RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Stage 1 Marine Conservation Zone Assessment

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Company:	**RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited**	Asset:	**Development**
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Glossary

Term	Definition
Array Areas	The DBS East and DBS West offshore Array Areas, where the wind turbines, offshore platforms and array cables would be located. The Array Areas do not include the Offshore Export Cable Corridor or the Inter-Platform Cable Corridor within which no wind turbines are proposed. Each area is referred to separately as an Array Area.
Array cables	Offshore cables which link the wind turbines to the Offshore Converter Platform(s).
Concurrent Scenario	A potential construction scenario for the Projects where DBS East and DBS West are both constructed at the same time.
Construction Buffer Zone	1km zone around the Array Areas and Offshore Export Cable Corridor, and 500m zone around the Inter-Platform Cabling Corridor, where construction vessels may be located.
Cumulative Effects	The combined effect of the Projects in combination with the effects of a number of different (defined cumulative) schemes, on the same single receptor/resource.
Cumulative Effects Assessment (CEA)	The assessment of the combined effect of the Projects in combination with the effects of a number of different (defined cumulative) schemes, on the same single receptor/resource.
Cumulative impact	The combined impact of the Projects in combination with the effects of a number of different (defined cumulative) schemes, on the same single receptor/resource.
Projects Design (or Rochdale) Envelope	A concept that ensures the EIA is based on assessing the realistic worst-case scenario where flexibility or a range of options is sought as part of the consent application.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).

Term	Definition
Development Scenario	Description of how the DBS East and / or DBS West Projects would be constructed either in isolation, sequentially or concurrently.
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the value, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Habitats Regulations Assessment (HRA)	The process that determines whether or not a plan or project may have an adverse effect on the integrity of a European Site or European Offshore Marine Site.
Horizontal Directional Drill (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
Impact	Used to describe a change resulting from an activity via the Projects, i.e. increased suspended sediments / increased noise.
In Isolation scenario	A potential construction scenario for one Project which includes either the DBS East or DBS West array, associated offshore and onshore cabling and only the eastern Onshore Converter Station within the Onshore Substation Zone and only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation.

Term	Definition
Intertidal	Area on a shore that lies between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.
Landfall Zone	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) and the Transition Joint Bays (TJBs) inclusive of all construction works, including the landfall compounds, Onshore Export Cable Corridor and intertidal working area including the Offshore Export Cables.
Mean High Water Springs (MHWS)	MHWS is the average of the heights of two successive high waters during a 24 hour period.
Mean Low Water Springs (MLWS)	MLWS is the average of the heights of two successive low waters during a 24 hour period.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP) between the Offshore Converter Platforms and Transition Joint Bays at the landfall.
Onshore Converter Stations	A compound containing electrical equipment required to transform HVDC and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network as HVAC. There will be one Onshore Converter Station for each Project.
Scoping Opinion	The report adopted by the Planning Inspectorate on behalf of the Secretary of State.
Scoping Report	The report that was produced in order to request a Scoping Opinion from the Secretary of State.

Term	Definition
Sequential Scenario	A potential construction scenario for the Projects where DBS East and DBS West are constructed with a lag between the commencement of construction activities. Either Project could be built first.
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South offshore wind farms).
Transition Joint Bay (TJB)	The Transition Joint Bay (TJB) is an underground structure at the landfall that houses the joints between the Offshore Export Cables and the Onshore Export Cables.
Wind Turbine	Power generating device that is driven by the kinetic energy of the wind.

Acronyms

Term	Definition
AoO	Advice on Operations
BAP	Biodiversity Action Plan
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
DBS	Dogger Bank South
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
HDD	Horizontal Directional Drill
HRA	Habitats Regulations Assessment
HVDC	High Voltage Direct Current
INNS	Invasive / Non-Native Species
JNCC	Joint Nature Conservation Committee
km	Kilometre
kV	Kilovolt
m	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone

Term	Definition
MCZA	Marine Conservation Zone Assessment
MEEB	Measures of Equivalent Environmental Benefit
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
mm	Millimetres
MMO	Marine Management Organisation
NE	Natural England
NEIFCA	North Eastern Inshore Fisheries and Conservation Authority
NSIP	Nationally Significant Infrastructure Project
O&M	Operation and Maintenance
PEMP	Project Environmental Management Plan
PINS	Planning Inspectorate
PLGR	Re-Lay Grapnel Run
PSD	Particle Size Distribution
RIAA	Report to Inform Appropriate Assessment
SACO	Supplementary Advice on Conservation Objective
SNCB	Statutory Nature Conservation Body
SSC	Suspended Sediment Concentrations
TJB	Transition Joint Bay
UK	United Kingdom

1 Introduction

1.1 Purpose of This Document

1. The purpose of this Stage 1 Marine Conservation Zone Assessment (MCZA) Report is to provide information to determine whether the proposed Dogger Bank South (DBS) East and DBS West offshore wind farms (collectively referred to hereafter as 'the Projects') have the potential to affect the features and conservation objectives of the Holderness Offshore and Holderness Inshore Marine Conservation Zones (MCZ) (hereby referred to as 'the MCZs').

2. There is no overlap of the Holderness Inshore MCZ and Holderness Offshore MCZ with the Projects' Array Areas or Offshore Export Cable Corridor where permanent infrastructure will be installed (the permanent burial corridor). There is an approximately 1km² overlap of the Offshore Export Cable Corridor's Construction Buffer Zone with the Holderness Inshore MCZ (**Figure 1-1**) in the nearshore, where there is a potential requirement for vessel anchoring during Offshore Export Cable installation.

3. The MCZA is a requirement of Section 126 of the Marine and Coastal Access Act 2009 (MCAA), which places specific duties on the regulating authority (i.e., the Marine Management Organisation (MMO) for marine licence applications and the Secretary of State (SoS) for Development Consent Order (DCO) applications) which require consideration of the MCZs when determining consent applications. As such, the MMO and SoS have incorporated the need to include a MCZA into their decision-making processes, where any MCZ has the potential to be affected by a marine licensable activity.

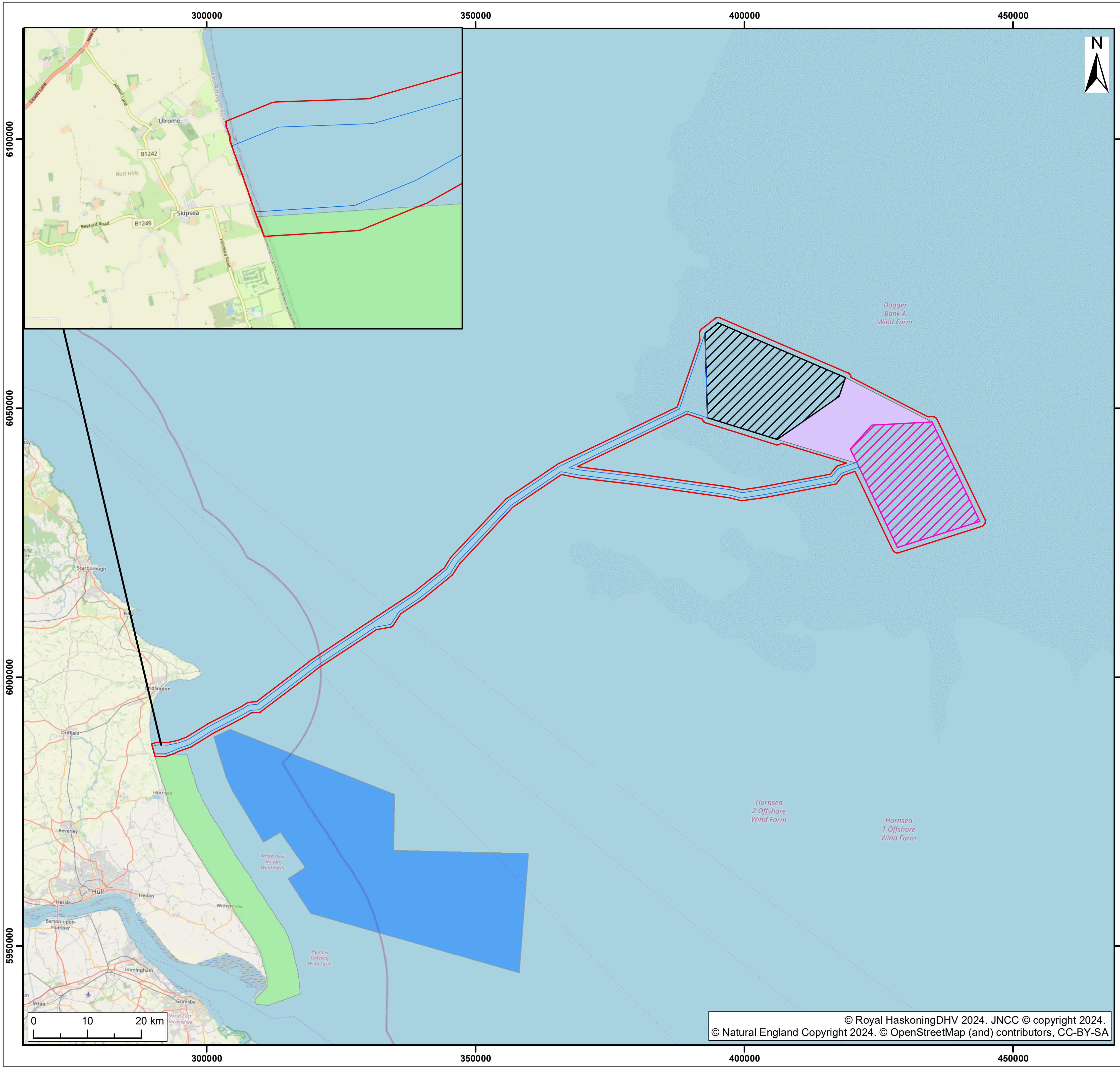
4. This document is informed by guidance published by the MMO (2013) on how such assessments should be undertaken and by advice from the Statutory Nature Conservation Bodies (SNCBs) during consultation in the pre-application phase of the Projects. The MCZA has been undertaken based on the description of the Projects provided within section 5 of this report and **Volume 7, Chapter 5 Project Description (application ref: 7.5)** of the Environmental Statement (ES).

5. The structure of this MCZA is as follows:

   - Section 1: (this section) Introduction to the document, structure of the assessment, project background and project description;
   - Section 2: Legislation, Policy and Guidance – This section provides the legislative context and details the policy and guidance given by a

number of Governmental, statutory and industry bodies in relation to the MCZA process;

- Section 3: Overview of the MCZ assessment process – Provides an overview of the MCZA Process and the approach taken by RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited ('the Applicants');
- Section 4: Consultation – Provides a summary of the consultation undertaken with respect to the MCZA including stakeholder comments and the Applicants' responses;
- Section 5: Project Description – An outline of the Projects is given with regard to the location of infrastructure and its construction, operation and maintenance (O&M), and decommissioning;
- Section 6: Screening Summary – This section summarises the screening process and outcomes that have been consulted on through the Evidence Plan Process (EPP). The screening report is provided in **Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report (application ref: 8.17.1)** (as updated to take account of consultation comments received);
- Section 7: Site Specific Surveys: A description of the site-specific survey data collected for the Projects in relation to the Holderness Inshore MCZ and Holderness Offshore MCZ.
- Sections 8 and 9: Baseline Description – A description of the Holderness Inshore and Holderness Offshore MCZs, including the protected features and conservation objectives. A description of the location of protected features within the offshore export cable corridor is also provided, incorporating the site-specific survey data that has been collected;
- Section 10: Stage 1 assessment – This section provides the stage 1 assessment for the MCZs. An assessment of cumulative effects with other plans and projects is also provided; and
- Section 11: Conclusion – A conclusion to the MCZA is provided with respect to the conservation objectives for both MCZs.



Legend:

- Offshore Development Area
- Offshore Export Cable Corridor
- DBS East Array Area
- DBS West Array Area
- Inter-Platform Cable Corridor
- Holderness Inshore MCZ
- Holderness Offshore MCZ

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S2	P01	12/03/2024	Suitable for Information	JH	SB	CC

Title: Location of Holderness Inshore MCZ and Holderness Offshore MCZ in Relation to the Offshore Development Area

Figure: 1-1

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0776

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:700,000

Project: Dogger Bank South Offshore Wind Farms

Report: Environmental Statement

Royal HaskoningDHV Enhancing Society Together

RWE

1.2 Project Background

6. In November 2017, The Crown Estate announced a new round of offshore wind leasing. In September 2019, the final bidding areas were announced, and the Offshore Wind Leasing Round 4 was launched. As part of the Round 4 process, developers were able to identify preferred sites within bidding areas defined by The Crown Estate. Applications were then submitted by developers under a competitive bidding process, culminating in an auction held in February 2021. RWE was successful in this auction process, securing preferred bidder status on two adjacent projects, DBS East and DBS West.

7. The Crown Estate carried out a plan-level Habitats Regulation Assessment (HRA) for the Offshore Wind Leasing Round 4, which assessed the potential cumulative impacts of the six offshore wind projects identified through the Round 4 tender process. The Crown Estate gave notice to the United Kingdom (UK) and Welsh Government of its intent to proceed with the Round 4 Plan on the basis of a derogation in April 2022. The Secretary of State for Business, Energy and Industrial Strategy has agreed that The Crown Estate can proceed with the Plan. The Applicants have signed an Agreement for Lease with The Crown Estate and have applied for a DCO.

8. The array areas are located more than 100km offshore on the Dogger Bank in the southern North Sea and each covers approximately 350km^2.

9. Based on an estimated capacity of 3 gigawatts (GW) once fully operational, the Projects could be capable of generating enough electricity to meet the average annual domestic energy needs of around 3 million typical UK homes[1].

[1] Calculation based on 2021 generation, and assuming average (mean) annual household consumption of 3,509 kWh, based on latest statistics from Department of Energy Security and Net Zero (Subnational Electricity and Gas Consumption Statistics Regional and Local Authority, Great Britain, 2021, Mean domestic electricity consumption (kWh per meter) by country/region, Great Britain, 2021

2 Legislation, Policy and Guidance

2.1 Marine and Coastal Access Act (2009)

10. The MCAA establishes a range of measures to manage the marine environment including establishing MCZs. The Marine Conservation Zone Project was established in 2008 by the Joint Nature Conservation Committee and Natural England (NE) to work with regional stakeholder led projects to identify and recommend MCZs to Government. The MCZs were designated in three tranches (2013, 2016 and 2019). The process is now complete.

11. Sections 125 and 126 of the MCAA place specific duties on the MMO relating to MCZs and marine licence decision making, and on the Secretary of State relating to DCO decision making. Section 126 applies where:

- (a) A public authority has the function of determining an application (whenever made) for authorisation of the doing of an act, and
- (b) The act is capable of affecting (other than insignificantly):
  - (i) The protected features of an MCZ.
  - (ii) Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent.

12. NE has responsibility under the MCAA to give advice on how to further the conservation objectives for the MCZ, identify the activities that are capable of affecting the designated features and the processes which they are dependent upon.

2.2 Guidance

13. The MCZA gives consideration to the following guidance:

- MMO 2013. Marine Conservation Zones and Marine Licensing guidance.
- NE 2020a. Guidance on how to use NE's Conservation Advice Packages for Environmental Assessments (Draft).
- Planning Inspectorate (PINS) 2019. Advice Note Seventeen: Cumulative effects assessment.

14. The approach to the screening assessment has also been informed by advice from NE and other stakeholders provided through the EPP (see as well as Advice on Operations (AoO) and Supplementary Advice on Conservation Objectives (SACO) for both MCZs (NE, 2020a).

3 Overview of MCZ Assessment Process

15. Guidance published by the MMO (2013) describes how MCZAs should be undertaken in the context of marine licensing decisions (note: there is no PINS guidance or advice on MCZ Assessments for DCO applications). To undertake its marine licensing function, the MMO has introduced a three stage sequential assessment process for considering impacts on MCZs.

16. In order for it to deliver its duties under Section 126 of the MCAA, Section 126 places specific duties on all public bodies in undertaking their licensing activities where they are capable of hindering the conservation objectives of an MCZ. The MCZA process is similar to, but separate from, the Habitats Regulations Assessment (HRA) process. The stages of MCZA are presented below.

3.1 MCZ Screening (Appendix A)

17. The screening process is required to determine whether Section 126 of the MCAA (2009) should apply to the application. All applications go through an initial screening stage to determine whether:

- The plan, project or activity is within or near to a MCZ.
- The plan, project or activity is capable of significantly affecting (without mitigation)
  - (i) The protected features of a MCZ, or
  - (ii) Any ecological or geomorphological processes on which the conservation of any protected feature of a MCZ depends (wholly or in part).

18. Where it has been determined through screening that Section 126 applies, the application is assessed further to determine which subsections of Section 126 should apply through Stage 1 assessment and Stage 2 assessment. The MCZA screening stage is summarised in **Plate 3-1**.

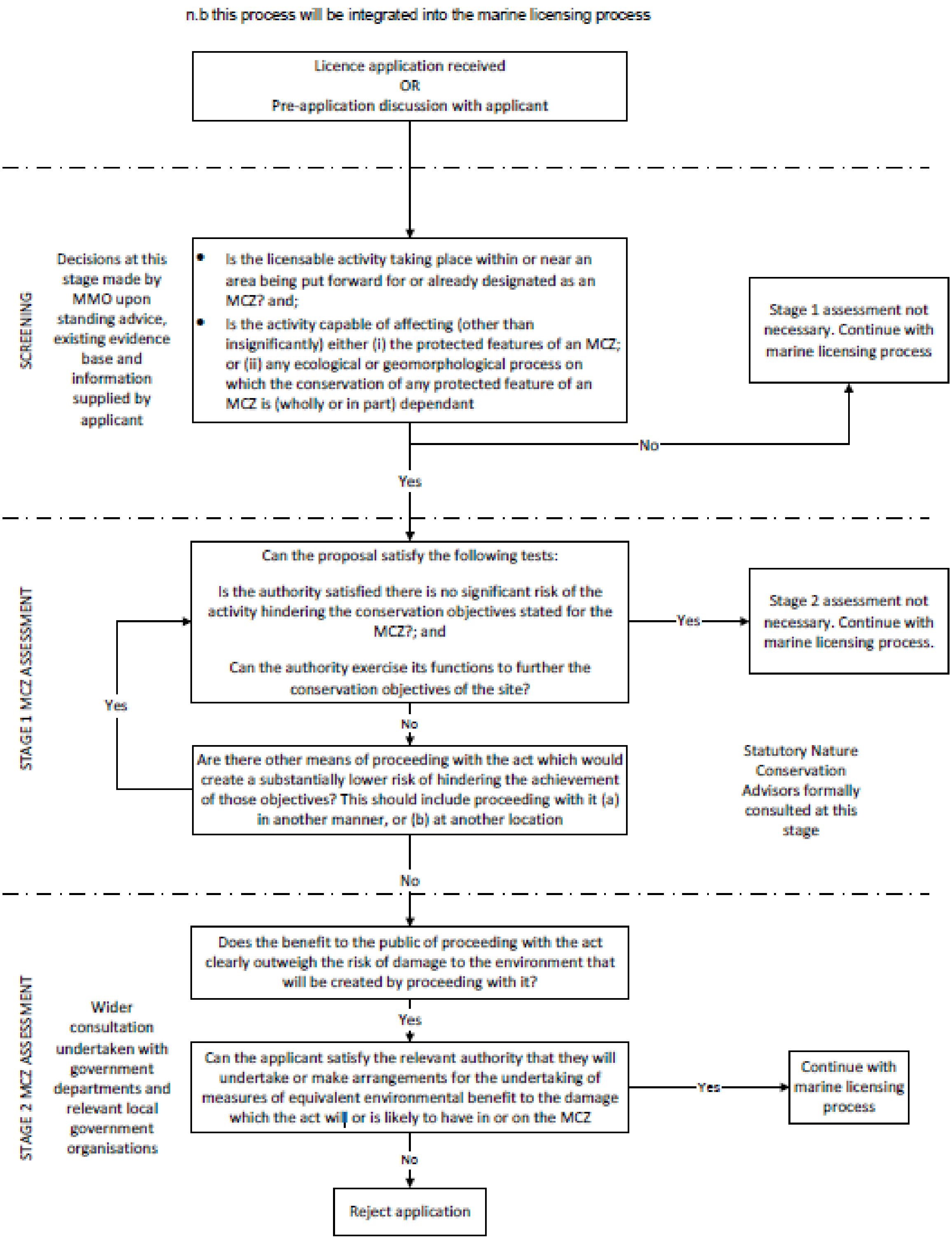


Plate 3-1 Flow chart summary of the MCZA process used by the MMO during marine licence determination (MMO, 2013).

3.2 Stage 1 Assessment (This Report)

19. This Stage 1 Assessment will consider whether the conditions in s.126(6) of the MCAA can be met, to determine whether:

- There is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ; and
- The MMO can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with s.125(2)(a)).

20. This Stage 1 Assessment considers the extent of the potential effects of the plan or project on the MCZs in more detail. The Stage 1 Assessment looks at whether the plan or project could potentially affect the conservation objectives for the site, that is, affect the site so that the features are no longer in favourable condition, or prevent the features from recovering to a favourable condition.

21. If mitigation to reduce identified effects cannot be secured, and there are no other alternative locations, then the Projects will be considered under Stage 2 of the assessment process. More information on the Stage 2 assessment is provided in section 3.3.

22. Within the Stage 1 Assessment, "hinder" will be considered as any act that could, either alone or in combination, present the following:

- In the case of a conservation objective of "maintain", increase the likelihood that the current status of a feature would deteriorate (e.g. from favourable to degraded) either immediately or in the future (i.e. they would be placed on a downward trend); or
- In the case of a conservation objective of "recover", decrease the likelihood that the current status of a feature could improve (e.g. from degraded to favourable) either immediately or in the future (i.e. they would be placed on a flat or downward trend).

23. In order to determine if there is 'no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ,' the MMO (2013) guidance states;

"this should take into account the likelihood of an activity causing an effect, the magnitude of the effect should it occur, and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant."

24. The Projects approach to determining no significant risk of the activity enabling achievement of the conservation objectives is set out below in section 3.2.1.

3.2.1 Assessment of Risk to Conservation Objectives

3.2.1.1 Magnitude of Effect

25. For each effect, a magnitude has been assigned, providing a definition of the spatial extent, duration, frequency and reversibility of the effect considered (where applicable). The definitions of magnitude for the purpose of the MCZA are provided in **Table 3-1**.

Table 3-1 Definitions of Magnitude

Magnitude	Definition
High	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the particular receptors character or distinctiveness.
Medium	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Low	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Negligible	Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptors character or distinctiveness.

3.2.1.2 Sensitivity of Receptors

26. In order to determine the sensitivity of the protected features of the MCZs, NE's AoO has been utilised which indicates the sensitivity of each receptor to relevant pressures. Specifically, the sensitivity range of the biotopes associated with each protected feature has been determined in relation to relevant pressures, taking the highest sensitivity as a worst-case scenario.

3.2.1.3 Assessment Against Conservation Objectives

27. Following determination of effect magnitude and receptor sensitivity, the Stage 1 assessment considers the risk that the Projects could hinder the conservation objectives for the MCZs with consideration of NE's SACOs.

28. SACOs present attributes which are ecological characteristics or requirements of the designated species and habitats within a site. The listed attributes are considered to be those which best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. These attributes have a target which is either quantified or qualified depending on the available evidence (NE, 2018). A summary of the consideration or pressures against the relevant attributes is provided in section 10, **Table 10-1**.

3.3 Stage 2 Assessment

29. Where it is required, the Stage 2 assessment considers the socio-economic impact of the plan or project together with the risk of environmental damage. There are two parts to the Stage 2 assessment process:

- Does the public benefit in proceeding with the Projects clearly outweigh the risk of damage to the environment that will be created by proceeding with it? If so,
- Can the Applicant satisfy that they can secure, or undertake arrangements to secure measures of equivalent environmental benefit (MEEB) for the damage the Projects will have on the MCZ features?

3.3.1 Measures of Equivalent Environmental Benefit

30. If Stage 1 identifies a significant risk of hindering the conservation objectives of the MCZs, an assessment of MEEB must also be included in the MCZA.

31. Given only temporary disturbance / habitat loss effects from vessel anchors will occur as a result of the Projects (see section 10 of this report), the Applicants, whilst recognising the Secretary of State's decision letter regarding MEEB and Hornsea Project Three, conclude that in-principle MEEB proposals are not required to be developed for the Projects.

3.4 Cumulative Effects

32. The MCAA does not provide any legislative requirement for explicit consideration of cumulative effects on the protected features of MCZs. However, the MMO guidelines (MMO, 2013) state that the MMO considers that in order to fully discharge its duties under section 69 (1) of the MCAA, cumulative effects must be considered. These duties include having regard to:

- The need to protect the environment,
- The need to protect human health, and
- The need to prevent interference with legitimate uses of the sea.

33. PINS Advice Note Seventeen (PINS, 2019) provides guidance on plans and schemes that should be considered in the Cumulative Effects Assessment (CEA), which include:

- Schemes that are under construction;
- Permitted applications, not yet implemented;
- Submitted applications not yet determined;
- Schemes on the PINS program of projects where a scoping report has been submitted;
- Schemes on the PINS program of projects where a scoping report has not been submitted;
- Development identified in relevant development plans, with weight being given as they move closer to adoption and 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.

34. Only schemes which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment are included in the CEA.

35. Schemes that are sufficiently implemented during the site characterisation for the Projects are considered as part of the baseline. Offshore cumulative effects may come from interactions with the following activities and industries:

- Other offshore wind farms;
- Aggregate extraction and dredging;
- Licensed disposal sites;

- Navigation and shipping;
- Subsea cables and pipelines;
- Potential port / harbour development;
- Oil and gas activities; and
- Fisheries management areas.

36. The assessment presents relevant cumulative effects of schemes based on their stage of development using the tiered approach as devised by NE (Parker *et al.*, 2022) and presented in **Table 3-2**.

Table 3-2 Description of tiers of other developments considered for CEA (Parker et al., 2022)

Tiers	Development Stage
Tier 1	Built and operational schemes should be included within the cumulative assessment where they have not been included within the environmental characterisation survey, i.e. they were not operational when baseline surveys were undertaken, and/or any residual impact may not have yet fed through to and been captured in estimates of "baseline" conditions, such as "background" distribution or mortality rate for birds.*
Tier 2	Tier 1 + schemes under construction.
Tier 3	Tier 2 + schemes that have been consented (but construction has not yet commenced).
Tier 4	Tier 3 + schemes that have an application submitted to the appropriate regulatory body that have not yet been determined.
Tier 5	Tier 4 + schemes that have produced a Preliminary Environmental Impact Report (PEIR) and have characterisation data within the public domain.
Tier 6	Tier 5 + schemes that the regulatory body are expecting an application to be submitted for determination (e.g., schemes listed under the Planning Inspectorate programme of projects).
Tier 7	Tier 6 + schemes that have been identified in relevant strategic plans or programmes.

**Or if there are ongoing impacts that are greater than predicted where there is no evidence that the impacts will dissipate over the lifetime of the Project, e.g., displacement*

37. Schemes classified under Tiers 1 to 4 and Tier 5 that have submitted a PEIR are included in the MCZA. Tier 5 schemes are where a PEIR has not yet been submitted and Tier 6 schemes will be considered where sufficient information is available.

38. For this MCZA, the Projects' activities and associated pressures are reviewed to determine whether they are capable of significantly affecting MCZs when combined with equivalent activities and associated pressures from other plans and projects. The potential for schemes to act cumulatively on MCZs is considered in the context of the likely spatial and temporal extent of pressures.

4 Consultation

39. Consultation of relevance to the MCZA process has been undertaken with SNCBs and other stakeholders through scoping and an ongoing EPP.

4.1 Scoping

40. Consultation has been undertaken with the appropriate authorities and stakeholders as part of the scoping stage of the EIA process. The scoping report was submitted to PINS on 26th July 2022 and a scoping opinion (PINS, 2022) was received on 2nd September 2022. Scoping established the potential impacts of the Projects to be assessed by the ES (and by association the MCZA).

4.2 Evidence Plan

41. The EPP is a non-statutory, voluntary process that aims to encourage upfront agreement on what information an applicant needs to supply to the Planning Inspectorate as part of a DCO application. It aims to ensure EIA, HRA and MCZA requirements are met and to reduce the risk of major infrastructure projects being delayed at (or before) the examination phase of the DCO application process. The EPP includes consultation through a Seabed Expert Topic Group (ETG) which focuses on issues related to baseline environment conditions of benthic and intertidal ecology; and fish and shellfish ecology. The Seabed ETG aims to agree the relevance, appropriateness and sufficiency of baseline data, key issues for the EIA, and the impact assessment approach (including MCZA). Stakeholders represented on the Seabed ETG are:

- Natural England;
- MMO;
- Cefas;
- North Eastern Inshore Fisheries and Conservation Authority (NEIFCA);
- The Wildlife Trusts (TWT); and
- Joint Nature Conservation Committee (JNCC) (via NE).

42. A draft of the MCZA screening report was made available for consultation in conjunction with the Projects Preliminary Environmental Impact Report (PEIR) issued on 5th June 2023. The MCZA screening assessment has been updated based on the comments received (**Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report (application ref: 8.17.1)**).

43. The consultation responses relevant to the MCZA which have been received to date are summarised in **Table 4-1** below.

Table 4-1 Consultation Responses Relevant to the MCZA

Consultee	Date	Comment	Response
Natural England, PEIR Response	17/07/2022	Natural England considers that both the Holderness Inshore MCZA and Dogger Bank RIAA are fundamental documents required to support the Application, plus any discussion and issues resolution prior to Application submission on In principle Compensation Measures and Measures of Equivalent Environmental Benefit. Natural England advises that these documents are provided in order to progress project discussions prior to submission.	The Stage 1 MCZA (section 10) and **Volume 6, Report to Inform Appropriate Assessment** (**RIAA) (application ref: 6.1)** for the Projects have been submitted alongside the ES. The Stage 1 MCZA concludes that the effect of the Projects on the Holderness Inshore MCZ and Holderness Offshore MCZ would not hinder the conservation objectives of the MCZ, and Measures of Equivalent Environmental Benefit would not be required for these sites (section 10.3).
Natural England, PEIR Response	17/07/2022	A WCS of 2,708,148m^2 has been estimated as the maximum lifetime footprint for export cable protection for sub-optimally buried cables. As above. We note that for the impact assessments it will be necessary to know how much of this (if any) could fall within Dogger Bank SAC or Holderness Inshore MCZ. Please also see Point B24.	No permanent infrastructure for the Projects, such as export cable protection, will be located within the Holderness Inshore MCZ. The only direct interaction that could potentially occur with the Holderness Inshore MCZ would be for anchoring events during offshore export cable installation. Cofferdams have been removed from the Projects design envelope following comments received at PEIR and through the EPP. Trenchless crossing (such as HDD) exit pits may still be located within the intertidal zone. The potential presence of construction vessels within the Holderness Inshore MCZ has been considered in section 10.1 of this report.
Natural England, PEIR Response	17/07/2022	Landfall works, including HDD exit pits and cofferdams, could occur in either the intertidal or subtidal zone. It is important that the worst-case scenario for landfall works is assessed with respect to benthic receptors in both the intertidal and subtidal, particularly where works are occurring within the Holderness Inshore MCZ. Consideration needs to be given to the presence and duration of ancillary infrastructure and access requirements for the landfall works.	
Natural England, PEIR Response	17/07/2022	Acknowledging that geophysical survey results have not yet been provided, it is unclear if sufficient data has been collected to characterise the baseline environment within Holderness Inshore MCZ and/or inform mitigation requirements of the landfall works. From the benthic characterisation report, it appears that only one grab sample has been taken within Holderness Inshore MCZ. We advise the results of the geophysical surveys are provided to the ETG as soon as possible, with an explanation as to how this data has been/will be used to inform grab sample and/or drop-down video ground truthing surveys to inform site characterisation.	Results of the geophysical surveys and how they have informed the site characterisation has been shared prior to the ETG meeting in January 2024. It should be noted that as a result of updates to the offshore export cable corridor and removal of a landfall option, the Projects no longer route through the Holderness Inshore MCZ. While indirect impacts from sediment dispersion have been assessed within section 10.2.1.2, there is no longer the potential for direct impacts to occur to the site as a result of the Projects.

Consultee	Date	Comment	Response
Natural England, PEIR Response	17/07/2022	The British Geological Survey have recently released MBES survey data for the Yorkshire coastline out to 10km, which may be of use in the characterisation of the nearshore environment: https://nora.nerc.ac.uk/id/eprint/534206/ A survey of Holderness Inshore MCZ was also completed by Natural England and the Environment Agency in 2018 (Alexander, C., Meaton, N. and Pryor, K. 2019. Holderness Inshore MCZ 2018 Survey Report. Natural England Commissioned Reports, Number 303.). It is unclear if this has currently been used to inform the nearshore baseline.	Noted. The BGS data has been used to inform the nearshore environment within **Volume 7, Chapter 8 Marine Physical Environment (application ref: 7.8)** and within the technical appendices for **Volume 7, Chapter 17 Offshore Archaeology and Cultural Heritage (application ref: 7.17)**. As the cable burial corridor no longer crosses the Holderness Inshore MCZ, the Holderness Inshore MCZ 2018 Survey Report has not been used to inform the nearshore baseline. In addition, there is no analysis of samples within the report which could have been used for comparison with the Offshore Export Cable Corridor.
Natural England, PEIR Response	17/07/2022	Natural England acknowledges the use of site proxies where site specific conservation advice is not available for Holderness Inshore MCZ. However, it may not be appropriate to use proxies for high and moderate energy circalittoral rock. Where possible, we advise that areas of high energy circalittoral rock and moderate energy circalittoral rock should be avoided or would require micro-siting around. The cliffs in this region are made of glacial till and areas of associated clay outcrops of varying height in the subtidal are common, and elevated examples are known as clay huts. We advise that exposed areas of clay are considered to be a component of the circalittoral rock feature and should be treated as such; it is a finite resource and will not recover from cable installation activities. We therefore recommend that clay is avoided where possible, and that rocky reef profile over the cable is reinstated at the time of construction where rock cannot be avoided. Whilst there will likely be a short to medium term impact on the epibenthos and infauna from installation, recovery is more likely if using the same substrate. As per Sheringham and Dudgeon Extension Projects, a Stage 1 MCZ assessment will be required as part of the Applicant's submission.	A Stage 1 MCZA (this report) has been submitted alongside the ES. Noted on the limitations of using proxies for high energy circalittoral rock and moderate energy circalittoral rock in regards their use as proxies for the existing glacial till and clay outcrops, this has been factored into the assessment (section 10).
Natural England, PEIR Response	17/07/2022	Natural England disagrees with the geological feature Spurn Point being screened out of further assessment. Longshore sediment transport through Holderness Inshore MCZ provides an essential source of sediment to Spurn and the Humber Estuary. It will need to be demonstrated that the projects both alone and in combination with other plans and projects will not impact sediment transport to Spurn and the Humber. We advise that Spurn Point is screened in for further assessment, and that Natural England's comments on Hornsea Project Four on the PINs website are considered by the Applicant (e.g. REP7-103, REP5-114).	As a result of updates to the Offshore Export Cable Corridor and removal of a landfall option, the export cable corridors no longer route through the Holderness Inshore MCZ, therefore there is no direct impact on the longshore sediment transport through Holderness Inshore MCZ. There still exists the potential for indirect effects on the MCZ and the Spurn Head geological feature however, due to the potential presence of cable protection measures in the nearshore environment. Therefore, potential indirect effects on the Spurn Head geological feature have been assessed within section 10.2.2.3 of this report.

Consultee	Date	Comment	Response
Marine Management Organisation PEIR Response	17/07/2023	It is indicated in the document that no Advice on Operations is available for the Holderness Inshore MCZ. As such, there exists no information detailing the sensitivities of the designated features of the Holderness Inshore MCZ specifically. Proxies have been used to determine the sensitivity of the sites features and pressures. The MMO is content that at this moment in time this an acceptable approach to managing and identifying the pressures which could be possible faced. As there may be unidentified issues within the proxy information, the MMO recommends trying to identify the sensitivity of the Holderness Inshore MCZ features to potential pressures before works are undertaken.	Following the submission of the MCZA Screening report, Advice on Operations for the Holderness Inshore MCZ were made available, and have been used to inform this assessment.
Marine Management Organisation PEIR Response	17/07/2023	The pressures from the introduction of chemicals have been screened out as best practice mitigation measures for pollution control are to be embedded in the design. This seems appropriate, however the use of chemicals during construction operation and decommissioning should be considered in line with OSPAR OWF guidance. All those chemicals used and discharged including paints and coatings, where there is a pathway to come into contact with the marine environment including those chemicals used in closed systems where there maybe draw down (e.g. not skipped and shipped) be notified and assessed for their fate and potential effect on receptors. The potential discharge of chemicals from construction cleaning maintenance operation and decommissioning like cements dyes rigwash paints and coatings etc. should be included for consideration within the ES.	Noted with thanks, potential impacts of chemical contamination during the operation and maintenance stage of the Projects is assessed in **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)** that accompanies this report.
Marine Management Organisation PEIR Response	17/07/2023	The MCZ screening describes mitigation for hydrocarbons in terms of pollution control e.g., spills however the use of all chemicals and the potential for contact or release in the marine environment from the construction operation maintenance and decommissioning activities should also be considered.	Potential impacts of chemical contamination during the operation and maintenance stage of the Projects have been assessed in **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)** that accompanies this report.
Marine Management Organisation PEIR Response	17/07/2023	MCZ ASR General: The marine physical environment baseline data are still being collected and/or analysed, therefore, the baseline is currently incomplete. These data should be used to make an informed assessment of impacts to MCZs	Project specific modelling results from **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)** have been used in to inform the assessment conducted in this report.

5 Project Description

44. The Projects' MCZA will be based on a Design Envelope approach in accordance with National Policy Statement (NPS) EN-3 (paragraph 3.8.87) (DESNEZ, 2023a) 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 to the Secretary of State. Such aspects may include*:

- the precise location and configuration of turbines and associated development;
- the foundation type and size;
- the installation technique or hammer energy;
- the exact turbine blade tip height and rotor swept area;
- the cable type and precise cable route;
- the exact locations of offshore and / or onshore substations."

45. NPS EN-1 (paragraph 4.2.12) states:

"*Where some details are still to be finalised, the ES should, to the best of the applicant's knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed*) (DESNEZ, 2023b).

46. The Projects' Design Envelope will therefore provide maximum and minimum parameters where appropriate to ensure the worst-case scenario can be quantified and assessed in the MCZA. This approach has been widely used 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*".

47. The following sections provide an overview of the current understanding of the potential infrastructure required for the Projects, including indicative parameters.

5.1 Development Scenarios

48. As set out in **Volume 7, Chapter 1 Introduction (application ref: 7.1)** of the accompanying ES, whilst the Projects are each Nationally Significant Infrastructure Projects (NSIPs) in their own right, a single application for development consent has been made to address both wind farms, and the associated transmission infrastructure. A single planning process and Development Consent Order (DCO) application provides consistency in the approach to the assessment, consultation and examination. While a single DCO application has been made for both Projects, five separate Deemed Marine Licences are included as schedules to the DCO to cover each Array Area, their associated transmission infrastructure and the inter-project cabling required for the Projects. This approach allows for ease of separate ownership of each of the asset should their ownership change over time.

49. The Applicants have developed DBS East and DBS West transmission infrastructure as co-ordinated projects in accordance with the National Grid Electricity System Operator (ESO) evolving Holistic Network Design (HND), as updated in February 2024 (National Grid ESO, 2024). The HND has confirmed the Projects will have a radial connection to the proposed National Grid Substation at Birkhill Wood.

50. Whilst the Projects are the subject of a single DCO application (with a combined ES and associated submissions), each Project is assessed individually, so that mitigation is Project specific (where appropriate). As such, the assessments cover the following three Development Scenarios:

- DBS East or DBS West are developed In Isolation (the In isolation Scenario);
- Both DBS East and DBS West are developed Concurrently (the Concurrent Scenario), or
- Both DBS East and DBS West are developed Sequentially (the Sequential Scenario).

51. In summary, the following principles set out the framework for how the Projects may be developed, as detailed in **Table 5-1**:

- DBS West and DBS East may be constructed at the same time, or at different times;
- If built In Isolation, either Project could be constructed in five years;
- If built Concurrent, both Projects could be constructed in five years;
- If built Sequentially, construction on either Project could commence first, but with staggered / overlapping construction; or

- If built sequentially, construction of the first Project would be completed within 5 years, with construction of the second Project being completed within 7 years.

52. Therefore, the maximum construction period over which the construction of both Projects could take place is seven years.

Table 5-1 Development Scenarios and Construction Durations

Development scenario	Description	Total Maximum Construction Duration (Years)	Maximum Construction Duration Offshore (Years)	Maximum Construction Duration Onshore (Years)
In Isolation	Either DBS East or DBS West is built In Isolation	Five	Five	Four
Sequential	DBS East and DBS West are both built sequentially, either Project could commence construction first with staggered / overlapping construction	Seven	A five year period of construction for each project with a lag of up to two years in the start of construction of the second project (excluding landfall duct installation) – reflecting the maximum duration of effects of seven years.	Construction works (i.e. onshore cable civil works, including duct installation) to be completed for both Projects simultaneously in the first four years, with additional works at the landfall, substation zone and cable joint bays in the following two years. Maximum duration of effects of six years.

Development scenario	Description	Total Maximum Construction Duration (Years)	Maximum Construction Duration Offshore (Years)	Maximum Construction Duration Onshore (Years)
Concurrent	DBS East and DBS West are both built concurrently reflecting the maximum peak effects	Five	Five	Four

5.1.1 Offshore Scheme Summary

53. The key offshore components that comprise the Projects include:

- Wind turbines;
- Offshore platforms, including offshore Collector Platforms (CPs) and / or converter platforms (OCPs), an Electrical Switching Platform (ESP) and / or an Accommodation Platform (hereafter collectively referred to as offshore platforms unless specified);
- Foundation structures for wind turbines and offshore platforms;
- Array cables;
- Inter-platform Cables;
- Offshore Export Cables from the Array Areas to the landfall; and
- Scour / cable protection (where required).

54. With regards to the assessment detailed in this report, only installation of the Projects Offshore Export Cables may result in an effect on the MCZs (see section 10 for further details).

5.1.2 Offshore Export Cables

55. Depending on the design scenario chosen, there would be up to four single core high voltage direct current (HVDC) Offshore Export Cables. Fibre optic cables would be bound externally to one of the export cables belonging to each project. The power cable voltage would be up to 525 kilovolt (kV) with an indicative external cable diameter of 155 millimetres (mm).

56. The total length of the export cables depends on the Development Scenario in question (**Table 5-2**). The maximum Offshore Export Cable length would be up to 682km (188km for DBS East and 153km for DBS West per cable, with two power cables required per project, or four power cables in total).

57. For DBS East In Isolation, the maximum length per Offshore Export Cable is 188km, giving a total of 376km as two cables are required.

58. For DBS West In Isolation, the maximum length per Offshore Export Cable is 153km giving a total of 306km as two cables are required.

59. The Offshore Export Cables make landfall near Skipsea, where they would be connected to the onshore cables in Transition Joint Bays (TJBs), having been installed by trenchless techniques (e.g. Horizontal Directional Drill (HDD).

60. Each offshore export cable would be installed in a separate trench with an indicative spacing of 50m between the cables, where two export cables are installed in parallel. For the purpose of the DCO application and environmental assessment, an Offshore Export Cable Corridor has been defined in order to encompass all required cables and the adjacent area of seabed that may be subject for temporary works, such as anchoring, lay-down or the use of jack-up vessels.

61. The Offshore Export Cable Corridor is 1km wide, but funnels out to up to approximately 3km on approach to the landfall and the crossing of the existing Langled pipeline, and approximately 15km on the approach to the DBS West Array Area. The greater width of the corridor at these locations is designed to provide greater flexibility in the detailed routeing of the export cables at the pre-construction stage. The corridor provides space for the installation works and any foreseeable operation and maintenance activities such as cable reburial or repairs.

62. The construction buffer zone measures 500m either side of the Offshore Export Cable Corridor, and provides room for temporary works such as anchoring, jacking up, placement of buoyage and relocation of fishing gear. No permanent infrastructure would be installed within the construction buffer zone. As the burial route for the Projects has not yet been finalised, the construction buffer zone is retained in locations even where the Offshore Export Cable Corridor widens to over 1km to accommodate the necessary construction room in the event any Offshore Export Cables are buried near the perimeter of the Offshore Export Cable Corridor boundary.

63. Due to the length of the Offshore Export Cable Corridor, and the limitations upon cable carousel size / weight on the installation vessel, it is very likely that the export cables would be installed in sections with pre-planned cable joints along the Offshore Export Cable Corridor. At the pre-planned cable jointing locations, the two ends of the cables are laid on the seabed with sufficient slack to allow them to be lifted onto a suitable vessel. The cable jointing is then completed onboard the vessel before the cable is lowered back down to the seabed. The cable is then buried, if possible, or protected using cable protection measures (see **Volume 7, Chapter 5 Project Description (application ref: 7.5)** for further information). A similar procedure is deployed for cable repairs.

Table 5-2 Offshore Export Cable Parameters

Parameter	DBS East	DBS West	Both Projects
Maximum length of export cable measured from OCPs to landfall (all cables) (km)	376	306	682
Offshore Export Cable Corridor width (km)	Approximately 1km plus a 0.5km temporary construction area buffer on both sides, but widening and varying at a small number of locations		
Offshore Export Cable Corridor width at landfall (approximate) (km)	3		
Maximum number of export power cables	2	2	4
Maximum number of trenches	2*	2*	4*
Typical spacing between cables in trenches (m)	50		
Maximum Offshore Export Cable Corridor temporary disturbance width during installation (per cable) (m)	20		
Export cable operating voltage (kV)	Up to +/-525		

**Trenches would split into three and six trenches on approach to landfall due to the co-located fibre-optic communications cable splitting from the Offshore Export Cables prior to making landfall.*

5.1.3 Cable Installation Methods

5.1.3.1 Pre-lay activities

5.1.3.1.1 Boulder Clearance

64. Boulders that present an obstacle to the construction activities would be confirmed by the pre-construction surveys. In the instance that a boulder cannot be avoided, it would be relocated to an adjacent area of seabed within the Offshore Development Area where they do not present an obstacle to the works, and where possible to an area of seabed with similar sediment type and avoiding any known sensitive habitats. If required, boulder clearance would be undertaken by sub-sea grab or plough.

5.1.3.2.1 Removal of Existing Out of Service Cables

65. Where the cable routes cross out-of-service cables, depending on the length of cable and burial depth, these would either be recovered from the seabed by grapple hook or similar method prior to the start of installation or cut at an appropriate distance either side of the cable and the free ends secured to the seabed by clump weights. The agreement of the relevant asset owner would be sought prior to taking such action.

5.1.3.3.1 Pre-Lay Grapnel

66. Before cable-laying operations commence, it must be ensured that the route is free from obstructions such as discarded fishing gear, anchors or abandoned cables, wires and ropes that may be identified as part of the pre-construction surveys. A survey vessel would be used to undertake a pre-lay grapnel run (PLGR) to clear such identified debris.

67. The width of seabed disturbance along the PLGR is estimated to be up to 6m, which would be encompassed within the maximum 20m footprint of cable installation works.

5.1.3.4.1 Sandwave levelling

68. Areas of mobile seabed (typically either in sandwaves or megaripples) may present a risk to the cable burial process either by preventing the cable burial tools from operating efficiently or by resulting in exposure and scouring of the cable once installed. In some cases, this could result over time in the cable being left 'free-spanning' over the seabed. Free spanning cables present a risk to other marine users and result in a large amount of strain being placed on the cables, significantly increasing the chance of their failure and the subsequent need for repair works.

69. In order to prevent this, cables can be placed where possible in the troughs of sandwaves to the reference seabed level, which would minimise the potential for cables becoming exposed. However, where this is not possible, the alternative is to dredge the top of the sandwaves prior to installation down to the seabed reference level. This process is termed sandwave levelling. If this was required, it would be completed before the cable is laid on the seabed.

5.1.3.2 Cable Burial

70. The purpose of cable burial is to ensure that the cables are protected from damage, either from other activities such as fishing and shipping, or from naturally occurring physical processes acting on the seabed.

71. Burial of the cables would be through any combination of ploughing, jetting, or mechanical cutting. The dimensions of the cable trenches and the overall seabed footprint affected by the burial process would depend on the installation method. The installation method and target burial depth will be confirmed post consent based on a cable burial risk assessment considering ground conditions as well as the potential for impacts upon cables such as from trawling and vessel anchors. For the purposes of the ES, a target burial depth of between 0.5m and 1.5m (relative to the non-mobile seafloor level) has been assumed for all cable burial activities. Information on the potential burial techniques is provided below.

5.1.3.1.2 Ploughing

72. A plough uses a forward blade to cut through the seabed, while burying the cable behind it. Ploughs can be used as a pre-trench tool (i.e. the cables are laid into a trench for later backfilling), a post-lay burial tool (i.e. the cable is first laid in position on the seabed before being ploughed in) or, more commonly, as a simultaneous lay and burial tool. Ploughing tools can be pulled directly by a surface vessel or can be mounted onto self-propelled caterpillar tracked vehicles which run along the seabed taking power from a surface vessel. The plough inserts the cable into the seabed as it moves. The indicative width of disturbance from ploughing is 15m.

73. There are two types of plough: displacement and non-displacement. The difference is important in terms of understanding the effect on the seabed. Displacement ploughs are typically used to pre-cut a trench in hard ground conditions, creating a trench that remains open for subsequent cable installation. A second backfilling pass of the plough is then undertaken to bury the cable.

74. By contrast, a non-displacement plough is designed to trench and bury the cable in a single pass, consequently causing less disturbance on the seabed as part of either a simultaneous or post lay and burial process. The plough may be fitted with additional equipment to help improve performance in certain soils, for example water jets for burying in sand.

5.1.3.2.2 Jetting

75. Jetting uses high powered jets of water to fluidise the seabed sediments and lower the cable to the required depth. Jetting may be undertaken either as a separate operation on a cable that has been pre-laid on the seabed, or by simultaneously laying and jetting. As with a plough, the jetting tool can either be pulled directly by a surface vessel or mounted onto self-propelled caterpillar tracked vehicles. The indicative width of disturbance from jetting is 18m.

5.1.3.3.2 Mechanical Cutting

76. This method involves the excavation of a trench (either by pre-trenching or simultaneously with cable laying), with the excavated material placed alongside. The cable is then laid in the trench and the sediment returned to the trench to complete the burial of the cable, either mechanically or by natural processes. The indicative trench width from mechanical cutting is 18m. An example mechanical cutting tool that could be used is the Global Marine Q1400 Trenching System (Global Marine, 2019).

5.1.3.4.2 Trench Sizes

77. The maximum temporary disturbance width for export, inter-platform and array cable installation would be up to 20m, encompassing the pre-grapnel run and trenching works. The respective indicative trench widths are as follows:

- Pre-lay ploughing 6m;
- Post-lay ploughing 0.5m;
- Jet trenching 1m; and
- Mechanical trenching 0.6m.

5.1.4 Landfall Works

5.1.4.1 Trenchless Landfall Exits

78. The exit pit would be prepared by excavating an area before or during the trenchless landfall installation, to capture the arisings, drilling fluid and the boring device when it punches out of the ground

79. Exit pits for landfall would be located either within the intertidal or subtidal zone depending on whether a long landfall (dredged) or short trenchless landfall (excavated/dredged) is pursued. There would be up to a maximum of 6 exit pits. The size of the excavation pits is mainly determined by the control accuracy of the borehole (width), the exit angle of the borehole (length), the water level at high water (height) and the subsequent minimum cover of the cable (depth). Maximum dimensions of 20m x 10m x 3m (length x width x depth) are assumed for each exit pit as identified in **Table 5-3**, which shows the main construction parameters for the intertidal zone which would be required for a short trenchless crossing exit.

80. It is currently anticipated that two floating units and/or a Jack-up barge(s) would be required to support landfall exits in the intertidal or subtidal. On a working pontoon or jack-up barge, a sufficiently large crawler crane would be installed for all lifting work. In addition, the recreation / sanitary containers would be set up here and storage areas would be provided. The working pontoon would have an area of approximately 12 x 50m. The crawler crane would be able to move longitudinally on the pontoon to further increase the reach. In addition to the working pontoon, a transport / storage pontoon with dimensions of approximately 12 x 20m may be required, on which additional material (sheet piles / drill rods) could be stored. Furthermore, the unit can also be used for transport.

81. For transportation, the pontoon units would be moved with the help of one to two tugboats. The site personnel would be transported to and from the site daily by a small crew transfer vessel.

Table 5-3 Intertidal Construction Onshore Maximum Parameters

Landfall	DBS East and DBS West In Isolation	DBS East or DBS West Concurrently	DBS East or DBS West Sequentially
Number of support vessels (approximate)	2	2	2
Number of pontoons	1	1	1
Number of exit pits	3	6	6
Indicative duration of landfall works	18	18	48
No. of Exit pits	3	6	6
Dimensions of each exit pits (length x width x depth) (m)	20 x 10 x 3	20 x 10 x 3	20 x 10 x 3

5.1.4.1.1 Long Trenchless Landfall- Subtidal Zone

82. The subtidal zone extends beyond MLWS, with the exit point determined considering the limitations of the trenchless methodology in the ground conditions and the draught requirements of the duct and cable installation vessels.

83. Works for the long trenchless landfall (with exit pits within the subtidal zone) include:

- Dredging of exit pits within the subtidal zone;
- Punch out of the bore installed from the TJB;
- Assembly of duct whilst being pulled through the bore to the landfall (may occur in the opposite direction); and
- Capping and burial of duct end prior to cable installation.

84. The ducts would be capped and buried until the cable installation... Once the cables are ready to be pulled through, the ducts would be re-exposed to pull in the cable. Once installation is complete the exit pits would be backfilled using available side-cast material and the remainder left to naturally backfill.

85. In a Sequential Scenario, the first Project would install the ducts for the second Project at the same time to ensure environmental impacts and disruption are minimised.

5.1.4.2.1 Short Trenchless Landfall – Intertidal Zone

86. The intertidal zone (between MHWS and MLWS) of the Projects is separated from the rest of the Landfall Zone by a series of beach cliffs. There is no direct access between the intertidal zone / beach and the TJB Compound within the Landfall Zone.

87. For an intertidal exit there would be a minimum 50m set back distance from the beach cliffs to the exit pits. This is to ensure the stability of the beach cliffs.

88. Intertidal works for the short trenchless landfall (with exit pits within the intertidal zone) include:

- Excavation of exit pits within the intertidal zone;
- Punch out of the bore installed from the TJB;
- Assembly of duct whilst being pulled through the bore to the landfall (may occur in the opposite direction).
- Laying of additional lengths of ducting in trenches (if required) from exit pits to a depth suitable for offshore cable installation using vessel or a plough, this may extend beyond MLWS (Offshore cable installation methods beyond MLWS, that may take place in the subtidal are described further in section 5.1.3).

89. The short trenchless exit pits would be excavated using low draught vessel based dredging or excavation plant undertaking low tide work accessed by landing craft to produce a suitable excavation.

5.1.4.3.1 Intertidal to Subtidal Trenching Works

90. Trenching may be required to install duct extensions or the Offshore Export Cables directly from the trenchless exit pits. Duct extensions could enable the landfall ducts to be extended further offshore from the exit pits to below LAT to facilitate cable installation from an installation vessel or plough situated offshore. This would take place in the intertidal or subtidal, depending on the installation technique selected, as described above.

91. These duct extensions would be of a similar diameter to the trenchless landfall ducts. They would be installed in their own trench, buried at a similar depth to the export cables. The duct extension trenches would be backfilled by excavators suitable for intertidal works before the arrival of the cable installation vessel.

92. A 20m corridor of disturbance for each individual export cable and communication cable, up to a maximum of 6, is assumed. A multicat vessel or jack-up barge would typically be used for various intertidal and subtidal construction activities, such as excavation and dive support. A shallow draught barge may be located at the exit point for a period of approximately 10 to 14 days while each trenchless landfall is completed, and each duct is installed.

5.2 Offshore Construction Programme

93. The earliest any construction works would start is assumed to be 2026. If built sequentially, construction of the first Project would be completed within five years, with construction of the second Project being completed within seven years. Therefore, the maximum construction period over which the construction of both Projects could take place is seven years, as described in section 5.1.1.

94. It should be noted that the construction programme is dependent on numerous factors including consent timeframes and funding mechanisms. The final design of the Projects (including for example the number and type of turbines, Onshore Converter Stations, offshore platforms, cables, etc.) would also affect the construction programme, as well as weather conditions once construction starts. As such, details of the construction programme are indicative at this stage in order to provide a reasonable and realistic basis for undertaking the environmental assessments. Offshore (seaward of mean low water) working hours during construction are assumed to be twenty-four hours a day and seven days a week.

5.3 Worst-Case Scenario

95. The final design of the Projects will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise.

96. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Volume 7**, **Chapter 6 EIA Methodology (application ref: 7.6)** of the ES.

97. The realistic worst-case scenarios for seabed disturbance and habitat loss, used for the MCZ Stage 1 assessment are summarised in **Table 5-4**. These are based on the project parameters described in **Volume 7**, **Chapter 5: Project Description (application ref: 7.5)** of the ES which provides further details regarding specific activities and their durations.

Table 5-4 Realistic Worst-Case Design Parameters

	Parameter			
	DBS East In-isolation	**DBS West In-isolation**	**DBS West and DBS East Concurrent or Sequential**	**Notes and rationale**
Construction In the instance of **sequential** development of the two Projects, up to a **two-year lag** between construction activities is possible, final overall area would be **identical** to the **concurrent** design scenario.				
Temporary physical disturbance (including sediment deposition and smothering)	**Offshore Export Cable Corridor** **Total temporary area disturbed for export cable installation (trenching, sandwave levelling, anchoring and foundation installation) – 19,885,242m²** Total offshore cable length per cable – 188km Maximum number of cables required – Two Max. offshore cable length for all cables – 376km *Note – Assumes a worst-case of a separate cable trench for each cable, spaced 50m apart.* Maximum temporary disturbance area for cable installation – 7,510,800m² (based on 376,000m distance x 20m width of temporary disturbance) Maximum seabed area disturbed by sandwave levelling – 12,282,010m² Maximum total area impacted by anchoring – 22,061m² *Note - 10km stretch along the Offshore Export Cable Corridor <10m Lowest Astronomical Tide (LAT), may require use of anchoring.* Foundation disturbance area for up to one ESP within the Offshore Export Cable Corridor (Gravity Based Structure (GBS) foundations) – 64,871m²	**Offshore Export Cable Corridor** **Total temporary area disturbed for export cable installation (trenching, sandwave levelling, anchoring and foundation installation) – 17,046,667m²** Total offshore cable length per cable – 153km Maximum number of cables required – Two Max. offshore cable length for all cables – 306km *Note – Assumes a worst-case of a separate cable trench for each cable, spaced 50m apart.* Maximum temporary disturbance area for cable installation – 6,120,400m² (based on 306,000m distance x 20m width of temporary disturbance) Maximum seabed area disturbed by sandwave levelling – 10,833,835m² Maximum total area impacted by anchoring – 22,061m² *Note - 10km stretch along the Offshore Export Cable Corridor <10m LAT, may require use of anchoring.* Foundation disturbance area for up to one ESP within the Offshore Export Cable Corridor (GBS foundations) – 64,871m² Vessel jack-up area for all platforms in Offshore Export Cable Corridor (1,100m²	**Offshore Export Cable Corridor** **Total temporary area disturbed for export cable installation (trenching, sandwave levelling, anchoring and foundation installation) – 36,861,507m²** Total offshore cable length per cable – 188km for DBS East, 153km for DBS West. Maximum number of cables required – Four Max. offshore cable length for all cables – 682km *Note – Assumes a worst-case of a separate cable trench for each cable, spaced 50m apart.* Maximum temporary disturbance area for cable installation – 13,631,200m² (based on 682,000m distance x 20m width of temporary disturbance) Maximum seabed area disturbed by sandwave levelling – 23,115,845m² Maximum total area impacted by anchoring – 44,091m² *Note – 10km stretch along the Offshore Export Cable Corridor <10m LAT, may require use of anchoring.* Foundation disturbance area for up to one ESP within the Offshore Export Cable Corridor (GBS foundations) – 64,871m² Vessel jack-up footprint for all platforms in Offshore Export Cable Corridor (1,100m²	Maximum export cable length assumes worst case that cable circuits are laid and buried in separate trenches rather than bundled. Sandwaves were divided into three categories: small bedforms (maximum height <0.4 m); medium bedforms (maximum height <0.4 m to 0.75 m); and large or very large bedforms (maximum height 5 m), as per the Ashley (1990) bedform classification. The total sandwave levelling volumes were calculated by estimating the profile area of a trenched sandwave (separately for small, medium and large or very large) and multiplying this figure by the estimated worst-case length of each export cable route where bedforms of each classification may be encountered. The separate figures for small, medium and large or very large bedforms were then added together and multiplied by the maximum number of offshore export cables for that particular scenario to

	Parameter			
	DBS East In-isolation	**DBS West In-isolation**	**DBS West and DBS East Concurrent or Sequential**	**Notes and rationale**
	Vessel jack-up area for all platforms in Offshore Export Cable Corridor (1,100m² combined leg area x five operations per platform x one offshore platform) – 5,500m²	combined leg area x five operations per platform x one offshore platform) – 5,500m²	combined leg area x five operations per platform x one offshore platform) – 5,500m²	give the final estimated volume of sediment disturbed by sandwave levelling activities.
	Landfall **Total volume of sediment disturbed by exit pits – 1,800m³** No. of exit pits – 3 Size of each exit pit – 20m length x 10m width x 3m depth Volume of displaced sediment per exit pit – 600m³ **Total volume of sediment disturbed by trenching in the intertidal - 990m³** Maximum temporary disturbance area for cable installation (based on 110m distance x 6m width) – 660m² Depth of cable – 1.5m	**Landfall** **Total volume of sediment disturbed by exit pits - 1,800m³** No. of exit pits – 3 Size of each exit pit – 20m length x 10m width x 3m depth Volume of displaced sediment per exit pit – 600m³ **Total volume of sediment disturbed by trenching in the intertidal - 990m³** Maximum temporary disturbance area for cable installation (based on 110m distance x 6m width) – 660m² Depth of cable – 1.5m	**Landfall** **Total volume of sediment disturbed by exit pits – 3,600m³** No. of exit pits – 6 Size of each exit pit – 20m length x 10m width x 3m depth Volume of displaced sediment per exit pit – 600m³ **Total volume of sediment disturbed by trenching in the intertidal - 990m³** Maximum temporary disturbance area for cable installation (based on 110m distance x 6m width) – 660m² Depth of cable – 1.5m	Technique for trenchless cable installation is not yet decided, however Horizontal Directional Drilling (HDD) is preferred. Number of exit pits assumes ducts for two power cables, one communications cable for each Project In Isolation. Exit pits may be located within the intertidal area or subtidal. Length of trench assumes 160m based on the distance between MHWS and MLWS minus mitigation to place exit pits at least 50m from the toe of the cliff.
Increased suspended sediment concentrations	Total Displaced sediment during sandwave levelling (Array Cables, Inter-Platform Cables and Export Cables) - 33,567,300m³ Maximum volume of displaced sediment during cable trenching – 6,369,000m³ Maximum volume of drill arisings – 37,197m³	Total Displaced sediment during sandwave levelling (Array Area, Inter-Platform Cables and Offshore Export Cables) - 29,762,372m³ Maximum volume of displaced sediment during cable trenching – 5,865,000m³ Maximum volume of drill arisings – 37,197m³	Total Displaced sediment during sandwave levelling (Array Cables, Inter-Platform Cables and Export Cables) – 63,428,644m³ Maximum volume of displaced sediment during cable trenching – 13,116,000m³ Maximum volume of drill arisings – 73,790m³	N/A
Temporary habitat loss	Indicative maximum footprint of a single anchoring event – 485m²	Indicative maximum footprint of a single anchoring event – 485m²	Indicative maximum footprint of a single anchoring event – 485m²	N/A

	Parameter			
	DBS East In-isolation	**DBS West In-isolation**	**DBS West and DBS East Concurrent or Sequential**	**Notes and rationale**
Introduction of invasive/non-native species	Maximum peak number of export cable vessels – 6 Maximum peak number of landfall installation vessels - 1	Maximum peak number of export cable vessels – 6 Maximum peak number of landfall installation vessels - 1	Maximum peak number of export cable vessels – 12 Maximum peak number of landfall installation vessels - 1	N/A
Operation				
Temporary physical disturbance (including sediment deposition and smothering)	Export cable repairs - seabed disturbance over Projects lifetime – 42,000m² (Seven events x 6,000m² per event)	Export cable repairs - seabed disturbance over Projects lifetime – 30,000m² (Five events x 6,000m² per event)	Export cable repairs - seabed disturbance over Projects lifetime – 72,000m² (12 events x 6,000m² per event)	N/A
Temporary habitat loss	**Estimated total operational anchoring footprint over lifetime of the Project – 3,395m²** Estimated number of export cable repairs over lifetime of the Project - 7 Indicative maximum footprint of a single anchoring event – 485m²	**Estimated total operational anchoring footprint over lifetime of the Project – 2,425m²** Estimated number of export cable repairs over lifetime of the Project - 5 Indicative maximum footprint of a single anchoring event – 485m²	**Estimated total operational anchoring footprint over lifetime of the Projects – 5,820m²** Estimated number of export cable repairs over lifetime of the Project - 12 Indicative maximum footprint of a single anchoring event – 485m²	N/A
Introduction of invasive/non-native species	Annual round trips of cable maintenance vessels - 1	Annual round trips of cable maintenance vessels - 1	Annual round trips of cable maintenance vessels - 1	N/A
Landfall	All cables will be buried below landfall, assumed no maintenance activities required during the operational stage. As such no operational impacts predicted to occur at landfall.			
Decommissioning				
No final decision regarding the final decommissioning policy for the offshore project infrastructure including landfall, has yet been made. It is also recognised that legislation and industry best practice change over time. It is likely that offshore project infrastructure will be removed above the seabed and reused or recycled where practicable. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the worst case scenario, the impacts will be no greater than those identified for the construction phase. A decommissioning plan for the offshore works would be submitted prior to any decommissioning commencing.				

5.4 Embedded Mitigation

98. This section outlines the embedded mitigation relevant to the benthic and intertidal ecology assessment, which has been incorporated into the design of the Projects or constitutes standard mitigation measures for this topic (**Table 5-5**). Where other mitigation measures are proposed, these are detailed in the Stage 1 Assessment (section 10).

Table 5-5 Embedded Mitigation Measures

Parameter	Embedded Mitigation Measures	Where commitment is secured
Offshore Export Cable Corridor	The offshore cable corridor was selected in consultation with key stakeholders to select route options which minimised impacts on designated sites, such as minimising its length within the Dogger Bank Special Area of Conservation (SAC), avoiding permanent overlaps with the Holderness Inshore Marine Conservation Zone (MCZ) and the Annex I Smithic Bank sandbank, as well as avoiding overlaps with the Flamborough Head SAC and Holderness Offshore MCZ. See **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)**.	DCO Schedule 1
Minimise use of scour and external cable protection	Following industry best-practice the Applicants will seek to minimise the use of scour protection and external cable protection for any stretches of unburied cables and cable crossings. This is presented in two Cable Burial Risk Assessments and secured in Cable Protection Plans, produced in line with the detail outlined in **Volume 8, Cable Statement (application ref: 8.20)** that has been submitted with the DCO application, and which will be updated in accordance with conditions attached to the Deemed Marine Licences (DMLs) in **Volume 3, Draft Development Consent Order (application ref: 3.1)**. In addition, the Applicants will seek to minimise the use of foundation scour protection. This is presented in **Volume 8, Outline Scour Protection Plan (application ref: 8.27)** that has been submitted with the DCO application, and which will be updated in accordance with conditions attached to the DMLs in **Volume 3,**	Scour Protection Plan Cable Statement DML 1 & 2 - Condition 15 DML 3 & 4 - Condition 13 DML 5 - Condition 11

Parameter	Embedded Mitigation Measures	Where commitment is secured
	Draft Development Consent Order (application ref: 3.1).	
Cable Burial Risk Assessment (CBRA)	Final Cable Burial Risk Assessments and Cable Protection Plans will be produced in line with the detail provided in **Volume 8, Cable Statement (application ref: 8.20)** that has been submitted with the DCO application, and in accordance with conditions attached to the DMLs in **Volume 3, Draft DCO (application ref: 3.1).** This will aid in determining where shallow areas of glacial till may be located within the Offshore Development Area. If required, the use of micro-siting to avoid any such features will be discussed and agreed with the MMO in consultation with Natural England post-consent.	DML 1 & 2 - Condition 15 DML 3 & 4 - Condition 13 DML 5 - Condition 11
Invasive Non-Native Species (INNS)	The risk of spreading INNS will be reduced by employing biosecurity measures in accordance with the following requirements: • International Convention for the Prevention of Pollution from Ships (MARPOL); • The Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2022); and • The Environmental Damage (Prevention and Remediation (England) Regulations 2015.	Pollution Environmental Management Plan (PEMP) Marine Pollution Contingency Plan (MPCP) DML 1 & 2 - Condition 15 DML 3 & 4 - Condition 13 DML 5 - Condition 11
Pollution Prevention Measures	Due to the presence and movements of construction and operation and maintenance vessels/equipment there is the potential for spills and leaks which could result in changes to water quality. All vessels involved will be required to comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78.	PEMP MPCP DML 1 & 2 - Condition 15 DML 3 & 4 - Condition 13

Parameter	Embedded Mitigation Measures	Where commitment is secured
	The production of one or more Project Environmental Management Plans (PEMPs) is a Condition of the five Deemed Marine Licences (DMLs). The final PEMP(s) would be in accordance with **Volume 8 Outline Project Environmental Management Plan (application ref: 8.21)** and would detail all procedures and measures (in the form of a Marine Pollution Contingency Plan (MPCP)) to be followed during the different phases of the Projects to minimise the risk of, and effects in, the event of an accidental spill. The final PEMP will identify all potential sources and types of accidental pollution for the relevant project phase and set out the proposed mitigation measures and will be developed in consultation with key stakeholders for approval by the MMO.The individual Projects and phases may require separate final PEMP(s). In addition separate PEMPs may also be produced for individual packages.	DML 5 - Condition 11
Trenchless Landfall	A trenchless technique will be used to install the export cables at the landfall for the Projects Any trenchless landfall exit pits located between MHWS and MLWS will be located a minimum of 50m seaward from the toe of the cliff line. If sediment begins to accumulate in the pits, it will be excavated and returned to the beach where it can be transported alongshore to the south, as per the prevailing sediment transport regime.	DML 3 & 4 - Condition 13
Pre-construction surveys and micro-siting	As secured through the DMLs in **Volume 3, Draft Development Consent Order (application ref: 3.1)**), pre-construction surveys will be undertaken to determine the presence of potential Annex I / UK BAP Priority Habitats within the proposed wind turbine locations or the Offshore Export Cable Corridor. The pre-construction survey methodology would be agreed with the MMO in consultation with Natural England. The survey design would be based on best practice at the time and is anticipated to consist of a mixture of geophysical, drop-down video (DDV) and grab surveys (as applicable) to	DML 1 & 2 - Condition 15 DML 3 & 4 - Condition 13 DML 5 - Condition 11

Parameter	Embedded Mitigation Measures	Where commitment is secured
	ensure a comprehensive ground-truthing of the proposed final wind turbine locations and cable route design. Initial geophysical surveys will be reviewed with DDV ground truthing surveys to confirm presence as appropriate. This shall then be used to inform detailed layout design in the design plan and will inform the mitigation scheme requirements. If potentially sensitive benthic features are identified, the results of the survey will be discussed at that time with the MMO and Natural England to agree whether the features constitute Annex I / UK BAP Priority Habitat features and whether they are required to be avoided through micro-siting. No benthic sampling is proposed for the section of the Offshore Export Cable Corridor that lies outside the Dogger Bank SAC.	
Jack Up Vessels	Jack-up vessels will not be used within the area of the 1km Construction Buffer Zone which overlaps with the Holderness Inshore MCZ or the Smithic Bank sandbank without agreement of MMO in consultation with Natural England.	DML 3 & 4 - Condition 13

6 Screening Summary

99. The Projects MCZ Screening process has been undertaken in consultation with relevant stakeholders through the following Seabed ETGs:

- Seabed ETG 2 meeting (7 February 2023); and
- Seabed ETG 3 meeting (21 September 2023).

100. A draft of the MCZA Screening Report (**Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report Screening Report (application ref: 8.17.1)**) was made available for consultation in conjunction with the Projects PEIR issued on 5th June 2023. The Screening Report, is a 'point in time' document and is submitted for reference purposes only.

101. Both MCZs (Holderness Offshore and Holderness Inshore) are screened in for further assessment because the Projects' Offshore Export Cable Corridor routes in close proximity to the sites (Holderness Offshore MCZ (**Figure 8-1**) and Holderness Inshore MCZ (**Figure 9-1**)). No other MCZs are screened in, primarily on account of their distance from the Projects and the range of potential effects.

102. The MCZA screening assessment proposed that the MCZs protected features listed in **Table 6-1** are to be screened into the Stage 1 Assessment subject to the results of the site benthic characterisation surveys. Further information on the results of the characterisation surveys are provided in section 7.

103. **Table 6-1** below identifies all of the pressures (derived from NE's AoO) associated with the Projects that have been screened into the Stage 1 Assessment, aligned with the relevant effects identified during EIA scoping.

104. It should be noted that following the submission of the MCZA Screening Report and PEIR and the feedback received from stakeholders from these submissions, the Projects' Offshore Export Cable Corridor was amended so that only the Construction Buffer Zone overlaps with the Holderness Inshore MCZ, with the permanent burial corridor being located approximately 300m north of the MCZ boundary (see **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)** for further information).

Table 6-1 Summary of Pressures Screened in, and Relationships to Impacts Identified through EIA Scoping

Potential Pressure (Scoping)	Pressure Name (AoO)	Holderness Offshore MCZ				Holderness Inshore MCZ			
		Construction	Operation	Decommissioning	Cumulative	Construction	Operation	Decommissioning	Cumulative
Temporary physical disturbance / temporary habitat loss	Abrasion / disturbance of the substrate on the surface of the seabed	x	x	x	x	✓	✓	✓	x
Increased suspended sediment concentrations (SSC)	Changes in suspended solids (water clarity)	✓	✓	✓	✓	✓	✓	✓	✓
	Smothering and siltation rate changes (heavy)	✓	✓	x	x	✓	✓	x	x
	Smothering and siltation rate changes (light)	✓	✓	✓	✓	✓	✓	✓	✓
Changes to bedload sediment transport	Water flow (tidal current) changes, including sediment transport considerations	x	x	x	x	x	✓	x	x
Invasive species	Introduction or spread of invasive non-native species (INNS)	✓	✓	✓	✓	✓	✓	✓	✓

7 Site Specific Surveys

105. In order to provide site specific and up to date information on which to base the impact assessment and MCZA, surveys were conducted in 2022 to characterise the seabed in the Projects' Offshore Development Area, including in the Offshore Export Cable Corridor (and associated Construction Buffer Zone). At the time of the survey, a section of Offshore Export Cable Corridor routed through the Holderness Inshore MCZ in the nearshore environment.

106. **Table 7-1** below provides details of each survey conducted. The method statements outlining the methodology to be followed for each survey were shared with external stakeholders prior to the surveys being undertaken to ensure they were fit for purpose. Comments resulting from these consultations were taken into account prior to the surveys being undertaken. The relevant guidelines to each research area were referenced and followed in each method statement, with the methods for the surveys below being detailed in the relevant appendices to this chapter.

107. The benthic characterisation and habitat mapping are described in further detail in sections 7.1 to 7.3.

Table 7-1 Site-Specific Data

Data set	Survey Date	Survey Techniques
Geophysical surveys	March – October 2022	Multibeam echosounder, side-scan sonar, sub-bottom profiler, magnetometer.
Benthic survey	6 – 19th August 2022	Drop-down video, grab sampling (including one macrofaunal sample and one particle size distribution (PSD) sample at each station), sediment chemistry samples and beam trawl.
Intertidal survey	28th September 2022	Phase 1 biotope mapping.

7.1 Intertidal Survey

108. A Phase I qualitative intertidal ecology survey was undertaken on 28th September 2022 at the possible two landfall locations for the Projects. The landfall selected for the Projects (Landfall 8, see **Volume 7, Chapter 4 Site Selection (application ref: 7.4**) of the ES for further information) falls outside of the Holderness Inshore MCZ, lying approximately 300m away. The boundary of the other landfall examined during this survey (Landfall 9) was located within the MCZ boundary.

109. Five transects across the two landfalls were surveyed to determine the habitats present within each landfall area and the presence/absence of any fauna. Three distinct habitats were identified within Landfall 8 and four within Landfall 9. Instances of *Arenicola marina* worm casts and *Lanice conchilega* tubes were found along the lower shore. While distinct differences in habitat and species composition were identified across the tidal range, such differences were not significant enough to constitute a change in biotope present. As such, the entirety of the survey area was classified as the biotope barren littoral coarse sand (EUNIS biotope MA5231).

110. See **Volume 7, Appendix 9-2 Intertidal Survey Report (application ref: 7.9.9.2)** for further details on the methodology and results of this survey.

7.2 Project Specific Benthic Characterisation Surveys

111. The site characterisation reports are available in **Volume 7, Appendix 9-3 Benthic Ecology Monitoring Report (application ref: 7.9.9.3)** of the ES.

112. The benthic characterisation survey was conducted in August 2022 and covered the Offshore Development Area. The survey included no sampling stations in the Offshore Export Cable Corridor within the Holderness Offshore MCZ as the corridor does not overlap the MCZ. The sampling consisted of drop-down video, grab sampling (including one macrofaunal sample and one particle size distribution (PSD) sample at each station), sediment chemistry samples and beam trawl. Two sample stations were located in close proximity to the Holderness Inshore MCZ boundary, measuring approximately 0.83km at their closest point.

7.3 Benthic Habitat Mapping

113. Benthic habitat maps have been produced for the Projects' Offshore Development Area, defining the distribution of habitats between survey sample stations, by combining the geophysical data sets and benthic sample data (grab and drop-down video imagery) using geostatistical processing and spatial statistical analysis. A technical report summarising the benthic habitat mapping method and results is provided in **Volume 7, Appendix 9-4 Environmental Features Report (application ref: 7.9.9.4)** of the ES. The spatial distribution of the EUNIS Level 3 main habitats (equivalent to Marine Habitat Classification for Britain and Ireland 'habitat complexes') identified in the Offshore Export Cable Corridor (and therefore in proximity to the Holderness Inshore and Holderness Offshore MCZs) are presented in **Figure 8-1** and **Figure 9-1**.

8 Holderness Offshore MCZ

114. The Holderness Offshore MCZ is located approximately 11km offshore from the Holderness coast (JNCC, 2021). This site extends across inshore and offshore waters as it crosses the 12nm territorial sea limit. The MCZ has relatively shallow depth ranges from 5m down to 50m and covers an area of 1,176km^2.

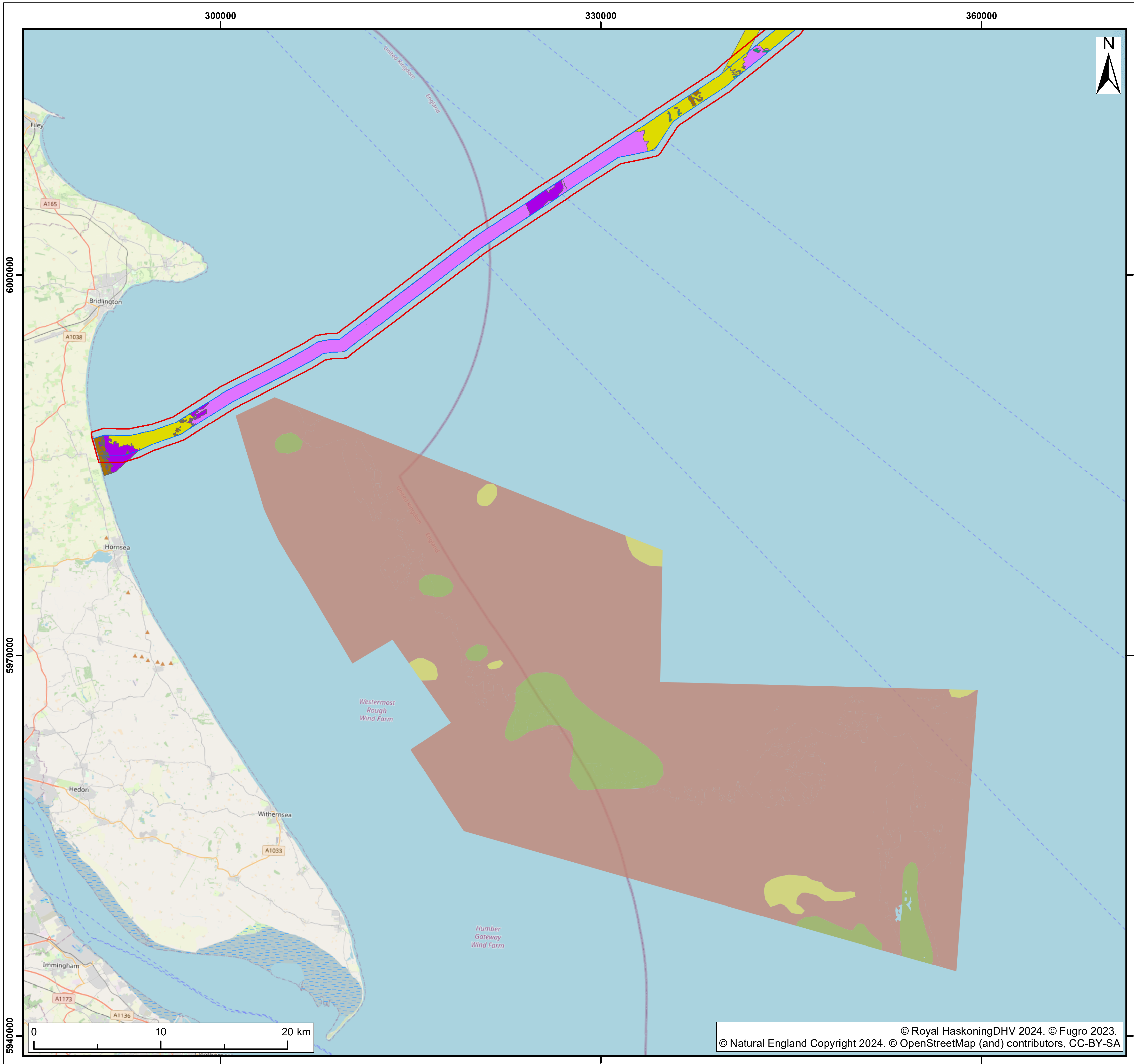
115. The seabed is dominated by subtidal coarse sediment and hosts subtidal sand, subtidal mixed sediments and part of a glacial tunnel valley. The diverse seabed allows for a wide variety of species which live both in and on the sediment such as, crustaceans (crabs and shrimp), starfish and sponges. This site is also a spawning and nursery ground for a range of fish species for example lemon sole *Microstomus kitt*, plaice *Pleuronectes platessa* and European sprat *Sprattus sp*. Therefore, the species living both in and on the sediment may benefit from the protection afforded to the habitat features within this site.

116. The slow-growing (but widely occurring) bivalve, Ocean quahog *Arctica islandica* has been found in the site. Ocean quahog is a threatened / declining species of bivalve mollusc that can take up to 6 years to reach maturity and can live for over 500 years.

117. **Table 8-1** details the designated features of the Holderness Offshore MCZ, with **Figure 8-1** presenting the locations of these features within the MCZ (in addition to the habitat type recorded within the Offshore Export Cable Corridor).

Table 8-1 Designated Features of the Holderness Offshore MCZ

Protected Feature	Type of Feature	Management Approach
Subtidal coarse sediment	Broadscale marine habitat	Recover to favourable condition
Subtidal sand	Broadscale marine habitat	Recover to favourable condition
Subtidal mixed sediments	Broadscale marine habitat	Recover to favourable condition
Ocean quahog *Arctica islandica*	Species feature of conservation importance	Recover to favourable condition
North Sea glacial tunnel valleys	Feature of geological interest	Maintain in favourable condition



Legend:

- Offshore Development Area
- Offshore Export Cable Corridor

EUNIS Habitat Type

- Muddy Sand
- Outcropping Bedrock
- Outcropping Till
- Subcropping Rock
- Subcropping Till

MCZ Broadscale Habitats

- Subtidal coarse sediment
- Subtidal sand
- Subtidal mixed sediments

S2	P01	25/04/2024	Suitable for Information	JH	SB	CC
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Holderness Offshore MCZ Protected Features with Offshore Export Cable Corridor Habitat Map

Figure: 7-2 Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0778

Co-ordinate system:	Page Size:	Scale:
WGS 1984 UTM Zone 31N	A3	1:300,000

Project:	Report:
Dogger Bank South Offshore Wind Farms	Environmental Statement

Royal HaskoningDHV
Enhancing Society Together
RWE

8.1 Protected Features

118. The Holderness Offshore MCZ lies approximately 0.7km to the southeast of the temporary disturbance area for cable installation and 1.2km from the permanent disturbance area. **Table 8-1** details the eight designated features of the Holderness Offshore MCZ.

119. As the Holderness Offshore MCZ lies outside of the Projects, direct effects on its features will be avoided. Suspended sediment concentrations (SSC) could increase in the Offshore Export Cable Corridor due to the seabed preparation for the cable installation. This could result in potential indirect effects on the MCZ from increases in sediment deposition or deterioration in water quality. It is important to note that the bathymetry data and site surveys noted no sandbanks or sand waves within the proximity of the MCZ, and therefore the required preparation is likely to consist of cable ploughing (see **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)**).

120. As indirect impacts on the protected features of the site cannot be ruled out, the potential for indirect impacts on MCZ features are assessed in the Stage 1 Assessment (see section 10.1).

8.2 Conservation Objectives

121. The conservation objectives for the Holderness Offshore MCZ are that the protected features:

- So far as already in favourable condition, remain in such condition.
- So far as not already in favourable condition, be brought into such condition, and remain in such condition.

122. With respect to Subtidal coarse sediment, Subtidal sand and Subtidal mixed sediments within the MCZ, this means that:

- Its extent is stable or increasing.
- Its structures and functions, its quality, and the composition of its characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or inhabiting that habitat) are such as to ensure that it remains in a condition which is healthy and not deteriorating.

123. With respect to ocean quahog within the MCZ, this means that the quality and quantity of its habitat and the composition of its population in terms of number, age and sex ratio are such as to ensure that the population is maintained in numbers which enable it to thrive.

124. Any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.

125. With respect to the North Sea glacial tunnel valleys within the MCZ, this means that:

- Its extent, component elements and integrity are maintained.
- Its structure and functioning are unimpaired.
- Its surface remains sufficiently unobscured for the purposes of determining whether the conditions detailed in the above bullets are satisfied.

126. Any obscurement or alteration of that feature brought about entirely by natural processes is to be disregarded.

8.2.1 Supplementary Advice on Conservation Objectives (SACOs)

127. NE and the JNCC have provided supplementary advice on conservation objectives (SACOs) for the Holderness Offshore MCZ (JNCC and NE, 2021). The SACOs provide further detail about the protected features' extent and distribution, structure, function and supporting processes. For these attributes, targets are provided and where possible quantified.

128. The implications of the Projects on the specific attributes for the Holderness Offshore MCZ protected features has been used to inform the Stage 1 MCZA presented in this report.

9 Holderness Inshore MCZ

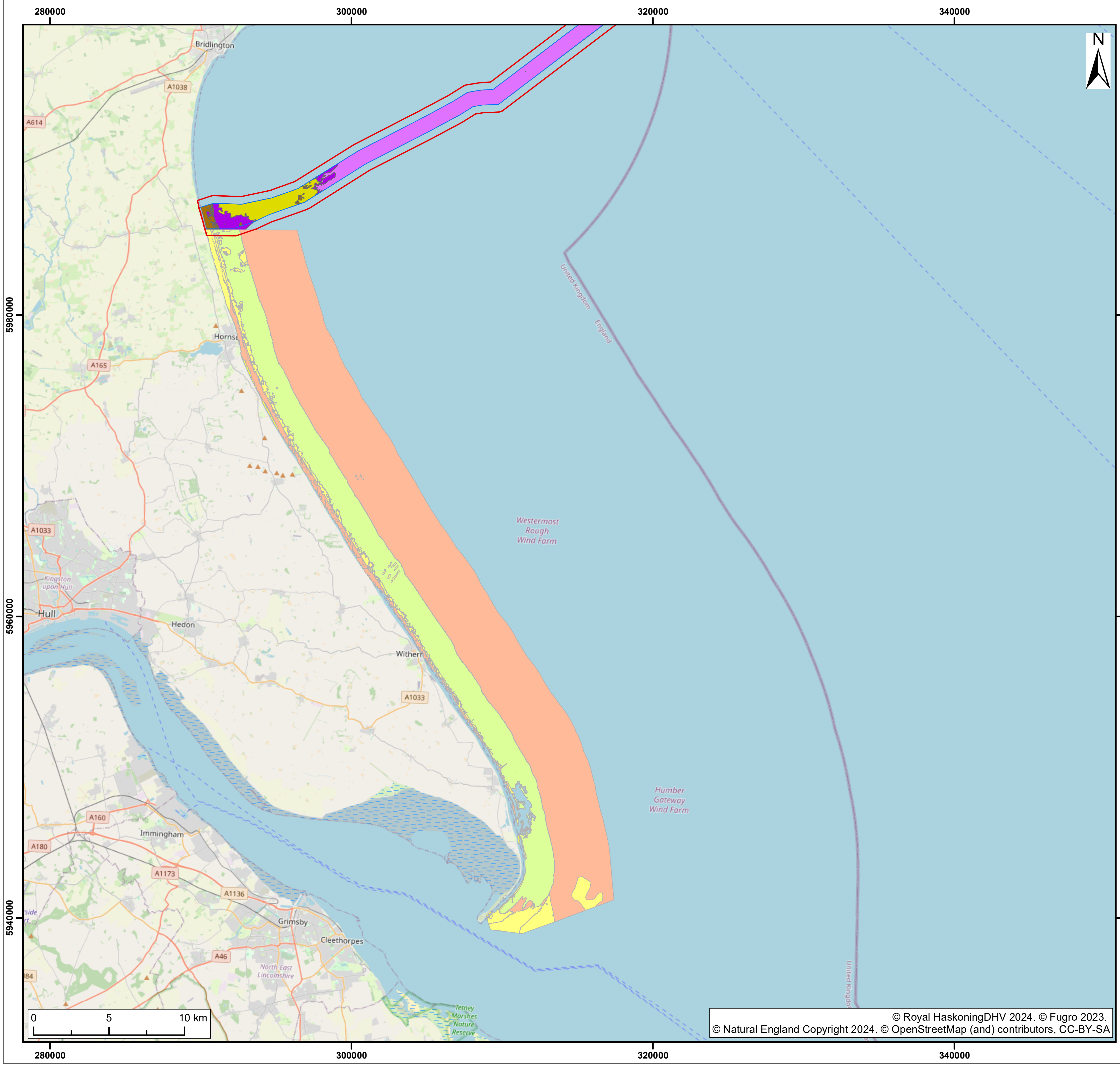
129. The Holderness Inshore MCZ is located north of the mouth of the Humber Estuary (DEFRA, 2016). The seabed in this site comprises rock, sand, mud and sediment. The mosaic of habitats within the site supports a diverse range of organisms including red algae, sponges and other encrusting fauna. The site also supports fish species such as European eel, dab and wrasse, as well as commercially significant crustaceans such as edible and velvet swimming crabs and lobster. Partly above the water, the sandy beaches of intertidal sand and muddy sand are uncovered at low tide. These beaches are home to many species, buried in the damp sand.

130. **Table 9-1** details the designated features of the Holderness Inshore MCZ, with **Figure 9-1** presenting the locations of these features within the MCZ (in addition to the habitat type recorded within the Offshore Export Cable Corridor).

Table 9-1 Designated Features of the Holderness Inshore MCZ

Designated Feature	Type of Feature	Management Approach
Intertidal sand and muddy sand	Broadscale marine habitat[2]	Maintain in favourable condition
Moderate energy circalittoral rock	Broadscale marine habitat	Maintain in favourable condition
High energy circalittoral rock	Broadscale marine habitat	Maintain in favourable condition
Subtidal coarse sediment	Broadscale marine habitat	Maintain in favourable condition
Subtidal mixed sediments	Broadscale marine habitat	Maintain in favourable condition
Subtidal sand	Broadscale marine habitat	Maintain in favourable condition
Subtidal mud	Broadscale marine habitat	Maintain in favourable condition
Spurn Head (subtidal)	Geological feature	Maintain in favourable condition

[2] Broadscale marine habitats are groups of habitats with shared ecological requirements which capture the coarse biological and physical diversity of the seabed (JNCC, 2022)



Legend:

- Offshore Development Area
- Offshore Export Cable Corridor

EUNIS Habitat Type

- Muddy Sand
- Outcropping Bedrock
- Outcropping Till
- Subcropping Till

MCZ Broadscale Habitats

- Intertidal sand and muddy sand (A2.2)
- Subtidal coarse sediment (A5.1)
- Subtidal sand (A5.2)
- Subtidal mixed sediments (A5.4)

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S2	P01	25/04/2024	Suitable for Information	JH	SB	CC

Title:

Holderness Inshore MCZ Protected Features with Export Cable Corridor Habitat Map

Figure: 8-2 Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0780

Co-ordinate system: WGS 1984 UTM Zone 31N | Page Size: A3 | Scale: 1:250,000

Project: Dogger Bank South Offshore Wind Farms

Report: Environmental Statement

Royal HaskoningDHV Enhancing Society Together

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9.1 Protected Features

131. **Table 9-1** details the eight designated features of the Holderness Inshore MCZ.

132. There is no overlap with the Holderness Inshore MCZ and the Projects' landfall and permanent burial corridor within the Offshore Export Cable Corridor, with the closest point where cable burial may take place being located 0.1km outside of the MCZ. In addition, the Applicants have committed to no jack-up activities taking place within the Holderness Inshore MCZ (see section 5.4). As such, only anchoring events within the approximately 1km² area of overlap between the MCZ and the Projects Construction Buffer Zone may result in any direct effects on the protected features of the site. SSCs could increase in the Offshore Export Cable Corridor due to the seabed preparation for the cable installation. However, **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)** of the ES has assessed this effect to be minimal and expects as a result of the excavation process, suspended sediment concentrations will be elevated above prevailing conditions but are likely to remain within the range of background nearshore levels (which are high close to the coast because of increased wave activity) and lower than those concentrations that would develop during storm conditions when sediment yields are higher due to cliff erosion. Once mobilised, the suspended sediment will dissipate rapidly (i.e. over a period of a few hours) in the water and be transported alongshore and offshore. Complete removal of the excavated material would be expected within weeks to months of excavation, at which point prevailing conditions will resume and there will be no changes suspended sediment concentrations.

133. **Table 9-2** summarises the Holderness Inshore MCZ features that, based on project survey information, may be directly impacted by the Projects offshore export cable activities in the construction corridor as the permanent infrastructure area lies outside of the MCZ. Note that the potential for indirect impacts on other MCZ features are also assessed in the Stage 1 Assessment (section 10).

Table 9-2 Holderness Inshore MCZ Protected Features that Spatially Coincide with the Export Cable Installation, Maintenance and Decommissioning Activities

Protected feature (EUNIS Code)	Possible direct impact
Intertidal sand and muddy sand (A2.2)	✓
Moderate energy circalittoral rock (A4.2)	X
High energy circalittoral rock (A4.1)	X
Subtidal coarse sediment (A5.1)	X
Subtidal sand (A5.2)	X
Subtidal mud (A5.3)	X
Subtidal mixed sediments (A5.4)	X
Spurn Head (subtidal)	X

9.2 Conservation Objectives

134. The overarching conservation objective for the site is for its designated features to be maintained in favourable condition. For each broadscale marine habitat, favourable condition means that, within an MCZ:

- Its extent is stable or increasing.
- Its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

135. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

136. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

9.2.1 Supplementary Advice on Conservation Objectives (SACOs)

137. NE and the JNCC have provided supplementary advice on conservation objectives (SACOs) for the Holderness Inshore MCZ (NE, 2023). The SACOs provide further detail about the protected features' extent and distribution, structure, function and supporting processes. For these attributes, targets are provided and where possible quantified.

138. The implications of the Projects on the specific attributes for the Holderness Inshore MCZ protected features have been used to inform the Stage 1 MCZA presented in this report.

10 Stage 1 Assessment

139. This section presents the Stage 1 MCZA of the effects of the construction, operation and decommissioning of the Projects on the protected features of the MCZs. Each of the impacts and corresponding pressures (derived from NE's AoO) identified during MCZA Screening (**Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report Screening Report (application ref: 8.17.1)**) are discussed individually. The assessment of each effect has considered the effects on the attributes and targets of each protected feature as provided by the Holderness Offshore MCZ SACOs (NE, 2021), and the Holderness Inshore MCZ SACOs (NE, 2023).

140. The attributes of each protected feature of the MCZs are listed in **Table 10-1** and **Table 10-2** below, along with signposts to the relevant sections of the Stage 1 Assessment where the assessment of that feature and attribute is provided. Attributes are categorised as either physical or biological to support the assessment, which first addresses impacts on the physical attributes of features, and then the biological attributes of broadscale habitat features (which are largely dictated by physical attributes).

141. Following the assessment of each impact screened into the assessment in relation to each protected MCZ feature and corresponding attributes, an assessment is made as to whether the impact has the potential to hinder the achievement of the MCZs conservation objectives.

142. The Stage 1 assessment assesses all scenarios relating to the Projects. The Projects being constructed concurrently or sequentially represents the worst-case with regard to offshore export cable installation, as there will be a larger seabed footprint from the four offshore export cables which will pass near to the MCZs, when compared to the two offshore export cables for the Projects in the isolation scenarios. The impact for the concurrent or sequential construction scenario would be identical as all four offshore export cables would be installed at the same time, regardless of the construction scenario.

143. Both direct and indirect impacts are considered during the Stage 1 assessment. As stated in section 9.1, the only protected features which have the potential to be directly affected by the Projects are those found inside the area of the Holderness Inshore MCZ which slightly overlaps with the offshore temporary works area and which may therefore be affected by vessel anchors during export cable installation and maintenance. Which is:

- Intertidal sand and muddy sand (A2.2).

Table 10-1 Pressures Assessed in Relation to the Relevant Attributes during the Holderness Offshore MCZ Stage 1 Assessment. Grey – No Impact Pathway, Pink – Assessment Undertaken.

MCZ Feature Attributes		**Effects**					
Attribute type	**Attribute**	**Construction**		**Operation**		**Decommissioning**	
		Increased SSC	**Invasive species**	**Increased SSC**	**Invasive species**	**Increased SSC**	**Invasive species**
Subtidal coarse sediment (A5.1), Subtidal sand (A5.2) Subtidal mixed sediments (A5.4)							
Biological	Distribution: Presence and spatial distribution of biological communities	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A
Physical	Structure: Extent and distribution	N/A	N/A	N/A	N/A	N/A	N/A
Biological	Structure and function: presence and abundance of key structural and influential species	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A
Biological	Structure: non-native species and pathogens	N/A	Section 10.1.1.2	N/A	Section 10.1.2.2	N/A	Section 10.1.3
Physical	Structure: sediment composition and distribution	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A
Biological	Structure: species composition of component communities	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A
Physical	Supporting processes: physico-chemical properties	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: sedimentation rate (for subtidal rock features)	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A
	Supporting processes: sediment contaminants	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: sediment movement and hydrodynamic regime	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: water quality - contaminants	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: water quality - dissolved oxygen	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: water quality - nutrients	N/A	N/A	N/A	N/A	N/A	N/A
	Supporting processes: water quality - turbidity	Section 10.1.1.1	N/A	Section 10.1.2.1	N/A	Section 10.1.3	N/A

Table 10-2 Pressures Assessed in Relation to the Relevant Attributes during the Holderness Inshore MCZ Stage 1 Assessment. Grey – No Impact Pathway, Pink – Assessment Undertaken.

MCZ Feature Attributes		**Effects**						
Attribute type	**Attribute**	**Construction**				**Operation**		
		Temporary disturbance / habitat loss	**Increased SSC**	**Invasive Species**	**Temporary disturbance / habitat loss**	**Increased SSC**	**Changes to sediment transport**	**Invasive Species**
Physical	Abrasion/disturbance of the substrate on the surface of the seabed	Section 10.2.1.1	N/A	N/A	Section 10.2.2.1	N/A	N/A	N/A
	Habitat structure changes - removal of substratum (extraction)	Section 10.2.1.1	N/A	N/A	Section 10.2.2.1	N/A	N/A	N/A
	Structure: sediment composition and distribution	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	Section 10.2.2.3	N/A
	Supporting processes: sedimentation rate (for subtidal rock features)	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	Section 10.2.2.3	N/A
	Supporting processes: water quality – turbidity	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	Section 10.2.2.3	N/A
	Water flow (tidal current) changes, including sediment transport considerations	N/A	N/A	N/A	N/A	N/A	Section 10.2.2.3	
	Supporting processes: sediment movement and hydrodynamic regime	N/A	N/A	N/A	N/A	N/A	Section 10.2.2.3	
Biological	Distribution: presence and spatial distribution of biological communities	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	N/A	N/A
	Structure: species composition of component communities	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	N/A	N/A
	Structure and function: presence and abundance of key structural and influential species	N/A	Section 10.2.1.2	N/A	N/A	Section 10.2.2.2	N/A	N/A
	Structure: non-native species and pathogens (habitat)	N/A	N/A	Section 10.2.1.3	N/A	N/A	N/A	Section 10.2.2.4

MCZ Feature Attributes		**Effects**						
Attribute type	**Attribute**	**Construction**				**Operation**		
		Temporary disturbance / habitat loss	**Increased SSC**	**Invasive Species**	**Temporary disturbance / habitat loss**	**Increased SSC**	**Changes to sediment transport**	**Invasive Species**
	No final decision regarding the final decommissioning policy for the offshore project infrastructure. However, it is likely that offshore project infrastructure will be removed above the seabed and reused or recycled where practicable. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the worst case scenario, the impacts will be no greater than those identified for the construction phase, which are discussed in the following sections: • Temporary disturbance / habitat loss – section 10.2.1.1; • Increased SSC – section 10.2.1.2; • Invasive Species – section 10.2.1.3;							

10.1 Holderness Offshore MCZ

144. There is currently no advice available regarding the sensitivity of North Sea glacial tunnel valleys to the pressures of offshore wind and power cable development. The North Sea glacial tunnel valleys are geological features characterised as curved sub-linear seabed depressions generally considered to have been formed by subglacial erosion and sediment backfill beneath the outer margins of a receding ice sheet (Pearce *et al*., 2012). Due to their status as a geological rather than ecological feature, it is considered that the tunnel valleys would not be sensitive to the effects of increased suspended sediment concentrations or invasive species. As such, based on professional judgement this feature has been screened out of the assessment.

145. **Table 6-1** describes each pressure detailed in the AoO screened in for further assessment. Table A-2 of **Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report (application ref: 8.17.1)** details each pressure and provides justification for why each pressure has been screened in/out of further assessment.

10.1.1 Potential Effects during Construction

10.1.1.1 Increased Suspended Sediment Concentrations during Export Cable Installation

146. Temporary increases in SSC within the water column, and subsequent deposition onto the seabed, may occur as a result of cable pre-installation activities (including PLGR), export cable burial and at the trenchless crossing (e.g. HDD)) exit pit and transition zone. Deployment of jack-up vessels at the trenchless crossing exit point and placement of external cable protection are not expected to increase SSCs to an extent that would result in a measurable effect on the MCZs' features. **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)** provides details of changes to SSC and subsequent sediment disposition.

147. It is important to note that the Projects do not overlap with the Holderness Offshore MCZ, with the nearest point being the Offshore Export Cables Construction Buffer Zone located 0.7km north-west of the site. However, due to the potential distance of sediment being transported in the water column, the following broadscale marine habitat features could be affected by temporary increases in SSC and subsequent deposition during construction:

- Subtidal coarse sediment (A5.1);
- Subtidal sand (A5.2); and

- Subtidal mixed sediments (A5.4).

148. Based on the modelling undertaken for **Volume 7, Chapter 8: Marine Physical Environment (application ref: 7.8)**, along the Offshore Export Cable Corridor, maximum suspended sediment concentrations are predicted to reach up to 750mg/l, or 1,500mg/l in localised hot spots. Closer inshore, and nearer to the MCZ, the extent of the plume can reach 18km due to stronger tidal currents. The maximum predicted deposition resulting from trenching will be up to 5cm within and immediately adjacent to the area of trenching, with a maximum change of up to 0.25m occurring in localised hotspots. **Table 5-4** summarises the worst-case volume of sediment displaced.

149. Sand and gravel-sized sediment would settle out of suspension rapidly to the bed in the immediate location of the Offshore Export Cable Corridor. Fine sand will most likely remain in the bottom 1-2m of the water column, and with settling velocities of around 10mm/s, this will ensure the fine sand settles within half an hour or less or become part of the ambient near bed transport (Soulsby, 1997).

150. Mud-sized material would be advected a greater distance and persist in the water column for hours to days. It is anticipated that under the prevailing hydrodynamic conditions, this sediment would be readily re-mobilised, especially in the shallow inshore area where waves would regularly agitate the bed. Accordingly, outside the immediate vicinity of the offshore export cable route, sediment deposition and any changes to seabed character are not expected to be measurable in practice.

151. Any released fine material will form a plume which would become advected by tidal currents. It is expected that the maximum predicted deposition resulting from a sediment plume will be an average of 1-5mm within 10km of the disturbance and is less than 0.5mm within 35km of the offshore cable corridor. This conceptual evidence-based assessment is supported by the findings of a review of the evidence base into the physical impacts of marine aggregate dredging on sediment plumes and seabed deposits (Whiteside *et al.* 1995; John *et al.* 2000; Hiscock and Bell, 2004; Newell *et al.* 2004; Tillin *et al.* 2011).

152. Overall, increases in SSC are expected to be localised and short-term. Fine suspended sediment may be transported a further distance than coarse sediments. However, this is likely to be widely and rapidly dispersed and within the range of natural variability within the region. It is likely that the increase in concentrations would be greatest in the shallowest sections of the Offshore Export Cable Corridor. SSCs are likely to remain within the range of background nearshore levels and lower than those concentrations that would develop during storm conditions. Also, once installation is completed, tidal currents are likely to rapidly disperse the suspended sediment (i.e. over a period of a few hours) in the absence of any further sediment input.

153. Based on the information presented above, the pressure 'Smothering and siltation rate changes (light)' has been used for the sensitivity assessment because 'Light' deposition is defined as "of up to 5cm of fine material added to the habitat in a single, discrete event", as opposed to 'Heavy' deposition "of up to 30cm of fine material added to the habitat in a single discrete event".

154. The remainder of this section assesses the impact of construction temporary increases in SSC and subsequent deposition against the attributes and targets of each protected feature as provided by NE's SACOs.

10.1.1.1.1 Physical Attributes

155. The following physical attributes of protected features are relevant to temporary increases in SSC and subsequent deposition impacts:

- Structure: sediment composition and distribution.
- Supporting processes: sedimentation rate (for subtidal rock features).
- Supporting processes: water quality – turbidity.

156. As described above, redeposition of suspended sediments will be local to the construction activity and is unlikely to change sediment composition and distribution. Changes to the sedimentation rate will be within the natural range and given the distribution of subtidal rock features in relation to the extent of effects, no impact is anticipated. Similarly, increases in SSC will be localised, short term and within the natural range of turbidity. Therefore, there will be no impact on the physical attributes and targets of Holderness Offshore MCZ features.

10.1.1.2.1 Biological Attributes

157. The following biological attributes of protected features are relevant to temporary increases in SSC and subsequent deposition impacts:

- Distribution: presence and spatial distribution of biological communities;
- Structure: species composition of component communities; and
- Structure and function: presence and abundance of key structural and influential species.

158. Increased suspended sediments have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon deposition of sediment.

159. The AoO for the site states that the designated features of the Holderness Offshore MCZ have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive (JNCC, 2021). Changes to the sedimentation rate will be within the natural range and given the distribution of subtidal rock features in relation to the extent of effects, no impact is anticipated. Similarly, increases in SSC will be localised, short term and within the natural range of turbidity. Therefore, there will be no impact on the biological attributes and targets of Holderness Offshore MCZ features.

10.1.1.3.1 Summary

160. The maximum predicted deposition resulting from a sediment plume during sandwave levelling for offshore export cable laying would be up to a depth of approximately 1-5mm in localised areas immediately adjacent to the Offshore Export Cable Corridor. Fine material (which represents only a very small proportion of the disturbed sediment) would disperse further and persist in the water column for hours to days, but at a level that is not expected to be measurable.

161. Elevated SSC will be within the range of background nearshore levels and will be lower than those concentrations that would develop during storm conditions. Once installation is completed, tidal currents are likely to rapidly disperse the SSC.

162. Biological communities recorded within the Holderness Offshore MCZ have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive. Therefore, the biological communities that may be affected by temporary increases in SSC and subsequent deposition will either not be impacted or would recover fully within two years.

163. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Offshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Offshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary increases in SSC and subsequent deposition impacts related to the construction of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.1.1.2 Invasive Species

164. Non-native species may become invasive and displace native organisms by preying on them or out-competing them for resources such as food, space or both. The primary pathway for the potential introduction of INNS during the construction phase is from the use of vessels and infrastructure that have originated from regions that are distinctly different, such as from other seas or oceans. **Table 5-4** presents the maximum number of vessels that will be used for the Projects for Offshore Export Cable / landfall construction activities. It should be noted that this represents vessel use across the entirety of the Projects' Offshore Export Cable Corridor and landfall area, and are therefore an overestimate of activity in proximity the Holderness Offshore MCZ.

165. This assessment considers the effects of increased vessel traffic and resulting colonisation by faunal communities on the ecological attributes and targets for the three broadscale marine habitat features most likely to be affected by the introduction of INNS:

- Subtidal coarse sediment (A5.1);
- Subtidal sand (A5.2); and
- Subtidal mixed sediments (A5.4).

166. The impact of invasive species has been defined using the following 'low risk' pressure identified by NE's AoO for the Holderness Offshore MCZ (**Table 6-1**):

- Introduction or spread of invasive non-native species (INNS).

10.1.1.1.2 Biological Attributes

167. The following biological attributes of protected features are relevant to temporary habitat loss and physical disturbance impacts:

- Structure: non-native species and pathogens (habitat).

168. Although the attributes 'Distribution – presence and spatial distribution of biological communities', 'Structure and function: presence and abundance of key structural and influential species' and 'Structure: species composition of component communities' are relevant to colonisation by INNS, effects on these attributes are normally assessed under the biological impacts of long-term habitat loss. This has been screened out of the assessment for Holderness Offshore MCZ due to the Projects' infrastructure not going through the MCZ directly.

169. The AoO for the site states that the designated features of the Holderness Offshore MCZ have Low sensitivity to the pressures associated with invasive species.

170. The risk of spreading INNS will be mitigated by the following relevant regulations and guidance:

- International Convention for the Prevention of Pollution from Ships (MARPOL). The MARPOL sets out appropriate vessel control procedures and maintenance.
- The Environmental Damage (Prevention and Remediation (England)) Regulations 2015, which set out a polluter pays principle where the operators who cause a risk of significant damage or cause significant damage to land, water or biodiversity will have the responsibility to prevent damage occurring, or if the damage does occur will have the duty to reinstate the environment to the original condition.
- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), which provide global regulations to control the transfer of potentially invasive species.

171. It should be noted that there is existing vessel activity within the Holderness Offshore MCZ including fishing, cargo, recreational and wind farm support vessels. Therefore, the small increase in vessel traffic in the MCZ associated with Projects will not represent a significantly increased risk of introduction of INNS.

10.1.1.2.2 Summary

172. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Offshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Offshore MCZ in a favourable condition, or restoring them to a favourable condition will **not be hindered** by the risks of introduction and spread of INNS related to the development of the Projects during the construction phase of the Projects.

10.1.2 Potential Effects during Operation

10.1.2.1 Increased Suspended Sediment Concentrations during Export Cable Maintenance

173. Increases in SSC within the water column, and subsequent deposition onto the seabed may occur as a result of O&M activities that require the use of jack-up vessels, as well as cable repair, replacement and reburial activities.

174. Section 10.1.1.1 describes the predicted impacts from construction within the Offshore Export Cable Corridor. Overall, increases in SSC are expected to be localised and short-term. Fine suspended sediment may be transported a further distance than coarse sediments. Once activities are completed, tidal currents are likely to rapidly disperse the suspended sediment (i.e. over a period of a few hours) in the absence of any further sediment input. O&M activities will be episodic and highly localised when compared to construction.

175. **Table 5-4** summarises the worst-case volume of sediment displaced. Volumes are presented as annual averages and operation phase totals. However, this makes the highly precautionary assumption that all the estimated cable repair, replacement and reburial activities for the offshore export cables occur in close proximity to the MCZ. In reality, the extent of operational phase temporary increases in SSC and subsequent deposition would be much less than that during the construction phase.

176. Biological communities recorded in the within the Holderness Offshore MCZ have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive. Therefore, they will either not be impacted or would recover fully within two years.

177. Based on the relevant pressures, receptor sensitivity, and assessment of impacts against the attributes of affected Holderness Offshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary increases in SSC and subsequent deposition impacts related to the operation of the Projects (either in isolation or together).

10.1.2.2 Invasive Species

178. Artificial hard substrates introduced by the Projects (including cable protection) could act as potential 'stepping stones' or vectors for INNS, as well as supporting species non-native to otherwise soft substrate habitats. This assessment considers the effects of placement of external cable protection and resulting colonisation by faunal communities on the ecological attributes and targets for the three broadscale marine habitat features most likely to be affected by the introduction of INNS:

- Subtidal coarse sediment (A5.1).
- Subtidal sand (A5.2).
- Subtidal mixed sediments (A5.4).

179. The impact of invasive species has been defined using the following 'low risk' pressure identified by NE's AoO for the Holderness Offshore MCZ (**Table 6-1**):

- Introduction or spread of invasive non-native species (INNS).

180. The risk of spreading INNS will be mitigated by the same means as discussed in section 10.1.1.2 and these commitments are secured in **Volume 8, Outline Pollution Environmental Management Plan (application ref: 8.21)**, which has been submitted with the DCO application.

10.1.2.1.2 Biological Attributes

181. The following biological attributes of protected features are relevant to invasive species:

- Structure: non-native species and pathogens (habitat).

182. Although the attributes 'Distribution – presence and spatial distribution of biological communities', 'Structure and function: presence and abundance of key structural and influential species' and 'Structure: species composition of component communities' are relevant to colonisation by INNS, effects on these attributes are normally assessed under the biological impacts of long-term habitat loss. This has been screened out of the assessment for Holderness Offshore MCZ due to the Projects' infrastructure not going through the MCZ directly.

183. The introduction of artificial hard substrates, namely external export cable protection, could act as potential 'stepping stones' or vectors for INNS, as well as supporting species non-native to otherwise soft substrate habitats. INNS may be introduced through the use of vessels and the installation of infrastructure. However, the risk of introduction and spread of INNS will be mitigated through adherence to the relevant regulations and guidance and secured through **Volume 8, Outline Project Environmental Management Plan (application ref: 8.21)**.

184. NE's AoO suggests that the designated features of the site have a Low sensitivity to INNS. Furthermore, seabed habitats exist in a mosaic of mixed, coarse and sandy sediments across much of the Offshore Export Cable Corridor. Therefore, the use of external cable protection across small and localised areas along the Offshore Export Cable Corridor is not anticipated to materially change the existing potential for the spread of INNS.

10.1.2.2.2 Summary

185. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Offshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Offshore MCZ in a favourable condition, or restoring them to a favourable condition will **not be hindered** by the risks of introduction and spread of INNS related to the development of the Projects.

10.1.3 Potential Effects during Decommissioning

10.1.3.1 Increased Suspended Sediment Concentrations

186. Temporary increases in SSC within the water column, and subsequent deposition on to the seabed may occur during the decommissioning phase as a result of cable removal activities, if required. Effects would be no greater, and are expected to be less, than those of the construction phase (section 10.1.1.1), and will affect the same features and attributes.

187. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Offshore MCZ features it can be concluded that the conservation objective of maintaining the protected features of the Holderness Offshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary increases in SSC and subsequent deposition effects related to the decommissioning of the Projects.

10.1.3.2 Invasive Species

188. Effects from the introduction of INNS as a result of cable removal activities would be no greater than and are expected to be less than those of the construction phase (section 10.1.1.2)

189. As described in section 10.1.1.2, based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Offshore MCZ features. It can be concluded that the conservation objective of maintaining the protected features of the Holderness Offshore MCZ in a favourable condition or restoring them to a favourable condition will **not be hindered** by the risks of introduction and spread of INNS related to the Projects.

10.2 Holderness Inshore MCZ

190. **Table 6-1** details each pressure detailed in the AoO (Natural England, 2023) screened in for further assessment. Table A-2 of **Volume 8, Appendix A - Marine Conservation Zone Assessment Screening Report (application ref: 8.17.1)** details each pressure and provides justification for why each pressure has been screened in / out of further assessment.

10.2.1 Potential Effects during Construction

10.2.1.1 Temporary Physical Disturbance / Temporary Habitat Loss during export cable installation

191. Temporary physical disturbance and habitat loss may occur as a result of the use of vessel anchors within the Offshore Export Cable Corridor Construction Buffer Zone. The following broadscale marine habitat feature has the potential to be affected by temporary physical disturbance and habitat loss during export cable construction:

- Intertidal sand and muddy sand (A2.2).

192. The impact of temporary physical disturbance and habitat loss has been defined using the following pressures identified by NE's AoO for the Holderness Inshore MCZ (**Table 6-1**):

- Abrasion/disturbance of the substrate on the surface of the seabed.

193. **Table 5-4** presents the worst-case extent of anchoring impacts during construction across the entirety of the Projects' Offshore Export Cable Corridor. The only activity that could overlap with the Holderness Inshore MCZ would be anchoring activity within the Construction Buffer Zone. The extent of temporary disturbance and habitat loss would be intermittent and restricted to discrete locations, with each anchoring activity disturbing a maximum area of 485m^2.

194. Therefore, whilst there will be potential for repeat disturbance to these areas, the area of overlap with the MCZ is minimal at approximately 1km². This represents an area of 0.32% of the total area of the Holderness Inshore MCZ.

195. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will not be hindered by temporary physical disturbance / temporary habitat loss related to the anchoring activities for the Projects (either in isolation or together).

10.2.1.2 Increased Suspended Sediment Concentrations during export cable installation

196. Increased SSC effects on the Holderness Inshore MCZ are similar to those discussed in section 10.1.1.1 for the Holderness Offshore MCZ:

- Intertidal sand and muddy sand (A2.2).

197. Tidal currents close to the Holderness coast and in the Holderness Inshore MCZ are approximately parallel to the coast in a north-south direction. Closer inshore, near the MCZ, the extent of the plume can reach 18km due to stronger tidal currents. The maximum predicted deposition resulting from trenching will be up to 5cm within and immediately adjacent to the area of trenching, with a maximum change of up to 0.25m occurring in localised hotspots. The following Holderness Inshore MCZ features are unlikely to be impacted due to their distance from, and / or distribution inshore, of construction activities (**Figure 9-1**):

- Intertidal sand and muddy sand (A2.2).

198. The remainder of this section assesses the impact of construction temporary increases in SSC and subsequent deposition against the attributes and targets of each protected feature as provided by NE's SACOs.

10.2.1.1.2 Physical Attributes

199. The following physical attributes of protected features are relevant to temporary increases in SSC and subsequent deposition impacts:

- Structure: sediment composition and distribution.
- Supporting processes: sedimentation rate (for subtidal rock features).
- Supporting processes: water quality – turbidity.

200. As described above and in section 10.1.1.1, redeposition of suspended sediments will be local to the construction activity and is unlikely to change sediment composition and distribution. Changes to the sedimentation rate will be within the natural range and given the distribution of subtidal rock features in relation to the extent of effects, no impact is anticipated. Similarly, increases in SSC will be localised, short term and within the natural range of turbidity. Therefore, there will be no impact on the physical attributes and targets of Holderness Inshore MCZ features.

10.2.1.2.2 Biological Attributes

201. The following biological attributes of protected features are relevant to temporary increases in SSC and subsequent deposition impacts:

- Distribution: presence and spatial distribution of biological communities.
- Structure: species composition of component communities.
- Structure and function: presence and abundance of key structural and influential species.

202. Increased suspended sediments have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon deposition of sediment.

203. NE's AoO states that the designated features of the Holderness Inshore MCZ have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive (Natural England, 2023). Changes to the sedimentation rate will be within the natural range and given the distribution of subtidal rock features in relation to the extent of effects, no impact is anticipated. The resilience for all biotopes has been determined to be high to medium (recovery in <2 years or less than 10 years respectively). However, as discussed, based on their location relative to construction activities, impacts on these features are unlikely as there is no overlap.

10.2.1.3.2 Summary

204. As discussed in section 10.1.1.1 and above, the biological communities that may be affected by temporary increases in SSC and subsequent deposition will either not be impacted or would recover fully within two years.

205. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary increases in SSC and subsequent deposition effects related to the construction of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.1.3 Invasive Species

206. The primary pathway for the potential introduction of INNS during the construction phase is from the use of vessels and infrastructure that have originated from regions that are distinctly different, such as from other seas or oceans. **Table 5-4** presents the maximum number of vessels that will be used for the Projects for Offshore Export Cable / landfall construction activities. It should be noted that this represents vessel use across the entirety of the Projects' Offshore Export Cable Corridor and landfall area, and are therefore an overestimate of activity in proximity the Holderness Inshore MCZ.

207. It should however be noted that there is an existing vessel activity within the Holderness Inshore MCZ including fishing, cargo, recreational and wind farm support vessels, and therefore the small increase in vessel traffic in the MCZ associated with the Projects will not represent a significantly increased risk of introduction of INNS.

208. The risk of spreading INNS will be mitigated by the same means as discussed in section 10.1.1.2 and these commitments are secured in **Volume 8, Outline Project Environmental Management Plan (application ref: 8.21)** which has been submitted with the DCO application.

209. The impact of invasive species has been defined using the following 'low risk' pressure identified by NE's AoO for the Holderness Inshore MCZ (**Table 6-1**):

- Introduction or spread of invasive non-native species (INNS).

10.2.1.1.3 Biological Attributes

210. The following biological attributes of protected features are relevant to invasive species:

- Structure: non-native species and pathogens (habitat).

211. NE's AoO states that there are no known records of non-native species or pathogens in areas of intertidal sand and muddy sand within the Holderness Inshore MCZ; however, the Humber / Holderness area is considered to be at risk from non-native invasive species due to the high levels of shipping in the estuary and an associated risk that invasive species could establish easily in the local habitat (Pearce *et al*. 2012).

10.2.1.2.3 Summary

212. The extent, distribution and structure of habitat features and presence / spatial distribution of associated biological communities will be maintained despite the potential for short term temporary interruption to a small portion of the subtidal sand broadscale marine habitat feature to the south of any external export cable protection.

213. Based on the relevant pressures, receptor sensitivity, and assessment of impacts against the attributes of affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary sediment transport impacts related to the construction of the Projects (either in isolation or if both are built concurrently or sequentially).

10.2.2 Potential Effects during Operation

10.2.2.1 Temporary Disturbance / Habitat Loss during export cable maintenance

214. The only activity that could overlap with the Holderness Inshore MCZ would be anchoring activity within the construction buffer. The extent of temporary disturbance and habitat loss would be intermittent and restricted to discrete locations, with each anchoring activity disturbing a maximum area of 485m^2.

215. The habitat features and attributes impacted, and the sensitivities of those habitats will be the same as those identified for construction in relation to this impact (section 10.2.1.1).

216. Disturbed subtidal coarse sediment, sand and mixed sediments will not be removed or relocated and based on similar activities in adjacent areas, the composition and distribution of sediments will not change. Therefore, the extent, distribution and structure of these habitat features will not change as a result of temporary disturbance and habitat loss.

217. Whilst there is potential for recurring disturbance during maintenance, these impacts would be at discrete locations and times, and it is highly unlikely that the same stretch of cable would repeatedly fail. Therefore, recurring disturbance in the same location is considered highly unlikely.

218. Based on the relevant pressures, receptor sensitivity, and assessment of impacts against the attributes of affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable conditions will **not be hindered** by temporary disturbance and habitat loss effects related to the operation of the Projects (either in isolation or if both are built concurrently and/or in sequence).

10.2.2.2 Increased Suspended Sediment Concentrations during offshore export cable maintenance

219. Increases in SSC within the water column, and subsequent deposition onto the seabed may occur as a result of O&M activities that require the use of jack-up vessels, as well as cable repair, replacement and reburial activities.

220. Section 10.2.1.2 describes the predicted impacts from construction within the Offshore Export Cable Corridor. Overall, increases in SSC are expected to be localised and short-term. Fine suspended sediment may be transported a further distance than coarse sediments. Once activities are completed, tidal currents are likely to rapidly disperse the suspended sediment (i.e. over a period of a few hours) in the absence of any further sediment input. O&M activities will be episodic and highly localised when compared to construction.

221. **Table 5-4** summarises the worst-case volume of sediment displaced. Volumes are presented as operation phase totals, make the highly precautionary assumption that all the estimated cable repair, replacement and reburial activities for the Offshore Export Cables occur inside the MCZ. In reality, this is not the case and the extent of operational phase temporary increases in SSC and subsequent deposition would be a fraction of that during the construction phase.

222. Biological communities recorded in the Projects' Offshore Export Cable Corridor within the Holderness Inshore MCZ have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive, therefore, they will either not be affected or would recover fully within two years.

223. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of potentially affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition **will not be hindered** by temporary increases in SSC and subsequent deposition effects related to the operation of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.2.3 Changes to Bedload Sediment Transport

224. Presence of Offshore Export Cable protection measures within the nearshore environment could potentially result in changes to bedload sediment transport in the region, affecting the Spurn Head geological feature of the site. **Volume 7, Chapter 8 Marine Physical Environment (application ref: 7.8)** provides full details of the assessment of potential coastal process effects in the nearshore.

225. There is potential that burial of the export cables would not practicably be achievable within the nearshore (subtidal) part of the Offshore Export Cable Corridor from the mean low water spring tide mark (130m from the base of the cliffs) to water depths less than 10m due to the presence of chalk bedrock in the shallow subsurface.

226. Interpretation of the nearshore geophysical data has provided an estimate of the anticipated amount of cable protection required in the nearshore subtidal area, approaching the Holderness coast. The data indicates that burial or trenching will be achievable for 90% of the route from the mean low water spring tide level out to the 10m depth contour (approximately 1,050m from mean low water spring). In addition, the Applicants have committed to no cable protection in the intertidal zone and from mean low water spring tide to 350m seaward of this tidal datum (included in the 90% above). At the landfall, the mean low spring tide line is about 130m seaward of the cliffs. This means that from the cliffs to approximately 480m seaward (across the intertidal zone and shallow subtidal zone), the cables will be buried and will have no effect on coastal processes.

227. The effects that export cable protection may have on the marine physical environment primarily relate to the potential for interruption of sediment transport processes and the footprint they present on the seabed. In areas of active sediment transport, any linear protrusion on the seabed may interrupt bedload sediment transport processes in the nearshore and along the coast during the operational phase. Depending on their water depth relative to the prevailing wave and tide regime, any measures in areas closest to the coast have the potential to affect alongshore sediment transport processes and circulatory pathways across any nearshore banks.

228. The seaward limit which marks the effective boundary of wave-driven sediment transport is called the 'closure depth' and can be calculated using the methods of Hallermeier (1978). For the seabed offshore from the landfall, this would typically be in around 6m of water based on the average significant wave heights recorded by the Hornsea buoy. This is approximately 860m from the base of the cliffs.

229. The magnitude of wave driven transport would decrease with distance offshore within the closure depth, with other evidence suggesting that the most active zone for wave-driven sediment transport along the Holderness coast is the intertidal zone. In a study at Easington along south Holderness, HR Wallingford (2011) showed that most of the longshore transport from wave breaking occurs close to the shoreline, within approximately 250m of the cliff line. Seaward of this, the wave-driven sediment transport is effectively zero. Given the similar shore profile gradients at the landfall and Easington (East Riding of Yorkshire Council, 2014) the conclusion can be drawn that the active zone at the landfall is similar in width to that at Easington. Hence, sediment transport driven by waves seaward of 250m from the cliffs at the landfall is very low (although still within the closure depth) and there will be no effect on these processes by the presence of the cable protection structures.

230. The evidence using the closure depth and analogous calculations at Easington shows that there will no interruption of wave-driven alongshore sediment supply to the beaches south of the landfall and to Spurn Head. This is because any export cables across the most active zone of wave-driven sediment transport will be buried (with the Applicants having committed to burial from the base of the cliffs to 480m offshore) and will have no effect on sedimentary processes.

10.2.2.1.3 Physical attributes

231. The following physical attributes of protected features are relevant to water flow (tidal current) changes, including sediment transport considerations:

- Structure: sediment composition and distribution;
- Water flow (tidal current) changes, including sediment transport considerations;
- Supporting processes: sedimentation rate (for subtidal rock features);
- Supporting processes: water quality – turbidity; and
- Supporting processes: sediment movement and hydrodynamic regime.

232. As described above, there will be no interruption to the existing sediment transport processes to the MCZ and the Spurn Head geological feature, with any changes to the sedimentation rate being within the natural range. Therefore, there will be no impact on the physical attributes and targets of Holderness Inshore MCZ features.

10.2.2.2.3 Summary

233. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by changes to bedload sediment transport related to the operation of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.2.4 Invasive Species

234. Artificial hard substrates introduced by the Projects, including cable protection, could act as potential 'stepping stones' or vectors for INNS, as well as supporting species non-native to otherwise soft substrate habitats. This assessment considers the effects of placement of external cable protection and resulting colonisation by faunal communities on the ecological attributes and targets for the three broadscale marine habitat features are most likely to be affected by the introduction of INNS because they have been identified as present where the Projects activities and cable infrastructure are located:

- Subtidal coarse sediment (A5.1);
- Subtidal sand (A5.2); and
- Subtidal mixed sediments (A5.4).

235. The risk of spreading INNS will be mitigated by the same means as discussed in section 10.1.1.2 and these commitments are secured in **Volume 8, Outline Project Environmental Management Plan (application ref: 8.21)** which has been submitted with the DCO application.

236. The impact of invasive species has been defined using the following 'low risk' pressure identified by NE's AoO for the Holderness Inshore MCZ (**Table 6-1**):

- Introduction or spread of invasive non-native species (INNS).

10.2.2.1.4 Biological Attributes

237. The following biological attributes of protected features are relevant to temporary disturbance and habitat loss effects:

- Structure: non-native species and pathogens (habitat)

238. Although the attributes 'Distribution – presence and spatial distribution of biological communities', 'Structure and function: presence and abundance of key structural and influential species' and 'Structure: species composition of component communities' are relevant to colonisation by INNS, impacts on these attributes are already assessed under the biological effects of long-term habitat loss (section 10.2.2.1).

239. NE's AoO states that there are no known records of non-native species or pathogens in areas of intertidal sand and muddy sand within the Holderness Inshore MCZ; however, the Humber / Holderness area is considered to be at risk from non-native invasive species due to the high levels of shipping in the estuary and an associated risk that invasive species could establish easily in the local habitat (Pearce *et al.* 2012).

10.2.2.2.4 Summary

240. INNS may be introduced through the use of vessels and the installation of infrastructure. However, the risk of introduction and spread of INNS will be mitigated through adherence to the relevant regulations and guidance and secured through **Volume 8, Outline Project Environmental Management Plan (application ref: 8.21)**.

241. Furthermore, seabed habitats exist in a mosaic of mixed, coarse and sandy sediments across much of the Offshore Export Cable Corridor within the Holderness Inshore MCZ (**Figure 9-1**). Therefore, the use of external cable protection across small and localised areas along the cable route is not anticipated to change the existing potential for the spread of INNS.

242. Based on the relevant pressures, receptor sensitivity, and assessment of impacts against the attributes of affected Holderness Inshore MCZ features it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by the risks of introduction and spread of INNS related to the development of Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.3 Potential Effects during Decommissioning

10.2.3.1 Temporary Disturbance / Habitat Loss

243. As a worst-case scenario, temporary disturbance and habitat loss within the Holderness Inshore MCZ during the decommissioning phase will be as a result of cable removal activities if deemed to be required at the time of decommissioning based on up to date guidance and consultation with the regulator. Effects would be no greater than, and are expected to be less than, those of the construction phase (section 10.2.1.1) and will affect the same features and attributes.

244. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by temporary disturbance and habitat loss effects related to the decommissioning of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.3.2 Increased Suspended Sediment Concentrations

245. Temporary increases in SSC within the water column, and subsequent deposition on to the seabed may occur during the decommissioning phase as a result of cable removal activities. Effects would be no greater than and are expected to be less than those of the construction phase (section 10.2.1.2) and will be the same features and attributes.

246. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by increased SSC effects related to the decommissioning of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.2.3.3 Invasive Species

247. Introduction of INNS via vessels or hard substrate may occur during the decommissioning phase as a result of cable removal activities. Effects would be no greater than and are expected to be less than those of the construction phase (section 10.2.1.3) and will be the same features and attributes.

248. Based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore MCZ features it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore MCZ in a favourable condition or restoring them to favourable condition will **not be hindered** by invasive species effects related to the decommissioning of the Projects (either in isolation or if both are built concurrently and / or in sequence).

10.3 Cumulative Effects

249. Projects, plans and activities (hereafter referred to as 'schemes') that exist at the time of the Projects' data collection (field surveys, etc.) are considered part of the baseline and are screened out of the cumulative assessment. With respect to the Holderness Offshore MCZ and Holderness Inshore MCZ, this includes commercial fishing activity within the MCZs. Schemes are also screened with reference to their likely spatial and temporal extent and potential for interaction with effects rising from the Projects.

250. The CEA has been based on information available on each relevant scheme as of January 2024. It is noted that the further information regarding the identified schemes may become available in the period up to construction, or may not be available in detail at all prior to construction. The assessment is therefore considered to be conservative, with the level of impacts expected to be reduced compared to those presented here.

251. Schemes have been assigned a tier, based on information used within the CEA. A seven-tier system, based on the guidance issued by Natural England and Defra (Parker *et al.* 2022), has been employed and presented in section 3.4.

252. With respect to these types of schemes, for those that are fully operational (i.e., Tier 1 schemes) at the time of this assessment, the cumulative assessment methodology considers them to be part of the baseline conditions for the surrounding area (and assumes that any residual effect has been captured within the baseline). As such, it is not expected that the Projects would contribute to cumulative effects with these existing activities and, therefore, have not been the subject of further assessment.

253. A review of the other currently planned schemes in the vicinity of the both MCZs has identified schemes that have the potential to interact with the proposed Projects activities are detailed in **Table 10-3**.

Table 10-3 High-Level List of Schemes Screened In / Out for Further Assessment in the Next Stage of the MCZA

Tier	Scheme	Distance to Holderness Offshore MCZ (km)	Distance to Holderness Inshore MCZ (km)	Screening
Offshore Wind Farms				
1	Westermost Rough	2	2	Out
1	Humber Gateway	4	2	Out
2	Triton Knoll	11	>15km	Out
Offshore Wind Farm Cable Corridors				
2	Dogger Bank A	2	2	Out
2	Dogger Bank B	2	2	Out
6	Dogger Bank D*	0 (within)	0 (within)	Out
1	Hornsea 1	1	4	Out
1	Hornsea Project Two	1	4	Out
4	Hornsea Project Four	2	9	Out
Carbon Capture and Storage				
3	Northern Endur-ance CCS (export pipeline)	0 (Within)	0 (Within)	In
Subsea Cables				
6	Eastern Link 2 (EGL2)	5	7	Out

Tier	Scheme	Distance to Holderness Offshore MCZ (km)	Distance to Holderness Inshore MCZ (km)	Screening
1	VikingLink Inter-connector	0 (Within)	>15km	Out
7	Third Eastern Link HVDC cable (TGDC)*	5	7	Out
7	Fourth Eastern Link HVDC cable (E4L5)*	5	7	Out
7	National Grid HND Bootstrap*	0 (Within)	0 (Within)	Out

**Cable route not yet finalised*

254. The schemes are screened with reference to their likely spatial and temporal extent and potential for interaction with effects arising from the Projects.

255. The southern North Sea is a mature area of oil and gas development with wells and production platforms producing from primarily gas reservoirs and exporting via pipelines to onshore terminals, such as the Perenco Gas Terminal in Easington on the Holderness Coast. Some of this infrastructure is now undergoing decommissioning as hydrocarbon fields reach the end of their economic life and the rate of new field development declines. However, it is acknowledged that the Oil and Gas Authority continues to award new licences.

256. There is a concentration of pipelines to the south east of the Projects linking southern North Sea gas fields to the Perenco Gas Terminal. These pipelines traverse through the Holderness Inshore and Holderness Offshore MCZs on route to Perenco Gas Terminal. The pipelines relevant to this assessment are:

- Centrica operated Easington to Rough 47/3B 36 inches gas import / export pipeline (PL150);
- Spirit Energy operated Easington to York platform methanol pipeline (PL2918);
- Perenco operated West Sole to Easington gas pipeline (PL28); and

- Gassco operated Langeled pipeline Sliepner Rise to Easington (PL2071).

257. All of the above pipelines run from Easington in a fanning out direction through the Holderness Inshore and Holderness Offshore MCZs (Figure 16.1 of **Volume 7, Chapter 16 Infrastructure and Other Users (application ref: 7.16.1)**).

258. The aforementioned pipelines are all in operation and no detail on the planned timescales or nature of decommissioning activities is available at the time of writing. Therefore, the potential impacts from decommissioning are not assessed. In terms of potential ongoing impacts, as noted above these assets are considered part of the baseline and are screened out of the cumulative assessment.

259. Other offshore wind farms in the vicinity of the MCZs have been screened out of further assessment due to construction being complete on these schemes prior to the Projects' construction beginning, or the schemes being located too far from the MCZ for any potential cumulative effects to occur.

260. Subsea cables have been screened out due to the cables already being operational, or being located at such a distance that cumulative effects with the Projects will not occur.

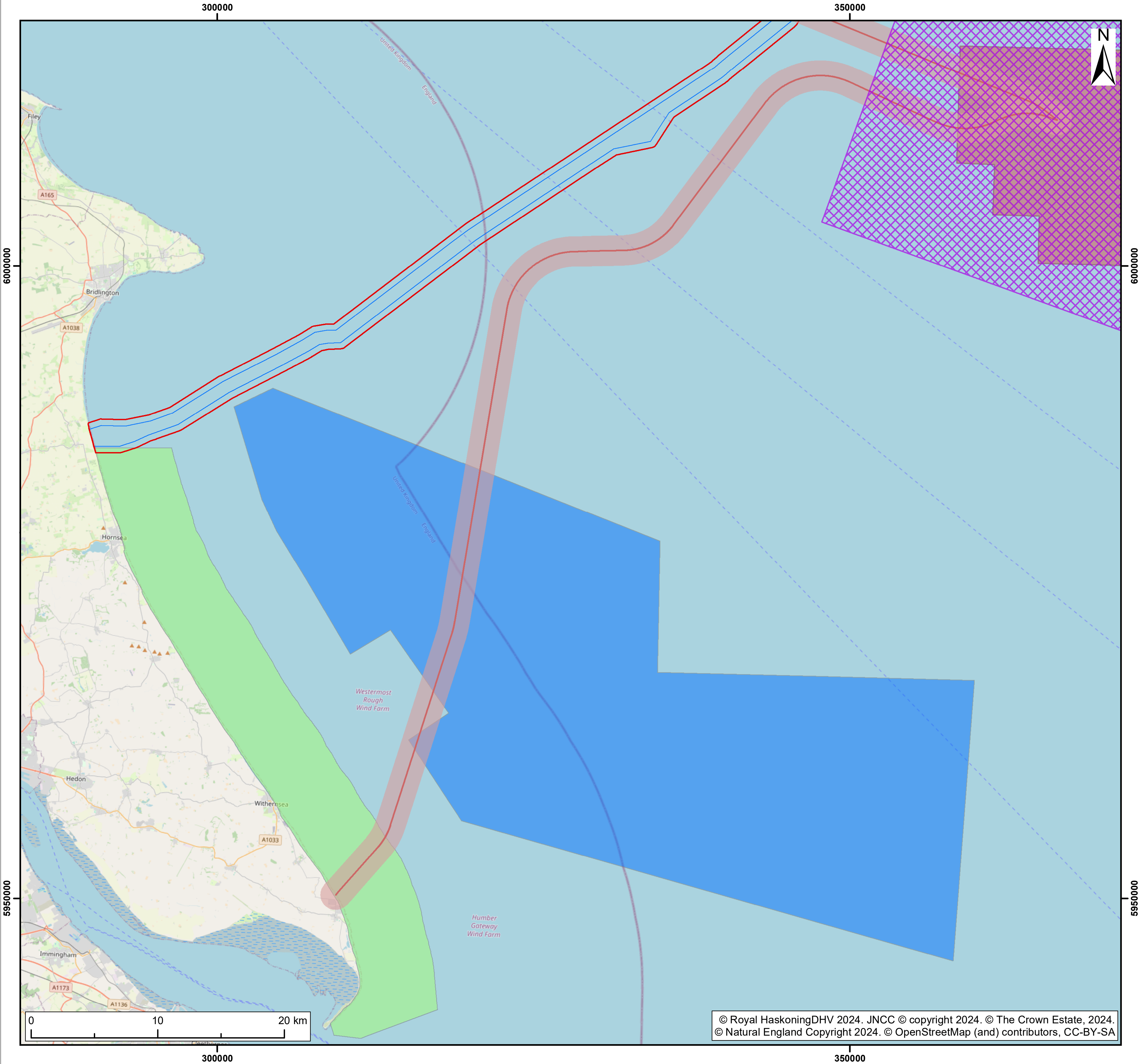
10.3.1 Northern Endurance Carbon Capture and Storage

261. Located approximately 2.3km south-east of the Offshore Export Cable Corridor at its nearest point is the proposed site of Northern Endurance CCS scheme. The associated pipelines are proposed to run from Redcar, Teesside and from Easington, Hull. Installation of the pipelines and seabed infrastructure for the project is scheduled to commence in 2024, with the first CO_2 injection anticipated to take place in 2026 (Xodus, 2021).

262. The Northern Endurance CCS submitted scoping in April 2022 and is currently in the process of submitting a DCO. This pipeline from Easington runs through the Holderness Inshore and Holderness Offshore MCZs and as part of the DCO application it is expected to submit a MCZA.

10.3.2 Cumulative Effects Assessment

263. **Figure 10-1** shows the location of the Northern Endurance CCS pipeline and its corridor through the Holderness Inshore and Holderness Offshore MCZ.



Legend:

- Offshore Development Area
- Offshore Export Cable Corridor
- Carbon Capture Storage Site
- Holderness Inshore MCZ
- Holderness Offshore MCZ

Northern Endurance CCS Project

- Proposed Route
- Proposed Corridor
- Geological Store

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S2	P01	12/03/2024	Suitable for Information	JH	SB	CC

Title:
Northern Endurance Carbon Capture and Storage Pipeline Route Within the Holderness Inshore and Holderness Offshore MCZ

Figure: 9-1 | Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0781

Co-ordinate system: WGS 1984 UTM Zone 31N | Page Size: A3 | Scale: 1:300,000

Project: Dogger Bank South Offshore Wind Farms

Report: Environmental Statement

Royal HaskoningDHV
Enhancing Society Together
RWE

10.3.2.1 Increased Suspended Sediment Concentrations

264. As described in sections 10.1.1.1 and 10.2.1.2, the majority of the sediment mobilised by the Projects' activities would settle out of suspension rapidly to the bed, redepositing within 20m of the works, with almost all the remainder (fine sand fraction) settling within 100m, to a maximum height of approximately 3cm. Elevated SSC will be within the range of background nearshore levels and will be lower than those concentrations that would develop during storm conditions. Suspended sediment from O&M activities at Northern Endurance CCS would redeposit in a similar manner to the Projects and would be in discrete locations within the Holderness Inshore and Holderness Offshore MCZs. The overall volumes of sediment disturbed would be spread across the operational lifetimes of the Projects and Northern Endurance CCS. Therefore, while there is potential for increased temporal disturbance, the individual areas affected by O&M activities would be minimal.

265. Once activities are completed, tidal currents are likely to rapidly disperse the suspended sediment. Biological communities recorded in the Projects' offshore export cable corridor have either Low sensitivity to the pressures associated with temporary increases in SSC and subsequent deposition or are Not Sensitive.

266. Given the short term and localised extent of effects, cumulative effects with the activities of other projects are not anticipated and it can therefore be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore and Holderness Offshore MCZs in a favourable condition or restoring them to favourable condition will **not be hindered** by cumulative increases in SSC.

10.3.2.1.1 Changes to Bedload Sediment Transport

267. As described in section 10.2.2.3, there will be no interruption of wave-driven alongshore sediment supply to the beaches south of the landfall and to Spurn Head resulting from the presence of any potential cable protection measures for the Projects.

268. The Northern Endurance CCS pipeline is projected to make landfall in close proximity to the Spurn Head geological feature (BP, 2023). Due to the greater potential for potential changes to bedload sediment transport to that could result from any pipeline protection measures, the project has committed to no rock protection landward of 10m Lowest Astronomical Tide. As such, there exists no potential for cumulative effects on changes to bedload sediment transport between the Projects and the Northern Endurance CCS pipeline.

269. Therefore, based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore and Holderness Offshore MCZs features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore and Holderness Offshore MCZs in a favourable condition, or restoring them to a favourable condition will **not be hindered** by changes to bedload sediment transport.

10.3.2.2 Invasive Species

270. As described in sections 10.1.1.2 and 10.2.1.3, INNS may be introduced through the use of vessels and the installation of infrastructure. The risk of introduction through the use of vessels will be mitigated through adherence to relevant regulations and guidance and secured through **Volume 8, Outline Project Environmental Management Plan (application ref: 8.21)**. The introduction of artificial hard substrates, namely the external export cable protection, could act as 'stepping stones' or vectors for INNS.

271. Introduction and spread of INNS would be similar for the Northern Endurance CCS, and would have a similar effect as the Projects' Offshore Export Cable Corridor. Therefore, while there is potential for increased disturbance, the areas affected by both projects would be minimal.

272. Therefore, based on the relevant pressures, receptor sensitivity, and assessment of effects against the attributes of affected Holderness Inshore and Holderness Offshore MCZs features, it can be concluded that the conservation objective of maintaining the protected features of the Holderness Inshore and Holderness Offshore MCZs in a favourable condition, or restoring them to a favourable condition will **not be hindered** by the risks of introduction and spread of INNS.

11 Conclusion

273. Based on the information presented in the preceding sections, which include assessments on the relevant broadscale habitats and features of geological interest, it can be concluded that the conservation objective of maintaining the protected features of the MCZs in favourable condition, or restoring them to favourable condition, will **not be hindered** by the construction, operation and decommissioning phases of the Projects, or cumulatively with any other plan, project or activity.

274. Based on the outcome of this Stage 1 Assessment, no further stages of MCZA are required.

References

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