Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 8: Examination Documents

Outline Cable Burial Risk Assessment

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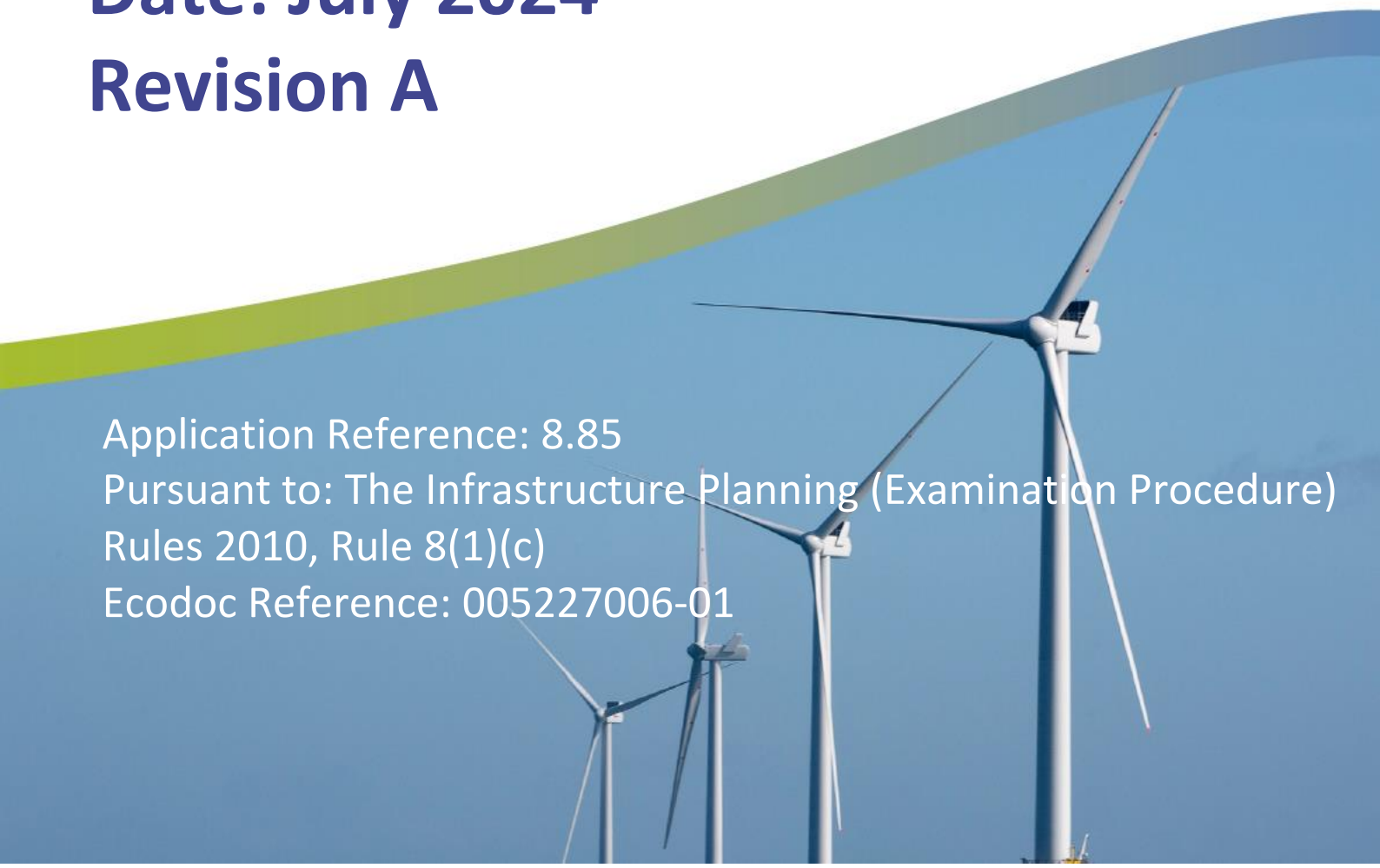

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Contents

Executive summary

The Outline Cable Risk Burial Assessment (CBRA) provides a detailed summary of the current project understanding of approach to cable routeing and the associated burial risk. The present report includes the key data sets used to inform the Final CBRA and the key consideration that will be explored further during the pre-construction period and will inform the final decisions around cable routeing.

Cable routeing is a multi-stage process used to identify and refine the cable corridor and preferred route within a corridor. The aim is to avoid hazards and UK Biodiversity Action Plan (BAP) Priority Species and Habitats within the seabed and reduce the risk of interaction with third parties.

The CBRA process is then used to identify the remaining risk from third parties such as fishing and vessel/anchor interaction and determine the burial depths to reduce the risk to an acceptable level.

This outline document sets out routeing and burial risk considerations at this point in time and provides a starting point for the Final CBRA.

The Final CBRA will inform and be informed by other management plans, specifically:

- **Outline Cable Specification and Installation Plan (CSIP)**, **[Document reference 8.88]** submitted at Deadline 5;
- **Outline Scour Protection and Cable Protection Plan** **[REP3-039]** (Updated at Deadline 5).
- **Outline Construction Method Statement** **[APP-255]** (Updated at Deadline 5).
- **In Principle Sensitive Features Mitigation Plan** (IPSFMP) **[REP4-053]** (updated at Deadline 5) (see section 3.2 for a list of commitments included in which develop the mitigations for cable installation).

1. Introduction

1.1.1 Rampion Extension Development Limited (hereafter referred to as 'RED') (the Applicant) is developing the Rampion 2 Offshore Wind Farm Project (Rampion 2) located adjacent to the existing Rampion Offshore Wind Farm Project ('Rampion 1') in the English Channel.

1.1.2 Rampion 2 (hereafter referred to as the 'Proposed Development') will be located between 13 km and 26 km from the Sussex Coast in the English Channel and the Offshore Array Area will occupy an area of approximately 160 km^2.

1.1.3 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 325 m above Lowest Astronomical Tide (LAT) and will have a 22 m 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;
- up to four Offshore Export Cables each in its own trench, will be buried under the seabed within the final cable corridor; and
- the export cable circuits will be High Voltage Alternating Current (HVAC), with a voltage of up to 275 kV.

1.1.4 The key onshore elements of the Proposed Development will be as follows:

- a single landfall site near Climping, Arun District, connecting offshore and onshore cables using Horizontal Directional Drill (HDD) installation techniques;
- buried onshore cables in a single corridor for the maximum route length of up to 38.8 km using:
  - trenching and backfilling installation techniques; and
  - trenchless and open cut crossings.
- a new onshore substation, proposed near Cowfold, Horsham District, which will connect to an extension to the existing National Grid Bolney substation, Mid Sussex, via buried onshore cables; and
- extension to and additional infrastructure at the existing National Grid Bolney substation, Mid Sussex District to connect Rampion 2 to the national grid electrical network.

1.1.5 A full description of the Proposed Development is provided in **Chapter 4: The Proposed Development, Volume 2** of the Environmental Statement (ES) **[APP-045]**.

2. Purpose of the document

2.1.1 The Outline Routeing and Cable Burial Risk Assessment (CBRA) summarises the current project understanding of approach to cable routeing and associated cable burial risk, including the key considerations that will be explored further during the pre-construction period and will inform the final routeing and Final CBRA.

2.1.2 Cable routeing is a multi-stage process used to identify and refine the cable corridor and preferred route within a corridor. The aim is to avoid hazards and UK Biodiversity Action Plan (BAP) Priority Species and Habitats within the seabed and reduce the risk of interaction with third parties.

2.1.3 The CBRA process is then used to identify the remaining risk from third parties such as fishing and vessel/anchor interaction and determine the burial depths to reduce the risk to an acceptable level.

2.1.4 This outline plan sets out routeing and burial risk considerations at this point in time and provides a starting point for the Final CBRA that will be submitted in line with the deemed Marine Licence (dML) conditions set out below.

2.1.5 The Final CBRA document will include details of:

- Risks to the cable (e.g. from sediment mobility, anchoring, future dredging and fishing);
- Routeing criteria, as set out in sections 5.1 and 5.2 of the **In Principle Sensitive Features Mitigation Plan** (IPSFMP) **[REP4-055]** (updated at Deadline 5). which will be developed following completion of the pre-construction surveys which will be undertaken prior to cable installation in accordance with Condition 16 of the dMLs (Schedules 11 and 12 of the **draft DCO** **[REP4-004]** (updated at Deadline 5);
- Target burial depths; and,
- Approach to defining the need for cable protection, and type/s of protection to be used if target burial is not met.

2.1.6 The Final CBRA is required to be submitted to the Marine Management Organisation (MMO) as set out in separate dML conditions contained within the **draft Development Consent Order (DCO)** **[REP4-004]** (updated at Deadline 5).

2.1.7 Schedule 11 (Generation Assets) of the **draft Development Consent Order (DCO)** **[REP4-004]** (Updated at Deadline 5) includes the inter-array cables and Schedule 12 (Transmission Assets Deemed Marine Licence) of the **draft Development Consent Order (DCO)** **[REP4-004]** (Updated at Deadline 5) covers the export cable and interconnector cables, and require a CBRA to be submitted as part of the Cable Specification and Installation Plan (CSIP) as set out in the following condition: *11(1)(n)(iii) a detailed cable laying plan for the Order limits within that stage, incorporating a burial risk assessment encompassing the identification of any cable protection that exceeds 5% of navigable depth referenced to Chart Datum and, in the event that any area of cable protection exceeding 5% of navigable depth is identified, details of any steps (to be*

determined following consultation with the MCA and Trinity House) to be taken to ensure existing and future safe navigation is not compromised or similar such assessment to ascertain suitable burial depths and cable laying techniques, including cable protection;

3. Outline Cable Burial Risk Assessment

3.1.1 The following sections describe the initial review of cable burial risk and preliminary routeing considerations that will influence the final design of the cable route and burial within the Offshore Array Area and Offshore Export Cable Corridor, including the micro routeing of the individual cables, the target burial depths and the need for (and type of) cable protection.

3.2 Embedded Environmental Measures

3.2.1 **Table 3-1** below sets out the committed to mitigation measures relating to cable routing and installation methodology.

Table 3-1 Commitments and securing mechanisms relevant to the CBRA, taken from the Commitments Register [REP4-057] (updated at Deadline 5)

Ref	Commitment Description	Securing Mechanism
C-41	The subsea inter-array cables will typically be buried at a target burial depth of 1 m below the seabed surface. The final depth of the cables will be dependent on the seabed geological conditions and the risks to the cable (e.g. from anchor drag damage).	Deemed marine licence, Schedule 11, Part 2, Condition 2 (7).
C-42	The subsea inter-array cables and the subsea export cables will be installed using one or a combination of the three methods: ploughing, trenching or jetting. It is likely that a combination of these methods will be adopted for localised areas depending on seabed conditions. The installation methods will be selected during detailed design and tendering phases.	Deemed marine licence, Schedule 11, Part 2, Condition 2 (7) & Deemed Marine Licence, Schedule 12, Part 2, Condition 2 (7)
C-43	The subsea export cable ducts will be drilled underneath the beach using horizontal directional drilling (HDD) techniques	Draft Development Consent Order, Schedule 1, Part 1 (1) (Work No. 6) & (Work No. 7)
C-44	An Outline Scour Protection and Cable Protection Plan (Document Reference: 7.12) has been submitted with this application, and includes details of the need, type, quantity and installation methods for scour protection. A Final Scour Protection and Cable Protection Plan will be completed prior to	Deemed marine licence, Schedule 11, (1)(i) & Deemed Marine Licence, Schedule 12, (1)(i)

Ref	Commitment Description	Securing Mechanism
	construction commencing and submitted to the MMO for approval.	
C-45	Where possible, subsea cable burial will be the preferred option for cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the Cable Specification and Installation Plan.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (n) & Schedule 12, Part 2, Condition 11 (1) (n)
C-53	An Outline Marine Pollution Contingency Plan (MPCP) has been submitted with this Application as Appendix A of the **Outline Project Environmental Management Plan [REP4-049].** This Outline MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Rampion 2. The Final MPCP will include relevant key emergency contact details.	Deemed Marine Licence, Schedule 12, Part 2, Condition 11 (1) (d)
C-65	The proposed offshore cable corridor and cable landfall (below mean high water springs [MHWS]) will avoid all statutory marine designated areas.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (a) (iii) & Schedule 12, Part 2, Condition 11 (1) (a) (iii)
C-96	Subsea array and export cables will be installed via either ploughing, jetting, trenching, or post-lay burial techniques, to a target burial depth of 1m.	Deemed marine licence, Schedule 11, Part 2, Condition 2 (7) & Schedule 12, Part 2, Condition 2 (7)
C-269	Cable routeing design will be developed to ensure micrositing where possible to identify the shortest feasible path avoiding subtidal chalk and reef features, peat and clay exposures and areas considered to potentially support black seabream nesting.	Deemed marine licence, Schedule 12, Part 2, Condition 1 (1) (c) (v)
C-270	As part of the routeing design, a working separation distance (buffer) will be maintained wherever possible from sensitive features, notably black seabream nesting areas, as informed by the outputs of the physical processes assessment, to limit the potential for impacts to arise (direct or indirect).	Deemed marine licence, Schedule 12, Part 2, Condition 11 (1) (c) (v)
C-271	The Offshore Export Cable routeing design will target areas of the seabed that enable maximising the potential for cables to be buried, thus providing	Deemed marine licence, Schedule 12, Part 2, Condition 11 (1) (a) (iii)

Ref	Commitment Description	Securing Mechanism
	for seabed habitat recovery in sediment areas and reducing the need for secondary protection and consequently minimising any potential for longer-term residual effects.	
C-272	Adoption of specialist Offshore Export Cable laying, and installation techniques will minimise the direct and indirect (secondary) seabed disturbance footprint to reduce impacts, which will provide mitigation of impacts to all seabed habitats, but particularly chalk and reef areas, peat and clay exposures, as well as potential (unknown) black seabream nesting locations, where avoidance is not possible. The Applicant will seek to utilise the most appropriate technology available at the time of construction and operation, if required, to reduce the direct footprint impact from cutting machinery, where practicable.	Deemed marine licence, Schedule 12, Part 2, Condition 11 (1) (c) (iv)
C-273	A seasonal restriction will be put in place to ensure Offshore Export Cable Corridor activities (including: construction and installation, preparatory works during cable installation, UXO clearance, preventive or scheduled maintenance, inspections and decommissioning) are undertaken outside the black seabream breeding period (1st March- 31st July inclusive) to avoid any effects from installation works on black seabream nesting within or outside of the Kingmere MCZ. This does not apply to emergency work required to maintain the operation, safety and integrity of the infrastructure.	Deemed marine licence, Schedule 12, Part 2, Condition 11 (1) (k)

3.3 Baseline Data

Overview

3.3.1 Surveys undertaken to date to inform the Offshore Export Cable Corridor selection and identification of potential constraints and considerations for cable installation across the Offshore Array Area are described below. Further surveys and assessment will be undertaken post-consent to inform the Final CBRA.

Seabed Surveys

3.3.2 There are a number of data sources available for the assessment of the Proposed Development cable routes. These are detailed in **Table 3-22** and include a project specific geophysical survey for the Proposed Development's Offshore Export

Cable Corridor which was undertaken by Gardline between July and August 2020 using single-beam and multibeam echo sounders (SBES and MBES respectively), side scan sonar (SSS), sub-bottom profiler (SBP) and a single magnetometer (MAG) (**Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES **[APP-138])**.

3.3.3 In addition to the project specific survey, additional bathymetry data have informed initial assessment of cable burial risks and provided information on the seabed and informed an assessment of sediment mobility.

3.3.4 Data and assessments that have and will inform the considerations on cable installation and specification are set out in **Table 3-22** and **Table 3-33** below.

Table 3-2 Summary of available bathymetric data for the Offshore Cables

Source	Date	Summary	Coverage of Study Area
Geophysical Survey of Rampion 2	2020 (a-c)	High resolution geophysical survey of the Rampion 2 Scoping Boundary area.	Complete coverage of the Rampion 2 area. Partial coverage of the wider study area.
Navigation Charts (UKHO)	Accessed November 2020	Description of bathymetry and general seabed type at a regional scale	Full coverage of the study area.
ABPmer SEASTATES Wave Hindcast Database	Accessed November 2020	Hindcast database of wave height, period and direction (approximately 40 years, 1979 to near present) approximately 5 km resolution.	Full coverage of the study area.
ABPmer SEASTATES Tide and Surge Hindcast Database	Accessed November 2020	Hindcast database of water levels, current speed and direction (approximately 40 years, 1979 to near present) approximately 2 km resolution.	Full coverage of the study area.
NOAA Climate Forecast System Reanalysis (CFSR)	Accessed November 2020	Hindcast database of wind speed and direction (approximately 40 years, 1979 to near	Full coverage of the study area.

Source	Date	Summary	Coverage of Study Area
		present) approximately 2 km resolution.	
Rustington Wave Buoy (Channel Coastal Observatory)	Accessed November 2020	Observations of wave height, period and direction (approximately 10 years used, January 2010 to near present).	Full coverage of the study area.
Rampion 2 Benthic Survey	7 December 2020 to 28 February 2021	Benthic survey including sediment grab samples at multiple locations within the Proposed DCO Order Limits. Data to be reported in Environmental Statement.	Full coverage of the study area.
National Tide and Sea Level Facility (Newhaven)	Accessed November 2020	Tide gauge collecting water level data since 1990	Full coverage of the study area.
Geophysical Survey of Zone 6 (Osiris Projects Ltd)	2010 - 2011	High resolution geophysical survey of the Round 3 Zone 6 area, including the present extent of Rampion 1 and parts of the Rampion 2 Scoping Boundary.	Full coverage of the study area.
Geotechnical Survey of Zone 6 (Fugro Geoconsulting Ltd)	2011	Geotechnical survey of the Round 3 Zone 6 area, including the present extent of Rampion 1 and parts of the Rampion 2 Scoping Boundary.	Full coverage of the study area.
Metocean Survey (EMU Ltd)	2011	Measurements of water levels, currents and waves at three locations (two for three months and one	Full coverage of the study area.

Source	Date	Summary	Coverage of Study Area
		for six months) in the Round 3 Zone 6 area, including the present extent of Rampion 1 and parts of the Rampion 2 Scoping Boundary.	
Benthic Survey (EMU Ltd)	2011	Benthic survey including sediment grab samples at 59 locations in the Round 3 Zone 6 area, including the present extent of Rampion 1 and parts of the Rampion 2 Scoping Boundary.	Full coverage of the study area.

Other Data Sources

Table 3-3 Data and assessments informing cable burial risk

Topic	Data
Unexploded Ordnance (UXO)	Magnetometry survey data (Fugro, 2021) UXO Hazard Assessment (Ordtek, 2021)
Archaeology	Wreck locations (United Kingdom Hydrographic Office (UKHO)) Site based information on internal sites and known wrecks (National Record of the Historic Environment (NRHE) (Historic England) County maintained database of all known archaeological monuments and events including designated and non-designated archaeological sites (East Sussex County Council (ESCC) Historic Environment Record (HER)) Assessment of marine archaeology from Geophysical Survey data (Maritime Archaeology)
Fishing	Fishing activity from public sources including Department for Environment, Food and Rural Affairs (DEFRA) and EMODNet Landings statistics data for UK-registered vessels (MMO) Maps of fishing effort within Sussex Inshore Fisheries and Conservation Authority (IFCA boundaries based on observed fishing activity during sea patrols (MMO)

Topic	Data
	Landings statistics for Belgian, Danish, Dutch, French, German and UK registered vessels (European Union (EU) Data Collection Framework (DCF) database)
Shipping	AIS and boat-based survey Anchor drag study (Anatec, 2023)
Dredging and dumping	Dredging and dumping sites from publicly available sources including UKHO, The Crown Estate (TCE) and DEFRA. Additional data from London Gateway Port British Marine Aggregate Producers Association (BMAPA) transit routes, indicating marine aggregate dredger activity (BMAPA, 2009, downloaded 2020) Marine aggregate dredging areas (licenced and active) (TCE)
Existing infrastructure	Existing sources including the Kingfisher Information Service – Offshore Renewable and Cable Awareness (KIS-ORCA) project.

3.4 Outline Routeing and Cable Burial Risk Assessment

3.4.1 The following sections describe the preliminary assessment of routeing and cable burial risk, based on the available data as set out above.

3.4.2 Routeing is initially used to avoid hazards and areas of increased risk. These include but are not limited to; UXO, boulders, seabed debris, excessive seabed gradients, sediment depth, archaeological features, known sensitive features (such as black seabream nesting sites and Natural Environment and Rural Communities (NERC) Act 2006 geogenic and biogenic reef habitats), areas of dredging or deposition, and areas of increased risk from fishing and vessels. There may be areas where these cannot be avoided and so alternate measures such as boulder relocation, clearance of sand waves, or deep burial are used to remove or reduce the risk.

3.4.3 Geophysical and geotechnical surveys will be carried out before works commence and the information from those surveys will allow route debris, boulders, archaeological features, UXO presence, seabed features, sediment depth and the nature of the seabed to be determined. If UXO clearance is required, a separate marine licence would be sought. An analysis of these factors would then inform the final locations of WTGs (micrositing), the requirement for foundation drilling, cable routeing design and installation methods, the target cable burial depth, and what (if any) additional cable protection would be required. Micrositing is intended to provide flexibility to make minor adjustments to the project layouts to accommodate unexpected onsite conditions encountered in the pre-construction surveys.

3.4.4 Key risks and hazards identified as present in the Proposed Development's array area and Offshore Export Cable Corridor are described below. These will be further detailed in the Final CBRA document.

Seabed Gradients

3.4.5 The project specific survey data has been used to evaluate the seabed gradients. The seabed undulates across much of the Offshore Export Cable Corridor, influenced by the underlying geology. Water depths within the Offshore Export Cable Corridor are greatest at the southern end where they reach approximately 28 m LAT within a significant seabed depression (**Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4 [APP-129]**).

3.4.6 In general, seabed gradients are less than one degree within the Offshore Export Cable Corridor dipping towards the south, with occasional rocky outcrops, especially towards the coast, with seabed gradients reaching ten degrees. Seabed gradients across the Offshore Order Limits are generally less than one degree, dipping towards the south although the seabed undulates across much of the Offshore Array Areas, influenced by the underlying geology (**Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4 [APP-129]**).

3.4.7 Sandwaves are prevalent over much of the central and eastern Offshore Array Areas trending northwest to southeast, with wave heights of up to 2m relative to the surrounding seabed. Wavelengths reach 25m and gradients on the flanks reach up to 30 degrees.

3.4.8 Some significant seabed depressions are present in the northwest of the Offshore Array Areas. The largest of these is approximately 345m across and 12.5m deep, with gradients reaching 20 degrees on its flanks. Smaller depressions, interpreted as spudcan imprints associated with the existing Rampion 1 Windfarm, are observed at the margins with the Rampion 1 site. Maximum depths are approximately 1.5m and are associated with gradients reaching 24 degrees on the sides

3.4.9 Steep slopes may prohibit the use of particular trenching tools, such as typical post lay tracked trenchers and SLB (simultaneous lay and burial) jetting ploughs and so the use of these will be assessed in detail during trenching tool selection. Seabed slopes can often be avoided through final cable routeing, consideration of which will be set out in the Final CSIP and typically slopes over 10 degrees are avoided.

Seabed Contacts

3.4.10 Boulders, debris and wrecks do not present a risk to the cables once installed, however, they may affect cable installation (and therefore the successful cable burial), and so require avoidance via routeing or removal/relocation.

3.4.11 The preference for any seabed obstruction will be to avoid it in the first instance. Where this is not possible the object will be further investigated and if needed, removed. Following final cable routeing, boulders that cannot be routed around may be relocated (as close as possible to the existing location) before a pre-lay grapnel run (PLGR) will be undertaken along the route to clear any remaining debris.

Paleo-channels

3.4.12 Holocene deposits are widespread across central and eastern parts of the Rampion 2 Offshore Array Areas. They are interpreted as comprising predominantly gravel and sand and reach 25m thick in places. They overlie the paleochannels and occasionally 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 Areas. The central and eastern parts of the Offshore Array Areas are dominated by a paleo-basin, with two main paleochannels cutting through the bedrock feeding into this basin.

3.4.13 Within the Western Offshore Array Area, the Quaternary deposits present are interpreted as comprising predominantly gravel and sand. The Quaternary deposits are widespread, although are much thinner than in the Southern Offshore Array Area and often too thin to identify on seismic data. Where these are absent, bedrock bedding plains are observed to outcrop and tie with bathymetric data. Bedrock is interpreted to comprise Tertiary Claystones to Cretaceous Chalk strata. These subcrop much of the survey area, occasionally outcropping. Four main paleochannels (along with smaller tributary channels) are present. These are associated with the former course of the River Arun which drained into the Northern Paleovalley that transects the English Channel south of the Rampion 2 Application area.

3.4.14 Within the Offshore Export Cable Corridor, the Quaternary deposits present are interpreted as comprising predominantly gravel and sand. These Quaternary deposits are found throughout much of the route, although are often too thin to identify on seismic data. Where these are absent, bedrock bedding planes are seen to outcrop and tie with bathymetric data.

3.4.15 There are three main paleo-channels with smaller tributary channels presented within the Offshore Export Cable Corridor, with depths found to be up to 27m below seabed (as shown on Figure 3.21 of **Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES **[APP-143]**. These are associated with the former course of the River Arun which drained into the Northern Paleovalley that transects the English Channel south of the Rampion 2 Application area. The offshore extension of the River Arun concluded to extend to about 8 km offshore. Channels are interpreted to comprise interbedded clay, sands and gravels. (**Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4 [APP-129]**). Additionally, the River Adur, part of a significant fluvial system east of the Study Area, the Adur Valley, makes its course through the chalk downlands, where a wide, flat-bottomed profile with clearly demarked valley edges indicates an alluvial depositional regime as well as a significant estuarine depositional regime during the development of this valley (**Appendix 16.1 Marine archaeology technical report [APP-162]**).

3.4.16 Wherever possible, the routeing design will take advantage of soil infilled paleochannels to maximise burial potential with conventional jetting methods, with trenchable geological formations targeted next; this minimises cable routeing through the harder more strongly cemented formations in the area. When examining feasibility, conservative target trench depths of 1.0m in Palaeogene and Cretaceous deposits have been selected.

3.4.17 Further detailed information on paleochannels is presented in **Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES **[APP-143],** **Chapter 16 Marine archaeology** **[APP-057]** and **Appendix 16.1 Marine archaeology technical report** **[APP-162]**.

Mobile Seabed Features

3.4.18 Evidence of sediment mobility, indicated by the presence of megaripples, has been identified along the Offshore Export Cable Corridor. The physical processes baseline undertaken by Gardline (**Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4** **[APP-129]**) describes megaripples present towards the southern end of the Offshore Export Cable corridor with heights of 0.2 m and wavelengths reaching 7 m.

3.4.19 Large areas of sandwaves of up to 2 m and megaripples were identified within the Proposed Development Offshore Array Area, where, consistent with the region, the crests are asymmetric, and indicate local bedload transport to the northeast (**Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4** **[APP-129]**).

3.4.20 These parameters illustrate the importance of a more detailed investigation into sediment mobility to inform the routeing, target burial depth and any seabed preparation such as sandwave clearance. **Appendix 6.1 Coastal Processes Technical report Baseline Description, Volume 4** **[APP-129]** estimates potential sediment mobility. The offshore cable parameters have been secured in Condition 2 of Schedule 11 and Schedule 12 of the **Draft DCO** **[REP4-004]** (updated at Deadline 5) and are detailed in Tables 5-2, 5-3 and 5-4 in the **Outline CSIP** **(Document reference 8.88)** (Submitted at Deadline 5).

3.4.21 The assessment of mobile seabed features will also consider the non-mobile reference level (NMRL). This surface represents the absolute level (mLAT) below which the seabed level is not expected to fall below locally during the economic lifetime of the Proposed Development. To mitigate against the risk of unburial due to seabed mobility cable burial will be calculated from this surface. This allows the sandwaves to migrate over the cable and reduces risk of exposure.

3.4.22 Other risks which could occur due to sediment mobility include thermal stresses within the cable due to increased burial depths from the overlying sandwaves.

3.4.23 The Final CBRA will describe the interactions with mobile sediment features and set out the target burial depth or need for cable protection in these areas. In addition, the **In Principle Sensitive Features Mitigation Plan** **[REP4-053]** (updated at Deadline 5) sets out specific considerations and commitments to mitigate impacts to marine designated areas, black seabream and NERC Biodiversity Action Plan reef habitats, peat and clay from cable installation and operation. Further information on sensitive receptors is set out below.

Sensitive Receptors

3.4.24 Sensitive receptors to array area and export cable installation were identified in the Rampion 2 EIA (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES **[APP-049]** (updated at Deadline 5)**,** and **Chapter 9: Benthic, subtidal and**

intertidal ecology, Volume 2 of the ES **[APP-050]** (updated at Deadline 5), as bedrock, chalk reef habitats, peat and clay (being listed under Section 41 of the NERC Act, and breeding black seabream, principally as a qualifying feature of the Kingmere Marine Conservation Zone (MCZ)). 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.

3.4.25 The Applicant has committed to undertaking a pre-construction survey, secured in Condition 16 of dML Schedules 11 and 12 of the **draft DCO** **[REP4-004]** (updated at Deadline 5)**,** which will inform the final cable design. The survey will be conducted to determine the location and extent and composition of chalk habitats, stony reef and potential *S. spinulosa* reef features, potential nesting sites for black seabream, and peat and clay exposures along the Offshore Export Cable Corridor, within which the proposed export cable installation works are proposed. Throughout export cable installation activities, there will be no anchoring of vessels within the Kingmere MCZ or other designated site boundaries.

3.4.26 The **In Principle Sensitive Features Mitigation Plan** **[REP4-053]** (updated at Deadline 5) develops the mitigations for export cable installation, with each adhering to Commitments made by the Applicant as set out in the ES and **Commitments Register** **[REP4-057]** (updated at Deadline 5)**.** Relevant Commitments are set out in **Section 3.2**

3.4.27 Table 4-3 in **Offshore In Principle Monitoring Plan** **[REP4-055]** (updated at Deadline 5) provides information on the monitoring requirements for benthic subtidal and intertidal ecology, to inform final Offshore Export Cable routeing. The proposed monitoring will be discussed and agreed with Natural England and the MMO. Where it is possible, synergies with engineering and design related monitoring made in Section 4.2 of **Offshore In Principle Monitoring Plan** **[REP4-055]** (updated at Deadline 5) would be explored in interpreting geophysical data.

3.4.28 Consideration has been given to habitats/species “of principal importance pursuant to section 41 of the NERC Act 2006”. The specific habitats of relevance identified within the project area are the focus for monitoring outlined within Table 4-3 of **Offshore In Principle Monitoring Plan** **[REP4-055]** (updated at Deadline 5). Pre-construction geophysical surveys will be reviewed with drop down surveys to confirm presence and extent of sensitive features, as appropriate. The results shall then be used to constrain the cable installation methods to minimise the area of physical disturbance to chalk habitat, stony reef and *Sabellaria spinulosa* reef (if recorded) and inform final Offshore Export Cable routeing, where these habitats were identified as requiring additional mitigation.

Dredging and Disposal

3.4.29 Although there are active marine aggregate license areas in proximity to the Order Limits, there are none within the Order Limits. Subsequently, marine aggregate areas would not be a constraint for cable burial.

3.4.30 The existing Rampion 1 project disposal site is located in the Proposed Order Limits as is the AQUIND Cable Site A, which, if consented, would run through the south west of the Offshore Array Area (see Figure 7.3, **Chapter 7: Other Marine Users, Volume 3** **[APP-080]**).

3.4.31 The process of cable burial for Rampion 2, including relevant advisory safe passing distances around vessels, may restrict access to and use of the AQUIND and Rampion 1 disposal sites. RED will seek proximity agreements with the operators of the Rampion 1 disposal site as well as the AQUIND site to reduce the potential conflicts on the operability of any of the projects that will arise by the overlap between the project areas. A proximity agreement with AQUIND is currently being sought by the Applicant.

Shipping and navigation

3.4.32 Vessel anchors may present a significant hazard to subsea cables, whether in designated anchorage zones (as further discussed below), or because of deployment of anchors in emergency situations such as mechanical failure or the need to prevent a collision. Defining the risk to a cable from shipping is a function of the intensity and frequency of vessel traffic, type of vessel, size and type of the deployed anchor, bathymetric profile and the seabed material in which it penetrates. This risk is normally assessed through a probabilistic risk assessment, which assesses the likelihood of an anchor striking the cable for different depths of burial. For the Proposed Development, the final version of this assessment will be carried out post consent once geotechnical data is available. The method used will align with the methodology outlined in “Cable Burial Risk Assessment Methodology: Guidance for the Preparation of Cable Burial Depth of Lowering Specification”, Carbon Trust, 2015. A summary of assessment will be contained within the Final CBRA.

3.4.33 There are no anchorage areas within or in proximity to the proposed Order Limits (**Chapter 13: Shipping and Navigation, Volume 2 [APP-054]**).

3.4.34 Current active aggregate areas are adjacent to the eastern limit of the proposed Order limits, in proximity to the Offshore Export Cable Corridor, potentially reducing available sea room for aggregate dredgers to operate and take avoiding action in the case of encounters with other vessels. The closest extraction areas lie immediately east of the Offshore Export Cable Corridor, and are operated by Cemex, Tarmac Marine and Hanson Aggregates Marine. Given the close proximity of current aggregate areas, the adequacy of the proposed cable burial depth of 1 m must be confirmed and the possibility of it being breached by the anchor penetration of a drifting vessel attempting to anchor without power must be assessed. The target burial depth of between 1.0 and 1.5m for the export cables may be insufficient based on consultation feedback from marine aggregate dredgers and this will be further considered in the Final Cable Burial Risk Assessment and, if necessary, either a greater burial depth will be achieved, or cable protection will be placed.

3.4.35 There is one commercial shipping route across the Offshore Export Cable Corridor generally used by marine aggregate dredgers (88%) travelling between Shoreham Port (UK) and marine aggregate dredging areas near Isle of Wight (**Chapter 13: Shipping and Navigation, Volume 2 [APP-054], Figure 13.5** in **Chapter 13: Shipping and Navigation, Volume 3 [APP-086]**).

3.4.36 The Offshore Export Cable Corridor is in an area frequently used by recreational vessels, whilst the Offshore Array Area is used by recreational and fishing vessels (**Figures 13.3 and 13.4**, **Chapter 13: Shipping and Navigation, Volume 3 [APP-**

086]). During the summer, an average of 12 and 15 unique vessels were recorded crossing the Offshore Export Cable Corridor and Offshore Array Area respectively. Recreational vessels were predominantly observed transiting in nearshore areas including to/from Brighton Marina, ports in the Solent, Shoreham Port, the Port of Newhaven and Littlehampton Harbour (**Chapter 13: Shipping and Navigation, Volume 2 [APP-054]**).

3.4.37 The Offshore Export Cable Corridor crosses the Littlehampton Harbour charted anchorage area (see Figure 13.2 **Chapter 13: Shipping and Navigation, Volume 3 [APP-086])** During consultation, Littlehampton Harbour expressed concern about a cable burial depth of 1m in proximity to the area but were content that this will be addressed as a key concern in the cable burial risk assessment. Subsequently, Littlehampton Harbour Board will be consulted and the pre-construction CBRA will confirm if analysis such as anchor penetration trials will need to be undertaken.

3.4.38 The primary concern noted by Littlehampton Harbour Board during consultation was that of cable burial and anchoring vessels in proximity to the export cables potentially requiring anchorage relocation. This concern will be investigated further within the cable burial risk assessment undertaken post consent (C-45, Table 13-14). The likelihood of anchor interaction with a sub-sea cable is further minimised by the burial of the cables and use of external cable protection where required, which will be informed by the Final Cable Burial Risk Assessment and detailed within the Final Cable Specification and Installation Plan (C-41, C-96 and C-45, Table 13-14).

3.4.39 The pre-construction CBRA will further assess the risks associated with anchor strikes and shipping traffic across the proposed Order limits, and this will inform the final target burial depth, burial equipment and the potential need for any cable protection (also considering the potential impact on shipping due to reduction of navigable depth). These considerations will be detailed in the final CSIP to be submitted for approval.

Fishing Activity

3.4.40 Fishing activity has been identified along the full length of the Offshore Export Cable Corridor and within parts of the Offshore Array Area and presents a hazard to the cable due to the risk of fishing gear interacting with the seafloor and snagging the cables.

3.4.41 Belgian beam trawlers targeting plaice and sole are understood to primarily operate outside of the 6 NM limit, and thus VMS data indicate limited UK beam trawl activity in the Offshore Export Cable Corridor. Additionally, pelagic trawl fisheries and dredge fisheries were assessed to not endure displacement as a result of the Offshore Export Cable Corridor since key fishing grounds are located outside of the Offshore Export Cable Corridor.

3.4.42 French bottom trawlers targeting a variety of species, but principally whiting and mackerel, based on vessel size are expected to operate outside of the 6NM limit. Though VMS data and IFCA patrol sightings data indicate that UK demersal otter trawlers fish within the Offshore Export Cable Corridor these are minimal.

3.4.43 Trawling is considered to be the key risk to the cables as the gear can be dragged along the seabed. Typical depths of both beam trawls and otter boards into sand are 0.15 m or less. In areas of scallop trawling or more aggressive and destructive forms of fishing it is greater, potentially up to 0.3 m. Based on the assumptions on soil type, the minimum depth of lowering to provide protection from all fishing is considered to be approximately 0.5 m.

3.4.44 The Sussex IFCA Nearshore Trawling Byelaw 2019 prohibits trawling along much of the Sussex Coast and extends out to 4km between Selsey and Shoreham-by-Sea (the area in which the Offshore Export Cable Corridor is located). Consequently, approximately 23% of the Offshore Export Cable Corridor is not affected by risks related to trawling.

3.4.45 Data indicate that trawling takes place within the Offshore Cable Corridor, with such activity fairly widespread throughout inshore waters along the wider coastline. Any activity by pelagic vessels within the array area is highly likely to be a sporadic, transitory event. Belgian beam trawlers targeting plaice and sole operate outside of the 6NM limit, and VMS data indicate areas of significant beam trawl activity across the eastern portion of the Offshore Array Area.

3.4.46 The Outline CBRA will consider the potential impact of fishing on the cables and propose suitable target burial depths and cable protection.

Existing Infrastructure

3.4.47 The baseline data collection exercise identified a number of subsea cables within the study area, but it should be noted that no subsea cables overlap the Proposed DCO Order limits for the Proposed Development.

3.4.48 The closest is the England-France High-Voltage Direct Current (HVDC) interconnector, ‘Interconnexion France-Angleterre’ (IFA2), commissioned in January 2021 and now operational, which runs approximately 300 m from the western boundary of the Proposed DCO Order Limits).

3.4.49 The second closest is the CrossChannel Fibre cable, connecting Slough, UK to Paris, France. This cable leaves the UK coast from Brighton, UK and lands in France at Veules-les-Roses. The cable route passes 4.9 km to the east of the northeastern part of the Rampion 2 Proposed DCO Order Limits at its closest.

3.4.50 Proposals exist for a further cable, the England-France HVDC ‘AQUIND’ Interconnector, which would have a nominal net capacity of 2,000 MW. The proposed route of this cable passes through the western part of the Proposed DCO Order Limits (**Figure 7.6**, **Chapter 7: Other Marine Users, Volume 3** of the ES **[APP-080]**), connecting France and the UK, with landfalls at Dieppe and Portsmouth respectively. Following a Judicial Review process, the AQUIND project is, at the time of writing, with the Secretary of State for re-determination.

3.4.51 There is one known future offshore renewable energy project close to the Proposed DCO Order Limits, which is the Perpetuus Tidal Energy Centre (PTEC), located approximately 43 km to the west of the Proposed DCO Order Limits. PTEC have achieved planning consents and secured a connection to the

electricity network, however, the developer is awaiting further investment and therefore have not progressed to the construction stage at this time.

3.4.52 There are two recent licence submissions (August and November 2021) for proposed seaweed farms offshore of Sussex and the Isle of Wight, locations for which are not currently available (MMO, 2022). However, the MMO predict that areas around the south coast (such as the Solent and West Sussex) have very high potential for bivalve mollusc aquaculture, as well as a range of seaweed and fish species (MMO, 2019). Given that there is a lack of publicly available information on the two seaweed farms submitted and that these are subject to funding, no changes are currently considered to the future baseline.

4. Lessons learned from Rampion 1

4.1.1 The Applicant notes that Rampion 1 (Rampion Offshore Wind Limited) is an independently operating company operating the Rampion 1 Offshore Wind Farm which has common shareholders with Rampion Extension Development Ltd. (RED). The Applicant has engaged with Rampion 1 and taken initial lessons learned into consideration for the development of the outline design, on the basis of which this DCO-Application was prepared.

4.1.2 The Offshore Wind industry has adopted a principle of continuous improvement and practices the “Lessons Learned” review process throughout the development of projects. Aligned with this, the Applicant will undertake a more detailed review of the Rampion 1 Lessons Learned and any relevant construction documentation that can be shared by Rampion 1 post Examination. The Applicant will also include relevant aspects of this review into the contractor tendering process, requiring bidders to present how they would incorporate Lessons Learned aspects into the construction or design.

4.1.3 The focus on such reviews is on matters of health and safety, construction efficiency, design risks and opportunities, environmental aspects during construction and operation as well as general operation and maintenance aspects.

4.1.4 Following engagement on these aspects with potential contractors and suppliers, and after further site surveys have been completed, the Applicant will include Lessons Learned from Rampion 1 and other projects where relevant into the Final CBRA which will be provided prior to construction.

5. Glossary of Terms and Abbreviations

Term	Definition
AIS	Automatic Identification System
BAP	Biodiversity Action Plan
BMAPA	British Marine Aggregate Producers Association
CBRA	Cable Burial Risk Assessment
CFSR	Climate Forecast System Reanalysis
CSIP	Cable Specification and Installation Plan
DCF	Data Collection Framework
DEFRA	Department for Environment, Food and Rural Affairs
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.
ESCC	East Sussex County Council
EU	European Union
HER	Historic Environment Record
Horizontal Directional Drill (HDD)	A trenchless crossing engineering technique using a drill steered underground without the requirement for open trenches. This technique is often employed when crossing environmentally sensitive areas, major water courses and highways. This method is able to carry out the underground installation of pipes and cables with minimal surface disruption.
HVAC	High Voltage Alternating Current

Term	Definition
HVDC	High Voltage Direct Current
IFCA	Inshore Fisheries and Conservation Authority
KIS-ORCA	Kingfisher Information Service – Offshore Renewable and Cable Awareness
Landfall	The area where the Export Cables come ashore and transition from the marine environment to the terrestrial environment.
Lowest Astronomical Tide (LAT)	The lowest tidal water level locally occurring during an approximately 18.6 year period.
MAG	A Single Magnetometer
Marine Conservation Zone (MCZ)	An area designated for protection of certain characteristic features under various UK regulations.
Marine Management Organisation (MMO)	The MMO's purpose is to protect and enhance the UK marine environment, and to support UK economic growth by enabling sustainable marine activities and development.
Maximum Design Scenario (MDS)	The maximum design scenario represents the worst-case scenario for each aspect whilst allowing the flexibility to make improvements in the future in ways that cannot be predicted at the time of submission of the DCO Application.
MBES	Multibeam Echo Sounders
MCA	Maritime Coastguard Agency
Mean High Water Springs (MHWS)	Mean High Water Springs
MPCP	Marine Pollution Contingency Plan
MW	Megawatts
NERC	Natural Environment and Rural Communities Act 2006
NRHE	National Record of the Historic Environment
Offshore Array Area	The offshore area within which wind turbine generators and offshore platforms and associated cables will be located.
Offshore Export Cable Corridor	Cables that transfer power from the offshore substation(s) to shore.

Term	Definition
Offshore part of the DCO Order limits	An area that encompasses all planned offshore infrastructure and relevant buffer areas.
Offshore Wind Farm (OWF)	A group of WTGs located offshore.
Outline Plan	An early version of a management plan produced to secure principles, for which the final approved management plan will adhere to.
paleo-channels	A geological term describing the remains of an inactive river or stream channel that has been filled or buried by younger sediment.
Planning Act 2008	The legislative framework for the process of approving major new infrastructure projects.
Planning Inspectorate (PINS)	The Planning Inspectorate is the government agency supervising the planning process for NSIPs under the Planning Act 2008. The purpose of the Planning Inspectorate is to provide Expertise on planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
PLGR	Pre-Lay Grapnel Run
Proposed DCO Order Limits	The Proposed DCO Order Limits combines the search areas for the offshore and onshore infrastructure associated with the Proposed Development. It is defined as the area within which the Proposed Development and associated infrastructure will be located, including the temporary and permanent construction and operational work areas.
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)
PTEC	Perpetuus Tidal Energy Centre
Rampion 1	The existing Rampion Offshore Wind Farm located in the English Channel off the south coast of England.
Rampion Extension Development Limited (RED)	Rampion Extension Development Limited
SBES	Single-Beam Echo Sounders

Term	Definition
SBP	Sub-Bottom Profiler
SSS	Side Scan Sonar
TCE	The Crown Estate
The Proposed Development/Rampion 2	The onshore and offshore infrastructure associated with the offshore wind farm located in the English Channel off the south coast of England.
UKHO	United Kingdom Hydrographic Office
Unexploded Ordnance (UXO)	Unexploded ordnance are explosive weapons (bombs, shells, grenades, land mines, naval mines, etc.) that did not explode when they were deployed and still pose a risk of detonation, potentially many decades after they were used or discarded.
Wind Turbine Generator (WTG)	The components of a wind turbine, including the tower, nacelle, and rotor.

6. References

Carbon Trust (2015), *Cable Burial Risk Assessment Methodology: Guidance for the Preparation of Cable Burial Depth of Lowering Specification.* [online] Available at: [redacted] (Accessed July 2024)

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Gardline (2020b). *Rampion 2 OWF Development: Area B Geophysical Survey*. Report 1521.3

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Rampion 2
WIND FARM