MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 1, Annex 4.2: Selection and Refinement of Offshore Infrastructure

September 2024
Rev: ES Issue

MOR001-FLO-CON-ENV-RPT-0061
MRCNS-J3303-RPS-10029

PINS Reference: EN020028
APFP Regulations: 5(2)(a)
Document reference: F1.4.2

Document status					
Version	**Purpose of document**	**Approved by**	**Date**	**Approved by**	**Date**
F01	For issue	AS	September 2024	IM	September 2024

Prepared by:

Morgan Offshore Wind Limited
Morecambe Offshore Windfarm Ltd

Prepared for:

Morgan Offshore Wind Limited
Morecambe Offshore Windfarm Ltd

Contents

Tables

Figures

Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Limited (Morecambe OWL).
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.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Environmental Impact Assessment (EIA)	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.
EIA Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Expert Working Group	A forum for targeted engagement with regulators and interested stakeholders through the Evidence Plan process.
Export cable corridor	The specific corridor of seabed (seaward of Mean High Water Springs and land (landward of Mean High Water Springs) from the Generation Assets to the National Grid Penwortham substation.
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.
Interconnector cables	Cables to connect the Offshore Substation Platforms to each other.
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 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).
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and County Borough Councils.

Term	Meaning
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 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	The highest water level reached during and average tide.
Mean High Water Spring	The height of mean high water during spring tides in a year.
Mean Low Water Spring	The height of mean low water during spring tides in a year.
Mean Sea Level	The average tidal height over a long period of time.
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 Limited is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra)and Flotation Energy Ltd.
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 and Morecambe Offshore Wind Farms: Transmission Assets	The transmission assets 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: Transmission Assets	The transmission 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.
Offshore booster station	A fixed structure located along the offshore export cable route, containing electrical equipment to ensure bulk wind farm capacity can be fully transmitted to the onshore substations.
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.

Term	Meaning
Offshore Infrastructure Area	The area within which the offshore substation platforms, Morgan offshore booster station, interconnector cables and offshore export cables will be located.
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.
Offshore Order Limits	See Transmission Assets Order Limits: Offshore (below).
Offshore substation platform(s)	A fixed structure located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
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.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substations.
Onshore export cable corridor	The corridor within which the onshore export cables will be located.
Onshore Infrastructure Area	The area within the Transmission Assets Order Limits landward of Mean High Water Springs. Comprising the offshore export cables from Mean High Water Springs to the transition joint bays, onshore export cables, onshore substations and 400 kV grid connection cables , and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses. Those parts of the Transmission Assets Order Limits proposed only for ecological mitigation/biodiversity benefit are excluded from this area.
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.
Onshore Order Limits	See Transmission Assets Order Limits: Onshore (below).
Onshore substations statutory consultation area	The area identified during the site selection process within which the onshore substations for the Transmission Assets will be located.
Order limits	The limits within which the Transmission Assets may be carried out.
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.
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
Point of Interconnection	The point where an offshore wind farm connects to the National Grid.
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.

Term	Meaning
Scoping Opinion	Sets out the Planning Inspectorate's response (on behalf of the Secretary of State) to the Scoping Report prepared by the Applicants. The Scoping Opinion contains the range of issues that the Planning Inspectorate, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment process.
Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Special Areas of Conservation	A site designation specified in the Conservation of Habitats and Species Regulations 2017 or the Conservation of Offshore Marine Habitats and Species Regulations 2017 in England and Wales and the UK offshore area. In combination with Special Protection Areas and Ramsar sites, these sites contribute to the national site network.
Special Protection Areas	A protected area for birds, classified in the UK under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 in England and Wales and the UK offshore area. They are classified for rare, threatened and vulnerable birds, as listed on Annex I of the Birds Directive (EU Council Directive 79/409/EEC on the conservation of wild birds), or certain regularly occurring migratory species.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
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.
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.
Transmission Assets Order Limits: Onshore	The area within which all components of the Transmission Assets landward of Mean High Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds). Also referred to in this report as the Onshore Order Limits, for ease of reading.
Transmission Assets PEIR Boundary	The term used to define the boundary used at the time the Preliminary Environmental Impact Report (PEIR) was submitted
Transmission Assets Scoping Boundary	The term used to define the boundary used at the time the Scoping Report was submitted

Acronyms

Acronym	Meaning
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
EWG	Expert Working Group
HVAC	High Voltage Alternating Current
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NGESO	National Grid Electricity System Operator
NNR	National Nature Reserve
OSP	Offshore Substation Platform
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
PoI	Point of Interconnection
SAC	Special Area of Conservation
SoS	Secretary of State
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UK	United Kingdom

Units

Unit	Description
%	Percentage
dB	Decibels
Kg	Kilogram
km	Kilometres
km^2	Square kilometres
m	Metres
m^2	Metres squared
m^3	Metres cubed
nm	Nautical mile
%	Percentage

4 Selection and Refinement of Offshore Infrastructure

4.1 Introduction

4.1.1 Overview

4.1.1.1 This document forms Annex 4.2: Selection and Refinement of Offshore Infrastructure to Chapter 4: Site Selection and Consideration of Alternatives of the Environmental Statement (ES) prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets'). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the Transmission Assets.

4.1.1.2 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. The Generation Assets are each subject to separate applications for development consent.

4.1.2 Purpose of this annex

4.1.2.1 This annex sets out the stages of siting and design iterations that the Transmission Assets offshore infrastructure has been through from inception to DCO submission. The Transmission Assets offshore infrastructure for the DCO submission consists of up to six offshore export cables (four for the Morgan Offshore Wind Project and two for the Morecambe Offshore Windfarm) as following the submission of the Preliminary Environmental Information Report (PEIR), the offshore substation platforms (OSPs), interconnector cables, and Morgan offshore booster station were removed from the design envelope.

4.1.2.2 An important part of the Transmission Assets design process is the consideration, selection, and refinement of potential siting options for the offshore infrastructure to communicate to consultees and stakeholders the rationale for how decisions have been reached and how adverse effects have been avoided, minimised and/or mitigated as far as practicable.

4.1.2.3 The site selection and refinement process followed an iterative approach to ensure the most appropriate and efficient solution was identified with consideration of environmental and engineering constraints. The site selection has been progressed through four stages, incorporating feedback received at each phase to further refine the siting and design of the offshore infrastructure in the next stage. These four stages are described in **Table 4.1** and **Figure 4.1**.

Table 4.1: Site Selection and Refinement Stages

Stage	Associated Document
Stage 1 – Identification of Point of Interconnection (PoI)	Volume 1, Chapter 4: Site Selection and Consideration of Alternatives
Stage 2 – Identification of areas of search	
Stage 2a – Identification of landfall areas of search	Volume 1, Annex 4.1: Selection and Refinement of Landfall
Stage 2b – Identification of offshore infrastructure search area	Volume 1, Annex 4.2: Selection and Refinement of Offshore Infrastructure
Stage 2c – Identification of onshore substations search areas	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure
Stage 2d – Identification of onshore export cable route search area	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure
Stage 3 – Refinement of the siting and design of the Transmission Assets for PEIR	
Stage 3a – Refinement of landfall for PEIR	Volume 1, Annex 4.1: Selection and Refinement of Landfall
Stage 3b – Refinement of offshore infrastructure for PEIR	Volume 1, Annex 4.2: Selection and Refinement of Offshore Infrastructure
Stage 3c – Refinement of onshore substation search areas for PEIR	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure
Stage 3d – Refinement of onshore export cable route options for PEIR	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure
Stage 4: Refinement of the siting and design of the Transmission Assets for DCO Application	
Stage 4a – Refinement of landfall for DCO Application	Volume 1, Annex 4.1: Selection and Refinement of Landfall
Stage 4b – Refinement of offshore infrastructure for DCO Application	Volume 1, Annex 4.2: Selection and Refinement of Offshore Infrastructure
Stage 4c – Refinement of onshore substations search areas for DCO Application	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure
Stage 4d – Refinement of onshore export cable route options for DCO Application	Volume 1, Annex 4.3: Selection and Refinement of Onshore Infrastructure

4.1.2.4 This annex focuses on the offshore infrastructure options seaward of Mean Low Water Springs (MLWS) and the refinement undertaken as part of Stages 2b, 3b and 4b as detailed in **Table 4.1**. Outlines the approach taken to defining the spatial boundaries and constituent parts of the offshore infrastructure;

- Explains the siting decisions taken by the Applicants; and
- Details the reasonable alternatives considered for the Transmission Assets, including location and infrastructure options.

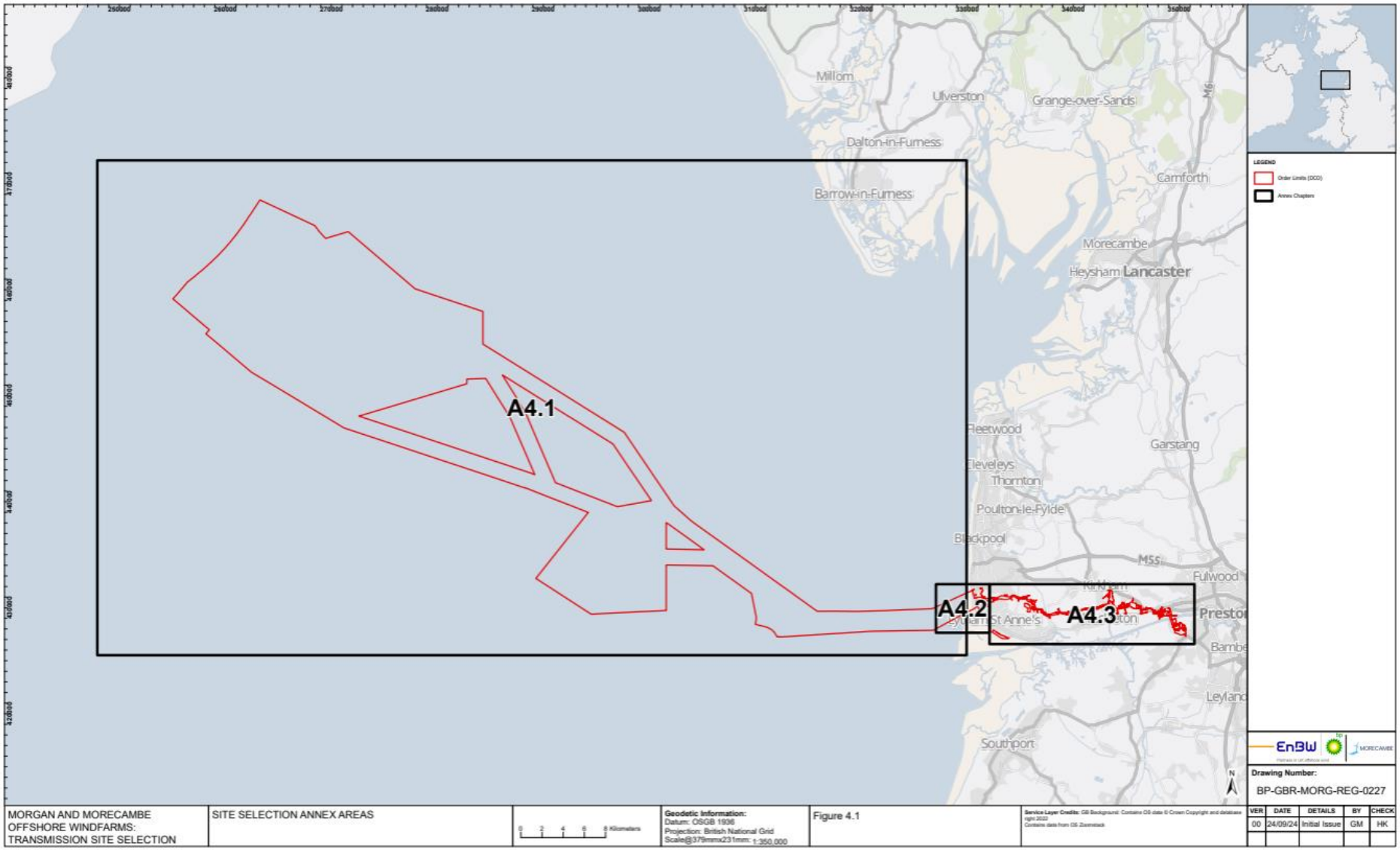

Figure 4.1: Site selection annex areas

4.1.3 Consultation and engagement

4.1.3.1 Stakeholder engagement and public consultation is recognised as vitally important for shaping the approach to development throughout each programme stage of development. **Table 4.2** provides a high level programme of key activities undertaken between Scoping and DCO application submission for the offshore infrastructure, landfall and onshore infrastructure.

Table 4.2: Summary of programme stages and activities undertaken for the Transmission Assets relevant to site selection and refinement

Programme Stage	Description of activities
EIA scoping October 2022	Submission of Scoping Report for Transmission Assets covering: • Scoping boundary of 1,667.9 km^2 • Landfall • Offshore infrastructure search area • Onshore infrastructure search area
Non-statutory consultation November 2022	Non-statutory public consultation events to present: • Overview of the Transmission Assets project and how separate DCO applications are needed for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. • Highlighting Pathways to 2030 and how both offshore windfarms are working to align infrastructure for the Transmission Assets. • Request for feedback from stakeholders and communities. • Landowner liaison • Evidence Process Plan (EPP) Steering Groups and Expert Working Groups (EWGs) on the scoping report and scoping boundary through to PEIR submission.
Non-statutory consultation April 2023	Overview of project refinements since scoping covering: • Selected Landfall option • Indicative onshore export cable corridor and associated temporary and permanent areas • Four indicative onshore substation search areas • Request for feedback from stakeholders and communities.

Programme Stage	Description of activities
PEIR October 2023	Submission of PEIR covering: • PEIR boundary of 697.8 km^2 • Landfall • Offshore substation platforms (OSPs) and interconnector cables • Morgan offshore booster station search areas • Three Morgan offshore export cable options and aligned Morgan and Morecambe offshore export cable route to landfall • One onshore substation statutory consultation area with preferred onshore substation sites (one for Morgan and two for Morecambe) • Two onshore cable route options • 400 kV grid connection cable corridor search area • Indicative construction compounds and access • Preliminary identification of areas for biodiversity benefit Section 42 and Section 47 Consultation Feedback from stakeholders and members of the public on the environmental assessment and site selection undertaken to date. Further engagement via the EWGs with stakeholders.
Targeted Consultation February 2024	• Consultation on minor amendments to PEIR red line boundary covering: 11 minor adjustments to temporary access tracks. • Two minor adjustments to temporary construction compounds. • Addition of 23 operation access routes. • Alternation of onshore cable route between Huck Lane and Bryning Lane. Four minor adjustments to export cable corridor.
DCO Application September 2024	Submission of DCO covering: • Application boundary of 624 km2 • Landfall • Three Morgan offshore export cable options and Morecambe offshore cable corridor which includes an aligned Morgan and Morecambe offshore export cable route • Onshore export cable corridor • Onshore substations • 400kV grid connection cable corridor

4.1.3.2 From project inception up to submission of the DCO application, the Applicants have engaged with a range of stakeholders on the site selection and design of the Transmission Assets through the Evidence Plan Process (EPP). An EPP was developed for the Transmission Assets, seeking 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 and bodies. Additionally, Expert Working Groups (EWGs) were set up to discuss and agree topic specific issues with the relevant stakeholders and to disseminate site and design refinements.

4.1.3.3 A summary of the key topics raised during consultation activities undertaken to date specific to the site selection and refinement of the offshore infrastructure is presented in Volume 1, Chapter 4: Site selection and consideration of the alternatives of the ES. Formal responses are provided for all consultation responses received and can be accessed in the Consultation Report (document reference E1).

4.2 Guiding Principles for Offshore Infrastructure

4.2.1.1 Alongside published policies detailed in Volume 1, Chapter 4: Site Selection and Alternatives, the following general principles guided the selection and refinement process of the offshore infrastructure:

- Locational alignment of the Morgan offshore export cable corridors and Morecambe export cables, where possible;
- Shortest route preference to reduce environmental impacts by minimising footprint as well as minimising electrical transmission losses;
- Avoidance of key sensitive features / receptors where possible, and where not, minimise interaction and mitigate potential impacts;
- Minimise interaction with existing marine infrastructure, where possible; and
- Find a site and route able to accommodate the offshore infrastructure design envelope at each stage.

4.2.1.2 Each step of the staged process as described in **Table 4.1** and detailed for the offshore infrastructure in this report involved gathering desktop and survey data and feedback from stakeholders and the public to define and assess refinement options for the components of Transmission Assets infrastructure. Internal workshops were then held to collate and review the data gathered and feedback to reach cross-discipline decisions about refining the site and design options.

4.3 Stage 2b: Identification of offshore search area

4.3.1 Initial selection of a search area

4.3.1.1 As part of the initial selection of a search area, there was a requirement to identify an area between the Generation Assets and Landfall at Lytham St Annes with optionality to accommodate routing options for up to six offshore export cables (four for the Morgan Offshore Wind Project and two for the Morecambe Offshore Windfarm), along with an Offshore Booster Station (for Morgan only which was dependent on the

overall cable corridor length and subsequently, removed from the design envelope after PEIR, as detailed in **section 4.5.2**).

4.3.2 Environmental Constraints

4.3.2.1 There are numerous offshore designations extend from MLWS springs seaward within the east Irish Sea including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and Marine Conservation Zones (MCZs). The offshore area of search looked to avoid and minimise any potential interactions with these designations, where feasibly possible.

4.3.2.2 The Liverpool Bay SPA extends from Anglesey in Wales to Morecambe Bay in northwest England extending from mean low water to approximately 20 km offshore, reaching the western edge of the Morecambe Offshore Windfarm: Generation Assets. Due to the spatial extent of the Liverpool Bay SPA over the east Irish Sea and the need to reach the point of interconnection at Penwortham, the area of search was unable to avoid the Liverpool Bay SPA.

4.3.2.3 The Fylde MCZ falls entirely within the Liverpool Bay SPA designated boundaries extending north / south for 20 km with the landfall location at Lytham St Annes lying just slightly north of the centre of the Fylde MCZ, i.e. with the MCZ extending north of the landfall site for approximately 8.5 km to the Shell Flat part of the Shell Flat and Lune Deep SAC, which extends a further 7.5 km north beyond the Fylde MCZ, and the Fylde MCZ extending south of the landfall for approximately 12.5 km (see **Figure 4.2**).

4.3.2.4 Routing to the north around the Shell Flat feature of the Shell Flat and Lune Deep SAC was discounted due to the increased potential for interaction with offshore designations around Morecambe Bay (i.e. the Morecambe Bay SAC and the Morecambe Bay and Duddon Estuary SPA). Routing around the Shell Flat and Lune Deep SAC and Fylde MCZ would also increase the length of the offshore export cable route and increase seabed disturbance requiring numerous crossings in shallow water depths between the Fylde MCZ and the coast (see **Figure 4.2** and **Figure 4.3**)

4.3.2.5 As such, the northern boundary of the offshore search area was selected to avoid designations to the north, notably Shell Flat and Lune Deep SAC as well as avoiding the West of Walney and West of Copeland MCZs. As such, the northern boundary of the offshore area of search begins to the south of the Shell Flat and Lune Deep SAC, encompassing the Fylde MCZ, Liverpool SPA and the Generation Assets (see **Figure 4.2)**

4.3.2.6 Routing to the south of the Fylde MCZ was similarly discounted due to increased potential for interaction with the Ribble and Alt Estuary SPA, which covers the mouth of the River Ribble and closer proximity to Sefton Coast SAC with a greater distance required to route to the south of the Fylde MCZ and then back up the coast to Lytham in very shallow water depths. As such, avoiding the Fylde MCZ and routing around it was not feasible due to the increased impact on other designations and

requirement to have a greater length of cables and cable crossings in shallow nearshore waters (see **Figure 4.2** and **Figure 4.3**)

4.3.3 Other marine users

4.3.3.1 The selection of the offshore infrastructure search area also sought to minimise proximity to existing marine infrastructure where possible, including existing offshore wind farms (Walney 1-4 and West of Duddon Sands lease areas), cables, pipelines, and the 'Liverpool Bay' marine aggregate extraction Area 457 as shown in **Figure 4.3** as well as oil and gas operators with associated infrastructure and gas pipelines as shown in **Figure 4.4**.

4.3.4 Selection of Offshore Area of Search

4.3.4.1 Taking into account the constraints set out above in **section 4.3.2** and **section 4.3.3,** a refined offshore area of search for the Transmission Assets was selected which extended from the Generation Assets to the selected landfall site at Lytham St Annes, as shown in **Figure 4.5**. This was the offshore boundary that was presented in the Scoping Report.

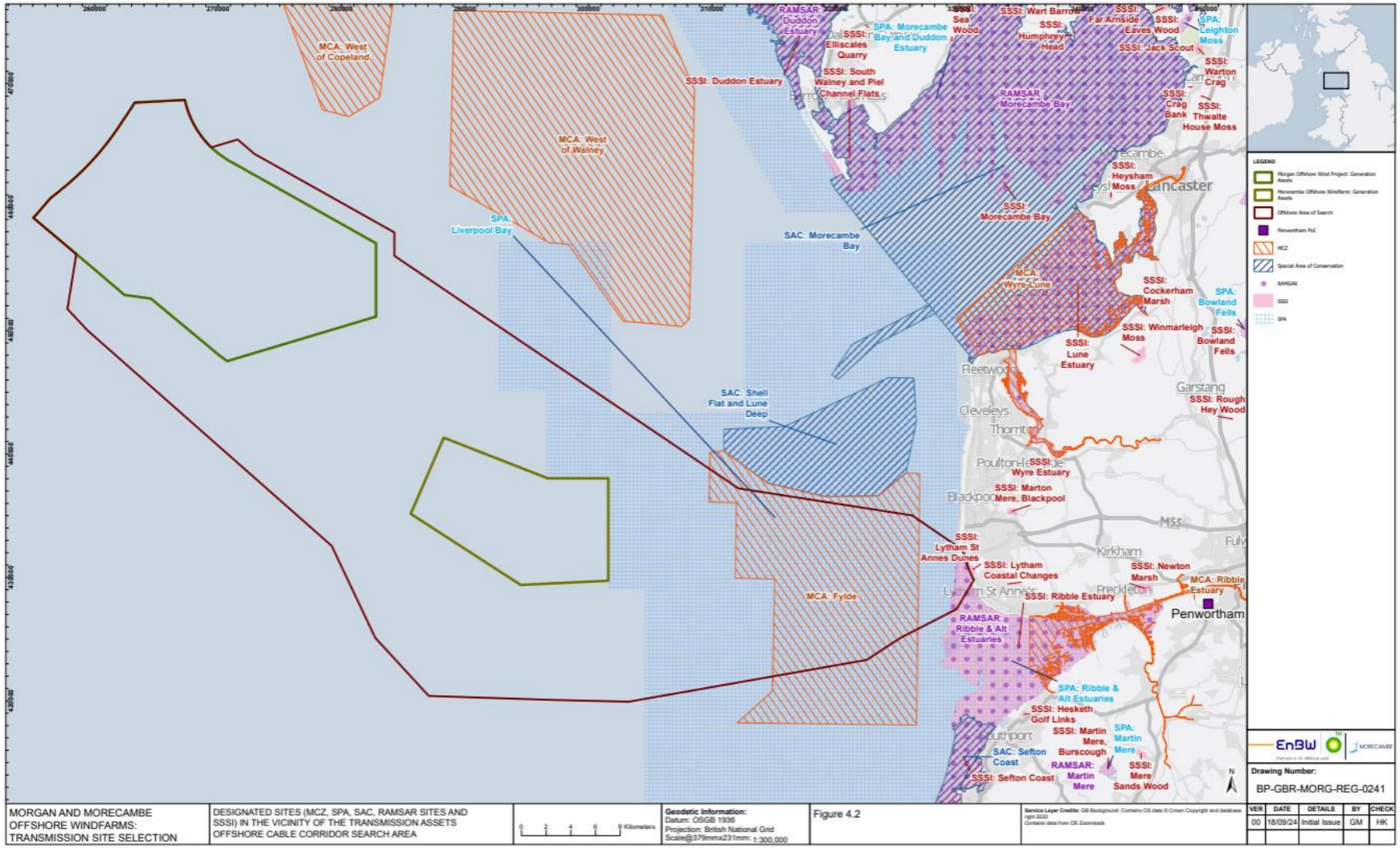

Figure 4.2: Designated sites (MCZ, SPA, SAC, Ramsar sites and SSSI) in the vicinity of the Transmission Assets offshore infrastructure search area

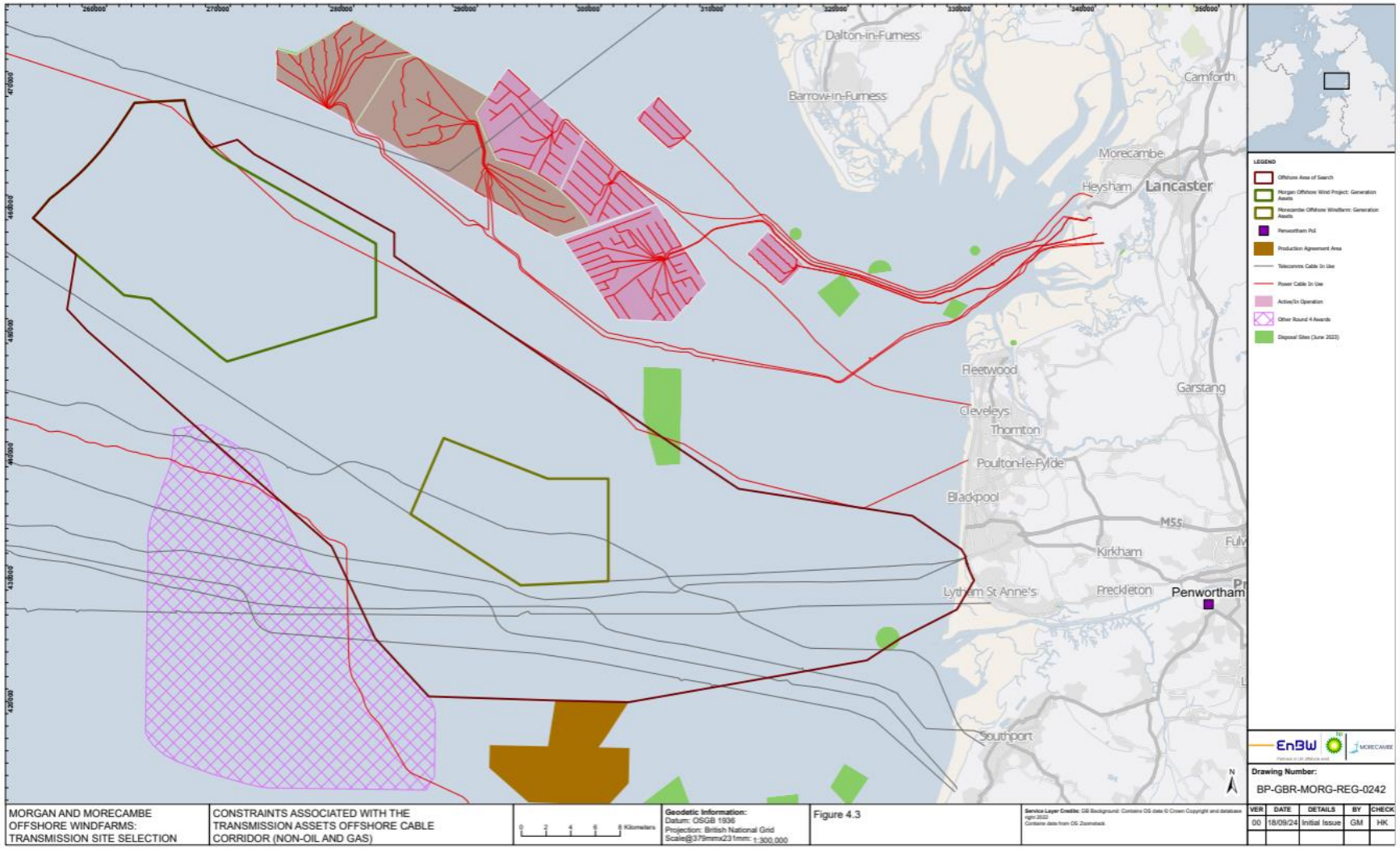

Figure 4.3: Constraints associated with the Transmission Assets offshore infrastructure search area (non-oil and gas)

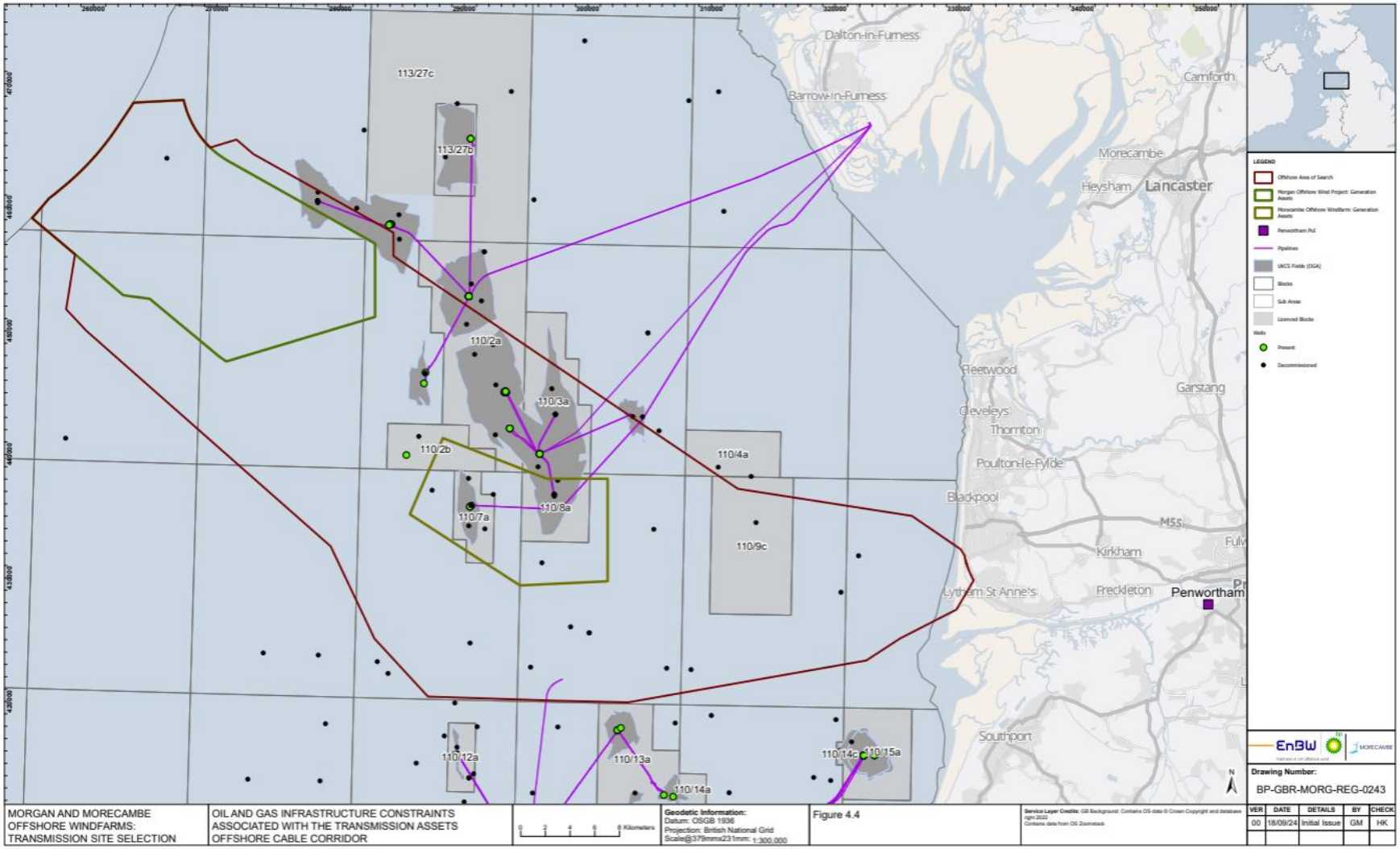

Figure 4.4: Oil and gas infrastructure constraints associated with the Transmission Assets offshore infrastructure search area

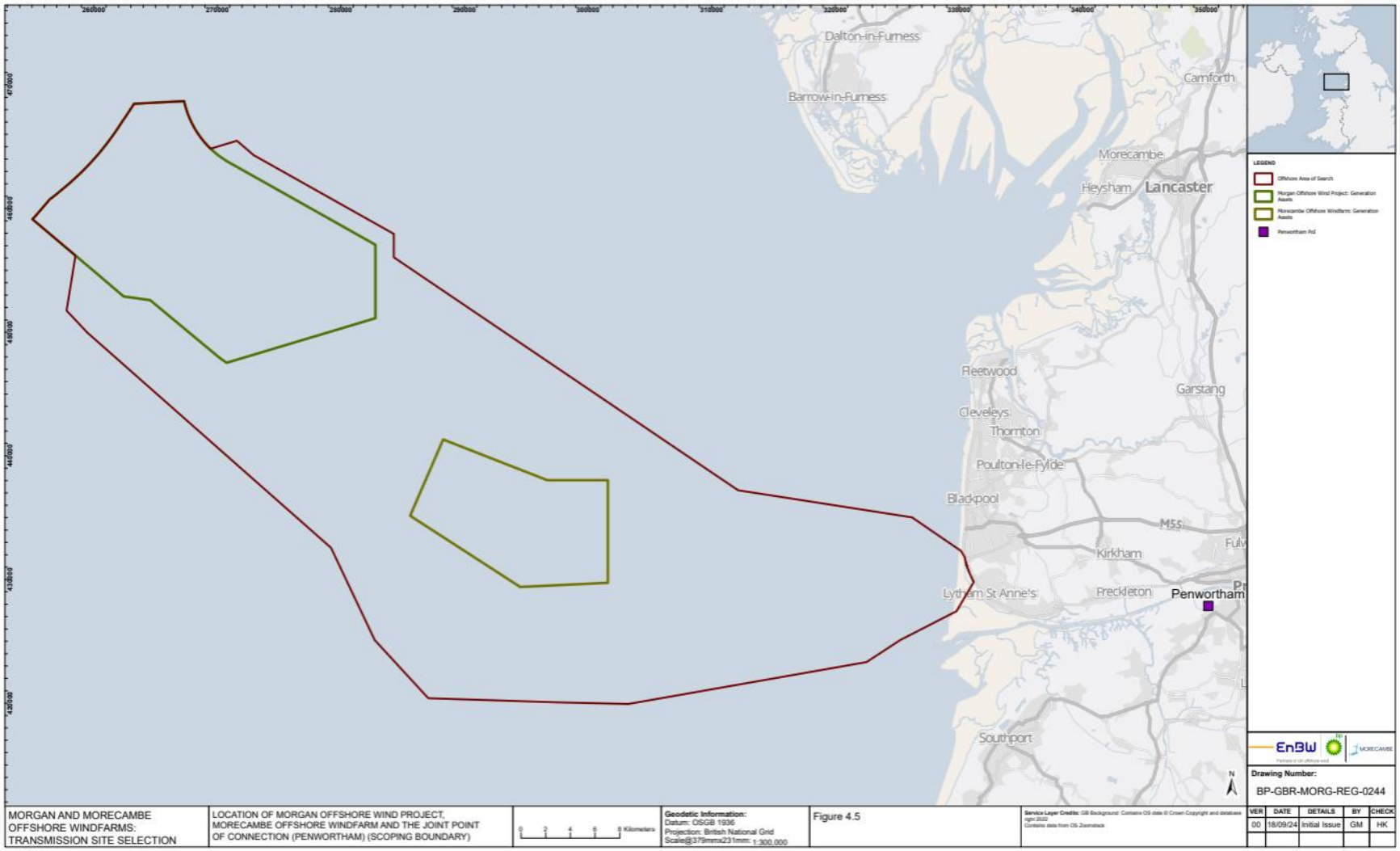

Figure 4.5: Location of Morgan Offshore Wind Project, Morecambe Offshore Windfarm and the Joint Point of Connection (Penwortham) (Offshore Scoping boundary)

4.4 Stage 3b: Refinement of offshore infrastructure options for PEIR

4.4.1 Identification of five route options

4.4.1.1 As part of the refinement of the offshore search area into offshore cable corridor options, routes were selected that were capable of accommodating up to four offshore export cables for the Morgan Offshore Wind Project and up to two offshore export cables for the Morecambe Offshore Windfarm, along with an Offshore Booster Station (for Morgan only which was dependent on the overall cable corridor length and subsequently, removed from the design envelope after PEIR, as detailed in **Section 4.5.2**).

4.4.1.2 The siting of offshore cable corridors and infrastructure (i.e. the Offshore Booster Station) was driven primarily by the offshore export cables starting point within the Generation Assets and the endpoint at Lytham St Annes landfall (further details on the landfall are provided in Volume 1, Annex 4.1: Selection and refinement of the cable landfall). Different corridor options were selected to ensure that the cables could maintain a typical separation distance of 200 m between cables in order to manage cable interaction and to enable maintenance operations. A buffer of 500 m was added to either side of those parameters to allow micrositing of the cables, which resulted in an average offshore export cable corridor width of approximately 1.5 km – 2 km, with some variation due to existing constraints as described below.

4.4.1.3 Five potential offshore export cable corridor options were identified with the necessary spacing to accommodate up to six offshore export cables and an offshore booster station location. Consideration was then given to avoiding / minimising interactions with sensitive features and other existing infrastructure in line with the principles outlined in **Section 4.2**. The five routes are summarised in **Table 4.3** and shown in **Figure 4.6.**

4.4.1.4 Four potential corridor routes were identified for the offshore export cable exiting the Morgan Offshore Wind Project: Generation Assets (Routes 1 – 4). Ultimately only one offshore cable corridor route exiting the Morecambe Offshore Windfarm: Generation Assets was taken forward (Route 5). This exits the Morecambe Offshore Windfarm: Generation Assets on the eastern boundary and minimises crossings and cable length when considering the future siting of infrastructure required for the Morecambe Offshore Windfarm: Generation Assets, (primarily the offshore substation platforms), the Morgan offshore export cable corridor routes (Routes 1 – 4) and the location of landfall.

Table 4.3 Offshore export cable corridor routes identified within the Offshore Area of Search

Option	Description
Route 1	Route 1 offshore cable corridor is the shortest and most direct route to landfall at approximately 85 km. Route 1 exits the Morgan Offshore Wind Project: Generation Assets from the north and travels southeast through the southern part of the North Morecambe gas fields to the south of the Millon platforms. Route 1 then passes through the northern part of the South Morecambe gas field where it joins with Route 5 to the east of the Morecambe Offshore Windfarm: Generation Assets. The aligned corridor (Route 1 and 5) then generally heads east to the landfall location at Lytham St Annes through the Liverpool Bay SPA and Fylde MCZ. Route 1 crosses six assets (two telecom cables and four pipelines).
Route 2	Route 2 offshore cable corridor is of intermediate distance between Route 1 and 3 at approximately 90 km to landfall. Route 2 exits the Morgan Offshore Wind Project: Generation Assets from north and travels southeast through the southern part of the South Morecambe gas field and to the north of the Morecambe Offshore Windfarm: Generation Assets. Route 2 joins Route 5 exiting the eastern side of the Morecambe Offshore Windfarm: Generation Assets and the aligned corridor (Route 2 and 5) then generally heads east to the landfall location at Lytham St Annes through the Liverpool Bay SPA and Fylde MCZ. Route 2 crosses eight assets (two telecom cables, four pipelines and four electrical platform lines).
Route 3	Route 3 offshore cable corridor is approximately 95 km to landfall. Route 3 exits the Morgan Offshore Wind Project: Generation Assets from the south and travels east, passing through the southern part of the South Morecambe gas field and to the north of the Morecambe Offshore Windfarm: Generation Assets. Route 3 joins Route 5 exiting the eastern side of the Morecambe Offshore Windfarm: Generation Assets and the aligned corridor (Route 3 and 5) then generally heads east to the landfall location at Lytham St Annes through the Liverpool Bay SPA and Fylde MCZ. Route 3 crosses eight assets (two telecom cables, four pipelines and four electrical platform lines).
Route 4	Route 4 offshore cable corridor is approximately 100 km to landfall. Route 4 exits the Morgan Offshore Wind Project: Generation Assets from the south and passes through the southern part of the South Morecambe gas field and to the south of the Morecambe Offshore Windfarm: Generation Assets. Route 4 joins Route 5 exiting the eastern side of the Morecambe Offshore Windfarm: Generation Assets and the aligned corridor (Route 4 and 5) then generally heads east to the landfall location at Lytham St Annes through the Liverpool Bay SPA and Fylde MCZ. Route 4 crosses five telecom cables.
Route 5	Route 5 is 42 km to landfall. Route 5 exits the eastern side of Morecambe Offshore Windfarm: Generation Assets and joins with Route 1, 2, 3 or 4 and the aligned cable corridor then generally heads east to the landfall location at Lytham St Annes through the Liverpool Bay SPA and Fylde MCZ. Route 5 crosses two telecom cables.

4.4.2 Selection of the Offshore Export Cable Corridors for PEIR

4.4.2.1 After completion of an initial constraints and feasibility analysis, Route 4 was discounted due to the numerous technical challenges associated with the telecom cables alignment and requirement for Route 4 to route through a narrow space between cables to the south of the Morecambe Offshore Windfarm: Generations Assets (see **Figure 4.6**). There was also an increased UXO risk which encroaches on the corridor in this area. As such, for PEIR, Routes 1, 2, 3 and 5 were taken forward as shown in **Figure 4.7**.

4.4.2.2 For PEIR, the offshore export cable corridor options exited the Morgan Offshore Wind Project: Generation Assets from either the north-eastern (Routes 1 or 2) or the southern (Route 3) boundaries, heading in a general easterly or south-easterly direction routing around existing oil and gas platforms and associated infrastructure, where possible. Route 5 exited to the east of the Morecambe Offshore Windfarm: Generation Assets travelling for a short distance to where Route 5 becomes aligned with the Routes 1, 2 and 3.

4.4.2.3 Where the Morgan Cable Route meets the Morecambe Cable Route (referred to as the Aligned Morgan and Morecambe Cable Route), the corridor width was expanded to accommodate all six offshore export cables (2.5 km for six cables) and then widened further to 4.5 km to enable crossing of existing telecom cables (Lanis 1 and Havhingsten) before it narrows to 2 km to run between the Havhingsten telecom cable to the north and Virgin Media Sirius South telecom cable to the south.

4.4.2.4 Cable corridor routes 1, 2, 3 and 5 were designed to be the shortest offshore export cable corridors, whilst minimising interactions with designated sites and other existing infrastructure (i.e. limiting cable / pipeline crossings). The PEIR offshore export cable corridors also minimised interaction with key vessel traffic routes and approaches to major ports as well as avoiding the herring spawning grounds to the northwest of the Transmission Assets and Outer Ribble Estuary protected shellfish waters.

4.4.2.5 Given the geographical location of the Generation Assets and landfall at Lytham St Annes, the refinement of the cable corridors for PEIR could not completely avoid the large extent of offshore designations that encompasses much of the east Irish Sea though the refined PEIR offshore cable routes looked to minimise the interaction with these designations as much as possible.

4.4.2.6 The Liverpool Bay SPA extends from Anglesey in Wales to Morecambe Bay in northwest England encompassing an area from mean low water springs to approximately 20 km offshore. As such, the offshore export cable corridor options were unable to avoid this designation; however, the cable route options take the shortest distance to landfall to minimise potential impacts within the Liverpool Bay SPA whilst avoiding proximity to the Lune Deep and Shell Flat SAC other designations to the north (see **Figure 4.7**).

4.4.2.7 The offshore export cable corridor also crosses the Fylde MCZ at its the narrowest point with the Morgan and Morecambe offshore export cable corridor joining to an aligned route prior to entering the MCZ to minimise potential impacts whilst also minimising the number of cable crossings within Fylde MCZ (**Figure 4.7**).

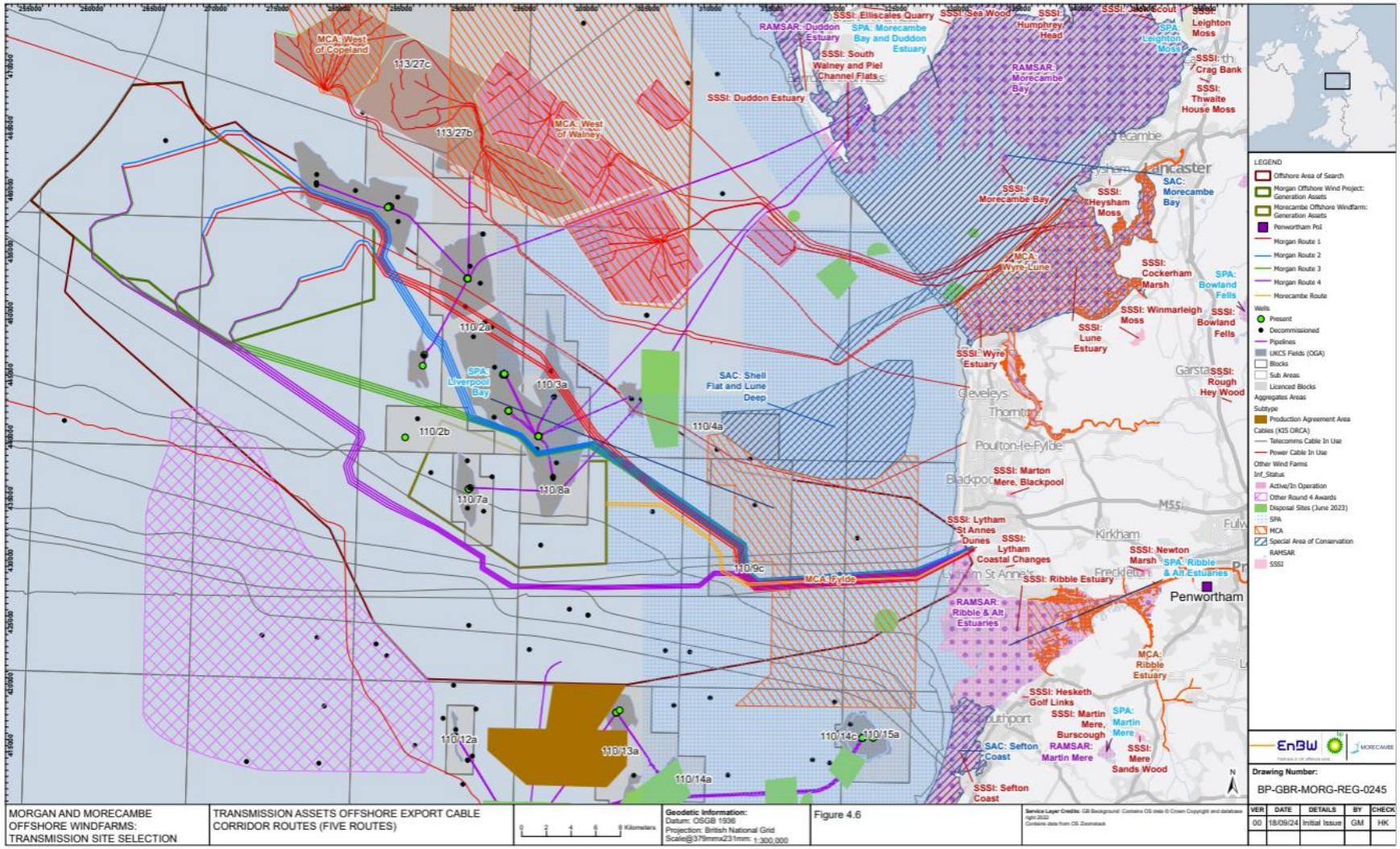

Figure 4.6: Transmission Assets offshore export cable corridor routes (Five Routes)

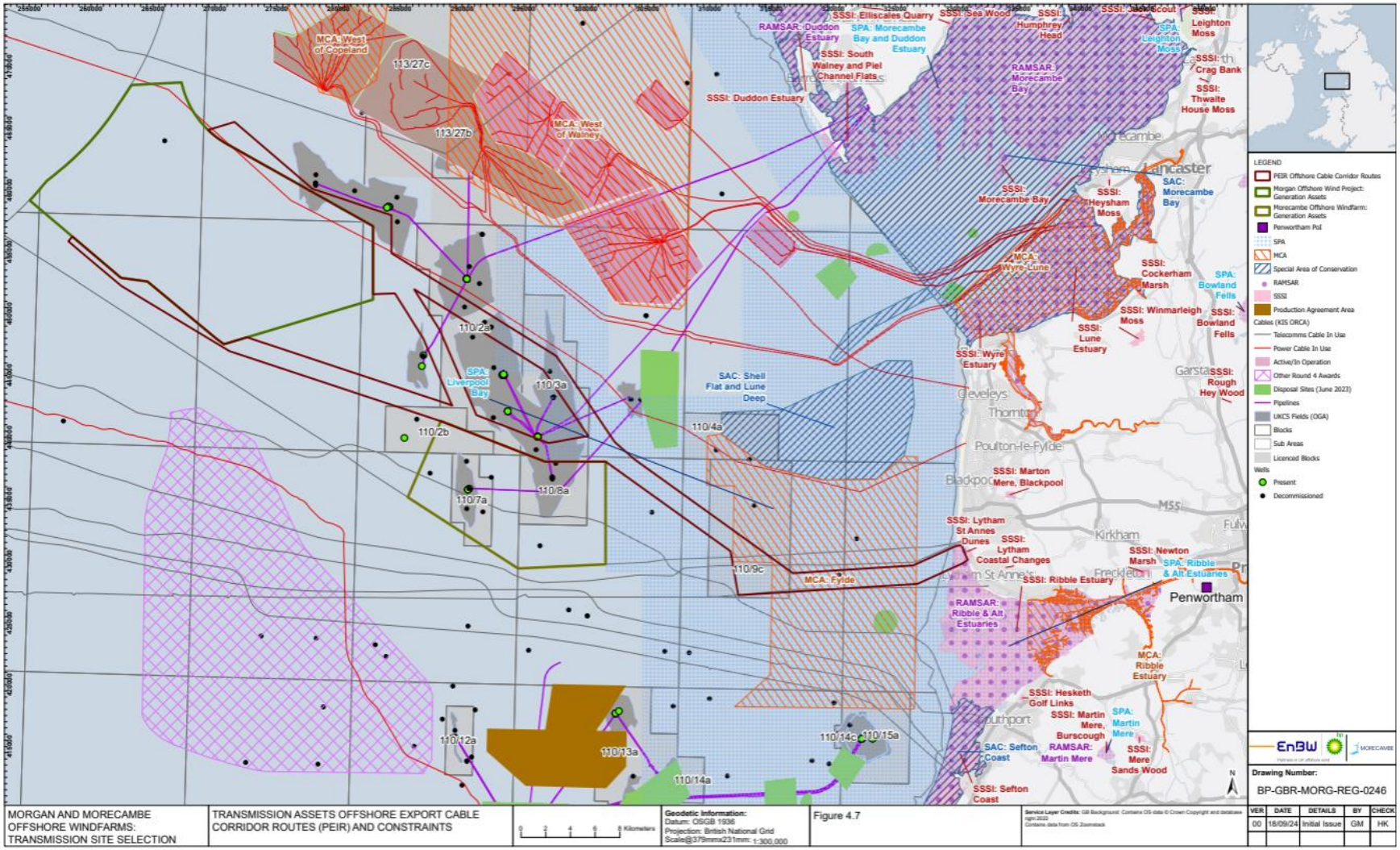

Figure 4.7: Transmission Assets offshore export cable corridor routes (PEIR) and constraints

4.4.3 Booster Station Search Areas

4.4.3.1 At PEIR, one offshore booster station was under consideration for the Morgan Offshore Wind Project. Offshore booster stations (also known as mid-point reactive power compensation substations) may be required in High Voltage Alternating Current (HVAC) transmission systems for longer offshore export cables. They are generally sited near the halfway point along an offshore export cable corridor. Two search areas were considered for the Morgan offshore booster station as shown on **Figure 4.8**.

4.4.3.2 The easterly search area was associated with Routes 1, 2 and 3 whilst the westerly search area was associated with Routes 2 and 3, noting that the booster station was subsequently removed from the design envelope after PEIR, as detailed in **Section 4.5.2**.

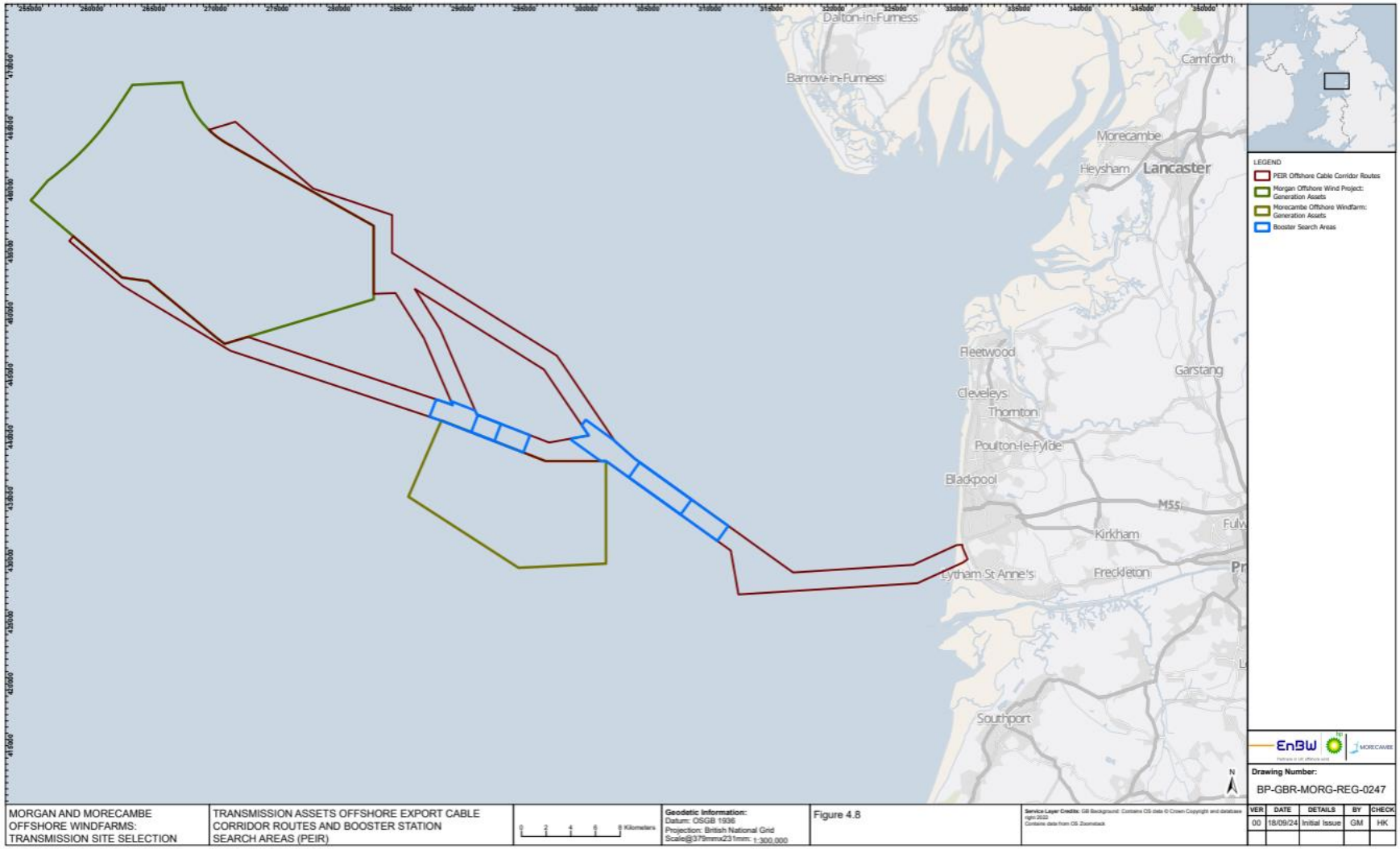

Figure 4.8: Transmission Assets offshore export cable corridor routes and booster station search areas (PEIR)

4.5 Stage 4b: Refinement of offshore infrastructure options for DCO Application

4.5.1 Refinements to Offshore Order Limits since PEIR

4.5.1.1 Following PEIR submission for the Transmission Assets, DCO applications were submitted for the Generation Assets. The Transmission Assets Offshore Order Limits have been aligned with the Morecambe Offshore Windfarm: Generation Assets order limits to remove the western portion of the Morecambe Offshore Windfarm: Generation Assets (see **Figure 4.9**).

4.5.1.2 There has also been a reduction of the north west corner of the Transmission Assets Order Limits (see **Figure 4.9**) to mitigate potential shipping and navigation impacts as raised by stakeholders during consultation, with further details within Volume 2, Annex 7.1: Navigational Risk Assessment of this ES.

4.5.2 Refinement of Offshore Infrastructure Design Envelope since PEIR

4.5.2.1 Following PEIR, changes to the design resulted in the removal of the offshore infrastructure elements from the Transmission Assets application as well as key refinements to the design envelope. These changes are detailed in **Table 4.4** with consultation detailed in Volume 1, Chapter 4: Site selection and consideration of alternatives.

Table 4.4: Summary of Project Design Envelope Changes since PEIR

PDE Change	Description
Removal of Offshore Substation Platforms (OSPs)	At PEIR, the OSPs and interconnector cables were included in both the Transmission Assets and Generation Assets. Stakeholder feedback during PEIR consultation raised that this approach was confusing and risked double-counting in cumulative assessments. As such, the six OSPs included in the Transmission Assets PEIR were removed. The OSPs are now solely included in the Morgan Offshore Wind Project: Generation Assets DCO and the Morecambe Offshore Windfarm: Generation Assets DCO.
Removal of interconnector cables	At PEIR, the OSPs and interconnector cables were included in both the Transmission Assets and Generation Assets. Stakeholder feedback during PEIR consultation raised that this approach was confusing and risked double-counting in cumulative assessments. As such, the interconnector cables included in the Transmission Assets PEIR were removed. The interconnector cables are now solely included in the Morgan Offshore Wind Project: Generation Assets DCO and the Morecambe Offshore Windfarm: Generation Assets DCO.
Removal of Offshore Booster Station (Search Areas)	Stakeholder feedback during PEIR consultation highlighted constraints associated with the booster station search areas. The easterly search area was located within the Liverpool Bay SPA and near the western boundary of the Fylde MCZ and stakeholders raised the potential for effects upon designated features of the SPA and MCZ. Additionally, shipping and navigation stakeholders raised its isolation from other infrastructure in regard to navigational safety. The westerly search area was in

PDE Change	Description
	proximity to the oil and gas platforms with constraints around line of sight and access, especially during an emergency. Upon review of further survey data and design constraints, the Morgan Offshore Booster Station was removed to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms.
Reduction in sandwave clearance volumes	Stakeholder feedback during PEIR consultation highlighted the large volumes of sandwave clearance included at PEIR. Subsequent analysis of further survey data indicated that seabed features are more prevalent within the western extents of the Offshore Order Limits which allowed for a significant reduction in sandwave clearance volumes from 60% of the length of the offshore export cables at PEIR to 9% for the Morgan Offshore Wind Project and from 30% at PEIR to 9% for the Morecambe Offshore Windfarm. Further analysis of seabed conditions within the Fylde MCZ (as detailed in the Outline Cable Burial Risk Assessment, document reference J14 and the Outline Offshore Cable Specification Plan, document reference J15), allowed sandwave clearance parameters to be further reduced through the Fylde MCZ from 60% for the Morgan Offshore Wind Project and 30% for the Morecambe Offshore Windfarm to 5% sandwave clearance of the offshore export cable routes within the Fylde MCZ.
Reduction in cable protection for ground conditions	Stakeholder feedback during PEIR consultation highlighted cable protection volumes as being large within the Fylde MCZ. Further analysis of seabed conditions within the Fylde MCZ (as detailed in the Outline Cable Burial Risk Assessment, document reference J14 and the Outline Offshore Cable Specification Plan, document reference J15) allowed further refinement of cable protection parameters within the Fylde MCZ. Cable protection for ground conditions was reduced from 20% of the offshore export cable route to 3% within the Fylde MCZ for the Morgan offshore export cables and from 15% to 3% for the Morecambe offshore export cables.

4.5.2.2 Full details of the project design envelope are presented in Volume 1, Chapter 3: Project Description of the ES.

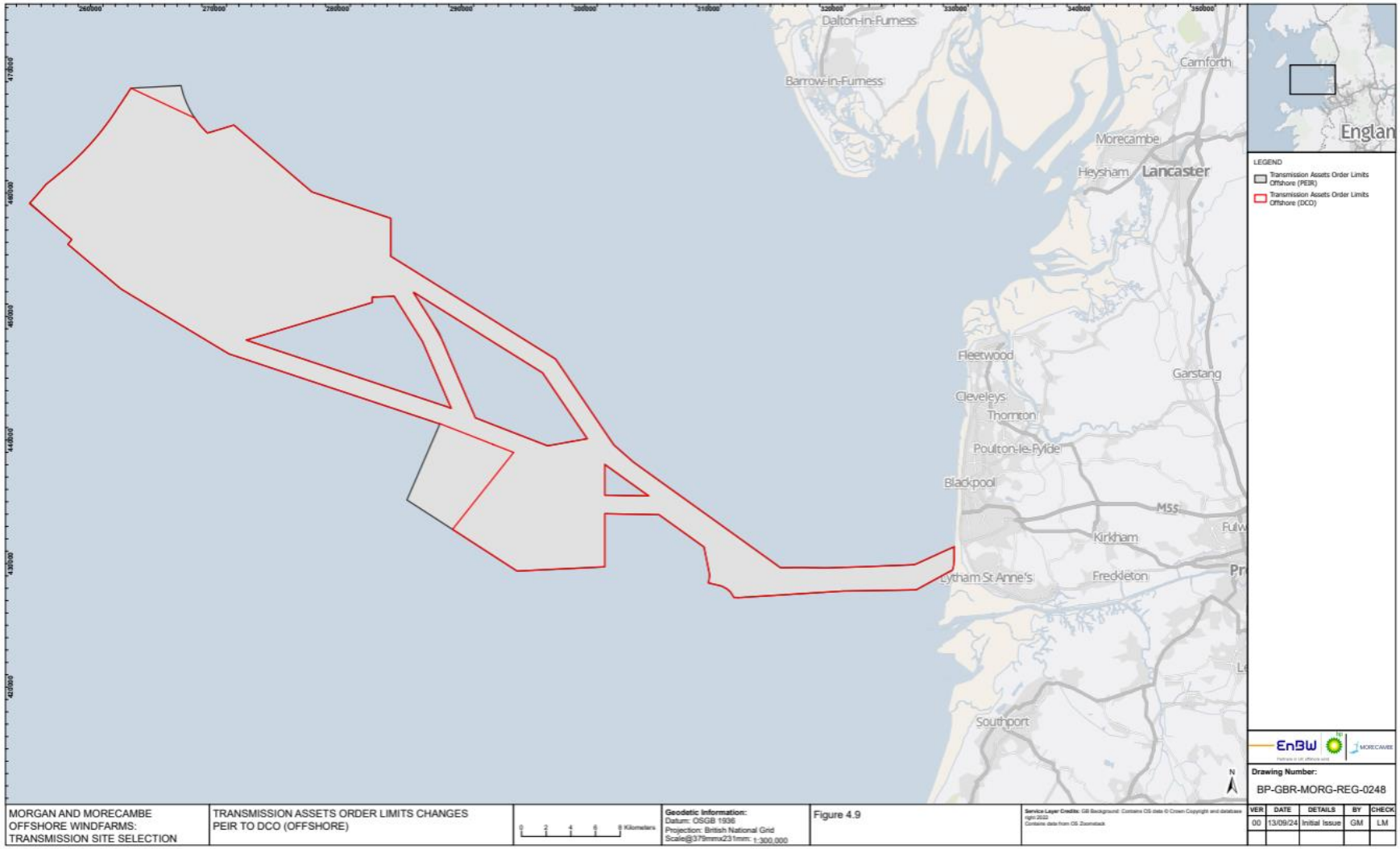

Figure 4.9: Transmission Assets Offshore Order Limit Changes between PEIR and DCO application

4.6 Conclusion

4.6.1.1 The final offshore export cable corridor route options as presented within this annex has evolved through a process of stakeholder engagement and a siting and design process that has sought to avoid and minimise environmental effects and existing infrastructure (see **Figure 4.10**).

4.6.1.2 The approach to the DCO application routes for the Morgan Offshore Wind Project (Routes 1, 2 and 3) is similar to the traditional funnel approach taken for other wind farm applications but with consideration of existing constraints within the area (e.g. routing around existing infrastructure as shown on **Figure 4.10**).

4.6.1.3 For the DCO application, the offshore export cable corridor as shown in **Figure 4.11** covers the full Generation Assets array area, as the location of the OSPs within the Generation Assets has not yet been identified. Due to the uncertainty around the final location of the OSPs and the outcome of pre-construction surveys, four offshore export cable corridors (Routes 1, 2, 3 and 5), as identified in Stage 3 PEIR, have been taken forward to Stage 4 DCO application.

4.6.1.4 The information presented and the decisions made were conducted by a multi-disciplinary team, taking into consideration stakeholder feedback and site specific data .

4.6.1.5 The final Order Limits taken forward for the Transmission Assets application for Development Consent is described and shown in Volume 1, Chapter 3: Project description.

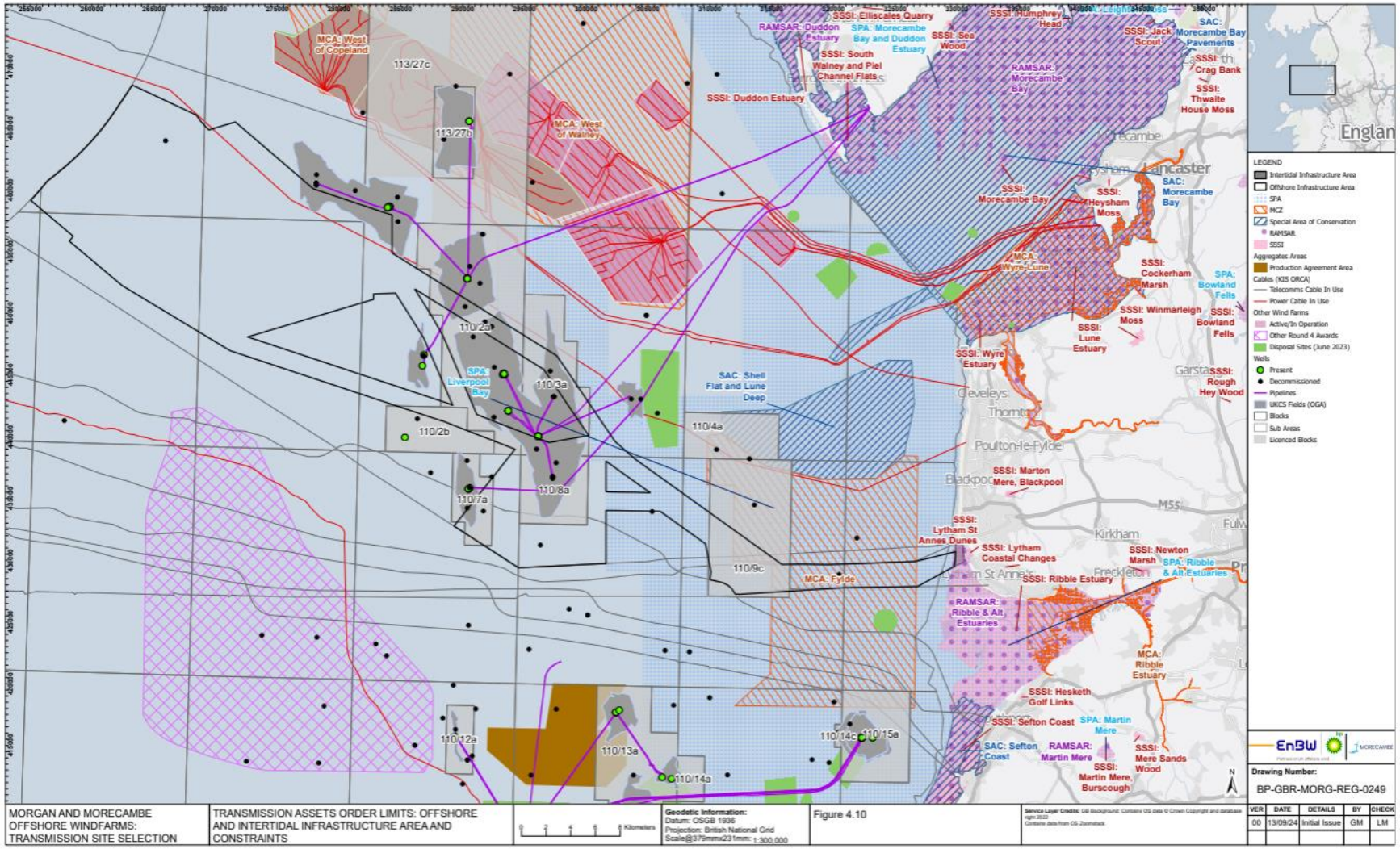

Figure 4.10: Transmission Assets Order Limits: Offshore and Intertidal Infrastructure Area and Constraints

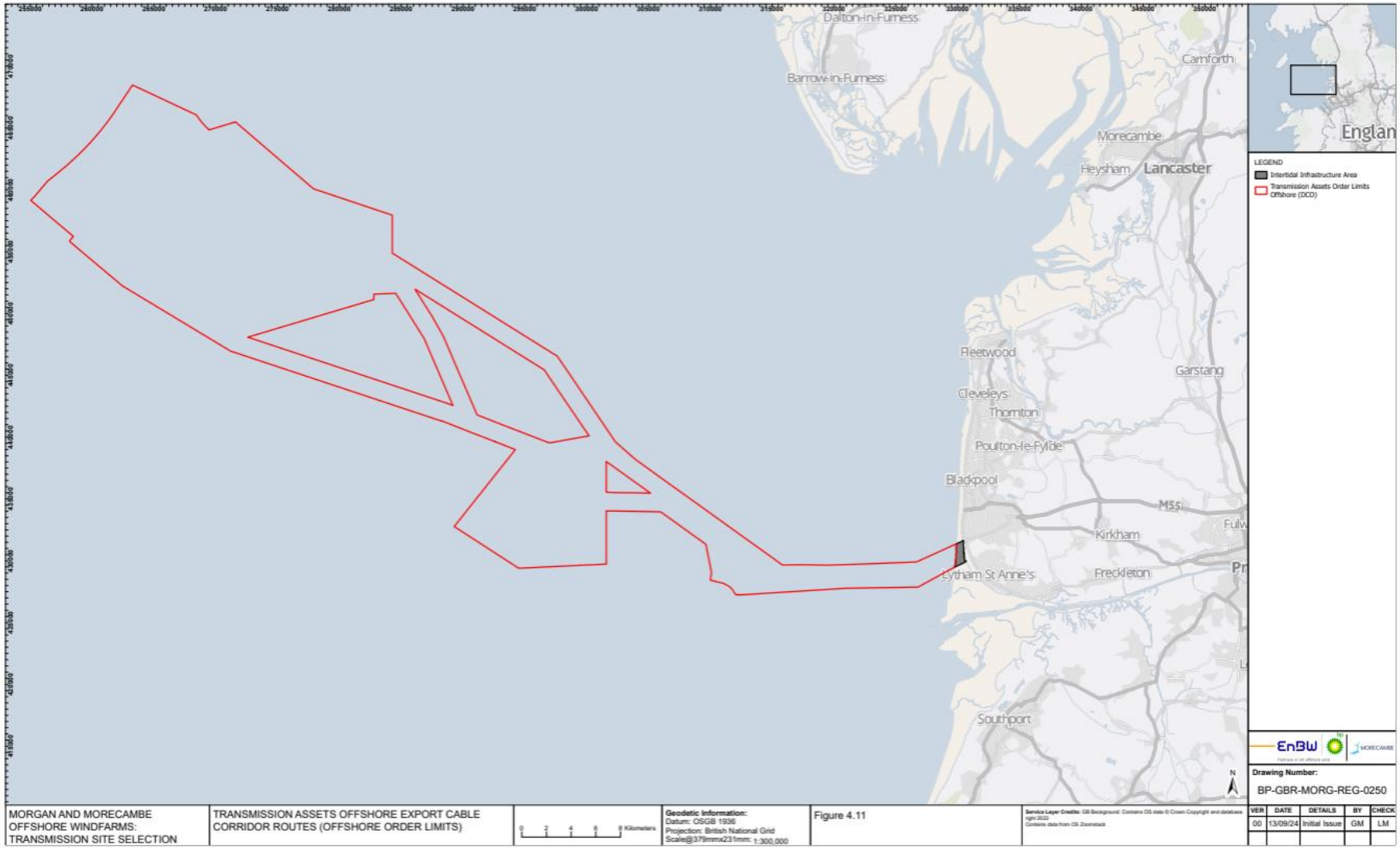

Figure 4.11: Transmission Assets offshore export cable corridor routes (Offshore Order Limits and Intertidal Infrastructure Area)

4.7 References

The Crown Estate. (2021). Cable Route Identification and Leasing Guidelines. Available online: The Crown Estate – Cable Route Identification & Leasing Guidelines

The Crown Estate. (2020). Offshore Leasing Round 4: Bidding Area Report

Defra (2011) Marine Policy Statement. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf. Accessed: September 2024

HM Government (2021b) North West Inshore and North West Offshore Marine Plan. Available at: North West Inshore and North West Offshore Marine Plan (publishing.service.gov.uk). Accessed: September 2024

Morgan OWL and Morecambe OWL (2022) Morgan and Morecambe Offshore Wind Farms: Transmission Assets Scoping Report. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020032/EN020032-000032-EN020028%20-%20Scoping%20Report.pdf Accessed: September 2024

Morgan OWL and Morecambe OWL (2023) Morgan and Morecambe Offshore Wind Farms: Transmission Assets Preliminary Environmental Information Report (PEIR). Available at: [redacted] Accessed: September 2024

National Grid (2003): Horlock Rules. Available at: https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf Accessed: September 2024

NGESO (2022) Pathway to 2030 Holistic Network Design.

Niras. (2022). Report to Inform Appropriate Assessment: Offshore Wind Leasing Round 4 Plan Level HRA. Available online: [redacted] Accessed: September 2024

Planning Inspectorate (2020) Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping.

Planning Inspectorate (2022) Scoping Opinion: Proposed Morgan and Morecambe Offshore Windfarms Transmission Assets [Online]. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020032/EN020032-000046-MMTA%20-%20Scoping%20Opinion.pdf Accessed: September 2024