MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Outline Offshore Cable Specification and Installation Plan

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Glossary

Term	Meaning
400 kV grid connection cables	Cables that will connect the proposed onshore substations to the existing National Grid Penwortham substation.
400 kV grid connection cable corridor	The corridor within which the 400 kV grid connection cables will be located.
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Commitment	This term is used interchangeably with mitigation. The purpose of commitments is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to, and information to support, the EIA and Habitats Regulations Assessment processes for certain topics.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bay inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Marine licence	The Marine and Coastal Access Act 2009 requires a marine licence to be obtained for licensable marine activities. Section 149A of the Planning Act 2008 allows an applicant for to apply for 'deemed marine licences' in English waters as part of the development consent process.
Maximum Design Scenario	The realistic worst-case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Transmission Assets
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.

Term	Meaning
Mega-Ripple	Mega-ripples have wave heights up to 3 m and, depending on their size, mega-ripples can migrate over a period of hours to days with larger ripples typically migrating more slowly than smaller ones.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.
Morecambe Offshore Windfarm: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morecambe Offshore Windfarm to the National Grid.
Morecambe OWL	Morecambe Offshore Windfarm Ltd is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore export cables, landfall and onshore infrastructure for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morgan Offshore Wind Project: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morgan Offshore Wind Project to the National Grid.
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between bp Alternative Energy Investments Ltd and Energie Baden-Württemberg AG (EnBW).
National Grid Penwortham substation	The existing National Grid substation at Penwortham, Lancashire.
Non-statutory consultee	Organisations that an applicant may choose to consult in relation to a project who are not designated in law but are likely to have an interest in the project.
Offshore export cables	The cables which would bring electricity from the Generation Assets to the landfall.
Offshore export cable corridor	The corridor within which the offshore export cables will be located.
Offshore Order Limits	See Transmission Assets Order Limits: Offshore (below).
Offshore Wind Leasing Round 4	The Crown Estate auction process which allocated developers preferred bidder status on areas of the seabed within Welsh and English waters and ends when the Agreements for Lease are signed.
Offshore Permanent Infrastructure Area	The area within the Transmission Assets Offshore Order Limits (up to MLWS) where the permanent offshore electrical infrastructure (i.e. offshore export cables) will be located.
Onshore export cables	The cables which would bring electricity from landfall to the onshore substations.
Onshore export cable corridor	The corridor within which the onshore export cables will be located.

Term	Meaning
Onshore substations	The onshore substations will include a substation for the Morgan Offshore Wind Project: Transmission Assets and a substation for the Morecambe Offshore Windfarm: Transmission Assets. These will each comprise a compound containing the electrical components for transforming the power supplied from the generation assets to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Project Design Envelope	A description of the range of possible elements and parameters that make up the Transmission Assets options under consideration, as set out in detail in Volume 1, Chapter 3: Project Description. This envelope is used to define the Transmission Assets for EIA purposes when the exact engineering parameters are not yet known. This is also referred to as the Maximum Design Scenario or Rochdale Envelope approach.
Ramsar sites	Wetlands of international importance that have been designated under the criteria of the Ramsar Convention. In combination with Special Protection Areas and Special Areas of Conservation, these sites contribute to the national site network.
Ridge and Runnel	Seabed features that are a series of ridges (highs) and runnels (lows)
Ripples	Ripples are microscale seabed features that have a wave height of centimetres (<10 cm). Ripples are transient features that are constantly moving.
Special Areas of Conservation	A site designation specified in the Conservation of Habitats and Species Regulations 2017. Each site is designated for one or more of the habitats and species listed in the Regulations. The legislation requires a management plan to be prepared and implemented for each SAC to ensure the favourable conservation status of the habitats or species for which it was designated. In combination with Special Protection Areas and Ramsar sites, these sites contribute to the national site network.
Special Protection Areas	A site designation specified in the Conservation of Habitats and Species Regulations 2017, classified for rare and vulnerable birds, and for regularly occurring migratory species. Special Protection Areas contribute to the national site network.
Statutory consultee	Organisations that are required to be consulted by an applicant pursuant to section 42 of the Planning Act 2008 in relation to an application for development consent. Not all consultees will be statutory consultees (see non-statutory consultee definition).
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.

Term	Meaning
The Secretary of State for Energy Security and Net Zero	The decision maker with regards to the application for development consent for the Transmission Assets.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds).
Transmission Assets Order Limits: Offshore	The area within which all components of the Transmission Assets seaward of Mean Low Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning Also referred to in this report as the Offshore Order Limits, for ease of reading.

Acronyms

Acronym	Meaning
BAS	Burial Assessment Study
CBRA	Cable Burial Risk Assessment
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CLV	Cable Lay Vessel
CoCP	Code of Construction Practice
CoT	Commitment (Transmission Assets)
CSIP	Cable Specification and Installation Plan
DESNZ	The Department for Energy Security and Net Zero
DCO	Development Consent Order
DoL	Depth of Lowering
EIA	Environmental Impact Assessment
EnBW	Energie Baden-Württemberg AG
EPP	Evidence Plan process
ES	Environmental Statement
EWG	Expert Working Group
HNDR	Holistic Network Design Review
IEMA	Institute for Environmental Management and Assessment
IFCA	Inshore Fisheries and Conservation Authority
KP	Kilometre Point (km location along cable route)

Acronym	Meaning
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NGESO	National Grid Electricity System Operator
NSIP	Nationally Significant Infrastructure Project
NTS	Non-technical summary
OTNR	Offshore Transmission Network Review
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
SNCBs	Statutory Nature Conservation Bodies
TJB	Transition Joint Bay
UK	United Kingdom

Units

Unit	Description
%	Percentage
GW	Gigawatt
LAT	Lowest Astronomical Tide
km^2	Square kilometres
KP	Kilometre Point (along cable route)
m^2	Square metres
MW	Megawatt
nm	Nautical mile

1 Outline Offshore Offshore Cable Specification and Installation Plan (CSIP)

1.1 Background

1.1.1 Introduction

1.1.1.1 This document forms the Outline Offshore Cable Specification and Installation Plan (CSIP) prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets').

1.1.1.2 Specifically, this Outline CSIP sets out the parameters for cable installation within the Fylde Marine Conservation Zone (MCZ). It is based on site-specific data collected to date within the Transmission Assets Order Limits and should be read in conjunction with the Cable Burial Risk Assessment (CBRA) (document reference J14).

1.1.2 Project overview

1.1.2.1 Morgan Offshore Wind Limited (Morgan OWL), a joint venture between bp Alternative Energy Investments Ltd. (bp) and Energie Baden-Württemberg AG (EnBW), is developing the Morgan Offshore Wind Project. The Morgan Offshore Wind Project is a proposed wind farm in the east Irish Sea.

1.1.2.2 Morecambe Offshore Windfarm Ltd (Morecambe OWL), a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd., is developing the Morecambe Offshore Windfarm, also located in the east Irish Sea.

1.1.2.3 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid.

1.1.2.4 Morgan OWL and Morecambe OWL (the Applicants) are jointly seeking a single consent for transmission assets comprising aligned offshore export cable corridors to landfall and aligned onshore export cable corridors to onshore substation(s), and onward connection to the National Grid at Penwortham, Lancashire.

1.1.2.5 The key components of the Transmission Assets include offshore elements, landfall and onshore elements. Details of the activities and infrastructure associated with the Transmission Assets are set out in Volume 1, Chapter 3: Project Description of the Environmental Statement (document reference F1.3).

1.1.2.6 This Outline CSIP has been developed for the offshore elements of the Transmission Assets seawards of Mean High Water Springs (MHWS), specifically focused upon cable installation within the Fylde MCZ.

1.1.2.7 In summary, the offshore elements of the Transmission Assets will comprise:

- up to six offshore export cables;
- up to four offshore export cables for the Morgan Offshore Wind Project; and
- up to two offshore export cables for the Morecambe Offshore Windfarm.

1.1.3 Structure of this document

1.1.3.1 The Outline CSIP is structured as follows.

- **Section 1.1**: Background presents an introduction to the Outline CSIP and background to the Transmission Assets.
- Section 2: Purpose of the Cable Specification and Installation Plan provides details on the scope of the CSIP as it relates to the Fylde MCZ.
- Section 3: Implementation summarises each Applicant's responsibilities in preparing their respective detailed CSIPs prior to commencement of construction.
- Section 4: Fylde Marine Conservation Zone provides a summary of the designation and its broadscale habitat features.
- Section 5: Summary of Consultation details the consultation relevant to the preparation of the Outline CSIP.
- Section 6: Maximum Design Parameters for the offshore export cables provides the EIA parameters assessed in which the offshore export cables can be installed.
- Section 7: Mitigation provides details on the commitments (CoTs) made by the Applicants in regard to cable specification and installation relevant to the CSIP.
- Section 8: Seabed and Sediment Conditions provides an overview of the pre-construction surveys results and seabed conditions and requirements for further pre-construction surveys.
- Section 9: provides a summary of the CBRA (document reference J14) including an overview of seabed features and geotechnical risk.
- Section 10: Cable Installation Strategy provides an overview of trenching methods under consideration and how cables will be installed.
- Section 11: Cable Protection Plan provides details on external cable protection for ground conditions and cable crossings.
- Section 12: Monitoring of Cables provides information on details of asset integrity surveys to monitor cable burial and protection.
- Section 13: Conclusions summarises the previous sections as to how requirements for cable burial and installation in the Fylde MCZ is currently expected.

1.2 Purpose of the Outline Cable Specification and Installation Plan

1.2.1.1 This Outline CSIP has been developed to provide further information on the specification and installation of the offshore export cables for the Transmission Assets, seawards of Mean High Water Springs (MHWS) to the western edge of the Fylde MCZ. To enable further consideration of specific locations along the offshore export cable route, locational reference is made to kilometre points (KPs) referencing the distance along the offshore export cable route as shown in **Figure 1** where:

- KP0 is the Transition Joint Bay (TJB) area at Blackpool Airport;
- KP05 is the approximate location of the eastern edge of the Fylde MCZ;
- KP17 is the approximate location of the lower western edge of the Fylde MCZ; and
- KP21 is the approximate location of the upper western edge of the Fylde MCZ.

1.2.1.2 Consideration of cable burial and cable protection requirements (collectively part of the cable specification and installation process) is a key component of assessing the potential impacts to designated sites, such as the Fylde MCZ. These assessments are generally undertaken prior to detailed engineering studies and pre-construction surveys, which occur following consent and prior to the commencement of construction; however, a level of clarity is required for the assessments on the nature of the works and how these are to be controlled via the DCO process. This Outline CSIP has been prepared to provide that clarity and enable greater confidence in the assessment assumptions made for the Fylde MCZ within the Environmental Statement (document reference F2) and within the MCZ Assessment (document reference E4).

1.2.1.3 As such, the purpose of this Outline CSIP is to set out the framework for the information required in the final detailed CSIPs and provide information on cable installation methodologies and mitigation that may be adopted to minimise impacts upon the Fylde MCZ as far as reasonably practicable.

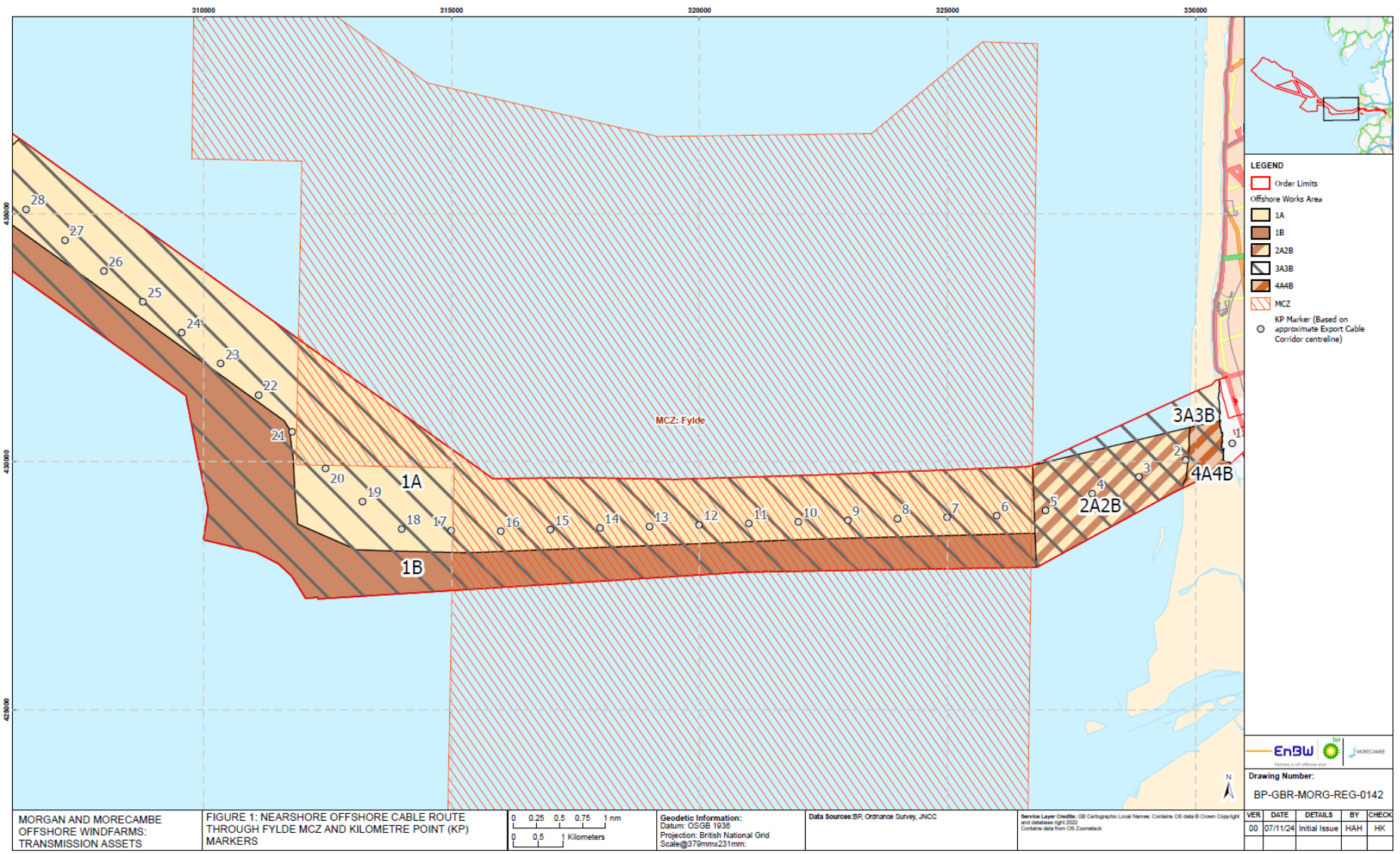

Figure 1: Nearshore Offshore Cable Route through Fylde MCZ and KP markers

1.3 Implementation

1.3.1.1 Following the granting of consent for the Transmission Assets, detailed CSIPs will be prepared, one on behalf of Morgan OWL and one on behalf of Morecambe OWL, prior to commencement of the licensed activities and will follow the principles established in this Outline CSIP. The detailed CSIPs will require approval by the Marine Management Organisation (MMO) following consultation with relevant stakeholders. The Applicants and all appointed contractors will be responsible for the implementation of their respective detailed CSIPs.

1.3.1.2 The Applicants have committed to implementation of CSIPs via the following commitment, CoT45 (see Volume 1, Annex 5.3: Commitments Register, document reference F1.5.3), and is secured by inclusion of condition 18(1)(e)(i) of the draft Development Consent Order (DCO) Schedules 14 (document reference C1). Below sets out the condition wording for Project A (Project B's Schedule 15 condition 19(1)(e)(i) mirrors those of Project A and, therefore, not repeated):

18.—(1) The licensed activities or any phase of those activities must not commence until the following (insofar as relevant to that activity or phase of activity) have been submitted to and approved in writing by the MMO, in consultation with Trinity House, the MCA and UKHO as appropriate—

(e) A construction method statement in accordance with the construction methods assessed in the environmental statement, including details of—

(i) cable specification, installation and monitoring (in accordance with the outline offshore cable specification and installation plan), including—

(aa) the technical specification of offshore cables below MLW;

(bb) a detailed cable laying plan for the authorised scheme, incorporating a cable burial risk assessment (in accordance with the outline cable burial risk assessment) encompassing the identification of any cable protection that exceeds 5 percent of navigable depth referenced to Chart Datum and, in the event that any area of cable protection exceeding 5 percent 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; and

(cc) proposals for monitoring offshore cables including details of cable protection until the authorised scheme is decommissioned which includes a risk based approach to the management of unburied or shallow buried cables;

1.3.1.3 The Transmission Assets may adopt a staged approach to the approval of DCO requirements. This will enable requirements to be approved in part or in whole, prior to the commencement of the relevant stage of works in

accordance with whether staged approach is to be taken to the delivery of the each of the offshore wind farms.

1.3.1.4 For offshore site preparation and construction activities seaward of Mean High Water Springs, this approach will be governed by the inclusion of condition 12 of Schedules 14 and 15 of the draft DCO, which requires a written scheme detailing the stages of construction for Project A or Project B to be submitted for approval by the Marine Management Organisation prior to the commencement of the licensed activities.

1.4 Fylde Marine Conservation Zone

1.4.1.1 The Fylde MCZ was originally designated in 2013 to protect 156 km^2 of subtidal sands, with this updated in 2016 to also include 104 km^2 of subtidal muds. The MCZ covers an area of approximately 260 km^2 within the Liverpool Bay area and is located between 3 and 20 km off the west coast of the Fylde and Ribble Estuary, with a depth range of approximately 0.35-22 m.

1.4.1.2 Both broadscale habitat features (subtidal sand and subtidal mud) are considered to be good representatives of these habitats in the east of the Liverpool Bay area, with the general management approach recommended to maintain both habitat types in favourable condition. There are pockets of mud present in small areas across the rest of the MCZ (Environment Agency, 2015).

1.5 Summary of Consultation

1.5.1 Application Engagement

1.5.1.1 Consultation on matters relating to the offshore export cable installation and cable protection in the Outline CSIP has been undertaken as part of the Evidence Plan Process (EPP) developed for the Transmission Assets. The EPP sought to ensure engagement with the relevant aspects of the EIA process throughout the pre-application phase. The development and monitoring of the Evidence Plan and its subsequent progress was undertaken by the EPP Steering Group. The Steering Group comprises the Planning Inspectorate, the Applicants, the Marine Management Organisation (MMO), Natural England, Historic England, the Environment Agency and the Local Planning Authorities as the key regulatory bodies.

1.5.1.2 As part of the EPP, EWGs were set up to discuss and agree topic specific issues with the relevant stakeholders. The offshore export cables and the Fylde MCZ were discussed via the Offshore Physical Processes, Benthic Ecology, Fish and Shellfish Expert Working Group (EWG), which is attended by the Marine Management Organisation (MMO), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Natural England, Joint Nature Conservation Committee (JNCC), The Wildlife Trusts, Environment Agency, and the Inshore Fisheries and Conservation Authority (IFCA).

1.5.1.3 At the time of writing, EWG meetings have been held in March 2023, July 2023, February 2024 and August 2024. These meetings have addressed the approach to scoping, data collection and evidence requirements in general,

the results of the project characterisation surveys carried out in 2022, Environmental Impact Assessment (EIA) and Stage 1 MCZ Assessment methodologies and the draft assessment outcomes.

1.5.1.4 A Preliminary Environmental Information Report (PEIR) was consulted on alongside a draft MCZ Assessment Report in October 2023, as part of the Transmission Assets section 42 consultation. Comments were received from stakeholders in November 2023 and have been considered in the process of finalising the assessments and plans that have been submitted as part of the DCO application.

1.5.1.5 A summary of the S42 responses and EWG discussions relevant to the CSIP is presented in **Table 1,** together with how these have been considered in the production of mitigation and the CSIP. It should however be noted that formal responses are provided for all consultation responses received and can be accessed in the Consultation Report (document reference E1).

1.6 Future Engagement

1.6.1.1 The Applicants acknowledge that it will be important to maintain ongoing dialogue with the relevant Statutory Nature Conservation Bodies (SNCBs) as their respective Final CSIPs are developed, particularly where the offshore export cables cross the Fylde MCZ. Each Applicant will nominate a main point of contact for the SNCBs throughout the pre-construction, construction and post-construction phases of the project. Wherever appropriate, representatives from the engineering team will be present during consultation meetings with the MMO and Natural England.

Table 1: Summary of Key Consultation Responses relevant to the Development of the Outline CSIP

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this Outline CSIP
November 2023	Environment Agency (National Infrastructure Team) - Section 42 Response	The Environment Agency highlighted that the Cable Specification and Installation Plan(s) (CSIP) should include measures to limit the extent of cable protection and sandwave clearance within the Fylde MCZ and should be informed through the undertaking of survey works pre-construction.	In acknowledgment of the mitigation hierarchy and to incorporate feedback from stakeholders, a number of PDE refinements were made and incorporated into the Outline CSIP. These refinements have significantly reduced the requirements for cable protection and sandwave clearance within the Fylde MCZ. The cable protection parameters in the Fylde MCZ have reduced from 20% to 3% contingency for the Morgan export cables (excluding cable crossings) and from 15% to 3% contingency for the Morecambe export cables (CoT47, **Table 5**). It should be noted that the aim is to bury all cables in the first instance and only where this is unsuccessful or where a cable crossing is required would cable protection be used. (CoT54, **Table 5**) Cable protection within the Fylde MCZ will very much be a contingency measure (See **Section 7.3**). Sandwave clearance in the Fylde MCZ has reduced from 60% to 5% for the Morgan export cables and from 30% to 5% for the Morecambe export cables (CoT47, **Table 5**). It should also be noted that sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection. Information on pre-construction surveys which will further inform the extent and location of cable protection and sandwave clearance are discuss in **section 4.2**
November 2023	Natural England – Section 42 Comments	Natural England advised that where possible, the avoid, reduce, mitigate hierarchy should be employed to reduce environmental impacts. Natural England advised that if the level of interaction with Fylde MCZ cannot be avoided, the next stage of the mitigation hierarchy would be for the project to minimise the amount of cable protection within the designated site. The final parameters for cable protection should be outlined. Further exploration of cable protection requirements is needed	In acknowledgment of the mitigation hierarchy and to incorporate feedback from Natural England, a number of PDE refinements were made and incorporated into the Outline CSIP. These refinements have significantly reduced the requirements for cable protection (and associated long term habitat loss) within the Fylde MCZ. The cable protection parameters in the Fylde MCZ have reduced from 20% to 3% contingency for the Morgan export cables (excluding cable crossings) and from 15% to 3% contingency for the Morecambe export cables (CoT47, **Table 5**). It should be noted that the aim is to bury all cables in the first instance and only where this is unsuccessful or where a cable crossing is required would cable protection be used. (CoT54, **Table 5**) Cable protection within the Fylde MCZ will very much be a contingency measure (See **Section 7.3**).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this Outline CSIP
		within Fylde MCZ, as well as development of design and installation measures that will increase the likelihood of successful burial.	A number of PDE refinements for sandwave clearance were made and incorporated into the Outline CSIP. Sandwave clearance in the Fylde MCZ has reduced from 60% to 5% for the Morgan export cables and from 30% to 5% for the Morecambe export cables (CoT47, **Table 5**). It should also be noted that sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection.
November 2023	Natural England – Section 42 Comments	Natural England advised that the submitted ES should include a commitment to remove cable protection from the MCZ as part of the decommissioning plan.	The Applicants have made a commitment for all cable protection within the Fylde MCZ to be designed to be removable as required at decommissioning (CoT108 and CoT109, **Table 5**). Further details on cable protection are provided in **section 7.**
November 2023	Natural England – Section 42 Comments	Natural England advised that the developer's Cable Burial Risk Assessment (CBRA) is provided and secured appropriately with the Application	An outline CBRA has been developed (document reference J14), which has informed the Outline CSIP and is summarised in **section 5.**
November 2023	Natural England – Section 42 Comments	While Natural England supported the use of sandwave levelling as a form of mitigation measure to reduce the likelihood of using cable protection they noted that the area impacted by sandwave clearance within Fylde MCZ is exceptionally large areas when compared to other offshore windfarm projects. Natural England recommend the use of best practice methods to reduce the area impacted by disposal of sandwave clearance materials. Natural England advised that site-specific geophysical survey data should be used to refine the maximum design scenario	A number of PDE refinements for sandwave clearance were made and incorporated into the Outline CSIP. Sandwave clearance in the Fylde MCZ has reduced from 60% to 5% for the Morgan export cables and from 30% to 5% for the Morecambe export cables (CoT47, **Table 5**). It should also be noted that sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection. Material arising from sandwave clearance within the Fylde MCZ will be disposed of in the immediate vicinity within the Transmission Assets Order Limits. Further details are provided CoT116, **Table 5** and **section 10.5**.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this Outline CSIP
		(MDS). Natural England advised full consideration should also be given to relocation of any disposal material and impacts that may have.	
November 2023	Natural England – Section 42 Comments	Natural England highlighted that the extent and location of sediment disturbance (area, volume) should be provided for affected MPAs/features (e.g. Fylde MCZ). Natural England also queried how the sediment would be retained within designated sites to ensure that the subtidal mud and sand will fully recover i.e., have the same structure and function.	A number of project design refinements have been made and incorporated into the Outline CSIP. These refinements have significantly reduced the requirements for sandwave clearance (and associated temporary habitat disturbance) within the Fylde MCZ. The MDS for sandwave clearance in the Fylde MCZ has reduced from 60% to 5% for the Morgan export cables and from 30% to 5% for the Morecambe export cables (as outlined in commitment CoT47, **Table 5**). It should also be noted that sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection. Material arising from sandwave clearance within the Fylde MCZ will be disposed of in the immediate vicinity within the Transmission Assets Order Limits. Further details are provided CoT116, **Table 5** and **section 10.5**.
November 2023	Natural England – Section 42 Comments	Natural England advised that the project should have adequate scope to include long term impact/recovery monitoring especially for receptors of medium and high sensitivity. Natural England also stated that an appropriate Benthic Monitoring Plan should be established at key impact locations that spatially and temporally represent all impacted biotopes, habitats, and species as well as focussing on the designated habitats of the Fylde MCZ. Natural England also advised than an appropriate survey design and power analysis should be conducted to ensure that adequate data is collected for long	The Offshore IPMP (document reference J20) details the Transmission Asset monitoring commitments made by the Applicants as per CoT115 (**Table 5**) which includes for representative monitoring for recovery of features within the Fylde MCZ, with further details on asset integrity surveys and monitoring of the seabed and benthic communities provided in **section 8**.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this Outline CSIP
		term comparisons of the effect of change compared to baseline data.	
November 2023	The Northwest Wildlife Trust – Section 42 Comments	The Northwest Wildlife Trusts noted that every effort should be taken to limit and reduce cable protection in soft sediments, particularly designated areas and MCZs.	A number of project design refinements have been made and incorporated into the Outline CSIP. These refinements have significantly reduced the requirements for cable protection (and associated long term habitat loss) within the Fylde MCZ. The cable protection parameters in the Fylde MCZ have reduced from 20% to 3% contingency for the Morgan export cables (excluding cable crossings) and from 15% to 3% contingency for the Morecambe export cables (CoT47, **Table 5**). It should be noted that the aim is to bury all cables in the first instance and only where this is unsuccessful or where a cable crossing is required would cable protection be used. (CoT54, **Table 5**) Cable protection within the Fylde MCZ will very much be a contingency measure (See **Section 7.3**).
February 2024	EWG03	Natural England suggested that an Outline CBRA, which will be required to be submitted with the application, should look at the tools likely to be used for the installation, and the likelihood of success for optimal cable burial depth based on geotechnical data.	An outline CBRA has been developed (document reference J14), which has informed the Outline CSIP and is summarised in **section 5.** Further details on cable specification and installation are provided throughout this Outline CSIP.
August 2024	EWG04	Natural England requested further consideration and commitment to not use walking jack-up vessels or barges within the Fylde MCZ.	To incorporate feedback from Natural England, the Applicants have made a commitment (CoT117, **Table 5**) to not use walking jack-ups within the Fylde MCZ.

2 Maximum Design Parameters for the offshore export cables

2.1 Offshore Export Cables Parameters

2.1.1.1 Offshore export cables are used for the transfer of power from the Generation Assets to the landfall site. Further details on the offshore export cable corridors are provided in Volume 1, Chapter 3: Project Description of the ES (document reference F1.3) with order limits and work plans for each Applicant provided as part of the DCO application (document references: B5 and B7).

2.1.1.2 The Applicants require flexibility in type, location, depth of burial and protection measures for the offshore export cables to ensure that anticipated physical and technical constraints and changes in available technology can be accommodated.

2.1.1.3 Up to six offshore export cables will be required (up to four for the Morgan Offshore Wind Project and up to two for the Morecambe Offshore Windfarm).

2.1.1.4 The Project Design Envelope for the offshore export cables is described in **Table 2** with specific parameters for within the Fylde MCZ provided in **Table 3**.

2.2 Landfall and Offshore Export Cable Pull In Parameters

2.2.1.1 The landfall location is constrained by the beach morphology and the allowable TJB location within the restricted access compound of Blackpool airport. A direct pipe trenchless technique has been selected to provide a cable duct between the airport and the beach through which the offshore export cables would traverse and be jointed to the onshore export cables via the TJBs.

2.2.1.2 Cable pull activities will be restricted to completing one cable pull in (a maximum of five weeks) per wintering season (i.e. during the months of November – February, inclusive), unless otherwise agreed with the MMO, in consultation with Natural England (CoT110). Additionally, the total number of vessels for both the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited actively working within the Liverpool Bay/Bae Lerpwl SPA during construction or during operation and maintenance phase will be limited to a maximum of five vessels at any one time in the wintering period, i.e. between November and February (inclusive). (CoT111).

2.2.1.3 Water depths in the nearshore zone gradually deepen along the corridor, whereby the level of 11m below LAT is not reached until approximately KP 10, i.e. 8 km offshore. This indicates that a conventional cable lay vessel (CLV) that is not able to ground (i.e. sit on the seabed) has restricted access to approach the beach; meaning that a long length of offshore export cable pull in will be required to reach the TJBs.

2.2.1.4 Due to the distance that the offshore export cables will need to be pulled from the cable lay vessels to the TJBs (up to 7,000 m, dependent upon the draft of

the selected cable lay vessels/barge and its closest approach position to the beach), up to two jack-up vessels per cable may be required to support the offshore export cable pull-in activities. As such, the worst case scenario has allowed for one jack-up vessel per cable to be within the Fylde MCZ at its eastern edges, noting that walking jack-ups would not be used in the Fylde MCZ during construction (CoT117). The other jack-up vessel would be located outside of the Fylde MCZ between its eastern boundary and the intertidal area. Parameters for jack-up vessels are provided in **Table 4**. The Applicants are currently exploring alternative and less impactful methodologies for use within the Fylde MCZ. Such methodologies may include spud pole vessels or shallow draft cable barges.

2.2.1.5 The detailed installation methods, including vessel requirements and locations, will be refined post-consent in the Final CSIPs taking into account further pre-construction survey results (see section 8.2).

2.2.1.6 Further details on the offshore export cable pull in are provided in Volume 1, Chapter 3: Project Description of the ES (document reference F1.3).

Table 2: Maximum Design Parameters for Offshore Export Cables

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter (Morgan and Morecambe)
Number of offshore export cables	4	2	6
Voltage (kV)	220 /275	220/275	275
HVAC/HVDC	HVAC 350	HVAC	HVAC
Maximum external cable diameter (mm)	350	350	350
Maximum length per cable (km)	100	42	-
Maximum total length of offshore export cables (km)	400	84	484
Maximum target burial depth (m)	3	3	3
Minimum target burial depth (m)	0.5	0.5	0.5
Maximum trench width (m)	3	3	3
Maximum width of seabed disturbance (m)	20	20	20
Maximum footprint of seabed disturbance – total (km2)	8	1.7	9.7

Table 3: Maximum Design Parameters within Fylde MCZ

Fylde MCZ Parameters	Maximum Design Scenario		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter (Morgan and Morecambe)
Number of offshore export cables	4	2	6
Maximum length per cable (km) within Fylde MCZ	16	12	-
Maximum total length of offshore export cables (km) within Fylde MCZ	64	24	88
Fylde MCZ Site Preparation			
Maximum boulder clearance width along offshore export cables (m) (occurs within sandwave clearance area)	20	20	20
Maximum sandwave clearance width along export cables (m)	60	48	-
Maximum proportion of offshore export cable route within Fylde MCZ that may require sandwave clearance (%)	5	5	5
Maximum sandwave clearance volume m3	172,800	97,200	270,000
Fylde MCZ Cable Protection (due to ground conditions)			
Cable protection type (ground conditions)	Rock dump, rock armour, mattresses, articulated pipe		
Maximum proportion of offshore export cable route within Fylde MCZ that may require cable protection (%)	3	3	3
Maximum length of cables requiring cable protection (m) within Fylde MCZ	1,920	720	2,640
Maximum cable protection height (m) within Fylde MCZ	2	2	-
Maximum cable protection width (m), per cable within Fylde MCZ	10	10	-
Maximum total cable protection footprint for export cable route excluding cable crossings (m2)	19,200	7,200	26,400
Maximum total cable protection volume for export cable route excluding cable crossings(m3)	19,200	7,200	26,400

Fylde MCZ Parameters	Maximum Design Scenario		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter (Morgan and Morecambe)
Fylde MCZ Cable Crossings			
Cable protection type (cable crossings)	Rock dump, rock armour, mattresses, articulated pipe		
Maximum number of Cable Crossings within Fylde MCZ	4	0	4
Maximum Cable Crossing Height (m)	2	-	2
Maximum cable Crossing Width (m)	20	-	20
Maximum Cable Crossing Length (m)	50	-	50
Maximum total cable protection footprint for cable crossing (m2)	4,000	0	4,000
Maximum total cable protection volume for cable crossings(m3)	4,000	0	4,000
Fylde MCZ Cable Protection Total for Ground Conditions and Cable Crossings			
Maximum total cable protection within Fylde MCZ (m2)	23,200	7,200	30,400
Maximum total cable protection volume within Fylde MCZ (m3)	23,200	7,200	30,400

Table 4: Design envelope – offshore export cable pull-in

Parameter	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Maximum number of offshore export cables	4	2	6
Vessel types under consideration for offshore export cable pull-in (see **section 2.2** for further details on vessel requirements)	Cable lay vessels, shallow draft barge, jack-up vessel, spud pole barge, anchored barge		
Maximum seabed footprint per jack-up vessel (assume 4 legs, each with 4m^2 spudcan) m^2	16	16	16
Total maximum seabed footprint for jack-up vessels (up to two jack-ups per cable, one of which could be within Fylde MCZ)	64	32	96
Maximum area of Intermediate Pulling Platform (m^2) – per platform (ballasted and/or vibro-piled) m^2	120	120	120
Total maximum area of Intermediate Pulling Platforms (up to 2 platforms per cable) m^2	960	480	1,440
Maximum number of roller boxes (per pull), each single vibro-pile spaced at approximately 3 m	600	600	600
Total maximum number of roller boxes	2,400	1,200	3,600
Maximum cofferdam area dimensions per pull (m2) (m)	75 (15 x 5)	75 (15 x 5)	75 (15 x 5)
Maximum width of corridor working areas (m) per cable pull	50	50	50

3 Mitigation

3.1 Measures adopted as part of the Transmission Assets (commitments)

3.1.1.1 The Applicants are committed to mitigating potential effects on the Fylde MCZ and will address this need through the adoption of the mitigation hierarchy i.e. avoid, minimise, and mitigate.

3.1.1.2 Based upon the initial survey work and CBRA (document reference J14), the Applicants have adopted mitigation measures to reduce the impact of the cable installation methodologies on the Fylde MCZ as detailed in **Table 5.**

3.1.1.3 The final agreed mitigation measures for the Fylde MCZ will be presented in the final CSIPs, refined and updated on the basis on the results of pre-construction surveys and the principles outlined in the sections above and the commitments (known as CoTs) summarised in **Table 5**.

Table 5: Measures (commitments) adopted as part of the Transmission Assets relevant to the CSIP

Commitment number	Measure adopted	How the measure will be secured
CoT45	The Outline Offshore Cable Specification and Installation Plan (CSIP) for the Fylde MCZ includes: details of cable burial depths, cable protection, and cable monitoring. The Outline CSIP also includes an Outline Cable Burial Risk Assessment (CBRA). Detailed CSIP(s) and CBRA(s) will be prepared by the Applicants covering the full extent of their respective offshore export cable corridors. Detailed CSIPs will be developed in accordance with the Outline CSIP and will ensure safe navigation is not compromised including consideration of under keel clearance. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the offshore export cable corridor route without prior written approval from the MCA.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)

Commitment number	Measure adopted	How the measure will be secured
CoT47	The Outline Offshore Cable Specification and Installation Plan (CSIP) includes measures to limit the extent of cable protection to 3% of the offshore export cable route within the Fylde (Marine Conservation Zone) MCZ (excluding cable crossings). Within the Fylde MCZ, external cable protection will only be used where deemed to be essential, e.g. for cable crossings or in the instance that adequate burial / reburial is not possible for any section of the route through the Fylde MCZ. The Outline CSIP also includes measures to limit sandwave clearance to up to 5% of the offshore export cable corridor route within the Fylde MCZ. Material arising from sandwave clearance in the Fylde MCZ will be deposited within the Fylde MCZ. The requirements for cable protection and sandwave clearance will be informed through the undertaking of survey works pre-construction. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT49	Construction Method Statement(s) (CMSs) including Offshore Cable Specification and Installation Plan(s), will be produced and implemented prior to construction. These will contain: - details of cable installation and methodology; and - details of foundation installation methodology covering scour protection and the deposition of material arising from drilling, dredging, and/or sandwave clearance.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT51	Crossing and proximity agreements, as set out in the Offshore Crossing Schedule submitted as part of the application for development consent, will be sought with known existing pipeline and cables operators.	DCO Schedule 18
CoT54	An Outline Offshore Cable Specification and Installation Plan (CSIP) includes for cable burial to be the preferred option for cable protection, where practicable. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)

Commitment number	Measure adopted	How the measure will be secured
CoT64	Detailed Marine Mammal Mitigation Protocols (MMMPs) will be developed and implemented in accordance with the Outline MMMP, to reduce the risk of injury to marine mammals. The Detailed MMMP(s) will include measures to apply in advance of UXO clearance. The Detailed MMMP(s) will include for the use of low order techniques, where possible, as the primary mitigation measure alongside other measures. The detailed MMMP(s) will be approved by Marine Management Organisation, in consultation with Natural England.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 20(1)(b) (UXO clearance) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition20(1)(b) (UXO clearance)
CoT90	HDD (or other trenchless techniques including micro tunnelling and direct pipe), will be used to cross the River Ribble where the 400 kV grid connection cable corridor is proposed.	Req 5(3) and Req 8.
CoT108	The Outline Offshore Cable Specification and Installation Plan (CSIP) submitted as part of the application for development consent, includes for all external cable protection used within the Fylde MCZ to be designed to be removable on decommissioning. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation)
CoT109	The requirement for removal of cable protection within the Fylde MCZ will be agreed with stakeholders and regulators at the time of decommissioning. Removal of cable protection will be in accordance with the Offshore Decommissioning Programme(s).	DCO Schedule 2A Requirement 21 (Offshore decommissioning) and & DCO Schedule 2B Requirement 21 (Offshore decommissioning)
CoT110	Construction activities associated with the offshore cable pull in for the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited will be undertaken in accordance with the Outline Offshore Cable Specification and Installation Plan (CSIP). This will restrict the Applicants to completing one cable pull in (a maximum of five weeks) per wintering season (i.e. during the months of November – February, inclusive), unless otherwise agreed with the MMO, in consultation with Natural England. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation)

Commitment number	Measure adopted	How the measure will be secured
CoT111	The total number of vessels for both the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited actively working within the Liverpool Bay/Bae Lerpwl SPA during construction or during operation and maintenance phase will be limited to a maximum of five vessels at any one time in the wintering period, i.e. between November and February (inclusive). This will be included within the Offshore Environmental Management Plan(s)'s measures to minimise disturbance to marine mammals and rafting birds from vessels.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 – 18(1)(f) (Pre-construction plans and documentation)
CoT114	All permanent infrastructure located between Mean Low Water Springs (MLWS) and Mean High Water Springs (MHWS) will be buried to a target depth of 3 metres, subject to further pre-construction surveys to be reported within Detailed Cable Burial Risk Assessments (CBRAs). An Outline CBRA has been prepared and submitted with the application for development consent.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition18(1)(e)(i)(bb) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e)(i)(bb) (Pre-construction plans and documentation)
CoT115	An Offshore In-Principal Monitoring Plan (OIPMP) has been prepared and submitted as part of the application for development consent. The OIPMP includes for monitoring of the recovery of sediments and benthic communities within representative areas of the Fylde MCZ potentially impacted by sandwave clearance, cable installation and cable protection, at appropriate temporal intervals as part of the operational asset integrity surveys. Detailed Offshore Monitoring Plans will be produced prior to operation and maintenance phases in accordance with the OIPMP and will be approved in consultation with statutory advisors and regulators.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(d) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(d) (Pre-construction plans and documentation)

Commitment number	Measure adopted	How the measure will be secured
CoT116	Any material arising from sandwave clearance within the Transmission Assets Order Limits will be deposited in close proximity to the works and within the licensed disposal sites within the Order Limits, as detailed in the Dredging and Disposal - Site Characterisation Plan prepared and submitted as part of the application for development consent	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and Part 2 – Condition16(4) (Chemicals, drilling and debris); and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and Part 2 – Condition16(4) (Chemicals, drilling and debris)
CoT117	The Outline Offshore Cable Specification and Installation Plan (CSIP) includes details for any jack-up vessels used within the Fylde MCZ to be stationary. No walking jack-ups would be used within the Fylde MCZ. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation)

3.1.1.4 Further details on the commitments made by the Applicants are provided below along with how these are anticipated to significantly reduce potential impacts on the Fylde MCZ and ensure that the Fylde MCZ is maintained in favourable condition.

Mitigation to Minimise Length and Width of Offshore Export Cable Corridor within the Fylde MCZ

3.1.1.5 The offshore export cable corridor routing exercise sought to identify the shortest route from the Generation Assets to the selected landfall location at Lytham St Annes, whilst avoiding constraints with consideration for other sensitivities, engineering constraints, and third-party / existing seabed users. Due to the numerous designations towards the coast and within the coastal zone (Special Areas of Conservation, Special Protection Areas, Ramsar sites, Sites of Special Scientific Interest, MCZs, National Nature Reserves, and Local Nature Reserves), the design sought to avoid designations in the first instance; however, avoiding the Fylde MCZ and routing around it was not feasible due to the increased impact on other designations and requirement for numerous cable crossings in shallow nearshore waters when routing around the MCZ (i.e. there would be numerous cable crossing required

between the eastern edge of the Fylde MCZ and the coast in areas with shallow water depth). The route identified is the most direct route and crosses MCZ at its the narrowest points minimising the corridor length through the MCZ. The Morgan OWL and Morecambe OWL offshore export cable corridors become co-located adjacent running cable corridors routes prior to crossing the Fylde MCZ in order to reduce the width of the corridor within Fylde MCZ as shown on **Figure 1** and in the Offshore Work Plans (documents reference B9).

3.1.1.6 Further details on site selection are provided within Volume 1, Chapter 4: Site Selection and Consideration of Alternatives of the Environmental Statement (ES).

Cable Burial Mitigation

3.1.1.7 Cable burial is the preferred option for cable protection (CoT54, **Table 5**) as it provides the best protection for cables. Cables will be buried where the substrate allows to target burial depths in accordance with the final CBRA with a minimum target burial depth of 0.5 m or greater, where possible, being acceptable within the Fylde MCZ to minimise need for external cable protection.

3.1.1.8 Seabed preparation (e.g. sandwave/ripple clearance) enables the passage of cable burial machinery to minimise cable exposure due to mobile seabed during the lifetime of the Transmission Assets. Initial analysis indicates that the Fylde MCZ is largely featureless with nearshore ridge and runnel features along the eastern edge of the MCZ and sporadic ripples present becoming more prevalent along the western boundary of the Fylde MCZ (see **section 5.1**). As such, some nominal seabed preparation within the Fylde MCZ is required of up to 5% of the offshore export cable route within the Fylde MCZ (CoT47, **Table 5**) to enable cable installation and burial.

Mitigation through Micro-siting

3.1.1.9 As part of the detailed design process, micro-siting of the offshore export cables within the corridor will be considered where successful burial could pose a challenge or where a higher risk of remedial works such as external cable protection may be required. The pre-construction surveys identified in **section 4.2** will be used to inform the final routing of the cables and any micro-siting requirements.

Mitigation to Minimise Cable Protection within the Fylde MCZ

3.1.1.10 Cable protection is considered as a last resort to ensure the integrity of the cables and would only be used where necessary.

3.1.1.11 Whilst the Applicants, in the first instance, sought to avoid cable crossings in the Fylde MCZ, this was not possible due to existing infrastructure alignment within and along the western boundary of the Fylde MCZ. The offshore export cables need to cross Vodafone's Lanis 1 Telecom Cable and Aquacomms Havhingsten Sec 1.5 Telecom Cable to enable landfall at Lytham St Anne's. The Hibernia Atlantic cable to the west limits the ability to move these cable crossings completely out

of the MCZ due to existing proximity and overlap of these cables further to the west; however, the Applicants have sought to avoid and minimise the crossings within the MCZ. The cables would not cross the Havhingsten Telecom Cable within the MCZ, and up to four of the six cables would cross the Lanis1 Telecom Cable within the Fylde MCZ as shown in **Figure 2**.

3.1.1.12 Ground conditions within the Fylde MCZ are largely sand and clay with some areas of slightly gravelly seabed (see **section 5.3**). Whilst slightly gravelly clay or slightly gravelly sand sediments are currently not anticipated to hinder cable burial via trenching techniques under consideration (**section 6.2**), more dense areas of gravel, if present, could present a risk of reduced burial, leading to the need for cable protection. Based on the initial survey results from four vibrocores / cone penetration tests (CPTS), the use of additional cable protection for ground conditions within the Fylde MCZ is not envisaged; however, due to the limited survey data used to extrapolate seabed conditions across the MCZ (see **section 5**), isolated disparate ground conditions could still be present. As such, the Project Design Envelope allows for 3% cable protection for ground conditions within the Fylde MCZ as a contingency only (CoT47, **Table 5**) should later surveys indicate discrete areas of harder seabed where cable burial to the target depth cannot be reached.

3.1.1.13 Any cable protection required within the Fylde MCZ, whether for cable crossings or for ground conditions (see **section 7**), would be designed to be removable if required at the time of decommissioning (CoT108 and CoT109, **Table 5**).

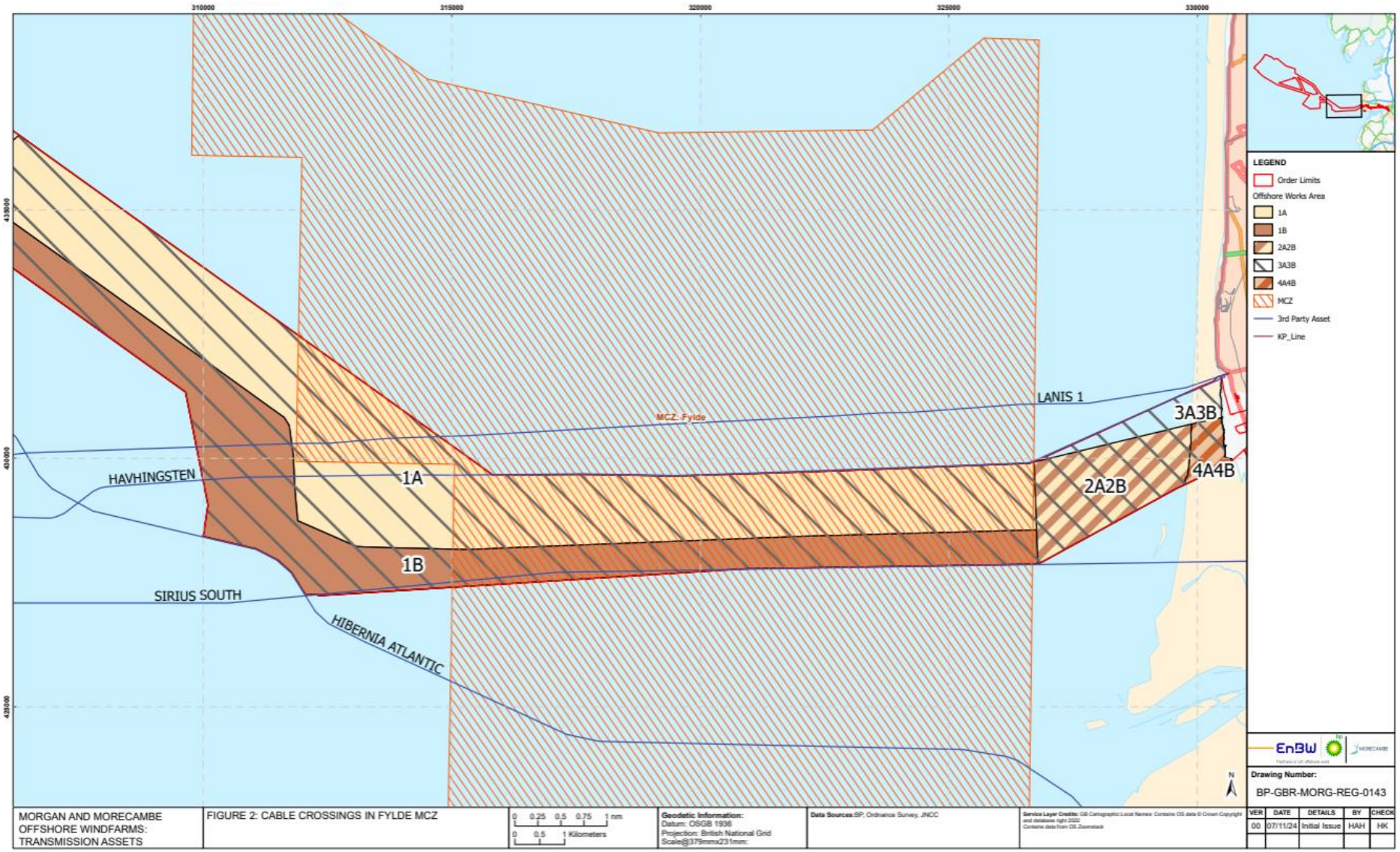

Figure 2: Cable crossings in Fylde MCZ

4 Seabed and Sediment Conditions

4.1 Overview

4.1.1.1 A description of the cable installation process, including seabed preparation and installation methods, is provided in Chapter 3 Project Description of the ES (document reference F1.3). The following will be undertaken to increase the chance of successful burial and installation of the offshore export cables:

- Pre-construction surveys to confirm that the seabed is clear of any obstructions prior to installation activities commencing;
- UXO clearance informed by the results of pre-construction surveys (**section 4.2**). Micro-siting will be used to avoid UXO where possible and detonation by low-order techniques will be utilised wherever possible (CoT64, **Table 5**);
- Boulder clearance (**section 6.3**) will be undertaken where it is considered necessary to optimise installation, for example to enable micro-siting of the cables to avoid areas where burial is expected to be more challenging;
- A pre-lay grapnel run will be used to clear obstacles such as discarded fishing gear from the cable corridor; and
- The most appropriate cable burial tool will be selected for the soil conditions (see **section 6.2**).

4.1.1.2 **Table 6** outlines a scope of work that the Applicants will carry out in the development of the detailed plans for installation and burial of cables in the MCZ. This forms a comprehensive evidence base providing confidence that execution of the installation and burial strategy will meet the relevant burial requirements.

Table 6: Proposed Scope of Works to Support Development of Detailed Plans for Cable Installation to Maximise the Chance of Burial Success within the Fylde MCZ

Task	Details
Lessons learned from other cable installation with the Fylde MCZ where data is available (e.g. nearby telecom cables like Vodafone's Lanis 1, Aquacomms Havhingsten, Virgin Media's Sirius South)	Identify key areas of successful / unsuccessful burial and where remedial protection was required; Identify primary causes of unsuccessful burial. Make recommendations to maximise chance of successful burial of the Transmission Assets.
Pre-construction survey campaigns	Further detailed geophysical and geotechnical surveys to: • Establish seabed sediment conditions (0-3m); • Confirm seabed mobility and sediment transport processes; • Identify sea bed anomalies and geotechnical risk such as from debris, magnetic targets (UXO), fishing gear, etc.
Cable Burial Risk Assessment	Define burial depths and risk (expanding upon information provided in the Outline CBRA)

Task	Details
Cable Route Study	Analysis of survey data (geophysical, geotechnical) and environmental constraints to determine likelihood of burial success to recommended depths of the CBRA
Landing Engineering Study	Determine appropriate alignment of offshore export cables to reach TJBs at landfall
Crossings Design and Engineering Study	To facilitate dialogue with third party asset owners

4.2 Pre-Construction Surveys

4.2.1.1 This section of the final CSIPs will provide details of the relevant pre-construction surveys that have been undertaken or will be required to inform cable installation and cable protection over the entirety of the offshore export cable routes. To inform the Outline CSIP, this section focuses on surveys undertaken to date within the Fylde MCZ.

4.2.1.2 In 2022, an initial geophysical and geotechnical survey (vibrocores) was undertaken to inform initial studies for cable route engineering and cable landing methodology assessments. Interpretation of this data and the evaluation of cable routes is still ongoing though gaps in the dataset have been identified and further pre-construction surveys are required.

4.2.1.3 Additional geophysical survey (currently planned for 2025 and 2026) is required to inform the development of route engineering and the methods to be employed on cable installation and burial. This survey will be used in conjunction with the field design to finalise individual cable corridors for the offshore export cables to be installed together with the cable burial risk assessment to finalise the cable protection methodology.

4.2.1.4 Post DCO consent, ahead of construction activities, a further survey will be undertaken on the cable routes, to include UXO identification survey and if required UXO classification and disposal. However, the preferred strategy will be to microsite the cables to avoid obstacles and minimise any seabed intervention.

4.2.1.5 Details of the finalised offshore export cable corridor and any necessary micro-siting within the Fylde MCZ will be provided in the final CSIPs, informed by the on-going survey analysis and pre-construction surveys described above in conjunction with more detailed design of the offshore export cable routing.

4.3 Seabed Sediment Type

4.3.1.1 The bathymetry of the offshore export cable in the nearshore zone gradually deepen along the offshore export cable corridor until -11.4 m at lowest astronomical tide (LAT) is reached at approximately KP10.5 (**Figure 1).** Water depths continue to deepen from -11.6 to -24.1 m LAT between KP11.7 and KP40.0 with bathymetric highs forming locally. Slope angels are less than 5 degrees in the nearshore area (KP0.0) through the Fylde MCZ (approximately KP5 – KP21).

4.3.1.2 Seabed sediments have been mapped using a combination of geophysical (side-scan sonar) (Gardline 2023) data ground truthed with environmental grab and camera data as well as geotechnical data from vibrocores (Gardline 2023).

4.3.1.3 The seabed between KP1.5 and KP25.0 shows the most variability in seabed sediments and includes areas of sand (medium to very fine) and clayey sand intersected by slightly gravelly clayey sand and sandy clay (Cable Burial Risk Assessment (CBRA) (document reference J14):

- Nearshore area to KP4.0: Principal sediment type is Sand.
- KP4.0 (eastern boundary of Fylde MCZ at approximately KP5 seaward to KP21) – KP7.0: Principal sediment type is Clayey Sand with Slightly Gravelly Clayey Sand and Sand.
- KP7.0 – KP10.6: Principal sediment type is Clayey Sand with Slightly Gravelly Clayey Sand though pitted features could indicate cemented/flocculated muds.
- KP10.6 – KP12.0: Principal sediment type is Sand and Clayey Sand with Slightly Gravelly Clayey Sand and Sand.
- KP12.0 – KP17.0 (western boundary of Fylde MCZ at KP21): Principal sediment type is Sand and Clayey Sand.
- KP17.0 – KP24.6: Principal sediment type is Sandy Clay and Clayey Sand and Sand.

4.4 Sediment Transport Processes

4.4.1.1 A review of sedimentary processes of the offshore export cable route in the Fylde MCZ relative to the Ribble Estuary was undertaken. Sediment supply along the coast is controlled in part by tidal currents that drive net onshore sediment transport of seabed sediment from sand banks offshore, and by alongshore littoral sediment transport. Sediment transport vectors based on numerical modelling indicate there is a sediment divide at Squires Gate as shown in **Figure 3** at Squires Gate. To the north of this divide, sediment is transported north. To the south, sediment is transported south towards the Ribble Estuary. This would suggest net longshore sediment transport at the landfall is from north to south. However, Jacobs (Halcrow 2013) note the exact location of the divide varies depending on wave climate and there is potential for this divide to move to the north and south. This could change net longshore sediment transport pathways on an annual basis.

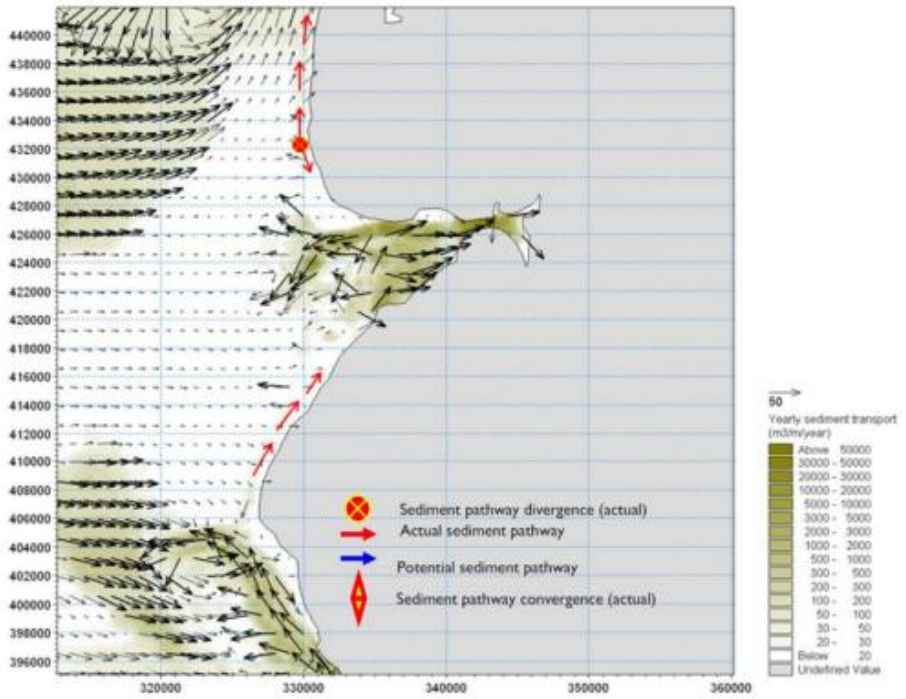

Figure 3: Sediment transport pathways in the vicinity of the Ribble Estuary (Halcrow 2013)

5 Cable Burial Risk Assessment

5.1 Geotechnical data

5.1.1.1 The outline CBRA (document reference J14) was developed by Royal HaskoningDHV based on six vibrocores undertaken as part of the Gardline 2022 survey. Of these, four were within the Fylde MCZ, one was in the nearshore between the MCZ and intertidal, and another just to the west of the Fylde MCZ, as shown on **Figure 4**. Due to the limited ground investigation of this survey, further survey work is planned prior to construction to further ground truth seabed conditions.

5.1.1.2 The initial Cable Burial Risk Assessment (CBRA) (document reference J14) is summarised below for the nearshore area and Fylde MCZ.

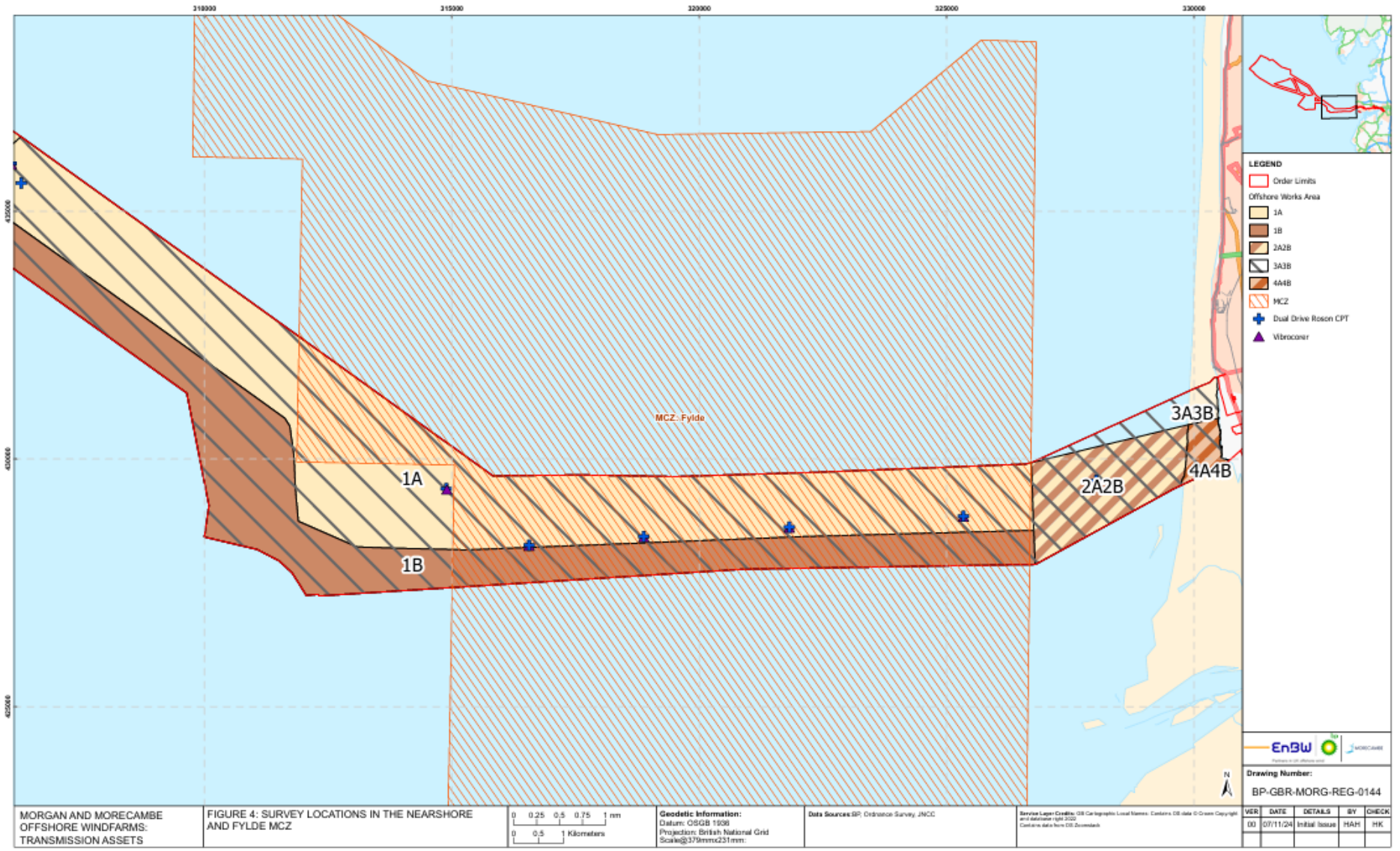

Figure 4: Survey locations in the nearshore and Fylde MCZ

5.1 Seabed Features (including Utilities and Marine Archaeology)

5.1.1.1 An interpretation of seabed features was undertaken by Gardline (2023), and the following key features were identified from the nearshore area through the Fylde MCZ (approximately KP5 – KP21 as shown on **Figure 1**, based on the initial route assessment CBRA in document reference J14):

- Nearshore area to KP4.0: Ridge and runnel features are present between KP1.6 - KP4.0 and are oriented broadly N-S with a wave height between 0.2 to 1.3 m and a wavelength of between 100 m and 350 m. The ridge and runnel features in the nearshore are not a constraint to cable installation but their influence on seabed variability needs to be understood to ensure a suitable depth of lowering that will ensure the cable remains buried over its lifetime. Principal sediment type is Sand.
- KP4.0 (eastern boundary of Fylde MCZ at approximately KP5 seaward to KP21) – KP7.0: Largely featureless with some ridge and runnel features present. Principal sediment type is Clayey Sand with Slightly Gravelly Clayey Sand and Sand.
- KP7.0 – KP10.6: Pitted seabed, individual features range from 40-130 m in diameter. Features have an irregular boundary and are slightly elongate in a E-W direction. Principal sediment type is Clayey Sand with Slightly Gravelly Clayey Sand though pitted features could indicate cemented/flocculated muds.
- KP10.6 – KP12.0: Ripples (up to 0.02 m in height) oriented N-S to NE-SW with a typical wavelength of <10 m and a wave height of <0.2 m. Principal sediment type is Sand and Clayey Sand with Slightly Gravelly Clayey Sand and Sand.
- KP12.0 – KP17.0 (western boundary of Fylde MCZ at KP21): Largely featureless with sporadic ripples orientated N-S with a typical wavelength of <10m and a wave height of <0.2m Principal sediment type is Sand and Clayey Sand.
- KP17.0 – KP24.6: Largely featureless with some ripples and mega-ripples present between KP18.5 – KP21.3, existing buried telecom cable infrastructure at KP18.6 Havhingsten and KP19.4 Lanis 1, wavelengths of 100-400 m and wave heights of <0.8m. Principal sediment type is Sandy Clay and Clayey Sand and Sand.
- Boulders are present in a low density across the majority of the study area but distributed sporadically along the cable routes.
- There are no Archaeological Exclusion Zones (AEZs) within the Fylde MCZ with one AEZ (MG23_0014) at nearshore area, approximate location KP3.0 and two further AEZs (MG23-0059 and MG23-0060) to the west of the Fylde MCZ, approximate location KP24).

5.2 Geotechnical Risk

5.2.1.1 For the nearshore and Fylde MCZ, the greatest risk to cable burial in the nearshore and Fylde MCZ is cable exposure and impact damage due to

hooking, snagging, etc. The most appropriate mitigation is to achieve suitable cable burial depths in accordance with the target burial depths identified along the cable routes which vary between 0.5 m and 3 m (see CBRA summary, **section 5.3**).

5.3 CBRA Recommendations for nearshore and Fylde MCZ

5.3.1.1 The CBRA (document reference J14) provides hazard depths and recommended target Depth of Lowering (DoL) to mitigate hazards as per **Table 7**, noting that the Fylde MCZ runs from approximately KP5.0 – KP21.0).

Table 7: Outline CBRA Summary for nearshore and Fylde MCZ

KP (km)	Hazards Depth (m)				Depth of Lowering (m)		
	Maximum mobile bedform height	Fishing	Anchor Threat*	Principal sediment type for anchoring	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Target Depth of Lowering (DoL)*
0.0 – 0.75	Trenchless technologies						
0.75 – 1.55	Intertidal						3.0m
1.55 – 3.55	0.53	0.2	0.25	Sand	0.73	0.25	1.5 m
3.55 – 6.35	0.53	0.2	0.25	Sand	0.73	0.25	1.5 m
6.35 – 9.85	0	0.2	0.25	Sand	0.2	0.25	1.5 m
9.85 – 11.5	0.03	0.2	0.2	Sand	0.23	0.25	1.5 m
11.5 – 13.25	0.03	0.2	0.25	Sand	0.23	0.25	1.5 m
13.25 – 17.0	0.02	0.25	1.1	Sand	0.27	1.1	1.5 m
17.0 – 21.0	0.5	0.7	3.3	Clay	1.2	3.3	3.0 m
21.0 – 29.0	0.5	0.7	3.3	Clay	1.2	3.3	3.0 m

*Probability of anchor strike is accounted for in Target DoL. Where Target DoL < Anchor threat, this indicates a low probability of anchor strike and the Target DoL is considered adequate to mitigate the risk.

5.3.1.2 Cables will be buried where the substrate allows to target burial depths in accordance with the final CBRA with a minimum burial depth of 0.5 m or greater, where possible, being acceptable within the Fylde MCZ.

6 Cable Installation Strategy

6.1 Overview

6.1.1.1 This section of the final CSIPs will detail the steps involved in the offshore export cable installation process of relevance to the offshore export cable routes including parameters for the Fylde MCZ, once known, including:

- Pre-construction cable corridor clearance (i.e. UXO clearance, boulder clearance, sandwave clearance, and pre-lay grapnel run);
- Cable installation method statement; and
- Placement of external cable protection including crossings (where relevant).

6.1.1.2 The installation strategy will be informed by the review of trenching considerations which will be updated as necessary pre-construction to identify any developments in the availability / performance of burial tools. Details of any updates will be provided here, taking account of the latest site investigation data and any updates to the CBRA. The aim is to identify tools suitable for the specific burial requirements in the Fylde MCZ and export cable corridors routes and to define the key technical requirements (relating to tool design and burial capability) to be used in the cable installation and burial.

6.1.1.3 Due to the cable lengths involved on Morgan Offshore Wind Project (up to 100 km per circuit), it may be necessary for separate cable lengths to be installed and subsequently jointed together. As a minimum there will be a near shore end of approximately 14km (subject to change) and one or two main lay offshore sections subject to cable length and available vessel capacities. The overall length for the Morecambe Offshore Windfarm cables is much shorter and hence either a single cable length will be installed, or a separate shore end (due to water depths) and a main lay section will be installed.

6.2 Trenching Considerations

6.2.1.1 A target depth of lowering of 1 m, with a proposed minimum of 0.5 m (as per **section 2**), has been recommended based on the Outline CBRA. To achieve the desired cable burial, a variety of trenching techniques and tools are available.

6.2.1.2 A wide range of burial tools exists on the market, based on various techniques such as jetting, cutting and ploughing. Hybrid tools combine different techniques to optimize burial depth and speed. Various attempts have been made to classify this wide range of tools into categories, as per **Figure 5** and **Figure 6**.

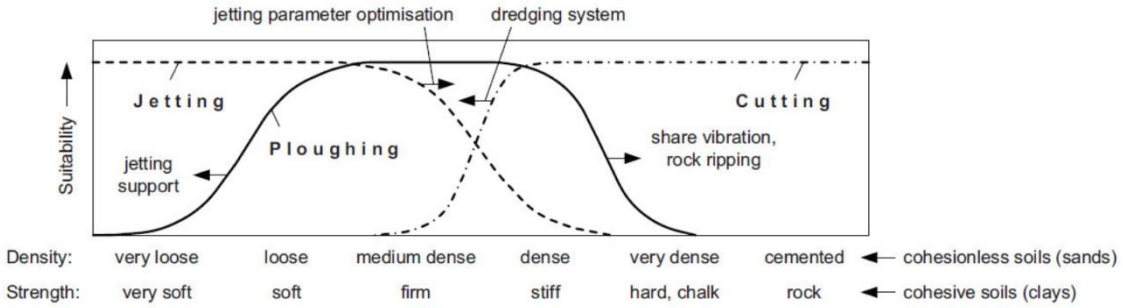

Figure 5: Burial Technique Suitability (DVNGL 2016)

Cable Burial Tool classification			Soil type								Area		
Tool Type Sketch	Soil penetration	Cable lowering	Peat	Clay < 20 kPa	Clay 20-60 kPa	Clay >60 kPa	Sand fine	Sand coarse	Gravel	Boulders	Sandstone	Beach	Near shore	Offshore
	V ploughing	Free lay	+++	+/+++	++/+++	+++	+++/+	+++/++	+++/++	+++/++	+/---	×	✓	✓
	Jet swords	No depressor	--/-	+++	+/++	-/+-	+++/++	-/+	--	--	---	×/✓	✓	✓
	Jet swords, eductor	No depressor	-	+++	+/++	-/+-	+++/++	+/++	-	-	---	×	✓	✓
	Jet swords, backwash sword	No depressor	-	+++	+/++	-/+-	+++	++/+++	+/+-	--	---	×/✓	✓	✓
	Jet swords, multiple swords	No depressor	-	+++	+/++	-/+-	+++	+++	++/+-	--	---		✓	✓
	Jetting	Stinger (angled)	-/+-	+++	+++	+	+++	++	+/+-	+-	---	×/✓	✓	✓
	Jetting	Vertical Injector	++/+	++/+++	+/++	-/+	+++	++	++/+	+-	---	×	✓	×
	Plough, soil balanced	Depressor	++/+++	+++	+++	++/+++	+++	++/+++	++/+++	+-	---	✓	✓	✓
	Plough, vibrating	Vertical Injector	++/+	+++	+++	+	+++	+++	+++/+	+/+-	--	×	✓	×
	Plough, vibrating	Stinger (angled)	+	+++	+++	+	+++	+++	+++/+	+/+-	--	✓	✓	✓
	Chain / wheel cutter	Free deployment	+++	+++/+	++	+/+++	---	-/---	--/---	--/---	++	×/✓	✓	✓
	Chain / wheel cutter, eductor	Free deployment	+++	+++/++	+++	+++	--	+/-/--	?/--	--	++	×/✓	✓	✓
	Chain / wheel cutter	Depressor	+++	+++/++	+++	+++	++	++	++	++/+-	++	×/✓	✓	✓
Suction trenching	Suction dredging	Free deployment	-	+	--/-	---	++/+++	+++	++	+/+-	---	×	✓	✓
Mass Flow Excavation	Mass Flow Excavation	Free deployment	--	+	--/-	---	++	++	+	+/+-	---	×	✓	✓

Figure 6: Cable Burial Tool Classification and Suitability (Cigre 2022)

6.2.1.3 Due to the sediment type found in the nearshore area and Fylde MCZ (i.e. predominantly sand and mud, see **section 4.3**), traditional burial techniques are suitable to achieve the target burial depths as shown **Figure 5** and **Figure 6.**

6.2.1.4 These burial techniques include:

- Ploughing, is a technique which copes with a wide range of soil conditions for depth of lowering up to 3 m. Ploughs can be used as a pre-trench tool (i.e. the cables are laid into a trench for later backfilling), a post-lay burial tool (i.e. the cable is first laid in position on the sea bed

before being ploughed in) or, more commonly, as a simultaneous lay and burial tool.

- Jetting solution can be applied to the majority of the export corridor as seabed sediments along the offshore export cable route are dominated by clayey sand. Jetting uses high powered jets of water to fluidise the seabed sediments and lower the cable to the required depth. Jetting may be undertaken either as a separate operation on a cable that has been pre-laid on the sea bed, or by simultaneously laying and jetting. Burial depths up to 2 to 3 m are achievable for most jet trenchers, though tools exist that can achieve burial depths up to 5 m.
- Mechanical cutting may be utilised where other methods are not feasible such as in areas of harder seabed conditions or material such as gravel is encountered. Mechanical cutting devices cut into hard soils to allow for the excavation of the trench (either by pre-trenching or simultaneous lay and burial) with the excavated material placed alongside and cable placed within the trench.

6.2.1.5 A combination of burial methods is likely to be adopted. This can be a combination of ploughing, jetting and mechanical cutting.

6.3 Pre-construction UXO clearance

6.3.1.1 Potential UXO identified during the pre-construction site investigation surveys (see **section 4.2**) will be investigated to determine whether they are confirmed as UXO. If they are classified as UXO, they will either be cleared or avoided. UXO may be avoided through micrositing of infrastructure or cleared through *in-situ* clearance or recovery of the UXO for disposal at an alternate location. The method of clearance will depend on factors such as the condition of the UXO and will be subject to the UXO clearance contractors' safety assessment.

6.3.1.2 There are a number of methodologies that may be used to clear UXO, including detonation of the UXO using an explosive counter-charge placed next to the UXO on the seabed (referred to as a 'high order' technique) or methods that neutralise the UXO to be safe without detonation (referred to as 'low order' techniques). These low order techniques include 'deflagration' which involves the use of a small charge to 'burn out' the explosive material without detonation.

6.3.1.3 The use of the low order techniques is dependent on the condition of the UXO and individual circumstances. Furthermore, the Applicants will not know what condition any UXO is in until it is investigated. Therefore, whilst the use of low-order techniques is a potentially viable and the preferred solution for clearance of UXO, it is not possible to commit to only using these techniques at this stage.

6.3.1.4 Based on pre-application surveys and desk top studies, a conservative estimate of up to 25 UXO are assumed to require clearance (21 for the Morgan Offshore Wind Project and four for the Morecambe Offshore Wind Project). UXO clearance is likely to include a range of UXO sizes with the net

explosive quantity (NEQ) ranging between 25 kg to 907 kg with 130 kg being the most likely.

6.3.1.5 Prior to any UXO removal or detonation, method statement(s) for UXO clearance will submitted for approval by the Marine Management Organisation (MMO) in lines with DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 20(1)(a) (UXO clearance) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition20(1)(a) (UXO clearance)). This will provide confirmation of the UXO identified for clearance and confirmation that clearance does not coincide with archaeology/sensitive seabed features.

6.4 Site Preparation Boulder Clearance Methodology

6.4.1.1 Boulder clearance is commonly required during site preparation for installation of offshore infrastructure. Micro-siting of the offshore export cables will be considered in the first instance, but micro-siting of cables around all boulders would be onerous and impractical. Boulders pose a risk of damage and exposure to cables as well as an obstruction risk to the cable installation equipment. Therefore, any boulders identified as likely to impact installation will need to be moved to the side (side cast), away from the immediate location of the cable infrastructure. 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 present, a subsea grab is expected to be employed.

6.5 Site Preparation Outline Sandwave Clearance Plan

6.5.1.1 An outline strategy for the treatment of sandwaves has been developed. It is intended that sandwave levelling is minimised and that reducing the height of sand waves is carried out using controlled flow excavation rather than dredging techniques. This results in displacement of the sand in the local region rather than transporting the sand to a different locality. It is therefore anticipated, based on existing seabed sediment type and existing transport processes (**section 4.3** and **section 4.4**), that re-instatement of the sandwave area by natural wave and tidal processes will be quite rapid due to the active bedform and its natural exposure to sediment redistribution as detailed in Volume 2, Chapter 1 Physical Processes of the ES (document reference F2.1).

6.5.1.2 Ridge and runnel are seabed features characterised by a series of ridges (highs) and runnels (lows). Ripples are microscale seabed features that have a wave height of centimetres (<10 cm). They are transient features that are constantly moving. Mega-ripples have wave heights up to 3 m and, depending on their size, they can migrate over a period of hours to days with larger ripples typically migrating more slowly than smaller ones.

6.5.1.3 Ridge and runnel features are present in the nearshore area extending into the eastern edges of the Fylde MCZ to approximately KP4.0. Ripples have been identified sporadically along the cable route within the Fylde MCZ from

KP10.6 – KP24.6 with mega-ripples present from K18.5 – KP21.3 (**section 5.1**). Ripples and mega-ripples along with ridges and runnels may require some levelling in order to allow cable installation. This levelling activity may be required to facilitate cable burial tool passage, cable lay vessel grounding, or for ensuring cable protection at asset crossings in mobile seabed. Levelling will only take place where absolutely necessary, which in practise means that short, isolated sections will be levelled where it is not possible to avoid the seabed features through alternative routing or deeper mechanical burial methods. Clearance is only required to remove the peaks of the sandwaves; it will likely not be required for the entirety of the cable routes within the regions where megaripples have been identified.

6.5.1.4 As described above, the Fylde MCZ has few major features that would affect cable burial operations and with cable burial being the preferred method of cable protection (CoT54, **Table 5**), some nominal clearance within the Fylde MCZ would be required primarily along the western edge of the MCZ where ripples become more prevalent. Initial surveys indicate that megaripples are identified in approximately 25% of the cable corridor between approximately KP17 and KP21.3 (not all of which falls within the Fylde MCZ as shown on **Figure 1**); however, clearance is anticipated to be required only for the tallest peaks as discussed in paragraph **6.5.1.3**. As such, for the reasons outlined above, and due to the wavelength and mobility of seabed features (ridge and runnel, ripples and mega-ripples) within the Fylde MCZ, sandwave clearance of up to 5% of the offshore export cable route within the Fylde MCZ (CoT47, **Table 5**) has been included within the Project Design Envelope assessed for the DCO application to ensure adequate burial of the cables through the MCZ. This equates to sandwave clearance volumes of up to 172,800 m^3 for the 84 km of offshore export cables through the MCZ for the Morgan OWL and 97,200 m^3 for the 24 km through the MCZ for the Morecambe OWL.

6.6 Material Excavated during Cable Installation

Spoil material will be disposed within the Transmission Assets Order Limits in the immediate vicinity from where it is dredged. No offsite disposal would be required for the Transmission Assets as detailed in the Dredging and Disposal – Site Characterisation Plan (document reference J22).

6.6.1.1 Material arising from sandwave clearance for example by controlled flow excavation, and cable installation within the Fylde MCZ will naturally disperse within the immediate vicinity of the Transmission Assets Order Limits from which it was displaced ensuring that material remains within the same sediment cell and that material is not lost from the system. Material will not be physically removed from the system but allowed to settle around the seabed from which it originated.

7 Cable Protection Plan

7.1.1.1 The strategy for cable protection will be principally by cable burial (CoT54, **Table 5**). Initial survey results assessments of the Fylde MCZ show that this is considered to be very feasible as the ground types are principally soft (e.g. largely sand or clay based as detailed in **section 4.3**). However, two factors

may necessitate additional cable protection, by mattressing or rock placement: the need for cable crossings and dense areas of gravelly seabed.

7.1.1.2 Further pre-construction surveys may identify areas that the minimum target burial depth would not be achievable within the Fylde MCZ. Subsequently, there may be instances during installation where the target burial depth is not achieved after multiple passes of the installation tool along portions of the offshore export cable route within the Fylde MCZ. Once this required information is available, this section of the final CSIPs will include:

- Decision making process on when and where cable protection could be utilised (this will detail, for example, how survey information is used to determine requirements for remedial burial works and / or external cable protection).
- Details on the types of external cable protection to be used in the MCZ with consideration for how this could be removed during decommissioning, including details of any alternative types considered;
- Locations where external cable protection may be needed;
- Installation methods for the external cable protection to be used; and
- Consideration of risks to other sea users from external cable protection, e.g. snagging of fishing gear and vessel anchors

7.1.1.3 Should cable protection be required, no more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the offshore export cable corridor route without prior written approval from the MCA (CoT45, **Table 5**).

7.1.1.4 Any cable protection required within the Fylde MCZ, whether for cable crossings or for ground conditions (see **section 7**), would be designed to be removable if required at the time of decommissioning (CoT108 and CoT109, **Table 5**). The integrity of any installed cable protection will be assessed as part of routine inspections of the cables during operation. Installed cable protection will be engineered to remain in place over the design lifetime and be constructed with inert and non-degradable materials, so issues with the recovery of cable protection during decommissioning are not anticipated. Recovery of installed protection would likely utilise industry standard processes such as clamshell grabs to remove rock and vessel cranes to remove concrete mattresses.

7.2 Cable Crossings within the Fylde MCZ

7.2.1.1 A number of cable crossings (see offshore crossing schedule, document reference F1.3.2) have been identified which will require mattressing / rock as a separation layer and external protection by rock/mattresses. Some of these crossings are in close proximity, which may make it difficult to bury the cable in-between crossing points, leading to the need for additional hard protection.

7.2.1.2 The offshore export cables need to cross Vodafone's Lanis 1 Telecom Cable and Aquacomms Havhingsten Sec 1.5 Telecom Cable to enable landfall at Lytham St Anne's. The Applicants sought to minimise the crossings / cable

protection by pushing the crossings as far as west as possible. However due to other existing infrastructure alignments within the Fylde MCZ (Sirius cable to the south of the offshore export cable corridor and Hibernia Atlantic running north/south along the western edge of the MCZ) and the need to cross existing infrastructure at 90 degree angles, up to four of the cables may need to cross the Lanis 1 cable within the Fylde MCZ (**Figure 2**).

7.2.1.3 Whilst this cable crossing cannot be avoided within the Fylde MCZ, separate parameters have been provided to minimise the amount of cable protection at this specific crossing, specifically reducing the maximum length, width and height of the crossing as detailed in **Table 8.**

Table 8: Cable Crossing Parameters

Export Cable Crossings Parameters	Within Fylde MCZ	Outside of MCZ
Crossing material	Mattresses, frond mattresses, rock dump/bags, rock armour	Mattresses, frond mattresses, rock dump/bags, articulated pipe, rock armour
Maximum number of crossings	1 crossing (4 cables)	47
Maximum length of crossing (m)	50	150
Maximum width of crossing (m), per cable crossing	20	30
Maximum height of crossings (m)	2	2.8

7.3 Cable Protection for ground conditions in Fylde MCZ

7.3.1.1 Slightly gravelly seabed sediment has been identified within the sediment interpretation for within the Fylde MCZ. Whilst slightly gravelly clay or slightly gravelly sand sediments are currently not anticipated to hinder cable burial via trenching techniques under consideration (**section 6.2**), more dense areas of gravel, if present, could present a risk of reduced burial, leading to the need for cable protection. Based on the initial survey results, the use of additional cable protection for ground conditions within the Fylde MCZ is not envisaged; however, limited vibrocore data has been used to extrapolate seabed conditions across the MCZ (see **section 5**) and isolated disparate ground conditions could still be present. As such, the Project Design Envelope allows for 3% cable protection for ground conditions within the Fylde MCZ as a contingency only (CoT47, **Table 5**) should later surveys indicate discrete areas of harder seabed where cable burial to the target depth cannot be reached and would enable cable protection to be installed over unexpected ground conditions in isolated locations, for example at a large subsurface boulder which was not identified during surveys.

7.3.1.2 Cable protection measures, should they be required, will be selected based on the water depths, current and wave conditions which may affect the stability of the cable protection with consideration to mitigate any perceived adverse effects on the environment. Should mattresses be used in shallow

water nearshore, then these would be taper edged mattresses to avoid and minimise scour at the location.

8 Monitoring of Cables

8.1.1.1 Asset integrity surveys would occur regularly, as required. Initially, these are anticipated to occur yearly during the first five years and then approximately every four years thereafter. These surveys will likely involve vessel based geophysical investigation techniques such as Side Scan Sonar and ROV based techniques such as Multi-Beam Echo Sounder. One purpose of these surveys is to confirm that the cable remains protected and that any installed cable protection is still in place.

8.1.1.2 The Offshore IPMP (document reference J20) details the Transmission Asset monitoring commitments made by the Applicants. Where the offshore export cables pass through the Fylde MCZ, the Applicants would monitor representative areas of sediment and benthic communities for recovery following completion of construction as part of the operational asset integrity surveys (CoT115) via the use of:

- Geophysical survey including side scan sonar and multibeam bathymetry; and
- sea bed imagery.

8.1.1.3 The Outline In Principle Monitoring Plan (document reference J20) and Outline Offshore Operations and Maintenance Plan (document reference J19) contains further details on the asset integrity surveys and monitoring.

9 Conclusions

9.1.1.1 In the nearshore area and Fylde MCZ (approximately KP5 – KP21), the seabed sediments include areas of sand (medium to very fine), and clayey sand intersected by slightly gravelly clayey sand and sandy clay. This portion of the offshore export cable route is largely featureless with small areas of ridge and runnel in the nearshore area, sporadic ripples throughout the MCZ, and mega-ripples along the western edge of the MCZ. As such, the Applicants have indicated that up to 5% sandwave clearance may be required within the Fylde MCZ (**section 6.5**).

9.1.1.2 The CBRA (document reference J14 and summarised in **section 5**) has demonstrated that a target depth of lowering of 1.5 m covers all external risk with the exception of specific areas, such as those with softer sediments or high mobility such as the beach, where a deeper 3 m target depth is recommended. As such, a target depth of lowering of between 1 and 3 metres, with a proposed minimum of 0.5 m has been applied for the Project Design Envelope (**section 2**).

9.1.1.3 For the nearshore and Fylde MCZ, the greatest risk to cable burial is cable exposure and impact damage due to hooking, snagging, etc. (**section 5.2**). The most appropriate mitigation is to achieve suitable cable burial depths in accordance with the target burial depths identified along the cable routes. Seabed preparation enables cable burial and up to 5% sandwave clearance

may be required within the Fylde MCZ (CoT47, **Table 5**). A wide range of burial tools exists on the market, based on various techniques such as jetting, cutting and ploughing or a hybrid, which would reach the target burial depths (**section 6.2**).

9.1.1.4 Based on the initial survey results and CBRA, there are no indications that the burial depths within the nearshore and Fylde MCZ of between 0.5 and 3 metres would not be achievable, though the presence of dense areas of gravelly seabed (if present) could hinder trenching burial tools. As such, the Applicants have allowed for a 3% for cable protection of the offshore export cable route within the Fylde MCZ (excluding cable crossings) with this only used where deemed to be essential (CoT47, **Table 5**). The Applicants have also committed that any cable protection used within the Fylde MCZ would be designed to be removable on decommissioning (CoT108 and CoT109, **Table 5**). The final requirement for cable protection will be informed by pre-construction surveys (Section 1.3.1).

9.1.1.5 Within the Fylde MCZ, one crossing is required for up to four of the six export cables along the Lanis 1 (KP19.4) telecoms cable located along the western edge of the Fylde MCZ (**section 7.2**). The Applicants sought to minimise the crossings / cable protection by pushing the crossings as far as west as possible. However due to other existing infrastructure alignments within the Fylde MCZ and the need to cross existing infrastructure at 90-degree angles, cable protection would be required to facilitate the cable crossings.

9.1.1.6 As detailed in **section 1.3**, this Outline CSIP will form the basis of two final detailed CSIPs: a final CSIP for the Morgan Offshore Wind Project: Transmission Assets and a final CSIP for the Morecambe Offshore Windfarm: Transmission Assets. Each Applicant will submit their final CSIP prior to the commencement of construction to take account of further surveys and detailed route engineering studies. The final CSIP will include a cable layout plan along with the preferred cable burial and installation methodology and will confirm and/or action the commitments as described in this Outline CSIP in **section 3.1**. The final CSIPs will be submitted for approval to the MMO in accordance with each Applicant's deemed marine licence conditions.

10 References

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