Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 5: Reports

Site Characterisation Report

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Executive Summary

This Site Characterisation Report (the Report) (Document Reference: sets out the site characterisation of the proposed offshore disposal sites associated with the construction of Rampion 2. As the detailed information required to support the disposal licence applications is presented within the Rampion 2 Environmental Statement, this report takes the form of a 'framework' that provides a summary of key points of relevance to site characterisation and refers to more detailed information, data and assessment presented within the relevant sections of the **Environmental Statement (ES)** (Document Reference: 6.2).

The Report provides the Marine Management Organisation (MMO) with the necessary information to permit disposal of material associated with construction. The objective of the Report is to inform the decision-making process and licensing of the proposed disposal site(s) and provide for the inclusion of any relevant conditions in relation to disposal activity within the deemed Marine Licences (dMLs) awarded under the Development Consent Order (DCO) for Rampion 2.

The source of material proposed to be disposed of within the Rampion 2 array and ECC comprises sediment from a number of sources. These comprise the upper layers of existing seabed retrieved via dredging and other activities as part of the seabed preparation works, cable installation preparation; the excavation of Horizontal Directional Drill (HDD) exit pits near the cable landfall; and deeper subsurface material arising from the potential need for drilling. Drilling activities may be required for piled foundations and this process will produce spoil from the deeper soil profiles as well as surface sediments.

The impacts of disposal via the return of spoil material to the water column and/or the placement of drill arisings adjacent to foundations has been fully assessed as part of the Environmental Impact Assessment (EIA) and is described in full in the ES. No moderate or major adverse effects, which would be significant in EIA terms have been identified, with only minor (not significant in EIA terms) effects predicted on certain receptors.

As the EIA has not predicted any significant adverse effects on receptors associated with the proposed disposal activity it is concluded that, whilst potential alternative options for the use of this material may exist in theory and at some point in the future, disposal in situ remains the most viable and environmentally sound option. In situ disposal also has the advantage of retaining sediment within the local sedimentary system.

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1. Introduction

1.1 Purpose of document

1.1.1 This Report provides the licensing authority with the necessary information to permit disposal of material associated with construction of the Rampion 2 Offshore Wind Farm Project (hereafter referred to as 'Rampion 2', or the 'Proposed Development'). Rampion 2 is a proposed extension to the existing Rampion 1 offshore wind farm (Rampion 1) located in the English Channel off the Sussex coast. Rampion Extension Development Limited (hereafter referred to as 'RED') (the Applicant) is developing Rampion 2.

1.1.2 The Report sets out site characterisation for the proposed offshore disposal site(s) associated with the construction of Rampion 2. Site characterisation is the process whereby a proposed marine disposal site for spoil material and drill arisings generated by construction activities is described in terms of the existing environment, using all available data sources.

1.1.3 As part of the construction of Rampion 2 it will be necessary to dispose of offshore spoil material and drill arisings. As part of the DCO application, RED is seeking permission to dispose of these materials within the Rampion 2 Offshore Array Area and Offshore Export Cable Corridor under the dMLs for the Proposed Development.

1.1.4 The material requiring disposal will comprise inert material of natural origin within the Order limits produced during construction drilling, seabed preparation for foundation works, cable installation preparation such as sandwave clearance, boulder clearance, pre-trenching, horizontal directional drill (HDD) arisings and excavation of HDD exit pits.

1.1.5 This Report will inform the decision-making process, the licensing of the proposed disposal site(s), and inclusion of any relevant conditions in relation to disposal activity within the dMLs awarded under the DCO for Rampion 2. The purpose of this Report is to summarise what the impacts are and signpost the reader as to where further information can be found.

1.1.6 As all of the necessary information required for site characterisation to support a disposal licence application is provided within the Rampion 2 Environmental Statement (ES), this document takes the form of a 'framework' that provides a summary of key points of relevance to site characterisation and refers to more detailed information and data presented within the relevant sections of the **ES** (Application Reference Number 6.2). This document provides a standalone characterisation but should be read in conjunction with the ES.

1.1.7 The following information is provided:

- the need for the new disposal sites;
- the dredged and/or drilled material characteristics;
- the disposal site characteristics;

- the assessment of potential effects; and
- the reasons for the site selection.

1.1.8 There are two proposed disposal sites:

- the Array Area; and
- the offshore Export Cable Corridor (ECC).

1.1.9 The Array Area includes the wind turbine generators (WTGs), offshore substation platforms, associated foundations, inter-array cables, offshore interconnector cables and sections of the offshore export cables. The array disposal site sought comprises the full extent of the Array Area (refer to **Works Plans Offshore** (Document Reference: 2.2.1)).

1.1.10 The offshore ECC comprises the area within which the offshore export cables will be installed, and the area where the HDD pits will be excavated. The ECC is located between the landfall and Array Area boundary. The ECC disposal site sought comprises the full extent of the ECC (refer to **Works Plans Offshore** (Document Reference: 2.2.1)).

1.2 Project overview

1.2.1 RED is developing Rampion 2 in an area adjacent to the existing Rampion Offshore Wind Farm Project ('Rampion 1') in the English Channel. Rampion 2 will be located between 13km and 26km from the Sussex Coast. The offshore array will occupy an area of approximately 160km^2, with the ECC covering an area of approximately 59km^2.

1.2.2 The key offshore elements of the Proposed Development will be as follows:

- up to 90 offshore wind turbine generators (WTGs) and associated foundations;
- blade tip of the WTGs will be up to 325m above Lowest Astronomical Tide (LAT) and will have a 22m minimum air gap above Mean High Water Springs (MHWS);
- inter-array cables connecting the WTGs to up to three offshore substations;
- up to two offshore interconnector export cables between the offshore substations; and
- up to four offshore export cables each in its own trench, will be buried under the seabed within the final cable corridor.
- the export cable circuits will be High Voltage Alternating Current (HVAC), with a voltage of up to 275kV.

1.2.3 There will also be a single landfall site near Climping, Arun District, connecting offshore and onshore cables using HDD installation techniques.

1.2.4 At this stage, the description of the Proposed Development is indicative and a 'design envelope' approach has been adopted which takes into account Planning Inspectorate Advice Note Nine: Rochdale Envelope, July 2018 (Planning Inspectorate, 2018). The provision of a design envelope is intended to identify key

design assumptions to enable the environmental assessment to be carried out whilst retaining enough flexibility to accommodate further refinement during detailed design. Further details on the use of the Rochdale Envelope as recommended by the National Policy Statement (NPS) for Renewable Energy (EN-3) (Department of Energy and Climate Change (DECC), 2011 and the Draft National Policy Statement for Renewable Energy Infrastructure (EN-3), (Department for Energy Security and Net Zero (DESNZ), 2023) are provided in **Chapter 2: Policy and legislative context**, Volume 2 of the ES (Document Reference: 6.2.2).

1.2.5 Assessing the Proposed Development using this assumption-based design envelope approach means that the assessment considers a maximum design scenario which allows flexibility to make design decisions in the future that cannot be finalised at the time of submission of the application for development consent. Such design decisions include, for example, selection of foundation type and size from the options assessed within the EIA; the precise models, dimensions and numbers of wind turbine generators (WTG) which will be available at the time of placing orders for the Proposed Development; the number of offshore substations final offshore WTG layout design to optimise wind energy capture; and detailed engineering factors which inform cable route designs, cable and foundation installation methodologies and the specifics of seabed preparation and secondary protection requirements.

1.2.6 The use of this approach has been adopted for this Environmental Statement (ES) and enables the Environmental Impact Assessment (EIA) to be based on a description of the location, design and size of the Proposed Development that is suitable to allow an assessment of its likely significant environmental effects, whilst retaining the required level of flexibility at the pre-consent stage of the development process.

1.2.7 There are three foundation options being considered for use on Rampion 2, as presented below in **Table 1-1.**

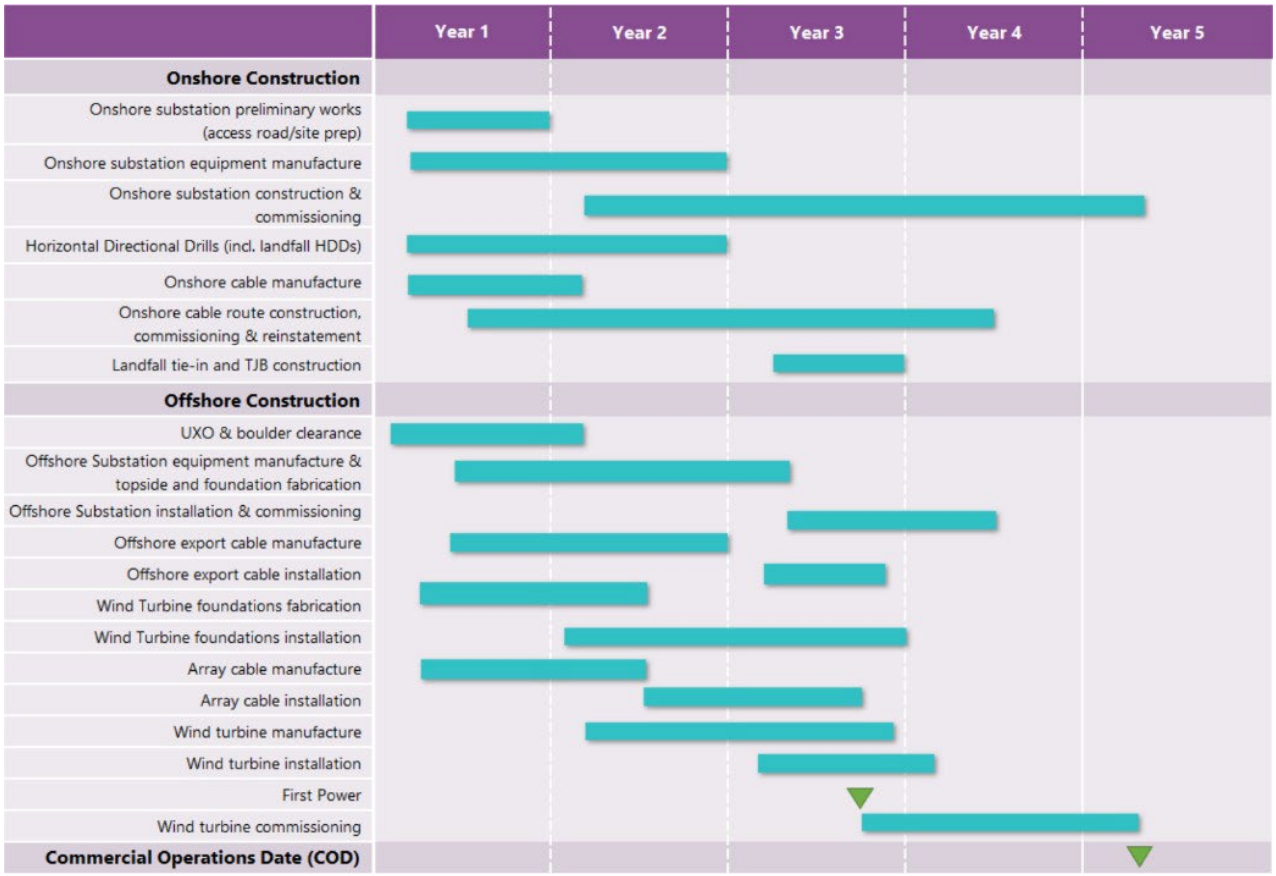
Table 1-1 Foundation options for use on Rampion 2

Foundation option	WTG	Offshore substation
Monopile	✓	✓
Multi-leg with pin piles	✓	✓
Multi-leg with suction buckets	✓	✓

1.2.8 An indicative construction programme for the Proposed Development is presented in **Graphic 1-1**. The indicative onshore construction programme information is provided for context. The programme illustrates the anticipated duration of the major construction / installation elements. The Proposed Development will be delivered in stages, which are to be confirmed through the requirements in the draft DCO.

1.2.9 Should consent be granted in 2025, it is anticipated that access and construction of the project would commence later in 2025, with the project becoming operational in 2030 following completion of the substation and WTG commissioning work.

Graphic 1-1 Indicative construction programme



1.2.10 A full description of the Proposed Development is provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

2. Predicted source and spoil amounts

2.1 Sources of spoil

2.1.1 Spoil will be generated from the installation of any of the WTG and OSS foundation options being considered for Rampion 2 either from seabed preparation works and/ or drilling. Material will also be generated from the seabed preparation and trenching works required for cable installation and from the excavation of exit pits for the HDD that facilitate cable connection at the landfall.

Seabed preparation and drilling- Array

2.1.2 Seabed preparation, which may include seabed levelling, sandwave removal and removal of surface and sub-surface debris, is likely to be required to enable installation of the WTG / Offshore Substation (OSS) foundations and offshore cables within the Array Area. Jack-up vessels will be required for certain construction activities, for example foundation installation, and some level of seabed preparation may be required where vessel legs are to be positioned. Seabed preparation provides as clear, level and stable a surface as possible for installation of foundations and offshore cables to maximise efficiency and minimise the risk of problems being encountered once installation begins which may result in delay, damaged equipment and/or risk to health and safety.

2.1.3 Requirements for seabed preparation will vary according to specific ground conditions and type of infrastructure being installed at each location. Detailed geophysical surveys will be carried out pre-construction to confirm the status of the seabed prior to construction and determine the presence of boulders and other obstructions on the seabed which may need to be removed prior to commencement of construction. Maximum design scenarios are set out in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and associated Appendices.

2.1.4 Seabed levelling and sandwave removal will typically be undertaken using trailing hopper suction dredging (THSD). Spoil from dredging for seabed preparation works will be released to the seabed from the base of the dredging vessel, with any overspill during these activities released at the water surface. Spoil created by drilling for WTG and OSS foundations will usually be disposed of adjacent to the foundation location (i.e. the drilling location) and will be discharged at or above the sea surface before settling to the seabed. It is assumed that up to 50% of pile locations across the array may require drilling.

2.1.5 Sandwave clearance and seabed preparation for cables within the Array, as required, will be undertaken using one or a combination of a range of techniques including the use of THSD as described above, as well as grapnel runs, ploughing, water injection excavation or dredging (jetter, mass flow excavator or equivalent), mechanical trenching (trencher or cutter), or backhoe dredging for trenching or seabed levelling works.

Cable installation preparation - ECC

2.1.6 Seabed preparation for cables within the ECC, as required, will be undertaken using one or a combination of the same techniques given above for cables within the Array. No sandwaves are expected on the export cable route and therefore sandwave clearance will not be required for export cables within the ECC area (see **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)).

2.1.7 For the installation of HDD ducts to connect the offshore export cables to the onshore export cables at landfall, up to four HDD exit pits will be excavated in the shallow subtidal area (below Mean High Water Springs (MHWS)). Excavation of the HDD exit pits is likely to be undertaken using a backhoe dredger, with material arising from the pits sidecast for subsequent re-use as infill.

2.2 Volumes of spoil for disposal

2.2.1 The maximum design scenario volumes of material to be disposed within the Array area from seabed preparation works for WTG and OSS foundations, pile drilling and cable installation are summarised below in **Table 2-1** and **Table 2-2**.

Table 2-1 Summary of MDS spoil volumes associated with seabed preparation and pile drilling for foundations in the Rampion 2 Array Area disposal site

Source	Drilling volume (m^3)	Sandwave clearance volume (m^3)	Seabed preparation volume (m^3)
WTG	234,000 (based on 65 x 13.5m monopile)	475,000	324,000 (based on 90 x multileg)
OSS	36,000 (based on 3 x multileg)	Included in above	19,500 (based on 3 x multileg)
Foundations total	**270,000**	**475,000**	**343,500**

Table 2-2 Summary of MDS spoil volumes associated with seabed preparation for cable installation in the Rampion 2 Array Area disposal site

Source	Trenching volume (m^3)	Sandwave/seabed preparation volume (m^3)
Array cables	500,000	900,000
Interconnector/Export cables (part within Array area)	80,000[1]	Included in above
Cables total	**580,000**	**900,000**

2.2.2 The maximum design scenario volumes of material to be disposed within the Array area from seabed preparation works for WTG and OSS foundations, pile drilling and cable installation are summarised below in **Table 2-3**.

Table 2-3 Summary of MDS spoil volumes associated with seabed preparation for cable installation and HDD pits in the Rampion 2 ECC disposal site

Source	Trenching / excavation volume (m^3)
Export cables	340,000
HDD pits	720
Export cables in ECC total	**340,720**

2.2.3 For the Proposed Development overall, then, based on the maximum design scenario the total volume of natural material that may require disposal would be up to 2,909,220m^3, comprising:

- Array total: 2,568,500 m^3
- ECC total: 340,720 m^3

2.2.4 Full details and justification for the MDS is set out in **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3).

[1] Volume for export cables within Array Area included in Array cables total.

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3. Alternative options for disposal

3.1.1 Once drilled or dredged material has been excavated, it is classified as a waste material and once it has entered the waste stream it is strictly controlled. Disposal of dredged and drilled material is controlled under the London Convention 1972, the Oslo-Paris Commission (OSPAR) Convention 1992, and the European Union (EU) Waste Framework Directive 2008/98/EC, as well as the South Inshore and Offshore Marine Plan (2018) that sets the safeguarding policy and policy principles for dredging and disposal activity (Policy S-DD-1 and S-DD-2).

3.1.2 At the core of the Waste Framework Directive is the Waste Hierarchy (Department for Environment, Food & Rural Affairs (Defra) 2011) which consists of:

i. Prevention;

ii. Re-use;

iii. Recycle;

iv. Other recovery; and

v. Disposal

3.1.3 Where prevention is not possible, management options for dealing with waste material must consider the alternative options in the order of priority indicated above (i.e., re-use, recycle, other recovery and then disposal).

3.1.4 The consideration of alternative solutions for the disposal of drilled and/or dredged material within the Offshore Array Area and Offshore Export Cable Corridor is therefore an important consideration of the site characterisation process and is required in order to inform the licensing authority's decision-making process. The following sections of this document present information on potential alternatives to the disposal of drilled and dredged material from Rampion 2.

3.2 Prevention

3.2.1 The Waste Hierarchy (Defra, 2011) places a strong emphasis on waste prevention or the minimisation of waste. Offshore construction activities such as foundation and cable installation will inevitably generate a certain volume of material requiring disposal. The following text describes how the generation of spoil for Rampion 2 will be minimised wherever possible.

3.2.2 For piled foundations, if percussive piling alone does not achieve full pile penetration due to the presence of hard ground, the material inside the monopile/pin piles may need to be drilled out before the pile can be driven to the required depth. If drilling is required, the generation of spoil arising from the drilling will be unavoidable. For piled foundations, the MDS assumption is that up to a maximum of 50% of the foundation may require drilling to assist with installation, this risk will be minimised by conducting pre-construction geotechnic surveys and through WTG layout optimisation. If drilling is required, a spoil volume of 4,000m^3 and 7,200m^3 has been assumed within the MDS for the Smaller WTG and the

Larger WTG types respectively. Refer to **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

3.2.3 If non-piled foundations are chosen, seabed preparation works including dredging and disposal will be unavoidable in order to achieve the flat and stable seabed that is required to install these particular foundation types. Volumes of spoil generated will depend on the size of foundations and the seabed conditions at each installation location.

3.2.4 Sandwave clearance is expected to be required in areas where sandwave gradients are in excess of the working limits for standard cable installation equipment, to avoid unnecessary strain on the cables through bending, and to maximise ploughing efficiency and reduce the chances of burial failure. Cables must be buried to a suitable depth in a location where they can be expected to stay buried for the duration of the asset's operational lifetime. Sandwaves are generally mobile in nature therefore cables must be buried beneath the level where natural sandwave movement would uncover them or increase burial depth to the extent it affects cable thermal properties. This may require removal of mobile sediments before installation takes place. To install the offshore cables (within the Array Area only) for Rampion 2, sandwave clearance and the associated dredging and disposal works will in some cases be unavoidable. No sandwave clearance is anticipated to be required in the export cable corridor.

3.3 Re-use

3.3.1 Where prevention is not possible, the re-use of spoil material is the preferred option. Potential options for the re-use of dredged and drilled material can include:

- beach nourishment/replenishment;
- land reclamation; and
- habitat enhancement.

3.3.2 Collection of drill arisings would be costly given the need for suction dredging vessels in addition to drilling vessels and the limited material produced at each foundation site means collection will not be viable.

3.3.3 Dredger movements to sites, or other projects away from the source of spoil production spoil material could be re-used would lead to additional environmental impacts due to increased vessel emissions that could be avoided if dredged material is disposed of in situ (i.e. close to the source of production). Barges for transporting material away from Rampion 2 may also require four-point anchoring systems at each loading point, which will also result in an additional environmental impact which the disposal of material in situ would preclude.

3.3.4 There are currently very few examples of recovery from dredged and drilled material (MMO, 2019), and no such options have been identified for the spoil material from Rampion 2. Therefore, even if it were technically and economically feasible to re-use the spoil material, at present there are no known projects to facilitate its re-use.

3.4 Recycle

3.4.1 Recycling of drilled and dredged material would involve transforming the material into a different form, for example to produce bricks or aggregate material. As outlined in the MMO guidance (MMO, 2011), these are generally land-based solutions with any material produced used in onshore construction projects. As such, the same issues with respect to vessel movements to transport the dredged material to land, as discussed in Section 3.3 will apply.

3.5 Other recovery

3.5.1 The definition of recovery provided by Directive 2008/98/EC of the European Parliament and of the Council of 19 November (Ec.europa.eu, 2018) on waste and repealing certain Directives, states:

> *"recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations"*

3.5.2 Due to the nature of spoil materials produced by the activities outlined in **Section 2**, there are no other feasible recovery options than those listed in **Section 3.3** and **Section 3.4** (for example, spoil could not be used as fuel to generate energy).

3.6 Disposal

3.6.1 Disposal sites are licensed to enable the disposal of material from specific locations and activities where preferred waste hierarchy options are not feasible or would result in additional environmental impacts.

3.6.2 The EIA identified that there were seven active disposal sites within the vicinity of the offshore DCO Order Limits. These are shown in **Table 3-1**.

3.6.3 Two of these disposal sites are within the Rampion 2 DCO Order Limits: (1) the existing Rampion 1 project disposal site, which is located in the Rampion 2 Proposed DCO Order Limits and (2) the proposed AQUIND Cable Site A, which will run through the south west of the Array Area.

3.6.4 It should be noted that there is a discrepancy between the Centre for Environment, Fisheries and Aquaculture Science (Cefas) data set for the marine disposal sites which has been raised with the MMO and Cefas. The Rampion 1 disposal site (as shown in **Figure 7.3, Volume 3** (Document Reference: 6.3.7)) should cover the entire Rampion 1 Order Limits.

3.6.5 It is not considered desirable to use an existing disposal site since they are not generally designated for additional volumes beyond those necessary for the specific purpose for which they were licensed. The consented Order Limits for Rampion 1 are wider than the area built out, and part of this area is now included in the proposed Rampion 2 DCO Order Limits and, consequently, the area proposed for the Rampion 2 waste disposal site.

Table 3-1 Marine disposal sites located within the vicinity of the Other Marine Users study area[2]

Code	Disposal site	Category of waste	Distance from Proposed DCO Order Limits (km)
Open			
WI011	Newhaven	Burial at sea	11.6
WI117	Rampion 1	Dredging of the seabed and the disposal inert material of natural origin. Disposal for the existing Rampion 1 project.	0
WI031	Shoreham	Maintenance dredging	12.4
WI020	Brighton/ Rottingdean	Dredged material from Brighton Marina	13.4
WI060	Nab Tower	Capital and maintenance dredge material	20.2
WI048	AQUIND Cable Site A	Unknown*	0
WI049	AQUIND Cable Site B	Unknown*	16.7
Closed			
WI012	Newhaven	Dredged material from Newhaven harbour and Ouse Estuary	N/A
WI040	Littlehampton	Unknown*	N/A
WI050	Isle of Wight Industry	Unknown*	N/A
*** The category of waste (Unknown) is categorised as unidentified according to Cefas online database.**			

[2] As shown on **Figure 7.1, Volume 3** (Document Reference: 6.3.7).

4. Characteristics of the Rampion 2 disposal sites

4.1 Introduction

4.1.1 Detail on the characteristics of the receiving environment of the disposal sites can be found in the ES (Application Reference Number 6.2). The relevant chapters are referenced in **Table 4-1** below with a high-level summary presented in the sections that follow.

Table 4-1 Locations of more detailed information for specific data categories

Data	Relevant document
Seabed geology	**Chapter 6: Coastal processes, Volume 2** Of the ES (Document Reference: 6.2.6) **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) **Appendix 6.1: Coastal Processes Technical Report: Baseline description, Volume 4, Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES (Document Reference: 6.4.9.4)
Biotopes and benthic fauna	**Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) **Appendix 9.3: Rampion 2 offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)
Fish and shellfish spawning and nursery areas	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8)

4.1.2 Two surveys were undertaken as part of the EIA which provide information on sediment characteristics specifically which are described in **Table 4-2**.

Table 4-2 Site surveys undertaken

Survey type	Scope of survey	Coverage of study area
Geophysical and geotechnical survey of Rampion 2	High resolution bathymetry, side scan sonar and sub-bottom geophysical data collection.	Full coverage of the Rampion 2 Offshore Array Area and Offshore Export Cable Corridor.
Benthic survey of Rampion 2	Including collection of seabed sediment samples and characterisation of sediment grain size distribution.	Full (discrete) coverage of the Rampion 2 Offshore Array Area and Offshore Export Cable Corridor.

4.2 Physical environment characteristics

Hydrodynamic regime

4.2.1 The Array and ECC are situated within a macro-tidal setting, with the mean spring tidal range increasing gradually from 4m to the west (around Selsey Bill), to 6.5m in the east. Storm surges may cause short term modification to predicted water levels and under an extreme (1:50 year return period) storm surge, water levels at the landfall are expected to reach 3.76m below Ordnance Datum Newlyn (ODN), approximately 1m above mean high water springs.

4.2.2 The tidal currents within the areas are generally energetic with peak spring current speeds between 0.75 and 1.1m/s in the offshore array areas, reducing gradually from 0.9m/s at the offshore end of the export cable corridor to 0.5m/s at the landfall. There is a general south-west to north-east reduction in current speeds and from offshore to onshore generally. The flood tide (to the east-northeast) is marginally stronger than the ebb tide (to the west-southwest) and this leads to a general net residual flow to the north-east, especially on spring tides.

4.2.3 The wave regime in the English Channel is the outcome of locally generated wind waves and swell waves. Analysis of long-term wave records from the study area show that the most frequent wave direction is from the south-west to south-southwest, with waves occurring from this direction approximately 60 percent of the time.

4.2.4 Extremes analysis of available long-term wave hindcast data shows a clear increase in wave height with distance offshore. Within the array, significant wave heights associated with a 1:2 year return period event are expected to be approximately 4.8m, whereas for the 1:10 year event this value increases to approximately 5.3m.

Morphological regime

4.2.5 Water depths across the Array Area vary from approximately 13m LAT (on a rocky outcrop in the north-west of the site) to 65m LAT (within a broad depression) in the

south-east on the array. Sandwaves are prevalent over much of the central and eastern array area, trending north-west to south-east, with wave heights of up to 2m relative to the surrounding seabed.

4.2.6 The seabed undulates across much of the export cable corridor, influenced by the underlying geology. Water depths within the export cable corridor are greatest at the southern end where they reach 28m LAT within a significant seabed depression. Megaripples are present towards the southern end of the export cable corridor with heights of 0.2m and wavelengths reaching 7m.

4.2.7 The sandwaves and megaripples mapped within the array and export cable corridor have axes broadly aligned perpendicular to the direction of flow. Given known relationships between sediment availability, flow speeds and bedform development, it is expected that these bedforms are active. This has been confirmed to be the case through a comparison in the area of partial overlap between the 2020 survey of the Rampion 2 Offshore Array Areas and the earlier Rampion Zone survey (undertaken in 2010).

4.2.8 The asymmetry of the sandwaves along with the easterly displacement of the features between the 2010 and 2020 bathymetric surveys points to a general easterly direction for sediment transport. This is entirely consistent with known sediment transport pathways across the wider study area.

Sedimentary regime

4.2.9 The seabed across both the Array and ECC areas is dominated by the presence of coarse-grained sediments (sands and gravels) with outcropping bedrock in places. Holocene deposits are widespread across central and eastern areas of the Rampion 2 array area whereas in western areas hard substrate is at or close to the surface in most areas. Bedrock is found throughout the seafloor within the export cable corridor, except when cut through by palaeo-channel systems.

4.2.10 Sediments across the Rampion 2 array and export cable corridor are characteristics of two very different depositional environments. The Holocene seabed sediments generally consist of sand, gravelly sand and sandy gravel and have been reworked and deposited by marine processes. The sediments associated with the palaeo-channels are also sands and gravels but have a fluvial origin, deposited in a terrestrial setting.

4.2.11 The available evidence suggests that net sediment transport as bedload is directed east-northeast towards the eastern English Channel. In the offshore environment, tidal currents are the primary agent for mobilising sediment through bedload and suspended load transport. Wave action during larger storms will occasionally increase the rate of transport, but is not a primary factor in the patterns of transport in offshore areas.

Suspended sediments

4.2.12 Within the array area, suspended sediment concentrations (SSC) are typically between 5 to 10mg/l. However, during stormier conditions, near bed SSC can be temporarily much higher (order of hundreds of mg/l) due to the influence of waves stirring of the seabed. Coarser sediments disturbed by waves may be transported

a short distance in the direction of ambient currents or down-slope under gravity before being deposited. Finer material that persists in suspension will eventually be transported in the direction of net tidal residual flow, that is, to the east-northeast.

4.3 Biological characteristics

Benthic ecology

4.3.1 The results from the site specific survey (**Appendix 9.3: Rampion 2 Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)) and habitat modelling undertaken for Rampion 2 revealed that 15 biotopes were identified as occurring throughout the proposed DCO Order Limits (both the offshore Array Area and the ECC). The biotopes are presented in **Table 4-3** and their predicted spatial distribution are presented in **Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9). A description of each biotope identified is also presented in **Table 4-3** below.

4.3.2 As detailed within **Appendix 9.2: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.2) a diverse macrobenthic community was identified across the proposed DCO Order Limits. Most stations were characterised by the presence of Nemertea which occurred in 57.6% of the samples, while the polychaete *Spirobranchus lamarcki* was the most abundant species recorded. Macrobenthic abundance and richness varied across samples, with a higher abundance and diversity identified for the stations located furthest inshore and west of the survey area. The invasive non-native species *Crepidula fornicata* was recorded forming aggregations at the two grab samples collected closest to land and was also observed in 114 images across the nearshore area of the proposed DCO Order Limits.

Table 4-3 Key biotypes recorded from site specific monitoring and habitat modelling

EUNIS BSH	EUNIS Code	EUNIS Description
A3.2 – Atlantic and Mediterranean moderate energy infralittoral rock	A3.215	*Sabellaria spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock
A4.1 – Atlantic and Mediterranean high energy circalittoral rock	A4.131	Bryozoan turf and erect sponges on tide-swept circalittoral rock
	A4.134	*Flustra foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock

EUNIS BSH	EUNIS Code	EUNIS Description
	A4.139	Sponges and anemones on vertical circalittoral bedrock
A4.2 – Atlantic and Mediterranean moderate energy circalittoral rock	A4.214	Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock
	A4.221	*S. spinulosa* encrusted circalittoral rock
	A4.231	Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay
A5.1 – Sublittoral coarse sediment	A5.131	Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)
	A5.141	*Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
	A5.142	*Mediomastrus fragilis, Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel
A5.2 – Sublittoral sand	A5.231	Infralittoral mobile clean sand with sparse fauna
	A5.233	*Nephtys cirrosa* and *Bathyporeia* species in infralittoral sand
	A5.261	*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment
A5.4 – Sublittoral mixed sediments	A5.422	*Crepidula fornicata* and *M. fragilis* in variable salinity infralittoral mixed sediment

EUNIS BSH	EUNIS Code	EUNIS Description
	A5.431	*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment
	A5.444	*F. foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment
A5.6 – Sublittoral biogenic reefs	A5.611	*S. spinulosa* on stable circalittoral mixed sediment

4.3.3 A more detailed description of the subtidal benthic ecology of the proposed disposal site can be found within **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

4.3.4 Bedrock, stony reef and *S. spinulosa* reef habitats were observed across the western areas of the array area and nearshore areas of the offshore export cable corridor (**Figure 4, Section 6.1.1** of **Appendix 9.3: Rampion 2 Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)). These reef habitats were deemed to correlate to those which fall under Annex I of the EC Habitats Directive but not protected under this legislation as they do not represent Annex I habitat designated within an SAC. The bedrock reef habitats present were representative of the habitat of conservation interest subtidal chalk at two stations (ST004 and ST036) and 6 transects, and peat and clay exposures at one station (ST032) and three transects (T_011, T_027 and T_033). Both these features are considered habitats of principal importance in England under Section 41 of the NERC Act (2006). The stony reef habitats across the study area were assessed to be of both low and medium resemblance (as per Irving (2009)). These stony reef habitats can, in some circumstances, support diverse communities of branching sponges and sea fans. Across the proposed DCO Order Limits these reef habitats were deemed to be representative of the HOCI 'Fragile sponge and anthozoan communities on subtidal rocky habitats', at one station (ST032) and three transects (T_011, T_027 and T_033). Observations of discrete *S. spinulosa* reef habitats were deemed to be of low 'reefiness' across the development site and representative of '*S. spinulosa* on stable circalittoral mixed sediment (A5.611)' and 'S. spinulosa encrusted circalittoral rock' (A4.221).

4.3.5 In addition to the above, NERC Act (2006) Section 41 Habitats of Principal importance are known to occur across the proposed DCO Order Limits. These include 'Sheltered Muddy Gravels' and 'Subtidal Sands and Gravel'.

4.3.6 Broadscale regional habitat mapping to EUNIS Level 4, detailing biological zone and substrate (JNCC, 2018), indicates the dominant habitats across the proposed DCO Order Limits. These are predominantly characterised by circalittoral coarse sediments, deep circalittoral coarse sediments, and deep circalittoral sand across the offshore portion of the proposed DCO Order Limits and by sublittoral sediments, infralittoral coarse sediments and circalittoral fine sands or circalittoral

muddy sands across the inshore portion of the proposed offshore ECC (**Figure 9.3, Volume 3** (Document Reference: 6.3.9)).

4.3.7 **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) presents point sediment data that has been collected across the benthic subtidal ecology study area, as part of monitoring programmes conducted at the existing Rampion 1 offshore wind farm (EMU Limited, 2011; Natural Power, 2016), in addition to the Regional Seabed Monitoring Plan (RSMP) baseline dataset (Cooper and Barry, 2017). This data shows that sediments within the western section of the proposed DCO Order Limits and offshore ECC are predominantly characterised by coarse and mixed sediments. In comparison, the eastern area of the proposed DCO Order Limits has a greater proportion of sand and muddy sand sediments.

4.3.8 Site specific sediment data has been collected within the benthic subtidal ecology proposed DCO Order Limits. Out of the 39 grab sample stations, 28 were dominated by sand, with gravel content varying across the study area and mud content recorded highest close to land and towards the east of the study area. The dominant habitats identified in the seabed imagery were subtidal coarse sediment (A5.1), high energy circalittoral rock (A4.1) and moderate energy circalittoral rock (A4.2). **Figure 8** within **Appendix 9.3: Rampion 2 Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) presents the spatial distribution of these sediment types across the proposed DCO Order Limits. These sublittoral sediment types represent 'subtidal sands and gravels' and 'subtidal mixed muddy sediments' listed as priority habitats under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. **Appendix 9.3: Rampion 2 Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) also notes that these habitats are among the most common habitats found below Mean Low Water Springs (MLWS) around the coast of the UK.

4.3.9 In summary, a variety of different seabed habitats have been recorded in the proposed DCO Order Limits including bedrock and sedimentary habitats in the offshore ECC and coarse and mixed sediments across the remainder of the area. A greater proportion of sand and muddy sediment has generally been recorded in the eastern area of the Order Limits.

Fish and shellfish ecology

4.3.10 A detailed literature review was undertaken to describe the use of the area by fish and shellfish species in relation to key life stages, spawning and juvenile behaviour and migratory pathways. The literature review was informed by surveys undertaken for Rampion 1, as well as data from broader surveys across the English Channel and its coastal waters. A full description of the baseline is given in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8).

4.3.11 The fish and shellfish assemblages within the area are typical of the wider English Channel, and the area supports a diverse assemblage of commercially and non-commercially important fish and shellfish species, all of which are typical of this eastern English Channel.

4.3.12 Offshore beam trawl surveys (ICES, 2019) in the English Channel were dominated by plaice (*Pleuronectes platessa*), Dover sole (*Solea solea*), poor cod (*Trisopterus minutus*), common dragonet (*Callionymus lyra*), thornback ray (*Raja clavata*), and lesser spotted dogfish (*Scyliorhinus canicula*) with European spider crab (*Maja squinado*) also present. Surveys conducted in July 2020 within the Eastern English Channel and the southern North Sea collected data on several species including, cod (*Gadus morhua*), whiting (*Merlangius merlangus*), dab (*Limanda limanda)*, lemon sole (*Microstomus kitt*), plaice and sole (*Solea solea*) (ICES, 2021b). Bottom trawls undertaken across the English Channel to inform the North Sea International Bottom Trawl Surveys (ICES, 2020) were dominated by whiting, European squid, dab, herring (*Clupea harengus*), plaice, lesser spotted dogfish, sprat (*Sprattus sprattus*) and poor cod (*Trisopterus minutus*). Previous surveys for Rampion 1, including otter trawl and beam trawl surveys conducted for characterisation, pre-construction and monitoring, recorded comparable ranges of species. Beam trawling effort has identified gobies (*Gobiidae* species), dragonet (*Callionymus* species), bib (*Trisopterus luscus*), dab, solenette (*Buglossidium luteum*) and weever (*Trachinidae* species), with commercial species such as plaice, and smaller numbers of Dover sole, lemon sole, black seabream (*Spondyliosoma cantharus*), thornback and spotted rays (*R. montagui*). A single short snouted seahorse (*Hippocampus hippocampus*) was recorded in 2011 (Brown and May, 2012a), with three further specimens identified in 2012 (Brown and May, 2012b).

4.3.13 Otter trawling has recorded, amongst other species, whiting, plaice and black seabream (both contributed to 6% of individuals caught), with smaller abundances of lemon sole, bass (*Dicentrarchus labrax*) and cod. Non-commercial species included horse mackerel (*Trachurus trachurus*) and dab are also characteristic of the area. Elasmobranch species recorded include the lesser spotted dogfish (*Scyliorhinus canicula*), tope (*Galeorhinus galeus*), smooth hound (Mustelus species) and rays (thornback, undulate (*R.undulata*), blonde (*R. brachyura*), spotted (*Raja montagui*) and cuckoo (*Leucoraja naevus*)). Shellfish species recorded include long-finned squid (*Loligo forbesi*), which comprised of 20% of the individuals caught in one survey, king scallop (*Pecten maximus*), queen scallop (*Aequipecten opercularis*), cuttlefish (*Sepia officinalis*), whelk and brown crab (*Cancer pagurus*).

4.3.14 **Table 4-4** below summarises the key fish and shellfish receptors of ecological value identified across the region.

Table 4-4 Summary of key fish and shellfish receptors

Receptor	Ecological value of the receptor
Sandeel	A large low intensity sandeel spawning ground lies approximately 13km east of the Rampion 2 Offshore Array Area.
Herring	Areas of high intensity herring spawning are located 47 km to the south-east of the Rampion 2 Offshore Array Area. Herring are also a UK BAP Priority Species.
Black seabream	Nesting black seabream are a protected feature of the Kingmere MCZ, which lies adjacent to the eastern boundary of the offshore export cable corridor. Recently active nests have also been identified within the Rampion 2 Offshore Export Cable Corridor.
European seabass	Seabass are of commercial importance to the region. A designated seabass nursery area is also located in Chichester harbour approximately 26km west of the Proposed Development. Pre-spawning and spawning bass have also been observed gathering offshore in winter, in the western English Channel, the Bay of Biscay, and the eastern Celtic Sea.
Seahorse	Short-snouted and spiny/long-snouted seahorses are of conservation importance (protected under Schedule 5 of the Wildlife and Countryside Act, 1981) and have been recorded in the English Channel. Short snouted seahorse are also a protected feature of the following MCZs: • Selsey Bill and the Hounds MCZ; • Beachy Head West MCZ; • Beachy Head West MCZ; and • Bembridge MCZ.
Cuttlefish	Cuttlefish are of commercial importance to the region and are regularly commercially exploited off the coast of Sussex.
Other fish receptors	Spawning grounds for lemon sole, sole, plaice, whiting and sprat overlap the Proposed Development. Spawning grounds for cod and sandeel lie approximately 15km and 12km from the array area respectively. Nursery grounds for whiting and lemon sole overlap the Proposed Development. Mackerel and sandeel nursery grounds lie approximately 23km and 12km from the Proposed development respectively. Dover sole are also a high value commercial species to the region.
Shellfish	Whelk, brown crab, European lobster and scallop are characterising shellfish receptors in relation to the Proposed Development and are of commercial importance to the region.

Receptor	Ecological value of the receptor
	European native oyster and blue mussel beds are protected features of the Beachy Head West MCZ. European native oyster is also a protected feature of the Bembridge MCZ.
Elasmobranchs	Nursery grounds for thornback ray and undulate ray overlap the Offshore Export Cable Corridor and Offshore Array Area. Undulate ray, spurdog, porbeagle shark, shortfin make, basking shark and blue shark are all UK BAP Priority Species and are therefore of conservation importance.
Migratory species	European smelt, sea trout, European eel, allis shad, twaite shad, Atlantic salmon and sea lamprey all have the potential to transit the Proposed Development during migration. Atlantic salmon, sea lamprey and sea trout are Annex II species. European eel, allis shad, twaite shad and European smelt are UK BAP Priority Species. Atlantic salmon are also a qualifying feature of the River Itchen SAC.

Marine mammals

4.3.15 A desk-based review of literature and existing datasets has been undertaken (**Appendix 11.1: Marine mammal baseline technical report, Volume 4** (Document Reference: 6.4.11.1) to establish the marine mammal baseline at the time of writing. This included relevant previous marine mammal records and surveys in the area, including the results of Rampion 1 site specific surveys and details of the consultation with Expert Topic Groups (ETG). The characterisation of the baseline environment has been supported by site-specific marine mammal surveys from the study area collected from April 2019 to March 2021. The survey area for the marine mammal assessment included the proposed DCO Order Limits plus a 4km buffer.

4.3.16 The Rampion 2 site-specific surveys resulted in sightings of harbour porpoise and common dolphin, alongside a number of unidentified cetaceans and seals. Harbour porpoises were recorded in only eight of the 24 surveys. This resulted in a maximum density estimate of 0.05 porpoise/km^2 within the Survey Area (Rampion 2 array area + 4 km buffer) and an average density across all 24 surveys of 0.01 porpoise/km^2. Only one common dolphin was sighted during the 24 months of site-specific surveys. The average density estimate across all surveys to date in the survey area was 0.001 dolphins/km^2. The unidentified cetaceans, presumed to be either a dolphin or porpoise species, were seen in ten of the survey months. This resulted in an average density estimate across all surveys of 0.01 individuals /km^2. The unidentified seals, presumed to be either grey or harbour seals, had a peak count in July when three seals were counted.

4.3.17 While not sighted during the Rampion 2 site-specific surveys, bottlenose dolphins and minke whales have been sighted during local and opportunistic surveys in the area.

4.3.18 Full details of the baseline collected for the Rampion 2 Order Limits and buffer area, along with review of other datasets and literature in characterising the area, are presented in **Chapter 11: Marine mammals, Volume 2** of the ES (Document Reference: 6.2.11).

Offshore ornithology

4.3.19 A programme of 24-months of aerial digital surveys was completed for the Rampion 2 assessment, covering the Rampion 2 Array Area plus a buffer of at least 4km. Full details of these surveys, along with other data sources considered, are presented in **Appendix 12.1: Offshore and intertidal ornithology baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1).

4.3.20 A total of 20 species were recorded across the surveys, with the key species comprising kittiwake (*Rissa tridactyla*), Guillemot (*Uria aalge*), razorbill (*Alca torda*), gannet (*Morus bassanus*), fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*), great black backed gull (*L. marinus*) and lesser black backed gull (*L. fuscus*).

4.3.21 A summary of the bird species recorded within the Rampion 2 area from 24 months of surveys is resented below in **Table 4-5**.

Table 4-5 Bird species recorded in site-specific digital aerial surveys of Rampion 2 Study Area

Divers and pelagic species	Gulls	Terns	Auks	Other
Red-throated diver	**Kittiwake**	Sandwich tern	**Guillemot**	*Cormorant*
Great northern diver	*Little gull*	*Common tern*	**Razorbill**	
Gannet	Common gull	*'Commic' tern		
Fulmar	*Mediterranean gull*			
Manx shearwater	**Herring gull**			
	Great black-backed gull			
	Lesser black-backed gull			

4.3.22 Further detailed information regarding survey methods and results are presented in **Chapter 12: Offshore and intertidal ornithology, Volume 2** of the ES (Document Reference: 6.2.12).

Designated sites

4.3.23 The Rampion 2 Order Limits is in proximity to a number of sites designated for nature conservation and water quality, including the Solent and Dorset Coast SPA, Chichester and Langstone Harbour SPA, Pagham Harbour SPA, South Wight Maritime SAC, Solent Maritime SAC, Offshore Overfalls MCZ, Kingmere MCZ, Pagham Harbour MCZ, Selsey and the Hounds MCZ, Beachy Head West MCZ, and Beachy Head East MCZ. There is no overlap between the Rampion 2 Order limits, and therefore the boundaries of the proposed disposal licence areas, with the boundaries of any site designated for nature conservation, with the closest adjacent sites comprising Kingmere MCZ and Offshore overfalls MCZ.

4.3.24 The Order Limits overlap with the Sussex coastal water body and the Arun transitional water body, with the inshore section of the ECC area being located in proximity to designated bathing waters at Littlehampton and Middleton-on-Sea.

4.3.25 Further information and assessment of impacts to designated sites can be found in the **Report to Inform Appropriate Assessment** (Document Reference: 5.9) which considers effects on sites within the National Site Network (SACs, SPAs and Ramsar sites), the **Marine Conservation Zone assessment** (Document Reference 5.11), and **Appendix 26.3: Water Framework Directive compliance assessment, Volume 4 of the ES** (Document Reference 6.4.26.3).

4.4 Human environment

Commercial fisheries

4.4.1 The commercial fisheries baseline has been set based on assessment of landings data from the Rampion 2 Order Limits area, within ICES rectangle 30E9.The receiving environment has then been determined following analysis on a fishery-by-fishery basis, with details on the nationality of vessels, species caught, and location of fishing activity all considered. Full details of the assessment are provided in **Chapter 10: Commercial fisheries, Volume 2 of the ES** (Document Reference 6.2.10), with extended descriptions of baseline conditions, including fishing gear and vessel characteristics and profiles of fishing activity on a country basis presented in **Appendix 10.1: Commercial fisheries technical baseline report, Volume 4** of the ES (Document Reference: 6.4.10.1).

4.4.2 An annual average value of £5.2 million is landed by all UK vessels for the years 2016 to 2020 from the study area ICES rectangle (based on data from MMO, 2022). Data presented for the annual (2016-2020) landed weight and value by UK vessels indicated that whelk *B. undatum*, King scallop *P. maximus*, sole *S. solea* and plaice *P. platessa*, bass *D. labrax*, brown crab *C. pagurus* and lobster *Homarus gammarus*, horse mackerel *T. trachurus* and cuttlefish *S. officinalis* represent key fisheries in the study area.

4.4.3 The average annual landings for the UK and all EU countries have been based on data from 2012 to 2016 as from 2017 onwards landings data in the EU Data Collection Framework (DCF) database by country is not available by ICES rectangle; data from 2012 to 2016 therefore ensures focus on the commercial fisheries study area. English vessels were responsible for the most significant portion (approximately 65%) of landings over this period. For non-UK vessels, the commercial fisheries study area is dominated by landings of horse mackerel, whiting *M. merlangus*, and plaice. Vessels from the Netherlands, France and Belgium are responsible for the majority of landings from the study area by non-UK vessels, though data also indicates fishing activity by German, Danish and Irish vessels.

4.4.4 Potting is undertaken almost exclusively by the UK fleet. Whelk represent the highest landings and value in the area, brown crab, cuttlefish and lobsters are all important target species.

4.4.5 The 2017 data indicate some potting activity in the array area by larger vessels (≥ 15 m), which also target grounds to the east, south and west of Rampion 2. No potting activity by larger vessels is observed within the Rampion 2 boundary in 2016, 2018 or 2019.

4.4.6 Data from the Sussex IFCA (Nelson, 2020) indicate that within the nearshore area of the offshore cable corridor, vessels are potting, predominantly for whelks, but also for crab, lobster and cuttlefish (the latter caught with traps). Analysis by the Sussex IFCA of Shellfish Permit 2019 to 2021 catch return data further confirms that whelk and cuttlefish, and to a lesser extent crab and lobster, are targeted in and around the offshore cable corridor. Whelk represent the dominant shellfish species landed from the offshore cable corridor.

4.4.7 Netting in the Rampion 2 area by vessels using fixed and drift nets are exclusively undertaken by the UK fleet from vessels under 10m in length. Target species include sole as well as bass, cuttlefish, plaice and turbot. The value of landings targeted by the netting fleet has declined since the most recent peak in 2018. Mapping of inshore fishing effort (inside of 6NM) between 2015 and 2019 by the Sussex IFCA (Nelson, 2020) based on fisheries patrol vessel sightings indicates that netting activity targeting mixed species including plaice, sole and bass is also recorded within the Rampion 2 offshore export cable corridor, though effort is greater to the east of the corridor.

4.4.8 Dredges are almost exclusively undertaken by the UK fleet, in this case comprised of English and Scottish vessels, although EU DCF landings data indicates some very limited activity by Irish and French dredgers in the area. The dredge fishery targets scallops, with minimal landings of other commercial species.

4.4.9 Annual landings by the dredge scallop fishery are variable, with lower catches from the study area between 2016 and 2018, compared with 2019 and 2020, reflecting the somewhat cyclable nature of scallop fisheries, where certain grounds are more productive in certain years and are therefore targeted on a cyclable basis. Scallop dredging is undertaken predominantly by larger (>10m) vessels, although vessels >14m in length are prohibited from fishing within 6NM and a further byelaw prohibits scallop dredging by any vessel within 3NM of the shoreline.

4.4.10 VMS data, for UK and EU vessels, shows activity by vessels ≥ 15m length actively fishing using dredges. Data indicate some dredge activity in the array area, with prominent scallop grounds present to the south of Rampion 2. Very limited scallop dredge activity is expected to take place within the Rampion 2 offshore cable corridor. UK vessel dredge activity within Rampion 2 boundaries is shown by the VMS data to have been most substantial in 2017.

4.4.11 Pelagic trawling in the general area is undertaken by fleets from a number of nations, targeting predominantly horse mackerel, with additional quantities of herring and mackerel associated with the catch. Pelagic catches taken from the area are highly variable year on year. Whilst it would be assumed some effort will be undertaken within the Rampion 2 Order Limits area, the fleets do not routinely target this area.

4.4.12 Beam trawling is undertaken by UK (24% by value) and Belgian (76%) fleets. The target species are principally sole and plaice, though a wide variety of species are taken as part of the catch. Total landings by beam trawl have dropped consistently across the years analysed. This may be due to changes in gear as well as fluctuations related to trends in Total Allowable Catches (TACs) and prices for the key species. Data indicate that both UK and Belgian beam trawl fisheries are active across Rampion 2, and beam trawlers are particularly active across the eastern half of the array area and in adjacent waters to the south and east.

4.4.13 The demersal trawl fishery, primarily English and French vessels, targets a wide variety of species including horse mackerel, sea breams and squid. Both UK and other EU demersal trawl fisheries are active across the Rampion 2 area, with more heavily targeted grounds located towards the southeast of the area. Mapping of inshore fishing effort (inside of 6NM) between 2015 and 2019 by the Sussex IFCA (Nelson, 2020) based on fisheries patrol vessel sightings indicate that trawling also takes place within the offshore cable corridor, with such activity fairly widespread throughout inshore waters along the wider coastline.

Shipping and navigation

4.4.14 Key navigational features in proximity to Rampion 2 include the existing Rampion 1 (fully commissioned in November 2018), the Dover Strait Traffic Separation Scheme (TSS) and several marine aggregate dredging areas. There are also several ports and harbours located along the coast within the Study Area.

4.4.15 The main IMO routeing measure present in the area is the Dover Strait routeing measure consisting of TSS lanes, separation zones and an Inshore Traffic Zone (ITZ). The Dover Strait TSS lies approximately 4.2nm from the proposed DCO Order Limits at the closest point, and 5.6nm from the outer edge of the westbound lane. An ITZ covers the sea area eastward of the line joining Shoreham and the CS1 light buoy and lies approximately 1.5nm from the proposed DCO Order Limits at the closest point. The ITZ is designed to protect local traffic including small craft and its use is subject to various restrictions.

4.4.16 Several ports and harbours are located along the coast close to the proposed DCO Order Limits with the closest port being Shoreham Port, located approximately 9.5nm to the north. Littlehampton Harbour lies immediately east of the offshore export cable corridor and the Port of Newhaven and Brighton Marina

are also located in the area. Further west there are various ports located in the Solent, with the NAB Deep Water Channel providing a suitable route for deep-laden inbound tankers, large containers and other vessels constrained by their draught.

4.4.17 There are anchorage areas associated with Shoreham Port, the Port of Newhaven and Littlehampton Harbour. There are no additional anchorage areas within or in proximity to the proposed DCO Order Limits.

4.4.18 From vessel traffic survey data recorded on-site there are notable volumes of vessel traffic passing within or in proximity to Rampion 2. Cargo, tankers, recreational and fishing vessels are all prominent, with movements dictated by navigational features.

4.4.19 From AIS and radar surveys of vessel traffic completed for the Proposed Development, the main vessel types recorded within the study area during the summer period were cargo vessels (37%), recreational vessels (26%), tankers (18%) and fishing vessels (8%). In the winter survey, the main vessels recorded comprised cargo vessels (49%), tankers (22%) and fishing vessels (13%).

4.4.20 Full details are presented within **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) and associated Appendices.

Marine archaeology

4.4.21 There are currently no protected wreck sites or other designated heritage assets within the marine archaeology study area encompassing the Rampion 2 Order Limits.

4.4.22 There is potential for archaeological material of a prehistoric date to exist within the marine archaeology study area, as the area of seabed within which Rampion 2 is located was previously dry land that were exploited by people during the Pleistocene and early Holocene. Early to Middle Pleistocene deposits of the West Sussex Coastal Plain and wider Solent Basin were shaped by successive interglacial sea-level highstands during the last 500,000 years (Bates *et al*., 2010).

4.4.23 Within the marine archaeology study area there are a total of 38 live wrecks, 22 dead wrecks, four unknown or unconfirmed, and two lifted wrecks. Of the wrecks recorded in the United Kingdom Hydrographic Office (UKHO) and National Record of the Historic Environment (NRHE) baseline data assessment, 28 were identified within the geophysical data. There are also 17 reported losses of aircraft, all but one, which is unidentified, dating to the Second World War, as well as an additional 24 recorded vessel losses within the study area whose location within the dataset is recorded as in the general area. In addition, a number of targets identified during seabed surveys may have further archaeological interest.

4.4.24 Full details are provided in **Chapter 16: Marine archaeology, Volume 2** of the ES (Document Reference 6.2.16) and associated Appendices.

Other marine users

4.4.25 Other marine users in or in proximity to the Rampion 2 Order Limits include marine aggregates, disposal sites, oil and gas, offshore wind, other offshore energy,

military activities and munitions, subsea cables and pipelines, recreational boating and sailing, diving and water sports (including surfing) recreational fishing and aquaculture.

4.4.26 There are six active marine aggregate-extraction sites located within the general, the closest licence area to the Proposed Development being the Inner Owers aggregate site (Licence area 396/1), from which flint gravel deposits are extracted. This licence area borders the Rampion 2 export cable corridor and at its closest is 0.06km away. There is no direct overlap with any marine aggregate licensed areas.

4.4.27 There are seven disposal sites within the study area, of which one open site, one closed site and one proposed site are directly within the study area. These comprise Littlehampton (closed), which is located within the export cable corridor; the existing Rampion 1 project disposal site (open), part of which is located within the Rampion 2 proposed DCO Order Limits; and the AQUIND Cable Site A (proposed), which would run through the south west of the array area.

4.4.28 In terms of other offshore wind projects, Rampion 1 sits to the north of the eastern part of the Rampion 2 Order Limits area with the export cable running inshore to join the coastline at Worthing. This is currently the only operational wind farm along the south coast of England. **Chapter 3: Alternatives**, **Volume 2** of the ES (Document Reference 6.2.3) explains how the different offshore wind farm agreements and extension sites interrelate.

4.4.29 An MoD Firing Practice and Navy exercise area is positioned directly adjacent to the South West of the Rampion 2 Order Limits area, with the two boundaries meeting at one single point (but with no actual overlap of the array).

4.4.30 A number of subsea cables are located in the general area, but currently none overlap with the proposed DCO Order Limits for Rampion 2. The closest is the England-France High-Voltage Direct Current (HVDC) interconnector, ‘Interconnexion France-Angleterre’ (IFA2), which runs in proximity to (approximately 300m from) the western boundary of the proposed DCO Order Limits. The CrossChannel Fibre cable, connecting Slough, UK to Paris, France runs between the Brighton coast and Veules-les-Roses, France. The cable route passes 4.9km to the east of the northeastern part of the Rampion 2 proposed DCO Order Limits at its closest. Other cable are located at greater distances (>12 km from the Rampion 2), although the disused ‘UK France 3’ cable is located approximately 1.6km to the east of the proposed DCO Order Limits.

4.4.31 There is a relatively high number of inshore sailing clubs and organisations in the vicinity of Rampion 2, operating primarily from Littlehampton, Worthing, Lancing, Shoreham, Hove and Brighton. There are also numerous sailing schools and other training establishments along this stretch of coastline. The Sussex coast is popular for sailing regattas, and races happen frequently in the area, including races around the Rampion 1 offshore wind farm.

4.4.32 Across the inshore section of the ECC area there is overlap with a general boating area with an area marked as being of high level usage across the central section of the cable corridor. Based on the RYA data, this appears to represent a vessel transit route passing through to Brighton and Eastbourne to/from the Solent.

4.4.33 The general coastal and inshore area within the region is popular for dinghy sailing and racing, activities that are undertaken from the various sailing clubs above, as well as independently run from beaches and harbours within the area. During the summer months in particular, jet skiing, water skiing and other small recreational motorboats are launched from the beaches along the coast. The majority of these recreational activities occur inshore, typically within 250m of the coast and are therefore well inshore of the Array Area. However, it is noted that some users they will go further out including with the area of the proposed Rampion 2 DCO order limits, and there will be potential for direct overlap with usage in the vicinity and inshore around Climping, where the ECC meets the landfall location.

4.4.34 The inshore coastal area is also used for a variety of activities, from recreational diving to a range of other water sports, diving, recreational fishing and surfing and bathing at beaches, for the most part, due to its proximity to a large population and good access.

4.4.35 Full details of the baseline and assessment for other marine users is given in **Chapter 7: Other marine users**, **Volume 2** of the ES (Document Reference 6.2.7).

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5. Characteristics of the material being disposed

5.1 Introduction

5.1.1 Detail on the characteristics of the material to be disposed of can be found in:

- **Chapter 6: Coastal processes, Volume 2 o**f the ES (Document Reference: 6.2.6);
- **Appendix 6.1: Coastal processes technical report: Baseline description, Volume 4**, (Document Reference: 6.4.6.1).
- **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9);
- **Appendix 9.3: Rampion 2 Offshore Wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3); and
- **Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES (Document Reference: 6.4.9.4).

5.2 Physical characteristics

Dredged material

5.2.1 The dominant sediment types identified in the array area that will be dredged are mainly sands and gravels with generally low (<5%) fines content. reproduces Figure 6.1.18 from **Appendix 6.1: Coastal processes technical report: Baseline description, Volume 4**, (Document Reference: 6.4.6.1), showing the distribution of sediments across the Order Limits area.

5.2.2 Although the process of disposal may result in a slight change to the existing particle size composition of seabed sediments, the material arising from sandwave clearance, seabed preparation and trenching that will be disposed will be of comparable nature to existing seabed sediment as the disposal will occur in the same area as the dredging.

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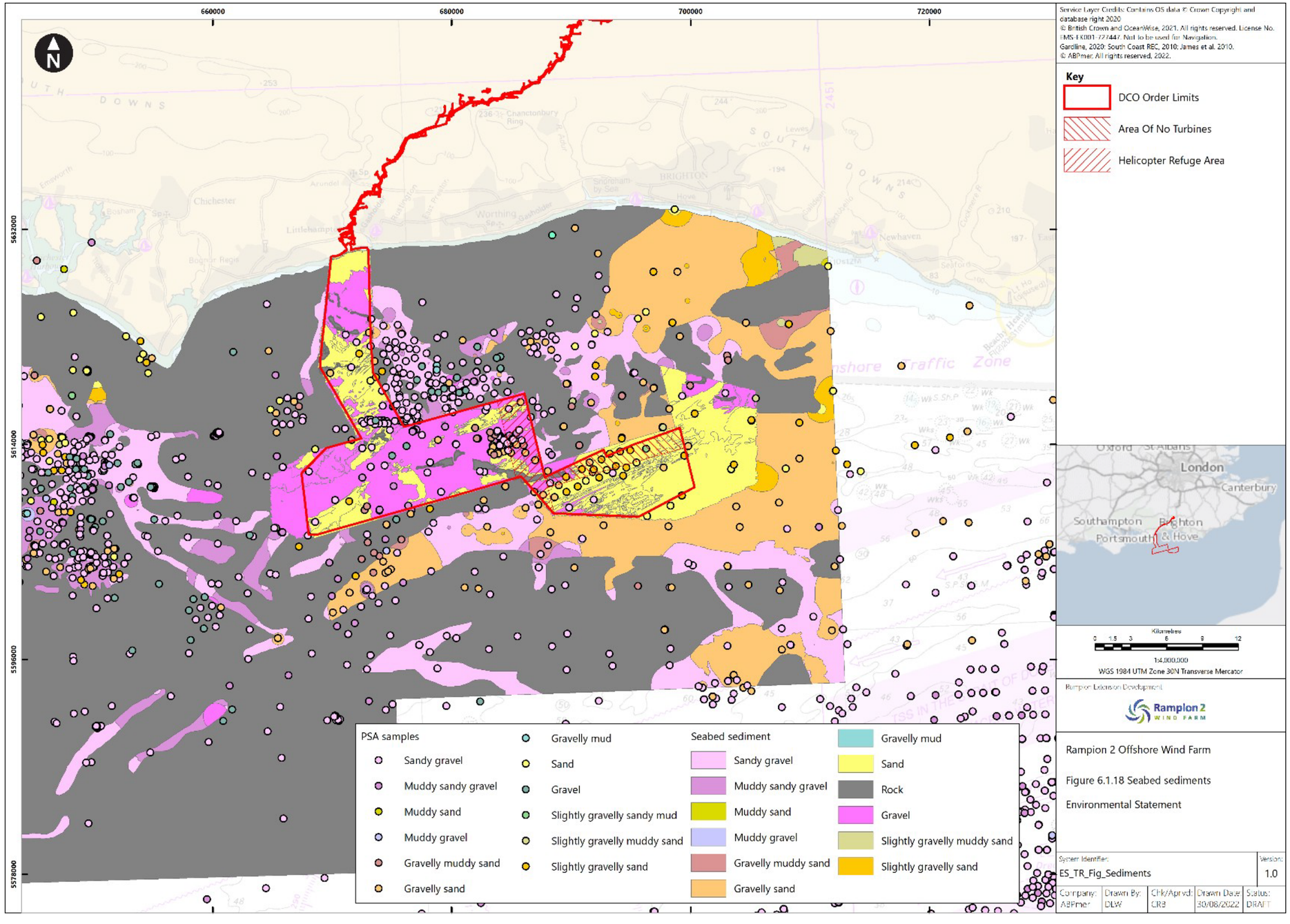
Graphic 5-1 Sediment distributions across the Array and ECC areas (extract from Figure 6.1.18)



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Drilled material

5.2.3 The spoil material derived from drilling activities will be different in nature to that disposed of via seabed preparation/dredging as these drilled materials will include predominantly sediment/rock from deeper in the soil profile.

5.2.4 Beneath the veneer of surficial sediments (sands), sub surface geology consists of occasional bedrock, which is interpreted to comprise Tertiary Claystones to Cretaceous Chalk strata which occasionally subcrop and outcrop in the northeast of the Rampion 2 Offshore Array Area. In some areas, there may be exposed chalk bedrock, or chalk bedrock close to the surface below surficial sediments.

5.2.5 The exact proportions of these deposits that will form the basis of the drill arisings deposited on the seabed will vary according to the drilling locations and the depth to which drilling occurs.

5.3 Chemical characteristics

5.3.1 This section summarises the chemical characteristics of sediments of the material being disposed. Further detail can be found in **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9).

5.3.2 Site specific sediment contaminant data has been collected within the benthic subtidal ecology study area (**Figure 9.2, Volume 3** of the ES (Document Reference: 6.3.9)). European Chemicals Agency (ECHA) (2021) collected a total of seven successful chemical samples (Heavy Metals and Hydrocarbons) across the benthic study area. Chemical samples were unable to be obtained from eight stations during the survey due to the coarse sediment (pebbles/cobbles/bedrock) present at the target location.

5.3.3 A total of eight heavy and trace metals were analysed from sediments taken at each of the seven stations. These were arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Concentrations of arsenic were recorded at levels that exceeded Cefas Action Level 1 at five stations, with no metals recording in excess of Cefas Action Level 2. Metal concentrations significantly below the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Background Assessment Concentration (BAC) are considered to be near background levels, with concentrations below the Effect Range Low (ERL) rarely causing adverse effects in marine organisms.

5.3.4 All stations exceeded ERL levels for arsenic. In addition, six stations exceeded BAC levels for chromium, but did not exceed ERL levels (see **Table 11** of **Appendix 9.3: Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)). All remaining metals did not exceed ERL or BAC levels. For the Canadian sediment quality guideline (CSQG, 2022), levels above the Threshold Effect Level (TEL) adverse effects may occasionally occur, whilst at levels above the Probable Effect Level (PEL) adverse effects may occur frequently. Concentrations of arsenic above TEL were recorded at all seven stations and above PEL at one station (ST051). All remaining metals fell below TEL and PEL limits (see **Table 11** of **Appendix 9.3: Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)).

5.3.5 Polycyclic Aromatic Hydrocarbons (PAH) were tested for from all seven samples collected. With the exception of Phenanthrene (ST020) and Pyrene (ST030), all PAHs were recorded below limits of detection across all seven sampling stations. At the two stations where PAHs were detected, reference levels were not exceeded (see **Table 12** of **Appendix 9.3: Offshore Wind Farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)).

5.3.6 In conclusion, concentrations of arsenic were recorded at levels that exceeded Cefas Action Level 1 at five stations, with no metals recording in excess of Cefas Action Level 2. Levels of arsenic also exceeded the OSPAR ERL and chromium exceeded BAC levels but did not reach the ERL. Levels of PAH recorded were all below the reference levels.

5.4 Biological characteristics

5.4.1 Biological characteristics of sediment areas were similar across all locations including the Array and the ECC, with a variety of different seabed habitats on coarse and mixed sediments across the majority of the area, although bedrock habitats are found in the ECC area along with sedimentary habitats. Further detail can be found above in **Section 4.3** and in the sources described in **Table 4-1**.

6. Assessment of the potential adverse effects of in-situ disposal

6.1 Introduction

6.1.1 The potential environmental impacts from disposal at Rampion 2 have been assessed as part of the EIA and described in full in the **ES** (Document Reference: 6.2). The purpose of this Report is to summarise what the impacts are and signpost the reader as to where further information can be found. The summary is presented in **Table 6-1**. It is important to note that only impacts related to the disposal of sediment through increased suspended sediment concentrations, sediment deposition and potential loss of seabed habitats are included in the assessment of the potential adverse effects of in-situ disposal.

6.1.2 Effects on marine characteristics are described but it should be noted coastal processes (including patterns of winds, waves, water levels, currents, coastal and seabed sediments and morphology, and water turbidity) are not in themselves receptors but are instead 'pathways' of effect, with the potential to indirectly impact other environmental receptors (refer to **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6)). However, changes to these processes may have an impact on other sensitive receptors.

6.2 EIA results

6.2.1 Potential changes to suspended sediment concentrations (SSC) and sediment deposition have been modelled in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6). To summarise, sediment plumes caused by seabed preparation and installation activities are expected to occur over a maximum distance of 16km (spring tide) from the source. Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of silt deposition (reducing exponentially from source). **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) provides a useful schematic summarising the spatial extent of the impact zones associated with SSC and deposition in relation to Rampion 2. The figure details that the results of modelling can be summarised broadly in terms of four main zones of effect, based on the distance from the activity causing sediment disturbance:

- 0 to 50m - zone of highest SSC increase and greatest likely thickness of deposition. All gravel sized sediment likely deposited in this zone, also a large proportion of sands that are not resuspended high into the water column, and also most or all dredge spoil in the active phase. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released and the manner in which the deposit settles;

- 50 to 500m - zone of measurable SSC increase and measurable but lesser thickness of deposition. Mainly sands that are released or resuspended higher in the water column and resettling to the seabed whilst being advected by ambient tidal currents. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released, the height of resuspension or release above the seabed, and the ambient current speed and direction at the time; and
- 500m to the tidal excursion buffer distance - zone of lesser but measurable SSC increase and no measurable thickness of deposition. Mainly fines that are maintained in suspension for more than one tidal cycle and are advected by ambient tidal currents. Plume dimensions and SSC are primarily controlled by the volume of sediment released, the patterns of current speed and direction at the place and time of release and where the plume moves to over the following 24 hours.

6.2.2 Further information on sediment plume distances and modelling are provided in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** (Document Reference: 6.4.6.3) of the ES.

6.2.3 The magnitude of the maximum potential increase in SSC resulting from construction activities is within the natural range of SSC, within the region and the impact will be short-term, intermittent and of localised extent and reversible.

6.2.4 The **ES** (Document Reference: 6.2) for Rampion 2 provides a detailed impact assessment of disposal activities on a number of sensitive biological and human environment receptors, including (amongst others) benthic habitats, fish and shellfish spawning and nursery habitats, marine mammals, birds, and commercial fisheries. **Table 6-1** signposts the relevant **ES** (Document Reference: 6.2) chapter for each of these assessments.

6.2.5 The effects defined within **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) have been interpreted with regard to their subsequent impact on various receptors. The sensitivity of various receptors to these effects (increased SSCs, sediment deposition and potential loss of seabed habitats) has been determined based on relevant literature and an assessment of the significance of any impacts undertaken.

Table 6-1 Summary of impacts from disposal of material from seabed preparation, sandwave clearance, pile driving and cable trenching within the Proposed Development Order Limits

Potential impact	Relevant Section of ES	Magnitude of Impact	Sensitivity of Receptor	Significance of Residual Effect
Coastal processes				
Potential changes to suspended sediment concentrations, bed levels and sediment type/character arising from dredging, drilling and cable installation	**Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6)	(Pathway)	(Pathway)	(Pathway)
Fish and shellfish				
Direct and indirect seabed disturbances leading to the release of sediment contaminants	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8)	Negligible	Medium	Minor adverse
Temporary localised increase in SSC and smothering	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8)	Negligible	Low to High	Minor adverse
Benthic subtidal and intertidal ecology				

Potential impact	Relevant Section of ES	Magnitude of Impact	Sensitivity of Receptor	Significance of Residual Effect
Direct and indirect seabed disturbances leading to the release of sediment contaminants	**Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)	Negligible	High	Minor, not significant
Temporary increase in Suspended Sediment Concentration and sediment deposition in the Rampion 2 Array Area and offshore cable corridor	**Chapter 9: Benthic subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)	Negligible	Medium	Minor, not significant
Temporary increase in Suspended Sediment Concentration and sediment deposition in the intertidal area		Negligible	Medium	N/A
Temporary increase in Suspended Sediment Concentration and sediment deposition from decommissioning of foundations, cables, and rock protection		Minor to negligible	Medium	Minor, not significant
Marine mammals				
Inter-related effects from the interaction of increased SSC and smothering, and habitat loss/ disturbance	**Chapter 11: Marine mammals, Volume 2** of the ES (Document Reference: 6.2.11)	Low	Low	Minor

Potential impact	Relevant Section of ES	Magnitude of Impact	Sensitivity of Receptor	Significance of Residual Effect
Offshore and intertidal ornithology				
Indirect impacts on bird species due to impacts on prey species habitat loss	**Chapter 12: Offshore and intertidal ornithology, Volume 2** of the ES (Document Reference: 6.2.12)	No impacts are predicted on offshore ornithological features as a result of increased SSC as no significant effects were identified to potential prey species (fish or benthic) or on the habitats that support them in the assessments on fish and benthic ecology (**Chapter 8: Fish and shellfish ecology, Volume 2 2** (Document Reference: 6.2.8) and **Chapter 9: Benthic subtidal and intertidal ecology, Volume 2** (Document Reference: 6.2.9) respectively). Then there is no potential for any indirect effects of an adverse significance to occur on offshore and intertidal ornithology receptors.		
Other marine users				
Temporary increases in suspended sediment and subsequent deposition	**Chapter 7: Other marine users, Volume 2** of the ES (Document Reference: 6.2.7)	Low	Medium	Minor, not significant
Commercial fisheries				
Rampion 2 Array Area and offshore cable corridor construction activities leading to disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity	**Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference: 6.2.10)	Minor	Low	Minor adverse

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6.3 Monitoring

6.3.1 Based on the findings of the impact assessments presented in the **ES** (Document Reference: 6.2), and summarised within this document, there are no predicted significant effects arising from disposal activities across physical processes, benthic or water quality that would necessitate monitoring for disposal and no monitoring is proposed by the specialists for those topics.

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7. Conclusions

7.1.1 This document presents site characterisation information for two proposed Rampion 2 disposal sites. It provides information to inform the licensing of these disposal sites, within the Array Area and the offshore ECC. Materials proposed for disposal are those arising from offshore construction activities and will include drill arisings, material from foundation seabed preparation, and cable installation preparation. This document has been produced to aid licensing authority decision making as part of the DCO determination process and inform the inclusion of any conditions relating to waste disposal in the dMLs.

7.1.2 The impacts of disposal via the return of dredged material to the water column and/or the placement of drill arisings adjacent to foundations has been fully assessed. No moderate, large or very large (significant in EIA terms) adverse effects have been identified, with only minor (not significant in EIA terms) effects predicted on certain receptors.

7.1.3 As the assessment has not identified any significant adverse effects on receptors for this proposed disposal activity, it is concluded that, whilst potential alternative options for the use of this material may exist in theory and at some point in the future, disposal in situ remains the most viable option. In situ disposal also has the advantage of retaining sediment within the local sedimentary system.

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8. Glossary of terms and abbreviations

Term (acronym)	Definition
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of the Proposed Development together with any known or foreseeable future changes that will take place before completion of the Proposed Development.
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment
Biotope	A region of habitat associated with a particular ecological community
Coastal processes	The processes that interact to control the physical characteristics of a natural environment, for example: winds; waves; currents; water levels; sediment transport; turbidity; coastline, beach and seabed morphology.
DCO Application	An application for consent to undertake a Nationally Significant Infrastructure Project made to the Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether development consent should be granted for the Proposed Development.
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
dML	Deemed Marine Licence
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
EUNIS habitat classification	A pan-European system which facilitates the harmonised description and classification of all types of habitat, through the use of criteria for habitat identification
Geophysical	Relating to the physics of the earth

Term (acronym)	Definition
Habitats Regulation Assessment (HRA)	The assessment of the impacts of implementing a plan or policy on a European Site, the purpose being to consider the impacts of a project against conservation objectives of the site and to ascertain whether it would adversely affect the integrity of the site.
Horizontal Directional Drill (HDD)	An engineering technique avoiding open trenches.
Hydrodynamic regime	The characteristic patterns and statistics of variation in water levels and currents for a given location or area. Potentially includes tidal, surge and other residual flow processes; (does not include waves).
Impact	The changes resulting from an action.
INNS	Invasive Non-Native Species
Inshore	The sea up to two miles from the coast.
Inshore Fisheries and Conservation Authority (IFCA)	There are 10 Inshore Fisheries and Conservation Authorities (IFCAs) in England. The 10 IFCA Districts cover English coastal waters out to 6 nautical miles from Territorial Baselines. The IFCAs have shared powers and duties which are found in the Marine and Coastal Access Act, 2009.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
km	Kilometre
m	Metre
Marine aggregate	Marine dredged sand and/or gravel.
Marine Conservation Zone (MCZ)	A Marine Conservation Zone (MCZ) is a type of marine nature reserve in UK waters. They were established under the Marine and Coastal Access Act (2009) and are areas designated with the aim to protect nationally important, rare or threatened habitats and species.
Marine Management Organisation (MMO)	MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. MMO license, regulate and plan marine activities in the seas around England so that they're carried out in a sustainable way.
Marine Policy Statement (MPS)	Framework for preparing Marine Plans and taking decisions affecting the marine environment.

Term (acronym)	Definition
MHWS	Mean High-Water Springs
MLWS	Mean Low-Water Springs
nm	Nautical Mile
NPS	National Policy Statement
Nursery habitat	Habitats where high numbers of juveniles of a species occur, having a greater level of productivity per unit area than other juvenile habitats.
Offshore	The sea further than two miles from the coast.
Offshore area	An area that encompasses all planned offshore infrastructure.
Offshore Wind Farm	An offshore wind farm is a group of wind turbines in the same location (offshore) in the sea which are used to produce electricity.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed development, Volume 2** of the ES (Document Reference: 6.2.4).
Rampion 1	The existing Rampion Offshore Wind Farm located in the English Channel in off the south coast of England.
Ramsar site	Areas designated by the UK Government under the International Ramsar Convention (the Convention on Wetlands of International Importance) 1971.
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to pollutants which could potentially arise as a result of the Proposed Development.
RED	Rampion Extension Development Limited
SBES	Single-beam Echo Sounder
SBP	Sub-bottom Profiler
Sediment deposition	Settlement of sediment in suspension back to the seabed, causing a localised accumulation.

Term (acronym)	Definition
Sediment transport	The movement of sediment by natural processes, as individual grains or as a collective volume
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value associated to that receptor.
Significance	A measure of the importance of the environmental effect, defined by criteria specific to the environmental aspect.
Significant effect	It is a requirement of the EIA Regulations to determine the likely significant effects of the development on the environment which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated. The significance of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and the sensitivity of the receptor) that should be attached to the impact described. Whether or not an effect should be considered significant is not absolute and requires the application of professional judgement. Significant – 'noteworthy, of considerable amount or effect or importance, not insignificant or negligible' (The Concise Oxford Dictionary). Those levels and types of landscape and visual effect likely to have a major or important/noteworthy or special effect of which a decision maker should take particular note.
Special Area of Conservation (SAC)	International designation implemented under the Habitats Regulations for the protection of habitats and (non-bird) species. Sites designated to protect habitats and species on Annexes I and II of the Habitats Directive. Sufficient habitat to maintain favourable conservation status of the particular feature in each member state needs to be identified and designated.
Special Protection Area (SPA)	Sites designated under EU Directive (79/409/EEC) to protect habitats of migratory birds and certain threatened birds under the Birds Directive
SSS	Side Scan Sonar

Term (acronym)	Definition
Study area	Area where potential impacts from the Proposed Development could occur, as defined for each aspect.
Subtidal	The region of shallow waters which are below the level of low tide.
Suspended sediment concentration (SSC)	The mass concentration (mass/volume) of sediment in suspension.
The Applicant	Rampion Extension Development Limited (RED).
Type or Nature of effect	Whether an effect is direct or indirect, temporary or permanent, positive (beneficial), neutral or negative (adverse) or cumulative.
Wave regime	The characteristic patterns and statistics of variation in waves for a given location or area.
WTG	Wind Turbine Generator

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