Outer Dowsing Offshore Wind

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Without Prejudice Benthic Compensation Strategy

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Table of Contents

List of tables

List of figures

Abbreviations

Acronym	Expanded name
AEoI	Adverse Effect on Integrity
BEIS	Department for Business, Energy & Industrial Strategy (now the Department for Energy Security and Net Zero (DESNZ))
BESS	British Energy Security Strategy
CBRA	Cable Burial Risk Assessment
Cefas	Centre for Fisheries, Environment and Aquaculture Science
COWSC	Collaboration on Offshore Wind Strategic Compensation
CSCB	Cromer Shoal Chalk Beds
DAS	Discretionary Advice Service
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero, formerly Department of Business, Energy and Industrial Strategy (BEIS), which was previously Department of Energy & Climate Change (DECC)
DEP	Dudgeon Extension Project
dML	deemed Marine Licence
EC	European Commission
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EIFCA	Eastern Inshore Fisheries and Conservation Authority
ENORI	Essex Native Oyster Restoration Initiative
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Technical Group
EU	European Union
HHW	Haisborough, Hammond and Winterton
HRA	Habitats Regulations Assessment
IDRBNR	Inner Dowsing, Race Bank, and North Ridge
JNCC	Joint Nature Conservation Committee
MCZ	Marine Conservation Zone
MEEB	Measures of Equivalent Environmental Benefit
MINNS	Marine Invasive Non-Native Species
MPA	Marine Protected Area
MMO	Marine Management Organisation
MRF	Marine Recovery Fund
NGO	Non-Governmental Organisation
NFFO	National Federation of Fishing Organisations
NNSSR	North Norfolk Sandbanks and Saturn Reefs
OWF	Offshore Windfarm
pSAC	possible SAC
PEIR	Preliminary Environmental Information Report
RLB	Project Red Line Boundary RLB
RAG	Red-Amber-Green
RIAA	Report to Inform Appropriate Assessment

Acronym	Expanded name
SAC	Special Area of Conservation
SCI	Site of Community Importance
SEP	Sheringham Shoal Extension Project
SG	Steering Group
SNCB	Statutory Nature Conservation Bodies
SoS	Secretary of State
WNNC	Wash and North Norfolk Coast

Term	Definition
Array area	The area offshore within the PEIR Boundary within which the generating stations (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling are positioned.
Baseline	The status of the environment at the time of assessment without the development in place.
Benthic subtidal and intertidal ecology study area	The benthic subtidal ecology study area is defined by a buffer of approximately 10km at landfall to 15km from the offshore ECC and 12km from the array, to represent the tidal ellipse distance, in order to incorporate the maximum distance sediments may travel in one tidal cycle. The benthic intertidal ecology study area is defined by the intertidal habitats up to the MHWS mark within the PEIR boundary.
deemed Marine Licence (dML)	A licence administered under the Marine and Coastal Access Act 2009. The licence set out within a Schedule within the Development Consent Order (DCO).
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Department for Energy Security and Net Zero (DESNZ).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Landfall	The location at the land-sea interface where the offshore export cable will come ashore.
Mitigation	Mitigation measures, or commitments, are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.

Outer Dowsing Offshore Wind	The Project.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Preliminary Environmental Information Report (PEIR) Boundary within which the export cable running from the array to landfall will be situated.
Preliminary Environmental Information Report (PEIR)	The PEIR is written in the style of a draft Environmental Statement (ES) and provides information to support and inform the statutory consultation process in the pre-application phase. Following that consultation, the PEIR documentation will be updated to produce the Project's ES that will accompany the application for the Development Consent Order (DCO).
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses *etc*.
PEIR Boundary	The PEIR Boundary is outlined in Figure 3.1 of Volume 1, Chapter 3: Project Description and comprises the extent of the land and/or seabed for which the PEIR assessments are based upon.
Statutory consultee	Organisations that are required to be consulted by the Applicant, the Local Planning Authorities and/or The Inspectorate during the pre-application and/or examination phases, and who also have a statutory responsibility in some form that may be relevant to the Project and the DCO application. This includes those bodies and interests prescribed under Section 42 of the Planning Act 2008. Not all prescribed bodies and interests will be statutory consultees (see non-statutory consultee definition).
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
The Project	Outer Dowsing Offshore Wind including proposed onshore and offshore infrastructure.
Subsea	Subsea comprises everything existing or occurring below the surface of the sea.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

1 Without Prejudice Compensation Strategy - Benthic

1.1 Introduction

1.1.1 GTR4 Limited (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant' is proposing to develop Outer Dowsing Offshore Wind (the Project), which will be located approximately 54km offshore from the Lincolnshire coastline in the southern North Sea. The offshore Export Cable Corridor (Offshore ECC) is currently planned to run from the array area to landfall at Wolla Bank on the Lincolnshire coast and the total export cable length is expected to be 514.8km. The final proposed Offshore ECC has been developed through extensive route selection and evaluation work, taking into consideration environmental and engineering constraints. Based on this detailed analysis and site selection, the final route passes through the Inner Dowsing, Race Bank, and North Ridge (IDRBNR) Special Area of Conservation (SAC). The Offshore ECC overlaps with 70.1km^2 of the SAC (8.3% of the total SAC).

1.1.2 The Applicant will be applying for a Development Consent Order (DCO), supported by a range of plans and documents including an Environmental Statement (ES) which will set out the results of the Environmental Impact Assessment (EIA). The Applicant is also submitting a Report to Inform Appropriate Assessment (RIAA), which sets out the information necessary for the competent authority to undertake a Habitats Regulations Assessment (HRA) to determine if there is any Adverse Effect on Integrity (AEoI) on the national site network. Prior to the Application, the Applicant has drafted the Preliminary Environmental Information Report (PEIR) which is accompanied by a draft RIAA. This document has been prepared to support the draft RIAA.

Without Prejudice Derogation Preparation

1.1.3 Whilst the Applicant is confident that a conclusion of no AEoI can be reached through the development of the Project design and mitigation, in acknowledgement of the previous decisions and taking account of the advice provided by Natural England as to the risk of an AEoI for this site and the relevant features, a 'without prejudice' derogation case is being developed for this site.

1.1.4 As part of the process of developing the 'without prejudice' derogation case, the Applicant has developed a 'longlist' of possible compensation options based on the existing Project proposal, precedence with HRA derogation matters in the UK and stakeholder feedback received to date. These longlisted options are discussed in the Benthic Longlist Compensation Options Report (Document reference 123-ODO-CON-K-RA-000004-01).

1.1.5 The longlist options have been narrowed down to a shortlist by applying a ranking criteria assessment (otherwise known as a Red-Amber-Green (RAG) assessment) (Appendix A – Benthic Compensation Rating Approach). The shortlisted options were presented to the benthic compensation Expert Topic Group (ETG) as part of the Evidence Plan Process (EPP), with the feedback received summarised in Section 1.4.

1.1.6 Based on recent DCO decisions by the Secretary of State (SoS) on other Offshore Windfarms (OWFs) (Hornsea Three, Norfolk Vanguard and Norfolk Boreas), it is considered that crossing designated sandbanks poses a risk of a conclusion of an AEoI on the IDRBNR SAC, where rock-based cable protection may be required over the cables. A preliminary Cable Burial Risk Assessment (CBRA) has been undertaken by the Project for the section of the cable route which passes through the Inner Dowsing, Race Bank and North Ridge SAC. This is helping to further define the approach to cable installation as well as informing the requirement or otherwise for cable protection material over the designated sandbank features within the SAC site and the type, design and installation process for any such protection.

1.1.7 The Project intends to discuss the outcomes of the CBRA with stakeholders throughout the remaining pre-application period, principally through the EPP, in determining the Project design including (where a need is identified) such options for alternative, feasible cable installation and protection techniques that would demonstrably avoid any adverse effects on the integrity of the sandbank features. Future phases of the Project design will subsequently inform the RIAA that will accompany the DCO Application, and which will set out in full the assessment of the potential AEoI on the SAC sandbank features.

Purpose of this Document

1.1.8 This document outlines the findings from the ranking of the longlist, briefly discusses the shortlisted options, and discusses the proposed road map and strategy towards developing the final compensation options to support the 'without prejudice' derogation case in relation to:

- Potential physical disturbance/loss of sandbanks slightly covered by sea water all the time (hereafter referred to as 'sandbanks') at IDRBNR SAC resulting from the installation of cable protection material on the offshore export cables in those parts of the SAC where they cross the designated sandbank features.

1.1.9 The Project currently considers it unlikely that cable protection will be required over sandbank features within the IDRBNR SAC during the construction phase of the development. However, further engineering analysis work is ongoing in relation to the cable burial approach. Therefore, the Project is developing plans for compensation on a 'without prejudice' basis.

1.1.10 The Applicant notes that under European Commission (EC) guidance (European Commission, 2018) the compensation should normally be in place before the effect on the designated feature takes place; however, it acknowledges that there may be situations where it will not be possible to meet this condition. The guidance goes on to say that "best efforts should be made to ensure that compensation is in place beforehand and, in the case this is not fully achievable, the competent authorities should consider extra compensation for the interim losses that would occur in the meantime".

1.2 IDRBNR SAC

Overview

1.2.1 The IDRBNR SAC covers an area of 845km^2 and is located off the south Lincolnshire coast, extending eastwards and north from the Burnham Flats on the North Norfolk coast, occupying the Wash Approaches. As this site straddles the 12nm limit, advice is jointly delivered between the Joint Nature Conservation Committee (JNCC) and Natural England.

1.2.2 The IDRBNR SAC encompasses a wide range of sandbank types and biogenic reef (JNCC and Natural England, 2010) and has therefore been designated for two Annex 1 habitat protected features:

- 1170 Reefs; and
- 1110 Sandbanks which are slightly covered by sea water all the time.

1.2.3 Biogenic reef created by the Ross worm *Sabellaria spinulosa* has consistently been recorded within the site. These reefs are known to support a variety of species including hydroids, sponges, bryozoans, anemones, as well as the commercial species European lobster *Homarus gammarus* and pink shrimp *Pandalus montagui*. Biogenic reefs formed by *S. spinulosa* allow colonisation by species not otherwise associated with the adjacent, looser sediment habitats.

1.2.4 The main sandbank features occur within the Wash Approaches, the Race Bank-North Ridge-Dudgeon Shoal system and at Inner Dowsing. The tops of the sandbanks are characterised by communities of polychaetes and amphipods. The trough areas between these sandbank features are composed of mixed and gravelly sands.

Conservation Objectives

1.2.5 The conservation objectives apply to the site and individual species and/or assemblage of species for which the site has been classified (the Annex 1 habitat features listed above). The conservation objectives for the site are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of the qualifying species;
- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of the qualifying species;
- the supporting process on which qualifying natural habitats and the habitats of qualifying species rely;
- the population of each of the qualifying species; and
- the distribution of qualifying species within the site.

1.2.6 The condition of the protected Annex I habitat features were last reviewed in August 2019 and were both assessed as ‘Unfavourable: No Change’, meaning that the state of the features were unfavourable but were neither declining or recovering.

Favourable Condition

1.2.7 'Favourable condition' is the term used in the UK to represent 'Favourable Conservation Status' for the interest features of SACs. For an Annex 1 habitat, 'Favourable Conservation Status' occurs under the Habitats Directive[1] (JNCC and Natural England, 2010) when:

- its natural range and the area it covers within that range are stable or increasing;
- the specific structure and function, which are necessary for its long-term maintenance, exist and are likely to continue to exist for the foreseeable future; and
- the conservation status of its typical species is favourable.

1.2.8 Favourable condition of Annex I Sandbanks which are slightly covered by seawater all the time and Annex I Reefs is based on the long-term maintenance of the following (JNCC and Natural England, 2013):

- extent of the habitat (and elevation and patchiness for reef);
- diversity of the habitat;
- community structure of the habitat (population structure of individual species and their contribution to the function of the habitat); and
- natural environmental quality (e.g., water quality, suspended sediment levels).

Existing Pressures

1.2.9 The IDRBNR sandbank and reef features are currently vulnerable to:

- Physical loss by removal (aggregate dredging) and obstruction (oil, gas, and windfarm infrastructure) (moderate level – sandbank, high level – reef); and
- Physical damage by surface and shallow abrasion (demersal fishing, aggregate dredging (moderate level – sandbank, high level – reef).

1.2.10 Therefore, to fulfil the conservation objectives for these Annex I features, the Competent Authorities for this area are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of the site's features from the pressures outlined above (JNCC and Natural England, 2013).

[1] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora.

Potential Effect on the IDRBNR SAC

1.2.11 Any known areas of *S. spinulosa* reef are to be considered in the offshore export cable routing process. During the baseline characterisation of the Offshore ECC (see Volume 2, Appendix 9.2: Benthic Ecology Technical Report (ECC)), all *S. spinulosa* aggregations were classified as 'Not a reef' in line with the criteria in Gubbay *et al.,* (2007), Hendrick and Foster-Smith (2006) and Limpenny *et al.,* (2010). However, whilst the ground-truthing data have concluded that aggregations of *S. spinulosa* identified within the samples were classified as 'Not a reef', the overall extent of potential *S. spinulosa* features cannot be cross-checked with the geophysical data because of the lack of unique signatures within this data. As a result, a precautionary approach has been applied to this characterisation whereby it is assumed that *S. spinulosa* reef occurs in some form. Therefore, it is proposed that a pre-construction survey will be undertaken within the IDRBNR SAC to re-assess for potential Annex 1 reef. If found at the pre-construction phase, it is currently considered that these features could be avoided through the micro-siting of the cables within the overall Offshore ECC, where practicable. However, the proposed offshore ECC also passes across two of the designated sandbank features within the SAC: the North Ridge sandbank and the Inner Dowsing sandbank, where micro-siting cannot be achieved (Figure 1.1).

1.2.12 The features of the IDRBNR SAC were identified as being "red" category features within the Round 4 Plan-Level HRA (The Crown Estate, 2022), in part due to the feature condition being considered to be 'unfavourable' with a conservation objective to 'restore feature to favourable condition'. In addition, Natural England's marine condition assessment (available within the online conservation advice package reports) that 33% of the sandbank feature has been assessed and categorised as 'unfavourable' status (Natural England, 2019) based on the limited attributes that were assessed (not limited to 'restore' attributes). Specifically, this appears to be due to the failure of the site to achieve its general management targets set as restoring the total extent and spatial distribution of subtidal sandbanks, restricting surface sediment contaminant levels, and maintaining all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered.

1.2.13 Therefore, causing an adverse impact on the attributes listed here, and/or impairing the ability for management targets to be met, could lead to a conclusion of AEoI to the IDRBNR SAC.

1.3 Compensation Approach

1.3.1 To allow for sufficient time to engage with stakeholders and develop robust 'without prejudice' compensation plans and supporting evidence, the Project is investigating the feasibility of compensation options during the pre-application period. However, it should be noted that these workstreams are not intended to prejudice the outcome of the ongoing HRA process. The final conclusions relating to AEoI and the need for and form of any derogation case will be provided as part of the DCO application.

Guidance

1.3.2 Should the SoS conclude that an AEoI cannot be ruled out and that there are no alternative solutions, Article 6(4) of the Habitats Directive *"requires that all necessary compensatory measures are taken to ensure the overall coherence of the network of European sites as a whole is protected."*

1.3.3 Ideally, compensation should be functioning before the effects takes place, although it is recognised that this may not always be possible, as stated in the EC Guidance (2012): *"in principle, the result of implementing compensation has normally to be operational at the time when the damage is effective on the site concerned. Under certain circumstances where this cannot be fully fulfilled, overcompensation would be required for the interim losses."*

1.3.4 The draft (2023) National Policy Statement for Renewable Energy Infrastructure (EN-3) states that applicants should refer to the latest Defra compensation guidance. Defra (2021) draft best practice guidance for developing compensatory measures in relation to Marine Protected Areas (MPAs) sets out the following principles that compensation should satisfy:

- Link to the conservation objectives for the site or feature and address the specific damage caused by the permitted activity;
- Focus on providing the same ecological function for the species or habitat that the activity is damaging OR, where this is not technically possible, provide functions and properties that are comparable to those that originally justified designation;
- Not negatively impact on any other sites or features;
- Ensure the overall coherence of designated sites and the integrity of the MPA network; and
- Be able to be monitored to demonstrate that they have delivered effective and sustainable compensation for the impact of the project. The monitoring and management strategy must require further action to be taken if the compensation is not successful.

1.3.5 In relation to the second bullet point above, the guidance provides a hierarchy approach (see Table 1.1).

Table 1.1 Compensation hierarchy (Source: Defra, 2021)

Hierarchy of Measures	Description
1. Address same impact at same location.	Address the specific impact caused by the permitted activity in the same location (within the site boundary)
2. Same ecological function different location	Provide the same ecological function as the impacted feature; if necessary, in a different location (outside of the site boundary)
3. Comparable ecological function same location	Provide ecological functions and properties that are comparable to those that originally justified the

Hierarchy of Measures	Description
	designation in the same location as the impact (within the site boundary)
4. Comparable ecological function different location	Provide ecological functions and properties that are comparable to those that originally justified designation; if necessary, in a different location (outside of the site boundary)

1.3.6 The guidance states that the compensation should be secured before the impact takes place, recognising that ideally the compensation would be functioning prior to construction but that this is not always possible: "*Where this is not possible, it is important that necessary licences are in place, finances are secured, and realistic implementation plans have been agreed with the appropriate bodies to demonstrate that the compensatory measure is secured*."

Longlist

1.3.7 The first stages of the "without prejudice" benthic compensation strategy involved reviewing all OWF projects that have proposed an equivalent compensatory measure to date. A longlist was collated based, in part, on the compensation provided as part of previous OWF derogation cases. This focused primarily on projects that have submitted DCO applications within the southern North Sea region as these are located within the same geographic regions as the Project and are likely to impact similar features and sites.

Shortlist Ranking System

1.3.8 From the longlist, each compensation option was evaluated using a set of criteria established drawing from the principles outlined by Defra (Defra, 2021). Seven ranking criteria were developed, which aimed to fairly rate each measure to produce a shortlist of the most viable options (see Table in Appendix A). This provided a clear, replicable and robust method to rank compensation options relative to each other.

1.3.9 Each rating criterion was scored on a scale of 1 (lowest) to 5 (highest). The scores were summed for all seven criteria for each compensation measure to provide a final score. This final score was then used to rank all the measures.

1.3.10 The Benthic Compensation Rating Approach is presented within Appendix A – Benthic Compensation Rating Approach. This outlines the methodology and rationale used to develop a longlist of compensation options for the sandbanks feature of the IDRBNR SAC. This was followed by a shortlisting process that uses a rating system to fairly rank the compensation options based on guidance from Defra (Defra, 2021). Full details of the shortlisting scores and rationale are presented in the accompanying Scoring Matrix (Appendix B – Benthic Compensation Longlist Scoring Matrix).

1.3.11 Table 1.2 shows the "Red, Amber, Green" (RAG) assessment results for the longlist compensation options for IDRBNR SAC sandbanks, of which five ranked as green (high scoring), six ranked as amber (intermediate scoring) and five ranked as red (low scoring). Only the green options were taken forward to the shortlist and discussed further in the Benthic Compensation Shortlist Report (123-ODO-CON-K-RA-000005-01).

Table 1.2: RAG scores for sandbank compensation options

Compensation option	RAG Score
Extend the IDRBNR SAC - sandbanks	GREEN
Redundant infrastructure removal	GREEN
Marine debris removal	GREEN
Marine debris reduction awareness and engagement	GREEN
Re-creation of biogenic reef	GREEN
Further fisheries management	AMBER
Marine activity restrictions	AMBER
Aggregate dredging activity management	AMBER
Removing marine non-native species	AMBER
Extend the IDRBNR SAC - *S. spinulosa* reef	AMBER
Enhancement of *S. spinulosa* reef	RED
Enhancement of sandbanks	RED
Establish a new site (with appropriate management)	RED
Management of physical and chemical processes	RED
Management of navigational and maintenance dredging methods	RED

1.3.12 The options ranked as Green in the RAG assessment were taken forward to the shortlist and detailed further within this "without prejudice" benthic compensation strategy:

- Extend the IDRBNR SAC – sandbanks.
  - This option refers to changing the boundary (extending the area) of the IDRBNR SAC to include an additional area of qualifying sandbank habitat.
- Redundant infrastructure removal.
  - This option refers to the identification and removal of existing redundant/disused infrastructure that would not normally be removed that is laid on the surface of the sandbank habitat within a SAC designated for sandbanks in the region (if not the IDRBNR SAC).
- Marine debris removal.
  - This option refers to the removal of marine debris within the boundary of the IDRBNR SAC e.g., lost or abandoned anthropogenic material on the seabed, including lost and abandoned fishing gear and debris lost from vessels.
- Marine debris reduction awareness and engagement.

- This option aims to develop prevention methods to reduce the instances of debris entering the marine environment.

- Re-creation of biogenic reef.
  - This option refers to the introduction of biogenic reef habitat to the IDRBNR SAC.

Strategic Compensation

1.3.13 One of the principal challenges for developers in relation to derogation is identifying and securing robust compensatory measures which are acceptable to regulators and Statutory Nature Conservation Bodies (SNCBs). To address this challenge, Defra is proposing to "*develop a library of ecologically robust strategic compensatory measures in partnership with industry and environmental stakeholders that are commercially feasible and deliverable*" (Defra, 2022).

1.3.14 Defra (2022) defined 'strategic compensatory measures' as measures "*that work across a wide area, joining-up across projects and organisations to deliver an ecological benefit greater than the sum of its parts and/or measures that can only be delivered by Government (e.g., enhanced protection of MPAs).*"

1.3.15 The Project understands that Natural England regard strategic compensation as highly ecologically effective and could provide a solution to species or habitats impacted by multiple offshore windfarms. Furthermore, the recently published British Energy Security Strategy (BESS) commits to speeding up the deployment of offshore wind and the measures proposed in the Offshore Wind Environmental Improvement Package policy paper, including strategic compensatory measures and a centralised Marine Recovery Fund (MRF) will aim to help facilitate delivery of those measures.

1.3.16 The proposed MRF would provide a framework allowing developers to deliver strategic compensation in a coordinated way through voluntary contributions to the fund. The MRF will provide a mechanism for the delivery of such strategic compensation measures, with appropriate input from regulators and SNCBs. This coordinated approach will allow ecological benefit to the national site networks to be maximised and delivered in a timely manner. It is understood that the MRF will be fully functional and available to developers in late 2023.

1.3.17 The MRF is, therefore, considered to be a relevant option for delivering compensation for the Project where this is ultimately required noting that the final scope, measures, and mechanism of the MRF are yet to be developed. Nonetheless, the Project is seeking to align the overall compensation strategy with the emerging MRF, whilst continuing to develop, where feasible, the project-specific compensation proposals so these can be relied upon if required.

1.3.18 In July 2021. Defra published draft best practice guidance for developing compensatory measures in relation to MPAs (Defra, 2021). Whilst this guidance does not mention strategic compensation, it does state that: "*On rare occasions it may be that other measures delivering wider ecological systems benefits will be the only option for compensation. These opportunities should be identified through developer discussions with SNCBs during the pre-application discussions. Delivery of these measures is likely to be through collaborative action between several developers in an area and with the agreement of the SNCBs.*"

Recent Examples

1.3.19 A number of recent consent decisions have required the delivery of compensation measures for benthic features (primarily sandbank features) due to the potential need for cable protection on the sandbank features of various SACs in the southern North Sea. This includes Hornsea Three, Norfolk Vanguard and Norfolk Boreas, with details of the measures required provided below. Dudgeon Extension and Sheringham Extension have considered the need to provide Measures of Equivalent Environmental Benefit (MEEB) for impacts from cable protection through the Cromer Shoals Marine Conservation Zone (MCZ) and is also discussed below.

1.3.20 These projects evaluated a range of compensation measures throughout the pre-application, examination and post-examination phases, providing evidence on the feasibility and effectiveness of the measures to the SoS, however, to date, only measures relating to the recovery of marine debris and reduction of marine debris and education have been required within the determined consents.

1.3.21 The measures initially proposed by those projects align with those considered for the Project; those measures included on the short-list for Hornsea Three, Norfolk Vanguard and Norfolk Boreas include:

- Blue mussel bed restoration;
- Removal of, and awareness raising in relation to, marine debris;
- Retention of dredged material within the relevant sandbank systems;
- Establishment of a new biogenic reef;
- Extending the boundary of SACs to incorporate currently unprotected Annex I habitats; and
- Fisheries management– reduction in intrusive fishing methods.

Hornsea Three

1.3.22 When the SoS granted consent for Hornsea Three OWF on the 31 December 2020, this was the first project in UK waters to be granted a DCO which contained within it a condition to secure compensation for AEoI on a marine SAC. The Appropriate Assessment completed by the former Department for Business, Energy & Industrial Strategy (BEIS) (2020) (now the Department for Energy Security and Net Zero (DESNZ)) as part of the HRA did not rule out AEoI to the North Norfolk Sandbanks and Saturn Reefs (NNSSR) SAC and therefore the consent was issued on the basis of a derogation and compensation was consequently required. The NNSSR SAC is designated for the same two features as the IDRBNR SAC: sandbanks which are slightly covered by sea water all of the time, and *S. spinulosa* reefs. The Appropriate Assessment for Hornsea Three also concluded that an AEoI could also not be ruled out for the Wash and North Norfolk Coast (WNNC) SAC which is also designated for, amongst other features, sandbanks which are slightly covered by sea water all of the time.

1.3.23 Compensation measures required for Hornsea Three were:

- Marine litter removal within the WNNC and NNSSR SACs;
- Marine debris reduction and awareness campaign measures in relation to the WNNC and NNSSR SACs; and
- Disposal of dredged material for retention with the sandbank system of the WNNC and NNSSR SACs.

Norfolk Boreas and Vanguard

1.3.24 During the Norfolk Boreas and Vanguard Examinations, a number of compensation measures were proposed that would address the potential effects of offshore export cable protection material on the Haisborough, Hammond and Winterton (HHW) SAC. The HHW SAC is also designated for sandbanks which are slightly covered by sea water all of the time and *S. spinulosa* reefs. A range of different compensatory measures were developed should the SoS conclude that AEoI on the HHW SAC could not be ruled out as a result of its Appropriate Assessment. The DCOs granted for these projects stipulated the following compensation measures:

- Marine debris removal within the HHW SAC; and
- Marine debris reduction and awareness campaign measures in relation to the HHW SAC.

1.3.25 As the Sheringham Shoal and Dudgeon Extension Projects (SEP and DEP) Offshore ECC passes through the Cromer Shoal Chalk Beds (CSCB) Marine Conservation Zone (MCZ), a Measures of Equivalent Environmental Benefit (MEEB) Implementation and Monitoring Plan for the CSCB MCZ has been proposed, to be finalised and approved prior to the commencement of construction works. The primary MEEB put forward by the Applicant is the restoration of a native oyster bed within the CSCB MCZ (noting that that a proposal for the creation of sediment habitat (which is the impacted feature) was not considered possible given the potential for existing marine conditions to rapidly erode any artificially created banks).

1.3.26 This compensatory measure proposed involves deploying and maintaining a native oyster bed of 10,000m^2 with an average density of five live oysters per m^2. Suitable habitat is considered likely to be present within the MCZ as oyster beds are known to have been present in the area historically; the oyster beds would be protected by the management measures of the MCZ. Further, oyster beds have been successfully planted in other North Sea coastal locations.

1.3.27 The SEP and DEP projects are at the time of writing, in the Examination phase and so no final decision on the required compensation has been made by the SoS.

1.4 Consultation

1.4.1 The Applicant recognised the potential need to develop without prejudice compensatory measures for impacts arising from the Project from an early stage of the development. Consequently, at the outset of the Evidence Plan Process (EPP), an ETG was developed to cover derogation and compensation matters (addressing both benthic and ornithological receptors). This ETG was later split out to enable topic specific compensation discussions to progress within the topic specific ETGs, with benthic compensation considered within the Marine Ecology and Marine Processes ETG. The ETG members were consulted on the longlist and the shortlisted compensation options throughout the development of these. The ETG members are Natural England, the Marine Management Organisation (MMO) and the Centre for Fisheries, Environment and Aquaculture Science (Cefas).

1.4.2 Feedback on the Benthic Compensation Short-List – December 2022 received from the ETG members and Defra, is summarised in Table 1.3.

1.4.3 Following consultation with the ETG, each of the shortlisted compensation options have been further explored in Section 1.5.

Table 1.3: Consultation responses from the benthic compensation ETG.

Consultee	Comment	The Project Response
Natural England Discretionary Advice Service (DAS), December 2022	<u>Conservation Advice</u> Natural England advises that the conservation advice for IDRBNR SAC is in the process of being updated and is expected to be published in draft in March 2023.	This is noted, and this document will be updated with any necessary changes once published.
	<u>RAG Status</u> Natural England doesn't agree with the RAG status given to Marine Debris Removal and Marine Awareness campaign and believe both should score much lower i.e., '1' for 'Extent' and 'Environmental value' due to the inability for them to offset the area of potential habitat change/loss.	Natural England's comment is noted. However, both measures have been kept in this "without prejudice" benthic compensation strategy as they have formed accepted compensation strategy for Hornsea 3 (Ørsted, 2022), and both Norfolk Boreas (Vattenfall, 2021a) and Norfolk Vanguard (Vattenfall, 2021b).
	<u>Extending the IDRBNR SAC – Sandbanks</u> Natural England would be supportive of a compensation measure involving the extension of the IDRBNR SAC. We feel there is sufficient scientific evidence regarding the area proposed for extension to assess the potential ecological merits of the Project compensation package. We consider that there are currently undesignated Annex I habitat habitats that could provide a similar ecological contribution to the MPA network to those impacted. These also have the advantage of being directly adjacent to the SAC and forming part of the same ecological system. Natural England therefore consider that extending the provisions of the Habitats Regulations to a contiguous, but currently unprotected area of equivalent ecological value could have the potential to address the impacts on the SAC and this initiative may also serve as	These points have been considered whilst preparing this "without prejudice" benthic compensation strategy (see Section 1.5). Defra have noted caution in terms of progressing this as an option as this and note any proposals to extend a Marine Protected Area would require full public consultation. However, the Project believe that it is still a potentially feasible compensation option and so have taken the measure forward to this strategy stage and are continuing conversations with Defra.

Consultee	Comment	The Project Response
	compensation/MEEB for impacts of multiple offshore windfarms including Round 4 and extension projects on several SACs/MCZs. At the time of designation, due to the expansive sandbank systems in the southern North Sea, a balance inevitably had to be sought between protecting all the Annex I habitats of equal ecological value, what was required by the Habitats Directive to be protected (representative best quality examples) and ensuring effective management of those areas in relation to anthropogenic activities. Inevitably, this has meant that some of the Annex I habitats in question therefore continue beyond the boundary of the SACs. For example: evidence from a refused OWF application, within the area immediately adjacent to the southern part of IDRBNR SAC shows that Annex I reef and Annex I sandbank systems of the same ecological value to those within the boundaries of the SAC are present. Importantly they also lie in the same sedimentary and hydrographic system as IDRBNR SAC. The protection of this larger area would enable greater ecosystem functionality for the SAC as a whole rather than it just being an inconsequential add on. By extending the SAC the requirements of the Habitats Regulations would then apply to the proposed extension, including the need to put in place management measures where needed. It is the ongoing protection and management of the extension area under the Habitat Regulations, rather than the extension per se, which would seem to provide the ecological benefit. We do appreciate the complexity of identifying compensatory measures in the marine environment and recognise there are some reservations in relation to this proposal, not least in relation to the uncertainties around the designation process. We recommend instigating discussions with	The Project note that there is a government-led workstream within the Collaboration on Offshore Wind Strategic Compensation (COWSC) programme which is specifically focussing on such measures and considering whether these could be included within the forthcoming 'library of compensations measures' and/or delivered within the MRF.

Consultee	Comment	The Project Response
	Defra regarding current thinking around the feasibility of designated site extension as a compensatory measure.	
	<u>Redundant Infrastructure Removal</u> Natural England advises that compensation measures which reduce/remove anthropogenic pressures impacting upon the favourable conservation status of the SAC features are most likely to deliver the compensation requirements from an ecological perspective. This includes the removal of redundant infrastructure which wouldn't normally be removed. However, unless the anthropogenic infrastructure is surface-laid or protected at the surface, we do not consider the removal to provide benefits to the impacted site and therefore constitute compensation. We recognise that there are significant challenges associated with delivering this compensation, which will have implications on the timeframes for delivering compensation. However, we are open to consideration of secured compensation not necessarily delivering prior to works starting, if i) appropriate levels of confidence in the delivery and the effectiveness of the measure is provided and ii) it can be demonstrated that there would be an overall ecological benefit to the SAC over the lifetime of the project.	This is noted, and a redundant pipeline which is laid on the seabed and is currently exposed within the IDRBNR SAC has been identified. Additional evidence in relation to this compensation measure is presented within Section 1.5.
	<u>Marine Debris Removal</u> We refer the Project to the SNCB advice provided to DESNZ (most recently in our January 2022 response regarding Hornsea Three) regarding the ineffectiveness of marine debris removal as a compensation measure in offsetting AEoI from the placement of cable protection. In addition, an SNCB paper will be published in the New Year setting out our position on why we do not believe that the removal of marine debris can be considered as compensation to offset habitat	This advice has been considered within this strategy. The MMO, in consultation with Cefas, have indicated that "the targeted removal of litter and/or measures to prevent litter from entering the marine environment could potentially improve the structure and function of sandbanks within the IDRBNR SAC". The Project have

Consultee	Comment	The Project Response
	change/loss. We also anticipate evidence supporting this position becoming available in the public domain in the near future.	included this option within this "without prejudice" benthic compensation strategy and proposed how this measure could be delivered and monitored (see Section 1.5).
	<u>Marine Debris Reduction Awareness and Engagement</u> Natural England continues to query how it could be demonstrated that an awareness campaign is having the desired positive outcome and is compensating for designated site impacts. In particular, how could it be demonstrated that the awareness campaign has reduced the amount of litter entering the marine environment, and if so has it benefitted the SAC where the compensation is required, and/or sufficiently helped to maintain the coherence of the national site network?	Further details on this compensation option are presented within this document, including information on how a marine debris reduction and awareness campaign could be monitored (see Section 1.5).
	<u>Enhancement/creation of Biogenic Reef</u> Natural England considers that this should be ranked low down as a possible option for sandbank compensation as it is not 'like for like' and therefore doesn't provide the required compensation for Annex I sandbanks. We draw the Project's attention to the 'compensation hierarchy' in the draft Defra best practice guidance. In addition, if this was Annex I reef compensation we would flag that the re-creation of Annex I reef is complex, and further background detail is needed to demonstrate feasibility in a given location, and that it will not be to the detriment of other features in that location. We therefore advise more detail is required on proposals before we can advise further.	This is noted by the Project. In a recent meeting, Defra referred to being more comfortable with a move away from like-for-like where it can be evidenced that like-for-like measures do not exist. Defra are aiming to publish updated final Compensation Guidance by the end of 2023. Therefore, this compensation measure has been included within the "without prejudice" benthic compensation strategy as an option. Within this strategy document, the Project have provided more detail on how the re-creation of Annex I reef could be delivered (see Section 1.5).

Consultee	Comment	The Project Response
	Natural England advises that there are other options which were included on the long list that could have a greater environmental benefit than those on the current short list. But we acknowledge that the options presented are reflective of challenging deliverability issues associated with marine benthic compensation. We continue to advise that other options which remove pressures from the designated site are progressed as they will be needed should the primary option not sufficiently offset the impacts as part of adaptive management.	This is noted, and the Project have provided the feasible options within this "without prejudice" benthic compensation strategy document. It is noted that other measures included in the longlist are not within the power of a single developer and would require regulator lead in many instances and may not pass the additionality test, hence having been excluded for considered within the Project's compensation measures.
	Natural England (and the other SNCBs) advise that marine debris removal and marine awareness campaigns will not sufficiently compensate for habitat change/loss. We also advise that other options are progressed ahead of Annex I reef creation for the loss of Annex I Sandbank habitat as it is not 'like for like'.	Taking into account feedback from Natural England as well as the MMO and Cefas, all options have been included in this "without prejudice" benthic compensation strategy.
MMO and Cefas, Response to benthic shortlist compensation measures, November 2022	In justifying the low ranking given to compensation options that involve protecting or enhancing *Sabellaria* reef, it is noted that this habitat is not a feature of the IDRBNR SAC. However, *Sabellaria* reef is a feature of the IDRBNR SAC. The Applicant should therefore clarify this apparent discrepancy and confirm whether *Sabellaria* reef being a feature of the IDRBNR SAC makes these options suitable for inclusion on the shortlist.	The Project notes this is an error. The longlist scoring in Appendix B – Benthic Compensation Longlist Scoring Matrix and references to this throughout the document has been amended to reflect this.
	<u>Extend the IDRBNR SAC to include additional sandbanks</u> This appears to be a potentially suitable option, providing that the new area of the SAC is managed in a way that removes/mitigates adverse impacts on sandbanks.	A strategy on how the extension could be managed is included in Section 1.5.

Consultee	Comment	The Project Response
	Redundant infrastructure removal This also appears to be a potentially suitable option, providing it can be confirmed that redundant infrastructure is present within the SAC and is having an adverse impact on sandbanks.	Details on the presence of an exposed pipeline within the SAC are included in Section 1.5.
	Marine debris removal / awareness and engagement The MMO, in consultation with Cefas, agree that the targeted removal of litter and/or measures to prevent litter from entering the marine environment could potentially improve the structure and function of sandbanks within the IDRBNR SAC. However, any beneficial effects of such activities may be difficult to quantify, particularly with respect to reducing marine litter through awareness and engagement. It is also questionable as to whether the proposed marine debris-related activities would sufficiently compensate for habitat loss, though this is a question for the relevant SNCB.	This compensation has been included within this "without prejudice" benthic compensation strategy and proposals on how beneficial effects could be quantified are detailed in Section 1.5.
	Enhancement of biogenic reef The MMO, in consultation with Cefas, agree that mussel beds and oyster reefs perform similar functions to *Sabellaria* reefs, and that enhancement/restoration efforts have greater likelihood of success for these habitats than for *Sabellaria* reef. However, several factors may determine the suitability of this option and require consideration. First, any enhancement/restoration efforts would need to target areas with suitable environmental conditions for these habitats, which may or may not be present within the IDRBNR SAC. Second, mussel beds are arguably a more appropriate focus of compensation measures than oyster reefs, as only the former habitat is recognised as 'biogenic reef' under the Habitats Directive. Third, it may be more appropriate to focus compensation efforts on sandbanks than on biogenic reefs (e.g., the options in paragraphs 13 and 14 above), as it appears that the proposed works are only expected to have an impact on sandbanks within the	These points have been noted by the Project and incorporated into Section 1.5 where the strategy towards the delivery of re-creation of biogenic reef as a compensation measure has been put forward.

Consultee	Comment	The Project Response
	IDRBNR SAC. These points are put forward only for consideration and the MMO ultimately defer to the relevant SNCB to identify the most appropriate compensation measures.	
Defra, Compensation meeting, January 2023 Defra	<u>SAC extension</u> Defra advised that there may be significant challenges in progressing this as an option and would need full consideration of impacts on other marine users. Any designation proposal would be subject to full public consultation (which could impact shape of designation). Likely minimum timescales of designation (i.e., delivery of compensation) is 3 years. Defra unable to recommend this as an option as this point but note that work is ongoing to establish a 'library of compensation measures' and this is one option that may be under consideration.	Taking into account feedback from Defra, as well and Natural England, MMO and Cefas, this compensation measure has been included in the "without prejudice" benthic compensation strategy as the Project believe that it is still a potentially feasible compensation option and so have taken the measure forward to this strategy stage (see Section 1.5).
	Defra and ministers advised that non-like-for-like compensation should be progressed only where it can be evidenced that like-for-like measures do not exist.	This is welcomed by the Project and re-creation of biogenic reef has been included in this "without prejudice" benthic compensation strategy, in the event that the like-for-like measure included are not able to be progressed.

1.5 Sandbanks Compensation Strategy

Overview

1.5.1 Following the short-listing process, the following measures have been further developed to explore how each could be delivered, considering:

- The specific benefit of each measure to the National Site Network;
- The expected scale which may be required;
- How the measure would be delivered;
- Specific challenges associated with implementation; and
- Monitoring requirements.

1.5.2 The following sections present information to address the above points for each of the short-listed measures. The four short-listed measures are the following;

- Extend the IDRBNR SAC – Sandbanks;
- Redundant Infrastructure Removal;
- Marine Debris Removal; and
- Re-Creation of Biogenic Reef

1.5.3 Further exploration of the challenges and risks associated with each measure will continue to be undertaken as the Project progresses to Application.

Extend the IDRBNR SAC – Sandbanks

Overview

1.5.4 The protection of currently unprotected Annex 1 sandbank habitat anywhere in the UK could potentially deliver compensation for the Project. However, a key opportunity for the IDRBNR SAC would be to extend its boundary to encompass sandbank outside but next to the current boundary (Figure 1.1). This would align with the EC guidance and Natural England's advice on locating any compensation as close to the point of effect as possible (by contrast to taking action elsewhere). The extension could then be covered by the existing conservation objectives and management measures for the IDRBNR SAC.

1.5.5 There is an area of unprotected sandbank habitat (Docking Shoal bank) between the IDRBNR SAC and the Wash and North Norfolk Coast SAC into which the IDRBNR SAC could be extended in order to protect an additional area of qualifying habitat. Furthermore, a project carried out by Natural England aiming to identify benthic habitats that have similar ecosystem service provision and ecological function (Ward *et al.*, 2022) found that there are areas of sublittoral macrophyte dominated sediment, a sub-type of Annex 1 Sandbanks, off the coast of Lincolnshire, contiguous with the sandbanks within the existing site, which are not currently included within a SAC, see Appendix C.

Value and Function

1.5.6 This measure will ensure that any sandbank habitat loss is offset, or compensated for, by increasing the area of designated sandbanks within the region which will in turn ensure that legal protection is afforded to the newly designated area, thereby maintaining the ecological coherence of the sandbank network in the region. It is also considered to be of high environmental value to other species of conservation importance.

1.5.7 The advice provided by Natural England on the extension of the IDRBNR SAC is that they felt there was sufficient scientific evidence regarding the area proposed for extension to assess the potential ecological merits of the compensation package (Table 1.3). They consider that there are currently undesignated Annex I habitats that could provide a similar ecological contribution to the MPA network to those impacted. These also have the advantage of being directly adjacent to the IDRBNR SAC, forming part of the same ecological system. Similar advice was provided by Natural England for the Norfolk Boreas and Vanguard Examinations on the extension of the HHW SAC.

Objective and Scale

1.5.8 The aim of this potential compensation measure would be to designate the site extension as soon as possible after consent is awarded, however it is noted that the delivery of this measure would be outside of the Project's control and likely would be delivered as a strategic measures. As such, it is possible that delivery of the measure could occur after the impact.

1.5.9 The extent of the area to be designated in comparison to the area lost to any cable protection material will be agreed with Natural England. The ratio of the scale of the extension relative to area of habitat affected by cable protection material will be developed to recognise the fact that the protection of an existing habitat is considered to have a lesser value than the direct creation of new and additional habitat, as well as allowing for overcompensation in the event of any delay between the effect occurring and the delivery of the compensatory measure.

Delivery Process

1.5.10 An extension to the IDRBNR SAC and/or designation of Annex 1 sandbank habitat outside the boundary of the SAC will have to be delivered by Defra in consultation with Natural England and the JNCC. The Applicant would expect to provide support and assistance to the process in a form determined by the DCO decision, in order to deliver the required compensation for the Project.

1.5.11 Based on the consultation undertaken with Natural England to date in relation to these compensatory measures (see Table 1.3), the Applicant understands that Natural England supports this measure in principle.

1.5.12 The Applicant nonetheless currently considers that an extension to the IDRBNR SAC is a feasible measure, noting that the COWSC group is evaluating the feasibility of such a measure. The Applicant recognises that this is a complex and rigorous process and that there is no certainty of the outcome (i.e. designation of the extension) prior to the process starting. It is noted that Natural England and the JNCC have already identified Annex I sandbank habitat in the neighbouring region.

Delivery Time Frame

1.5.13 The aim of this potential compensation measure will be to designate the site extension as soon as possible, however, as noted above, this may occur after the impact.

1.5.14 Recognising that a notified possible SAC (pSAC) and Site of Community Importance (SCI) should be treated as if it has been formally designated or classified at the point that it becomes a possible site, it is considered that it would be sufficient for the site to reach pSAC or SCI status to be considered as constituting compensation. The Applicant would expect to continue to support the measures beyond this point to ensure that the compensation continued to function throughout the Project lifetime.

1.5.15 Promoting an extension to the IDRBNR SAC is considered to have significant advantages over identifying a new site for designation elsewhere, given that it could be brought forward on a shorter timescale. The IDRBNR SAC has clear areas for a potential extension where the Annex I sandbank habitat extends beyond the existing site boundary (Figure 1.1) and has the existing support of Natural England.

1.5.16 The process of delivering the SAC extension as a compensatory measure could be enhanced by the early collection of the evidence required and preparing for consultation on any proposed extension, as well developing a better understanding of any consequential effects on the commercial fisheries industry and other relevant marine users. Defra has advised that the likely minimum timescales for an SAC extension designation is 3 years.

Monitoring and Reporting

1.5.17 Once designated, the management of the extension could be aligned with the existing management measures that are already established for the IDRBNR SAC. The Applicant would expect to support the process of designation, in proportion to the scale of the compensation ultimately required.

1.5.18 The Applicant could, for example, provide monitoring data to support the process, for example by targeted surveys of the sandbank feature within the extension area.

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Humber Estuary
Southern North Sea
Inner Dowsing, Race Bank and North Ridge
The Wash and North Norfolk Coast
North Norfolk Coast

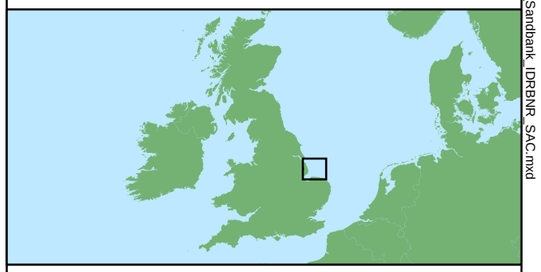
N

Legend

- Array Area
- Offshore Export Cable Corridor
- Special Areas of Conservation

Annex I Sandbanks (Confidence)

- High
- Potential



Coordinate System: WGS 1984 UTM Zone 31N

0 5 10 km

Scale: 1:300,000

Sandbank Habitat Identified Inside and Outside the IDRBNR SAC Boundary

Figure 1.1

OUTER DOWSING OFFSHORE WIND

Date: 31/05/2023
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Revision: 0.1

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Redundant Infrastructure Removal

Overview

1.5.19 As discussed in Section 1.1.10, existing infrastructure (such as cables and pipelines) represent an existing pressure on the IDRBNR SAC. Based on advice from Natural England that artificial features hinder the development of Annex I habitats, the removal of existing out of service infrastructure could remove or reduce an existing pressure on the IDRBNR SAC (thereby providing a compensatory measure).

1.5.20 Natural England has advised that compensation measures which reduce/remove anthropogenic pressures impacting upon the favourable conservation status of the SAC features are most likely to deliver the compensation requirements from an ecological perspective. This could include the removal of redundant infrastructure which would not otherwise be removed. However, unless the anthropogenic infrastructure is surface laid or protected at the surface, they do not consider the removal, *per se*, to provide benefits to the affected site or feature and, therefore, to constitute compensation.

1.5.21 An initial search of the IDRBNR SAC has identified potentially redundant gas/methanol pipelines that run through the northern part of the SAC (Figure 1.2). Preliminary analysis of available bathymetry data, suggests that this infrastructure is exposed, thus providing hard substrate within an otherwise sedimentary environment within the SAC. It is anticipated that other redundant infrastructure within sandbank features could have similar exposures, which demonstrates the potential for this measure to provide compensation for loss of sandbank features.

1.5.22 If this option is further progressed, the Project would prioritise the IDRBNR SAC as an initial area of search and if suitable infrastructure could not be identified, the area of search could then be widened, as agreed with stakeholders, if required.

Value and Function

1.5.23 This measure, if considered feasible and acceptable, would compensate for any sandbank habitat loss by reinstating an area of qualifying habitat within the SAC, with the intention of maintaining the overall ecological coherence of the sandbank. Furthermore, it might also be expected to have a beneficial effect on the local hydrodynamic regime as well as removing hard substrate from areas of the SAC that might otherwise support the development of *S. spinulosa* reef. This measure would be additional to the existing site management measures and is potentially deliverable before the loss of the sandbank feature through cable protection placement occurs.

Objective and Scale

1.5.24 On the basis that this would be a direct like-for-like replacement of equivalent habitat within the SAC, a 1:1 ratio is considered to be appropriate.

1.5.25 It is noted by the Applicant that should the SoS determine that compensation is required and that this should, in part, or wholly be in the form of removal of redundant infrastructure, the SoS may also set the scale of compensation. In case of the Hornsea Three, for example, the SoS inserted a condition within the DCO which dictated that a spatial scale of 41.8ha was required within the NNSSR SAC.

1.5.26 Hornsea Three received consent with the condition stating that the project must subject an area of 41.80ha to removal of marine debris. This scale was determined in order to provide compensation for the worst-case scenario of the loss of up to 418,404m^2 (approximately equivalent to 41.80ha) of habitat within the NNSSRSAC due to cable protection (BEIS, 2000), representing a 1:1 ration of effect to compensation.

1.5.27 When determining the ratio to be applied, consideration would be given to the area of the features affected by cable protection material and the corresponding compensation realised from removal which might be greater than simply the area directly occupied by the pipeline. For example, a large pipeline sitting proud of the seabed could be affecting at least 10m either side of that structure, through scour and disruption to physical processes. By comparison, cable protection installed by the Project would be low profile and therefore only affect a small area of such indirect effect.

Delivery Process

1.5.28 Agreement from the owner of any seabed infrastructure is an obvious precursor to the feasibility of this sort of compensatory measure. In addition, extensive feasibility studies would need to be completed to determine the practicalities of how the removal could be safely achieved.

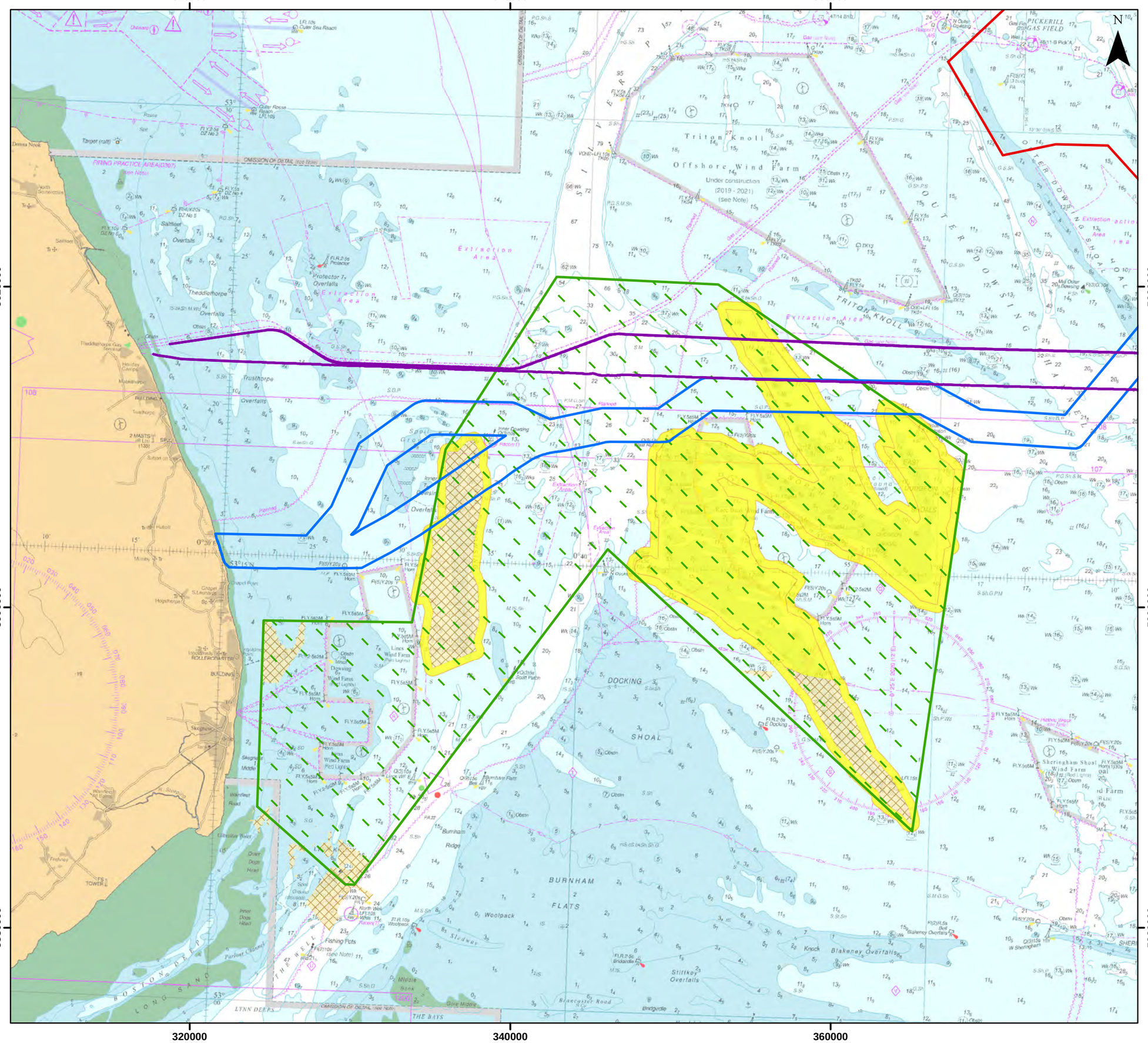
1.5.29 The final form and process of any removal would need to be agreed with Natural England. Once the method for removal has been agreed, a further marine licence would be required for the removal works. It is considered that the timescales associated with the development of the detailed approach to delivering this measure would exclude the option of including the permissions for these works within the DCO Application for the Project.

Delivery Time Frame

1.5.30 It is currently anticipated that this compensatory measure, where it is shown to feasible, could be progressed in terms of detailed design prior to the installation of any cable protection material, with the removal then progressed as quickly as possible thereafter.

Monitoring and Reporting

1.5.31 Once redundant infrastructure has been removed from the seabed it is considered likely that monitoring will be required in order to assess the recovery of the relevant features and wider SAC following removal. It is expected that a monitoring programme would be established with clear objectives agreed.

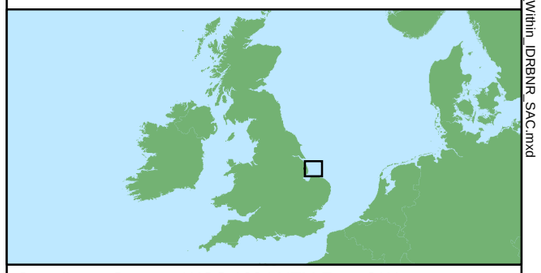


Legend

- Array Area
- Offshore Export Cable Corridor
- Gas/Methanol Pipeline
- Inner Dowsing, Race Bank and North Ridge Special Area of Conservation

SAC Components

- High Confidence Sandbank Habitat
- Annex I Sandbank



Coordinate System: WGS 1984 UTM Zone 31N

0 5 10 km

Scale: 1:225,000

Potential Redundant Infrastructure Identified Within the IDRBNR SAC

Figure 1.2

OUTER DOWSING OFFSHORE WIND

Date: 31/05/2023
Produced By: BPHB
Revision: 0.1

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Marine Debris Removal

Overview

1.5.32 The conservation objectives of the IDRBNR SAC include ensuring that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features by maintaining or restoring their structure and function. The removal of marine debris (principally lost or abandoned fishing gear) within the IDRBNR SAC will serve to support the restoration of the sandbank habitat and alleviate anthropogenic pressures on *S. spinulosa* habitat.

1.5.33 For the purpose of the Project "without prejudice" benthic compensation strategy, 'marine debris' consists of any lost or abandoned, non-natural or introduced material on the seabed which does not offer a practical purpose, has low biodiversity value and may detract from the extent and functionality of the designated features of the IDRBNR SAC.

Value and Function

1.5.34 The problems caused by marine debris are well documented (Veiga *et al*., 2016; Richardson *et al*., 2019). Discarded fishing gear is a particularly destructive type of marine debris. If not retrieved, discarded fishing gear can move with marine currents, scouring large areas of seabed and therefore affect an area far greater than its actual size. Similarly, other sources of marine debris, such as discarded anchor and chain, could also sweep the seabed, continually affecting a larger area.

Objective and Scale

1.5.35 The removal of marine debris has the objective of restoring sandbank habitat to the extent of the footprint of the litter and to alleviate anthropogenic pressures on *S. spinulosa* habitat. This will be achieved through the direct removal of such material from the seabed.

1.5.36 The geographic focus of this compensation measure would be off the coast of Lincolnshire and, particularly, within the IDRBNR SAC. As a minimum, this measure would target marine litter within the SAC. However, if necessary, the scale of this measure could be expanded further to include marine litter removal work over a wider area, for example where there are neighbouring sandbank features.

Delivery Process

1.5.37 The Project would work with the agreed delivery partners (currently proposed to be the Eastern Inshore Fisheries and Conservation Authority (EIFCA) and the MMO), the local fishing industry, and local conservation groups to establish areas where there is known or likely potential for lost or abandoned fishing gear. This process would be followed by site investigation works to identify the precise location of marine litter. Following identification of any marine litter, any necessary approvals would be secured, and the material subsequently removed in a single campaign and returned to shore for re-purposing where possible, or appropriate waste disposal.

1.5.38 A marine debris data search will collate data to identify an area within the IDRBNR SAC which may contain high levels of marine debris. If no suitable areas are identified within the SAC, the search would be widened to other suitable SACs within the network or neighbouring sandbank features.

Delivery Time Frame

1.5.39 The compensation strategy would be approved prior to the commencement of the offshore cable protection installation works. The implementation of the physical compensation measures would then be conducted in accordance with the programme provided within the compensation plan. Debris removal works would provide an immediate improvement in terms of physical attributes and ecosystem recovery.

Monitoring and Reporting

1.5.40 The monitoring of debris removal work would be limited to the duration of the works themselves. The removal process would be monitored, and the amount of debris recorded and reported, but there would not be an ongoing monitoring process.

1.5.41 The report would include photographs of the debris following removal, a categorisation of the type of debris, a figure showing the locations of each item of marine debris and identification of any areas of scour or habitat damage that were visible around the item of debris.

1.5.42 Once the debris had been removed, the impact of the debris will have been removed, and the affected area would be expected to recover. It is not considered that ongoing monitoring following completion of the debris removal campaign will be needed to provide any further evidence of habitat restoration following removal of the debris.

Marine Debris Awareness and Engagement

Overview

1.5.43 The conservation objectives of the IDRBNR SAC include ensuring that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring their structure and function. The delivery of a programme to increase awareness and measures to improve to recovery of lost fishing gear would serve to support the restoration of the sandbank habitat within the IDRBNR SAC.

1.5.44 Rapid recovery of fishing gear would support fishermen in the retrieval of their gear in a more efficient manner, thereby potentially reducing any effects of the seabed from repeated efforts of retrieval. This in turn would potentially reduce the affected seabed area impacted by drifting lost or derelict gear, all of which could reduce the scale of any effect.

1.5.45 Natural England have advised for Hornsea Three and for Norfolk Boreas and Vanguard that marine litter has not been raised as a wider MPA network issue resulting in other marine SACs being in unfavourable condition. In providing this advice they focused on the North Norfolk Sandbanks, IDRBNR and The Wash and North Norfolk Coast SACs. Therefore, currently it is noted by the Applicant that Natural England do not consider a removal of marine litter and awareness campaign as providing a compensatory measure under the Habitats Regulations for the predicted impacts.

1.5.46 Nonetheless, the Project considers, with regard to the position of Natural England, this measure could form part of a wider package of compensatory measures, rather than being considered as a stand-alone measure.

Value and Function

1.5.47 As previously discussed (paragraph 1.5.34) marine debris can be very destructive to the seabed, leading to continual sweeping and scouring of benthic and epibenthic communities.

1.5.48 The awareness campaign would focus on stakeholder engagement to promote a 'stopping at the source' approach to reducing marine debris and aims to target several marine debris sources including lost and abandoned fishing gear, debris from other industries, recreational activities, and onshore sources. This campaign would aim to promote long term changes in activities and processes from those groups that the awareness campaign will target.

Objective and Scale

1.5.49 An education programme would be set up in agreement with the regulator, with the aim of reducing the quantity of debris being added to the marine environment. This would include consultation with the fishing industry and the provision of better methods for static gear removal.

1.5.50 As well as the direct causes of loss of fishing gear (such as snagging and entanglement) there are also indirect causes that result in lost or abandoned gear, including lack of disposal facilities and inaccessible or expensive disposal facilities. In order to encourage the appropriate disposal of end-of-life fishing gear, the provision of collection bins in strategic locations will make it easy for fishers to dispose of waste and reduce the marine debris that may otherwise be discarded at sea.

1.5.51 Industry awareness events for the fishing industry would be closely linked to the rapid retrieval campaign, in terms of illustrating success through use of technology or other strategies but would also focus on disseminating the economic cost and potential loss to catch resulting from marine debris presence. Workshops will additionally aim to encourage the fishing industry to play an active role in collecting marine debris identified at sea, where practicable. Existing best practice guidance would be promoted.

Delivery Process

1.5.52 Marine debris removal works would be accompanied by awareness events within the fisheries industry in the EIFCA's district and for vessels that operate within the IDRBNR SAC. These could be undertaken in partnership with relevant Non-Governmental Organisations (NGOs), the MMO and National Federation of Fishing Organisations (NFFO), and would focus on the ecological, safety and economic risks associated with lost gear.

1.5.53 The awareness campaign would aim to conduct a variety of awareness events and work with various stakeholder groups/industries to launch initiatives, or support ongoing initiatives, to help reduce marine debris entering the marine environment in the long term.

1.5.54 It is also proposed that the identification of suitable measures to facilitate the rapid recovery of lost gear would be developed with the EIFCA. These may comprise options such as voluntary reporting and provisions of technical solutions that can be fixed to static gear.

Delivery Time Frame

1.5.55 The programme of delivery to improve the recovery process of lost gear would be agreed within the approved compensation plan prior to the commencement of offshore cable protection installation works, and ideally delivered prior to completion of those works. The first year of delivery would focus on the identification of appropriate solutions and engagement within the fishing industry (through the EIFCA), potentially including education and awareness events. The measure to enhance the recovery of lost gear (including education/awareness/technology delivery) could be delivered simultaneously to offshore export cable installation works.

Monitoring and Reporting

1.5.56 An annual report is proposed, for the duration of the relevant offshore construction works, that covers measures associated with the uptake of technology aimed at the rapid identification and reporting or lost gear. The need for any future ongoing reporting would be defined within the compensation plan.

1.5.57 Monitoring of the awareness of marine debris would include the quantification of any fishing equipment and discarded material disposed of within bins and monitoring of how often fishing gear retrieval was successful following any provision of new technology. Attendance at the provided events and industry forums would also be monitored.

Re-Creation of Biogenic Reef

Overview

1.5.58 The conservation objectives of the IDRBNR SAC include ensuring that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring their structure and function (including typical species). Creation of new and additional sandbank habitat is not considered possible, as artificially created banks can be easily eroded. Furthermore, there is no evidence that *S. spinulosa* reef can be successfully established artificially. However, establishing another type of biogenic reef could support biodiversity comparable to *S. spinulosa* reefs.

1.5.59 Best practice guidance from Defra for developing compensatory measures in relation to MPAs sets out that, if providing the same ecological function for the species or habitat that the activity is damaging is not technically possible, then compensatory measures should provide functions and properties that are comparable to those that originally justified designation (Defra, 2021). Furthermore, advice from Natural England on habitat compensation focuses on identifying benthic habitats that have similar or identical ecological function and ecosystem service provision to the original habitat (Ward *et al.*, 2022). This will minimise the disruption to marine ecosystem functions from potential compensatory measures.

1.5.60 Although blue mussel and native oyster beds are not currently known to be present within the SAC, they are known to have been widely present historically throughout the southern North Sea, including along the Lincolnshire coastline; as such, these species are considered to have been naturally present within the SAC historically. Since the 1800's there has been a 95% decline in shellfish populations around the UK and across the Lincolnshire coast (Laing *et al*., 2006; Smyth *et al*., 2009; Harding *et al*., 2016; Baden *et al*., 2021). This is due to a combination of factors from overexploitation through destructive fishing methods, pollution, and habitat loss (Perry, 2019; Eastern IFCA, 2023).

1.5.61 The recreation of these biogenic reefs would provide equivalent ecosystem services to the component communities of the existing *S. spinulosa* reef. As natural components of the wider ecosystem and demonstrable historical presence of these reef systems, this measure would be complementary to the existing conservation measures for biogenic reef within the SAC.

1.5.62 Whilst this would comprise and non-like-for-like measure, within the IDRBNR SAC, sandbanks and biogenic reef features are often co-located and provide complementary ecosystem services. As such, this measure would support the integrity of the wider National Site Network through supporting the key component communities associated with a combination of sandbank and reef habitats.

Value and Function

1.5.63 '*Mytilus edulis* (blue mussel) beds on sediment' are recognised as biogenic reef under the European Union (EU) Habitats Directive (as transposed into the UK Habitats Regulations 2017 (as amended)). Furthermore, mussel bed features are linked to Annex I sandbank habitat so, although not a feature of the IDRBNR SAC, it is considered that the creation of this habitat will contribute to the species composition of component communities of the sandbank feature due to the important ecological function of *M. edulis* (Gutiérrez *et al*., 2003; Ørsted, 2022). *M. edulis* is widely farmed and readily colonises exposed surfaces. It is, therefore, possible to seed new *M. edulis* beds in areas of suitable habitat (Tyler-Walters, 2008; Vattenfall, 2021a). In addition, the ecosystem services provided by *M. edulis* beds are similar to those provided by *S. spinulosa* reef already existing within the IDRBNR SAC.

1.5.64 *Ostrea edulis* (native oyster) beds also support increased biodiversity and can be successfully seeded onto suitable habitat (Preston *et al.*, 2020). However, these are not included in the Habitats Directive and would, therefore, not qualify Annex 1 habitat. Subject to agreement with stakeholder, this species could be part of the compensation measure.

1.5.65 Native oyster beds support increased biodiversity and provide nursery grounds for juvenile fish and other species (Coen *et al*., 2007; Robertson *et al*., 2021). They are also filter feeders, supporting water quality by removing impurities. Particles that are not eaten are deposited as pseudofaeces which enriches surrounding sediment and contributes to organic nitrate and organic carbon fixation and removal from the water column (Fodrie *et al*., 2017). In addition, research (Fodrie *et al*. 2017) suggests that oyster beds have the capacity to deliver carbon sequestration, due to their use of carbon in producing the calcium carbonate shell.

1.5.66 Feedback from Natural England on the MEEB document for the SEP and DEP projects noted that they are supportive of the progression of an oyster bed from an ecological perspective. Based on the compensation hierarchy set out by Defra (2021), Natural England would prefer the MEEB to be delivered within the Cromer Shoal Chalk Beds (CSCB) MCZ. However, unlike the IDRBNR SAC, oyster beds are known to have been present in the CSCB MCZ area historically, so would be regarded as a restoration project rather than re-creation.

1.5.67 The planting of oyster beds in offshore areas may result in a permanent loss of benthic habitat within the IDRBNR SAC. It is proposed that the Project would present further detail such as the location of any proposed oyster or mussel beds in order to fully determine the impacts of potential permanent habitat change to assess whether these re-creation activities would adversely impact the designated features of the IDRBNR SAC.

1.5.68 Olsen's Piscatorial Atlas (1883) shows that both blue mussel and native oyster have historically been present along the Lincolnshire coast. If it is not feasible to create mussel or oyster beds within the IDRBNR SAC, they could instead be restored along the coast where they were once abundant. Under Defra's compensation hierarchy (2021), this would adhere to the second option as it would provide the same ecological function as the impacted feature; if necessary, in a different location (outside of the site boundary).

Objective and Scale

1.5.69 To qualify as a "bed", blue mussels should provide at least 20% cover of sediments over an area of at least 5m x 5m (OSPAR, 2010), which indicates that the ecosystem engineering effect caused by the mussel is most apparent under high densities, when substrate binding and habitat provision for other plants and animal occur.

1.5.70 OSPAR define a native oyster bed as *O. edulis* occurring at densities of 5 or more per m^2 on shallow mostly sheltered sediments (typically 0-10m, but occasionally down to 30m). There may also be considerable quantities of dead oyster shell making up a substantial portion of the substratum (OSPAR, 2009).

1.5.71 If this compensatory measure were to be taken forward, the area of biogenic reef creation will need to be calculated based on the worst-case long-term impact from the development of the Project (due to placement of cable protection) within the IDRBNR SAC.

1.5.72 Feedback from EIFCA in relation to the SEP and DEP MEEB proposals noted a preference for oyster bed planting to occur within the windfarm array where inshore fisheries would not be impacted and indicated they would not support an oyster bed within the CSCB MCZ if this required fisheries restrictions to be put in place. Within the IDRBNR SAC, there is already a byelaw in place to protect biogenic *S. spinulosa* reef in the inshore portion of the site which prohibits the use of bottom towed fishing gear. Creating more biogenic reef within this area would ensure that no further fishing restrictions are required.

Delivery Process

1.5.73 In the first instance, the Project would work with its proposed delivery partners, the EIFCA and the MMO, to:

- identify suitable location(s) with environmental conditions that are most likely to be conducive to supporting strong and healthy beds;
- identify a suitable method for preparing and seeding the beds;
- develop or acquire appropriate volumes of seed and/or prepare a bed of suitable size to support a bed; and
- prepare any necessary supporting documents to facilitate the establishment of bed(s).

1.5.74 All methods for seed development would be explored, with some of the more well documented methods for mussel seed development including suspended collectors, hatchery production or harvesting from wild beds (such as those in The Wash, Morecambe Bay and Caernarfon Bay). A full feasibility assessment would be carried out for the chosen method.

1.5.75 Cultch may be required to enhance the substrate suitability for oyster bed planting. A mixture of aggregate pebbles purchased from an onshore of offshore source and waste oyster shell from local markets could be used, or waste shell from the mussel and scallop industry. The requirement for cultch would be determined following final site selection and a survey of the existing habitat. Natural England have previously recommended working with local fishermen to source the cultch.

1.5.76 There are a number of oyster farms (including at Blakeney Harbour on the North Norfolk coast) and hatcheries throughout the UK which could be used to source seed oyster. The Project would, as far as possible, seek to use suppliers and partners from within the Norfolk region, providing benefits to local communities.

1.5.77 Once the upfront works are complete, a suitable marine contractor would be appointed to deploy the mussel seed onto the desired location (equating to the delivery of this measure). Once the mussel bed(s) had been laid, monitoring and any necessary adaptive management would occur.

1.5.78 There are several threats to blue mussel beds, including parasitic infestation, disease, toxins and environmental factors (including water temperature), which have the potential to influence long term establishment in the IDRBNR SAC. The Applicant would continue to engage with the EIFCA and the MMO to align this measure with the best available evidence at the time of the works.

1.5.79 Feedback from EIFCA from the SEP and DEP MEEB suggests that a feasibility study is needed to ascertain the likelihood of success of biogenic reef establishing in the locality. This study should consider the existing environmental conditions (including physical, chemical and biological parameters) and existing activities (fishing, in particular) and should research other initiatives in the North Sea.

1.5.80 The Project have included a search area for the re-creation of biogenic reef within the PEIR which covers the whole of the IDRBNR SAC. The purpose of this inclusion is to enable consultation on this proposal through the formal consultation process, with the intention that responses will facilitate the refinement of the potential search area for the Application. This will facilitate the delivery of this compensation measure under the DCO and deemed Marine Licence (dML). Discussions with The Crown Estate will be undertaken to establish what consents and/or legal agreements (if any) may be required by The Crown Estate.

Delivery Time Frame

1.5.81 It is anticipated that the preparatory works associated with identifying site(s) and developing/sourcing an appropriate amount of seed mussel, securing necessary licenses for the work, appointing competent third parties to undertake the field-based components of the work, etc. will take one to two years, after which bed(s) could be laid. Preparatory works would include a full feasibility study undertaken by a suitably qualified person, and the chosen method would be in line with the best available scientific evidence. Once the seed is laid, establishment works would be complete, and the bed will be subject to ongoing monitoring.

1.5.82 The desk-based preparatory works would take place post consent, with the development/sourcing of seed and subsequent deployment to site taking place pre-commencement of offshore cable protection installation works in the IDRBNR SAC. Therefore, it would be expected that the compensation measure would be delivered before the impact occurs to the SAC.

1.5.83 Feedback from Natural England from the SEP and DEP MEEB recognises the time required for ecological functionality to occur and therefore they advised the implementation of oyster restoration prior to the cable installation but reflected that it may not be fully delivering at the point of construction (impact).

Monitoring and Reporting

1.5.84 Monitoring would focus on the establishment of the mussel bed(s) and the expected changes to the associated benthic communities in the vicinity over time. As the bed established in the first two to three years, a suitable monitoring campaign would be developed in consultation with the EIFCA and the MMO, after which monitoring would be undertaken on an annual basis for a duration as agreed with the relevant stakeholders.

1.6 Summary

1.6.1 In summary, this report has put forward a high-level strategy for compensatory measures for Annex I sandbank habitat within the IDRBNR SAC. The Applicant considers all these measures capable of compensating for an AEoI to the IDRBNR SAC, where rock-based cable protection may be required over the cables on the sandbank features.

1.6.2 It is currently considered likely that the seabed condition within the IDRBNR SAC will facilitate cable burial within all sandbank locations and therefore the installation of cable protection to protect unburied or sub-optimally buried cables will likely not be required. However, whilst engineering studies are being undertaken to inform the need or otherwise for cable protection over the sandbank features, without prejudice compensation measures have been developed, which could be provided to compensate for any impacts to this feature.

1.6.3 The Applicant has included an option to contribute to a Strategic Compensation Fund (such as the MRF) as a strategic alternative. This would be implemented wholly or partly in substitution for the proposed Project level compensation measures or as part of an adaptive management approach. Defra's proposal to introduce legislation to enable to establishment of the MRF should give decision-makers comfort that a strategic solution will be in place to support the Project and can therefore be relied upon by the SoS in their decision to grant the Project's development consent.

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2 Appendix A – Benthic Compensation Rating Approach

2.1 Purpose of this Appendix

2.1.1 The purpose of this appendix is to outline the methodology and rationale used to develop a longlist of compensation options for the sandbanks feature of the IDRBNR SAC. This is followed by a shortlisting process that uses a rating system to fairly rank the compensation options based on guidance from Defra (Defra, 2021). The results of this short-listing exercise are presented towards the end of the document.

2.1.2 This document has been produced to facilitate the development of compensation measures that will form part of an HRA derogation case if required. It provides information to help inform decisions regarding the potential feasibility of compensation measures. The document outlines the ranking methodology used to narrow down an initial longlist of compensation ideas into a shortlist of options. Categories against which compensation options were evaluated are outlined, and the scoring system and criteria discussed.

2.2 Methodology

Rating Approach

2.2.1 Three documents were used to inform the design of the ranking criteria against which the longlist of compensation options will be scored and narrowed down into a short list. These are the EC publication "Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC" (European Commission, 2018); Defra guidance, currently under consultation, titled "Best practice guidance for developing compensatory measures in relation to Marine Protected Areas" (Defra, 2021); and the Natural England "Checklist for compensatory measure submissions" (Natural England, 2021).

2.2.2 The EC (2018) outlines the following criteria for designing compensatory measures:

- Targeted compensation – the compensatory measures must be specific and appropriate to the predicted impacts;
- Effective compensation – to ensure compensation measures are effective, "technical feasibility must go hand in hand with the appropriate extent, timing and location of the compensatory measures". Monitoring during the implementation period is needed to ensure long-term effectiveness;
- Technical feasibility - the compensatory measure must follow the best scientific knowledge, and take into account the specific requirements of the ecological features;
- Extent of compensation – the extent required "is directly related to the quantitative and qualitative aspects inherent to the elements of integrity likely to be impaired and to the estimated effectiveness of the measures";
- Location of compensatory measures – compensatory measures should be located as to be most effective at maintaining Natura 2000 network coherence;

- Timing of compensation – compensation must be in place at a time that ensures continuity in ecological processes; and
- Long term implementation – the legal and financial basis for long-term implementation, protection, monitoring, and maintenance must be secured.

2.2.3 The draft Defra guidance (2021) propose that all projects should consider the following factors:

"a) The extent of the impact – the number and status of the features affected;

b) The environmental value and function of the affected feature;

c) The environmental value and function of the proposed compensatory measure;

d) The location of the proposed compensatory measure;

e) How quickly compensatory measures are expected to be functioning and contributing to the network; and

f) The confidence in the measure being entirely effective and the ability for its success to be monitored and managed accordingly."

2.2.4 In addition, Defra outline a hierarchy of compensatory measures based on the principle that the use of non-like for like measures decreases the certainty of success. Compensatory measures lower on the compensation hierarchy are likely to be required to deliver a larger extent of compensation. The compensation hierarchy is described as follows:

- Address same impact at same location;
- Same ecological function, different location;
- Comparable ecological function, same location; and
- Comparable ecological function, different location.

2.2.5 Natural England, in its check list for compensatory measures submissions (Natural England, 2021), provides the following list of aspects that need to be included in detail in application submissions:

"a) What, where, when: clear and detailed statements regarding the location and design of the proposal.

b) Why and how: ecological evidence to demonstrate compensation for the impacted site feature is deliverable in the proposed locations

c) For measures on land, demonstrate that on ground construction deliverability is secured and not just the requirement to deliver in the DCO e.g. landowner agreement is in place. For measures at sea, demonstrate that measures have been secured e.g. agreements with other sea or seabed users.

d) Policy/legislative mechanism for delivering the compensation (where needed)

e) Agreed DCO/DML conditions

f) Clear aims and objectives of the compensation

g) Mechanism for further commitments if the original compensation objectives are not met – i.e. adaptive management

h) Clear governance proposals for the post-consent phase – we do not consider simply proposing a steering group is sufficient

i) Ensure development of compensatory measures is open and transparent as a matter of public interest, including how information on the compensation would be publicly available

j) Timescales for implementation especially where compensation is part of a strategic project, including how timescales relate to the ecological impacts from the development

k) Commitments to ongoing monitoring of measure performance against specified success criteria

l) Proposals for ongoing 'sign off' procedure for implementing compensation measures throughout the lifetime of the project, including implementing feedback loops from monitoring.

m) Continued annual management of the compensation area including to ensure other factors are not hindering the success of the compensation e.g., changes in habitat, increased disturbance as a result of subsequent plans/projects".

2.3 Rating Criteria

2.3.1 Using the recommendations from the EC, Defra and Natural England discussed in the previous section, the following seven ranking categories were designed:

- Specificity (the measure is appropriate to the type of impact);
- Effectiveness (the measure ensures ecological coherence);
- Technical feasibility (the measure can be delivered and monitored);
- Extent (the measure can be delivered at the extent required);
- Timing (the timescales are proportionate to the impacts);
- Environmental value (the measure fully benefits the impacted feature); and
- Long-term planning (the legal and financial basis for the project is secured).

2.3.2 This provided a clear, replicable, and robust method to rank compensations options relative to each other. The seven criteria were created to rate the compensation options, which are presented in Table 2.1 below.

2.3.3 For each ranking category, a scoring system ranging from one to five was designed, with one representing the lowest score and five the highest. The highest-scoring compensation measures will be taken forward to the compensation measure shortlist. In the section below, each category and the corresponding scoring criteria are discussed in detail.

2.4 RAG Grouping

2.4.1 Longlisted compensation measures are scored according to the criteria outlined above. Scores for each category are then summed to provide a total score (out of a maximum of 35 points)

2.4.2 Each compensatory measure was then allocated to a Red, Amber or Green group based on their total score as follows:

- RED: 7 – 15 points
- AMBER: 16 – 25 points
- GREEN: 26 – 35 points

2.4.3 Measures from the GREEN group are taken forward to the shortlist of compensation options.

Table 2.1. Compensation criteria definitions and rating criteria

Rating	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning
Definition	Certainty that the measures are the most appropriate to the type of impact predicted and focus on objectives and targets clearly addressing the feature/habitat affected.	Likelihood of the measure ensuring overall ecological coherence of designated sites and the integrity of the MPA network, including consideration that the measure will deliver sustainable compensation for the impact.	Evaluation of whether a measure can be feasibly delivered and monitored successfully, considering technical, regulatory and legal delivery.	Likelihood that the measure can be feasibly delivered at the extent (e.g., at the necessary size/area/duration) needed to deliver the required compensation.	Evaluation of whether the timescales are proportionate to the anticipated ecological impacts and are appropriate for implementation.	Assessment of the environmental value and function of the proposed compensatory measure fully benefits the impacted feature.	Confidence that the legal and financial basis for the project is secured with long-term monitoring plans in place including assured management and maintenance.
5	The proposed measure benefits the same impacted feature/ecological function at the same SAC.	There is strong evidence that the measure is effective and provides a similar ecological function within the SAC.	There is strong evidence of delivery and certainty of the outcomes.	The full measure can be delivered in a very short timeframe, with substantial additional environmental gains likely over the measure's lifetime. Ecological function will be reinstated so rapidly that ratios of 1:1 (or below) could be considered.	There is certainty that measures will be in place, functioning and contributing to the SAC before impact occurs.	The measure benefits the impacted feature and will improve multiple features or ecological processes. Non-target ecological features and processes include one or more features of conservation concern (e.g., a locally struggling habitat).	The legal & financial basis will be secured within the DCO. Long-term management and maintenance of measure can be fully planned and secured within the DCO. Adaptive management mechanisms can be fully secured.
4	The proposed measure benefits the same feature/ecological function, but at a different SAC.	There is some evidence that the measure is effective and will provide a similar ecological function within the SAC.	There is evidence of delivery but some challenges with delivery and some uncertainty in the outcomes.	The compensation measure can be delivered at a large extent and is anticipated to deliver more than the required quantum of compensation.	There is some certainty that measures will be in place, functioning and contributing to the SAC prior to impact occurring. Any time lag is not anticipated to compromise ecological coherence of the feature network. Overcompensation may be delivered to compensate for any interim losses.	The measure benefits the impacted feature and has the potential to benefit multiple other features or ecological processes of conservation concern (e.g., a locally struggling habitat).	The legal & financial basis OR the long-term management & maintenance OR the long-term monitoring & adaptive management can or will NOT be secured by DCO submission, but all are anticipated to be in place before construction through clearly outlined, existing, regimes.
3	The proposed measure benefits a comparable feature/ecological function, at the same SAC.	There is some evidence that the measure is effective, but some uncertainty on its ecological function within the SAC.	There is some evidence of delivery and some uncertainty regarding outcomes.	The measure can be delivered at the extent required for full compensation, but substantial additional gains are not anticipated.	The measure could be in place, functioning and contributing to the SAC by the time the ecological impact occurs, but the required compensation cannot feasibly be fully delivered at that time (e.g., due to time needed	The measure benefits the impacted feature and has the potential to improve another feature or ecological process of conservation concern (e.g., a locally struggling habitat).	Multiple aspects of the long-term planning (i.e., legal & financial basis, long-term management & maintenance, long-term monitoring) can NOT be secured by DCO submission, but all are anticipated to be in place

Rating	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning
					for ecological processes to mature).		before construction through clearly outlined, existing, regimes.
2	The proposed measure benefits a comparable feature/ecological function at a different SAC.	There is some evidence that the measure is effective, but high uncertainty as to the outcome in a full-scale deployment.	There is little to no evidence of delivery and considerable uncertainty in outcomes.	There is uncertainty of delivery at the required extent for full compensation. Ratios significantly above 1:1 and adaptive management measures will be needed to ensure the required quantum of compensation is delivered.	There is uncertainty that measures will be in place, functioning and contributing to the SAC at the time of impact, but delivery will be possible early within the operational phase. Overcompensation may be delivered to compensate for the interim losses.	The measure is anticipated to deliver the necessary compensation for the impacted feature at a ratio or spatial scale significantly larger than required (i.e., overcompensates), but no wider environmental benefits are delivered.	There is uncertainty about fully securing all long-term planning before construction. One or more aspects of the long-term planning can likely NOT be secured before construction, but all are anticipated to be in place before the operational phase.
1	The proposed measures benefit a different feature at a different SAC (either within the national site network or elsewhere).	There is little to no evidence that the measure is effective and there is considerable uncertainty in outcomes.	There is no evidence of delivery and considerable uncertainty in outcomes.	The measure cannot feasibly be realised at the required extent to deliver the quantum of compensation.	There is uncertainty in delivery by the time impact occurs and there is uncertainty about the feasibility of delivering the compensation during the lifetime of the windfarm.	The measure is anticipated to deliver the necessary compensation for the impacted feature, at the ratio required, but no wider environmental benefits are delivered.	There is uncertainty around the delivery of the long-term planning, and/or not all aspects of long-term planning can be feasibly delivered.

2.5 Longlist

2.5.1 A longlist of potential compensation measures was collated by reviewing peer-reviewed literature, advice from SNCBs and based on previous OWF compensation applications.

2.6 References

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3 Appendix B – Benthic Compensation Longlist Scoring Matrix

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
Extend the IDRBNR SAC - sandbanks	Extend the IDRBNR SAC boundary to include additional sandbanks outside of current boundary, including the Docking Shoal. This could be achieved strategically through development of a case to extend the site.	5	5	3	5	2	5	3	28	Environmental value assigned a 5 on the basis that this measure would benefit various species, including rays, sharks, crabs, polychaete worms, sandeel, harbour porpoise, red-throated diver and seal colonies. Precautionary assumptions have been raised regarding timing and long-term planning, due to uncertainties on the procedures to be followed, following Brexit and anticipated timescales.
Marine debris removal	Removal of anthropogenic waste; facilitating the rapid recovery/ retrieval of lost fishing equipment across the sandbanks.	4	3	5	4	4	4	4	28	Regarding timing, there are uncertainties about whether this would be an ongoing operation. A score of 4 has been assigned as there is no guarantee that the required volume of litter or waste would be removed by the time the ecological impact occurs (i.e., only partial volume removed). Note, agreeing quantities and timescales has been challenging for Hornsea Three. Would need to identify how debris is identified and removed, and if this is done periodically to satisfy

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
										DCO. This could be applied across different National Site Network sites; specificity has therefore been assigned a lower score.
Redundant infrastructure removal	Removal of disused infrastructure across sandbanks.	4	3	5	4	4	4	4	28	Effectiveness has been scored 3 as there is no guarantee that the required volume of infrastructure is available for removal. Agreeing quantities and timescales could pose a challenge and the Project would need to identify how debris is identified and removed. This measure could be applied across different National Site Network sites; specificity has therefore been assigned a lower score.
Marine debris reduction awareness and engagement	Fund engagement with general public to raise awareness of marine litter, and ways to reduce plastic waste and fishing equipment loss and improve disposal and recycling.	3	1	5	4	5	4	4	26	Awareness raising events with the fisheries industry would support the implementation of a scheme to reduce the on-going nature of this threat.

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
Re-creation of biogenic reef	Re-creation of other biogenic reef feature (*Ostrea, Mytilus*) that provides the same ecological function as *S. spinulosa* reefs within the SAC (as a wider feature of the SAC).	3	4	3	4	3	5	4	26	Regarding specificity, mussel bed features are linked to Annex I sandbank habitat so it is considered that restoration of this feature will enhance the quality of designated sandbank habitat at a network level. Tech feasibility - scored high but not highest (due to non like for like). Effectiveness - Oyster bed restoration is used fairly widely now and there is an active project in the Essex Estuaries Essex Native Oyster Restoration Initiative (ENORI) project (this feature is included in the Blackwater, Crouch, Roach and Colne MCZ). Extent - blue mussel beds have been found to support more diversity and richness at local and regional scales than some sub-features of the Annex I sandbank feature, 'ecologically' it would provide compensation at a ratio of over 1:1. Environmental Value has been assigned a higher score, as according to OSPAR, oyster beds are known to provide a solid surface for settlement by other species,

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
										providing a cryptic habitat that serves as a nursery ground for, and protects, small fish and other species, stabilising sediments which may in turn provide some protection from shoreline erosion, and filtration of large quantities of water.
Aggregate dredging activity management	Further reduction/management of aggregate dredging pressure (spatial or temporal). Requires cross-industry engagement and agreement. Financial incentives?	5	5	3	3	1	5	2	24	Timing was scored a 1 on account of the length of time it might take to implement, on account of the in-depth liaison and appraisal that would be required with the aggregates industry. Technical feasibility is also low scoring as the management of aggregate activities would have to be shown to directly benefit relevant sandbank habitat.
Marine activity restrictions	Financial contribution to the cost of ending, or buying-out, other harmful activities across sandbanks of IDRBNR SAC or alternative SAC.	5	5	2	3	2	4	2	23	Technical feasibility assigned a 2 as securing offshore exclusion zones is challenging - beyond the capability of an individual project.
Removing marine non-native species	Invasive species eradication within sandbanks of IDRBNR SAC or alternative SAC. Implementation of controls or active removal to minimise the spread and impact of	5	4	2	2	4	2	3	22	No evidence of success as a compensation measure in OWF industry.

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
	Marine Invasive Non-Native Species (MINNS) on the SAC.									
Further fisheries management	Introduction of mechanism that would enable fisheries management to be re-considered. Spatial reduction of bottom trawling across sandbanks etc.	2	5	2	3	2	5	3	22	Effectiveness was assigned 5 as fisheries management is currently being implemented in other areas of the site to maintain favourable condition of this feature. Technical feasibility was assigned 2 as will require a bylaw which requires in-depth liaison with EIFCA and fishing community. The application for the bylaw would also include a financial impact assessment.

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
Extend the IDRBNR SAC – *S. spinulosa* reef	Extend the SAC boundary to include additional areas where established *S. spinulosa* reef is found (rather than just encrustations). This could be achieved strategically through development of a case to extend the site.	5	4	3	2	1	1	2	18	Effectiveness is assigned a score of 4 on the basis that this measure has not been implemented before (therefore cannot be assigned a score of 5). Additionally, official extension of the SAC and designation of a new feature would allow management to be introduced to protect the habitat. *S. spinulosa* encrustations are not a feature and could therefore be difficult to get protection for. However Natural England and MMO acknowledge presence of *S. spinulosa* is part of the wider sandbank health. Technical feasibility assigned a 3 on the basis that following Brexit there are uncertainties about the procedures to be followed for this measure. Extent assigned a 2, as this is dependent on how much *S. spinulosa* reef is present. Environmental value assigned a 1, as regarding this measure a different feature (not sandbanks) is benefited.
Establish a new site (with appropriate management)	Establish a new site for Annex 1 sandbanks and/or *S. spinulosa* reef (or other biogenic reef feature: *Ostrea,*	1	2	3	2	2	2	1	13	Specificity assigned a 1 as potentially non like for like compensation and there is no evidence that this measure will benefit the sandbank feature of the IDRBNR SAC.

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
	Modiolus, Mytilus) and appropriately manage it, at a location away from the IDRBNR SAC.									Technical feasibility assigned a score of 3, as the measure will need planning permission and landowner agreements.
Management of navigational and maintenance dredging methods	Work with the ports and shipping industry to implement best navigational and maintenance dredging practices (i.e., Water Injection Dredging) within the local area, to minimise impact on sedimentary regime by ensuring that sediment is maintained within the system and is available for sandbank sustainment.	1	1	3	1	2	4	1	13	Regarding long term planning, there are uncertainties about how to monitor the quantity of sediment maintained. Regarding environmental value, this has been assigned a score of 4, on the basis that the offshore measures would benefit offshore habitats as well. Timing is assigned a score of 2, on the basis that there needs to be a significant amount of liaison with ports and the shipping industry prior to and during the implementation of the measure.
Enhancement of *S. spinulosa* reef	Enhancement/restoration of the undesignated *S. spinulosa* as a wider feature of the SAC.	2	1	1	1	1	1	5	12	This option has scored low for specificity as *S. spinulosa* is not a feature of the site so reaching AEoI is impossible for this habitat. A low score was assigned for technical feasibility since there is little previous experience of active enhancement/restoration.

Measure	Description	Specificity	Effectiveness	Technical feasibility	Extent	Timing	Environmental value	Long-term planning	Total	Initial justification
Management of physical and chemical processes	Improving hydrodynamics across sandbanks (removing threat of adverse impacts on sedimentary regime for sediment disturbance and replenishment, as well as encouraging larval dispersal)	5	1	1	1	1	1	1	11	Feasibility low due to need for engagement and agreement across sectors. Limited evidence for success.

4 Appendix C – Sublittoral Macrophyte Sediment Map (Ward *et al.*, 2022).