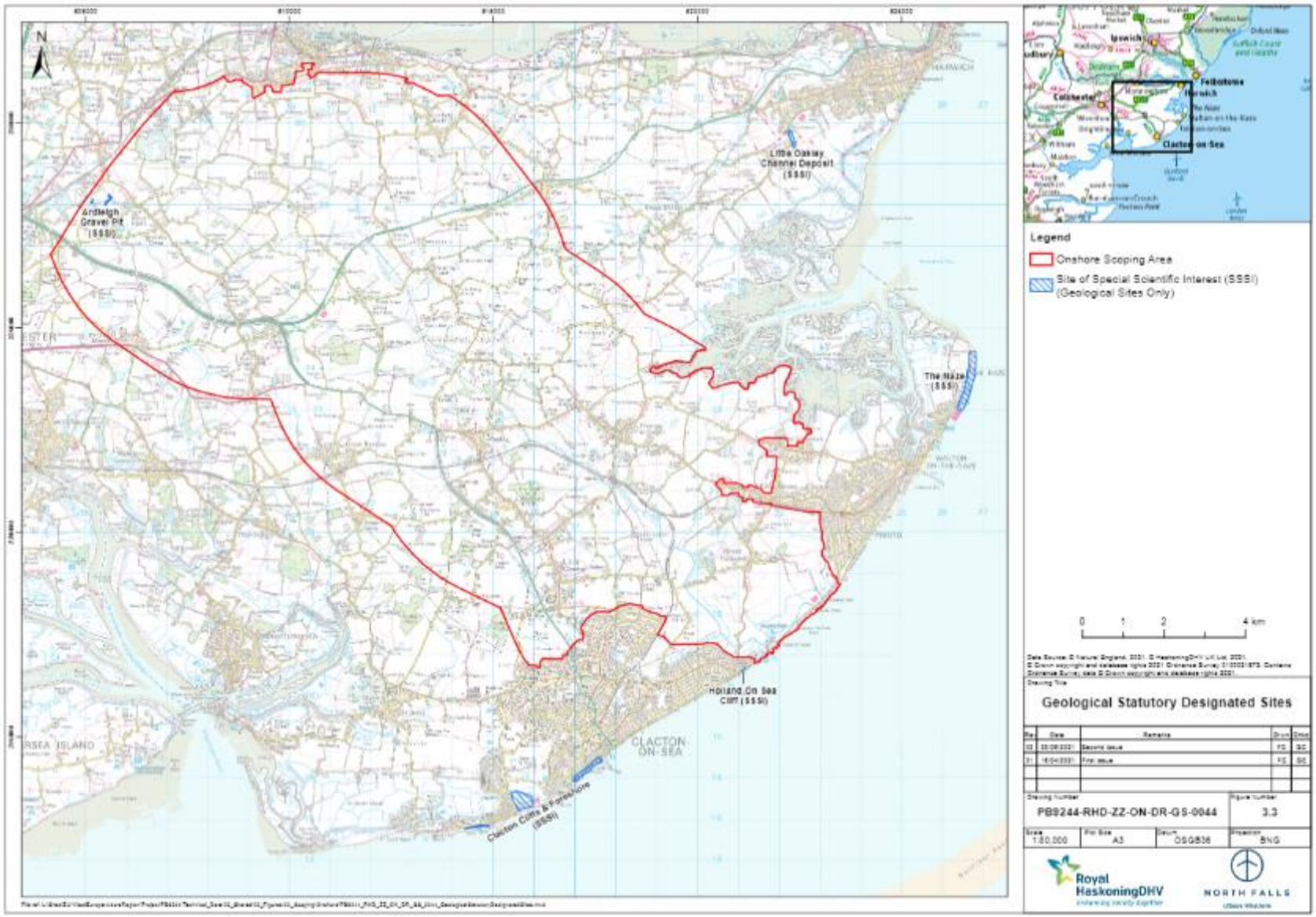

Figure 3.3 Geological statutory designated sites

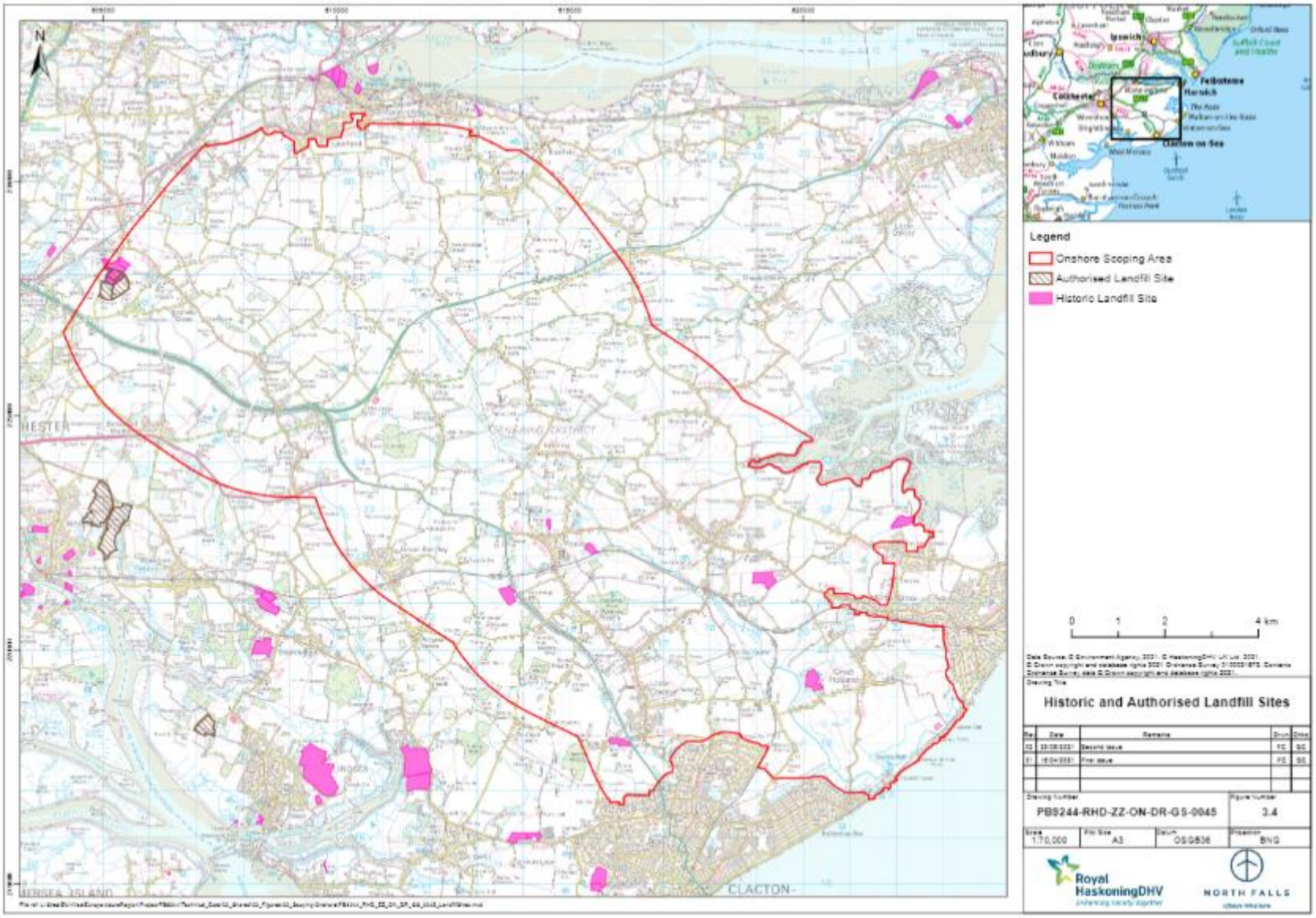

Figure 3.4 Historic and authorised landfill sites

3.1.2 Approach to data collection

422. The existing environment will be characterised using the data sources set out in Table 3.2.

Table 3.2 Existing datasets

Data Source	Data Contents
Envirocheck Report	Historical maps, site sensitivity data, trade directory and regulatory information.
Public Health England	Radon gas risk.
Environment Agency	Historical landfill sites, permitted waste sites – authorised landfill site boundaries, aquifer designations, groundwater abstractions and groundwater SPZs.
Coal Authority	Closed mining sites.
BGS	Solid geology, superficial geology and borehole records. Mineral extraction sites.
Multi Agency Government Information for the Countryside (MAGIC) map application	Ramsar sites, SPAs, SACs, SSSI, National and Local Nature Reserves, groundwater vulnerability and aquifer designations – superficial deposits and bedrock.
Essex County Council	Mineral Safeguarding Areas and groundwater abstractions. Private groundwater abstractions, brownfield register, Part 2A sites determined as contaminated land.

423. Any additional datasets will be identified through ongoing consultation with stakeholders.

3.1.3 Potential impacts

3.1.3.1 Potential impacts during construction

424. The following potential construction stage impacts have been identified:

- Direct impacts to the Secondary A Aquifers and Secondary B Aquifers and the superficial deposits, SPZs and groundwater abstractions associated with them may occur due to the intrusive nature of earthworks, trenching and piling (if required). The significance of the disturbance will be dependent on the depth of the aquifer unit in relation to the proposed depth of the intrusive works. During construction, surface layers will be excavated allowing increased infiltration of rainwater and surface run-off to the subsurface. This could potentially mobilise existing sources of contamination and create new pathways to the superficial aquifers. This could lead to a deterioration in groundwater quality.
- Direct impacts to the Principal Aquifer of the Crag Formation and SPZs, and associated groundwater abstractions, may occur from deep ground workings associated with trenchless crossings. There is the potential for drilling mud to leak along the drill path, or from the immediate area, which could cause contamination of groundwater and a deterioration in groundwater quality. Trenchless techniques also have the potential to create new preferential pathways allowing existing sources of contamination

to migrate into both the Principal and Secondary Aquifers and deteriorate groundwater quality.

- Direct impacts to the Principal Aquifer and SPZs may also occur as a result of piling. Piling may be required to provide foundations for the onshore substation, which could potentially be located in the area associated with the Principal Aquifer. Piling has the potential to create new preferential pathways through superficial deposits allowing existing sources of contamination to migrate into the underlying Principal Aquifer leading to a deterioration in groundwater quality.
- Direct impacts to surface water receptors and associated ecological habitats from existing sources of contamination by the creation of new pathways to surface waters via groundwater, installation of temporary drainage or surface water run off during construction. This could result in a reduction in WFD status.

425. The construction works could also introduce new sources of contamination i.e. from the storage of fuels and chemicals or via spillages and leaks. These have the potential to migrate into the underlying aquifers or surface waters. Human receptors may also be directly exposed to these contaminants during construction works.

426. Excavation activities, including trenchless techniques, surface excavation and earthworks during cable laying and site preparation for the onshore substation and other onshore infrastructure has the potential to mobilise existing sources of ground contamination. This could result in impacts to human and ecological receptors through the generation of potentially contaminated dusts, vapours or ground gases released during construction works.

427. Direct impacts to geologically designated sites through construction activities such as excavation works during cable laying and site preparation.

428. Construction activities have the potential to result in direct impacts to Mineral Safeguarding Areas located within the onshore scoping area through prevention of future extraction of identified reserves.

3.1.3.2 Potential impacts during operation and maintenance

429. Installation of cables along the onshore cable route and the permanent footprint of both landfall and the onshore substation infrastructure within the onshore scoping area would prevent future extraction of mineral resources within the permanent footprint of the project for the duration of the project's lifetime.

430. Indirect impacts along the onshore cable route and the permanent footprint of both landfall and the onshore substation infrastructure within the onshore scoping area may occur as a result of leakages of stored materials or spillages of materials during the operational phase.

431. Additional significant impacts from the operation of the project are considered unlikely. Routine operation and maintenance activities will follow standard procedures therefore minimising any potential impacts.

3.1.3.3 Potential impacts during decommissioning

432. It is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower. It is anticipated that there would be no additional impacts associated with mineral sterilisation during the decommissioning phase.

3.1.3.4 Potential cumulative impacts

433. Cumulative effects on ground conditions and contamination resulting from the effects of the project and other developments will be assessed in accordance with the guidance and methodologies set out in Section 1.8. The assessment will be dependent on the availability and accessibility of information for other developments.

3.1.3.5 Summary of potential impacts

434. Table 3.3 outlines the effects which are proposed to be scoped into the EIA.

Table 3.3 Summary of impacts relating to ground conditions and contamination

Potential Impact	Construction	Operation	Decommissioning
Impacts on human health both on and off site from contamination sources	✓	✓	✓
Direct impacts on groundwater quality and groundwater resources from contamination sources and construction methods	✓	✓	✓
Impacts on surface water quality and the ecological habitats they support, from contamination	✓	✓	✓
Physical impacts on geological designated sites (SSSIs)	✓	x	✓
Loss, damage or sterilisation of mineral resources	✓	✓	x
Cumulative impacts	✓	✓	✓

3.1.4 Approach to assessment

435. As part of the EIA process, the existing environment with respect to ground conditions and contamination will be described, including, but not limited to, the following:

- hydrology;
- geology and mineral resources;
- hydrogeology, aquifer designations and groundwater resources;
- historical land use and potential contamination sources; and
- sensitive land uses.

436. The baseline for ground conditions and contamination will be established following current guidance (see below) which advocates a phased risk-based approach. A Land Quality Desk Study and Preliminary Risk Assessment (PRA) will be undertaken to develop a Preliminary Conceptual Site Model (CSM) to aid in the identification of potential sources of contamination at the site and the risk they may pose to sensitive receptors that currently exist at the site or will be introduced by the project e.g. construction workers. The PRA will include the area within the proposed application boundary plus a 250m buffer zone to assess for potential sources of contamination, discharge consents, pollution incidents, landfills and contemporary trade entries. In addition to the 250m buffer zone, a 1km buffer zone will also be included within the PRA within which historical maps will be reviewed to identify potential contaminant sources in the surrounding area. Both groundwater and surface water abstraction points within the 1km buffer zone will also be assessed as part of the PRA.

437. The key guidance which will be used to inform the assessment will include:

- Defra 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance', PB13735 (2012);
- The National Planning Policy Framework (NPPF) (2019);
- Environment Agency 'Land Contamination: Risk Management Framework', October 2020;
- Department of the Environment 'Industry Profiles for previously developed land' (1995).
- Construction Industry Research and Information Association (CIRIA) 'Assessing Risks Posed by Hazardous Ground Gases to Buildings', C665 (2007);
- British Standard 'Investigation of Potentially Contaminated Sites – Code of Practice', BS EN 10175:2011;
- British Standard 'Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs)' BS 8576:2013;
- British Standard 'Code of Practice for Ground Investigations', BS 5930:2015; and
- CIRIA 'Contaminated Land Risk Assessment –A Guide to Good Practice', C552 (2001).

438. The desk-based study forms the initial step in the assessment of ground conditions and provides valuable information for the design of intrusive investigation works that may be required in the event of the PRA identifying potentially unacceptable risks associated with the ground conditions. The PRA will be progressed based on data obtained from a Envirocheck Report which incorporates historical maps, site sensitivity data, and regulatory information, and will be supplemented with information from those sources listed in Table 3.2.

439. Following the identification of the proposed application boundary, further liaison with the stakeholders will be undertaken to agree the approach and

methodology to data collection for EIA purposes and the specific assessment methodology. A detailed method statement will be developed and agreed with stakeholders accordingly.

3.2 Onshore air quality

3.2.1 Existing environment

440. Tendring District Council is part of the Essex Air Quality Consortium, which consists of all local authorities in Essex, in addition to several other stakeholders. The Essex Air website (Essex Air Quality Consortium, 2021) provides air quality information for each of the member authorities; the website states that the district of Tendring is predominantly rural, with the main source of air pollution being road traffic emissions, particularly from the major A roads (the A133 and A120 trunk roads).

441. A review of the Defra 'UK-AIR' Air Quality Management Areas (AQMAs) Interactive Map (Defra, 2021) showed that Tendring District Council has not declared any statutory AQMAs within its area of jurisdiction. As such, air quality can be considered to be generally good within the onshore scoping area.

442. Tendring District Council has not published any recent air quality Annual Status Reports either on its own website or on the Essex Air website; the most recent available report is from 2012 which reported 2011 data. As such, information on background air pollution concentrations across the area was obtained from Defra's background pollution maps (Defra, 2020), which provides concentrations of nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of 10µm or less (PM_{10}) and of 2.5µm or less ($PM_{2.5}$) across 1km x 1km grid squares across the UK. These concentrations are presented as maximum, minimum and average values across the onshore scoping area for 2021 in Table 3.4. It should be noted that the maps are based on a 2018 reference year and future year projections do not take into account the short or long-term impacts of the Covid-19 pandemic on pollutant concentrations.

Table 3.4 Background pollutant concentrations across the onshore scoping area

	Mapped Background Concentration 2021 (µg.m^{-3})		
Parameter	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Minimum	6.68	11.83	8.05
Maximum	18.81	17.36	10.91
Average	7.82	14.55	8.91
Air Quality Objective	40 µg.m^{-3}	40 µg.m^{-3}	25 µg.m^{-3}

443. As shown in Table 3.4, maximum background pollutant concentrations across the scoping area are less than 50% of the respective air quality objectives. There is a larger variation in minimum and maximum concentrations of NO_2 than particulate matter; this is likely due to background NO_2 being higher in proximity to more urban areas or major roads, and correspondingly lower in areas with very few pollution sources. Concentrations of particulate matter may show less variation as this pollutant is not only emitted by road traffic or industry

but has a natural component which can form a significant proportion of the total concentration, particularly in coastal areas where sea salt aerosol is present.

444. Receptors which may be sensitive to changes in air quality are as follows:

- Human receptors, present within scattered small settlements across the onshore scoping area, and more isolated residential properties;
- Holland Haven Marshes SSSI and Holland Haven LNR, designated for its vascular plant assemblage, invertebrate assemblage and breeding and overwintering bird species;
- Weeleyhall Wood SSSI (and Essex Wildlife Trust Reserve), designated for woodland habitat;
- Great Holland Pits Essex Wildlife Trust Reserve
- A number of ancient woodlands scattered across the onshore scoping area; and
- Hamford Water SAC, SPA, Ramsar, SSSI and NNR is located adjacent to the onshore scoping area and is designated for its intertidal habitats and the Fisher's estuarine moth which may be sensitive to impacts of air pollution on its habitat.

3.2.2 Approach to data collection

445. It is not anticipated that primary air quality data will be collected as part of the project. However, it is noted that the locations of air quality monitoring sites operated by Tendring District Council are currently unknown, as their most recent air quality Annual Status Report is not available within the public domain. If Tendring District Council continues to undertake air quality monitoring, particularly at roadside locations, it is expected that this would be sufficient for use within the air quality assessment. If there are no available monitoring locations within the air quality study area (once defined), then a site-specific monitoring survey of at least six months duration may be required to provide suitable baseline data.

446. The assessment will also use data obtained from the following sources:

- Background pollution mapping from Defra (Defra, 2020); and
- Background pollution concentrations and deposition at designated ecological sites from the Air Pollution Information System (APIS) (Centre for Ecology and Hydrology (CEH), 2021b).

447. The spatial area over which baseline data are collected will be dictated by the air quality study area, once defined. The maximum extents of the study area are typically defined by the extent of the road network affected by the project.

3.2.3 Potential impacts

3.2.3.1 Potential impacts during construction

448. Impacts during construction may occur at human and ecological receptors as a result of the following:

- The generation of dust and particulate matter during onshore construction works, e.g. from earthworks and stockpiling of soils; and
- Emissions from construction phase plant and road vehicles generated during construction will contribute to existing pollutant concentrations at human receptors and pollutant concentrations and deposition levels at designated ecological sites.

3.2.3.2 Potential impacts during operation and maintenance

449. Air quality impacts during the operational phase of the project are expected to be negligible. During operation, the proposed built infrastructure would not give rise to any emissions to air, and maintenance activities would generate a nominal amount of additional road vehicles which would not give rise to any significant air quality effects. It is therefore proposed to scope operational phase air quality out of the ES.

3.2.3.3 Potential impacts during decommissioning

450. It is anticipated that impacts associated with decommissioning would be similar in nature to those experienced during construction, although it is likely that there would be a lower magnitude of effect, particularly if some subsurface infrastructure is left in-situ.

3.2.3.4 Potential cumulative impacts

451. Onshore cumulative impacts will be considered as set out in Section 1.8. There is a potential for cumulative impacts to be experienced as a result of concurrent construction activities with other plans or projects, or as a result of cumulative road traffic emissions on road links used by the project.

3.2.3.5 Summary of potential impacts

452. Table 3.5 outlines the effects which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

453. In summary, air quality impacts have the potential to occur predominantly within the construction and decommissioning phases due to the nature of the works to be undertaken. During operation, there are anticipated to be negligible emissions to air, and it is therefore proposed to scope these impacts out of the assessment.

Table 3.5 Summary of impacts relating to air quality

Potential Impact	Construction	Operation	Decommissioning
Impacts on human and ecological receptors as a result of dust and particulate matter emissions	✓	x	✓
Impacts on human and ecological receptors as a result of plant and machinery emissions	✓	x	✓
Impacts on human and ecological receptors as a result of road traffic emissions	✓	x	✓

3.2.4 Approach to assessment

454. Baseline data will be used to characterise existing air quality within the study area. Receptors will be identified using OS mapping data for human receptors and the Defra MAGIC website for ecological sites.

455. The air quality assessment will be undertaken in accordance with the following guidance:

- Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction;
- IAQM and Environmental Protection UK (EPUK) (2017) Land-Use Planning and Development Control: Planning for Air Quality;
- Natural England (2018) Natural England's Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations;
- IAQM (2020) A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites; and
- Defra (2018) Local Air Quality Management Technical Guidance LAQM.TG (16).

456. A risk-based assessment of the potential for impacts of dust generated during the construction of the project will be undertaken in accordance with IAQM guidance (IAQM, 2016). The risk of dust impacts will be determined for both human and ecological receptors, and mitigation measures will be recommended which are commensurate with the identified risk, to ensure that significant impacts would not occur.

457. Non-Road Mobile Machinery (NRMM) and plant used during construction can increase air emissions which can impact upon human and ecological receptors. Defra technical guidance (Defra, 2018) states that emissions from NRMM on construction sites are typically unlikely to lead to significant air quality impacts. However, intensive construction activities, for example HDD works, may temporarily increase pollutant concentrations in the vicinity of receptors. The location of human and ecological receptors in relation to construction works will be reviewed to determine whether any further assessment of emissions from NRMM is required; if required, this assessment may be qualitative or quantitative depending on the scale and nature of activities, their duration and baseline pollutant concentrations.

458. The increase in construction traffic flows generated by the project will be screened using criteria in IAQM and EPUK (IAQM and EPUK, 2017) and Natural England (Natural England, 2018) guidance. Where traffic flows exceed the screening criteria and there are relevant human or ecological receptors located within 200m of the road, a detailed dispersion modelling assessment will be undertaken to consider impacts at these locations. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be predicted at human receptors, and concentrations of NOx, ammonia and associated nutrient nitrogen and/or acid deposition will be calculated at ecological receptors. The significance of effects at human receptors will be determined in accordance with IAQM and EPUK guidance

(IAQM and EPUK, 2017). The significance of impacts on ecological receptors will be considered by the project ecologists.

459. The approach to the assessment would be discussed and agreed with stakeholders through the EPP prior to commencement.

3.3 Water resources and flood risk

3.3.1 Existing environment

3.3.1.1 Surface water drainage and quality

460. The majority of the onshore scoping area is covered by two main surface water catchments[2] (see Figure 3.5):

- Holland Brook catchment: The river rises near Little Bromley and flows in a south-easterly direction to Holland Haven where it meets the sea. It is a largely rural catchment and is fed by numerous tributaries. These include Tendring Brook, which flows in a westerly direction into Holland Brook just south of the village of Tendring. In the lower reaches of the catchment, the main river bisects the Holland Haven Marshes SSSI, an area of neutral grassland in 'favourable' condition, reclaimed estuarine saltmarsh and freshwater marsh with an extensive ditch system (Natural England, 2021a). Additional key tributaries include Picker's Ditch which joins the main river from the west through Clacton-on-Sea, and Frinton Brook which flows west from Frinton-on-Sea into the Holland Brook, close to its mouth;
- Tenpenny Brook catchment: The river rises just south-west of Great Bromley, from where it flows in a southerly direction towards Mill Dam and into Alresford Creek and the Colne Estuary, designated as a SSSI for littoral sediment, inshore sublittoral sediment and neutral grassland (Natural England, 2021b).

461. The onshore scoping area also includes parts of the following surface water catchments (Figure 3.5):

- Sixpenny Brook;
- Salary Brook;
- Wrabness Brook;
- Ramsey River;
- St. Osyth Drain;
- Hamford Water;
- Stour; and
- Colne.

462. The onshore scoping area comprises eight WFD surface water body catchments identified by the Environment Agency in the Anglian River Basin

[2] As defined on the basis of hydrological catchments by the Environment Agency for the purposes of the Water Framework Directive.

Management Plan (RBMP) (Environment Agency, 2020). A summary of each WFD surface water body and its water quality status is presented in Table 3.6. WFD ecological status is predominantly at 'Moderate' status across the identified surface water catchments, however, for several catchments fish and invertebrates are assigned a 'Poor' status. This is largely attributed by the Environment Agency to physical barriers causing ecological discontinuity, poor soil management and land drainage.

463. The physico-chemical status of the surface water bodies is 'Moderate' or 'Good' for all water bodies identified. However, phosphate and dissolved oxygen levels are elevated in some catchments due to poor agricultural management, urbanisation, and sewage discharges from the water industry. The hydrological regime supports good status in the majority of catchments except for St. Osyth Drain, Sixpenny Brook and Wrabness Brook due to surface and groundwater abstraction from agriculture and land management.

Table 3.6 WFD surface water bodies

WFD Surface Water Body	Designation	Water Quality
Essex GB650503520001	Heavily modified coastal water body designated for flood and coastal protection.	Moderate ecological status
Holland Brook GB105037077810	Heavily modified river water body designated for flood protection and land drainage.	Moderate ecological status.
Tenpenny Brook GB105037041310	Heavily modified river water body designated for land drainage.	Moderate ecological status.
Sixpenny Brook GB105037034200	Heavily modified river water body designated for land drainage.	Poor ecological status.
Salary Brook GB105037041320	Heavily modified river water body designated for land drainage.	Moderate ecological status.
St Osyth Drain GB105037034170	Heavily modified river water body designated for recreation and land drainage.	Moderate ecological status.
Wrabness Brook GB105036040800	Heavily modified river water body designated for land drainage.	Good ecological status
Ramsey River GB105036040830	Heavily modified river water body designated for flood protection and land drainage.	Moderate ecological status.

3.3.1.2 Flood risk

464. Flood zone maps (Environment Agency, 2021) show the majority of the onshore scoping area to be within Flood Zone 1 (Figure 3.6). This is land with less than a 1 in 1,000 annual probability of river flooding (<0.1%). Land immediately adjacent to the Holland Brook and its tributaries would be at greater risk of flooding, within areas here located within both Flood Zone 2 (land between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%)) or 3 (land that has a 1 in 100 or greater annual probability of river flooding (>1%)). The area of highest flood risk within the onshore scoping area is land to the west of Hamford Water and land within the lower reaches of the Holland Brook catchment, where there is potential for both river and coastal flooding.

3.3.1.3 Groundwater

465. The bedrock geology of the onshore scoping area is dominated by the sedimentary Thames Group of Clay, Silt and Sand, classified as unproductive strata. There is one, small isolated patch of Red Crag sedimentary bedrock at Beaumont which is classified as supporting a principal aquifer (an aquifer of highly permeable rocks that support high levels of water storage).

466. Superficial deposits of glacial sands and gravels, river terrace deposits and Diamicton till overlay the bedrock in this area (BGS, 2021). These superficial units support several Secondary A aquifers (smaller aquifers capable of supporting water supplies at a local scale) and Secondary B aquifers (lower permeability layers which can store limited amounts of groundwater). Further detail on the aquifers which underlie the onshore scoping area are provided in Section 3.1.

467. Under the WFD, the Essex Gravels groundwater body underlies a large proportion of the onshore scoping area (Figure 3.7). This water body is at 'Poor' overall status and is affected by diffuse agricultural pollution pressures of poor livestock management and poor nutrient management (Environment Agency, 2021).

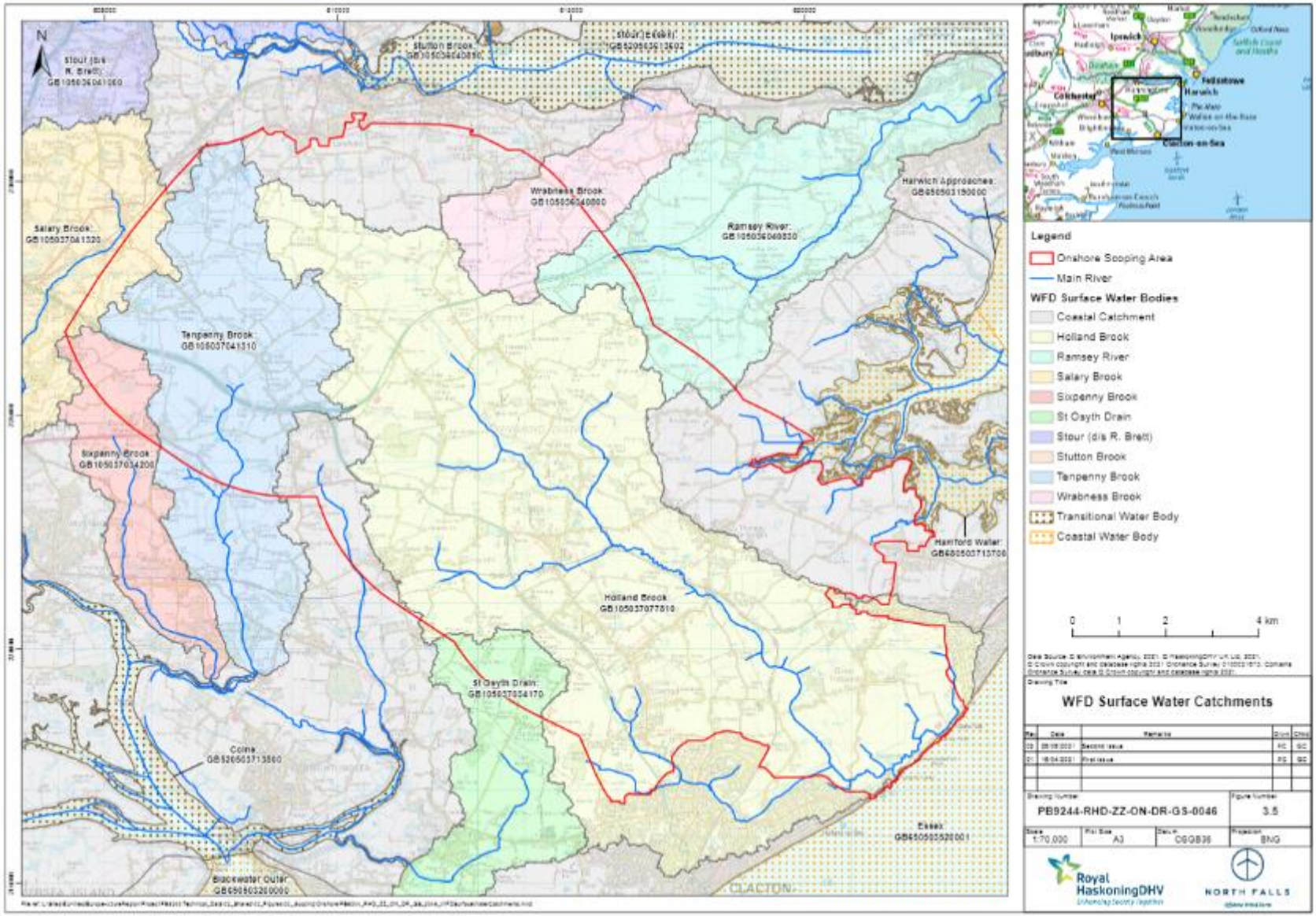

Figure 3.5 WFD surface water catchments

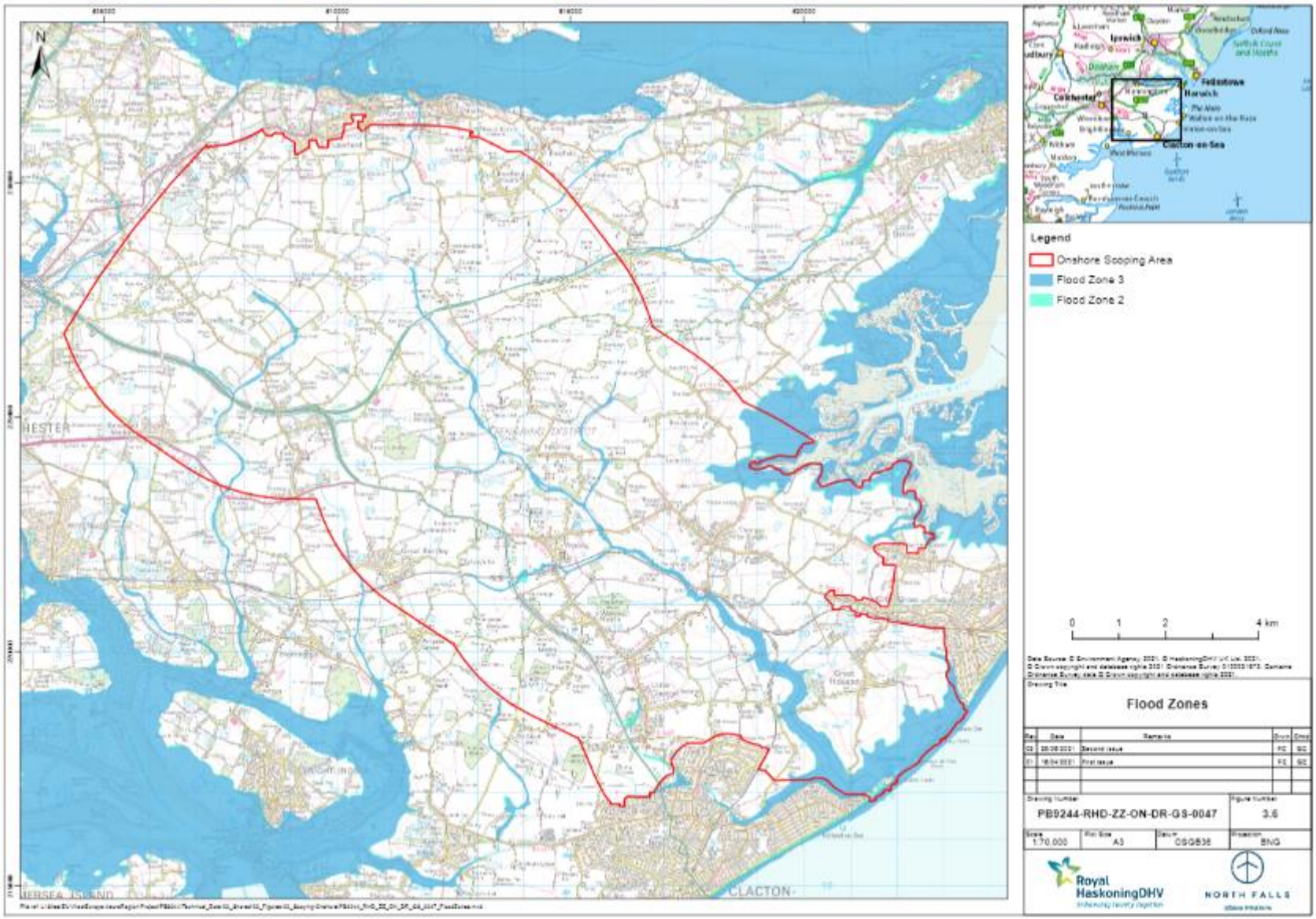

Figure 3.6 Flood zones

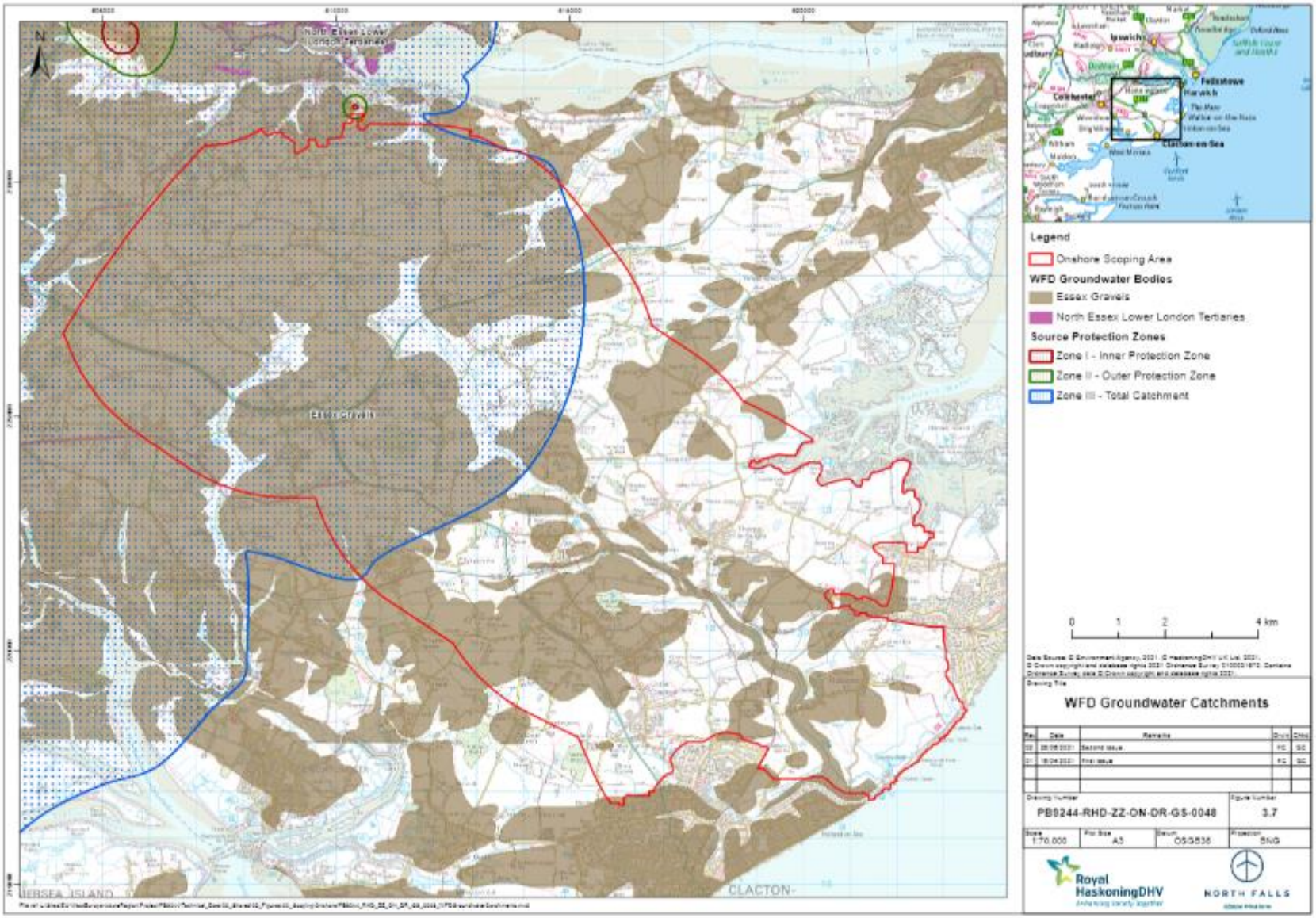

Figure 3.7 WFD groundwater catchments

3.3.2 Approach to data collection

468. Table 3.7 outlines secondary datasets that have been used to inform this section and will also be used to inform the EIA.

Table 3.7 Secondary datasets to be used

Data Source	Data Contents
Environment Agency Catchment Data Explorer https://defra-cde-beta.publishmydata.com/catchment-planning	WFD surface water and groundwater catchments (2020)
Environment Agency https://flood-map-for-planning.service.gov.uk/	Flood zones (2021)
Historic flood incident information relating to high, surface water and/or drainage flooding.	Lead Local Flood Authority (LLFA) (2021)
Any previous site investigation and public sewer records.	LLFA and Environment Agency (2021)
Defra https://magic.defra.gov.uk/MagicMap.aspx	MAGIC map showing designated site, aquifer designations and SPZs.
BGS https://mapapps.bgs.ac.uk/geologyofbritain/home.html	Geological mapping (1: 50 000 scale) (2021)
Natural England (e.g. Holland Haven Marshes SSSI) https://designatedsites.naturalengland.org.uk/	Data on designated sites

469. Primary data will be also be collected to inform the EIA and is outlined in Table 3.8. A geomorphology baseline survey will be undertaken to acquire primary data on the watercourses which are scoped into the next stage of the EIA. This will be carried out in accordance with best practice geomorphological walkover methodologies. Agreement will be obtained from the Environment Agency prior to undertaking the survey. Any additional primary or secondary datasets will be identified through ongoing consultation with stakeholders.

Table 3.8 Primary data to be used in EIA

Data content	Timing	Data information
Geomorphology baseline	TBC	The geomorphology baseline survey would collect information about the existing condition of the major watercourses within the onshore scoping area. It will specifically focus on reaches where crossings of main rivers or other sensitive watercourses are proposed.

3.3.3 Potential impacts

470. The Water Resources and Flood Risk assessment is likely to have key inter-relationships with Ground Conditions and Contamination and Onshore Ecology.

3.3.3.1 Potential impacts during construction

471. Direct disturbance of surface water bodies: Construction activities within the onshore scoping area could potentially directly impact upon the geomorphology, hydrology, water quality and physical habitats of the surface water bodies identified. This disturbance could occur from the installation of the buried electrical cables and associated infrastructure such as temporary access crossings over surface watercourses. It could also occur in the event of an accidental release ('frack-out') of drilling fluid (bentonite) during HDD activities used to install cables below sensitive watercourses.

472. Increased sediment supply: Construction activities could increase potential for soil erosion and supply of fine sediment (e.g. clays, fine silts and sands) to surface watercourses. This could arise from earthworks activities and vegetation cover removal to construct the onshore cable route and necessary temporary and permanent infrastructure. Increased sediment supply would increase turbidity levels within the water column resulting in greater fine sediment deposition on the channel bed. This could in turn alter local geomorphological adjustment rates and impact upon in-channel morphological features. Higher sediment loads entering the channel could also smother bed habitats, reducing light penetration and decreasing temperature and dissolved oxygen levels. These impacts could adversely affect stream biota such as fish, macroinvertebrates and macrophytes.

473. Supply of contaminants to surface and groundwaters: The operation of construction machinery working in or adjacent to surface watercourses has the potential to accidentally release lubricants, fuels and oils into a surface water body. This could also be caused through spillage, leakage and in-wash from vehicle storage areas following rainfall, accidental release of foul waters (e.g. from welfare facilities) and construction materials such as concrete and inert drilling fluids from any trenchless crossings. Such contaminants could enter the aquatic system and adversely affect its physico-chemistry. This could have associated impacts upon stream biota. Any activities that disturb the ground, such as excavation or piling, could discharge contaminants below ground and potentially adversely affect groundwater quality elements.

474. Changes to surface and groundwater flows and flood risk: Site preparation and construction activities within the onshore scoping area could lead to an increase in surface water runoff due to alterations in surface drainage patterns and surface flows. Infiltration rates could be reduced as a result of soil compaction by construction vehicles and surface infrastructure. Increased surface runoff could have an adverse impact upon the geomorphology of surface watercourses (e.g. through associated bed and bank scour and increase in fine sediment input) and alter and/or increase flood risk, particularly to third-party land and property in areas of the onshore scoping area designated as Flood Zone 2 or 3. Subsurface flow patterns could also be altered due to potential changes in infiltration rates and surface flow patterns.

3.3.3.2 Potential impacts during operation and maintenance

475. Supply of contaminants to surface and groundwaters: There is the potential for accidental release of contaminants to surface water during planned and unplanned operational maintenance. Activities could lead to accidental release

of fine sediment, oils, fuels and lubricants to surface water bodies. This could adversely affect the geomorphology and water quality of the surface water drainage network. Accidental spillage or leakage of fuel oils or lubricants could also occur and impact upon the surface water quality and connected groundwater quality. This in turn could impact on aquatic ecology and the use of water resources for abstractions.

476. Changes to surface runoff and flood risk: Permanent onshore infrastructure is likely to increase the impermeable area across the surface water catchments. This could decrease infiltration rates and permanently change surface runoff pathways which may increase and/or alter flood risk. The greatest flood risk impact from these changes is likely to be in areas of the scoping area designated as Flood Zone 2 or 3.

3.3.3.3 Potential impacts during decommissioning

477. It is anticipated that decommissioning impacts would be similar in nature to those of construction. It is likely that the magnitude of the effects from decommissioning will be lower than that of construction impacts.

3.3.3.4 Potential cumulative impacts

478. Onshore cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to water resources and flood risk are likely to include increased sediment supply if other projects are being constructed within 1km of the onshore construction area.

3.3.3.5 Summary of potential impacts

479. Table 3.9 sets out a summary of the potential impacts relating to water resources and flood risk at construction, operation and decommissioning phases of the project.

Table 3.9 Summary of impacts relating to water resources and flood risk

Potential Impact	Construction	Operation	Decommissioning
Direct disturbance of surface water bodies	✓	×	✓
Increased sediment supply	✓	✓	✓
Supply of contaminants	✓	✓	✓
Changes to surface water runoff and flood risk	✓	✓	✓
Cumulative	✓	✓	✓

3.3.4 Approach to assessment

480. The subsequent stages of assessment will be informed by a desk-based assessment and detailed review of available data from the Environment Agency and LLFA. It will be undertaken in line with best practice for water resources and flood risk EIA using the Design Manual for Roads and Bridges (Standards for Highways, 2020).

481. As stated in Section 3.3.2, a geomorphology baseline survey will be undertaken to further inform the EIA. Geomorphological monitoring guidelines and River

Habitat Survey guidance will be followed when conducting this survey (Environment Agency, 2003; Environment Agency, 2007; River Restoration Centre, 2011).

482. The EIA will be supported by the following additional assessments:

- Flood Risk Assessment: This will be undertaken in accordance with the NPPF to assess the flood risk to development and surrounding areas. It will identify any required mitigation measures.
- WFD Compliance Assessment: This will be required to assess compliance of the proposed construction, operation and decommissioning activities with The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. This assessment will comprise of screening, scoping and detailed assessment stages, in accordance with the Planning Inspectorate (2017e). It will outline the any appropriate mitigation measures required to ensure compliance with the WFD.

3.4 Land use

3.4.1 Existing environment

3.4.1.1 Existing land uses

483. The land use within the onshore scoping area is predominantly arable agricultural land in active use. A range of other land cover types are present, including built-up urban areas including the settlements of Little Clacton, Thorpe-le-Soken, Weeley, Great Bentley, Frating Green, Hare Green, Elmstead Market, Bromley Cross, Bradfield Heath and Great Holland; areas of light industry including glasshouses and solar installations; other agricultural land such as pastoral grassland; parcels of woodland; non-agricultural land such as areas of wetland, watercourses and ponds; extractive sites such as sand gravel pits; and recreational land uses such as caravan parks and golf courses.

3.4.1.2 Agricultural land and soil quality

484. The agricultural land which comprises the majority of the onshore scoping area is considered in terms of its agricultural value using Natural England's Agricultural Land Classification (ALC) dataset (see Figure 3.8). ALC grades agricultural land from Grade 1 (best quality) through to Grade 5 (poorest quality) based on factors including climate, nature of the soil and site-based factors. 'Best and Most Versatile' (BMV) agricultural land is defined as ALC Grades 1, 2 and 3a (Grade 3 is split into 3a and 3b). As Grade 3 is not split within Natural England's ALC mapping dataset, at this stage it has been assumed that all Grade 3 land could be Grade 3a.

485. The onshore scoping area contain agricultural land of Grades 1 – 4, with land closer to the coast (i.e. between Weeley and Holland-on-Sea) predominantly Grades 3 and 4 (with Grade restricted the fluvial floodplain), and land further in land (i.e. north and west of the A120) predominately Grades 1 and 2.

486. Approximately 10% of the onshore scoping area is land held under 'Entry level plus higher level' Environmental Stewardship Schemes[3], which are designed to encourage environmentally beneficial land management practices. In particular this includes land at Elmstead Market, Weeley and Great Holland.

3.4.1.3 Development proposals and green belt

487. The onshore scoping area includes part of the Tendring / Colchester Borders Garden Community, as identified in the adopted Tendring District Local Plan 2013-2033 and Beyond (Section 1) (2021). This land is allocated for a planned new settlement, based on the Town and Country Planning Association (TCPA) Garden City Principles.

488. The existing 2007 local plan[4] (Tendring District Council, 2007) includes a number of land uses covered by policies in the plan, including retail / development allocations, allotments, caravan parks, historic parks and gardens, community facilities and safeguarded civil technical sites.

489. The 2007 plan also includes provision for 'Local Green Gaps', as areas to be kept open and free of development. These includes areas around Little Clacton, Kirby-le-Soken within the onshore scoping area.

490. Four small (<3ha in area) parcels of common land are located within the onshore scoping area, including Galloway Close, Great Holland Common, Thorpe Green and Far Thorpe Green.

3.4.1.4 Utilities

491. Utilities are present within the onshore scoping area, including telecommunications, buried and above ground electricity cables, gas and public water mains. These include the provision of a 132kV overhead line connecting Ardleigh Road to Little Clacton (see Figure 3.9). Detailed utilities data has not been sought at this stage and therefore there are likely to be other unknown utilities not yet identified. Detailed utilities data will be sought once the project has been refined during the EIA process.

[3] Note: Defra is in the process of piloting a series of schemes to replace the existing environmental stewardship schemes (Defra, 2021). These schemes will likely be in place starting between 2022-24. Therefore the information on participation in new schemes will be considered in the projects' Environmental Statement.

[4] Note: the local plan is in the process of being updated, with Tendring District Local Plan 2013-2033 and Beyond submitted to the Planning Inspectorate in 2017. Section 1 of the 2013-2033 and Beyond has been adopted in January 2021, with Section 2 (specific policies and allocations) current undergoing Examination.

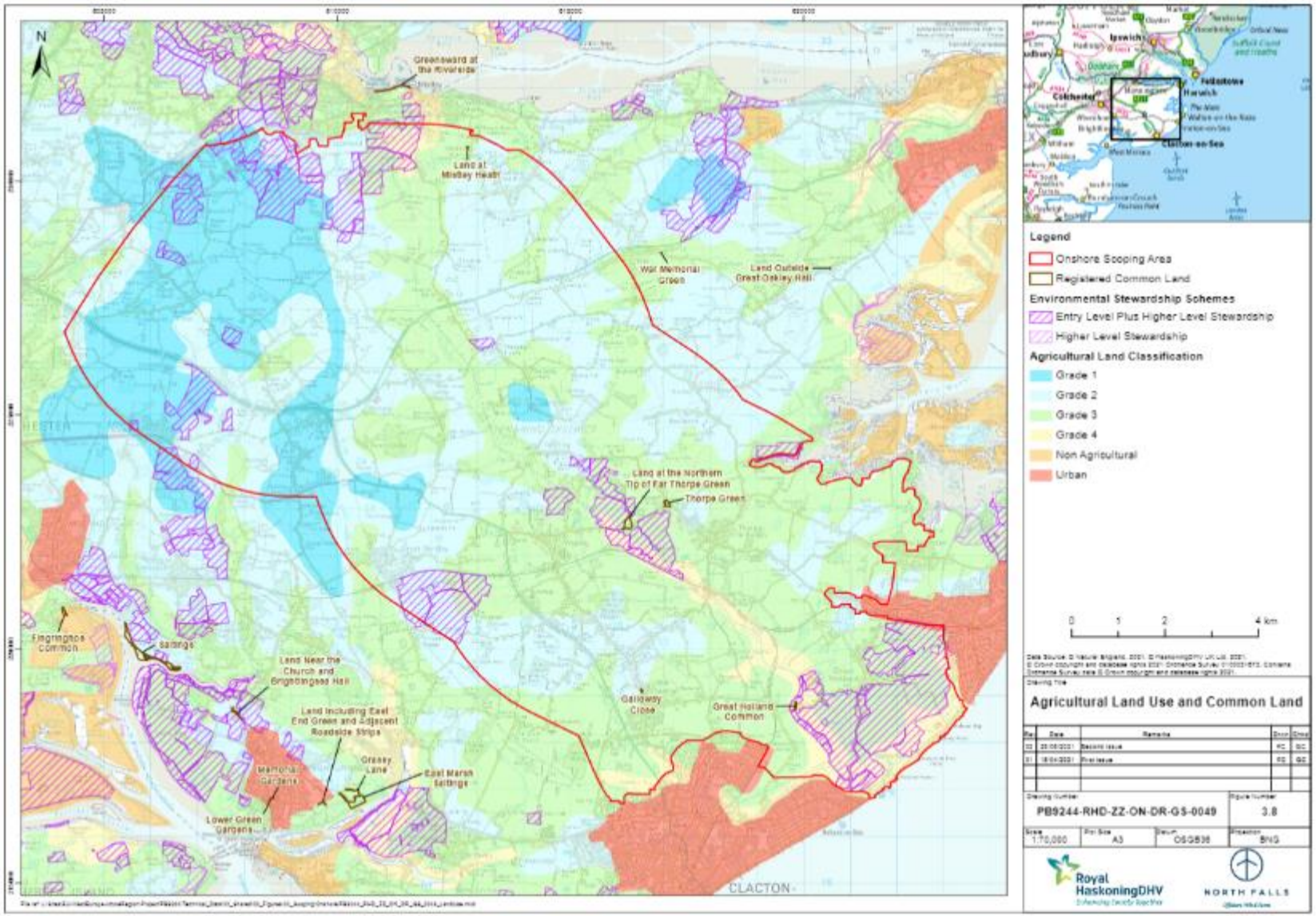

Figure 3.8 Agricultural land use and common land

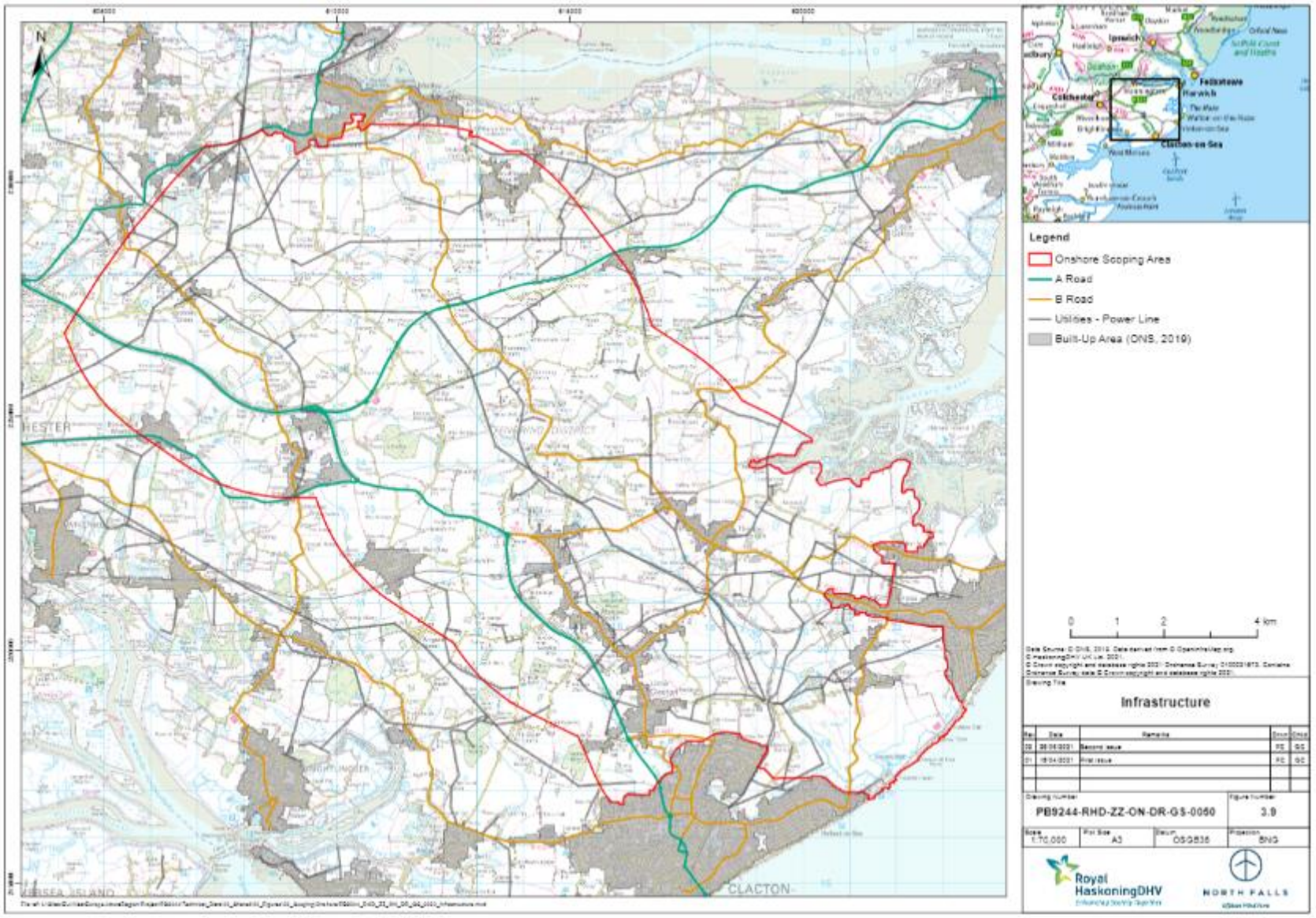

Figure 3.9 Infrastructure

3.4.2 Approach to data collection

492. The existing environment will be characterised using the data sources set out in Table 3.10.

Table 3.10 Existing datasets

Data Source	Data Contents
Natural England	Agricultural land classification maps
Natural England	Environmental stewardship schemes
Countryside and Rights of Way Act 2000 - Section 4 Conclusive Registered Common Land, Natural England	Common land
Tendring District Local Plan (Adopted 2007) Tendring District Local Plan 2013-2033 and Beyond: Section 1 (when available) Tendring District Local Plan 2013-2033 and Beyond: Section 2 (when available)	Planning policy adopted proposals map
Ordnance Survey mapping Aerial photography	'A' Roads, Railway Lines and Urban Areas
Utilities records request from local utilities suppliers (various)	Utilities

493. Any additional datasets will be identified through ongoing consultation with stakeholders. No surveys are proposed to inform the assessment of impacts related to land use.

3.4.3 Potential impacts

494. The Land Use and Agriculture assessment is likely to have key inter-relationships with Onshore Ecology, Traffic and Transport and Tourism and Recreation. These will be considered where relevant.

3.4.3.1 Potential impacts during construction

495. Agricultural productivity: There is potential for adverse impacts to soil structure and future agricultural productivity of soils impacted during construction through the use of heavy machinery and disturbance.

496. Drainage: There is potential for an adverse impact to the natural and artificial field drainage systems during construction works.

497. Disruption to farming practices: There is potential for adverse impacts on farming and other land use practices through the temporary loss of land availability, restricted access and disruption caused by working areas and construction traffic.

498. Existing utilities: During the construction phase, cable installation activity has the potential to impact on water, power and gas infrastructure.

3.4.3.2 Potential impacts during operation and maintenance

499. Permanent loss of BMV: The presence of permanent infrastructure at the onshore substation will potentially result in the permanent loss of land including agricultural land, and therefore also a loss in agricultural productivity of these

areas. Given the extent of BMV within the onshore scoping area, there is a potential for loss of BMV during the lifetime of the project.

500. Soil heating: Buried cable systems emit some heat, potentially causing impacts on soil characteristics and productivity. The electrical system is designed to minimise heat loss to a level which is not likely to affect crop growth.

501. Drainage: Permanent infrastructure and hardstanding at the onshore substation, plus the presence of buried cables has the potential to permanently impact upon land drainage. Impacts on drainage are considered further in Section 3.3.3.

502. Disruption to farming practices: There is the potential for farming practices to be restricted due to the presence of cables and access restrictions.

503. Public health and safety: Issues of public concern and health such as EMF arising in relation to buried cables will be considered further in Section 3.10.

3.4.3.3 Potential impacts during decommissioning

504. It is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant regulator.

3.4.3.4 Potential cumulative impacts

505. Onshore cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to land use include other nearby development project interacting with the same utilities or existing land uses with temporal overlaps with the project's construction phase.

3.4.3.5 Summary of potential impacts

506. Table 3.11 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 3.11 Summary of impacts relating to land use.

Potential Impact	Construction	Operation	Decommissioning
Agricultural productivity	✓	x	✓
Drainage	✓	✓	✓
Disruption to farming practices	✓	✓	✓
Existing utilities	✓	x	✓
Loss of BMV	x	✓	x
Soil heating	x	✓	x
Public health and safety	x	✓	x
Cumulative impacts	✓	✓	✓

3.4.4 Approach to assessment

507. The EIA for land use will identify the likely impacts of the project, assess the impacts and identify appropriate mitigation measures if required. The assessment will consider both direct and indirect impacts.

508. The methodology for the assessment of the effects on land use will be informed by the following current guidance:

- NE124 – Look after your land with Environmental Stewardship (Natural England, 2012);
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 6 (Land Use); and
- Defra guidance including the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009).

3.5 Onshore ecology

3.5.1 Existing environment

3.5.1.1 Designated sites

509. There are two ecological SSSI located within the onshore scoping area:

- Holland Haven Marshes SSSI; and
- Weeleyhall Wood SSSI.

510. In addition, the Holland Haven LNR is also located within the onshore scoping area.

511. A further 22 statutory designated sites are located within 5km of the onshore scoping area.

512. Figure 3.10 shows the location of these designated sites and Table 3.12 presents a summary of the qualifying features/reasons for notification of these designated sites.

513. Details of non-statutory designated sites (for example, Essex Local Wildlife Sites (LoWS) including Essex Wildlife Trust Reserves) have not been sought from Essex Wildlife Trust Biological Records Centre at this stage, but will be sought at the next step in the EIA process (see Section 3.5.2 below).

Table 3.12 Designated sites for nature conservation of relevance to onshore ecology

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
Sites located within the onshore scoping area			
Holland Haven Marshes	SSSI	Within onshore scoping area	An area of reclaimed estuarine saltmarsh and freshwater marsh situated between Holland-on-Sea and Frinton-on-Sea. The site is bisected by Holland Brook and its tributaries, from which an extensive ditch system radiates. The ditch network represents an outstanding example of a freshwater to brackish water transition intimated by the aquatic plant communities, which include a number of nationally and locally scarce species. The adjoining grasslands are of botanical importance in their own right as well as acting as a buffer zone to the ditch system. Further interest is provided by the aquatic and terrestrial invertebrates and the birds which frequent the area, especially in winter.
Weeleyhall Wood	SSSI	Within onshore scoping area	Weeleyhall Wood is one of the largest ancient woods in the Tendring peninsula. It contains one of the best examples in Essex of base-poor springline alder woodland, a type of woodland which is rare in the county, as well as good examples of lowland hazel-pedunculate oak and some wet ash-maple woodland, and chestnut coppice-with-standards derived from these last two.
Holland Haven	LNR	Within onshore scoping area	This site comprises mown amenity grassland, hawthorn scrub, rough grassland, wet grazing marsh, scrape area and ponds. This site is known to support invertebrates such as the ruddy darter dragonfly (*Sympetrum sanguineum*), larger carder bee (*Bombus muscorum*), Roesel's bush cricket (*Metrioptera roeselii*). Plants include birds foot trefoil (*Lotus corniculatus*), birds foot fenugreek (*Trigonella foenum-graecum* and soft hornwort. A large number of bird species have also been recorded on site including purple sandpiper, avocet and short eared owl.
Ardleigh Gravel Pits	SSSI	Within onshore scoping area	Geological SSSI (See Section 3.1)
Sites located within 5km of the onshore scoping area – SPA, Ramsar, SAC and their associated NNR / SSSIs			
Hamford Water	SPA	Adjacent	Qualifies under Article 4.1 of the EU Birds Directive by supporting: *During the breeding season:* • *Sterna albifrons* – breeding (Eastern Atlantic) - 2.3% of the UK breeding population. *Over winter:* • *Recurvirostra avosetta* – breeding (Western Europe/Western Mediterranean) - 25% of the UK population. Qualifies under Article 4.2 of the EU Birds Directive by supporting over winter: • *Anas crecca* (North-western Europe) - 2.7% of the population in UK 5 year peak mean 1991/92-1995/96;

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
			• *Branta bernicla bernicla* (Western Siberia/Western Europe) - 2.3% of the population 5 year peak mean 1991/92-1995/96; • *Charadrius hiaticula* (Europe/Northern Africa - wintering) - 1.1% of the population 5 year peak mean 1991/92-1995/96; • *Limosa limosa islandica* (Iceland - breeding) - 1.7% of the population 5 year peak mean 1991/92-1995/96; • *Pluvialis squatarola* (Eastern Atlantic - wintering) - 7.5% of the population in UK 5 year peak mean 1991/92-1995/96; • *Tadorna tadorna* (North-western Europe) - 2.2% of the population in UK 5 year peak mean 1991/92-1995/96; and • *Tringa totanus* (Eastern Atlantic - wintering) - 0.8% of the population 5 year peak mean 1991/92-1995/96.
	Ramsar	Adjacent	Qualifies under Criterion 6 (A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird): *Species with peak counts in spring/autumn:* • Ringed plover, *Charadrius hiaticula* (Europe/Northwest Africa) • Common redshank, *Tringa totanus totanus* *Species with peak counts in winter:* • Dark-bellied brent goose, *Branta bernicla bernicla,* • Black-tailed godwit, *Limosa limosa islandica* (Iceland/W Europe) • Grey plover, *Pluvialis squatarola* (E Atlantic/W Africa -wintering)[5]
	SAC	Adjacent	Annex II species that are a primary reason for selection of the site: • 4035 Fisher's estuarine moth *Gortyna borelii lunata*
	NNR	Adjacent	Unlike many of the other Essex NNRs, Hamford Water is not an estuary as it does not have a major river running into it. Instead it is classified as a coastal embayment that has been formed due to a natural dip in the underlying geology of the area. The bird life that this variety of habitats attracts is outstanding, especially the waders and waterfowl that can be seen in winter. Main habitats: salt marsh, intertidal mud flats, coastal, grazing marsh, sands, shingle, small freshwater ponds and ditches

[5] Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
	SSSI	Adjacent	Hamford Water is a tidal inlet whose mouth is about three miles south of Harwich. It is a large and shallow estuarine basin comprising tidal creeks, intertidal mud and sand flats, saltmarshes, islands, beaches and marsh grasslands. The site is of international importance for breeding Little Terns and wintering Dark-bellied Brent Geese, wildfowl and waders, and of national importance for many other bird species. It also supports communities of coastal plants which are rare or extremely local in Britain, including Hog's Fennel *Peucedanum officinale* which is found elsewhere only in Kent.
Stour and Orwell Estuaries	SPA	0.5km	Qualifies under Article 4.1 of the EU Birds Directive by supporting: *During the breeding season:* • *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) – 3.6% of the UK breeding population. Qualifies under Article 4.2 of the EU Birds Directive by supporting: *Over winter:* • *Anas acuta* (North-western Europe) - 1.2% of the population • *Branta bernicla bernicla* (Western Siberia/Western Europe) - 1.2% of the population • *Calidris alpina alpina* (Northern Siberia/Europe/Western Africa) - 1.4% of the population • *Calidris canutus* (North-eastern Canada/Greenland/Iceland/Northwestern Europe) - 1.3% of the population • *Limosa limosa islandica* (Iceland - breeding) – 7.3% of the population • *Pluvialis squatarola* (Eastern Atlantic - wintering) – 1.3% of the population • *Tringa totanus* (Eastern Atlantic - wintering) – 2.8% of the population *On passage:* • *Tringa totanus* (Eastern Atlantic - wintering) – 2% of the population Qualifies under Article 4.2 of the EU Birds Directive by supporting and internationally important assemblage of birds: *Over winter:* • 63017 waterfowl (*Podiceps cristatus, Phalacrocorax carbo, Branta bernicla bernicla, Tadorna tadorna, Anas penelope, Anas strepera, Anas acuta, Bucephala clangula, Charadrius hiaticula, Pluvialis squatarola, Vanellus vanellus, Calidris canutus, Calidris alpina alpina, Limosa limosa islandica, Numenius arquata, Tringa totanus, Arenaria interpres*)
	Ramsar	0.5km	Qualifies under Criterion 2 (A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities): • Contains nationally scarce plants and British Red Data Book invertebrates.

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
			Qualifies under Criterion 5 (A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds): Species with peak counts in winter: 51,285 waterfowl Qualifies under Criterion 6 (A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird): *Species with peak counts in winter:* • Black-tailed godwit, *Limosa limosa islandica* (Iceland/W Europe) • Common redshank, *Tringa totanus totanus* • Dark-bellied brent goose, *Branta bernicla bernicla*, • Dunlin, *Calidris alpina alpina* (W Siberia/W Europe) • Grey plover, *Pluvialis squatarola* (E Atlantic/W Africa -wintering) • Red knot, *Calidris canutus islandica* (W & Southern Africa)[6]
Stour Estuary	SSSI	0.5km	The Stour Estuary is nationally important for 13 species of wintering waterfowl and three species on autumn passage. The estuary is also of national importance for coastal saltmarsh, sheltered muddy shores, two scarce marine invertebrates and a vascular scarce plant assemblage.
Colne Estuary (Mid-Essex Coast Phase 2)	SPA	2km	Qualifies under Article 4.1 of the EU Birds Directive by supporting: *During the breeding season:* • *Sterna albifrons* (Eastern Atlantic - breeding)– 1.6% of the GB breeding population. *Over winter:* • *Circus cyaneus* – 2.5% of the GB breeding population. Qualifies under Article 4.2 of the EU Birds Directive by supporting: *During the breeding season:* • *Aythya farina* (North-western/North-eastern Europe) – up to 6% of the GB breeding population • *Charadrius hiaticula* (Europe/Northern Africa - wintering) – up to 1.6% of the GB breeding population *Over winter:* • *Branta bernicla bernicla* (Western Siberia/Western Europe) – 1.6% of the population

[6] Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
			• *Tringa totanus* (Eastern Atlantic - wintering) – 1.2% of the population Qualifies under Article 4.2 of the EU Birds Directive by supporting and internationally important assemblage of birds: *Over winter:* • 38600 waterfowl (5 year peak mean 01/04/1998) Including: Branta bernicla bernicla, Tringa tetanus.
	Ramsar	2km	Qualifies under Criterion 1 (A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region): • The site is important due to the extent and diversity of saltmarsh present. This site, and the four other sites in the Mid-Essex Coast complex, includes a total of 3,237 ha, that represent 70% of the saltmarsh habitat in Essex and 7% of the total saltmarsh in Britain. Qualifies under Criterion 2 (A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities): • The site supports 12 species of nationally scarce plants and at least 38 British Red Data Book invertebrate species. Qualifies under Criterion 3 (A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region): • This site supports a full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. Qualifies under Criterion 5 (A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds): • Species with peak counts in winter: 32,041 waterfowl Qualifies under Criterion 6 (A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird): *Species with peak counts in winter:* • Dark-bellied brent goose, *Branta bernicla bernicla* • Common redshank, *Tringa totanus totanus* • Black-tailed godwit, *Limosa limosa islandica* (Iceland/W Europe)[7]

[7] Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
Essex Estuaries	SAC	2km	Annex I habitats that are a primary reason for selection of the site: • 1130 Estuaries • 1140 Mudflats and sandflats not covered by seawater at low tide • 1310 Salicornia and other annuals colonizing mud and sand • 1320 Spartina swards (*Spartinion maritimae*) • 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • 1420 Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea *fruticosi*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of the site: • 1110 Sandbanks which are slightly covered by sea water all the time
Colne Estuary	SSSI	2km	The Colne Estuary is comparatively short and branching, with five tidal arms which flow into the main river channel. The estuary is of international importance for wintering Brent Geese and Black-tailed Godwit and of national importance for breeding Little Terns and five other species of wintering waders and wildfowl. The variety of habitats which include mudflat, saltmarsh, grazing marsh, sand and shingle spits, disused gravel pits and reed beds, support outstanding assemblages of invertebrates and plants.
Upper Colne Marshes	SSSI	3.1km	The Upper Colne Marshes lie along both sides of the River Colne and Roman River, south east of Colchester. The site consists of grazing marshes with associated ditch and open water habitats, a series of tidal salt marshes behind old flood defence walls following a number of breaches, the sea walls themselves, and a small area of intertidal mud. It is considered to be of special interest as it supports an outstanding assemblage of nationally scarce plants and an unusual diversity of brackish ditch-types. Additional interest is provided by the terrestrial and aquatic invertebrates found within the site, and breeding and wintering birds. Part overlaps with Colne Estuary (Mid-Essex Coast Phase 2) SPA /Ramsar and Essex Estuaries SAC.
SSSIs			
Holland on Sea Cliff	SSSI	0.3km	Geological SSSI (See Section 3.1)
Riddles Wood	SSSI	0.6km	Riddles Wood contains some of the best examples in Essex of chestnut coppice, derived from ancient pedunculate oak-hazel and pedunculate oak-hornbeam woodland. The soils are varied, being derived from glacial sands and gravels in the west and London Clay in the east. This results in a diversity of woodland types and a rich and varied ground flora, including several uncommon Essex species.
Wivenhoe Gravel Pit	SSSI	1.3km	Geological SSSI (See Section 3.1)

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
Cattawade Marshes	SSSI	1.6km	Cattawade Marshes lie at the head of the Stour Estuary, between freshwater and tidal channels of the River Stour. These grazing marshes with associated open water and fen habitats are of major importance for the diversity of their breeding bird community, which includes species that have become uncommon throughout lowland Britain as a result of habitat loss. The site has benefited from a sympathetic management regime aimed at enhancing the ornithological interest. The marshes are also of value as a complement to the adjacent Stour Estuary SSSI where breeding habitats for birds are relatively scarce.
Bullock Wood	SSSI	2km	Bullock Wood is an ancient coppice-with-standards woodland with a wide range of tree species. The principal woodland type is the nationally rare Lowland Hazel-Sessile Oak woodland type modified in places by the presence of Sweet Chestnut *Castanea sativa*. The wood is situated on an almost level plateau with acidic soils developed over Brickearth, and lies within the former Royal Forest of Kingswoode.
St. Osyth Pit	SSSI	2.5km	Geological SSSI (See Section 3.1)
Clacton Cliffs & Foreshore	SSSI	2.7km	Geological SSSI (See Section 3.1)
Stour and Copperas Woods, Ramsey	SSSI	3.4km	Stour and Copperas Woods together comprise the largest area of woodland in north-east Essex. They are ancient woods lying on glacial sands and gravels on the southern shore of the Stour Estuary between Wrabness and Ramsey. They have a coppice-with-standards structure and contain the only example in the county where coastal and woodland habitats meet. The White Admiral butterfly *Limentis camillad*, has been recorded sparingly in recent years.
The Naze	SSSI	3.6km	Geological SSSI (See Section 3.1)
LNRs			
Pickers Ditch Meadow	LNR	0.5km	Meadow surrounding Pickers Ditch tributary, representing a valuable green space in the Great Clacton area. Hedge planting along the border helps screen the site, whilst tree planting in the adjacent area provides a copse area surrounding the existing footpath.
Salary Brook	LNR	1.4km	This river valley corridor covering 48 acres constitutes an important urban wildlife area and comprises a wealth of habitats including pasture, grassland, marsh, fishing ponds and the brook itself which runs the entire length of the reserve.
Welsh Wood	LNR	1.5km	Welsh Wood is a piece of ancient woodland covering 6.5 acres. A stream runs along its eastern edge on its way to join Salary Brook further downstream.

Site Name	Designation	Distance from onshore scoping area	Qualifying features/reasons for notification
Wrabness	LNR	1.8km	The reserve is located on the southern bank of the River Stour between Manningtree and Harwich, and is a mixture of unimproved grassland, wooded areas and marshland with extensive intertidal mudflats and saltmarsh. In the spring, nightingales can be heard.
Colne	LNR	2.6km	The Colne LNR lies on the north side of the river Colne on rising ground between Essex University and Wivenhoe. A 85 acre reserve consisting of 3 main areas: Wivenhoe Woods is a mixed coppice and secondary woodland; Ferry Marsh is a former grazing marsh; and Lower Lodge Farm is mainly scrub and grassland.

3.5.1.2 Terrestrial habitats

514. UK Habitats of Principal Importance recorded within the onshore scoping area include the following (see Figure 3.11):

- Coastal and floodplain grazing marsh;
- Deciduous woodland;
- Semi-improved grassland;
- Maritime cliff and slope;
- Hedgerows;
- Arable field margins;
- Lowland meadows;
- Reedbeds;
- Traditional orchards;
- Lowland heathland;
- Rivers; and
- Ponds.

3.5.1.3 Protected, notable and invasive species

515. A review of biological data records obtained to date indicates that there are records for the following legally protected species within the onshore scoping area:

- Water vole *Arivicola amphibious* and otter *Lutra lutra;*
- Great crested newt *Triturus cristatus;*
- Bats (roosting and commuting/foraging);
- Hazel dormice *Muscardinus avellanarius;*
- Reptiles;
- White-clawed crayfish *Austropotamobius pallipes;* and
- Invertebrates (aquatic and terrestrial species).

516. Notable plant species, primarily associated with the Holland Haven Marshes SSSI and Holland Haven LNR, have also been recorded within the onshore scoping area.

517. Invasive non-native species have also been recorded within the onshore scoping area, namely American mink (*Neovison vison*), butterfly bush (*Buddleja davidii*) and Japanese knotweed (*Fallopia japonica*).

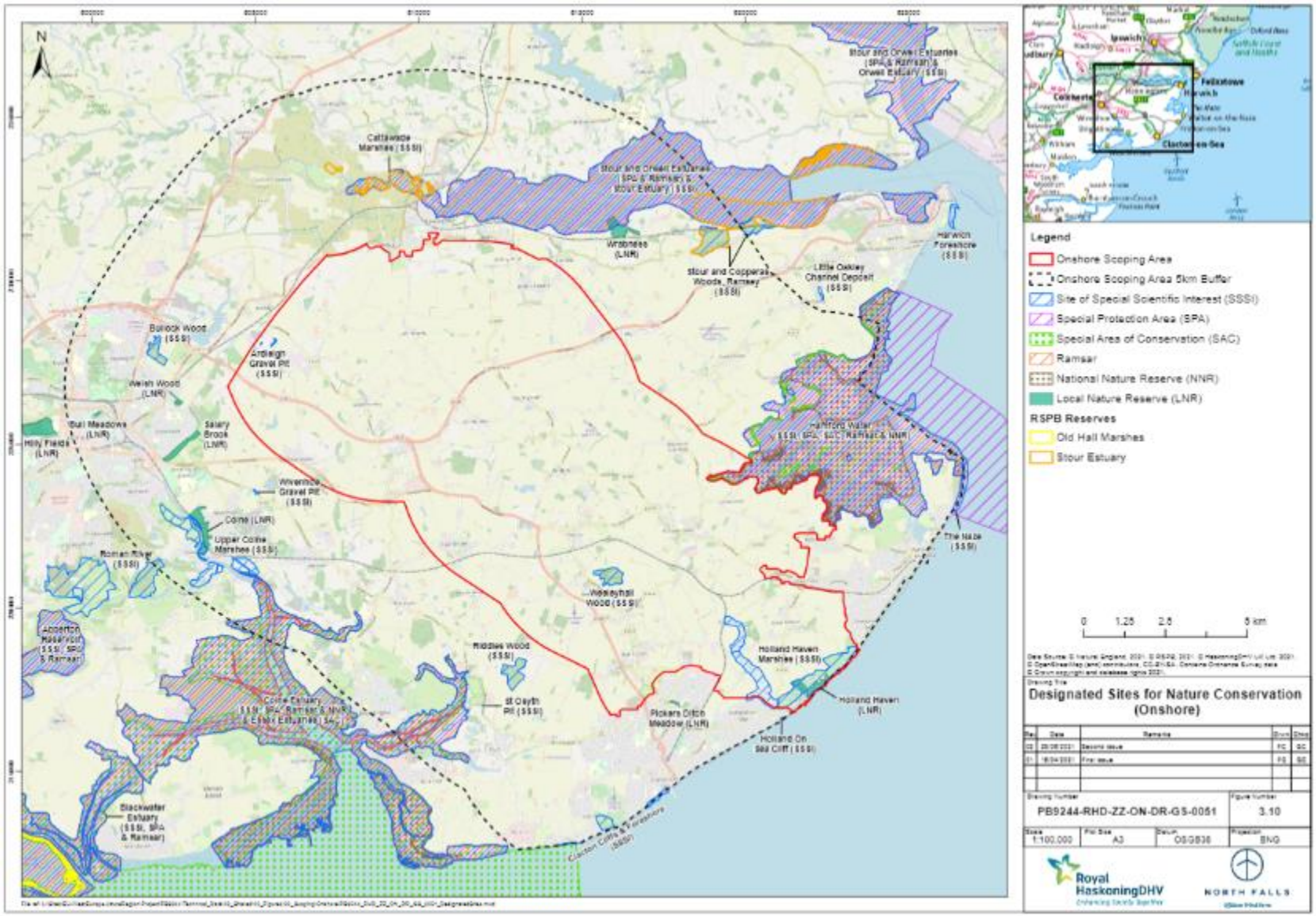

Figure 3.10 Designated sites for nature conservation (onshore)

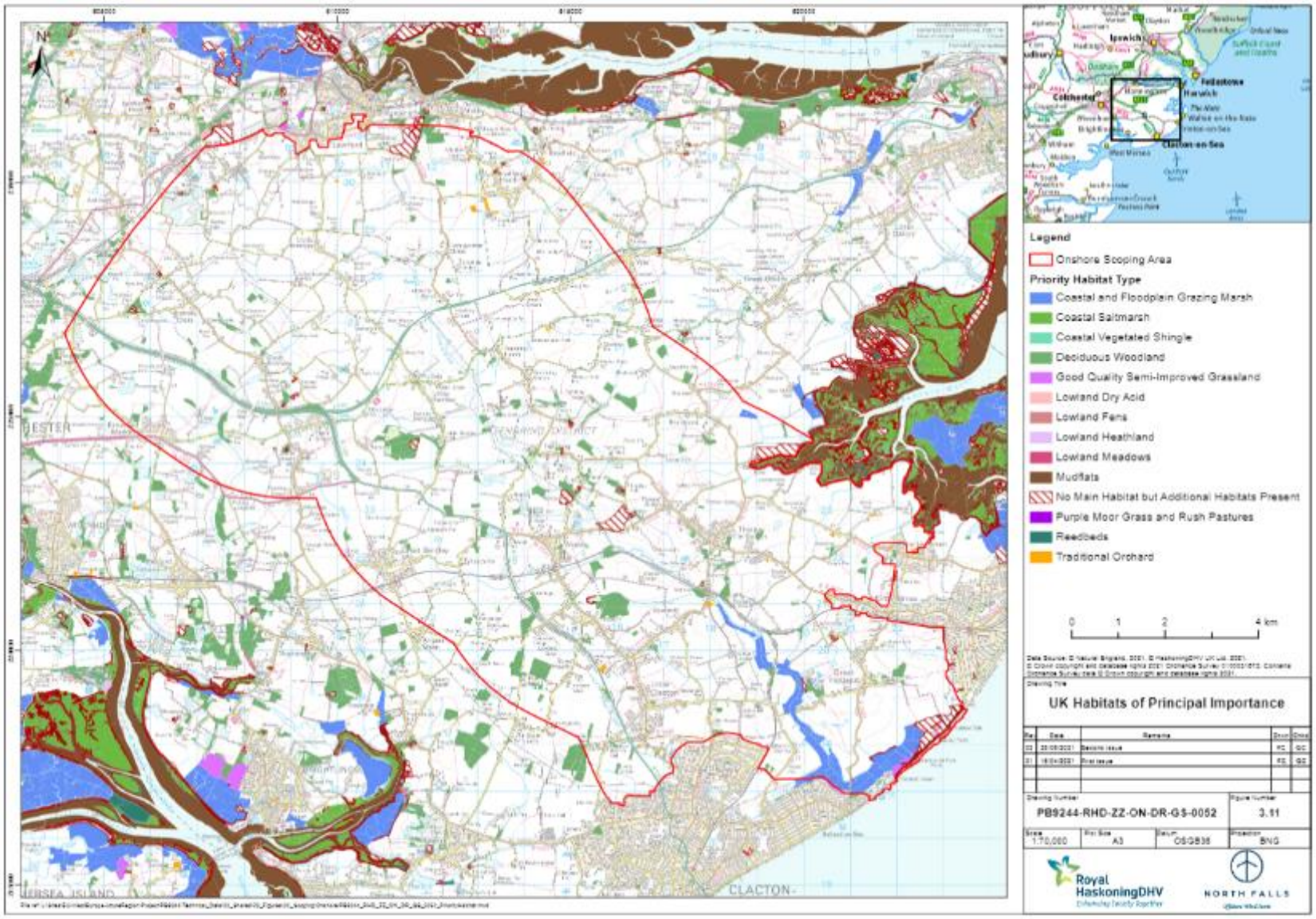

Figure 3.11 UK habitats of principal importance

3.5.2 Approach to data collection

518. The onshore ecology ecological impact assessment (EcIA) will be informed by a combination of desk-based data searches and field survey data collected through targeted surveys undertaken in 2021 and 2022.

519. The data sources used to inform this assessment are presented in Table 3.13.

Table 3.13 Existing datasets

Data Source	Data Contents
JNCC MAGIC website	Statutory designated sites, including: • International sites (Ramsar sites); • Sites comprising the UK National Sites Network (SPA and SAC); and • Other UK designated sites (SSSI, NNR and LNR).
Essex Wildlife Trust Biological Records Centre (obtained via an ecological data search)	Non-statutory designated sites, including: • Essex Local Wildlife Sites (LoWS); • Essex Wildlife Trust Nature Reserves; • Special Roadside Verges; and • Buglife 'B-lines'-Pollinator corridors.
JNCC National Biodiversity Network (NBN) Trust website	UK Habitats of Principal Importance
Essex Wildlife Trust Biological Records Centre (obtained via an ecological data search)	Records of protected, notable and invasive non-native species. 'Protected' species includes all those listed under The Conservation of Habitats and Species Regulation 2017 (as amended), the Wildlife and Countryside Act 1981 (as amended) and the Protection of Badgers Act 1992. 'Notable' species include: • NERC Act 2006 Section 41 species; • Essex BAP species; • IUCN 'Red List' species; • Birds of Conservation Concern (BoCC4) 'Red list' species; • Locally or nationally rare or scarce species; • Veteran trees.
Essex Field Club	Records of protected, notable and invasive non-native species.
Natural England	SSSI condition assessment reports.

520. Any additional datasets will be identified through feedback from stakeholders during the EPP.

521. The field surveys which will be used to inform the baseline for the onshore ecology EIA are presented in Table 3.14.

Table 3.14 Proposed suite of onshore ecology surveys

Survey	Proposed date of survey	Proposed survey details
Extended Phase 1 Habitat Survey	2021	Will include all land within and up to 50m from the project boundary. The survey will classify all broad habitats types and identify the suitability of all habitats for their ability to support legally protected and notable species. The survey will be used to define the scope of all 'Phase 2' ecology surveys.

Survey	Proposed date of survey	Proposed survey details
'Phase 2' ecology surveys		
Great crested newt presence/absence surveys	2022	Will include all waterbodies within and up to 250m from the project boundaries.
Bat activity transect surveys (monthly)	2022	Will include all suitable commuting/foraging habitats that may be affected by the project.
Bat emergence/re-entry surveys	2022	Will include all features (buildings, trees) that may be affected by the project.
Water vole presence/absence surveys	2022	Will include all waterbodies within the project boundaries.
Otter presence/absence surveys	2022	Will include all waterbodies within the project boundaries.
Reptile presence/absence surveys	2022	Will include all areas of suitable habitats that may support significant populations of reptiles and that may be affected by the project.
Hazel dormice presence/absence surveys	2022	Will include all suitable woodland habitats that may be affected by the project.
White-clawed crayfish surveys	2022	Will include all suitable aquatic habitats that may be affected by the project.
National Vegetation Classification (NVC) surveys	2021/2	Will include habitats that may be affected by the project and which may contain rare or notable flora. As the present stage, this is expected to include land within and adjacent to the Holland Haven Marshes SSSI.
Invertebrate surveys	2021/2	Will include all terrestrial and aquatic habitat which may support rare or notable invertebrate species, and which may be affected by the project. As the present stage, this is expected to include land within and adjacent to the Holland Haven Marshes SSSI.

3.5.3 Potential impacts

3.5.3.1 Potential impacts during construction

522. Construction activities which could affect onshore ecological receptors include: open cut trench excavation; intrusive groundworks; piling and construction of any temporary work areas or permanent above ground infrastructure, in addition to general construction activities such as plant movement, noise and lighting.

3.5.3.1.1 Impacts to statutory and non-statutory designated sites

523. Statutory and non-statutory designated sites for nature conservation will be avoided wherever possible. . However, temporary potential impacts (i.e. noise, dust, lighting) arising from construction related activities may occur.

3.5.3.1.2 Permanent and temporary loss of terrestrial habitats

524. Construction of the onshore substation is likely to result in the permanent loss of terrestrial habitat due to its construction footprint. The construction of the. onshore cable route, will result in direct, but temporary, impacts on terrestrial habitats. The majority of these impacts will be avoided wherever possible through considerate onshore cable routing; however, where this may not be possible habitats will be reinstated following installation of the onshore cable.

525. It is anticipated that there will be a temporary loss of sections of hedgerows along the eventual cable route as a result of the construction activities associated with the project. As part of embedded mitigation (detailed in full in Section 1.8.2.4) for the project, hedgerow removal will be restricted to a minimum working width where possible, and hedgerows will be reinstated on completion of works.

3.5.3.1.3 Habitat fragmentation and species isolation

526. The linear nature of the cable route means that habitat fragmentation and species isolation could potentially occur during construction, particularly for habitats such as hedgerows or for species such as great crested newts. Efforts will be made to avoid 'important' hedgerows or those that support species such as hazel dormouse or are valuable bat commuting routes by the use of trenchless techniques (e.g. HDD). As above, as part of embedded mitigation for the project, habitat removal will be avoided or restricted to a minimum working width where possible and will be reinstated on completion of works.

3.5.3.1.4 Impacts on protected species and/or their resting/breeding sites

527. A risk exists of directly affecting protected species through increased mortality. In addition, indirect impacts may occur where the proximity of the works may lead to a disturbance / displacement effect on protected species associated with noise, traffic, lighting, presence of workforce, etc. Species-specific surveys have yet to take place, therefore at this stage it has been assumed that they will be found in the scoping area. Species of key concern include water vole, otter, bats, badger, hazel dormice, great crested newts, reptiles and invertebrates.

3.5.3.1.5 Spread of invasive non-native species

528. There is the potential for invasive non-native species to be encountered during construction, which in turn could be spread further by construction related activities. The control of invasive non-native species, (where required) will be included within a project specific Ecological Management Plan (EMP).

3.5.3.2 Potential impacts during operation and maintenance

529. Maintenance activities following completion of the project will be required. However, it is considered likely that where this is required, any works will be localised and, in the unlikely event that remedial works are required, these will be undertaken. As such, it is anticipated that any impacts on onshore ecology receptors (habitats and/or species) will be limited to temporary indirect disturbance to the adjacent habitats and species.

530. During the operation of the onshore substation, there is a low risk that operational noise and lighting may result in disturbance and/or illumination of adjacent habitats and species. It is expected that both operational lighting and noise will be controlled.

531. In the unlikely event of a cable failure, there may be a need to access the buried cables to enable the replacement of a cable section. Such reactive repairs are expected to have potential impacts similar to those of construction, however they would be expected to be more localised, of smaller scale and temporary in nature.

532. Any potential planting and other biodiversity enhancements such as wildflower grassland seeding, management of watercourses, planting additional hedgerows and creation of new waterbodies which may be included as part of potential landscaping and screening proposals at the onshore substation could result in a beneficial impact.

3.5.3.3 Potential impacts during decommissioning

533. No decision has been made regarding the final decommissioning policy for the substation, as it is recognised that industry best practice, rules and legislation change over time. However, the substation station equipment will likely be removed and reused or recycled. It is expected the onshore cables will be removed from ducts and recycled, with the transition pits and ducts left in situ.

534. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan would be provided.

535. It is anticipated that the decommissioning impacts will be similar in nature to those of construction.

3.5.3.4 Potential cumulative impacts

536. Onshore cumulative impacts will be considered as set out in Section 1.8. Cumulative impacts on onshore ecology receptors will be considered as part of the EIA process. Any other project with the potential to result in impacts that may act cumulatively with the project will be identified and all available information will be reviewed. These projects will be subsequently included in the CIA and therefore scoped into the assessment.

537. The assessment will consider the potential for significant cumulative impacts to arise as a result of the construction, operation and decommissioning of the project in the context of other developments that are existing, consented or at the application stage.

3.5.3.5 Summary of potential impacts

538. Table 3.15 outlines the impacts which are proposed to be scoped into the EcIA. This may be refined through the EPP as additional information and data become available.

Table 3.15 Summary of impacts relating to onshore ecology

Potential Impact	Construction	Operation	Decommissioning
Impacts to statutory and non-statutory designated sites	✓	✓	✓
Permanent and temporary loss of habitats	✓	✓	✓
Temporary habitat and species fragmentation	✓	✓	✓
Impacts on protected/notable species or their resting/breeding sites	✓	✓	✓
Spread of invasive non-native species	✓	✓	✓
Cumulative impacts	✓	✓	✓

3.5.4 Approach to assessment

539. The EcIA will be undertaken following CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (September 2018) (CIEEM, 2018). In addition, the following guidelines will be adhered to during data collection and EcIA:

- British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development;
- Defra Biodiversity Metric calculation tool, user guide and technical supplement (Version 2.0) (2019);
- Natural England (2015) Standing advice on protected species (bats (all species), great crested newt, badger, water vole Arvicola amphibius, otter, reptiles, protected plants, invertebrates, white-clawed crayfish, ancient woodlands and veteran trees);
- Bat Conservation Trust and Institute of Lighting Engineers (2018) Bats and Artificial Lighting in the UK;
- Dean *et al.* (2016) The Water Vole Mitigation Handbook (The Mammal Society Guidance Series);
- Edgar *et al.* (2010). Reptile Habitat Management Handbook;
- English Nature (2001) Great Crested Newt Mitigation Guidelines;
- JNCC (2003) Herpetofauna Worker's Manual;
- Strachan and Moorhouse (2011) Water Vole Conservation Handbook, 3rd Edition; and
- GB Non-native Species Secretariat (2015) Species Information.

540. The approach to assessment and the scope of field surveys will be discussed and agreed as part of the EPP prior to commencement. Consultation will be undertaken at key stages throughout the EIA process.

541. The EIA will include an assessment of biodiversity net gain, which will be appended to the Onshore Ecology ES chapter. Although not currently a mandatory requirement for NSIPs, NFOW are keen to ensure that biodiversity net gain is included within the project's design.

3.6 Onshore ornithology

3.6.1 Existing environment

542. Figure 3.10 shows all of the onshore designated sites for nature conservation that are located within 5km of the onshore scoping area, and each of these are detailed in Table 3.12.

543. Not all of these sites are designated for their ornithological interest features, albeit some of them are recognised as supporting bird species. The key designated sites within 5km of the onshore scoping area designated for their ornithological interest are:

- Holland Haven Marshes SSSI (within the onshore scoping area);

- Hamford Water SPA, Ramsar and SSSI (adjacent to the onshore scoping area);
- Stour and Orwell Estuaries SPA, Ramsar and Stour Estuary SSSI and Cattawade Marshes SSSI (0.5km from the onshore scoping area); and
- Colne Estuary (Mid-Essex Coast Phase 2) SPA, Ramsar and Colne Estuary SSSI and Upper Colne Marshes SSSI (2km from the onshore scoping area).

544. The ornithological interest features of these sites can be found in Table 3.12**.**

3.6.2 Approach to data collection

545. The onshore ornithology EIA will be informed by a combination of desk-based data searches and field survey data collected through targeted surveys undertaken in 2020 - 2022.

546. The data sources used to inform this assessment are presented in Table 3.16.

Table 3.16 Existing datasets

Data Source	Data Contents
JNCC MAGIC website	Statutory designated sites, including: • International sites (Ramsar sites); • SPA; and • Other UK designated sites (SSSI, NNR and LNR) with ornithological interest features.
Essex Wildlife Trust Biological Records Centre (obtained via an ecological data search)	Records of target bird species, i.e. birds listed on: • Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); • Annex I of the EU Birds Directive; • BoCC4 'Red list' species.
British Trust for Ornithology (BTO)	Wetland Bird Survey (WeBS) counts for the Holland Marshes count sector.

547. Any additional datasets will be identified through feedback from stakeholders during the EPP.

548. The field surveys which will be used to inform the baseline for the onshore ornithology EIA are presented in Table 3.17.

Table 3.17 Proposed suite of onshore ornithology surveys

Survey	Proposed date of survey	Proposed survey details
Extended Phase 1 Habitat Survey	2021	Will include all land within and up to 50m from the project boundary. The survey will classify all broad habitats types and identify the suitability of all habitats for their ability to support legally protected and notable species. This includes observation of suitable bird nesting / roosting habitat.
Overwintering bird surveys	2020-2021 2021-2022	Surveys have been undertaken during October 2029 – March 2021 to date to record the bird species using habitat within land within the onshore scoping area and approximately 3km inland (i.e. the landfall search area). This is in order to provide baseline wintering bird survey data to inform impact assessment on works particularly in the vicinity of Holland Haven Marshes SSSI.

Survey	Proposed date of survey	Proposed survey details
		These surveys will be repeated from October 2021-March 2022.
Breeding bird surveys	2021 2022	Surveys are being undertaken during March – July 2021 to record the bird species showing signs of breeding within habitat within land within the onshore scoping area and approximately 3km inland (i.e. the landfall search area). This is in order to provide baseline breeding bird survey data to inform impact assessment on works particularly in the vicinity of Holland Haven Marshes SSSI. These surveys will be repeated in 2022 and extended out to the cable route and substation location, once confirmed. The survey area will extend to 400m from the cable route.

3.6.3 Potential impacts

3.6.3.1 Potential impacts during construction

3.6.3.1.1 Temporary loss of habitat

549. The construction activities associated with the project may result in the temporary loss of suitable habitat for nesting, roosting and foraging birds. Such habitats may be affected either physically or from disturbance associated with construction related activities.

3.6.3.1.2 Noise and visual disturbance

550. Noise and visual disturbance to birds as a result of construction activities associated with the project may occur. There is potential for increased levels of disturbance caused by the presence and movements of construction vehicles, equipment and/or personnel to also occur. This disturbance can result in impacts on any nesting, roosting and foraging birds that may be present both within and adjacent to the construction footprint. Disturbance may result in increased energy expenditure to find alternative sites and consequently in reduced survival rates of the birds.

3.6.3.2 Potential impacts during operation and maintenance

3.6.3.2.1 Noise and lighting disturbance

551. During operation there is a low risk that operational noise and lighting associated with the permanent above ground infrastructure (i.e. the onshore substation) may disturb birds. It is expected that both operational lighting and noise will be controlled.

3.6.3.2.2 Temporary disturbance associated with maintenance requirements

552. Maintenance activities following completion of the project will be required. However, it is considered likely that where this is required, any works will be localised and, in the unlikely event that remedial works are required, these will be undertaken. As such, it is anticipated that any impacts on birds will be limited to temporary indirect disturbance to the adjacent habitats and be at an extremely localised scale.

3.6.3.3 Potential impacts during decommissioning

553. No decision has been made regarding the final decommissioning policy for the onshore substation, as it is recognised that industry best practice, rules and

legislation change over time. However, the onshore substation equipment will likely be removed and reused or recycled. It is expected the onshore cables will be removed from ducts and recycled, with the transition pits and ducts left in situ.

554. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan would be provided.

555. It is anticipated that the decommissioning impacts will be similar in nature to those of construction.

3.6.3.4 Potential cumulative impacts

556. Onshore cumulative impacts will be considered as set out in Section 1.8. Any other project with the potential to result in impacts that may act cumulatively with the project will be identified and all available information will be reviewed. These projects will be subsequently included in the CIA and therefore scoped into the assessment.

557. The assessment will consider the potential for significant cumulative impacts to arise as a result of the construction, operation and decommissioning of the project in the context of other developments that are existing, consented or at the application stage.

3.6.3.5 Summary of potential impacts

558. Table 3.18 outlines the impacts which are proposed to be scoped into the EcIA. This may be refined through the EPP as additional information and data become available.

Table 3.18 Summary of impacts relating to onshore ornithology

Potential Impact	Construction	Operation	Decommissioning
Temporary and permanent loss of habitat suitable for nesting, roosting and foraging birds	✓	✓	x
Noise, vibration and visual disturbance to birds	✓	✓	✓
Cumulative	✓	✓	✓

3.6.4 Approach to assessment

559. The EcIA will be undertaken in accordance with the methodology outlined in the CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (September 2018).

560. The approach to assessment and data gathering will be discussed and agreed as part of the EPP prior to commencement. Consultation will be undertaken at key stages throughout the EIA process.

3.7 Onshore archaeology and cultural heritage

3.7.1 Existing environment

561. Essex has a rich and varied history, with nationally significant archaeological remains being identified in the region alongside a built heritage resource which include some nationally and regionally significant examples of country estate manor houses with their associated parklands, as well as numerous historic ecclesiastical and vernacular buildings.

562. In order to inform this scoping exercise, a search of designated heritage assets from the NHLE has been carried out for the onshore scoping area, the locations of designated heritage assets within the study area are illustrated on Figure 3.12.

563. Within the onshore scoping area, there are five Scheduled Monuments, 230 Listed Buildings (including four at Grade I and 13 at Grade II*), and one Registered Park and Garden.

564. These designated heritage assets include some highly significant remains of archaeological interest and numerous built heritage assets. For example, Beaumont Quay (NHLE 1020688) is located on the south-eastern edge of the project area, on Hamford Water, alongside four other Scheduled Monuments, including a World War II bombing decoy (NHLE 1019882) within Kirby-le-Soken within the south-eastern edge of the project area. There is also the important designed landscape at Thorpe Hall (Grade II Registered Park and Garden, NHLE 1000521), towards the central southern half of the project area. Amongst the 230 Listed Buildings, several notable ones are the 12th century Grade I Listed Church of St Mary (NHLE 1111455), along with the late 17th century Grade II* Listed Beaumont Hall (NHLE 1322628) and associated Grade II Listed buildings, including barns and a byre (e.g. NHLE 1112128, NHLE 1322629).

565. At this scoping stage, data for non-designated heritage assets from the EHER has not been acquired. This would, however, be an essential requirement to inform the subsequent EIA process (see Section 1.8 and Section 3.7.4).

566. The region as a whole has high potential for archaeological remains of local, regional and national importance. For example, excavations at Walton-on-the-Naze, at the former Martello Caravan Park identified multi-period agricultural activity, dating from the early Neolithic to the Late Bronze Age, through to the medieval and post-medieval periods (Pooley, 2016a). Another example includes an archaeological evaluation in Weeley, revealing a possible deserted medieval village with a church/hall complex at Weeley Hall (Pooley ,2016b).

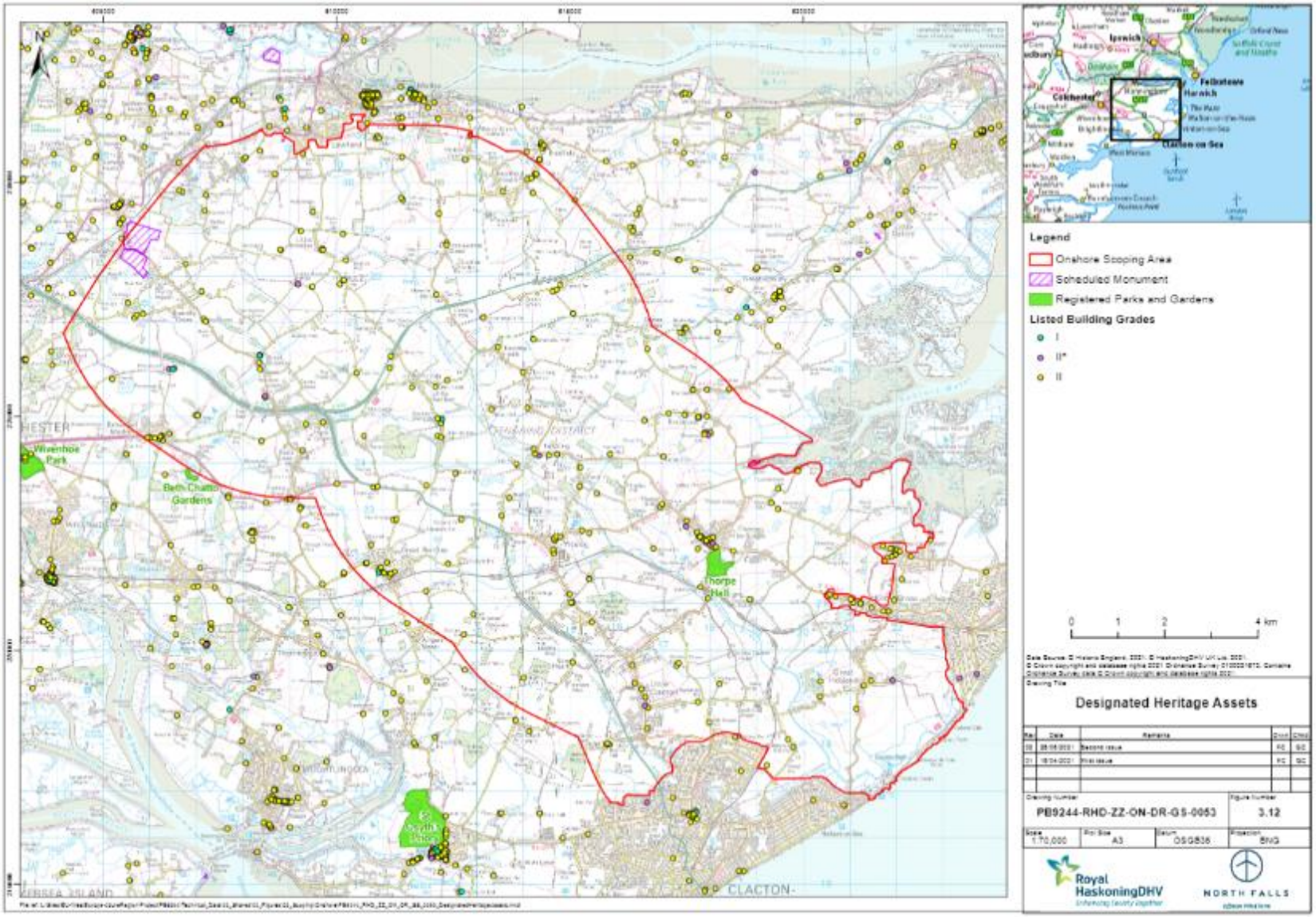

Figure 3.12 Designated heritage assets

3.7.2 Approach to data collection

567. Table 3.19 below identifies the sources that will be accessed to inform the characterisation of the existing environment within respect to onshore archaeology and cultural heritage.

Table 3.19 Existing datasets

Data Source	Data Contents
BGS	Historic borehole logs and the wider geological background for the region.
NHLE	Data on all designated heritage assets within England, maintained by Historic England. GIS data for all Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields.
EHER	Data on all recorded non-designated heritage assets, maintained by Essex Historic Environment Services. The data includes findspots, monuments and locally listed buildings. Information on previous events (archaeological surveys and investigations) will also be obtained.
NRHE	Maintained by Historic England and contains information derived from the former National Buildings Record (NBR) and National Archaeological Record (NAR).
Walkover Surveys and Site Visits	Data from walkover surveys and site visits will be used, identifying current land-use and any potential unrecorded non-designated heritage assets.
Zone of Theoretical Visibility (ZTV) Model	Any ZTV produced by the SLVIA team will be assessed to help inform settings assessment.
Existing archaeological studies and published sources	Background information on the archaeology of Essex, including the results of archaeological assessments. These are to include the Tendring geoarchaeology study, palaeolithic survey and historic grazing marsh study at landfall (full details available from Tendring District Council).
EHER, Historic England Archive, other regional and local records offices.	Aerial Photographs, LiDAR data and historic maps to assist in the detection and assessment of archaeological remains.

568. The following surveys (Table 3.20) will be undertaken to inform the assessment in accordance with industry guidelines and agreed in advance with the relevant historic environment stakeholders.

Table 3.20 Proposed baseline surveys onshore archaeology and cultural heritage

Survey/study	Timing	Spatial coverage
Walkover Surveys	TBC	Targeted areas of the proposed application boundary will be visited to identify current land use and any potential unrecorded non-designated heritage assets, as well as ground truthing of certain previously recorded assets.
Setting Assessment Site Visits	TBC	Heritage assets identified as potentially being affected by the project (through a change in their setting) will be visited to inform the setting assessment.
Priority Geophysical Survey	TBC	Targeted areas for geophysical survey, identified through desk-based baseline collation, e.g. Aerial photographic and LiDAR analysis. These are to include areas of 'blank' land, where no features where identified in the desk-based assessment. Techniques proposed for this survey include magnetometry and any other techniques deemed as required following the findings of the desk-based assessment.

Survey/study	Timing	Spatial coverage
Targeted Trial Trenching (if/where required and land access is achievable pre-application)	TBC	Targeted locations to be informed by desk-based approaches and priority geophysical survey.
Archaeological and Geoarchaeological elements to any engineering-led site/ground investigation work (SI/GI or equivalent)	TBC	Bespoke approaches, including the possibility of onsite monitoring and watching brief associated with any engineering-led site/ground investigation work (SI/GI or equivalent), if/when applicable. E.g. test pits, boreholes etc. Borehole cores will be made available to view by relevant stakeholders, if possible.

569. Following these initial baseline surveys, consideration of the requirement for any initial targeted archaeological evaluation (e.g. trial trenching) will be undertaken. Any targeted trial trenching may be undertaken at areas where the baseline surveys have identified a high potential for buried archaeological remains to be present, and/or at project related 'pinch points'. Any initial phase of targeted trial trenching would, however, be highly dependent on landowner access permissions being agreed. A more comprehensive (onshore project wide) approach to trial trenching is anticipated to take place in the post-consent stages.

3.7.3 Potential impacts

570. Potential impacts to heritage assets include both direct and indirect impacts, as well as changes in the setting of heritage assets, which could affect heritage significance.

571. A direct, physical impact is one where construction works directly involved with the project (e.g. excavations and groundworks) result in a direct physical change to the fabric of a heritage asset (e.g. partial or complete removal).

572. An indirect, physical impact is one that results from the project, but not resulting from direct (planned) intervention by the project's construction (e.g. vibration from groundworks/construction traffic affecting the fabric of a heritage asset or changes in ground conditions resulting in an effect on preservation conditions beyond the project parameters).

573. Impacts to the significance of a heritage asset may also occur if a development changes the surroundings in which a heritage asset is located, experienced, and appreciated (i.e. its setting). Similarly, historic character may also be affected if the project results in a change to the prevailing character of the area.

574. The onshore archaeology and cultural heritage assessment is likely to have key inter-relationships with Offshore and Intertidal Archaeology, Water Resources and Flood Risk, Noise and Vibration, Traffic and Transport, and SLVIA. These will be considered where relevant.

3.7.3.1 Potential impacts during construction

575. Construction activities which could affect the onshore archaeology and cultural heritage resource are: any intrusive groundworks, including directional drilling, piling, and open cut trench excavation; construction of any temporary work

areas or permanent above ground infrastructure; general construction activities such as plant movement or increased traffic movements due to construction.

576. The potential impacts during construction that will be assessed are:

- Direct, physical impacts to designated heritage assets;
- Direct, physical impacts to non-designated heritage assets;
- Indirect, physical impacts to designated heritage assets;
- Indirect, physical impacts to non-designated heritage assets;
- Temporary change to the setting of designated heritage asset, which could affect their heritage significance; and
- Temporary change to the setting of non-designated heritage assets, which could affect their heritage significance.

3.7.3.2 Potential impacts during operation and maintenance

577. As the majority of the onshore project infrastructure is buried sub-surface (i.e. infrastructure associated with the buried cable systems), this element of the operational project will have limited potential to further impact the onshore archaeology and cultural heritage resource. Activity which could have an ongoing impact to the onshore archaeology and cultural heritage resource will be the presence of the onshore substation and the potential visibility of the offshore infrastructure from coastal heritage assets. Any permanent above ground infrastructure has the potential to result in a change to the setting of heritage assets, which could affect heritage significance.

578. The potential impacts during operation are:

- Permanent change to the setting of designated heritage assets, which could affect their heritage significance; and
- Permanent change to the setting of non-designated heritage assets, which could affect their heritage significance.

3.7.3.3 Potential impacts during decommissioning

579. It is anticipated that the decommissioning impacts could be similar in nature to those of construction, depending on the extent and depths to which any further intrusive sub-surface decommissioning groundworks may occur. This will be considered in more detail as the EIA process progresses.

3.7.3.4 Potential cumulative impacts

580. Onshore cumulative impacts will be considered as set out in Section 1.8.

581. The project could interact cumulatively with other projects, which also have the potential for impacts associated with the onshore archaeology and cultural heritage resource. These cumulative impacts are considered primarily as:

- Direct, physical impact to the archaeological resource of the immediate and wider region; and
- Change in the setting of designated and/or non-designated heritage assets which could affect their heritage significance.

582. Where these impacts occur because of the project, in combination with other developments within the area with similar associated impacts, there is the potential for the impacts to be of greater significance than when assessed individually.

3.7.3.5 Transboundary impacts

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

3.7.3.6 Summary of potential impacts

584. Table 3.21 outlines the summary of the impacts proposed to be scoped into the EIA relating to onshore archaeology and cultural heritage.

Table 3.21 Summary of impacts relating to onshore archaeology and cultural heritage

Potential Impact	Construction	Operation	Decommissioning
Direct, physical, impacts to designated heritage assets.	✓	x	✓
Direct, physical, impacts to non-designated heritage assets.	✓	x	✓
Indirect, physical, impacts to designated heritage assets.	✓	✓	✓
Indirect, physical, impacts to non-designated heritage assets.	✓	✓	✓
Changes to the setting of designated heritage assets, which could affect their heritage significance.	✓	✓	✓
Changes to the setting of non-designated heritage assets, which could affect their heritage significance.	✓	✓	✓
Cumulative	✓	✓	✓

3.7.4 Approach to assessment

585. Assessment of the onshore archaeology and cultural heritage resource will be an iterative and ongoing process that will be combined with ongoing site selection work to refine the project footprint. To date, designated heritage assets only, as recorded within the NHLE, have been identified within the onshore scoping area.

586. The existing baseline and proposed assessment methodologies of potential impact below MHWS (including the intertidal zone) will be set out in the offshore archaeology and cultural heritage assessment (see Section 2.10).

587. The impact assessment upon the onshore archaeology and cultural heritage resource will follow a heritage significance-based approach to historic environment decision-making, as set out in the NPPF, Section 16: conserving and enhancing the historic environment (Ministry of Housing, Communities, and Local Government, 2019). The assessment will also follow all relevant and appropriate guidance as produced by Historic England (e.g. Historic England, 2015a, b and 2017).

588. As part of the EIA, a commercial search of the EHER will be undertaken, to provide the dataset on previously recorded non-designated heritage assets and events. Further research will also be undertaken to inform the baseline data, including assessment of archaeological archive reports, published archaeological articles, monographs and other sources.

589. As part of the EIA process, the existing historic environment with respect to onshore archaeology and cultural heritage will be described, including, but not limited to the following:

- Known non-designated heritage assets within 500m of the onshore proposed application boundary;
- Potential buried archaeological remains and previously unrecorded above ground heritage assets within 500m of the onshore proposed application boundary;
- Designated heritage assets within 1km of the project boundary and 5km of the onshore substation, to inform a setting assessment of heritage assets identified as potentially being affected by the project through a change in their setting; and
- Designated heritage assets along the coast which could be affected by the presence of offshore infrastructure will be included in the assessment, identified through professional judgement and consideration of a ZTV developed by SLVIA consultants.

590. Identification of heritage assets potentially affected by the project will be undertaken through spatial analysis of the heritage data within a GIS framework. Initial consideration of the setting of heritage assets and any potential for impact upon heritage significance will be undertaken as part of the setting assessment, informed by walkover surveys and site visits. A full consideration of, and conclusions regarding, setting impacts will be made in the final ES, following finalisation of the project design.

591. Identification of any areas which will potentially be subject to intrusive evaluation (as set out in Section 3.7.2), as part of the DCO application, would be decided through consideration of the baseline data and non-intrusive surveys and would be discussed and agreed in consultation with Essex County Council Historic Environment Service (Place Services).

592. The EIA will be undertaken with reference to and/or in accordance with following primary legislation, policy, standards and guidance:

- Ancient Monuments and Archaeological Areas Act 1979. (c.46);
- Planning (Listed Buildings and Conservations Areas) Act 1990). (c.9);
- Conserving and enhancing the historic environment. (Ministry of Housing, Communities & Local Government (2019);
- Planning Practice Guidance (PPG): Historic Environment (Ministry of Housing, Communities & Local Government (2019);
- The Historic Environment in Local Plans: Historic Environment Good Practice Advice in Planning 1 (Historic England, 2015a);

- Managing Significance in Decision-Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning 2 (Historic England, 2015b);
- The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning 3 (Historic England, 2017);
- Standard and guidance for historic environment desk-based assessment (CIfA, 2020); and
- Code of Conduct (CIfA, 2019).

593. The assessment will be supported by a series of related technical reports, annexes and appendices. The identification of these report requirements is ongoing but will as a minimum include an ADBA, undertaken to identify the currently recorded designated and non-designated heritage assets within defined study areas. The ADBA will include assessment of aerial photography, LiDAR analysis and review of cartographic sources, in respect to a historic map regression exercise of the onshore project area and/or targeted parts of the onshore cable route and onshore substation location, to identify changes in land use throughout history and provide further information on potential heritage assets.

594. Other technical reports to be produced which will inform the baseline environment, and ultimately inform assessment (see Table 3.20 above), are:

- Priority Geophysical Survey(s);
- Initial Targeted Intrusive Evaluation (trial trenching), if/where required, relevant and undertaken pre-application. To be confirmed through progression of the iterative approach to survey work and ongoing consultation and collaboration with Essex County Council Historic Environment Service (Place Services); and
- Any archaeological and geoarchaeological approaches to be applied to engineering-led ground/site investigation, if/when applicable and undertaken. For example, monitoring and/or watching briefs.

595. An initial settings assessment will also be undertaken as part of the ADBA, which will identify heritage assets and their associated heritage significance which could be affected by change in setting as a result of the project. This will follow the Historic England five-step approach (Historic England, 2017).

596. Following this scoping stage technical-level consultation with Historic England and Essex County Council Historic Environment Service (Place Services) will begin in order to further identify and agree the primary methodologies, present initial findings and ensure potential historic environment issues are identified and considered during the EIA.

3.8 Noise and vibration

597. This section of the Scoping Report considers the assessment of onshore noise and vibration effects relating to the project. Consideration is given to the potential impacts and any significant effects from the construction, operation

and decommissioning of the onshore components in terms of noise and vibration effects on identified receptors.

3.8.1 Existing environment

598. The onshore scoping area is within the administrative area of Tendring District Council; one of the local authorities forming part of the wider Essex County Council region.

599. The area is predominantly rural, comprising largely of arable agricultural land in active use. Built up urban areas and settlements are in the form of towns, small villages and isolated residential properties which are likely to experience low ambient noise levels presently.

600. Noise sources across the Tendring district contributing to the prevailing baseline noise environment within the onshore scoping area include:

- A120 heading west from Harwich to the A12 near Colchester;
- A133 from Colchester to Clacton-on-Sea;
- Aircraft using Clacton-on-Sea airfield;
- Local roads;
- The railway line from Walton-on-the-Naze heading inland and to other coastal towns;
- Commercial and entertainment premises, and from activity relating to the coastal tourist industry; and
- Industrial areas at Great Clacton and Harwich.

601. Sensitive receptors with respect to noise within the onshore scoping area are typically residential premises. It is also necessary to consider a wider range of receptors including schools, places of worship, noise sensitive commercial/industrial premises, historic buildings, spaces used for recreation and ecological receptors.

602. Tendring district comprises of a variety of receptors across the onshore scoping area, with the larger coastal towns of Manningtree to the north, Frinton-on-Sea to the east and Holland-on-Sea and Clacton-on-Sea to the south-east located adjacent to the onshore scoping area.

603. Inland, other smaller settlements include Thorpe-le-Soken, Weeley, Hare Green, Elmstead Market, Bromley Cross and Great Bentley, all of which are located within the onshore scoping area.

604. Recreational and ecological receptors within / adjacent to the onshore scoping area include:

- AONB including Suffolk Coast and Heaths (located adjacent to the onshore scoping area);
- SSSI including Holland Haven Marshes SSSI and Weelyhall Wood SSSI;
- Holland Haven LNR;

- Great Holland Pits Essex Wildlife Trust Reserve;
- Hamford Water SAC, Ramsar and LNR (located adjacent to the onshore scoping area); and
- A number of ancient woodlands scattered across the onshore scoping area.

605. A list of potential receptors which will be considered within the onshore scoping area along with their classification and respective sensitivity level is defined in Table 3.22.

Table 3.22 Definition of the different types and sensitivity levels for noise

Assigned Sensitivity	Definitions and Classification Type
High	Noise receptors have been categorised as high sensitivity where noise may be detrimental to vulnerable receptors. Such receptors include: Certain hospital wards (e.g. operating theatres or high dependency units) or care homes at night
Medium	Noise receptors have been categorised as medium sensitivity where noise may cause disturbance and a level of protection is required but a level of tolerance is expected. Such subgroups include: • Residential accommodation • Private gardens • Hospital wards • Care homes (during the day) • Schools • Universities • Research facilities • National parks (during the day) • Temporary holiday accommodation (including holiday lets)
Low	Noise receptors have been categorised as low sensitivity where noise may cause short duration effects in a recreational setting although particularly high noise levels may cause a moderate effect. Such subgroups include: • Offices • Shops (including cafes) • Outdoor amenity areas during the day (including recreation, public amenity space/play areas), long distance footpaths (including PRoW, dog walking routes, bird watching areas, footpaths and other walking routes, visitor attractions, cycling routes including rural roads) • Doctors‘ surgeries • Sports facilities • Places of worship
Negligible	Noise receptors have been categorised as negligible sensitivity where noise is not expected to be detrimental. Such subgroups include: • Warehouses • Light industry • Car parks • Agricultural land

3.8.2 Approach to data collection

606. The approach to assessment and data gathering will be discussed and agreed as part of the EPP prior to commencement.

607. Identification of potential sensitive receptors and for the purposes of the characterisation of the existing environment will be undertaken using a range of data sources.

608. The existing environment will be characterised using the data sources set out in Table 3.23.

Table 3.23 Existing datasets

Data Source	Data Contents
Google Maps Aerial Photography Local Authority Local Plans	Location of noise sources and sensitive receptors within the onshore scoping area
Environment Agency LIDAR Data (Open Licence)	Topographical data
OS Mapping	Vector mapping
Existing and proposed baseline noise surveys	Baseline noise data

609. No baseline noise monitoring has been undertaken to date. Once the noise and vibration onshore scoping area has been refined, a baseline noise survey will be undertaken to inform the assessment.

610. The baseline survey methodology and geographical extent will be agreed in advance with Tendring District Council who are responsible for the administrative district in which the onshore scoping area is located.

611. Measurements will be undertaken in accordance with guidance detailed within British Standard (BS) 7445:1991 'Description and measurement of environmental noise Part 2:Guide to the acquisition of data pertinent to land use' and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

612. Survey locations would be representative of the potentially most affected noise sensitive receptors.

613. Data collection will likely comprise a combination of short term attended and longer term (up to a week) unattended measurement. A weather station would also be deployed to identify site-specific meteorological conditions during the surveys.

614. A review of baseline data contained within ESs and planning applications for other developments would also be undertaken where data is available and relevant.

3.8.3 Potential impacts

615. The noise assessment is likely to have key inter-relationships with Seascape, Landscape and Visual, Air Quality, Onshore Ecology, Tourism and Recreation and Traffic and Transport. These will be considered where relevant.

3.8.3.1 Potential impacts during construction

616. Noise and vibration issues associated with the onshore elements of the project's construction works will be assessed using the guidance contained in BS 5228:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise' and Part 2: Vibration.

617. This guidance defines the accepted prediction methods and source data for various construction plant and activities.

618. Typically, noise and vibration generating activities are associated with:

- Earthworks;
- Directional drilling;
- Surface excavation and earth moving during cable laying and site preparation for the substation and other onshore infrastructure;
- Piling of foundations for the onshore substation;
- Temporary increases in Heavy Goods Vehicles (HGVs) delivering to site, operating in designated works areas and using haul routes;
- Nearshore vessels and offshore cable laying activities; and
- Other general onshore construction activities.

619. Piling may also be used (if necessary) to provide a stable temporary platform for the drilling rigs at landfall and along the onshore cable route at potential trenchless crossings.

620. Construction effects will be temporary and will vary both spatially and temporally in nature across the onshore scoping area. The magnitude of impact is likely to be based on the proximity of the proposed construction activities within the onshore scoping area to noise and vibration sensitive receptors.

621. The closest sensitive human and ecological receptors have the potential to be impacted by noise from these temporary works activities.

622. Vibration impacts could occur from temporary heavy construction works, at residential, commercial, industrial and historical buildings and monuments.

3.8.3.2 Potential impacts during operation and maintenance

623. There are no operational noise impacts from the buried infrastructure at the landfall site and along the cable route. An assessment would be undertaken to determine the likely impacts due to operational noise emissions from the onshore substation on identified sensitive receptors.

624. The magnitude of impact is likely to be based on the proximity of the proposed onshore infrastructure to noise and vibration sensitive receptors within the onshore scoping area. Examples include:

- The proximity of the onshore substation to noise sensitive premises (including residential properties);
- The proximity of onshore infrastructure to noise sensitive locations that are particularly valued for their acoustic environment or landscape quality including AONBs and PRoWs; and

- The proximity of the project to designated sites for nature conservation where noise may have an adverse impact on protected species or other wildlife, including SPAs, SACs, Ramsar, SSSIs, LNRs.

625. The potential permanent impacts of operational noise from the project's onshore substation may arise from:

- The inherent operational noise generated by the project's onshore substation, and any associated characteristics (tonality, intermittency, impulsivity, other acoustic characteristics);
- Noise from onshore substation maintenance activities, including emergency switchgear and back-up generators.

626. There are unlikely to be any noise and vibration impacts relating to operational or maintenance vehicular traffic, but operational noise impacts may arise from the operation of equipment within the onshore substation (e.g. reactors, filters, and transformers).

627. Operational onshore project substation plant such as transformers and other wound power equipment vibrate at twice the power frequency i.e. 100Hz and associated harmonic frequencies e.g. 200Hz, 300Hz.

628. The operational vibration effects are considered negligible as industry standard requires the use of vibration isolation pads/mounts to prevent transmission of ground borne vibration. The onshore substation will be designed to achieve negligible levels of ground-borne vibration.

629. Therefore, it is considered there will be no significant sources of vibration associated with the operational project and operational vibration impacts have therefore been scoped out of further assessment.

3.8.3.3 Potential impacts during decommissioning

630. It is anticipated that impacts associated with decommissioning would be similar in nature to those experienced during construction, although it is likely that there would be a lower magnitude of effect, particularly if some subsurface infrastructure is left in-situ.

631. There is potential for some offshore decommissioning activities to create airborne noise.

3.8.3.4 Potential cumulative impacts

632. Onshore cumulative impacts will be considered as set out in Section 1.8.

633. Onshore cumulative impacts will be considered as part of the EIA process. Any other project with the potential to result in impacts that may act cumulatively with the project will be identified during consultation as part of the EPP and following a review of available information. These projects will then be included in the CIA and therefore are scoped into the assessment.

634. The predicted cumulative effects of construction, operation and maintenance, and decommissioning from the project on noise and vibration are considered to be localised to within the onshore scoping area.

635. There is potential for cumulative effects at sensitive receptors where other schemes or activities within the project onshore scoping area occur at the same time as a result of:

- Concurrent North Falls construction activities with other plans or projects;
- From construction phase road traffic noise and vibration on highway links used by the project and other schemes;
- Site construction noise from other major infrastructure or road and rail projects in close proximity; and
- Construction phase impacts at newly formed residential, commercial or industrial projects.

3.8.3.5 Summary of potential impacts

636. In summary, noise and vibration impacts have the potential to occur within the construction and decommissioning phases due to the nature of the works to be undertaken. Noise and vibration impacts are summarised in Table 3.24.

637. It is anticipated there will be negligible vibration impacts during operation due to the necessity to engineer this aspect into the plant and equipment design. It is therefore proposed to scope operational vibration impacts out of the assessment.

638. During the operational phase, there is the potential for noise impacts. Section 5.11 Noise and Vibration of Overarching National Policy Statement for Energy (EN-1) details mitigation measures. These include consideration to the use of engineering, lay-out and administrative decisions and can form part of Best Practice Measures (BPM).

639. Due to the limited pathway for offshore airborne noise to impact receptors it is proposed that offshore airborne noise is scoped out of the EIA for operation.

Table 3.24 Summary of impacts relating to noise and vibration

Potential Impact	Construction	Operation	Decommissioning
Noise affecting human and ecological receptors	✓	✓	✓
Vibration affecting human receptors	✓	x	✓
Road traffic Impacts	✓	x	✓
Nearshore airborne noise	✓	x	✓
Cumulative Impacts	✓	✓	✓

3.8.4 Approach to assessment

640. The assessment of construction noise and vibration impacts will refer to the guidance detailed in BS 5228:2009+A1:2014. The assessment will be based on the proposed construction phasing and associated activities, for example, cable installation, directional drilling works and piling.

641. The spatial scope of the construction and decommissioning noise assessment would include the following:

- Landfall, cable routes, onshore substation and offshore airborne noise where activities could affect noise sensitive receptors; and
- Traffic routes and routes subject to significant changes in traffic flows (and/or percentage HGV) associated with the construction of the project.

642. Construction phase traffic noise impacts will be calculated as a Basic Noise Level (BNL) using the methodology detailed in Calculation of Road Traffic Noise (CRTN) (HMSO, 1988), and using criteria from the DMRB, LA111 Noise and Vibration, Revision 2 (Highways England, 2020).

643. Results of geophysical surveys and grab sampling (detailed in Section 2.1) would confirm methodologies required for installing the offshore infrastructure and inform the assessment process for offshore airborne noise.

644. Operational impacts will include noise associated with the onshore substation. The assessment will be based on the guidance and methodology detailed in BS 4142:2014+A1:2019.

645. The noise and vibration assessment will be undertaken in accordance with following standards and guidance (or the latest published version thereof):

- Overarching NPS for Energy (EN-1) (DECC, 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b);
- NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c);
- BS 4142:2014+A1:2019 – Method for Rating and Assessing Industrial and Commercial Sound;
- BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings;
- BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures;
- BS 7445-2:1991 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use;
- BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise;
- BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration;
- BS 6472-1:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings;
- CRTN 1988;
- DMRB, LA111 Noise and Vibration, Revision 2;
- WHO (1999) Guidelines for Community Noise;
- WHO (2009) Night Noise Guidelines for Europe; and
- WHO (2018) Environmental Noise Guidelines for the European Region.

646. Following the refinement onshore scoping area, further liaison with Tendring District Council and other relevant stakeholders (where necessary) will be undertaken to agree the approach and methodology to data collection for EIA purposes and the specific assessment methodology.

3.9 Traffic and transport

3.9.1 Existing environment

647. At this scoping stage, no decision has been made with regards to the onshore grid connection location. As such, a high level onshore scoping area has been established and is depicted in Figure 3.13.

3.9.1.1 Road network

648. The A120 provides the main road connecting the onshore scoping area to the wider highway network. The A120 forms part of the Strategic Road Network managed by Highways England and provides the main link between Colchester and the A12 to the north west and the port of Harwich to the east (see Figure 3.13).

649. Within the onshore scoping area, the A120 comprises of a dual carriageway until the junction with the A133. This section of the A120 carries in the region of 44,278 vehicles per day, of which approximately 6.1% are HGVs (DfT, 2020).

650. To the east of the junction with the A133, the A120 continues towards Harwich as a single carriageway, albeit with short sections of dual carriageway on the approach to and exit from roundabouts. This section of the A120 carries in the region of 12,561 vehicles per day, of which approximately 12.7% are HGVs.

651. Essex County Council other roads within the onshore scoping area fall under the administration of Essex County Council as the local highway authority. The Essex County Council Local Transport Plan (LTP) identifies the Haven Gateway (the sub-region covering north-east Essex and south-east Suffolk) as one of the key international gateways to the UK, containing the internationally significant Haven Ports of Harwich and Felixstowe (Essex County Council, 2011).

652. The Essex County Council LTP identifies that the key interurban highway routes serving the Haven Gateway are the A12, A120 and the A133. It is identified that these routes can suffer from congestion at times of increased demand and can suffer from substantial delays should a major accident occur on or near them.

653. Essex County Council have established a strategic County Routes network comprising Priority 1 (PR1) and Priority 2 (PR2) roads, with the remaining network categorised as Local Roads.

654. Essex County Council identify that it is the County Routes network which provides the main arteries for the flow of commerce, goods and people, and therefore carries high volumes of traffic through and around the county.

655. Within the onshore scoping area, the A133 provides the main link to the wider strategic road network (via the A120 and A12) and heads south from the A120 towards Clacton-on-Sea. The A133 is a single carriageway road and to the

south of the A120 carries in the region of 30,732 vehicles per day of which 3.7% are HGVs. The A133 is identified by Essex County Council as a County Route and also provides key links to the B1033.

656. The B1033 is identified by Essex County Council as a County Route and provides the main link from the A133 to the towns of Walton-on-the-Naze and Frinton-on-Sea. The B1033 is a single carriageway road and carries in the region of 9,405 vehicles per day, of which approximately 3.2% are HGVs.

657. The towns of Walton-on-the-Naze and Frinton-on-Sea are linked to the nearby town of Clacton-on-Sea by the B1032. The B1032 runs parallel to the area of shoreline in which the offshore cables would make landfall.

658. The B1032 is a single carriageway road and is identified by Essex County Council as a County Route. The B1032 carries approximately 6,407 vehicles per day, of which 1.9% are HGVs.

3.9.1.2 Walking and cycling

659. Within the onshore scoping area there is an extensive network of walking routes within the towns and villages. In addition, National Cycle Route 150 also runs along the coast connecting towns of Clacton-on-Sea and Frinton-on-Sea.

660. Section 4.3 includes details of PRoW within the onshore scoping area.

661. Further evaluation of the baseline walking and cycling routes would be undertaken once the onshore electrical infrastructure locations are finalised.

3.9.1.3 Rail

662. Within the onshore scoping area, Clacton-on-Sea and Walton-on-the-Naze form the two eastern termini of the Sunshine Coast Line, a branch of the Great Eastern Main Line.

663. The Sunshine Coast Line passes through a number of smaller stations within the onshore scoping area before in connects to the Great Eastern Main Line at Colchester.

664. There are no existing rail freight facilities within the onshore scoping area.

Figure 3.13 Road network

3.9.2 Approach to data collection

665. To date, the existing environment has been characterised using the data sources set out in Table 3.25.

Table 3.25 Existing datasets

Data Source	Data Contents
Department for Transport road traffic statistics - https://roadtraffic.dft.gov.uk	Annual average traffic counts for all main 'A' roads
Google Maps, Bing Maps, etc.	Online mapping
Essex Highways – www.essexhighways.org/interactive-maps-and-live-travel-information/highways-information-map	Mapping of key highway asset information within Essex, including County Route designations
Sustrans – https://www.sustrans.org.uk/national-cycle-network	Details of national and regional cycle routes

666. To facilitate the impact assessment, the following additional data will also be obtained:

- Baseline traffic flow data for all roads within the traffic and transport study area;
- Details of sensitive receptors (as defined within Table 3.29);
- Collison data for the latest five year period for all links within the traffic and transport study area;
- Existing pedestrian/ cycle/ bus routes; and
- Trip generation, including number and type of construction vehicles and employee trips.

3.9.3 Potential impacts

3.9.3.1 Potential impacts during construction

667. The construction phase will result in a requirement for the import / export of materials and plant. However, at this stage, no information is available for construction traffic demand or intermodal delivery strategies. In order to consider a worst case, it would be assumed that the majority of construction traffic would be by road.

668. Table 3.26 sets out the potential construction traffic impacts and the likely user groups that would be affected.

Table 3.26 potential construction traffic impacts

Potential Impact	Potential Impact of Construction Traffic	Affected user groups
Driver delay	Increases in traffic leading to delays at junctions; and Construction traffic using narrow roads resulting in increased delays.	Commuters, visitors, and business users.
Road safety	Construction traffic impacting upon sites with a history of collisions and / or the introduction of new risks associated with the formation of new construction accesses.	Commuters, visitors, and business users.
Severance	Increases in traffic impacting upon non-motorised users of the public highway.	Local communities and tourists in the area.
Amenity		
Abnormal loads	Increases in traffic leading to delays to traffic and the suitability of the delivery routes to accommodate abnormal load deliveries.	Commuters, visitors, and business users.

669. Traffic borne impacts upon air quality and noise and vibration are considered separately in Section 3.2 and Section 3.8 respectively.

670. The preferred base port (or ports) for the offshore construction of the project is not known and any decision would not be expected until post-consent. Such facilities would be provided or brought into operation by means of one or more planning applications or as port operations with permitted development rights. It is therefore proposed to scope out of the assessment the onshore impacts of the traffic and transport impacts associated with offshore construction activities. This approach has been accepted for other recently consented nationally significant offshore wind farm projects, e.g. East Anglia THREE and Hornsea Three.

3.9.3.2 Potential impacts during operation and maintenance

671. The onshore substation is not expected to be permanently manned; however, staff will periodically visit to carry out routine checks and maintenance. Most annual maintenance will be short, but if necessary, some campaigns may be longer.

672. Any inspections/ maintenance of the onshore cable route will be infrequent and subject to very low vehicle demand.

673. Considering the activities above, no significant traffic impacts are anticipated during the operational phase and it is therefore proposed that this phase will be scoped out of the assessment.

674. Similar to the construction phase, no decision has been made on a preferred base port for the offshore operation and maintenance of the project. Therefore, it is proposed to scope out of the assessment the onshore traffic and transport impacts of offshore operation and maintenance activities.

3.9.3.3 Potential impacts during decommissioning

675. It is anticipated that the decommissioning impacts will be similar or less in nature to those of construction. It is proposed to scope out decommissioning impacts.

3.9.3.4 Potential cumulative impacts

676. Onshore cumulative impacts will be considered as set out in Section 1.8 as part of the EIA Process. Any other project with the potential to result in impacts that may act cumulatively with the project will be identified. Consultation with the highway authorities (Essex County Council and Highways England) will seek to identify any significant developments that could have a cumulative impact with the construction phase of the project (e.g. improvements to the A120, other Nationally Significant Infrastructure projects, large residential development over 100 homes etc).

677. The assessment would consider the potential for significant cumulative impacts to arise because of the construction of the project in the context of other developments that are existing, consented or at the application stage.

3.9.3.5 Summary of potential impacts

678. Based on the information available to date, the potential traffic and transport impacts to be assessed are presented in Table 3.27.

Table 3.27 Summary of impacts relating to traffic and transport

Potential Impact	Construction	Operation	Decommissioning
Driver delay	✓	×	×
Road safety	✓	×	×
Severance	✓	×	×
Amenity	✓	×	×
Abnormal loads	✓	×	×

3.9.4 Approach to assessment

679. The principle guidelines for the assessment of the environmental impacts of road traffic associated with new developments are the 'Guidelines for the Environmental Assessment of Road Traffic' (GEART) published by the Institute of Environmental Assessment in January 1993.

680. The guidance provides a framework for the assessment of traffic borne environmental impacts and will be supplemented by technical transport guidance outlined in Table 3.28.

Table 3.28 Supplementary technical transport guidance

Document	Purpose/Application
PPG - Travel Plans, Transport Assessment and Statements (Ministry of Housing Communities and Local Government, March 2014)	Provides overarching guidance upon the structure of transport assessments and travel plans.
DMRB CD 123 - Geometric design of at grade priority and signal-controlled junctions (Highways England, January 2020)	Provides the standards for the design of new points of access.
Manual for Streets (Department for Transport, September 2007)	Guidance to inform the visibility requirements for junctions where measured speeds are below 40mph.
Manual for Streets 2 (Chartered Institute of Highways and Transportation September 2010)	
Traffic Signs Manual Chapter 8 Traffic Safety Measures and Signs for Road Works and Temporary	Provides guidance upon temporary traffic management that will be used to inform the

Document	Purpose/Application
Situations Part 1: Design (Department for Transport, 2009)	assessment of driver delay impacts related to temporary traffic management/ road closures.

681. GEART suggests the following rules to define the extent and scale of the assessment required:

- **Rule 1:** Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%).
- **Rule 2:** Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

682. The above criteria applied to the projects traffic demand will dictate the extent of the traffic and transport study area and the scale of the impact assessment. Changes in traffic flows below the GEART rules are assumed to result in negligible, environmental impacts and would not be assessed further.

683. The exception to GEART Rule 1 and 2, is the consideration of the impacts upon driver delay and road safety. These impacts can be potentially significant when high baseline traffic flows are evident, and a lower change in traffic flow can be potentially significant and therefore GEART rules would not be applied.

3.9.4.1 Identification of sensitive locations

684. The sensitivity of a road can be defined by the type of user groups who may use it. GEART identifies that it is useful to identify particular groups or locations which may be sensitive to changes in traffic conditions and provides a checklist of sensitive locations and groups; however, the list is not exhaustive and can be added to by the assessor.

685. Applying the GEART principles, Table 3.29 provides broad definitions of the different sensitivity levels that would be adopted for the assessment.

Table 3.29 Example definitions of the different sensitivity levels

	Receptor sensitivity definitions		
Sensitivity	**Severance and amenity**	**Driver delay (capacity)**	**Highway safety**
High	High concentrations of sensitive receptors (e.g. hospitals, schools, areas with high footfall) and limited separation provided by the highway environment; or a low concentration of sensitive receptors and no separation from traffic provided by the highway environment.	Junctions operating at or over capacity and / or roads less than 5.5m wide with no passing places provided.	Links with collision rates above national averages and / or collisions clusters with emerging patterns of collisions.
Medium	A low concentration of sensitive receptors (e.g. residential dwellings, pedestrian desire lines, etc.) and some separation from traffic provided by the highway environment.	Junctions or links operating close to capacity and or roads less than 5.5m wide but with passing places provided.	Links with collision rates close to national averages and / or collision clusters.
Low	Few sensitive receptors and / or highway environment can accommodate changes in volumes of traffic.	Junctions or links with spare capacity and / or roads in excess of 5.5m in width.	Links with collision rates lower than national averages and

Receptor sensitivity definitions			
Negligible	Links that fall below GEART Rule 1 and 2 screening thresholds and major 'A' roads or motorways with no pedestrian or cycle environment.		/ or no collision clusters.

3.9.4.2 Impact assessment process

686. Construction traffic demand will be derived by way of a 'first principles' approach whereby traffic generation is calculated from an understanding of likely material demand and resourcing requirements.

687. The project's traffic demand would be assigned to the highway links within the traffic and transport study area and the increase in traffic flow to baseline conditions determined. This would facilitate an assessment of the magnitude of effect by applying the thresholds in Table 3.30 to inform a detailed evaluation of potential impacts.

Table 3.30 Magnitude of effect thresholds

Impact	Negligible	Low	Medium	High
Severance	Change in total traffic flow of less than 30%	Change in total traffic flow of 30-60%	Change in total traffic flow of 60-90%	Change in total traffic flows of over 90%
Amenity	Change in traffic flow (or HGV component less than 100%)		Greater than 100% increase in traffic (or HGV component) and a review based upon the quantum of vehicles, vehicle speed and pedestrian footfall	
Driver delay	Informed by a review of the potential increase in peak hour traffic through sensitive junctions and links			
Highway Safety	Informed by a review of existing collision records from within the study area and the forecast increase in traffic.			
Abnormal Loads	Informed by an assessment of the suitability of the access routes to accommodate abnormal loads.			

688. The magnitude of effect (Table 3.30) would then be combined with the receptor sensitivity (Table 3.29) to determine the overall impact of the project's traffic in accordance with the impact assessment matrix (Table 1.5 in Section 1.8).

3.10 Human health

3.10.1 Existing environment

689. The Essex Joint Health and Wellbeing Strategy (EJHWS) 2018-2022 (Essex County Council and Healthwatch Essex, 2017) identifies a number of key aspects of the health landscape within the county, under the topics of mental health, obesity, health inequalities and long term conditions.

3.10.1.1 Mental health

- 8.7% or 17,390 children and young people aged between 5-16 years have a mental health disorder and 16% of the population aged 16-74 across Essex have a common mental health disorder. Up to 40% of some groups of older people have depression.

- 25,290 people in Essex are in contact with specialist mental health services, 4,385 on a Care Programme Approach and 160 subject to the Mental Health Act.
- 24% of adults in contact with secondary mental health services live in stable and appropriate accommodation, which is significantly worse than England average.
- There is a 72.5% gap in the employment rate between those in contact with secondary mental health services and the overall employment rate. This 'employment gap' is growing and is significantly worse than England (67.4%).
- Suicide rate is 10.7 per 100,000 of population (16.6 per 100,000 males and 5.4 per 100,000 females) (Essex County Council and Healthwatch Essex, 2017).

3.10.1.2 Obesity

- Around 1 in 3 of 10 to 11 year olds and almost two thirds of adults in Essex are overweight or obese.
- Over 250,000 adults in Essex are physically inactive. 6.3% of adults (17+) have a recorded diagnosis of diabetes (Essex County Council and Healthwatch Essex, 2017).

3.10.1.3 Health inequality

- Life expectancy in Essex – at 80.1 years for males and 83.4 years for females - has decreased, and the gap in life expectancy between the most and least deprived areas of Essex has widened to 7.5 years for men and 5.8 years for women.
- While 16.4% of children in Essex live in low income families – less than the England average – this ranges from 7.9% in Uttlesford to 27% in Tendring (Essex County Council and Healthwatch Essex, 2017).

3.10.1.4 Long term conditions

- In Essex, the forecast growth in over 65s in the next decade is 28%, with a 55% rise in over 85s.
- Dementia is common and increasing. Essex County Council supported 3,850 people with dementia during 2016/17, providing services for around 2,640 people at any given time. 32% of Essex County Council's admissions to residential care were for people known to have dementia.
- People with mental health issues and those with disabilities are less likely to be in work and may face financial challenges and be more likely to be socially isolated. Only around 1 in 13 adults with learning disabilities are in employment in Essex.
- 17% of the population in Essex report they have a health problem or disability that limits their day-to-day activities and has lasted, or is expected to last, at least 12 months.
- 31,940 or 38.5 per 1000 of working age people in Essex received Disability Living Allowance in 2014.

- Additionally, 1,520 or 181.2 per 100,000 people aged 18-64 in Essex are registered blind or partially sighted (2013/14) (Essex County Council and Healthwatch Essex, 2017).

3.10.2 Approach to data collection

690. The assessment will focus on the onshore elements of the project, and on the local population within a study area most likely to be affected. Existing baseline statistics will be obtained from publicly available data, such as from the Office of National Statistics (ONS) (i.e. census data) and Public Health England (PHE) (e.g. Public Health Outcome Framework, health asset profiles, etc.), to provide information on population health (both general and vulnerable groups) in the study area. No baseline human health surveys or monitoring is proposed to be undertaken as part of the assessment. The human health impact assessment (HIA) will bring together the conclusions of the assessments made in other relevant chapters of the EIA.

3.10.3 Potential impacts

691. The human health assessment is likely to have key inter-relationships with Ground Conditions and Contamination, Air Quality, Water Resources and Flood Risk, Noise and Vibration, Traffic and Transport, Tourism and Recreation and Socio-economics. These topics will be considered as appropriate.

3.10.3.1 Potential impacts during construction

692. Potential impacts that are anticipated to arise during construction are outlined below, grouped under the different wider determinants of health and wellbeing 'themes' included in PHEs 'Health Impact Assessment in spatial planning' guidance (PHE, 2020), and also referenced in the 'Essex Healthy Places' guidance (Essex Planning Officers Association (EPOA), 2019) and PHEs 'Healthy Urban Planning Checklist' (NHS, 2017). These themes include 'traffic and transport', 'land use' and 'socio-economics' and are set out below (using current PHE theme nomenclature with the equivalent former PHE/NHS category stated in brackets).

3.10.3.1.1 Traffic and Transport (Active Travel)

693. Potential impacts on PRoW have the potential to cause changes in accessing the footpath, cycleway and bridleway network (i.e. active travel). Increased traffic associated with construction may give rise to effects on highway safety and severance/connectivity.

3.10.3.1.2 Land Use (Healthy Environment)

694. Construction of the onshore infrastructure associated with the project has the potential to cause impacts on wellbeing through stress and disturbance.

695. Onshore construction works have the potential to impact air quality from the generation of construction dust and traffic emissions, and thereby to cause nuisance soiling and an increase in local air pollutants which may affect vulnerable people.

696. Onshore construction phase noise emissions have the potential to cause disturbance and affect local residents' health and wellbeing.

697. Contaminated land (if found to be present) disturbed during construction could result in health effects through ingestion, inhalation or contact with liberated contamination. Pollution of surface or groundwater bodies which are subsequently used as a potable source could result in health effects. Tendring District is a predominantly agricultural area and food health could be compromised by contaminated soils or water, if encountered.

3.10.3.1.3 Socio-economics (Vibrant Neighbourhoods)

698. Beneficial impacts are anticipated in relation to enabling residents of the Tendring District area to access employment opportunities through construction activities.

3.10.3.2 Potential impacts during operation and maintenance

699. Potential impacts that are anticipated to arise during operation are outlined below, grouped again under the different wider determinants of health themes ('traffic and transport', 'land use' and 'socioeconomics') where relevant (PHE, 2020).

3.10.3.2.1 Land Use (Healthy Environment)

700. Onshore operational phase noise emissions associated with the onshore substation have the potential to cause disturbance and thereby to affect health.

3.10.3.2.2 Socio-economics (Vibrant Neighbourhoods)

701. Beneficial impacts are anticipated in relation to employment opportunities associated with the project's operations and maintenance base (depending on final location).

3.10.3.3 Potential impacts during decommissioning

702. It is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant regulator.

3.10.3.4 Potential cumulative impacts

703. Onshore cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to human health include other nearby development projects interacting with the same vulnerable populations during their construction and operation.

3.10.3.5 Summary of potential impacts

704. Table 3.31 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 3.31 Summary of impacts relating to human health

Potential Impact	Construction	Operation	Decommissioning
Interference with users of footpath, cycleway and bridleway network.	✓	x	✓
Stress / disturbance associated with construction activities	✓	x	✓

Potential Impact	Construction	Operation	Decommissioning
Degradation of local air quality	✓	x	✓
Noise disturbance	✓	✓	✓
Land contamination giving rise to health effects	✓	x	✓
Access employment opportunities	✓	✓	✓

3.10.4 Approach to assessment

705. The HIA methodology will use best practice as published by the Institute of Environmental Management and Assessment (IEMA) in line with the 'Health in Environmental Impact Assessment: A Primer for a Proportionate Approach' (outlined in Cave *et al.*, 2017) and working within the framework of the PHE guidance 'Health Impact Assessment in spatial planning' (PHE, 2020), EPOA 'Essex Healthy Places' (EPOA, 2019) and the NHS 'Healthy Urban Planning Checklist' for including health in consideration of development planning (NHS, 2017). The methodology will provide a framework to identify:

- The 'likelihood' of the proposed project having an effect on health; and
- If an effect is likely, whether it may be 'significant'.

706. A study area for the HIA will be determined based on including all local populations which have the potential to be affected during the project's construction, operation and decommissioning. The study area will be located within the onshore scoping area.

707. Effects will be considered with regard to the general population and vulnerable groups (identified as 'priorities' in EJHWS 2018-2022 (Essex County Council and Healthwatch Essex, 2017)), with populations being considered at a geographical scale in proportion to the project, and in accordance with PHE Guidance (PHE, 2020). The conclusions will consider alignment with relevant national, regional and local planning policies on population health and wellbeing protection within the study area.

708. The HIA will bring together the conclusions of assessments undertaken in other relevant chapters in the EIA (e.g. Ground Conditions and Contamination, Air Quality, Water Resources and Flood Risk, Noise and Vibration, Traffic and Transport, Tourism and Recreation and Socio-economics) and the relevant information in terms of population health (i.e. ONS data, PHE data, etc.), thereby assisting in identifying any potential project factors which may affect human health and wellbeing.

3.11 Onshore inter-relationships

710. The EIA will identify the full range of inter-relationships which are likely to result from the construction, operation and decommissioning of North Falls. The inter-relationships relevant to the onshore environment are outlined in Table 3.32.

Table 3.32 Onshore inter-relationships

Onshore topics	Inter-relationships
Ground Conditions and Contamination	Will have effects on: • Land use • Onshore ecology
Air Quality	Is affected by: • Traffic and transport Will have effects on: • Health • Onshore Ecology • Onshore Ornithology
Water Resources and Flood Risk	Is affected by: • Ground conditions and contamination Will have effects on: • Health • Onshore Ecology • Onshore Ornithology
Land Use	Is affected by: • Ground conditions and contamination • Traffic and transport • Socio-economics
Onshore Ecology	Is affected by: • Water resources and flood risk • Air quality • Noise and vibration • Ground Conditions and Contamination
Onshore Ornithology	Is affected by: • Water resources and flood risk • Air quality • Noise and vibration
Onshore Archaeology and Cultural Heritage	Is affected by: • Landscape and visual • Noise and vibration
Onshore Noise and Vibration	Is affected by: • Traffic and transport Will have effects on: • Onshore Ecology • Onshore Ornithology • Onshore Archaeology and Cultural Heritage • Health
Traffic and Transport	Will have effects on: • Noise and vibration • Air quality • Land Use

Onshore topics	Inter-relationships
	• Health
Health	Is affected by: • Water resources and flood risk • Air quality • Noise and vibration • Traffic and transport • Tourism and recreation • Socio-economics
Tourism and recreation	Is affected by: • Traffic and transport • Landscape and visual • Noise and vibration Will have effects on: • Health
Socio-economics	Is affected by: • Traffic and transport • Landscape and visual • Noise and vibration Will have effects on: • Health • Land Use

4 Part Four: Project wide aspects

4.1 Seascape, landscape and visual

4.1.1 Existing environment

711. The offshore existing environment is described for a study area of 50km radius around the array areas, including parts of the outer Thames estuary, Suffolk, Essex and Kent (Figure 4.1). The onshore existing environment is described for the onshore scoping area, within Tendring District, Essex (Figure 4.2). The two areas overlap in eastern Tendring.

4.1.1.1 Seascape character

712. The seascape of the array areas, and of the outer Thames estuary in which they lie, is characterised by human activity including existing offshore wind farms and shipping activity. Nevertheless, the seascape provides an open backdrop for seaward views from sections of the low-lying Essex, Suffolk and Kent coasts.

713. Seascape character is defined at a national scale in the seascape assessments published by the MMO (MMO, 2012). The array areas will be within the East Anglian Shipping Waters character area, within the East Offshore Marine Plan Area. The key characteristics of this character area are:

- *"Dense concentration of shipping activity.*
- *Consistently deep water between 20 and 50 metres.*

- *Designated shipping routes.*
- *Visually unified and expansive open water character with few surface features.*
- *Extensive offshore commercial activities such as fishing and dredging.*
- *Large military practice area.*
- *Wind farm developments and gas fields.*
- *Important archaeological features present." (MMO, 2012)*

714. Seascape character and sensitivity is defined more locally for the array areas and surrounding area in the Suffolk Seascape Sensitivity to Offshore Wind Farms (White Consultants, 2020) report. The following 'seascape character zones' (SCZ) are of relevance to the wind farm and surrounding area:

- SCZ01 Suffolk Heritage Coast Inshore- South;
- SCZ02 Suffolk Heritage Coast Offshore- South;
- SCZ03 Greater Gabbard Environs; and
- SCZ08 East Anglia Outer Offshore.

715. The northern components of the operational GGOW and GWF are within SCZ03, which is assigned 'medium' sensitivity in the Suffolk Seascape Sensitivity to Offshore Wind Farms report, and the majority of the northern array area would be within this same zone. The outer array area may be on the edge of SCZ01, which is of 'high-medium' sensitivity. The southern array area would, along with the southern components of the operational GGOW and GWF, fall into SCZ08, which is assigned 'low' sensitivity, although some parts may fall in to the 'medium' sensitivity SCZ02.

4.1.1.2 Onshore landscape character and designations

716. In terms of onshore landscape character within the offshore study area, the coastline to the west of the array areas, as far north as Harwich, is part of the Greater Thames Estuary (81) National Character Area (NCA) (Natural England, 2014a). This is a "*predominantly flat, low-lying coastal landscape where extensive open spaces are dominated by the sky, and the pervasive presence of water and numerous coastal estuaries extend the maritime influence far inland*". Behind this coastal NCA is the Northern Thames Basin (111) NCA (Natural England, 2014b), described as "*a diverse area which extends from Hertfordshire in the west to the Essex coast in the east*", including the "*predominantly arable area of the Essex heathlands, with areas of urbanisation mixed in throughout*." North of Harwich, the seascape study area includes part of the Suffolk Coast and Heaths (82) NCA, whose "*distinctive landscape character is a product of its underlying geology, shaped by the effects of the sea and the interactions of people. It is mainly flat or gently rolling […] wildlife habitats and landscape features lie in an intimate mosaic, providing great diversity in a small area*."

717. The landscape of the onshore scoping area is covered by the Tendring District Landscape Character Assessment (LUC, 2001). This landscape character assessment covers the coastal edge south of Clacton-on-Sea to the south,

Harwich to the north, and rural areas and settlements inland to the west, to the east of Colchester.

718. In terms of landscape designations, the Suffolk coast to the north of the array areas and adjacent to the northern edge of the onshore scoping area is part of the Suffolk Coast and Heaths AONB and Suffolk Heritage Coast (see Figure 4.2). These designations extend from Felixstowe north towards Lowestoft. The special qualities of the AONB are set out in the AONB Management Plan (Suffolk Coast and Heaths AONB, 2018), and include the landscape and scenic qualities of the area, and its relative wildness. There are no relevant local landscape designations.

4.1.1.3 Coastal character

719. The coastline north of Felixstowe, within the AONB, is generally undeveloped, with smaller settlements such as Aldeburgh and limited tourism development. The low-lying coast has sand and shingle beaches, and the notable expanse of Orford Ness, a long shingle spit hosting defence installations. Estuaries and creeks extend inland, with a mix of pasture, arable and remnant heath between.

720. Between the Thames estuary and Felixstowe, the Essex coastline is more developed, including the seaside towns of Felixstowe, Harwich, Frinton-on Sea and Clacton-on-Sea. These towns have popular seafronts, promenades, piers and beaches, from which sea views are a key element of the experience. Between these settlements are more rural or undeveloped coasts, including the creeks and islands of Hamford Water National Nature Reserve, and the headland of The Naze. Public footpaths and cycleways give access to these more rural locations.

721. South of the Thames estuary, in Kent, seaside towns along the northern coastline include Herne Bay, Westgate-on-Sea and Margate. These towns offer coastal views north and north-east towards the array areas.

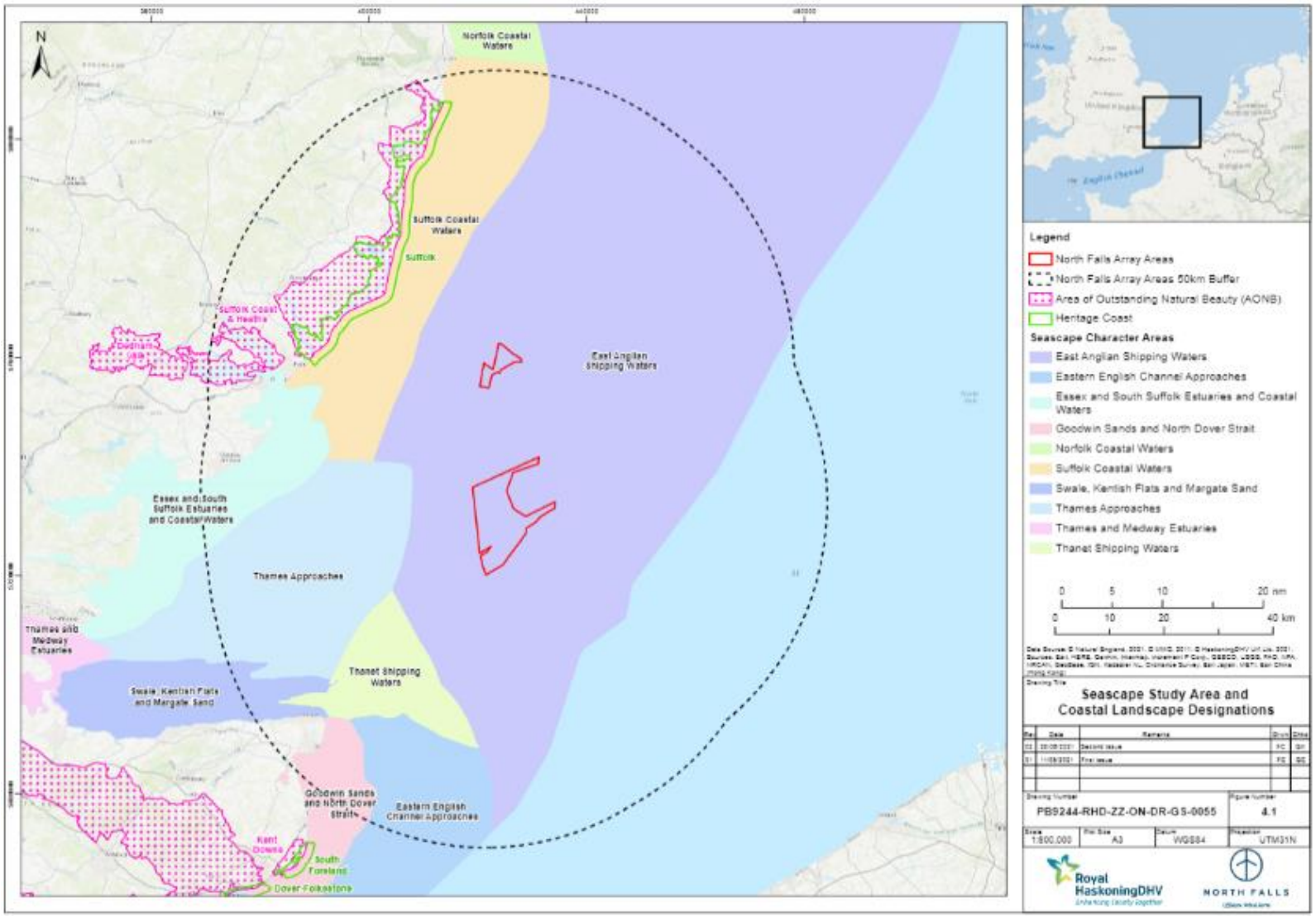

Figure 4.1 Seascape study area and coastal landscape designations

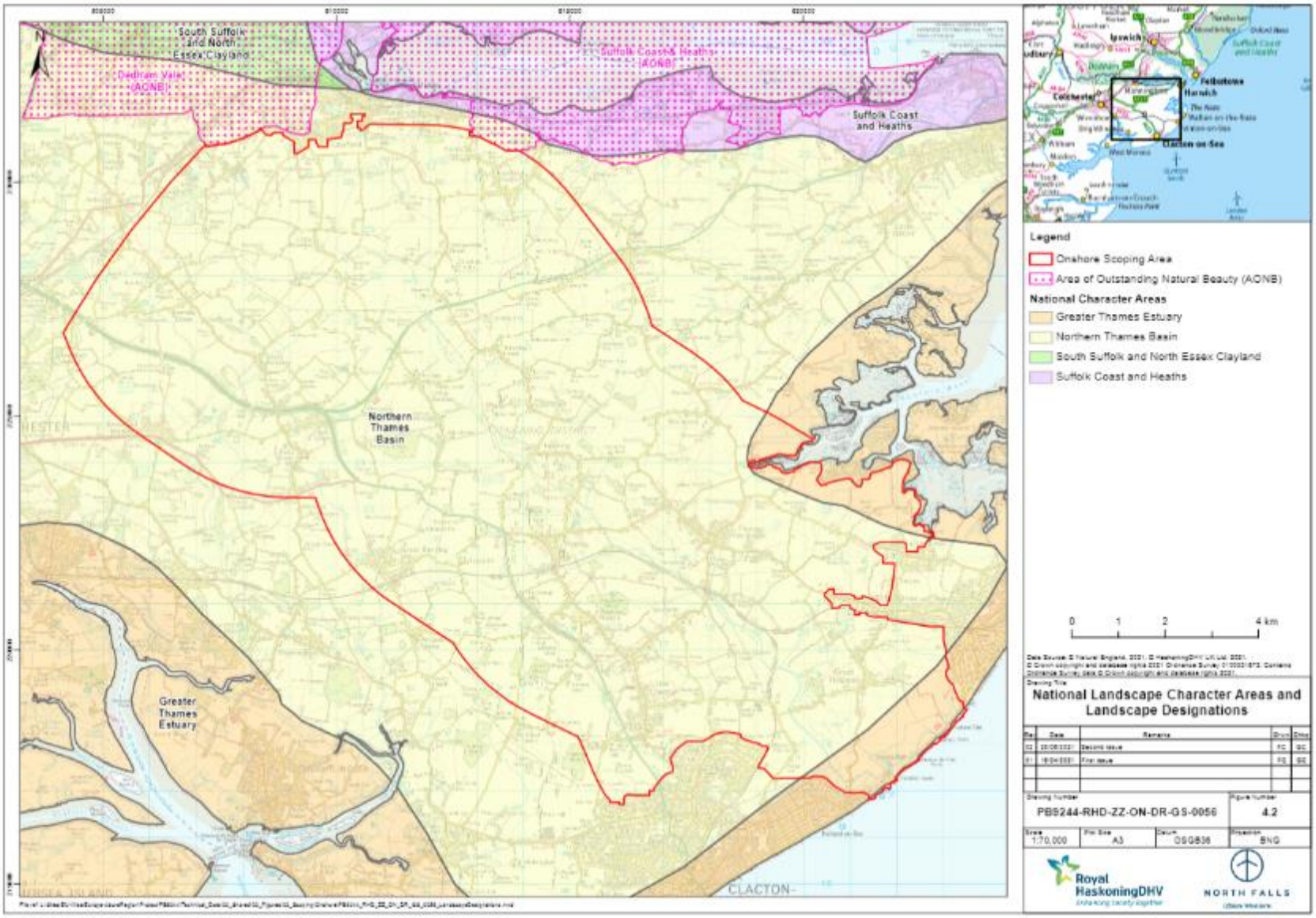

Figure 4.2 National landscape character areas and landscape designations

4.1.2 Approach to data collection

722. The following data sources will be used to inform the Seascape, Landscape and Visual Impact Assessment (SLVIA):

- White Consultants (2020) Suffolk Seascape Sensitivity to Offshore Wind Farms. Suffolk County Council and Suffolk Coast and Heaths AONB Partnership;
- Alison Farmer Associates (2018) Suffolk Coastal Landscape Character Assessment. Suffolk Coastal District Council;
- MMO (2018) Seascape Character Assessment for the South East Inshore marine plan area;
- MMO (2012) Seascape character area assessment East Inshore and East Offshore marine plan areas;
- Suffolk County Council (2018) Seascape Character Assessment: Suffolk, South Norfolk & North Essex;
- Natural England (2014) NCA Profiles;
- Suffolk Coast and Heaths AONB. Suffolk Coast and Heaths Area of Outstanding Natural Beauty Management Plan 2018 -2023;
- Land Use Consultants (2001) Tendering District Landscape Character Assessment. Prepared for Tendring District Council;
- Tendring District Council (2013-2033) Local Plan;
- Ordnance Survey (OS) maps at a range of scales;
- OS digital terrain model (DTM) datasets;
- Field survey and photography; and
- Aerial and street-level photography available online.

4.1.3 Potential impacts

4.1.3.1 Potential impacts during construction

723. During construction of the offshore infrastructure, the presence of construction activity and partially completed structures within the seascape has the potential to impact seascape and coastal character, designated landscapes and visual receptors. However, impacts during the temporary construction phase of the offshore infrastructure will never be greater than the operational effects of the completed wind farm. As such, it is proposed that offshore construction effects are scoped out of the SLVIA.

724. During construction of the onshore infrastructure (substation, cable and landfall) the presence of construction activity and partially completed structures has the potential to locally impact coastal and landscape character and visual receptors. Impacts, whilst temporary and localised, have the potential for direct and significant impacts on landscape and visual amenity arising from loss of

landscape features and temporary disturbance. Onshore construction impacts are proposed to be scoped in to the SLVIA.

4.1.3.2 Potential impacts during operation and maintenance

725. There is potential for significant impacts as a result of the introduction of larger turbines adjacent to the smaller turbines associated with the existing GGOW. Impacts on seascape and coastal character, in relation to the presence of a new offshore wind farm, are proposed to be scoped in to the SLVIA.

726. The presence of the offshore wind farm in the sea is unlikely to significantly impact the key characteristics of non-coastal landscapes, therefore changes to landscape character in relation to the offshore wind farm will be scoped out of the SLVIA. However, impacts on landscape and coastal character in relation to the onshore infrastructure have the potential for locally significant impacts, and are proposed to be scoped in.

727. Visibility of the offshore wind farm and onshore infrastructure may alter the special qualities or key attributes that underpin designated landscapes (including the Suffolk Coast and Heaths AONB and Heritage Coast). Impacts on designated landscapes, in relation to the offshore wind farm, are proposed to be scoped in the SLVIA. Due to distance and the more localised nature of landscape and visual impacts associated with onshore infrastructure, impacts on designated landscapes (Suffolk Coast and Heaths AONB and Heritage Coast) are unlikely to be significant, and are proposed to be scoped out, although this will be confirmed once the substation site is known and through analysis of distance and potential visibility.

728. There is potential for significant impacts on visual amenity as a result of the introduction of an offshore wind farm and its associated onshore infrastructure (electrical substation). Effects on visual receptors (people) at locations within the ZTV of the array areas and onshore substation, including static and moving receptors, are proposed to be scoped in the SLVIA. An initial list of assessment viewpoints identifying representative views towards the array areas is outlined in Table 4.1 below. This list will be supplemented with further viewpoints to provide appropriate cover for the assessment of visual effects in relation to the onshore infrastructure once the location has been identified and further viewpoints to cover the offshore wind farm identified through consultation.

Table 4.1 Initial proposed SLVIA assessment viewpoints

Viewpoint	Location	Easting	Northing	Reason for selection
1	Clacton on Sea	617746	214400	Coastal settlement with pier and seafront
2	The Naze	626509	223592	Accessible headland and nature reserve
3	Felixstowe	628441	231814	Key settlement along the coast
4	Bawdsey	635790	240046	Representative of inland views from the AONB
5	Orford Ness	644996	248877	Closest coast to the offshore wind farm
6	Orford Castle	641944	249868	Elevated viewpoint (on tower) with panoramic views
7	Aldeburgh	646525	256500	Coastal settlement in the AONB
8	Southwold	651072	276454	Coastal settlement in the AONB

Viewpoint	Location	Easting	Northing	Reason for selection
9	North Foreland	639352	170015	Representative view from Kent coast

4.1.3.3 Potential impacts during decommissioning

729. The presence of activity and partially dismantled structures during decommissioning has the potential to impact seascape, coastal and landscape character, designated landscapes and visual receptors. However, impacts during the temporary decommissioning phase will never be greater than during construction or operation phases considered in the SLVIA, and are proposed to be scoped out.

4.1.3.4 Potential cumulative impacts

730. Onshore cumulative impacts will be considered as set out in Section 1.8. Cumulative interactions with the existing and adjacent GGOW and GWF, and other existing offshore wind farms in the wider Thames estuary, will be considered in the primary SLVIA, as they form part of the baseline.

731. In terms of cumulative seascape, landscape and visual effects due to interactions with consented and proposed (as yet unbuilt wind farms) these will be considered in the cumulative assessment. This is likely to include the proposed East Anglia TWO Offshore Wind Farm, approximately 30km to the north of NFOW, and the planned Five Estuaries Offshore Wind Farm to the east.

732. Cumulative impacts in relation to the onshore infrastructure, with other similar types of projects such as underground cables and substations, are unlikely to be significant as effects are typically more localised. These are proposed to be scoped out of the SLVIA unless consultees are aware of any similar proposed projects within a range where cumulative interactions may potentially lead to significant impacts.

4.1.3.5 Transboundary impacts

733. Due to the size of the proposed SLVIA study area (50km radius) any potentially significant landscape and visual transboundary effects will be identified in the SLVIA, including potentially significant cumulative interactions with other as yet unbuilt offshore wind farms.

4.1.3.6 Summary of potential impacts

734. Table 4.2 below outlines the impacts which are proposed to be scoped into the SLVIA. This may be refined through consultation and as additional information and data become available.

Table 4.2 Summary of impacts relating to seascape, landscape and visual

Potential Impact		Construction	Operation	Decommissioning
Seascape and coastal character / landscape character	In relation to the array areas	x	✓	x
	In relation to onshore infrastructure	✓	✓	x
Designated landscape	In relation to the array areas	x	✓	x

Potential Impact		Construction	Operation	Decommissioning
	In relation to onshore infrastructure	x	x	x
Visual receptors	In relation to the array areas	x	✓	x
	In relation to onshore infrastructure	✓	✓	x
Cumulative landscape and visual impacts	In relation to the array areas	x	✓	x
	In relation to onshore infrastructure	x	x	x

4.1.4 Approach to assessment

735. The approach to impact assessment will be based on the principles set out in the guidance listed below, primarily GLVIA3:

- Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment. 3rd edition. Routledge. ("GLVIA3");
- Landscape Institute (2019) Visual Representation of Development Proposals. Technical Guidance Note 06/19;
- MMO (2020) An approach to Seascape Sensitivity Assessment;
- Scottish Natural Heritage (2017) Siting and designing wind farms in the landscape. Version 3a;
- Scottish Natural Heritage (2017) Visual Representation of Wind Farms: Good Practice Guidance. Version 2.2;
- Scottish Natural Heritage (2012) Offshore Renewables: Guidance on assessing the impact on coastal landscape and seascape;
- DECC (2011) NPS for Renewable Energy Infrastructure (EN-3);
- DECC (2016) UK Offshore Energy Strategic Environmental Assessment: OESEA3; and
- White Consultants with Northumbria University (2020) Offshore Energy Strategic Environmental Assessment: Review and Update of Seascape and Visual Buffer study for Offshore Wind farms.

4.1.4.1 Impact assessment methodology

736. Effects of the offshore turbines will be examined across a study area of 50km radius around the wind turbine locations. The precise locations of the turbines is unknown, but a 50km radius around the array areas would include parts of Suffolk, Essex and Kent coasts as described in Section 4.1.1.

737. Effects of the onshore infrastructure will be examined across a study area of 5km radius around the onshore substation location, and more locally along the

onshore cable route between the onshore substation and landfall. Onshore substation and landfall locations are currently unknown.

738. The approach to impact assessment will be based on the principles set out in the guidance listed above, primarily GLVIA3. Preparation of the SLVIA will involve the following key steps:

- The 'worst case' project parameters will be identified, and the study areas described above will be determined and agreed through consultation;
- ZTVs for the array areas (based on the realistic maximum turbine height) and onshore infrastructure will be generated across these study areas;
- The seascapes/landscapes of the study area will be analysed to identify landscape receptors, drawing on published landscape/ coastal/ seascape character assessments;
- The visual baseline will be recorded in terms of the different groups of people who may experience views of the offshore wind farm and onshore components, the places where they will be affected and the nature of their views and visual amenity;
- A series of assessment viewpoints will be selected in consultation with Natural England and local planning authorities. This will expand upon the initial assessment viewpoints identified in Table 4.1 above, taking note of scoping comments and further follow up consultation;
- Visualisations (wirelines and photomontages) will be generated based on 3D modelling and will be produced to standards agreed with Natural England and local planning authorities – the viewpoints to be illustrated with photomontages, including any requirement for night-time photomontages to be agreed with consultees;
- Potentially significant effects on seascape, landscape and coastal character will be identified, including implications for designated landscapes;
- Potentially significant effects on visual amenity will be identified; and
- The level and significance of residual landscape and visual effects will be judged with reference to the sensitivity of the resource/receptor (its susceptibility and value) and magnitude of change (a combination of the scale of change, geographical extent and duration/reversibility).

739. For the onshore infrastructure, mitigation proposals in the form of building design, form and finish, and landscape treatments, will be developed in response to any potentially significant impacts that are identified in the SLVIA.

4.2 Socio-economics

4.2.1 Existing environment

740. The existing environment relevant to the EIA will consider two receptor groups:

- Economic receptors, essentially people or businesses that would benefit from or be adversely affected by the project and associated development; and
- Social receptors, which are the social infrastructure relevant to a community, that would benefit from or be adversely affected by the project and associated development. Impacts on social receptors subsequently impact on the population often in ways that influence their health and wellbeing.

741. The onshore scoping area is located wholly within Tendring District a local authority district within the County of Essex in Eastern England. It has a population of approximately over 150,000 people and is administered by Tendring District Council and Essex County Council. Approximately forty percent of the district's population (56,000) live in the seaside town of Clacton-on-Sea, with the majority of the district population resident in other coastal towns of Harwich, Frinton-on-Sea, Brightlingsea, Manningtree and Walton-on-the-Naze.

742. Of the population in Tendring district, 53.8% is aged between 16 and 64 (compared to the UK average of 62.5%) and of those 69.4% are employed and 5% are unemployed (compared to the UK average of 79.1% and 4.6%) (ONS, 2020). Skilled trades, technical and professionals comprise 63.8% of employment, the remainder being retail, leisure, caring, plant and process, and elementary and unskilled occupations (ONS, 2020). The biggest employment sectors are human health and social work and wholesale and retail trade (including repair of motor vehicles) (together accounting for 35.8% of employees).

743. Businesses within the onshore scoping area include retail, light industry, tourist attractions (see Section 4.3), tourist accommodation including caravan parks, cafes and restaurants, agriculture and recreational facilities (e.g. golf courses, fishing lakes). Agricultural activity within the onshore scoping is predominantly arable agriculture.

744. Offshore, the Outer Thames Estuary is a busy shipping area, used by commercial shipping vessels and fishing vessels, recreational yachting and dredging. Impacts to shipping and navigation are considered in Section 2.10 and commercial fishing is considered in Section 2.9.

745. Impacts on sensitive landscape receptors within 50km of the array areas are considered in Section 4.1

4.2.2 Approach to data collection

746. The socio-economics assessment presented in the EIA will be informed by a desk-based assessment of socio-economic impacts. This will include collecting data on:

- Regional and local labour market and trends;
- High level indication of temporary and rented accommodation supply and trends;

- Current workforce;
- Local and regional population and trends;
- Local and regional employment and trends;
- Education (including special educational needs and school standards);
- Skills – including data from *The Technical Skills Legacy for Norfolk and Suffolk* (Suffolk Growth Programme Board, 2020).

747. Social data relating to crime, health and leisure will also be considered where this is available, along with the identification of social infrastructure such as schools, nurseries, libraries, doctors, dentists, pharmacies, social care homes, post offices, pubs, community halls, churches and other places of worship. Data on health is presented in Section 3.10. Data sources for this baseline review would include:

- ONS; and
- NOMIS.

748. All data will be linked to the Lower Layer Super Output Areas (LLSOAs) for the areas within the relevant disturbance zone of the likely impacts, whether they are direct (physical) or indirect (transport and access, noise, air / dust) impacts. All LLSOAs for Tendring district will be linked to the tabulated dated on social and economic data listed above.

4.2.3 Potential impacts

4.2.3.1 Potential impacts during construction

749. The construction of offshore wind farm projects can have beneficial socio-economic effects in terms of providing employment and continuing to develop the wind energy market at a national level, i.e. encouraging wind energy manufacturers to be based in the UK. However, there are potential adverse impacts on social infrastructure where the project components and activities to construct them impact on specific receptors, unless they are identified and avoided through micro-siting and mitigation measures.

750. The EIA will consider direct economic benefit through the supply chain required for the project, including spending on local goods and services supplied by local businesses, such as security, catering and hotel facilities.

751. Increased employment, as well as potential changes to demographics due to national and international immigration will be assessed, taking into account likely recruitment strategies.

752. Loss of, or disruption to onshore and offshore activities which contribute to the existing social and economic characteristics of the study area will also be assessed. This may include disturbance as a result of potential air quality, noise, visual, and traffic impacts on social infrastructure, based on the conclusions of the relevant ES chapters (see impacts from dust, Section 3.2; noise, Section 3.8; traffic and transport, Section 3.9 and visual impacts in Section 4.1).

753. The impacts described above exclude tourism and recreation, which are considered in Section 4.3.

4.2.3.2 Potential impacts during operation and maintenance

754. The impacts assessed for the operation and maintenance phase of the project will be as described above for construction. However, it is anticipated that the local economic impact (beneficial and adverse, direct and indirect) will be most significant during the construction phase, with a lesser direct impact on the local economy during the operational phase (depending on the location of the project's operation and maintenance base, which is yet to be evaluated).

4.2.3.3 Potential impacts during decommissioning

755. It is anticipated that the decommissioning impacts would be similar in nature to those of construction. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant regulator.

4.2.3.4 Potential cumulative impacts

756. Cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to socio-economics include agglomerative effects with other offshore wind development in the region to potentially boost the local skill-base. Conversely, there is also potential to cumulatively impact upon other industries negatively as a result of displacement of workers currently employed in other industries. This will be considered further in the EIA.

4.2.3.5 Summary of potential impacts

757. Table 4.3 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

758. The socio-economics assessment is likely to have key inter-relationships with shipping, commercial fisheries, tourism and recreation, and land use. These will be considered where relevant.

Table 4.3 Summary of impacts relating to socio-economics

Potential Impact	Construction	Operation	Decommissioning
Direct economic benefit (supply chain)	✓	✓	✓
Increased employment	✓	✓	✓
Change in demographics due to immigration	✓	✓	✓
Loss of, disruption to or pressure on local infrastructure	✓	✓	✓
Loss of, disruption to or pressure on offshore activities	✓	✓	✓
Disturbance (noise, air, visual, and traffic) to social infrastructure	✓	✓	✓
Cumulative	✓	✓	✓

4.2.4 Approach to assessment

759. The Overarching NPS for Energy (EN-1) states that where a project is likely to have an impact on socio-economics at a local or national scale the assessment should consider all relevant impacts, including those listed earlier in this section.

760. There is no set of recognised standards for the assessment of socio-economic impacts. In light of this, the socio-economic assessment will present a qualitative assessment of the anticipated impacts and benefits, their extent and when they are expected to occur.

761. Economic impacts will be dependent on a range of factors which will be considered in the EIA where possible, such as:

- The technologies and infrastructure to be deployed onshore and offshore;
- Construction, operation and maintenance and decommissioning methodologies;
- Procurement/contracting strategy;
- Availability and capacity of the supply chain;
- Number of workers;
- Where the workers come from; and
- The duration of employment.

762. The absolute scale of economic impacts, both beneficial (e.g. the number of jobs which construction, operation and maintenance, and decommissioning activity is expected to support) and adverse (e.g. disruption to activities) would be calculated based on a worst case scenario, using an approach consistent with methods for economic impact assessment set out in HM Treasury Green Book (2020). The socio-economic impact magnitude will be determined by consideration of the predicted deviation from baseline conditions.

4.3 Tourism and recreation

4.3.1 Existing environment

4.3.1.1 Coastal / marine tourism and recreation

763. Tourism is important to the Essex economy, contributing £3.4 billion to the county's economy and providing 66,000 jobs, accounting for 9.6% of all employment (Destination Research, 2018). Within Essex, Tendring district's attractions include its extensive beaches and traditional seaside resorts, internationally important nature reserves, picturesque market towns, and extensive network of walking and cycling paths.

764. The onshore scoping area includes the Tendring coast ('the Essex Sunshine Coast') between the seaside resort towns of Clacton-on-Sea and Frinton-on-Sea. An extensive sand beach (Holland-on-Sea beach) runs along the coast in this location, and beach huts are located within the onshore scoping area adjacent to both Clacton-on-Sea and Frinton-on-Sea settlements, which can

service the beach within the onshore scoping area (although the beach is more expansive either side of the onshore scoping area adjacent to the settlement of Clacton-on-Sea and Frinton-on-Sea, where erosion management structures are in place). The bathing water quality within the onshore scoping area is rated excellent, based on 2019 samples (Environment Agency, 2021).

765. Clacton-on-Sea and Frinton-on-Sea are the main settlements along the coast, both located adjacent to the onshore scoping area. Both expanded in the 19th century as seaside resorts and still provide extensive facilities as part of the tourism economy. Other key attractions along the Tendring Coast include historic Martello towers, the nearest of which is located at Clacton-On-Sea, the National Cycle Route Network Route 51 and a public footpath which runs along the seawall within the onshore scoping area.

766. Within the inshore area, sailing is typically undertaken by smaller vessels including dinghies and recreational craft. There are sailing clubs at Frinton-On-Sea (Walton and Frinton Yacht Club) and Clacton-On-Sea (Gunfleet Sailing Club and Clacton Sailing Club) which service recreational sailing in the inshore area. Recreational sailing and vessels are covered in further detail in Section 2.10.

767. There are no boat trips or water sports facilities within the coastal and nearshore scoping area, although there are boat trip operating out of Walton-On-The-Naze, servicing Hamford Water. No diving sites are location within the scoping area. Other water sport activities including wind and kite surfing, kayaking, canoeing and recreational fishing are pursued close to shore, and potentially in proximity to the proposed export cable routes.

4.3.1.2 Inland tourism and recreation

768. The onshore scoping area is located entirely within Tendring District. The majority of the District's tourist activities are located at its coasts and within the main towns, focussed in particular around Clacton-On-Sea, Walton-On-The-Naze, Harwich and St Osyth (Tendring District Council, 2021). Tourism sites located within the onshore scoping area as identified by Visit Essex include Green Islands Gardens near Bromley Cross (Visit Essex, 2021). Holland Haven LNR, Holland Haven Country Park and Thorpe Hall Registered Park and Garden are also located within the onshore Scoping area. Annual tourist events within the District include Clacton Air Show (at Clacton Airfield), and Tendring Show (at Lawford House Park), along with other local carnivals, village fetes, town fairs and regattas (Tendring District Council, 2021).

769. Recreational amenities within the onshore scoping area include campsites and caravan parks (of which there are 10), B&Bs/guesthouses, fishing lakes (of which there are two), commons (of which there are four, Galloway Close, Great Holland Common, Thorpe Green and Far Thorpe Green) and other public open space (see Figure 4.3).

770. An extensive network of PRoW are also present within the onshore scoping area, including footpaths, bridleways and permitted byways (see Figure 4.3). NCN routes are also present, including NCN Route 51, which cross the onshore scoping area twice (along the coast, and inland between Great Oakley and Wivenhoe).

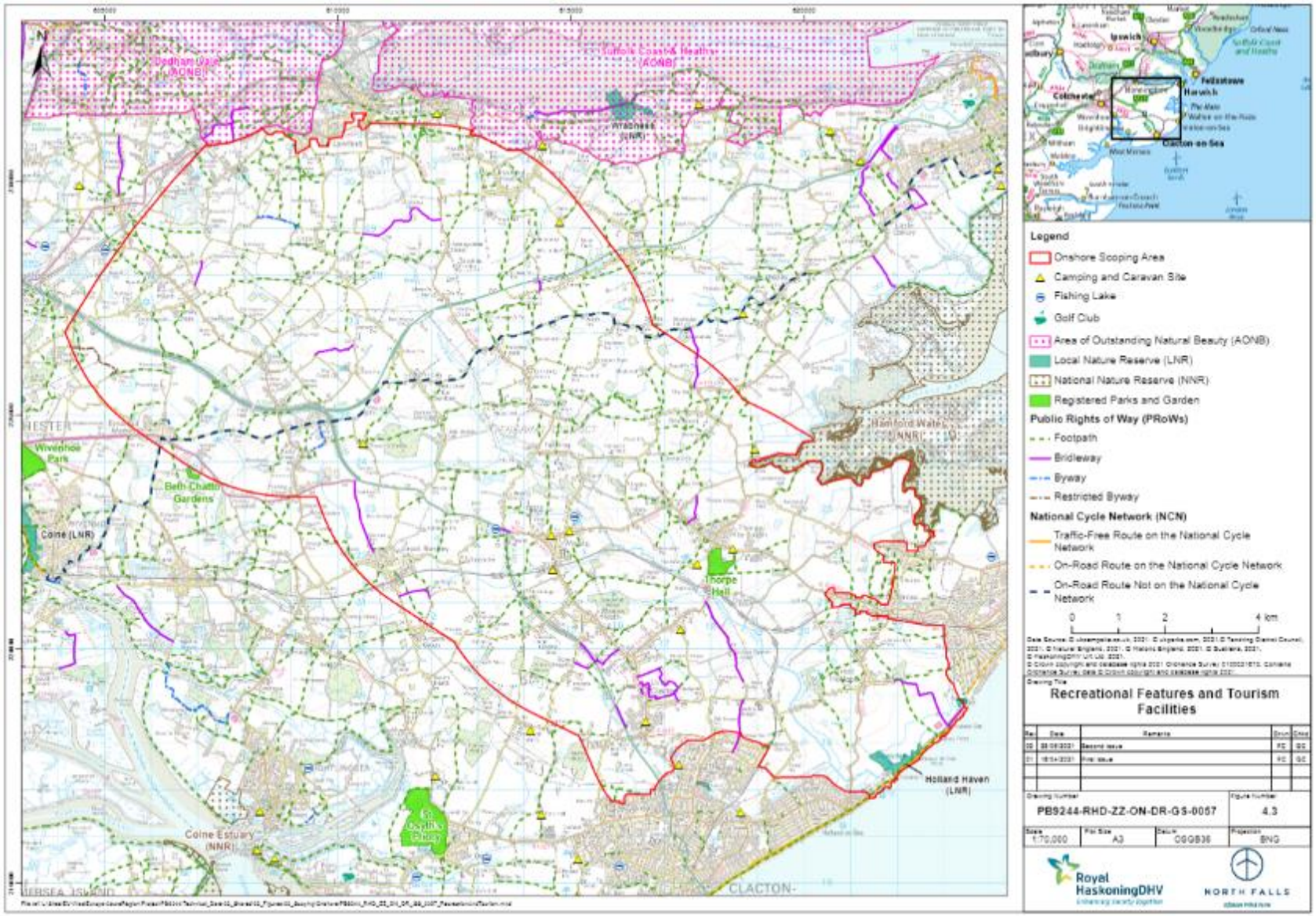

Figure 4.3 Recreational features and tourism facilities

4.3.2 Approach to data collection

771. A desk-based study will be undertaken to identify tourism and recreation features which may be affected by the project, using the data sources set out in Table 4.4. Ongoing consultation with statutory stakeholders will also be used to review and add to the baseline.

772. The existing environment will be characterised using the data sources set out in Table 4.4.

Table 4.4 Existing datasets

Data Source	Data Contents
visitessex.com	General information on tourism in Norfolk and location/details of specific attractions.
Google Maps / OS Maps	Locating/searching for attractions within the onshore project area.
Tendring District Council / Essex County Council	Information on local plans, designations and tourism initiatives.
RYA	UK Coastal Atlas of Recreational Boating (September 2019). GIS dataset of recreational boating activity around the UK, comprising spatial data including indicators of intensity of use, general boating areas, offshore routes, as well as the locations of clubs, training centres and marinas.
Defra Sea Angling Survey (2012)	A survey of shore-based and private boat recreational sea angling activity and economic value of sea angling in England.
SeaSearch	A project for volunteer scuba divers and snorkelers who survey and map types of near-shore seabed around Britain.
Finstrokes dive sites	Source of dive site information for SCUBA divers.

773. If particular issues are identified during a review of the available desk-based material and through early stakeholder consultation which cannot be answered through a review of desk-based data sources alone, then targeted surveys may be required in order to assess the potential impacts on particular tourism and recreation issues. The details of any such surveys would be included within the North Falls PEIR.

4.3.3 Potential impacts

774. The Tourism and Recreation assessment is likely to have key inter-relationships with Socio-economics, Seascape, Landscape and Visual, and Traffic and Transport (in particular with regard to labour resources). These will be considered where relevant.

4.3.3.1 Potential impacts during construction

4.3.3.1.1 Coastal and marine

775. Temporary visual impacts associated with cable laying vessels and vessels moving to and from the offshore construction zone, as well as plant, machinery, personnel at the coastal landfall (see Section 4.1), may occur.

776. Offshore and landfall construction activities and associated Safety Zones may disrupt marine and coastal recreational activities, and these will need to be identified and assessed. This obstruction or disruption will be temporary in nature. Marine users will be informed of Safety Zones, and these will be removed or reduced following completion of construction. The risk of collision

with structures and reduced navigable area as a result of the construction activity will be assessed and is discussed in Section 2.10.

777. There is the potential for beach access to be obstructed during works at the landfall, for health and safety purposes and Construction & Design Management (CDM). However, this will be temporary in nature, with access restored upon completion of construction.

778. The landfall and associated nearshore cable construction works could result in deterioration to the bathing water quality status of nearby beaches. Such deterioration could discourage visits by both residents and non-residents. Impacts to water quality are discussed in Section 3.3.

4.3.3.1.2 Inland (onshore)

779. The working areas and exclusion areas during construction could result in the obstruction to or disruption of key recreational assets or activities.

780. Local businesses and tourism facilities may be temporarily disrupted through access route diversions as a result of construction work (see Section 3.9).

781. Temporary closures or alternative routes for PRoWs (including National Trails), cycle routes and other long-distance paths, if required to facilitate construction, could discourage visitors.

782. During the installation of the onshore infrastructure, noise, dust and visual disturbance could all cause potential impacts to tourism or recreational receptors. However, these will be temporary in nature. Impacts from dust and noise are considered in Section 3.2 and Section 3.8, and visual impacts are considered in Section 4.1.

783. Where there is a non-resident construction workforce there will need to be temporary / short-term accommodation during the construction phase. Whilst this will be a positive economic impact for accommodation providers, the reduction in available accommodation could reduce the availability of accommodation for tourists and could be considered a potential negative impact. This could have both temporary, short- and medium-term impacts.

4.3.3.2 Potential impacts during operation and maintenance

784. The operational offshore wind farm has the potential to be visible from part of the Suffolk, Essex and Kent coastlines and inland and to give rise to significant impacts upon visual receptors along these coastlines, the extent of which will be assessing the project's SLVIA, which may result in an effect on tourism and recreation receptors. Visual impacts are considered in more detail in Section 4.1.

785. The main source of impact upon coastal and marine recreational activities during operation is associated with navigational restrictions i.e. Safety Zones around each fixed structure and during maintenance activities in the coastal and marine environment. Impacts on recreational vessels from a navigational perspective will be considered in Section 2.10.

786. If any PRoWs require permanent closure as a result of the proposed infrastructure, this would reduce availability of access as well as attractiveness the area for informal recreational activities such as walking. However, the

project will seek to avoid placing permanent operational above ground infrastructure on a PRoW.

787. There would be no ongoing activities during the operational phase that would result in disturbance to tourism or recreation receptors with the exception of maintenance activities, which could result in increased noise, dust, traffic, or visual disturbance. However, these will be temporary in nature albeit intermittent throughout the operational phase. Impacts from dust and noise are considered in Section 3.2 and Section 3.8, and visual impacts are considered in Section 4.1.

788. The attendance of non-resident maintenance personnel during the annual maintenance season represents a need for temporary / short-term accommodation throughout the operational lifetime. Accommodation providers may prioritise workers' accommodation over tourist visitors, thus reducing the available provision (albeit intermittently) and resulting in a potential long-term impact.

4.3.3.3 Potential impacts during decommissioning

789. It is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant regulator. There is the potential for a positive impact as a result of reverting land to previous or improved condition, making the area more attractive to visitors.

4.3.3.4 Potential cumulative impacts

790. Onshore cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to tourism and recreation include other nearby development projects interacting with the same tourism receptors, e.g. affecting the same length of beach, with temporal overlaps with the project's construction phase.

4.3.3.5 Summary of potential impacts

791. Table 4.5 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 4.5 Summary of impacts relating to tourism and recreation

Potential Impact	Construction	Operation	Decommissioning
Coastal / marine			
Visual impacts	✓	✓	✓
Disruption to marine and coastal recreational activities	✓	✓	✓
Restricted beach access	✓	x	✓
Deterioration to bathing water quality and resulting effect on tourism and recreation	✓	x	✓

Potential Impact	Construction	Operation	Decommissioning
Onshore (inland)			
Visual impacts	✓	✓	✓
Loss of and disturbance to local tourism and recreation assets	✓	x	✓
Alternate routes / temporary/permanent closure of PRoWs	✓	✓	✓
Disturbance to recreation / tourism assets from noise, dust and visual impact	✓	x	✓
Reduction in available accommodation due to construction personnel	✓	✓	✓
Cumulative impacts	✓	✓	✓

4.3.4 Approach to assessment

792. There are no specific statutory guidelines which inform the assessment of impacts upon tourism and recreation receptors. The assessment will focus on the factors that have the potential to reduce the number of tourists visiting or returning to an area. The tourism baseline will be described on the basis of trends for visitor numbers, visitor origin, expenditure, secondary benefits from tourism, and the timing of visitor periods, and based on the desk-based assessment outlined in Section 4.3.2.

793. The assessment will be undertaken in accordance with following relevant guidance:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy, June 2019 (RYA, 2019); and
- Guidance on Environmental Impact Assessment of Offshore Renewable Energy Development on Surfing Resources and Recreation (SAS, 2009).

794. Consultation with the local communities and landowners will be undertaken to further understand features of importance for local tourism and recreation.

4.4 Climate change

4.4.1 Existing environment

795. In the Intergovernmental Panel on Climate Change (IPCC)'s most recent synthesis Report (IPCC, 2013) on the science of climate change, it was reported that '*It is extremely likely (i.e. 95-100% likelihood] that human influence has been the dominant cause of the observed warming since the mid-20th century*' (IPCC, 2013), and that the observed temperature rises over this period and those predicted in the future are anticipated to give rise to deleterious effects across the globe arising from temperature rises, changes to the global water

cycle, changes to ocean temperatures, changes to sea level and changes to the global carbon cycle.

796. On 12 December 2015, the UK along with 195 other parties signed the 'Paris Agreement', a legally binding international treaty on climate change committing all parties to the goal of limiting global warming to well below 2 degree Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The Agreement requires all parties to submit plans to reduce their emission (along with other climate action) every 5 years, starting in 2020.

797. In December 2020, the UK set a Sixth Carbon Budget, recommending a reduction in UK greenhouse gas emissions of 78% by 2035 relative to a 1990 baseline (a 63% reduction from 2019) (CCC, 2020). This target has been set in line with the UK commitments in relation to the Paris Agreement and with the goal of achieving a target of reaching net zero greenhouse gas emissions by 2050 and will be enshrined in UK law by July 2021.

798. As part of this budget, the role of the offshore wind sector and the construction industry are both the focus of action to contribute to meeting these targets.

4.4.2 Approach to data collection

799. The existing environment will be characterised using the data sources set out in Table 4.6.

Table 4.6 Existing datasets

Data content	Data source
Greenhouse gas assessment	
Forecast construction and operational emissions data	NFOW
Vulnerability assessment	
Design data of infrastructure and assets	NFOW
UKCP18 database	Met Office

800. Any additional datasets will be identified through ongoing consultation with stakeholders. No surveys are proposed to inform the assessment of impacts related to climate change.

4.4.3 Potential impacts

801. The Climate Change assessment is likely to have key inter-relationships with Marine Geology, Oceanography and Physical Processes, Water Resources and Flood Risk and Accidents and Disasters. These will be considered where relevant.

802. The Climate Change chapter will comprise two separate sub-assessments (see Section 4.4.4). Firstly, a greenhouse gas assessment will be carried out to determine the impact of the project to climate change. In addition, a climate vulnerability assessment will be undertaken to consider the potential impacts of climate change to the project.

4.4.3.1 Potential impacts during construction

803. The project's net emissions will be assessed across the project lifecycle, encompassing construction (including fabrication), operation and decommissioning where information is available. There is potential for a net positive impact on the UKs attempts to meet the targets set out in The Sixth Carbon Budget (CCC, 2020), however this will need to be demonstrated through an greenhouse gas emissions assessment.

804. As the construction phase is anticipated to occur within the next 10 years, the impact of effects arising from climate change on construction activities associated with the project is considered to be unlikely and will not be included within the assessment.

4.4.3.2 Potential impacts during operation and maintenance

805. As noted above, the project's operational activities will be considered as part of a life-cycle assessment of the project net emissions.

806. The project's operational infrastructure will be potentially vulnerable to the effects of climate change, in particular in relation to flood risk and coastal erosion.

4.4.3.3 Potential impacts during decommissioning

807. As noted above, decommissioning will be considered as part of a life-cycle assessment of the project net emissions. To do this, information for likely emission sources during decommissioning of the project will be obtained from relevant literature.

4.4.3.4 Potential cumulative impacts

808. Onshore cumulative impacts will be considered as set out in Section 1.8. Potential cumulative impacts related to the climate change vulnerability assessment relate to other projects which have the potential to exacerbate the vulnerability of the project to the effects of climate change, for example other projects giving rise to increased flood risk or coastal erosion. These cumulative effects will be picked up in the relevant EIA topic (for example water resources and flood risk) and summarised within the Climate Change chapter.

809. As the project is responsible for greenhouse gas emissions associated with its activities only, a cumulative assessment with other projects will be scoped out of this aspect of the assessment.

4.4.3.5 Transboundary impacts

810. The effects of climate change are by definition transboundary, in that they are felt not in proximity to the sources of emission, and that all releases of greenhouse gases contribute to climate change. However, in order to proportionately frame the assessment, the greenhouse gas emissions assessment will assess the project against the UK's most recent carbon budget (CCC, 2020). In this sense, the impacts will not be transboundary but national, in the degree to which they contribute to the UK climate targets. Transboundary impacts are therefore scoped out of specific assessment.

4.4.3.6 Summary of potential impacts

811. Table 4.7 outlines the impacts which are proposed to be scoped into the EIA. This may be refined through the EPP as additional information and data become available.

Table 4.7 Summary of impacts relating to climate change

Potential Impact	Construction	Operation	Decommissioning
Net contribution to the UK's climate targets	✓	✓	✓
Vulnerability of infrastructure to climate change	x	✓	x

4.4.4 Approach to assessment

812. The climate change assessment will comprise of two parts:

- A greenhouse gas emissions assessment; and
- A climate change vulnerability assessment.

813. The greenhouse gas emissions assessment will be carried out in accordance with the Greenhouse Gas Protocol (WBCSD and WRI, 2015), an international standard for corporate reporting. Greenhouse gas emissions arising from activities associated with the construction, operation and decommissioning of the project will be quantified. In addition, the 'net' effect of the project will be determined, which will consider the effect of the provision of renewable energy onto the UK electricity grid against the project lifetime emissions.

814. The vulnerability assessment will use sector-specific examples to determine the likely climate hazards, based on the UKCP18 climate database, that could affect the operation of the project. The vulnerability assessment will use the output of other assessments, such as the flood risk assessment, to provide an assessment of the vulnerability of the project's infrastructure to climate change.

815. The methodology for the assessment of the effects on land use will be informed by the following current guidance:

- Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017); and
- Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation (IEMA, 2020).

4.5 Accidents and disasters

816. Following guidance published by IEMA on Major Accidents and Disasters in EIA (IEMA, 2020), it is proposed that consideration of major accidents and disasters within the EIA process for the project is based on assessments conducted within individual technical chapters, where this can be adequate covered by the scope of these chapters.

817. Following a review of the potential major accidents and disaster which may interact with, or arise from the project, the following have been identified:

- Coastal erosion and flood risk (considered within the ‘Marine Geology, Oceanography and Physical Processes’, ‘Water Resources and Flood Risk’ and ‘Climate Change’ EIA chapters);
- Accidental spills of hazardous material (considered within the ‘Marine Water and Sediment Quality’, and ‘Human Health’ EIA chapters);
- Vessel collision (considered within the ‘Navigation’ EIA chapter); and
- Exposed cables leading to vessel snagging (considered within the ‘Navigation’ chapter and ‘Commercial Fisheries’ EIA chapters).

818. As the impacts of these accidents / disasters are being considered individually within technical EIA chapters, a separate Major Accidents and Disasters chapter is not considered to add to the EIA, and the topic is therefore proposed to be scoped out of further assessment.

4.6 Inter-relationships of project wide aspects

819. The EIA will identify the full range of inter-relationships which are likely to result from the construction, operation and decommissioning of North Falls. The project-wide impacts of landscape and visual, socio-economics, and tourism and recreation are all closely interlinked. Inter-relationships between impacts associated with the offshore and onshore project areas will also be considered as outlined in Sections 2.14 and 3.11.

5 References

ABPmer (2017) UK Renewables Atlas. Available at: https://www.renewables-atlas.info/explore-the-atlas/
Ancient Monuments and Archaeological Areas Act 1979. (c.46).
Balmer, D., Fuller, R., and Gillings, S., (2013) Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland
Band, W., (2012) SOSS-02: Using a Collision Risk Model to Assess Bird Collision Risks For Offshore Wind Farms (No. SOSS-02).
Barker J., Seymour A., Mowat S. and Debney. A. (2014). Thames Harbour Seal Conservation Project. UK and Europe Conservation Programme. Zoological Society of London.
Barker, J. (2015) Greater Thames Estuary Seal Surveys Report. UK & Europe Conservation Programme, Zoological Society of London
Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C. and Buck, A.L., eds. (1998) Coasts and seas of the United Kingdom. Region 7 South-east England: Lowestoft to Dungeness. Joint Nature Conservation Committee, Peterborough (Coastal Directories Series).
BEIS (2020). UK Energy in Brief 2020. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904503/UK_Energy_in_Brief_2020.pdf
Bowgen, K., Cook, A., 2018. Bird Collision Avoidance: Empirical evidence and impact assessments (JNCC Report No. 614). JNCC, Peterborough.
Brasseur S., Carius F., Diederichs B., Galatius A., Jeß A., Körber P., Schop J., Siebert U., Teilmann J., Bie Thøstesen C. & Klöpper S. (2020) EG-Seals grey seal surveys in the Wadden Sea and Helgoland in 2019-2020. Common Wadden Sea Secretariat, Wilhelmshaven, Germany.
British Geological Survey (2021) Geology of Britain viewer (classic) (Online). Available at: https://mapapps.bgs.ac.uk/geologyofbritain/home.html
British Geological Survey (BGS) (2021). GeoIndex Onshore [online]. Available at URL: https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed April 2021]
British Standards Institute (2011). Investigation of potentially contaminated sites - code of practice (BS10175)
British Standards Institute (2013). Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs) (BS 8576:2013)
British Standards Institute (2015). Code of Practice for Ground Investigations (BS 5930:2015)
Bynoe R. (2017). Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton

Cave, B., Fothergill, J., Pyper, R., Gibson, G., Saunders, P. (2017). Health in Environmental Impact Assessment: A Primer for a Proportionate Approach. Ben Cave Associates Ltd, IEMA and the Facility of Public Health. Lincoln, England.
Cefas (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Available at: https://tethys.pnnl.gov/sites/default/files/publications/CEFAS_2012_Eenvironmental_Assessment_Guidance.pdf
Cefas (2021) WaveNet. Available at: http://wavenet.cefas.co.uk/Map
Centre for Ecology and Hydrology (2021a) Guide to Habitats Used in APIS http://www.apis.ac.uk/habitat_table.html
Centre for Ecology and Hydrology (2021b) Air Pollution Information System
Centre for Environment, Fisheries and Aquaculture Science, Department of Environment and Regulatory Affair, Department of Trade and Industry, and Marine Consents and Environment Unit (2004) Offshore wind farms: Guidance note for environmental impact assessment in respect of FEPA and CPA requirements Version 2, Marine Consents Environment Unit, pp. 48.Available at: http://www.cefas.co.uk/publications/files/windfarm-guidance.pdf
Chartered Institute for Archaeologists (2014a). Standard and Guidance for Historic Environment Desk-Based Assessments. Available at: https://www.archaeologists.net/sites/default/files/CIfAS&GDBA_2.pdf.
Chartered Institute for Archaeologists (2014b).Code of Conduct. Available at: https://www.archaeologists.net/sites/default/files/CodesofConduct.pdf.
Chartered Institute for Archaeologists (CIfA) (2014). Code of Conduct. Reading: University of Reading.
Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. September 2018.
Chartered Institute of Ecology and Environmental Management (CIEEM), 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland. CIEEM, Winchester.
CIfA (2017). Standard and guidance for archaeological desk-based assessment. Reading: University of Reading.
Clean Seas Environment Monitoring Programme (CSEMP) (2018) Contaminant and biological effect data 1999-2017 for the 2018 CSEMP assessment. Available at: https://data.marine.gov.scot/dataset/contaminant-and-biological-effect-data-1999-2017-2018-csemp-assessment
Cleasby, I., Owen, E., Wilson, L., Wakefield E.D., O'Connell, P., and Bolton, M. (2020) Identifying important at- sea areas for seabirds using species distribution models and hotspot mapping. Biological Conservation. Volume 241, January 2020, 108375

Cleasby, I.R., Owen, E., Wilson, L.J., and Bolton, M., (2018) Combining habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK (Research Report No. 63). RSPB Centre for Conservation Science.
Climate Change Committee (2020). Sixth Carbon Budget. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/
CMACS (2014) Greater Gabbard Offshore Wind Farm Year 1 post-construction benthic ecology monitoring survey technical report (2013 survey). Report prepared by Centre for Marine and Coastal Studies Ltd for Greater Gabbard Offshore Wind Farm Ltd. 237pp
Construction Industry Research and Information Association (CIRIA) (2001). Contaminated Land Risk Assessment –A Guide to Good Practice (C552)
Construction Industry Research and Information Association (CIRIA) (2007) Assessing Risks Posed by Hazardous Ground Gases to Buildings (C665)
Cook, A.S.C.P., Burton, N.H.K., Humphreys, E.M., Masden, E.A. (2014) The Avoidance Rates of Collision Between Birds and Offshore Turbines. Scottish Marine and Freshwater Science Vol 5 No 16. Edinburgh: Scottish Government, 247p. DOI: 10.7489/1553-1
Cook, A.S.C.P., Johnston, A., Wright, L. and Burton, N.H.K. (2012) A review of flight heights and avoidance rates of birds in relation to offshore wind farms. British Trust for Ornithology
Coull, K.A., Johnstone, R., and S.I. Rogers. (1998). Fisheries Sensitivity Maps in British Waters. Published and distributed by UKOOA Ltd.
Cucknell A.C, Moscrop A., Boisseau O. & McLanaghan R. (2020) Confirmation of the presence of harbour porpoise (Phocoena phocoena) within the tidal Thames and Thames Estuary. Mammal Communications 6: 21-28, London
DECC (2011a). Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf
DECC (2011b) National Policy Statement for Renewable Energy Infrastructure (EN-3) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37048/1940-nps-renewable-energy-en3.pdf
DECC (2011c) National Policy Statement for Electricity Networks Infrastructure (EN-5) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37050/1942-national-policy-statement-electricity-networks.pdf
DECC (now Department for Business, Energy and Industrial Strategy) (2016). UK Offshore Energy Strategic Environmental Assessment 3 (OESEA3).
Defra (2018) Local Air Quality Management Technical Guidance LAQM.TG(16)
Defra (2020) Background Mapping Data for Local Authorities https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Defra (2021) AQMAs Interactive Map https://uk-air.defra.gov.uk/aqma/maps/
Defra (2021) Environmental Land Management scheme: overview. Guidance. Published 15 March 2021. Available at: https://www.gov.uk/government/publications/environmental-land-management-schemes-overview/environmental-land-management-scheme-overview
DEFRA (undated) MAGIC map. (Online) Available from: www.magic.defra.gov.uk
Department for Environment, Food and Rural Affairs (Defra) (2012). DEFRA 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'. PB13735 (2012)
Department for Environment, Food and Rural Affairs (Defra) (2021). Multi Agency Government Information for the Countryside (MAGIC) map application [online]. Available at URL: https://magic.defra.gov.uk/magicmap.aspx [Accessed April 2021]
Department for Transport (DfT) (2020) Road Traffic Statistics. Available at: https://roadtraffic.dft.gov.uk/
Department of Environment (DoE) (1995). Industry Profiles for previously developed land [online]. Available at URL: https://webarchive.nationalarchives.gov.uk/20140328091253/http://www.environment-agency.gov.uk/research/planning/33708.aspx [Accessed April 2021]
Destination Research (2018) Economic Impact of Tourism – Essex 2018. Available at: https://www.visitessex.com/dbimgs/Economic%20Impact%20of%20Tourism%20-%20%20Essex%20Report%202018.pdf
Drewitt, A. and Langston, R., (2006). Assessing the impacts of wind farms on birds. Ibis, 148, pp.29-42.
East Anglia Offshore Wind (2012) East Anglia ONE Offshore Wind Farm Environmental Statement
East Anglia ONE North Limited (2019) East Anglia ONE North Offshore Wind Farm Environmental Statement
East Anglia THREE Limited (2015) East Anglia THREE Offshore Wind Farm Environmental Statement
East Anglia TWO Limited (2019) East Anglia TWO Offshore Wind Farm Environmental Statement
Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. (2012). Spawning and nursery grounds of selected fish species in UK waters in 2010. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56pp.
Environment Agency (2003) River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual. Environment Agency, Bristol.
Environment Agency (2007) Geomorphological monitoring guidelines for river restoration schemes. Environment Agency, Bristol.

Environment Agency (2018) Part 1: Anglian river basin district management plan. (Online) Available at: https://www.gov.uk/government/publications/anglian-river-basin-district-river-basin-management-plan
Environment Agency (2020) Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018)
Environment Agency (2021) 2021 Bathing Water Profile for Holland. Available at: https://environment.data.gov.uk/bwq/profiles/profile.html?site=ukh3311-11350
Environment Agency (2021) Catchment Data Explorer. (Online) Available at: https://environment.data.gov.uk/catchment-planning/
Environment Agency (2021) Flood Map for Planning Service. (Online) Available at: https://flood-map-for-planning.service.gov.uk/
Environment Agency (EA) (2020). Land contamination risk assessment (LCRM) [online]. Available at URL: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm [Accessed April 2020]
Environment Agency (undated). Water Resources online viewer [online]. Available at URL: https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=c9176c299b734cff9a6deffcf7f40a4e
Essex Air Quality Consortium (2021) Essex Air: Local Authorities https://essexair.org.uk/AQInEssex/LA/Tendring.aspx
Essex and South Suffolk Shoreline Management Plan (2010) Essex and South Suffolk Shoreline Management Plan 2. October 2010
Essex County Council (2011) Essex Transport Strategy: the Local Transport Plan for Essex. June 2011. Available at: https://www.essexhighways.org/uploads/downloads/essex_ltp.pdf
Essex County Council and Healthwatch Essex (2017) Essex Joint Health and Wellbeing Strategy 2018-2022
Essex County Council, (2021). Minerals policies map [online]. Available at URL: https://images.ctfassets.net/knkzaf64jx5x/3kRWyM7PIyxdi1ccSCRb3Z/8b8c8d6e33e65d4673e5bdf376b185aa/policies-map.jpg [Accessed April 2021]
Essex Planning Officers Association (EPOA) (2019) Essex Healthy Places Advice Notes for Planners, Developers and Designers
European Marine Observation and Data Network (EMODnet) (2021) Predictive European Nature Information System (EUNIS) seabed habitats. Available at: https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/
Frost, T., Austin, G., Hearn, R., McAvoy, S., Robinson, A., Stroud, D., Woodward, I., and Wotton, S. (2019) Population estimates of wintering waterbirds in Great Britain. British Birds 112. 130-145
Furness, R., (2015) Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report 164.

Furness, R.W., Wade, H.M., (2012) Vulnerability of Scottish seabirds to offshore wind turbines. Marine Scotland Science.
Furness, R.W., Wade, H.M., Masden, E.A., (2013) Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119, 56–66. https://doi.org/10.1016/j.jenvman.2013.01.025
Galatius A., Brackmann J., Brasseur S., Diederichs B., Jeß A., Klöpper S., Körber P., Schop J., Siebert U., Teilmann J., Thøstesen B. & Schmidt B. (2020) Trilateral surveys of Harbour Seals in the Wadden Sea and Helgoland in 2020. Common Wadden Sea Secretariat, Wilhelmshaven, Germany.
Galloper Wind Farm Limited (2011) Galloper Wind Farm Project: Environmental Statement
Garthe, S., Hüppop, O., (2004) Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. Journal of Applied Ecology 41, 724–734. https://doi.org/10.1111/j.0021-8901.2004.00918.
GE Wind Energy (2002) Gunfleet Sands Offshore Wind Farm Environmental Statement
Global Renewable Energy Partners (GREP) UK Marine Ltd (2002) Kentish Flats Offshore Wind Farm, Environmental Statement
Greater Gabbard Offshore Winds Ltd (2005) Greater Gabbard October 2005 Offshore Wind Farm Environmental Statement
Hammond P.S., Macleod K., Berggren P., Borchers D.L., Burt L., Cañadas A., Desportes G., Donovan G.P., Gilles A., Gillespie D., Gordon J., Hiby L., Kuklik I., Leaper R., Lehnert K, Leopold M., Lovell P., Øien N., Paxton C.G.M., Ridoux V., Rogano E., Samarraa F., Scheidatg M., Sequeirap M., Siebertg U., Skovq H., Swifta R., Tasker M.L., Teilmann J., Canneyt O.V. and Vázquez J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164, 107-122.
Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Boerjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M., Scheidat, M. and Teilmann, J. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Wageningen Marine Research.
Hawkins A. D. (1986). Underwater Sound and Fish Behaviour. In The Behaviour of Teleost Fishes, pp. 114–151. Ed. by Pitcher T. J. Springer US, Boston, MA
Hawkins A. D., Popper A. (2014) Assessing the impacts of underwater sounds on fishes and other forms of marine life. Acoustics Today, 10: 30–41
Hawkins, A.D. and Popper, A.N. (2016). A sound approach to assessing the impact of underwater noise on fish and invertebrates. ICES Journal of Marine Science, doi:10.1093/icesjms/fsw205.
Heinänen, S. and Skov, H. (2015). The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area, JNCC Report No.544 JNCC, Peterborough.
Her Majesty's Stationary Office (HMSO) (1988). Calculation of Road Traffic Noise.

Highways England (2020). Design Manual for Roads and Bridges (DMRB), LA111 Noise and Vibration, Revision 2.
Historic England (2013) Marine Geophysics Data Acquisition, Processing and Interpretation. Guidance prepared by Plets, R., Dix, J., Bates, R. Available at: https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/mgdapai-guidance-notes/
Historic England (2015) Making Significance in Decision-Taking in the Historic Environment. Historic Environment Good Practice Advice in Planning: 2.
Historic England (2015a). The Historic Environment in Local Plans. Historic Environment Good Practice Advice in Planning: 1. London: Historic England.
Historic England (2015b). Making Significance in Decision-Taking in the Historic Environment. Historic Environment Good Practice Advice in Planning: 2. London: Historic England.
Historic England (2017). Historic Environment Good Practice in Planning Note 3 Second Edition: The Setting of Heritage Assets. London: Historic England.
HM Government (2011) UK Marine Policy Statement. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf
HM Government (2014) East Inshore and East Offshore Marine Plans. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312496/east-plan.pdf
HM Government (2020a). United Kingdom of Great Britain and Northern Ireland's Nationally Determined Contribution. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943618/uk-2030-ndc.pdf
HM Government (2020b) The Energy White Paper. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf
HM Treasury (2020) The Green Book Central Government Guidance on Appraisal and Evaluation
HR Wallingford (2010). MAREA: Tidal flows and sediment transport study. Technical Note DDR4318-05. Prepared for Thames Estuary Dredging Association.
HR Wallingford, Cefas/UEA, Posford Haskoning and D'Olier, B. (2002). Southern North Sea Sediment Transport Study, Phase 2. HR Wallingford Report EX4526.
https://qsr2010.ospar.org/en/index.html
Hutchison, Z. L., Sigray, P., He, H., Gill, A. B., King, J., and Gibson, C. (2018). Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-003.

IAMMWG (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.
IAQM (2020) A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites
IAQM and Environmental Protection UK (EPUK) (2017) Land-Use Planning and Development Control: Planning for Air Quality
ICES (2020) ICES Fisheries Overviews. Greater North Sea Ecoregion. Available at: https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2020/2020/Fisheries Overview_GreaterNorthSea_2020.pdf
ICES (2021) International Herring Larvae Survey (IHLS) data Eastern and northern North Sea 2005 – 2021
Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction
Institute of Environmental Management and Assessment (IEMA) (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance
Institute of Environmental Management and Assessment (IEMA) (2020) Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation.
Institute of Environmental Management and Assessment (IEMA) (2020) Major Accidents and Disasters in EIA: A Primer.
Intergovernmental Panel on Climate Change (IPCC) (2013) Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA
International Council for the Exploration of the Sea (ICES) (2019) Report of the Working Group 2 on cod and plaice egg surveys in the north sea (WGEGGS2). 3-7 December. IJmuiden, The Netherlands. ICES CM 2018/EOSG:09. 37 pp. Available at: https://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=35195
Irwin, C., Scott, M., S., Humpries, G. & Webb, A. (2019). HiDef report to Natural England - Digital video aerial surveys of red-throated diver in the Outer Thames Estuary Special Protection Area 2018. Natural England Commissioned Reports, Number 260.
JNAPC (2006). Code for Practice for Seabed Development. Available at: http://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf.
JNCC (2013) Outer Thames Estuary Special Protection Area

JNCC (2017) Margate and Long Sands. Special Area of Conservation (SAC) Site Code UK0030371. Available at: https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030371.pdf
Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M., Burton, N.H.K., (2014a) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology 51, 31–41. https://doi.org/10.1111/1365-2664.1219
Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M., Burton, N.H.K., (2014b). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Corrigendum. Journal of Applied Ecology 51, 1126–1130.
Joint Nature Conservation Committee (JNCC) and Natural England (2011) General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation. Available at: https://data.jncc.gov.uk/data/6aff8099-10e1-4323-a4d5-b8539b8013b0/MCZs-and-human-activities-2011.pdf
Jones, L.A., Coyle, M.D., Evans, D., Gilliland, P.M. and Murray, A.R. (2004). Southern North Sea Marine Natural Area Profile: A contribution to regional planning and management of the seas around England. Peterborough, English Nature.
Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L.J., Reid, J.B., 2010. An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs (JNCC Report No. 431). JNCC, Peterborough.
Land Use Consultants (2001) Tendering District Landscape Character Assessment. Prepared for Tendring District Council.
Langston, R.H.W. (2010). Birds and wind farms: where next? BOU Proceedings – Climate Change and Birds. Available at: http://www.bou.org.uk/bouproc-net/ccb/langston.pdf
London Array Limited (LAL) (2005) London Array Offshore Wind Farm Environmental Statement
Love, M., Nishimoto, M., Snook, L., Schroeder, D. and Scarborough Bull, A., (2017) A Comparison of Fishes and Invertebrates Living in the Vicinity of Energized and Unenergized Submarine Power Cables and Natural Sea Floor off Southern California, USA. Journal of Renewable Energy, 2017, pp.1-13.
MacGregor, R.M., King, S., Donovan, C.R., Caneco, B., Webb, A., 2018. A Stochastic Collision Risk Model for Seabirds in Flight. Marine Scotland.
MALSF (2009) The Outer Thames Estuary Regional Environmental Characterisation (09/J/1/06/1305/0870) London, GB. ALSF/MEPF (DEFRA) 145pp
Marine Life Information Network (MarLIN) (2021) Marine Evidence based Sensitivity Assessment (MarESA). Available at: https://www.marlin.ac.uk/sensitivity/sensitivity_rationale

Marine Management Organisation (MMO) (2012) Seascape character area assessment East Inshore and East Offshore marine plan areas. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312481/east_seascape.pdf]
MARINElife (2021) Marine mammal sightings from southern North Sea ferry routes, [Online], Available: http://www.marine-life.org.uk/sightings
Ministry of Housing, Communities & Local Government (2019). Planning Practice Guidance (PPG): Historic Environment (July 2019). London: HMSO.
Ministry of Housing, Communities & Local Government, 2018. Conserving and Enhancing the Historic Environment. London: HMSO.
Ministry of Housing, Communities and Local Government (MHCLG) (2019). National Planning Policy Framework [online]. Available at URL: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed April 2021].
Mitchell, I., Newton, S.F., Ratcliffe, N., and Dunn, T.E., (Eds.). (2004). Seabird Populations of Britain and Ireland: results of the Seabird 2000 census (1998-2002). Published by T and A.D. Poyser, London.
MMO (2012) East marine plan areas: Evidence and Issues Report. Available at: https://www.gov.uk/government/publications/east-marine-plan-areas-evidence-and-issues-report
MMO (2018) Fishing Activity for UK Vessels 15m and over 2016. From 2014 to 2018. Available at: https://data.gov.uk/dataset/4bd80f1a-4ead-44c5-b3fa-975da1cb4d7d/fishing-activity-for-uk-vessels-15m-and-over-2016
MMO (2020a) Draft South East Inshore Marine Plan. Available at: https://www.gov.uk/government/publications/draft-south-east-marine-plan-documents
MMO (2020b) UK sea fisheries annual statistics report 2019. Available at: https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2019
Moriarty, M. & Greenstreet, S. (2020) Greater North Sea International Otter Trawl Quarter 3 Groundfish Survey Monitoring and Assessment Data Products - 2017-2019 Update. DOI: 10.7489/12311-1
National Grid Company (NGC) (2006) Guidelines on Substation Siting and Design (‘The Horlock Rules’)
National Health Service (NHS) (2017) Healthy Urban Planning Checklist
Natural England (2010) Departmental Brief: Outer Thames Estuary. Special Protection Area. Available at: http://publications.naturalengland.org.uk/file/3264082
Natural England (2014a) NCA Profile: 81 Greater Thames Estuary (NE473).
Natural England (2014b) NCA Profile: 111 Northern Thames Basin (NE466).
Natural England (2014c) NCA Profile: 82 Suffolk Coast and Heaths (NE491)

Natural England (2018) Natural England's Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations
Natural England (2021a) SSSI Condition Summary: Holland Haven Marshes SSSI. (Online) Available at: https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S1006349&ReportTitle=Holland%20Haven%20Marshes%20SSSI
Natural England (2021b) SSSI Condition Summary: Colne Estuary SSSI. (Online) Available at: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000666&SiteName=&countyCode=15&responsiblePerson=&SeaArea=&IFCAArea=
Norfolk Boreas Limited (2017) Norfolk Boreas Offshore Windfarm Environmental Statement
Norfolk Vanguard Limited (2016) Norfolk Vanguard Offshore Windfarm Environmental Statement
Normandeau, Exponent, T. Tricas, and A. Gill. (2011) Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA.OCS Study BOEMRE 2011-09
Office for National Statistics (ONS) (2020) NOMIS Official Labour Market Statistics. Labour market profile – Tendring. Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157220/report.aspx?town=tendring#tabeinact
OSPAR (2010) OSPAR Commission Quality Status Report 2010. Available at:
OSPAR (2017) OSPAR Intermediate Assessment 2017. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/introduction/ospar-and-intermediate-assessment-2017/
Oxford Archaeology (2008). Guidance for the Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy. Guidance prepared by Oxford Archaeology and issued by COWRIE. Available at: https://www.biofund.org.mz/wp-content/uploads/2018/11/F1349.Cowrie-Ciarch-Web.pdf
Palmer, M., Howard, T., Tinker, J., Lowe, J., Bricheno, L., Calvert, D., Edwards, T., Gregory, J., Harris, G., Krijnen, J., Pickering, M., Roberts, C. Wolf, J. (2018) UKCP18 Marine report, November 2018.
Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E. and Thomas, L. (2016). Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources with Advisory Note, JNCC Report 517, ISSN 0963-8091: http://jncc.defra.gov.uk/page-7201
Planning (Listed Buildings and Conservation Areas) Act 1990. (c.9).

Pooley, L. (2016a). Archaeological evaluation on land at the former Martello Caravan Park, Kirby Road, Walton-on-the-Naze, Essex, CO14 8QP. Colchester Archaeological Trust: CAT Report 1015. Essex: Colchester
Pooley, L. (2016b). Archaeological evaluation at Kirkmead, Clacton Road, Weeley, Essex. Colchester Archaeological Trust: CAT Report 931. Essex: Colchester
Popper AN, Hawkins AD, Fay RR, Mann D, Bartol S, Carlson T, Coombs S, Ellison WT, Gentry R, Halvorsen MB, Løkkeborg S, Rogers P, Southall BL, Zeddies D and Tavolga WN (2014). Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report, ASA S3/SC1.4 TR-2014 prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer and ASA Press, Cham, Switzerland.
Public Health England (PHE) (2017) Health and Environmental Impact Assessment: A Briefing for Public Health Teams in England
Public Health England (PHE) (2020) Health Impact Assessment in spatial planning
River Restoration Centre (2011): Practical River Restoration Appraisal Guidance for Monitoring Options. (Online) Available at https://www.therrc.co.uk/monitoring-guidance
Russell, D.J.F, Jones, E.L. and Morris, C.D. (2017) Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. Scottish Marine and Freshwater Science Vol 8 No 25, 25pp. DOI: 10.7489/2027-1.
Russell, D.J.F. and McConnell, B.J. (2014). Seal at-sea distribution, movements and behaviour. Report to DECC. URN: 14D/085. March 2014 (final revision).
SCOS (2019) Scientific Advice on Matters Related to the Management of Seal Populations: 2019. Available from: http://www.smru.st-andrews.ac.uk/files/2020/08/SCOS-2019.pdf
SCOS (2020) Scientific Advice on Matters Related to the Management of Seal Populations: 2020. Available from: http://www.smru.st-andrews.ac.uk/files/2021/06/SCOS-2020.pdf
Sea Watch Foundation (2021). Reports of cetacean sightings eastern England, Available at: http://www.seawatchfoundation.org.uk/recentsightings/
Seascape, Landscape and Visual
Sharples, R.J., Moss, S.E., Patterson, T.A. and Hammond, P.S. (2012). Spatial Variation in Foraging Behaviour of a Marine Top Predator (Phoca vitulina) Determined by a Large-Scale Satellite Tagging Program. PLoS ONE 7(5): e37216.
SNCBs (2014). Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review.
SNCBs, (2017) Joint SNCB Interim Displacement Advice Note: Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments.
Socio-economics

Speakman, J.R., Gray, H., Furness, L., Energy, G.B.D. of, Change, C., Great Britain. Department for Business, I., Skills, Biological, U. of A.I. of, Sciences, E., (2009). University of Aberdeen Report on Effects of Offshore Wind Farms on the Energy Demands on Seabirds. Department for Business, Innovation & Skills.
Standards for Highways (2020) Design Manual for Roads and Bridges. [online] Available at: https://www.standardsforhighways.co.uk/dmrb/
Stienen, E.W., Waeyenberge, V., Kuijken, E. and Seys, J. (2007) Trapped within the corridor of the southern North Sea: the potential impact of offshore wind farms on seabirds. In Birds and Wind farms. de Lucas, M., Janss, G.F.E. and Ferrer, M. (Eds). Quercus, Madrid.
Stone, C.J. Webb, A., Barton, C., Ratcliffe, N., Reed, T.C. Tasker, M.L. Camphuysen, C.J. and Pienkowski, M.W. (1995) An atlas of seabird distribution in north-west European waters. JNCC, Peterborough
Suffolk Coast and Heaths AONB (2018) Suffolk Coast and Heaths AONB Management Plan 2018-2023. [https://www.suffolkcoastandheaths.org/wp-content/uploads/2021/01/SCH-AONB-Management-Plan-2018-23.pdf]
Tendring District Council (2021) Essex Sunshine Coast website. Available: http://essex-sunshine-coast.org.uk/towns-villages/.
Tendring District Council, Colchester Borough Council and Braintree District Council (2021) North Essex Authorities' Shared Strategic Section 1 Plan. Adopted January 2021. Available at: https://www.tendringdc.gov.uk/sites/default/files/documents/planning/Planning_Policy/Section_1/Tendring%20District%20Local%20Plan%202013-2033%20and%20Beyond%20-%20Section%201.pdf
Thaxter, C., Lascelles, B., Sugar, K., Cook, A., Roos, S., Bolton, M., Langston, R. and Burton, N., (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, 156, pp.53-61.
The Crown Estate (2019) Review of Cable Installation, Protection, Mitigation and Habitat Recoverability. Available at: https://www.rpsgroup.com/media/4295/review-of-cable-installation-protection-mitigation-and-habitat-recoverability.pdf
The Crown Estate (2021). Offshore Wind Leasing Round 4. Available at: https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/offshore-wind-leasing-round-4/
The Planning Inspectorate (2016) Application by Vattenfall Wind Power Ltd for an Order Granting Development Consent for the Norfolk Vanguard Offshore Wind Farm Issue of Scoping Opinion. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-001922-6.04%20Scoping%20Opinion.pdf
The Planning Inspectorate (2017a). Advice Note Ten: Habitats Regulations Assessment (version 4). Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/06/Advice-note-10v4.pdf

The Planning Inspectorate (2017b) SCOPING OPINION; Proposed Norfolk Boreas Offshore Wind Farm. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000860-6.5%20Scoping%20Opinion.pdf
The Planning Inspectorate (2017c) SCOPING OPINION: Proposed East Anglia ONE North Offshore Windfarm. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010077/EN010077-001006-6.5%20EA1N%20Scoping%20Opinion.pdf
The Planning Inspectorate (2017d) SCOPING OPINION: Proposed East Anglia TWO Offshore Windfarm. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010078/EN010078-001616-6.5%20EA2%20Scoping%20Opinion.pdf
The Planning Inspectorate (2017e). Advice note eighteen: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/06/advice_note_18.pdf
The Planning Inspectorate (2019) Proposed Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Scoping Opinion. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010109/EN010109-000006-EQNR_Scoping%20Opinion%202017%20EIA%20Regs.pdf
The Planning Inspectorate (2021). Advice Note Nine: Using the Rochdale Envelope (version 3). Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf
Thompson, D. (2012). Distribution and abundance of harbour seals (Phoca vitulina) during the breeding season in The Wash and along the Essex and Kent coasts. Report to Natural England covering survets carried out in 2004 to 2011.
Tickell, S.C. and Barker, J., (2015). Thames Marine Mammal Sightings Survey Ten Year Report (2004-2014).
Traffic and transport
UK Government (2020) United Kingdom of Great Britain and Northern Ireland's Nationally Determined Contribution.
van Damme, C.J.G., Hoek, R., Beare, D., Bolle, L.J., Bakker, C., van Barneveld, E., Lohman, M., os-Koomen, E., Nijssen, P., Pennock, I. and Tribuhl, S. (2011) Shortlist Master plan Wind Monitoring fish eggs and larvae in the Southern North Sea; Final Report. Report number C098/11
Vincent, C., Huon, M., Caurant, F., Dabin, W., Deniau, A., Dixneuf, S., Dupuis, L., Elder, J.F., Fremau, M.H., Hassani, S. and Hemon, A., 2017. Grey and harbour seals in France: Distribution at sea, connectivity and trends in abundance at

haulout sites. Deep Sea Research Part II: Topical Studies in Oceanography, 141, pp.294-305.

Visit Essex (2021) Things to do website. Available at: https://www.visitessex.com/

Waggitt, J.J., Evans, P.G., Andrade, J., Banks, A.N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C.J., Durinck, J. and Felce, T., 2019. Distribution maps of cetacean and seabird populations in the North-East Atlantic. Journal of Applied Ecology, 57(2), pp.253-269.

Wakefield, E.D., Bodey, T.W.,Bearhop, S., Blackburn, J., Colhoun, K., Davies, R., Dwyer, R.G., Green, J.A., Grémillet, D., Jackson, A.L., Jessopp, M.J., Kane, A., Langston, R.H.W., Lescroël, A., Murray, S., Le Nuz, M., Patrick, S.C., Péron, C., Soanes, L.M., Wanless, S., Votier, S.C., Hamer, K.C., (2013). Space Partitioning Without Territoriality in Gannets. Science 341, 68. https://doi.org/10.1126/science.1236077

Wernham, C.V., Toms, M.P., Marchant, J.H., Clark, J.A., Siriwardena, G.M. & Baillie, S.R. (eds) (2002) The Migration Atlas: movements of the birds of Britain and Ireland

Wessex Archaeology (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector. Guidance prepared by Wessex Archaeology and issued by COWRIE. Available at: https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex_%20-%20archaeo_%20guidance_Final_1-2-07.pdf

White Consultants (2020) Suffolk Seascape Sensitivity to Offshore Wind Farms. Suffolk County Council and Suffolk Coast and Heaths AONB Partnership. [http://suffolklandscape.org.uk/wp-content/uploads/2020/10/Suffolk-seascape-sensitivity-to-wind-farms-final-061020.pdf]

Wildfowl and Wetland Trust (WWT) (2009). Distributions of Cetaceans, Seals, Turtles, Sharks and Ocean Sunfish recorded from Aerial Surveys 2001-2008: Report to Department of Energy and Climate Change.

Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D.A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. British Birds 113: 69–104.

Woodward, I., Thaxter, C.B., Owen, E., Cook A.S.C.P., (2019). Desk-based revision of seabird foraging ranges used for HRA screening.

World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) (2015) The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Revised Edition.

Wright, L. J., Ross-Smith, V. H., Massimino, D., Dadam, D., Cook, A. S. C. P., & Burton, N. H. K. (2012) Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas (and other Annex 1 species). BTO report to the Strategic Ornithological Support Service (SOSS), Thetford.