Category 8: Examination Documents

Rampion 2 Wind Farm

Outline Cable Specification and Installation Plan

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Executive summary

The Outline Cable Specification and Installation Plan (CSIP) provides a detailed summary of the current Proposed Development understanding of the cable specifications and approach to installation. The Plan provides the key considerations for cable route design, identifying where specific constraints of requirements regarding burial depth and cable protection will need to be included in that final design.

Mitigation measures to protect breeding black seabream as a qualifying feature of the Kingmere Marine Conservation Zone (MCZ) and priority habitats such as bedrock and chalk reef as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act are detailed within this plan.

This Outline Plan sets out the principles and considerations at this point in time, providing a starting point for the Final CSIP to be submitted prior to construction commencing.

1. Introduction

1.1 Project Background

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 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 km².

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 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;
- 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 Drilling (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 ES **[APP-045]**.

1.2 Purpose of this document

1.2.1 This Outline Cable Specification and Installation Plan (CSIP) provides an outline of the information which will be contained within the Final CSIP and sets out the principles with which the Final CSIP must accord. The Final CSIP will be developed post-consent. Where specific commitments are listed in this document, the relevant stage specific plan shall include detail on how that commitment is delivered where it is applicable to that stage of works.

1.2.2 The purpose of the CSIP will be to provide information relating to cables which will lie within the Offshore Export Cable Corridor and the Array Area, including a summary construction programme, the final technical specification of the cables, a detailed installation plan, including a Cable Burial Risk Assessment (CBRA), proposals for cable protection measures and proposals for monitoring offshore cables, including a risk based approach to the management of unburied or shallow buried cables.

1.2.3 This Outline CSIP details mitigation measures relevant to the installation of the cables which will be adhered to during the construction of the Proposed Development, including in relation to breeding black seabream as a qualifying feature of the Kingmere MCZ and priority habitats such as bedrock and chalk reef as listed under Section 41 of the NERC (Natural Environment and Rural Communities) Act.

1.2.4 The final detailed design of the Proposed Development will be determined post-consent. The Final CSIP, which will accord with this Outline CSIP, will be submitted to the Marine Management Organisation (MMO) for approval in accordance with the conditions of the deemed Marine Licence (dML).

1.2.5 In accordance with the draft dML, Schedule 11, Part 2, Condition 11 (1) (n) and Schedule 12, Part 2, Condition 11 (1) (n) in the **draft DCO [REP4-004]** (updated at Deadline 5)**,** the CSIP will address the following conditions detailed below in **Table 1-1**.

Table 1-1 Deemed Marine Licence conditions and where they have been addressed

dML Condition 11(1)(n) (Schedule 11)	Where addressed
(i) technical specification of offshore cable circuits on or below the seabed, including a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with industry good practice;	The outline technical specification of the offshore cables is set out in Section 2 of this Outline CSIP, the Outline CBRA and the **Outline Scour Protection and Cable Protection Plan [REP3-039]** (updated at deadline 5).

dML Condition 11(1)(n) (Schedule 11)	Where addressed
(ii) a sandwave and other seabed clearance plan for all designated sites affected, including details of the volumes of material to be dredged, timing of works, locations for disposal and monitoring proposals;	Details of seabed clearance will be provided in the Final Cable Burial Risk Assessment (CBRA). This is addressed in Section 3.4 of the **Outline CBRA (Document reference 8.85).**
(iii) a detailed cable laying plan for the Order limits, 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;	The Final CSIP will contain a review of cable route locations where water depth is reduced by >5%. The burial risk assessment will be included in the Final CBRA.
(iv) proposals for the volume and areas of cable protection to be used for each cable crossing (if any) and arrangements for crossing and proximity agreements to be put in place with existing subsea pipelines and cable operators; and	The Final CSIP will contain full details, within the parameters set within the dML. Outline details are available in Section 5.3.1 and Table 5.2 of this Outline CSIP.
(v) proposals for monitoring array cables including cable protection during the operational lifetime of the authorised scheme which includes a risk-based approach to the management of unburied or shallow buried cables;	The need for monitoring will be informed by the Final CBRA as set out in Section 7 of this Outline CSIP.
dML Condition 11(1)(n) (Schedule 12)	
(i) technical specification of offshore cable circuits on or below the seabed, including a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable circuit burial depth in accordance with industry good practice;	The outline technical specification of the offshore cables is set out in Section 4 of this Outline CSIP and the **Outline Scour Protection and Cable Protection Plan [REP3-039]** (updated at deadline 5)**.**
(ii) a sandwave and other seabed clearance plan for all designated sites affected, including details of the volumes of material to be dredged, timing of works, locations for disposal	Details of seabed clearance will be provided in the Final Cable Burial Risk Assessment (CBRA).

dML Condition 11(1)(n) (Schedule 11)	Where addressed
and monitoring proposals;	
(iii) a detailed cable laying plan for the Order limits, 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 circuit laying techniques, including cable protection;	The Final CSIP will contain a review of cable route locations where water depth is reduced by >5%.
(iv) proposals for the volume and areas of cable protection to be used for each cable crossing (if any) and arrangements for crossing and proximity agreements to be put in place with existing subsea pipelines and cable operators; and	The Final CSIP will contain full details, outline details are available in Section 5.3.1 and Table 5.2 of this Outline CSIP.
(v) proposals for monitoring offshore cable circuits including cable protection during the operational lifetime of the authorised scheme which includes a risk based approach to the management of unburied or shallow buried cable circuits;	The need for monitoring will be informed by the Final CBRA as set out in Section 7 of this Outline CSIP.

1.2.6 This Outline CSIP and the Final CSIP covers the installation and cable route preparation of the Offshore Export Cables within the Export Cable Corridor, the inter array cables and interconnector cables within the array area.

1.3 Interfaces

1.3.1 The considerations, mitigations and measures that are described in this Outline CSIP are informed by relevant assessments and descriptions contained within the Environmental Statement (ES), with particular reference to the following:

- **Chapter 4: The Proposed Development, Volume 2** of the Environmental Statement (ES) **[APP-045]**;
- **Chapter 7: Other marine users, Volume 2** of the ES **[APP-048]**
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES **[APP-049];**
- **Chapter 9: Benthic, subtidal and Intertidal Ecology, Volume 2** of the ES **[APP-050];**
- **Chapter 11: Marine mammals, Volume 2** of the ES **[APP-051]**; and

- **Chapter 13: Shipping and navigation, Volume 2** of the ES **[APP-054]**

1.3.2 The Final CSIP will interface with a number of other management plans and will be drafted to be consistent with the timings, approaches and controls set out in the preconstruction plans and documents to be submitted for approval under the dML. Specifically, the Final CSIP will interface with the final versions of the following Outline Plans:

- **Project Environmental Management Plan [REP4-049]** as secured in Condition 11(1)(d) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **Marine Written Schemes of Investigation [REP3-041]** as secured in Condition 11(2) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **In Principle Sensitive Features Mitigation Plan [REP4-053]** (updated at Deadline 5) as secured in Condition 11(1)(k) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **Scour Protection and Cable Protection Plan [REP3-039]** as secured in Condition 11(1)(i) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **Offshore Operations and Maintenance Plan [REP3-043]** as secured in Condition 3 of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **Fisheries Liaison and Co-existence Plan [REP1-013]** as secured in Condition 11(1)(g) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5),
- **Offshore In Principle Monitoring Plan [REP4-055]** as secured in Condition 11(1)(j) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5).

1.3.3 In addition, the Final CSIP will be informed and influenced by the results of pre-construction surveys including:

- Geophysical and geotechnical surveys as secured in Condition 16 of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5).
- Marine archaeology surveys as secured in Condition 16 and 11(2) of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at deadline 5).
- Unexploded Ordinance (UXO) surveys as secured in Condition 16 of the dML, Schedules 11 and 12 of the **draft DCO [REP4-004]** updated at deadline 5.

1.4 Consultation

1.4.1 The site selection of the Offshore Export Cable Corridor and Array Area and the mitigation measures contained within the ES (described in Section 2) have been developed in consultation undertaken with relevant stakeholders and statutory authorities. RED has sought to engage with the MMO (and their advisors Cefas),

the MCA, Natural England, Sussex IFCA, and Trinity House from the earliest stages of the process.

1.4.2 The Final CSIP will be developed in consultation with the following stakeholders:

- Marine Management Organisation (MMO)
- Maritime and Coastguard Agency (MCA)
- Natural England
- Sussex Inshore and Fisheries Conservation Authority (IFCA)
- Trinity House Corporation

1.4.3 The Final CSIP will be submitted to the MMO for approval.

2. Environmental Impacts

2.1 Environmental impacts and mitigation

2.1.1 Table 2-1 sets out the potential impacts identified in the ES and committed-to mitigations which relate to cable routeing and installation methodology. The final export cable, inter array cables and interconnector cables routes and installation method will be influenced by a range of considerations. including seeking to avoid or minimise environmental impacts and managing cable burial risk.

2.1.2 Through the final cable routeing it may not be possible to address all potential impacts without compromise. Where conflict arises between routeing and installation considerations, the Applicant will engage with the relevant stakeholders (as set out in **Section 1.4**) to apply the mitigation hierarchy and seek the most appropriate solution.

2.1.3 Table 2-1 below sets out the committed to embedded environmental measures relating to cable routing and installation methodology referred to throughout this Outline CSIP.

Table 2-1 Commitments and securing mechanisms relevant to the CSIP, taken from the Commitments Register [REP4-057]

Ref	Commitment Description	Securing Mechanism
C-41	The subsea inter-array cables will typically be buried at a target burial depth of 1m 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)

Ref	Commitment Description	Securing Mechanism
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-46	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins. The undertaker must ensure that a local Notice to Mariners (NtM) is issued at least 14 days prior to the commencement of the authorised Proposed Development or any part thereof advising of the start date of each activity and the expected vessel routes from the construction ports to the relevant location.	Deemed marine licence, Schedule 11, Part 2, Condition 5 (7) & (8) & Schedule 12, Part 2, Condition 5 (7) & (8)
C-47	Ongoing liaison with fishing fleets will be maintained during pre-construction, construction, maintenance and decommissioning operations via an appointed Fisheries Liaison Officer and Fishing Industry Representative to ensure that the fishing community are fully informed of any offshore activities and works. Also see C-91, C-92 and C-93.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (g) & Schedule 12, Part 2, Condition 11 (1) (g)
C-48	Monitoring of marine vessel traffic will be undertaken for the duration of the construction period.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (e) (i) & Schedule 12, Part 2, Condition 11 (1) (e) (i)
C-56	RED will apply for Safety Zones post consent. Safety Zones of up to 500m will be sought during construction, maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.	Electricity application procedures (Section 95 of Energy Act 2004) Deemed marine licence, Schedule 11, Part 2, Condition 13 & Schedule 12, Part 2, Condition 13
C-57	Marine Written Schemes of Investigation (WSI) will be developed in accordance with the Outline Marine Written Schemes of Investigation (WSI) (Application	Deemed marine licence, Schedule 11, Part 2, Condition 11 (2)

Ref	Commitment Description	Securing Mechanism
	Document Reference 7.13). The Marine WSI will detail environmental measures including the archaeological exclusion zones (AEZ), the implementation of a Protocol for Archaeological Discoveries in accordance with 'Protocol for Archaeological Discoveries: Offshore Renewables Projects' (The Crown Estate, 2014) and methodologies for future monitoring, survey and assessment requirements.	& Schedule 12, Part 2, Condition 11 (2)
C-58	Offshore geophysical surveys (including Unexploded Ordnance (UXO) surveys) undertaken during the life of the project will be subject to full archaeological review where relevant in consultation with Historic England.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (2) (c) & Schedule 12, Part 2, Condition 11 (2) (c)
C-59	Offshore geotechnical undertaken during the life of the project will be undertaken following early discussions with Historic England. Areas with geoarchaeological potential will be targeted during the geotechnical sampling campaigns and the results of the geoarchaeological assessment will be presented in staged geoarchaeological reports inclusive of publication. The published results will aim to enhance the paleogeographic knowledge and understanding of the area.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (2) (g) & Schedule 12, Part 2, Condition 11 (2) (g)
C-60	All intrusive activities undertaken during the life of the project will be routed and microsited to avoid any identified marine heritage receptors, with Archaeological Exclusion Zones (AEZs) (buffers) as detailed in the Outline Marine Written Schemes of Investigation (WSI) (Application Document Reference 7.13) unless other mitigation is agreed with Historic England as per the Marine WSI. Micrositing and AEZs will further be applied to yet undiscovered marine heritage receptors should they be located.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (2) (e) & Schedule 12, Part 2, Condition 11 (2) (e).
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-85	RED will ensure that the local notice to mariners (NtM) is updated and reissued at weekly intervals during construction activities and at least five days	Deemed marine licence, Schedule 11, Part 2, Condition 5 (9)

Ref	Commitment Description	Securing Mechanism
	before any planned operations and maintenance works and supplemented with VHF (very high frequency) radio broadcasts agreed with the Maritime & Coastguard Agency (MCA) in accordance with the construction and monitoring programme approved under DML conditions.	& Schedule 12, Part 2, Condition 5 (9)
C-88	Marine coordination will be implemented to manage Rampion 2 vessels throughout construction and maintenance periods.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (f) & Schedule 12, Part 2, Condition 11 (f)
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-102	A UXO Clearance Marine Mammal Mitigation Protocol (MMMP) will be developed in consultation with Natural England to appropriately manage the risk to marine mammals during UXO clearance. A Draft UXO Clearance MMMP (Document Reference 7.15) has been submitted with this Application.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (m) & Schedule 12, Part 2, Condition 11 (1) (m)
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 for seabed habitat recovery in sediment areas and reducing the need for secondary protection and consequently minimising any potential for longer-term residual effects.	Deemed marine licence, Schedule 12, Part 2, Condition 11 (1) (a) (iii)

Ref	Commitment Description	Securing Mechanism
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)
C-283	Gravel bags laid on the seabed to protect the cable barge during construction of Rampion 2, will be removed prior to the completion of construction, where practicable.	Deemed Marine Licence, Schedule 12, Part 2, Requirement 11 (1) (d)
C-288	The Applicant is committed to minimising the release of plastics into the marine environment, and commits to using suitable alternatives, where this is practicable.	Deemed Marine Licence, Schedule 11, Part 2, Condition 11 (1) (i) & Schedule 12, Part 2, Condition 11 (1) (i)
C-289	The Applicant will use secondary protection material, where practicable, that has the greatest potential for removal on decommissioning of the Proposed Development.	Deemed Marine Licence, Schedule 11, Part 2, Condition 11 (1) (i) & Deemed Marine Licence, Schedule 12, Part 2, Condition 11 (1) (i)
C-297	The location of gravel beds will be microsited to avoid sensitive features, where practicable.	Deemed Marine Licence, Schedule 12,

Ref	Commitment Description	Securing Mechanism
		Part 2, Condition 11 (1) (i)
C-300	Cable protection will be used that minimises the environmental impacts as far as practicable. At the point of selecting a cable protection supplier, consideration will be given to using the method of cable protection which is likely to be removable at decommissioning.	Deemed Marine Licence, Schedule 11, Part 2, Condition 11 (1) (i) & Schedule 12, Part 2, Condition 11 (1) (i)
C-304	The Windfarm Separation Zone to the west of Rampion 1, as set out in the Figure 17.1 of **Navigational Risk Assessment [APP-155]** and as secured by the **Offshore Works Plan [PEPD-004],** will be open to navigation for all vessels and compliant with Marine Guidance Note (MGN) 654.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (a) & Schedule 12, Part 2, Condition 11 (1) (a)
C-305	Excavated chalk will be used to infill cable trenches produced by mechanical cutter, where practicable.	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (k) & Schedule 12, Part 2, Condition 11 (1) (k)

2.1.4 A summary of the individual commitments to mitigate against impacts relating to cable installation for the Proposed Development can be seen in Section 3.2 of the **Outline CBRA (Document reference 8.85)**.

Table 2-2 Relevant environmental impacts and embedded mitigation measures

Topic	Potential Impact	Mitigation	Consideration in Final CSIP	Commitment Ref
Shipping and navigation	Reduction in navigable depth	Where scour protection is required for subsea cables, MGN 654 will be adhered to with respect to changes greater than 5% to the under-keel clearance	The initial considerations of cable burial risk are outlined in Section 3.4 of the **Outline CBRA (Document reference 8.85)**.	**C-83**
Shipping and navigation	Interactions with vessels in	The Structures Exclusion Zone to the west of	The commitments in the ES will be reflected in the final	**C-304**

Topic	Potential Impact	Mitigation	Consideration in Final CSIP	Commitment Ref
	sensitive navigation locations	Rampion 1, as set out in the Figure 17.1 of **Navigational Risk Assessment [APP-155]** and as secured by the **Offshore Works Plan [PEPD-004],** will be open to navigation for all vessels and compliant with Marine Guidance Note (MGN) 654	construction method statement set out in the CSIP.	
Shipping and navigation	Interactions with other vessels during construction and operation	Ongoing liaison with fishing fleets will be maintained during pre-construction, construction, maintenance and decommissioning operations via an appointed Fisheries Liaison Officer and Fishing Industry Representative to ensure that the fishing community are fully informed of any offshore activities and works. Monitoring of vessel traffic will be undertaken for the duration of the construction period.	The CSIP will be consistent with measures set out in **Chapter 13: Shipping and Navigation, Volume 2** of the ES **[APP-054]**.	**C-47, C-48**

Topic	Potential Impact	Mitigation	Consideration in Final CSIP	Commitment Ref
Shipping and navigation, Benthic, subtidal and intertidal ecology, Fish and shellfish ecology, Other marine users	General impacts including impacts to ecology, navigable depth, safety of navigation	Target burial depth of 1m below seabed surface. Where possible, subsea cable burial will be the preferred option for cable protection.	This Outline CSIP sets out the principles by which the Final CSIP will accord. The associated **Outline CBRA (Document reference 8.85)**. provides the initial considerations of cable burial risk which will be expanded upon for the final CBRA.	**C-41, C-45, C-96, C-304, C-305**
Other marine users	Safety of navigation	Safety Zones of up to 500m will be sought during construction, maintenance and decommissioning phases. Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.	The Final CSIP will consider the impacts on navigation from safety zones associated with cable installation and will be consistent with measures set out in the ES.	**C-46, C-56**
Marine mammals	Permanent Threshold Shift (PTS) / Disturbance from UXO clearance prior to export	A UXO Clearance Marine Mammal Mitigation Protocol (MMMP) will be	Final cable routeing will be set out in the Final CSIP.	**C-102**

Topic	Potential Impact	Mitigation	Consideration in Final CSIP	Commitment Ref
	cable installation	developed in consultation with Natural England.		
Benthic, intertidal and subtidal ecology, Fish and shellfish ecology	Permanent habitat loss	Micrositing and adoption of specialist offshore export cable laying and installation techniques will minimise the direct and indirect (secondary) seabed disturbance footprint.	Cable routeing and use of cable protection will be set out in the Final CSIP. Final locations of cable protection will be confirmed following installation.	**C-269, C-272, C-305**
Fish and shellfish ecology	Impacts to black seabream as a qualifying feature of the Kingmere MCZ	Seasonal restriction on construction, installation and maintenance.	The Final CSIP will include a construction programme avoiding the black seabream breeding period (1st March to 31st July).	**C-273**
Marine archaeology	Damage to archaeological features	All intrusive activities undertaken during the life of the project will be routed and microsited to avoid any identified marine heritage receptors, with Archaeological Exclusion Zones (AEZs) (buffers) as detailed in the **Outline Marine Written Schemes of**	Cable routeing will be set out in the CSIP and will take into consideration any identified AEZs.	**C-57, C-58, C-60**

Topic	Potential Impact	Mitigation	Consideration in Final CSIP	Commitment Ref
		Investigation [REP3-041] (WSI). All geophysical surveys will be subject to full archaeological review.		

2.2 Approach to cable routeing and design

2.2.1 The following sections describe the considerations for avoiding or minimising impacts on sensitive receptors through cable routeing. How these receptors have been considered in the final cable route, design and approach to installation will be set out in the Final CSIP.

Shipping and navigation (including commercial fisheries)

2.2.2 As with the equivalent construction phase impact, encounter and collision risk involving a project vessel will be well mitigated, including through marine coordination (**C-88**) carriage of Automatic Identification System (AIS) and compliance with Flag State regulations by project vessels, and promulgation of information to fishing fleets via an appointed Fisheries Liaison Officer (**C-47**).

2.2.3 An application for safety zones of 500 m radius will be sought during the operation and maintenance phase (**C-56**). These will serve to protect project vessels engaged in major maintenance activities. Minimum advisory passing distances, as defined by risk assessment, may also be applied, with advanced warning and accurate locations of both safety zones and any minimum advisory safe passing distances provided by Notifications to Mariners and Kingfisher Bulletins (**C-46** and **C-85**)

2.2.4 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 CBRA and detailed within the Final CSIP (**C-41, C-96 and C-45**). The target burial depth of between 1.0 and 1.5 m for the export cables may be insufficient based on consultation feedback from marine aggregate dredgers and this will be further considered in the Final CBRA.

2.2.5 Any potential impacts on shipping that cannot be avoided through cable routing will be managed through engagement with the relevant stakeholders and the measures contained in management plans including the Final CSIP.

Unexploded ordnance

2.2.6 The potential impacts from UXO relate to their disposal and the associated noise emissions that can affect marine mammals and fish.

2.2.7 Using data acquired from the baseline geophysical survey, potential UXO will be identified and where necessary will be further investigated pre-construction using ROVs or divers.

2.2.8 Where potential UXO are identified, the priority will be to avoid disturbance with the final cable routing. This reduces the risk to personnel and installation equipment as well as limiting impacts due to disposal.

2.2.9 Should an UXO require disposal this will be the subject of a separate Marine Licence application.

Archaeology

2.2.10 The location of the Offshore Export Cable and Array Area Cables will be microsited to avoid any identified archaeological receptors (with buffer zones as to be detailed in the Final Written Scheme of Investigation).

2.2.11 **C-57** and **Outline Marine Written Scheme of Investigation** **[REP3-041]** details the AEZs which have been recommended following desk-based studies combined with the assessment of geophysical data to ensure correct location as well as appropriate size and extent of protective area. This is further discussed in Section 5 of **Appendix 16.1: Marine archaeological technical report, Volume 4** of the ES **[APP-162].**

2.2.12 Confirmed locations of identified marine heritage receptors in the array area and Offshore Export Cable Corridor are informed by archaeological assessments of geophysical and geotechnical data, as per embedded environmental measures **C-58** and **C-59**. As yet unidentified marine heritage receptors have the potential to be discovered as a result of planned survey work as highlighted in the embedded environmental measures (**C-58** and **C-59**).

2.2.13 Embedded environmental measure **C-60** will ensure that direct impacts as a result of cable laying operations during the construction phase of Rampion 2 on all known and located marine heritage receptors are avoided, where practicable. Where it is deemed that impacts cannot be avoided, measures to reduce, remedy or offset disturbance will be agreed with Historic England and West Sussex County Council for components of the Proposed Development within the intertidal area.

2.2.14 The commitment to undertake further archaeological works throughout the life of the Proposed Development will be a requirement under **Outline Marine Written Scheme of Investigation** **[REP3-041]** (updated at Deadline 5) and associated documents, in accordance with embedded environmental measure **C-57**.

Benthic, intertidal and subtidal ecology

2.2.15 Potential impacts on benthic ecology from export and array cable installation includes temporary loss of habitat, smothering due to sediment dispersal and deposition, and permanent loss of habitat where cable protection is required.

2.2.16 Benthic habitats have been identified through baseline surveys as set out in the **Chapter 9: Benthic, subtidal and Intertidal Ecology, Volume 2** of the ES **[APP-050]** (updated at Deadline 5) and will be further informed through pre-construction

surveys (as secured through Conditions 11, 12 and 16 of the dML, Schedule 11 and 12 of the **draft DCO** **[REP4-004]**).

2.2.17 The Offshore Export Cable Corridor covers Bedrock, stony reef and *S. spinulosa* reef habitats, 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. Bedrock, stony reef and *S. spinulosa* reef habitats were also observed across the western areas of the Array Area.

2.2.18 The Kingmere MCZ lies adjacent to the Offshore Export Cable Corridor. Climping Beach SSSI Overlaps with the Offshore Export Cable Corridor landfall, but the use of HDD will ensure no direct impact to features. For a full list of marine nature conservation designations with relevance to benthic subtidal and intertidal ecology, see Table 9-13 in **Chapter 9: Benthic, subtidal and Intertidal Ecology, Volume 2** of the ES **[APP-050]** (updated at Deadline 5)**.**

2.2.19 All phases of the cable routing and design will seek to minimise impacts on features of conservation interest by micrositing and the adoption of specialist offshore export cable laying and installation techniques including consideration of the use, type and location of cable protection.

2.2.20 Once pre-construction surveys are completed, and the location of sensitive features has been determined, consideration will be given during the detailed design of the Proposed Development to identify suitable locations for the temporary storage of excavated material, in areas which minimise impacts on sensitive features and designated sites, where practicable.

Fish and shellfish ecology

2.2.21 Fish and shellfish receptors may be impacted by the cable installation through direct and indirect seabed disturbances, and associated increases in suspended sediment and deposition, as set out in **Chapter 8: Fish and shellfish ecology, Volume 2** of the **ES [APP-049]** (updated at Deadline 5).

2.2.22 The Offshore Export Cable Corridor is in close proximity to breeding areas for black seabream as a qualifying feature of the Kingmere MCZ and priority habitats such as bedrock and chalk reef as listed under Section 41 of the NERC (Natural Environment and Rural Communities) Act. Bedrock, stony reef and *S. spinulosa* reef habitats were also observed across the western areas of the Array Area.

2.2.23 All phases of the cable routing and design will seek to minimise impacts on features of conservation interest by micrositing and the adoption of specialist offshore export cable laying and installation techniques including consideration of the use, type and location of cable protection. This will be informed through pre-construction surveys (as secured through Conditions 11, 12 and 16 of the dML, Schedule 11 and 12 of the **draft DCO** **[REP4-004]**).

Other marine users

2.2.24 Although there are active marine aggregate license areas in proximity to the Order Limits, there are none within the Order Limits (as set out within **Chapter 7: Other**

Marine Users, Volume 3 **[APP-080]**). Subsequently, marine aggregate areas would not be a constraint for cable burial.

2.2.25 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]**).

2.2.26 Regarding recreational boating and sailing, the greatest potential for impact during the construction phase will be on the general boating area through which the Offshore Export Cable Corridor passes, however, this will be limited spatially to the locations where construction vessels are present and of temporary duration. Similarly, impacts from cable installation on diving activities, whilst potentially affecting a number of dive sites across the area within which raised suspended sediment and deposition may occur, will be spatially and temporally limited, with no long-term effects anticipated.

2.2.27 Whilst it is considered that the routing and installation of the offshore export cables, array cables and interconnector will have no significant effects on other marine users, where considerations have been given in the final design, this will be reflected in the Final CSIP.

3. Data Sources

3.1.1 As part of the planning, assessment and development of Rampion 2, a geophysical survey covering the full extent of the development area (including the Offshore Export Cable Corridor) has been undertaken. This has provided information on seabed elevation and surficial sediment type, as well as the nature and thickness of underlying sedimentary units (Gardline, 2020a; 2020b; 2020c). Further details of data and assessments that have and will inform the considerations on cable installation and specification are set out in Table 3-3 of the **Outline CBRA** **(Document reference 8.85)**.

3.1.2 Geophysical and geotechnical surveys would be carried out before works commence and the information from those surveys would allow route debris, boulders, archaeological features, UXO presence, seabed features, sediment depth and the nature of the seabed to be determined (as secured by the Offshore **In Principle Monitoring Plan** **[REP4-055]** secured in Conditions 11(1)(j) of the dML, Schedule 12 of the **draft DCO** **[REP4-004]**)). An analysis of these factors would then inform the final locations of WTGs (micrositing), the final location(s) of the OSS(s) (micrositing), the requirement for cable routeing design and installation methods, the target cable burial depth, and details of additional cable protection would be required. Micrositing is intended to provide flexibility to make minor adjustments to the Proposed Development layouts to accommodate unexpected on-site conditions encountered in the pre-construction surveys

3.1.3 Results from the pre-construction surveys will be used to inform the Final CSIP. As discussed in the **In Principle Sensitive Features Mitigation Plan** **[REP4-053]** (updated at Deadline 5)**,** specific trenching equipment may be required along different sections of the route. Details of the specific equipment that would be utilised will be presented in the Final Plan.

3.1.4 As detailed in the **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 or habitats and species of relevance, as appropriate. The results shall then be used to constrain the Offshore Export Cable installation methods to minimise the area of physical disturbance to chalk habitat, stony reef and Sabellaria spinulosa reef and inform final Offshore Export Cable routeing.

4. Technical Specification

4.1 Overview

4.1.1 This section of the Outline CSIP details the technical specifications of the offshore cables to be used for the Proposed Development. For full details of current parameters see **Chapter 4: The Proposed Development, Volume 2** of the ES **[APP-045]**.

4.1.2 To allow for design flexibility at this stage of the Proposed Development, the Environmental Statement has considered a range of parameters for each aspect of the Proposed Development, defined as the Maximum Design Scenario (MDS). For full details please see **Chapter 4: The Proposed Development, Volume 2** of the ES **[APP-045]**.

4.1.3 The key design parameters for the offshore cables at the point of application are presented below. These will be refined during the detailed design phase post consent. Final details of the cable specification, including routeing, burial depth, technical specifications and installation method statements will be provided in the Final CSIP.

4.1 Inter-array Cables

4.1.1 Inter-Array cables (IAC) will link the turbines to each other and the offshore substations (OSSs). A number of WTGs will typically be grouped together on the same cable string, branch or loop connecting to the OSSs, and multiple array cables will connect each string back to each OSS.

4.1.2 The array cable profile will likely be a three core, armoured cable with copper or aluminium conductors covered in insulation material. The array cables will also contain fibre-optic cores that will be used for protection, control, and communications systems. The maximum design parameters and associated assumptions for the inter-array cables are presented in **Table 4-1.**

Table 4-1: Indicative key maximum design parameters and assumptions for the inter-array cables

Assessment assumption or parameter	**Maximum value** (Parameters presented in **bold** text)
Total array cable length	**250km**
Array cable burial depth	1m target depth
Cable diameter	Up to 350mm
Cable trench width	2m
Voltage	Up to 132kV

4.2 Offshore Interconnector Cables

4.2.1 The Proposed Development may require up to two offshore interconnector cables to link together the OSSs. These interconnector cables also ensure that in the event of one cable failing, the flow of electricity can continue through the other cable(s). The interconnector cables are likely to be armoured and have three core cables with copper or aluminium conductors and cross-linked polyethylene (XLPE) insulation, with a voltage up to 275kV. The interconnector cables will also contain fibre-optic cores that will be used for protection, control, and communications systems. The parameters and associated assumptions for design and installation of the offshore interconnector cables are presented in Table 4-2.

Table 4-2: Indicative maximum design parameters and assumptions for offshore interconnector cables

Assessment assumption or parameter	**Maximum value** (Parameters presented in **bold** text)
Number of cables	**2**
Total Cable length	**40km**
Array cable burial depth	1m target depth
Cable diameter	Up to 350mm
Interconnector cable trench width	2m
Voltage	Up to 275kV

4.3 Offshore Export Cables

4.3.1 The transmission technology for the Proposed Development will be HVAC technology. Table 4-3 presents the design envelope for the Offshore Export Cables.

Table 4-3 Indicative key maximum design parameters and assumptions for Offshore Export Cables

Assessment assumption or parameter	**Maximum value** (Parameters presented in **bold** text)
Export cable	
Export cable rated capacity	Up to 275kV
Number of HVAC offshore cables	**4**

Assessment assumption or parameter	Maximum value (Parameters presented in **bold** text)
Export cable trenches	Up to 4
Fibre optic cables	Bundled into export cable
Export cable trench depth	1.0 m to 1.5 m
Export cable trench width	2 m
Export cable corridor	59 km^2
Number of cable circuits (HVAC)	**4**
Cable diameter	Up to 350mm
Export cable corridor	
Length of offshore cable corridor, link to shore	17 km
Width of offshore cable corridor, link to shore	1.5 km
Total length of export cables	**170 km**

4.4 Review of Cable Route Locations where Water Depth is Reduced by >5%

4.4.1 In the Final CSIP, this section will incorporate a CBRA encompassing the identification of any cable protection that exceeds 5% of navigable depth referenced to Chart Datum. In the event that any area of cable protection exceeding 5% of navigable depth is identified, details of any steps to be taken will be given.

4.4.2 As stated in Condition 11 (n)(iii) of the dMLs, Schedules 11 and 12 of the **draft DCO** **[REP4-004]** (updated at Deadline 5) *"a detailed cable laying plan for the Order limits, 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"*

4.4.3 This review will be informed by data in other management plans:

- **Outline Scour Protection and Cable Protection Plan** **[REP3-039]** (updated at Deadline 5).

- **In Principle Sensitive Features Mitigation Plan** (IPSFMP) **[REP4-053]** (updated at Deadline 5).

5. Cable Laying Plan and Installation Methodology

5.1 Overview

5.1.1 In the Final CSIP, this section will also include:

- A detailed cable laying plan for cables within the offshore order limits; and,
- detailed cable installation methodology for the Proposed Development.

5.2 Pre-construction surveys

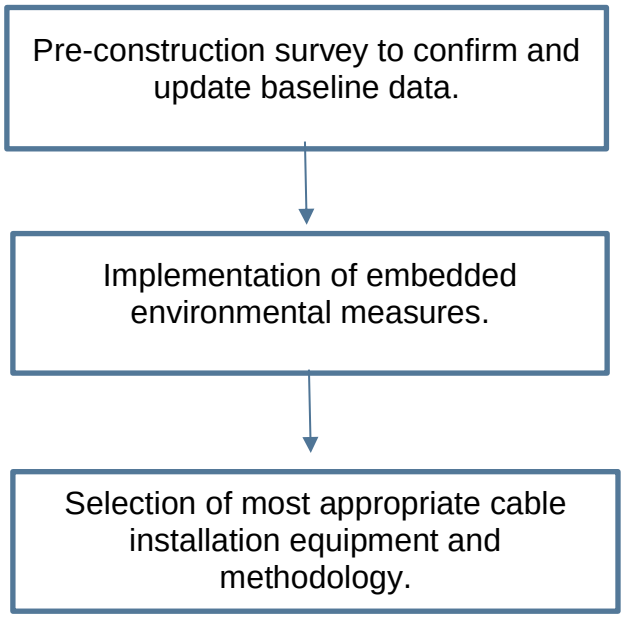
5.2.1 Geophysical, geotechnical, marine archaeological and UXO surveys would be carried out prior to works commencing. The information from those surveys would allow the locations of constraints to be determined, such as:

- Route debris;
- Boulders;
- Archaeological features;
- UXO presence;
- Seabed features;
- Sediment depth; and
- The specific nature of the seabed.

5.2.2 The data from these surveys will be used to define the final cable routeing, specification, installation and potential need for cable protection.

5.3 Cable installation flow chart

5.3.1 The Final CSIP will detail the cable installation process as outlined in the following flowchart:



5.4 Relevant Project Parameters

Cable protection

5.4.1 Cable protection will be required where cable burial depth is not achieved or possible due to ground conditions and at third party cable crossings which may occur on the cable routes. It is estimated that approximately 20% of the array and interconnector cables may require protection measures.

5.4.2 The exact form of cable protection used will depend upon local ground conditions, hydrodynamic processes, and the selected cable protection contractor, however, the final choice will include one or more of the following:

- concrete ‘mattresses’;
- rock placement;
- geotextile bags filled with stone, rock, or gravel;
- polyethylene or steel pipe half shells, or sheathes; and/or
- bags of grout, concrete, or another substance that cures hard over time.

5.4.3 If rock placement, or filled bags are used to protect cables, they are typically used to construct a berm on the seabed on top of the cable. The rock placement method of cable protection involves placing rocks of different grade sizes from a fall pipe vessel over the cable. Initially smaller stones are placed over the cable as a covering layer. This provides protection from any impact from larger grade size

rocks, which are then placed on top. The rock berm will be up to 1 m in height and a maximum of 6 m wide.

5.4.4 The mitigation measures listed below are in place to prioritise protection with the greatest likelihood of removal whilst minimising any potential for harm to the marine environment:

- C-283 - Gravel bags laid on the seabed to protect the cable barge during construction of Rampion 2, will be removed prior to the completion of construction, where practicable.
- C-288 - The Applicant is committed to minimising the release of plastics into the marine environment, and commits to using suitable alternatives, where this is practicable.
- C-289 - The Applicant will use secondary protection material, where practicable, that has the greatest potential for removal on decommissioning of the Proposed Development.
- C-297 - The location of gravel beds will be microsited to avoid sensitive features, where practicable.
- C-300 - Cable protection will be used that minimises the environmental impacts as far as practicable. At the point of selecting a cable protection supplier, consideration will be given to using the method of cable protection which is likely to be removable at decommissioning.

Seabed preparation

5.4.5 Requirements for seabed preparation will vary according to the specific ground conditions and the type of infrastructure being installed. Detailed geophysical surveys will be carried out preconstruction to provide further detail and to clarify the presence of boulders, archaeological features, UXO and other obstructions on the seabed.

UXO Clearance

5.4.6 Where UXO are identified, the initial process will be to undertake a risk assessment to determine the appropriate action (including avoidance, removal or in situ detonation). If UXO clearance is required, a separate licence would be sought. Recent advancements in the available methods for UXO clearance, mean that high-order detonation may be avoided. The methods of UXO clearance considered for the Proposed Development may include:

- Removal/ relocation; and Other less intrusive means of neutralising the UXO
- Low-order detonation (deflagration);
- High-order detonation;

Boulder Clearance

5.4.7 Geophysical surveys will be undertaken within the Offshore Export Cable Corridor and will be used to inform boulder clearance requirements.

5.4.8 Where large volumes of boulders are present, micrositing of cables around these would be onerous and impractical. If left in-situ, these boulders will pose the following risks:

- exposure of cables and/or shallow buried cables, that might lead to the requirement for post-lay cable protection such as rock placement;
- obstruction risk to the cable installation equipment, leading to damage and/or multiple passes and therefore, a delayed cable installation programme (with no guarantee of achieving target burial depth); and
- risk of damage to the cable assets.

5.4.9 Based on current industry experience the following assumptions are made:

- boulders greater than 0.3 m in any dimension must be cleared;
- for cables within the Offshore Export Cable Corridor, a corridor of up to 25 m per cable (circuit) must be cleared to ensure that all the export cable burial tools being considered can operate in the cleared corridors; and
- for any cables within the Offshore Array Area, a corridor of up to 25 m must be cleared per cable circuit as this width is sufficient for the operation of the cable burial tools under consideration.

5.4.10 There are two key methods of clearing boulders, boulder plough and boulder grab. Where a high density of boulders is seen, the expectation is that a plough will be required to clear the cable installation corridor. Where medium and low densities of boulders are seen, a subsea grab is expected to be employed.

5.4.11 The Final CSIP will detail that where a plough is used to remove boulders, boulders will be moved to adjacent areas of seabed within the same habitat type. No boulders will be removed and placed on priority sensitive habitat areas to ensure no impacts from boulder placement will arise on such receptors. **Appendix 9.5: Technical Note Cable Corridor area mitigation for sensitive features, Volume 4** **[APP-145]** exemplifies how the micrositing exercise will be conducted based on data from the pre-construction surveys.

Pre-lay grapnel run

5.4.12 Following the pre-construction route survey and boulder clearance works, a Pre-Lay Grapnel Run (PLGR) and an associated route clearance survey of the final cable route will be undertaken. A vessel will be mobilised with a series of grapnels, chains, recovery winch and survey spread suitable for vessel positioning and data logging. Any items recorded will be recovered onto deck where possible and the results of this survey will be used to determine the need for any further clearance. The PLGR work will take account of and adhere to any archaeological protocols developed for the Proposed Development.

5.4.13 **Table 5-1** provides detail of the maximum assessment assumptions for the seabed preparation works for the Proposed Development. The table identifies the use of both a pre-lay plough and a subsea grab for boulder clearance. Pre-lay ploughs are designed to be pulled along the seabed in areas of high densities of boulders or where large boulders are present. They clear the corridor ready for cable installation and can also have the capability to concurrently form a cable

trench. Sub-sea grabs are operated from vessels (e.g., multicat vessels) and are able to pick-up and relocate boulders in areas where low densities of boulders are present.

5.4.14 Until the array layout is finalised, and the associated geophysical data is analysed in detail, it will not be known if sand waves will be affected by the works. Estimates are provided of sand wave clearance quantities for the maximum design scenario for assessment purposes. No sandwaves are expected in the Offshore Export Cable Corridor.

Table 5-1 Seabed preparation maximum assessment assumptions and parameters

Assessment assumption	Maximum value
Unexploded Ordnance clearance	
Avoidance buffer: Foundation exclusion Zone Radius (from each structure)	200 m
Avoidance buffer: Cables (all offshore cables) Exclusion Zone Radius (from each cable)	40 m
Boulder clearance in the Proposed Development array area	
Array area cable corridor (all cables) width: pre-lay plough	25 m
Export interconnector cable clearance corridor width: pre-lay plough	25 m
Clearance corridor width: subsea grab	15 m
Total clearance impact area: pre-lay plough for cables	8,800,000 m^2
Total clearance impact area: subsea grab for cables	5,280,000 m^2
Boulder clearance in the Proposed Development Offshore Export Cable Corridor	
Clearance corridor width: pre-lay plough	25 m
Clearance corridor width: subsea grab	15 m
Total clearance impact area: pre-lay plough	1,700,000 m^2
Total clearance impact area: subsea grab	1,020,000 m^2
Sandwave clearance in the Proposed Development array area	

Assessment assumption	Maximum value
Sandwave clearance impact width: array and interconnector cables	10 m
Length of cables affected by sandwaves	60 km
Sand-wave clearance: total in array area (export cables, array cables, interconnector cables and foundations)	1,375,000 m^3

5.5 Cable installation methodology

5.5.1 As secured by Condition 2 of the dMLs, and in accordance with the **In Principle Sensitive Features Mitigation Plan [REP4-053]** (updated at Deadline 5)**,** it is anticipated that the offshore cables will be installed via either ploughing, jetting, trenching, or a combination of these techniques, depending on ground conditions along the specific cable route. The following installation (burial) methodologies, which are captured within the main types of techniques (ploughing, trenching and jetting) as set out in Condition 2(7) of the dMLs, Schedules 11 and 12 of the **draft DCO [REP4-004]** (updated at Deadline 5), are considered appropriate for the export, array and interlink cables, and have therefore been included for assessment within the MDS for the Proposed Development:

- Jet-trenching;
- Pre-cut and post-lay ploughing or simultaneous lay and plough;
- Mechanical trenching (such as chain cutting);
- Dredging (typically Trailer Suction Hopper Dredger (TSHD), backhoe dredging or water injection dredging);
- Mass flow excavation;
- Controlled flow excavation (CFE);
- Rock cutting;
- Burial sledge;
- surface laid / self-burying cable;
- cable installed in pipe / duct; and
- cable protection installed, where necessary

5.5.2 The cables will either be directly buried using the above techniques or, for cables at landfall where a trenchless construction method, such as HDD will be employed, pulled into a duct.

5.5.3 Duct extensions may be required to enable the landfall cable ducts (see paragraph 4.4.1 of **Chapter 4: The Proposed Development [APP-045]**) to be extended further offshore to facilitate cable installation from an installation vessel situated offshore.

5.5.4 The technical limitation for the maximum length of the trenchless application at landfall is influenced by the chosen trenchless construction method, the ground conditions at landfall and the cable specification which will influence the sizing of ducts and in turn the required bore diameter. The Applicant currently estimates the feasible length of the crossing to be up to 1,500m from the onshore compound locations, however this is subject to further surveys and design work.

5.5.5 In shallow water sections of the export cable route, where ground conditions are not suitable to 'ground out' the export cable installation vessel on the seabed, the construction of temporary sand / gravel beds may be required. These beds will allow the vessel to safely 'ground out' before pulling and installing the cables. Following cable installation, these sand/gravel beds will be removed.

5.5.6 The methods for installing and removing gravel bags will be detailed at the construction stage and set out in the final CSIP. It is likely that this method will involve barges with lifting equipment, lowering and lifting the bags out of the water. It is likely that filling of the bags will take place at a port location. Risk assessments and method statements will be utilised to minimise the potential to damage any rock bags when they are installed and if they are required to be removed

5.5.7 With regards to trenching and burial, it is clear from the geophysical survey data for the Offshore Export Cable Corridor area that a mechanical trencher is likely to be required to achieve burial in chalk areas without sufficient soft sediment cover. The selection of the technique deemed most appropriate to the seabed conditions does not negate the mitigation strategy of micrositing and avoidance during the routeing design works; rather, this is a critical component considered alongside the mapping of sensitive features derived from the pre-construction surveys in the cable routeing design as part of the Final CSIP. The objective of the Final CSIP is to identify cable routeing that delivers avoidance of sensitive features where practicable and the minimisation of impacts where this cannot be achieved. Key considerations as to which particular trenchers may be suitable include:

- The need or requirement for a support vessel to house pumps and power systems;
- The ability to operate in lay-back from a cable lay barge, and the distance over which this is possible;
- The degree of disturbance to the seabed, both in terms of the dimensions of the trench excavated, and the disturbance caused by machine tracks;
- The manoeuvrability of the trencher and ability to traverse seabed irregularities; and
- The ability of the nearshore trencher to continue on to successfully complete the offshore scope, thus reducing both repeat impact to the environment and mobilisation costs.

5.5.8 However, as detailed in the **In Principle Sensitive Features Mitigation Plan [REP4-053]** (updated at Deadline 5) there are a number of potentially suitable trenching solutions available, which would reduce the temporal and spatial impact to the NERC reef features, as well as minimise suspended sediment impact to the black seabream nest areas, examples of which are presented below. Details of the

specific equipment that would be utilised, if required, will be presented in the Final Plan.

Aratellus Leviathan – Onshore, Nearshore and Offshore Mechanical and Jet Trencher

5.5.9 The Aratellus Leviathan – Onshore, Nearshore and Offshore Mechanical and Jet Trencher utilises a combination of a mechanical cutting chain and jetting to deliver burial in a post-lay mode. It is unique in its capability to automatically self-level through a suspension system, and to independently steer it's front and rear tracks, giving enhanced manoeuvrability. It is largely independently operated but would require a separate support vessel for shallow water and beaching operations.

5.5.10 This trencher could continue from the nearshore section to trench the remainder of the route in both jetting and cutting modes. The total footprint of the trencher is small in comparison to other cable laying equipment such as cable ploughs, being approximately 4m, with the direct trench cutting area of 1m, and a trenching speed of approximately 75-100m an hour.

Van Oord Deep Dig-It – Nearshore, Offshore Mechanical and Jet Trencher

5.5.11 A similar proposition to the Aratellus Leviathan with deeper burial capability and more power, but less manoeuvrable. The Van Oord Deep Dig-It – Nearshore, Offshore Mechanical and Jet Trencher is remotely operated and therefore does require support vessels in the nearshore environment.

Other trenchers exist on the market for nearshore conditions, in hard seabed soils and soft rocks, such as Enshore's T1 and SWT1 combined jetting and cutting trenchers.

Maximum design parameters and assumptions for cable installation

5.5.12 The following tables detail the maximum design parameters and assumptions for the installation of array cables, interconnector cables and export cables.

Table 5-2: Indicative maximum design parameters and assumptions for array cable installation

Assessment assumption or parameter	Maximum value (Parameters presented in bold text)
Array cable installation	
Installation methodology	Plough, trencher or jetter (using pre- or post-lay burial techniques)
Target burial depth 1m	1m

Assessment assumption or parameter	Maximum value (Parameters presented in bold text)
Width of seabed affected by array cable installation	25m
Total seabed disturbance	6,250,000m2
Burial spoil: ploughing and jetting	500,000m3
Duration: per array link (hours) – Jetting	Approximately 12hrs
Duration: per array link (hours) – Ploughing	Approximately 30hrs
Duration: total (months)	12 months
Jetting excavation rate – soft soil	300m/hr
Jetting excavation rate – loose soil	125m/hr
Ploughing excavation rate – medium soil	125m/hr
Ploughing excavation rate – hard soil	50m/hr
Cable protection placement	
Cable protection area	**300,000m^2**
Cable protection volume	**175,000m^3**
Number of crossings (estimate)	4
Cable/pipe crossings: total impacted area	**10,000m^2**
Cable/pipe crossings: pre-lay rock berm volume	**10,000m^3**
Cable/pipe crossings: post-lay rock berm volume	**10,000m^3**
Height of cable protection berm	1m
Width of cable protection berm	6m
Proportion of array cable requiring protection	20%
Replenishment during operations (% of construction total)	25%
Cable rock protection: maximum rock size	0.3m
Vessel requirements	
Number of main laying vessels	3

Assessment assumption or parameter	Maximum value (Parameters presented in bold text)
Number of main burial vessels	3
Number of trenching vessels	2
Number of crew boats or SOVs	6
Number of service vessels for pre-rigging of towers	2
Number of diver vessels	2
Number of vessels for Pre-Lay plough	2
Number of dredging vessels	1
Main laying vessels (total number of return trips)	12
Main burial vessels (total number of return trips)	6
Support vessels (total number of return trips)	300

Table 5-3: Indicative maximum design parameters and assumptions for interconnector cable installation

Assessment assumption or parameter	Maximum value (Parameters presented in **bold** text)
Cable protection area	**122,000m^2**
Cable protection volume	**110,500m^3**
Installation methodology	Plough, trencher or jetter
Target burial depth	1m
Total seabed disturbance	1,000,000m^2
Burial spoil – jetting	80,000m^3
Burial spoil – ploughing / trenching	80,000m^3
Jetting excavation rate – soft soil	300m/hr
Jetting excavation rate – loose soil	125m/hr

Assessment assumption or parameter	Maximum value (Parameters presented in **bold** text)
Ploughing excavation rate – medium soil	125m/hr
Ploughing excavation rate – hard soil	50m/hr
Trenching machine excavation rate - soft soil	200m/hr
Trenching machine excavation rate - hard soil	50m/h

Table 5-4 Indicative maximum design parameters and assumptions for export cable installation

Assessment assumption or parameter	Maximum value (Parameters presented in **bold** text)
Export cable installation	
Cable protection area	**517,000 m^2**
Cable protection volume	**470,000 m^3**
Installation methodology	Plough, trencher or jetter
Area of temporary sand/gravel beds for grounding installation vessel	115,000 m^2
Volume of temporary sand/gravel beds for grounding installation vessel	57,600 m^3
Total seabed disturbance	4,250,000 m^2
Burial spoil – jetting	340,000 m^3
Burial spoil – ploughing/ trenching	340,000 m^3
Duct extensions (total length)	4 km total (one duct per cable from HDD exit pit to approximately 1km further offshore)
Duration	6 months
Jetting excavation rate – soft soil	300 m/hr
Jetting excavation rate – loose soil	125 m/hr
Ploughing excavation rate – medium soil	125 m/hr

Assessment assumption or parameter	Maximum value (Parameters presented in **bold** text)
Ploughing excavation rate – hard soil	50 m/hr
Trenching machine excavation rate - soft soil	200 m/hr
Trenching machine excavation rate - hard soil	50 m/hr
Vessel requirements	
Jack-up area per leg	250 m^2
Jack–up number of legs	6
Number of jack-ups per exit pit	2
Number of barge groundings per exit pit	2
Number of main laying vessels	2
Main laying vessels (total number of return trips)	6
Number of trenching machines	2
Number of main jointing vessels	2
Main jointing vessels (total number of return trips)	6
Number of main burial vessels	2
Main burial vessels (total number of return trips)	6
Number of multicat-type vessels (for excavating duct extensions)	4
Multicat-type vessels (total number of return trips)	16
Number of spoil barges (for duct extensions)	4
Spoil barges (total number of return trips)	60
Number of support vessels	10
Support vessels (total number of return trips)	60

6. Cable Burial Risk Assessment

6.1.1 This section will summarise the results of the cable burial risk assessment (CBRA) which will be undertaken for the Proposed Development. An **Outline CBRA** (**Document reference: 8.85)** has been submitted into the examination at Deadline 5.

6.1.2 Once the risk assessment has been completed, this section will include the following information:

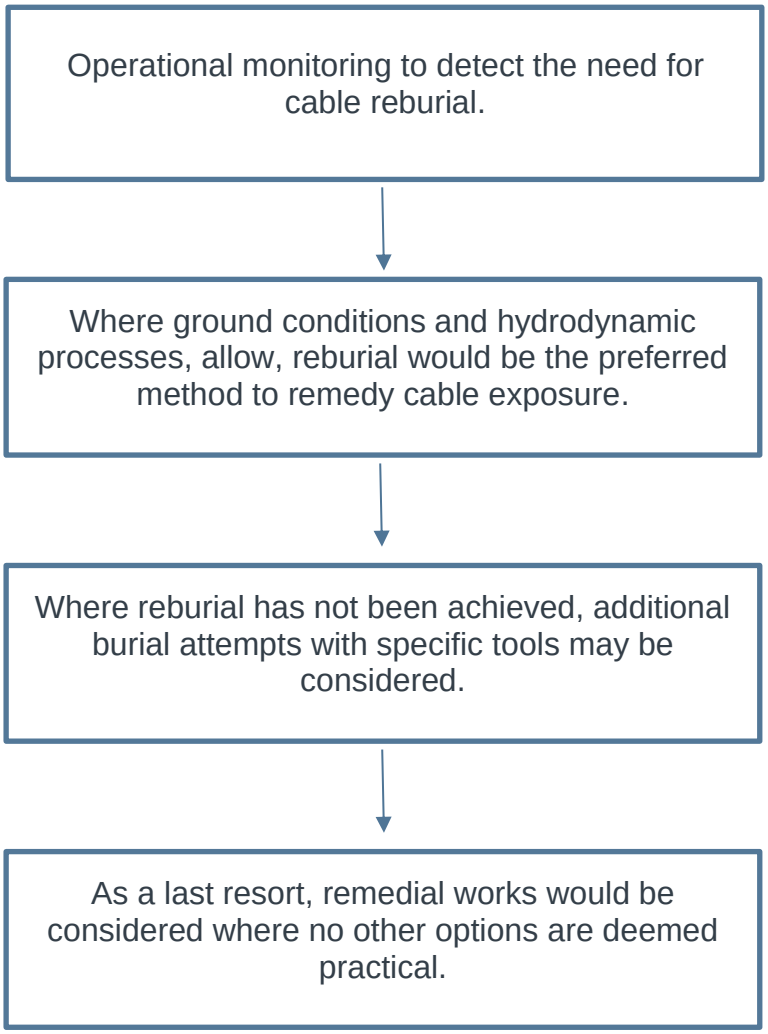
- Overview of the risk assessment;
- Overview of the site (bathymetry and seabed compositions);
- Mobile sediments (sandwaves and megaripples); and
- Seabed conditions (steep slopes, boulders and debris)
- Sensitive receptors and monitoring programme
- Scour and Cable Protection - The CBRA will inform where cable protection as set out in the **Outline Scour Protection and Cable Protection Plan [REP3-039]** (updated at Deadline 5) may be required along the routes.
- Dredging and disposal
- Shipping and Fishing activity
- Existing infrastructure

7. Cable Reburial

7.1.1 In the Final CSIP, a full and detailed process for cable reburial will be included, an outline of what this may include is detailed in the below.

7.1.2 Proposals for monitoring offshore cables including cable protection during the operational lifetime of the authorised scheme, this includes a risk-based approach to the management of unburied or shallow buried cables. This would follow the hierarchy of mitigation to avoid and reduce the need for external cable protection.

7.1.3 The environmental impacts of addressing cable exposure would be determined on a case-by-case basis depending on the nature of the exposure.



8. Summary

8.1.1 Within this Outline CSIP, the Applicant has summarised information relating to the offshore cables, including the current design parameters for the technical specification and installation of the cables, information on the approach to the Cable Burial Risk Assessment and specific mitigation in relation to cable burial activities.

8.1.2 The Applicant considers the cables on this Proposed Development to have a high probability of successful installation by burial, at the target depth, through the means noted in this Outline CSIP, with the aim of minimising the impact within the offshore order limits.

8.1.3 The final detailed design of the Proposed Development will be determined post-consent. The Final CSIP will be developed by the Applicant and submitted to the Marine Management Organisation (MMO) for approval (as required under the conditions of the dMLs).

8.1.4 The proposed structure for the Final CSIP will be as follows

- Introduction – this section would include the Purpose of the Document, details and outcomes of consultation on the Plan, a construction programme and a cable installation plan;
- Data sources – details of all the reports and surveys that have been used to create the Final CSIP will be explained;
- Technical Specifications of export cables;
- A summary of the CBRA, including a monitoring programme;
- Review of Cable Route Locations where Water Depths may be reduced by >5%;
- Cable Laying Plan and Installation Methodology including embedded environmental measures, the process involved in the seabed preparation and confirmation of the cable installation methodology;
- Cable protection for crossings, and a
- Cable reburial hierarchy.

9. Glossary of Terms and Abbreviations

Term	Definition
AIS	Automatic Identification System
CFE	Controlled Flow Excavation
CBRA	Cable Burial Risk Assessment
CSIP	Cable Specification and Installation Plan
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.
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
IFCA	Inshore Fisheries and Conservation Authority
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.
Marine Conservation Zone (MCZ)	An area designated for protection of certain characteristic features under various UK regulations.

Term	Definition
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.
MCA	Maritime Coastguard Agency
Mean High Water Springs (MHWS)	Mean High Water Springs
MW	Megawatts
NERC	Natural Environment and Rural Communities Act 2006
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.
Offshore part of the DCO Order limits	An area that encompasses all planned offshore infrastructure and relevant buffer areas.
Outline Plan	An early version of a management plan produced to secure principles, for which the final approved management plan will adhere to.
Planning Act 2008	The legislative framework for the process of approving major new infrastructure projects.
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.
Rampion 1	The existing Rampion Offshore Wind Farm located in the English Channel off the south coast of England.

Term	Definition
Rampion Extension Development Limited (RED)	Rampion Extension Development Limited
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.
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.

10. References

Gardline (2020a). *Rampion 2 OWF Development: Area A Geophysical Survey.* Report 1521.2
Gardline (2020b). *Rampion 2 OWF Development: Area B Geophysical Survey*. Report 1521.3
Gardline (2020c). *Rampion 2 OWF Development: Area C Geophysical Survey.* Report 1521.4

Rampion 2
WIND FARM