# LLYR FLOATING OFFSHORE WIND PROJECT

# SCOPING REPORT

## Volume 1 – The Proposed Project

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## Acronyms and Abbreviations

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| AA | Appropriate Assessment | MCZ | Marine Conservation Zone |
| BEP | Best Environmental Practice | MHCLG | Ministry for Housing, Communities and Local Government |
| EC | European Commission | MHPA | Milford Haven Port Authority |
| EIA | Environmental Impact Assessment | MMO | Marine Management Organisation |
| EPS | European Protected Species | MW | megawatt |
| ES | Environmental Statement | NGET | National Grid Electricity Transmission |
| ESO | Electricity System Operator | NRW MLT | Natural Resources Wales Marine Licensing Team |
| ETI | Energy Technologies Institute | NSRA | Navigational safety risk assessment |
| GIS | Geographical Information System | O&M | Operation and Maintenance |
| GW | gigawatt | PCC | Pembrokeshire County Council |
| HDD | Horizontal Directional Drilling | PCNPA | Pembrokeshire Coast National Park Authority |
| HDPE | High Density Polyethylene | PEDW | Planning and Environment Decisions Wales |
| HRA | Habitats Regulations Assessment | PPW | Planning Policy Wales |
| Hs | Maximum wave height | S.36 | Section 36 |
| IEMA | Institute of Environmental Management and Assessment | SAC | Special Area of Conservation |
| IROPI | Imperative Reasons of Overriding Public Interest | SPA | Special Protection Areas |
| KIS-ORCA | Kingfisher Information Service – Offshore Renewable & Cable Awareness | SSSI | Site of Special Scientific Interest |
| kV | kilovolts | T&D | Test and Demonstration |
| LDP | Local Development Plan | TLP | Tension-leg platform |
| LMP | Lighting and Marking Plan | UK BAP | United Kingdom Biodiversity Action Plan |
| LPA | Local Planning Authority | UXO | Unexploded Ordnance |
| LSE | Likely Significant Effect | WFD | Water Framework Directive |

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# 1 INTRODUCTION

## 1.1 Overview

Floventis Energy (hereafter referred to as 'the Applicant') is developing proposals for two 100 megawatt (MW) floating offshore wind development projects (200 MW in total) in the Celtic Sea, known as Llŷr 1 and Llŷr 2 (hereafter referred to as 'the proposed Project').

This Environmental Impact Assessment (EIA) Scoping Report constitutes a request for a joint EIA Screening and Scoping Opinion regarding the proposed scope and approach to the EIA. A Screening and Scoping Opinion is requested from Natural Resources Wales (NRW) in accordance with the Marine Works (EIA) Regulations 2007 (as amended) and the Electricity Works (EIA) (England and Wales) Regulations 2017 (as amended). The following organisations will be consulted as needed:

- NRW – The Marine Works (EIA) Regulations 2007 (as amended); and
- Planning and Environment Decisions Wales (PEDW)[1] (acting on behalf of Welsh Ministers), Pembrokeshire County Council (PCC) and the Pembrokeshire Coast National Park Authority (PCNPA) – Section 36 consent under The Electricity Works (EIA) (England and Wales) Regulations 2017 (as amended).

## 1.2 The Proposed Project

### *1.2.1 Need for the proposed Project*

As part of their commitments to tackling climate change, the UK and Welsh governments have set a legally binding target to become net-zero in all greenhouse gases by 2050 for England and Wales. In addition, the Government has shown clear commitment to developing offshore wind at scale through the Ten Point Plan and Energy White Paper, identifying a target of delivering 40 gigawatts (GW) of wind energy by 2030 which is enough to power every home in the UK (Prime Minister and Department for Business, Energy and Industrial Strategy, 2020).

Average wind speeds in the Celtic Sea are high, meaning there is an opportunity to develop floating offshore wind in waters surrounding Wales and the south west (Offshore Renewable Energy Catapult, 2020). A study by Offshore Renewable Energy Catapult (2020) has highlighted to Wales the benefits of developing floating offshore wind and demonstrates (through modelling) the advantages of developing larger projects, such as reductions in cost.

The overall aim of the proposed Project is to deliver cost-efficient development sites to enable the demonstration of two new floating wind technologies – providing validation of the technology proposition and establishing a pathway to series production. Each project is focussed on a distinct and separate floating platform technology which individually has a need to demonstrate to allow progress to deployment at commercial scale. The proposed Project has an additional function to act as pathfinder projects to aid the establishment and development of an indigenous UK offshore floating wind industrial capability in the Celtic Sea region in preparation for the larger commercial opportunity for floating wind, not only within Wales and the UK, but the wider western European region. The aims and potential benefits of the proposed Project are to:

- Demonstrate different full-scale floating offshore wind technology solutions with a turbine capacity greater than 12 MW in UK waters;
- Optimize the design of floating wind arrays to reduce the costs of large scale floating offshore wind developments within the UK;

[1] On 1 October 2021 the staff and functions of Planning Inspectorate Wales transferred to PEDW.

- Contribute to the accelerated development of the UK floating offshore wind industry as a pathfinder project, piloting the development, construction, installation and operation of floating offshore wind at a large scale in UK waters;
- Contribute to the learning of how floating wind interacts at a large scale with the natural environment and local interests, to better understand the benefits and challenges and to identify opportunities to enhance the local environment; and
- Identify and maximize the potential opportunities and benefits to the local UK supply chain and employment.

### *1.2.2 Project Overview*

The Crown Estate confirmed their intention, subject to a Habitats Regulations Assessment (HRA), in July 2021 to lease two floating wind test and demonstration sites, the proposed Project, in the Celtic Sea to the Applicant. While the HRA is ongoing and awaiting the formal award of these lease areas by The Crown Estate, the proposed Project will progress with environmental assessments and surveys in line with the regulatory consent processes.

The proposed Project is a proposed floating offshore wind development in the Celtic Sea, within Welsh Waters, offshore from the Pembrokeshire coastline (see Figure 1-1). At its closest point, the boundary of the proposed Project is approximately 38 km from the Lundy Island shore and 31 km from the Welsh coastline.

The proposed Project consists of two adjacent array areas, known as Llŷr 1 and Llŷr 2, each with a capacity of up to 100 MW. Each Crown Estate Lease Option area (i.e. the array areas, Llŷr 1 and Llŷr 2) of the proposed Project covers an outline area of interest of 50 $km^2$, which will be refined through the EIA and design process (see Section 1.4). These areas represent an 'area of search' and the footprint will be reduced as the design development progresses and with input from stakeholder consultation and Crown Estate negotiation.

The proposed Project will comprise of the following main components to achieve a total installed capacity of 200 MW:

- Wind turbines, with a rating of between 12 and 20 MW per turbine;
- Floating offshore wind platforms and associated moorings;
- Offshore inter-array cables and up to one subsea connection point per project;
- Up to two electricity export cables per project following the same route to the landfall;
- Up to one transition joint bay / riser per project to connect the offshore cable to the onshore cable;
- Onshore cabling between the landfall and the grid connection;
- Onshore substation / control building near to the grid connection point; and
- Other associate infrastructure, such as navigational buoys.

An application has been submitted by Blue Gem Wind (Erebus) for a floating offshore wind development of up to 100 MW, approximately 1.7 km from the proposed Project. The Applicant intends to work with Blue Gem Wind to integrate the two developments as far as possible, which may include use of a common export cable route, grid connection location and substation / control building for the two projects.

### *1.2.3 Grid Connection*

The preferred grid connection location for the proposed Project is the National Grid operated Pembroke 132 kV Substation adjacent to Pembroke Power Station, and a Project grid connection application for connection at this location has been submitted by the Applicant. The National Grid

Electricity System Operator (ESO) will ultimately determine the connection location and timescale of the grid connection, which will be identified through an independent cost / benefit analysis by National Grid ESO. As such there remains the potential that the National Grid ESO may determine an alternate connection point, as shown in Figure 4-7. The point of connection and associated cable route will be defined in the ES.

The Crown Estate has announced an intention to unlock up to 4 GW of new floating wind capacity in the Celtic Sea by 2035 and to work with National Grid ESO and others to support a coordinated grid solution for floating wind projects in the area (The Crown Estate, 2021). This is in line with the work currently underway through the Offshore Transmission Network Review to accelerate grid development and mitigate impacts on communities onshore. The Applicant will work with other developers, the Crown Estate and the ESO to share infrastructure, share infrastructure routes and minimise construction disruption, aiming to minimise the cumulative environmental impacts with Erebus (and other relevant developments).

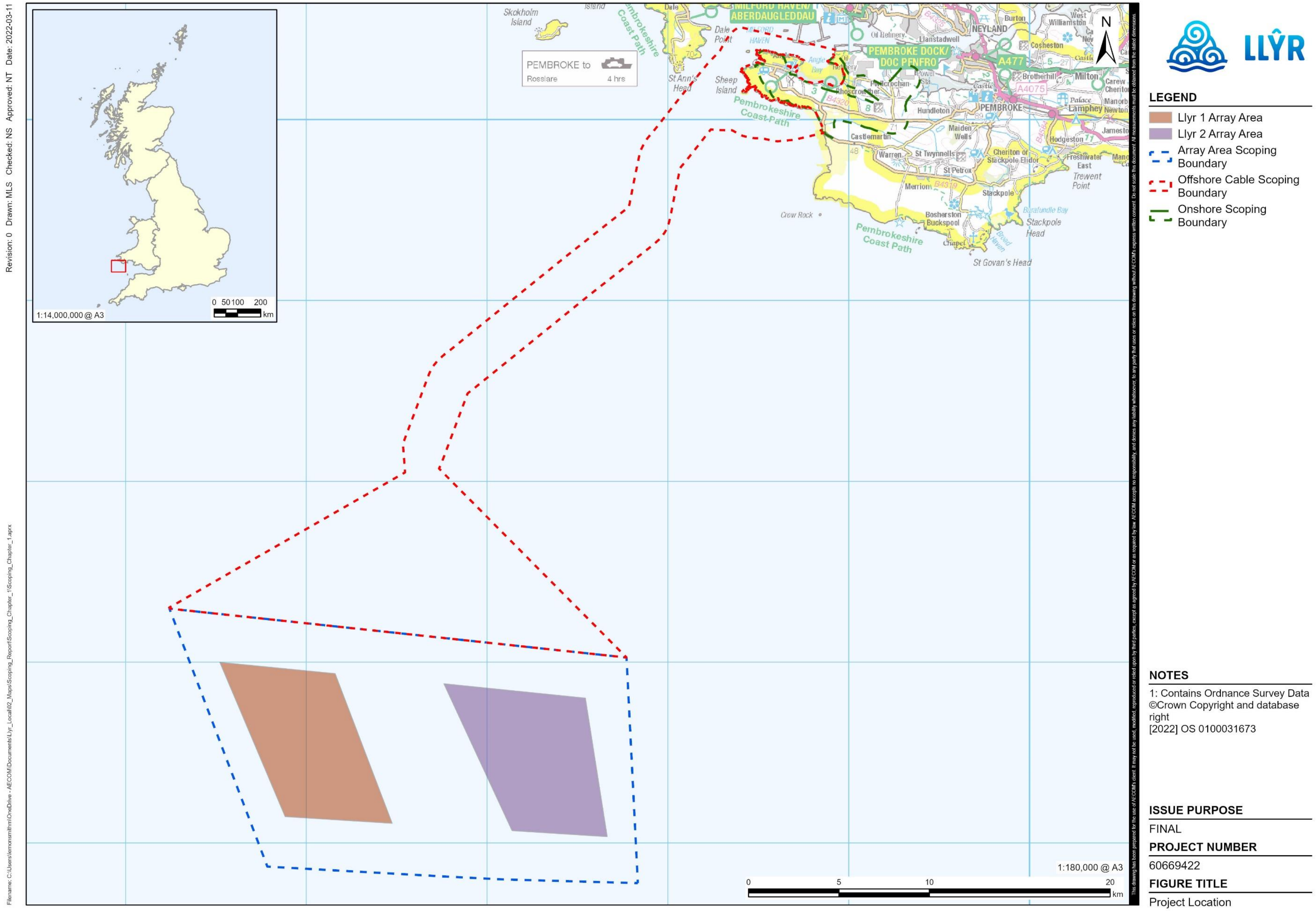


*Figure 1-1. Project Llyr location*

### 1.3 The Applicant

The Applicant, Floventis Energy, is a joint venture between the renewable energy project development company Cierco and SBM Offshore, who specialise in floating offshore energy. Floventis Energy has a goal of *"becoming a market leader in offshore floating wind power"* and is building a portfolio of projects with the aim of reaching full scale commercial development proposals by 2030.

### 1.4 Scoping Boundary

Figure 1-1 shows the Scoping Boundary upon which this Scoping Report is based (hereafter referred to as the 'Array Area Scoping Boundary', 'Offshore Cable Scoping Boundary' and 'Onshore Scoping Boundary'). The Array Area Scoping Boundary incorporates both the Llŷr 1 and Llŷr 2 arrays. The Scoping Boundaries represent the footprint within which the proposed Project infrastructure will be placed and is used to inform this Scoping Report, and will be refined through the design and EIA process.

The Array Area and Offshore Cable Scoping Boundaries intersect with a number of designated sites:

- Skomer Marine Conservation Zone (MCZ);
- Castlemartin Coast Special Protection Area (SPA);
- Skomer, Skokholm and the Seas off Pembrokeshire SPA;
- Pembrokeshire Marine Special Area of Conservation (SAC);
- Limestone Coast of South West Wales SAC;
- West Wales Marine SAC;
- Bristol Channel Approaches SAC;
- Arfordir Penrhyn Angle/ Angle Peninsula Coast Site of Special Scientific Interest (SSSI);
- Broomhill Burrows SSSI;
- Castlemartin Range SSSI; and
- Milford Haven Waterway SSSI.

The Onshore Scoping Boundary passes through the Castlemartin Coast SPA, Pembrokeshire Marine SAC, Limestone Coast of South West Wales SAC, and several SSSIs. More information on the designated sites is provided in Volume 4.

### 1.5 Structure of the Scoping Report

This Scoping Report follows the structure set out below:

- **Volume 1 – The Proposed Project**

  1. Introduction – provides a general overview of the proposed Project;
  2. Regulatory and Planning Policy Context – sets out relevant national and local planning policy and consenting requirements;
  3. Site Selection – summarises the site selection process;
  4. Description of the Project – provides a description of the main components of the proposed Project;
  5. EIA Approach and Methodologies – explains the overall approach and proposed methodology to be followed in this EIA;
  6. Approach to the Environmental Statement – describes the overarching approach proposed for the Environmental Statement (ES);

- **Volume 2 – Terrestrial**

  7. Seascape, Landscape and Visual;
  8. Ecology and Biodiversity;

9. Historic Environment and Cultural Heritage;
10. Water Environment;
11. Geology and Hydrogeology;
12. Agriculture and Soils;
13. Traffic and Transport;
14. Aviation and Radar;
15. Air Quality;
16. Noise and Vibration;
17. Socio-economics, Recreation and Tourism;
18. Health and Wellbeing;

- **Volume 3 – Marine**

19. Physical Environment;
20. Benthic Ecology;
21. Fish and Shellfish Ecology;
22. Marine Mammals;
23. Ornithology;
24. Marine Archaeology;
25. Shipping and Navigation;
26. Commercial Fisheries;
27. Other Sea Users;

- **Volume 4 – Project Wide Effects**

28. Designated Sites;
29. Climate Change and Major Accidents and Disasters;
30. Combined and Cumulative Effects of the Project; and
31. Conclusions.

### 1.6 References

Offshore Renewable Energy Catapult, 2020. *Benefits of Floating Offshore Wind to Wales and the South West*. [Online]. Available at: https://www.marineenergywales.co.uk/wp-content/uploads/2020/01/Benefits-of-Floating-Offshore-Wind-to-Wales-and-the-South-West.pdf [Accessed: 11 February 2022].

The Crown Estate, 2021. *Celtic Sea Floating Wind Programme*. [Online]. Available at: https://www.thecrownestate.co.uk/media/3982/celtic-sea-floating-wind-position-paper.pdf [Accessed: 11 February 2022].

Wave Hub, 2020. *European Regional Development Fund.* [Online]. Available at: https://www.wavehub.co.uk/pembrokeshire-wave-zone [Accessed: 11 February 2022].

## 2 REGULATORY AND PLANNING POLICY CONTEXT

### 2.1 Introduction

The following chapter details the regulatory and planning policy context of the proposed Project, including the main consents that will be required prior to construction and operation. Details of the key documents that will be required to accompany the consent applications are also provided, including an Environmental Statement (ES) documenting the Environmental Impact Assessment (EIA) process.

## 2.2 Consents to Install and Operate an Offshore Energy Installation

### *2.2.1 Consents Required*

The following primary consents are required for the proposed Project:

- Section 36 (S.36) consent to construct and operate an offshore generating station, under the Electricity Act 1989. This would include deemed planning permission[2] for onshore works. Given that deemed planning permission would be sought, a separate planning application under the Town and Country Planning Act 1990 would not be required. The S.36 application would be consented by the Planning and Environment Decisions Wales (PEDW), administering on behalf of the Welsh Ministers[3]; and
- A Marine Licence consented under Part 4 of the Marine and Coastal Access Act 2009 to carry out certain activities in the marine environment, including construction works on the seabed, depositing substances or articles and dredging. The Natural Resources Wales Marine Licensing Team (NRW MLT) administers marine licences on behalf of the Welsh Ministers.

To support the primary consent applications, an EIA and HRA are required. Details of these elements are provided in Sections 2.3 and 2.4 respectively.

It is recognised that the UK left the European Union on the 31 January 2020. However, at the time of writing, all legal obligations regarding compliance with environmental permitting and legislation continue to apply. This document is therefore produced in compliance with all existing and relevant EU and UK environmental legislation.

### *2.2.2 Consenting Authorities*

#### 2.2.2.1 Section 36 Consent with Deemed Planning Permission

Section 36 (10) of the Electricity Act 1989 provides that the Welsh Ministers are the appropriate authority in respect of applications for S.36 consent for generating stations between 1 MW and 350 MW. Projects with a capacity of over 350 MW would require an application for a Development Consent Order under the Planning Act 2008 Section 15(3B), provided that the project is in waters adjacent to Wales up to the seaward limited of the territorial sea, or in the Welsh Zone[4].

The Project is not a Development of National Significance, a consenting regime for medium to large scale infrastructure in Wales consented under the Planning (Wales) Act 2015, as this consenting regime is restricted to terrestrial projects and so does not cover offshore wind farms.

S.36 applications are administered by PEDW on behalf of Welsh Ministers and, following an appropriate consultation period (and hearings if necessary), the Inspector will submit their report to the Welsh Ministers for determination. Planning permission can be deemed to be granted with a S.36 consent under Section 90(2) of the Town and Country Planning Act 1990 (as amended by S.21 of the Growth and Infrastructure Act 2013).

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[2] Deemed planning permission would be sought from Welsh Ministers through a direction under section 90(2A) of the Town and Country Planning Act 1990 for the onshore development authorised by the Order.

[3] This consenting route was introduced for offshore wind schemes in Welsh waters between 1 and 350 MW under Section 39 of the Wales Act 2017, which came into force on 1 April 2019. Previously these consents would have been determined by the Marine Management Organisation.

[4] The Welsh Zone is as defined in the Government of Wales Act 2006 Section 158, meaning *'the sea adjacent to Wales which is—(a)within British fishery limits (that is, the limits set by or under section 1 of the Fishery Limits Act 1976), and (b) specified in an Order in Council under section 58 or an order under subsection (3).'*

PEDW wrote to Floventis on 25 November 2021 confirming that the Welsh Ministers are satisfied that:

- NRW will undertake an assessment of any significant effect on the environment under the Marine Works (EIA) Regulations 2007;
- This assessment will be sufficient to meet the requirements of the EIA Directive; and
- NRW will make this assessment available for the purposes of determining the applications under S.36 of the Electricity Act 1989.

Therefore, under powers provided by Regulation 39 (2) of the 2017 Regulations, the Welsh Ministers have decided there is no need to assess the environmental effects of the proposed Project under the 2017 Regulations. Paragraphs (3) to (10) of Regulation 39 of the 2017 Regulations will now apply to the determination of the S.36 application(s). In other words, whilst two separate consent applications are required, the two are inextricably linked. It is NRW who will effectively assess the potential significant effects using the Environmental Statement and no decision can be made on the S.36 application until NRW has concluded the marine works assessment carried out for the Marine Licence.

The onshore works will be located in the Local Planning Authority (LPA) areas of PCC and PCNPA. Therefore, PCC and PCNPA would be statutory consultees on both applications. The Welsh National Marine Plan (Welsh Government, 2019), is the main decision-making document for applications for a Marine Licence, although other national and local planning documents would be material in decision making.

In 2018 the Welsh Government announced its intention to identify a ‘one stop shop’ infrastructure consent in Wales known as the Welsh Infrastructure Consent. This consent is intended to consolidate existing consents under the Town and Country Planning Act, Electricity Act and a number of other consents into a single type of consent. For offshore development, this could help address the fact that the Electricity Act does not provide certainty on timeframes or provide the one-stop-shop for consents that the development industry requires. No timescale has been announced for the introduction of the new consent so it is considered highly unlikely that the regime, if introduced, would apply to this proposed Project.

#### 2.2.2.2 Marine Licence

NRW MLT administers Marine Licence applications under the Marine and Coastal Access Act 2009 for licensable marine activities within Welsh inshore and offshore waters.

Prior to April 219, NRW MLT administered marine licences for projects within Welsh inshore waters out to 12 nautical miles (nm) only. The Wales Act 2017 transferred functions for marine licensing beyond 12 nm to the median line, from the Marine Management Organisation to Welsh Ministers. Subsequently, Welsh Ministers delegated this function to NRW MLT.

As set out in Section 2.2.2.1, NRW MLT will lead on the EIA for both the Marine Licence application and the S.36 consent, as Regulation 39 has been invoked by Welsh Ministers.

## 2.3 Environmental Impact Assessment

The EIA Directive (2014/52/EU) requires that public and private projects that are likely to have significant effects on the environment, by virtue of their size, location or nature, be made subject to an assessment prior to consent being given. The following regulations transpose the EIA Directive (2014/52/EU) into UK legislation and apply to the proposed Project:

- The Electricity Works (EIA) (England and Wales) Regulations 2017 – applies to applications for S.36 consent under the Electricity Act 1989; and

- The Marine Works (EIA) Regulations 2007 (as amended) – applies to applications for a Marine Licence under the Marine and Coastal Access Act 2009.

Under both regulations listed above, the proposed Project would be considered a Schedule 2 development requiring screening to identify if EIA is required. Schedule 2 developments require screening to identify if EIA is required whereas Schedule 1 developments always require EIA. A separate EIA Screening Request has not been submitted for the proposed Project, however this report is intended to act as both an EIA Screening and Scoping Request. As defined in the EIA Regulations and due to the Project type, scale and location in relation to sensitive areas, an EIA will be required. This was agreed through initial discussions with PEDW, detailed in Section 2.2.2.1. The proposed Project falls under the following EIA Regulations:

- *1. Development to provide a generating station (other than a generating station of a description set out in paragraph 1 of Schedule 1)* under Schedule 2 of The Electricity Works (EIA) (England and Wales) Regulations 2017; and
- *21. Installations for the harnessing of wind power for energy production (wind farms)* under Schedule A2 of The Marine Works (EIA) Regulations 2007 (as amended).

A copy of this EIA Scoping Report has been submitted to PEDW, for deferral to NRW MLT for the S.36 consent and a copy submitted to NRW MLT for the Marine Licence application.

Details of the proposed methodology for the EIA are provided in Chapter 5 below. This section also includes a list of relevant EIA guidance and details the 'Project envelope' approach to assessment that will be adopted in the EIA. This approach, which is well-established for EIAs of offshore renewable projects, ensures that the worst-case scenario is assessed for each EIA topic.

## 2.4 Conservation of Habitats and Species Regulations and Habitats Regulations Assessment

The aims of the EC Habitats Directive (Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) and Birds Directive (2009/147/EC) are to maintain or restore European protected habitats and species; contribute to a coherent European ecological network of protected sites by designating SACs and SPAs; and ensure appropriate assessment of plans and projects likely to have a significant effect on the integrity of an SAC/SPA.

As a matter of UK policy, internationally designated wetland sites, Ramsar sites, are also considered through the HRA process.

The UK has transposed the Directives into law through a series of regulations, referred to as the Habitats Regulations. Those relevant to the proposed Project are:

- The Conservation of Habitats and Species Regulations 2017 (as amended) (apply to terrestrial and territorial waters out to 12 nm); and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (apply to the UK's offshore water area i.e. from 12 nm from the coast out to 200 nm, or to the limit of the UK Continental Shelf Designated Area).

Following the UK's exit from the EU and end of transition period on the 31 December 2020, various pieces of legislation have been passed to remove the domestic constitutional basis for EU law in the UK. This includes changes to the 2017 Habitats Regulation (above) through The Conservation of Habitats and Species and Planning (Various Amendments) (England and Wales) Regulations 2018 and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

The amendments that have been applied aim to provide legal certainty and minimise disruption following EU exit. Legislation has been maintained as closely as possible to that which was already in place, to ensure the Regulations continue to have the same working effect following the UK's exit from the EU. Overall, the legislative changes do not result in material changes in how HRAs are undertaken in the UK.

References to "European sites" and "Natura 2000 sites" throughout this report, are to be read as references to "European sites within the UK national site network, (as defined by Regulation 3 of the Conservation of Habitats and Species Regulations 2017)" designated before the UK left the EU or designated after the UK left the EU under transposing regulations (Department for Environment, Food and Rural Affairs, 2020).

Due to the proximity of European Sites to the proposed Project, an HRA will be required to assess whether the proposed Project will have a likely significant effect on the integrity on any European site, either individually or in combination with other plans or projects. Where a significant effect cannot be excluded beyond reasonable scientific doubt at the screening stage, an Appropriate Assessment will be required to assess the implications of the proposed Project on the site's conservation objectives.

To undertake the HRA as required by the Regulations, it is the developer's responsibility to provide the competent authority with such information as may reasonably be required "for the purposes of the assessment" or "to enable them to determine whether an appropriate assessment is required" (European Commission, 2018). The relevant competent authorities are NRW MLT for the Marine Licence and the Welsh Ministers, administered by PEDW, for the S.36 consent.

Further details of the proposed approach to the HRA process are provided in Section 5.4.1.

## 2.5 Marine Conservation Zone Screening Assessment

Alongside Marine Licensing, a fundamental component of the Marine and Coastal Access Act 2009 (Section 126) is the provision of powers to the appropriate authority to designate Marine Conservation Zones (MCZs); in England and Wales. MCZs set out to protect a range of nationally important marine wildlife, habitats, geology and geomorphology, and can be designated anywhere in English and Welsh territorial and UK offshore waters. In Wales, the process is managed by the Welsh Ministers. A proposed project must demonstrate that the development will not affect the conservation objectives of MCZs.

A MCZ Screening Assessment will be prepared to identify any aspects of the proposed Project that could cause an adverse effect on the integrity of MCZs and advise on additional assessment and/or appropriate mitigation required where such effects are identified. See Section 5.4.2 for the proposed approach to the MCZ Assessment.

## 2.6 Water Framework Directive Assessment

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 implement the Water Framework Directive (WFD) (2000/60/EC) in England and Wales. The WFD provides protections to different waterbodies, including transitional and coastal waterbodies, with the aim of improving ecological and chemical waterbody condition. WFD waterbodies can extend out to 1 NM, and to 12 NM for the chemical waterbody status. Development must demonstrate that a project will not cause "deterioration in the waterbody", documented through a WFD Assessment.

Compliance with the WFD is separate from the EIA process, however the environmental assessments will be coordinated with the EIA. A more detailed methodology for the WFD assessment is provided in Section 5.4.3.

## 2.7 Secondary Consents

In addition to the primary consents, the following secondary consents and approvals may be required for the proposed Project:

- Declaration, pursuant to Section 36A of the Electricity Act, to extinguish public rights of navigation where the floating offshore wind structures are located;
- Safety Zone application as set out in the Energy Act 2004 and under the amendments to The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 introduced by The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) (Amendment) (Wales) Regulations 2019;
- European Protected Species Derogation Licence issued under the Conservation of Habitats and Species Regulations 2017 to undertake works that may affect European Protected Species (EPS) administered by NRW; and
- Site of Special Scientific Interest (SSSI) Consent / Assent for works that may affect a SSSI, administered by NRW.

## 2.8 Coordination of Consenting

It is the intention of the Applicant to twin track the submission of the application for S.36 consent with deemed planning permission, with the Marine Licence application. The Project application submissions for both the S.36 consent and Marine Licence will be supported by one ES, covering offshore and inshore marine, coastal and terrestrial environments.

It is understood that a submission will be made to PEDW for the S.36 with deemed planning and to NRW for the Marine Licence. Each will be accompanied by a common ES, although NRW will lead on the processing of the EIA. Each submission will also be accompanied by sufficient information for both competent authorities to undertake an HRA.

The ES will include sufficient information to meet the requirement of the following national and local policy considerations:

- **The Conservation of Habitats and Species Regulations 2017 (as amended) and associated Regulations:** Recognising any impacts arising from the proposed Project on European Protected Species and the requirement for derogation licences (see Section 2.4 for further detail);
- **Water Framework Directive (WFD):** Assessment of potential impacts and possible non-compliance with any relevant WFD objectives (as discussed in Section 2.7);
- **Marine and Coastal Access Act 2009:** In respect of a Marine Licence and potential impacts on Marine Conservation Zones;
- **UK Marine Policy Statement (Her Majesty's Government, 2011):** The submission will be in accordance with the policies set out in the UK Marine Policy Statement. The high level marine objectives of the UK Marine Policy Statement are to promote sustainable economic development, enable the UK's move towards a low-carbon economy, ensure a sustainable marine environment and contribute to the societal benefits of the marine area;
- **The Well-being of Future Generations (Wales) Act 2015:** To provide a framework for the consideration of social, economic, environmental and cultural impacts on the well-being of Wales, climate change being integral to those goals;
- **The Environment (Wales) Act 2016:** Recognition of policy and area statements to reflect the priorities and opportunities for Wales' natural resources, including provisions relating to marine licensing;

- **Planning Policy Wales (PPW) (Welsh Government, 2018):** Recognition of current planning policy set out in PPW Edition 11, such as the inclusion of large scale wind energy development to Welsh Government's vision for future renewable energy production;
- **Welsh National Marine Plan (Welsh Government, 2019):** The submission will be in accordance with the policies, including a compliance assessment to ensure marine resources are used in a sustainable way in line with the high-level marine objectives. Sector objective 1 of the low carbon sector policy includes supporting the deployment of offshore wind technologies, as a proven and strategically important energy technology;
- **Relevant Welsh Area Statements developed by NRW (2022):** Using the themes in the Marine Area Statement (buildings resilience of marine ecosystems, nature-based solutions and adaptation at the coast and making the most of marine planning) and South West Area Statement (reducing health inequalities, ensuring sustainable land management, reversing the decline of and enhancing biodiversity and mitigating and adapting to a changing climate); and
- **Local Development Plans (LDPs):**
  - Pembrokeshire County Council Local Development Plan (2013) – the PCC LDP will be referred to for any terrestrial elements of the proposed Project that are within PCC's jurisdiction. Offshore wind energy is noted as a potential technology that could contribute to Policy GN.4 which seeks to enable the supply of renewable energy through environmentally acceptable solutions;
  - Pembrokeshire Coast National Park Local Development Plan 2 (adopted 2021) – works, within the jurisdiction of PCNPA, will be in accordance with the relevant LDP policies, such as Policy 29 on sustainable design, Policy 33 on renewable and low carbon energy and associated Supplementary Planning Guidance.

Topic-specific legislation and guidance is also provided in each technical chapter (Volumes 2 to 4), as appropriate.

## 2.9 Consultation to Date

Effective stakeholder engagement and consultation is crucial to secure buy-in from statutory bodies and local communities, increase policy compliance and deliver a project that responds to its location. The process of consultation is also critical to the development of a comprehensive and balanced ES. The views of a range of stakeholder groups – technical, statutory, external and community based – will serve to focus necessary environmental studies and identify specific issues that require further investigation.

Consultation will be an ongoing process, where feedback from stakeholder groups will be used to further refine and enhance the Project wide approach. Stakeholder engagement for the proposed Project is based on the following core principles:

- Early and ongoing engagement to inform Project progression and to secure consent from the respective authorities;
- Ensuring appropriate consultation is undertaken in compliance with the requirements of the consents outlined in Section 2.2;
- Building of long-term relationships with key stakeholders throughout the different stages of the proposed Project to help better understand their views, underpinned by open and honest dialogue; and
- Where possible and practicable ensuring concerns are addressed, and potential mitigations investigated.

The proposed Project has a wide range of stakeholders (including local authorities, landowners, statutory bodies, local communities and specialist interest groups) with differing interests that will require varied levels of consultation. Specific communication activities will be focused to meet the needs of particular individuals and groups. This requires an understanding of the stakeholders and their interests in the proposed Project. As a first step, a comprehensive Stakeholder Mapping exercise has been undertaken where key stakeholders have been captured and collated into a tracker. As engagement progresses each stakeholder or group of stakeholders will be categorised in relation to their influence and interest in the proposed Project.

Engagement with stakeholders will be focused on two specific workstreams – a public consultation phase and stakeholder workshops. Engagement at a planning and technical level will be undertaken throughout the life of the proposed Project and captured in the Stakeholder Engagement tracker.

The main pillars of proactive stakeholder engagement envisaged are outlined below:

- Six weeks of public consultation. This is expected to include a virtual consultation room and physical events to be held in community venues;
- Virtual briefings with local authorities, elected representatives and other key local interest and community groups;
- Production of a consultation report outlining engagement and feedback;
- Exchanges of correspondence, meetings and workshops with local community groups and businesses (online or in person, as appropriate); and
- A series of up to 10 technical forums pertaining to onshore and marine issues.

A summary of preliminary discussions with regulatory and statutory bodies to date is presented in Table 2-1.

*Table 2-1. Summary of consultation to date*

| Consultee | Date(s) | Purpose | Outcome |
|---|---|---|---|
| Planning Inspectorate | 15 November 2018 | Email introduction to Applicant and presentation of the proposed floating wind innovation and demonstration zone. | Initial meeting proposed and arranged. |
| Natural Resources Wales | 15 November 2018 | Email introduction to Applicant and presentation of the proposed floating wind innovation and demonstration zone. | Initial meeting proposed and arranged. |
| Welsh Government | 16 January 2019 | Introduction to the Applicant's proposal to wider members of the Welsh Government team. | Agreement to maintain contact as proposal develops. |
| Natural Resources Wales | 14 February 2019 | NRW email clarification to understand potential project. | Clarification email sent by Applicant to NRW on 15 February 2019. |
| Planning Inspectorate | 17 January 2019 | Inception meeting to discuss the Applicant's Innovation and Demonstration Zone. | Identification of key considerations to bring forward in the technology demonstration project. |
| Natural Resources Wales | 18 February 2019 | Email of completed Discretionary Advice Service (DAS) form and provision of further information on proposed way forward in bird monitoring. | NRW reviewed proposal prior to meeting. |
| JNCC | 19 February 2019 | Email follow up to a phone conversation. | Provision of information on the proposed floating wind innovation and demonstration zone. |
| Natural Resources Wales | 21 February 2019 | Email confirmation of DAS and quotation for meeting. | NRW confirm earliest meeting date is 15 March. |
| Welsh Government and ORE Catapult | 15 March 2019 | Follow up to discuss the Applicant's Innovation and Demonstration Zone further. | Clarification on the proposal and identification of key Welsh policies, organisation and aspects that need to be addressed in bringing the proposal forward. |

| Consultee | Date(s) | Purpose | Outcome |
|---|---|---|---|
| Natural England | 11 March 2019 | Email introduction to the Applicant and presentation of the proposed floating wind innovation and demonstration zone. | Provision of information following conversation with NRW about potential transboundary issues. |
| Natural England (NE) | 13 March 2019 | Phone call with Natural England. | Confirmed Natural England won't attend meeting on the 15th and that NE consider there should only be one Statutory Nature Conservation Body involved in consultation on the proposal. NE believes that the Joint Nature Conservation Committee and NRW will come to an agreement on who the lead Statutory Nature Conservation Body will be and they will represent all three bodies from the nature conservancy point of view. |
| Natural Resources Wales and Joint Nature Conservation Committee | 15 March 2019 | Meeting and video conference to discuss the Applicant's Innovation and Demonstration Zone. | NRW / Joint Nature Conservation Committee explained that understanding the risks to marine mammals, especially the anchoring methods, is key to establishing the survey needs. Baseline characterisation following a review of existing data was therefore required. Understanding the seasonality of mammal movements / presence is also important. |
| Welsh Government | 29 July 2021 | Catch up meeting and update on progress with proposal and notification of Crown Estate intent to award lease agreement pending HRA. | Agreement to keep Welsh Government up to date on progress on activities, particularly around port infrastructure and to ensure that your project requirements are reflected in Welsh government thinking. |
| Welsh Government | 13 August 2021 | Introduction of the Project to wider Welsh Government team. | Further discussion on development of Welsh supply chain and exchange of information and ideas on future development. |
| NRW MLT and DAS | 19 November 2021 | Introduction to the Project. | Overview of the Project provided. |

| Consultee | Date(s) | Purpose | Outcome |
|---|---|---|---|
| Planning and Environment Decisions Wales | 25 November 22 | PEDW response to Applicant’s Request for EIA deferral. | EIA Deferral Direction. PEDW to defer to NRW to undertake an assessment for any significant effect on the environment under the Marine Works (EIA) Regulations 2007. |
| Planning and Environment Decisions Wales | 17 February 22 | Requested clarification on the ability to consent onshore works via deemed consent in the Section 36 application. | PEDW confirmed that onshore works could be consented via deemed consent in the Section 36 application. |

### 2.10 References

Department for Environment Food & Rural Affairs (Defra), 2020. *Guidance to the UK Marine Policy Statement from 1 January 2021*. [Online]. Available at: https://www.gov.uk/government/publications/uk-marine-policy-statement/guidance-to-the-uk-marine-policy-statement-from-1-january-2021 [Accessed: 11 February 2022].

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Welsh Government, 2018. *Planning Policy Wales*. [Online]. Available at: https://gov.wales/planning-policy-wales [Accessed: 11 February 2022].

## 3 SITE SELECTION

### 3.1 Site Selection Process

The Applicant first developed the concept for the floating offshore wind projects in the summer of 2018. At that stage the whole of the United Kingdom was considered, with the initial selection of an appropriate region and development area determined through the following step by step considerations:

(a) Engaging with key stakeholders at a strategic level to help inform the development strategy;

(b) Optimising the development opportunity through the identification of the most technically and environmentally suitable development site; and

(c) Site refinement through consideration of potential interactions with existing and potential seabed users across a selected region.

The suitability of the seabed areas was evaluated based on the restrictions that were present. Restrictions are defined as policies, activities, developments, technical complexity, or interests which may not preclude development, but are considered in the planning of the proposed Project.

The identification of the proposed Project location was an iterative process which was undertaken over 18 months, as information sources and stakeholder views were assessed and evaluated.

## 3.2 Key Strategic Regulatory and Stakeholder Views

### *3.2.1 UK and Devolved Administrations Policy Environment*

A stated above, the whole of the United Kingdom was considered at an early stage. An initial high-level consideration of the potential regional economic and policy support for floating wind technology projects and conversations with key policy stakeholders. The following policy decision had an impact on the identification of the development region:

(a) The Crown Estate Scotland (CES) closed their test and demonstration lease process in September 2018 in preparation for their ScotWind commercial lease process. Crown Estate Scotland has only recently (February 2022) announced their intent to reopen the test and demonstration process through their INTOG proposal after the ScotWind process had concluded. This ruled out the ability to host the proposed Project in Scottish waters during the initial development period;

(b) There was no support mechanism within the devolved Northern Ireland administration or ability to create one during the period of site selection, as it was suspended between January 2017 and January 2020. Although this situation has recently changed with positive messages being promoted by the Northern Ireland administration on Test and Demonstration opportunities, the political uncertainty before 2020 was too high of a development risk at the time of identifying the appropriate site in 2018/19.

As a result, the regional area of search was confined to the English and Welsh regions.

### *3.2.2 National Grid Electricity Transmission and Grid Connection Capacity*

Grid capacity for renewable energy developments on the scale of 200 MW is heavily dependent on accessing a grid connection at a reasonable economic base. Information was gathered through initial conversations with the National Grid Electricity Transmission (NGET) and a subsequent published study (Poffley, 2018) on the modelling and analysis of future electricity markets within the UK and Europe. The NGET analysis concluded that new offshore wind situated in Southern England and Wales resulted in cost savings to consumers due to their proximity to high demand zones and exporting interconnectors. As a result, the Applicant concentrated their focus in these areas.

### *3.2.3 Regional Economic Support, Regulatory Authorities and Development Risk*

Regionally, the Applicant was attracted to Wales and South West England due to their supportive economic and carbon targets, marine and energy infrastructure, and favourable offshore wind resources. Two areas were identified as appropriate development sites for floating offshore wind with significant technical and environmental information as they had been subject to previous fixed foundation offshore wind development proposals: a site in North Wales and a site in the Bristol Channel. Both developments undertook the initial steps in Project consenting, which provided significant information on both the environmental characteristics of the area and potential views of stakeholders on offshore wind development proposals.

Meetings were held with the Planning Inspectorate[5], Natural Resources Wales, the Welsh Government, and industry organisations such as Offshore Renewable Energy Catapult to explore the proposals and understand the economic, regulatory, and political environments in both areas.

#### *3.2.4 The Crown Estate*

As the owner of the seabed and administrator of the Test and Demonstration seabed lease process, the Crown Estate is the ultimate decision maker on where an offshore wind demonstration project can be located. A series of meetings were held between 2018 and 2019 to identify an appropriately scaled development in a suitable area. Both development areas were discussed and, following the publication of the Crown Estate's Offshore Wind Leasing Round 4 areas for commercial scale lease opportunities, it was decided to concentrate on the Western Approaches and Bristol Channel area to avoid conflict with the Round 4 and associated HRA processes.

### 3.3 Identification of the Optimum Technical and Environmentally Suitable Site

Following the selection of the Western Approaches and Bristol Channel region as the preferred development location, an internal site selection process was carried out over the spring of 2019. The process appraised the potential constraints / key considerations to identify suitable areas for development, including a range of engineering, environment, and economic considerations. The environmental and technical information came from a variety of sources including a previous development proposal, available bathymetric and seabed geology datasets, environmental information from the statutory nature conservation groups and infrastructure information available from the Crown Estate.

From a technical point of view there are three hard constraints that must be addressed for a floating offshore wind farm to be viable, which are:

- Water depths (a minimum of 45 m is required);
- Wind resource and potential energy yield; and
- Seabed conditions / characteristics.

Once the above are addressed, the following secondary criteria were considered where there is an element of flexibility to the siting of the development:

- Grid connection options;
- Shipping and navigation;
- Visual impact;
- Fishing effort;
- Civil and military aviation;
- Construction and operational & maintenance (O&M) ports; and
- Marine ecology, including internationally designated sites; other nature conservation designations; Annex 1 Habitats (not part of a designated site); ornithology; and features of marine ecological interest.

The site identification process used a Geographical Information System (GIS) which enabled layering of relevant spatial constraints from existing sources to produce a series of constraints maps to help identify areas within the general Western Approaches and Bristol Channel region. The maps were used to:

- Confirm areas that were not subject to hard constraints;

[5] The functions of Planning Inspectorate Wales transferred to Planning and Environment Decisions Wales on 1 October 2021.

- Confirm areas with fewer secondary constraints and of least environmental sensitivity; and
- Inform the proposed area of search for the seabed lease application.

The constraints mapping exercise informed an initial development strategy that evolved as discussions with stakeholders developed to minimise the potential areas of conflict.

### 3.4 Site Refinement

The initial development area proposal focussed on the western edge of the original development area with the intent to maximise the use of existing baseline environmental data gathered as part of that abandoned project. Whilst the bathymetry, water depths and most environmental data was positive, following a review of stakeholder feedback, ecological sensitivities and environmental designations, the development area shifted further to the west.

The new western area identified raised further concerns on potential impact and conflict with seabed cabling, the proximity of a marine conservation zone, military training area and Pembrokeshire wave demonstration development which led to the identification of the proposed location for the proposed Project, which were the subject of a Phase 1 application for Test and Demonstration (T&D) leases. The areas considered during site refinement are set out in Figure 3-1.

It is recognised that all areas of the UK seabed are currently used by differing interests at different levels of intensity. The site selection process has been designed to minimise disruption to the majority of stakeholders and natural assets. However, it is also recognised that the Project location still has areas of potential interaction that will require active management, but it is currently thought that these aspects can be resolved through the development process. Considerations include:

- There is one abandoned oil and gas wellhead within the Array Area and Offshore Cable Scoping Boundary. Further details of the nature and decommissioned status of the wellhead are currently unknown. Mitigation measures, such as use of a buffer zone or exclusion zone around the abandoned wellhead may be required to ensure installation and operation and maintenance activities can be undertaken safely. The mitigation measures will be addressed as part of detailed design; and
- Marine traffic to the west of the Array Area and Offshore Cable Scoping Boundary. There is evidence of regular tanker movements and occasional fishing activity / transits across the western edge of the development area. Further engagement with these local stakeholders through the navigational risk assessment process and fisheries evaluation will seek to identify local solutions to ensuring that an accommodation can be reached which is acceptable to all interests.

The Applicant has a long history of working and reaching acceptable solutions with local stakeholders on marine renewable developments and is committed to ensuring that local stakeholders have the opportunity to raise their concerns and achieve mutually agreeable solutions. In moving forward with this development, the Llŷr Project team will undertake a robust stakeholder engagement process and seek to minimise potential impacts with existing interests in the area (as discussed in Section 2.9).

### 3.5 Conclusion

The Array Area, Offshore Cable and Onshore Scoping Boundaries represent an ‘area of search’ that will be refined through detailed site investigations and stakeholder engagement, to provide a balance between environmental constraints and the need to maintain design flexibility and economic viability. It represented the Applicant’s view of an optimised development location that minimised stakeholder impact, whilst achieving the required economic and technical objectives.

As a result, the Applicant submitted the Test and Demonstration Lease applications in the identified area on 30 October 2019. The application process was paused at the request of the Crown Estate, whilst it considered the HRA implications of the Test and Demonstration application and of a wider early-commercial scale floating wind strategy in the Celtic Sea.

The key factors which led to the selection of the proposed Project are:

- Available wind resource, with the estimated mean annual wind speed at 100 m exceeding 10 m/s;
- Each location has minimised its visibility and potential conflict with inshore uses as, at its closest point, the edge of each project is approximately:
  - 38 km (Llŷr 1) and 50 km (Llŷr 2) from the Lundy Island shore;
  - 67 km (Llŷr 1) and 57 km (Llŷr 2) from the Devon coastline;
  - 38 km (Llŷr 1) and 31km (Llŷr 2) from the Welsh coastline;
- Water depths and ground conditions are suitable for a number of mooring and anchor types;
- There are several electrical infrastructure connection points near the adjacent coastline to enable an efficient connection to the National Grid;
- There is good access to suitable ports and local supply chain for construction and operations. There are also nearby facilities for fabrication, assembly, and maintenance support. The distance to these facilities is important during operations as it enables shorter response times for servicing, maximising the operational availability and economic feasibility of the wind farm;
- There are no known active telecommunication cables, submarine cables, aquaculture, or aggregate interests in the development area; and
- It avoids Military Practice Areas and areas of Intense Military Aerial Activity.

### 3.6 References

Poffley, T., 2018. *Offshore Wind constraints Study on behalf of the Crown Estate*. National Grid


*Figure 3-1. Site refinement*

# 4 DESCRIPTION OF THE PROJECT

## 4.1 Overview of Technology

Conventional fixed bottom offshore wind is limited in application in that it is restricted to areas of shallow seabed. In contrast, floating offshore wind, which consists of floating substructures anchored to the seabed, can exploit deeper offshore waters whilst remaining economically viable. It is estimated that in Europe, 80% of the potential offshore wind resource is found in waters of 60 m or deeper (WindEurope, 2017). In developing offshore wind in far-shore deep-water locations there is the potential to harness a stronger and more consistent wind resource than is available closer to shore (Crown Estate Scotland and Offshore Renewable Energy Catapult, 2018). Work by the Energy Technologies Institute (ETI) as part of their Offshore Wind Programme highlighted that floating offshore wind has the potential to represent a significant proportion of the UK's low carbon energy source, consisting of a safe and secure option which would also be very cost-effective (ETI, 2015). However, ETI highlighted that in order for there to be the large-scale deployment of floating wind in the UK by the mid-2020s, demonstration projects will need to be developed sooner.

Floating offshore wind represents an exciting opportunity to utilise the full extent of offshore wind resource potential in the UK, which is already a global leader in this sector. The proposal for the Llŷr projects consists of two 100 MW demonstration projects, known as Llŷr 1 and Llŷr 2. The establishment of the two demonstration sites that form the proposed Project will provide a facility to demonstrate new models of floating offshore wind technology, which will be used to generate clean electricity from a renewable source of energy, the wind.

The proposed Project will comprise of the following components, depicted in Figure 4-1:

- Wind turbines, with a rating of between 12 and 20 MW per turbine;
- Floating offshore wind platforms and associated moorings;
- Offshore inter-array cables with up to one subsea connection point per project;
- Up to two electricity export cables per project following the same route to the landfall;
- Up to one transition joint bay / riser per project to connect the offshore cable to the onshore cable;
- Onshore cabling between the landfall and the grid connection;
- Onshore substation / control building near to the grid connection point; and
- Other associated infrastructure, such as navigational buoys.

It is anticipated that the proposed Project would be operational for a period of 25 years from final commissioning, followed by a decommissioning process.

The description of the proposed Project is based on a 'design envelope' which captures the full range of potential design options and is intended to provide enough flexibility to accommodate further expected refinement in design as the proposed Project moves through the consenting process (see Section 5.1.3). This section describes the different Project elements, for which maximum values provide a 'realistic worst-case scenario'. For example, several cable construction scenarios are considered in this Scoping Report to ensure the assessment of potential effects remains comprehensive.

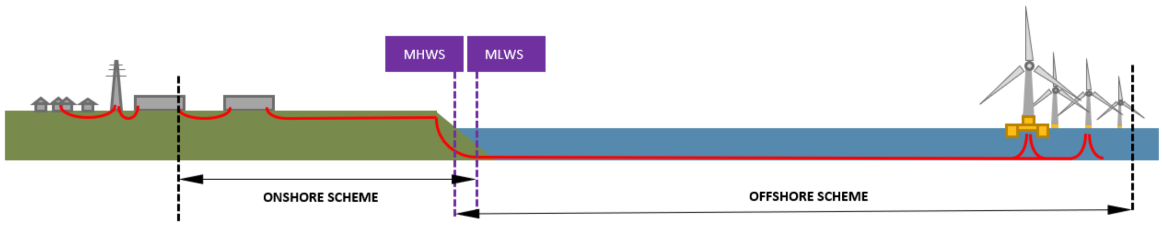



*Figure 4-1. Overview of floating offshore wind technology*

## 4.2 Offshore Infrastructure

The offshore infrastructure consists of wind turbines secured to floating offshore wind platforms moored to the seabed via anchoring systems. Each turbine will have an electrical cable connection to the wind farm inter-array cable network. One export cable will take the electricity from the wind farm array for each project onshore.

### *4.2.1 Wind Turbines*

The proposed turbine design will be visually similar to a 'conventional' offshore wind turbine, though the internal technical design differs and the turbine is larger with a higher generation capacity.

The main characteristics and specifications of the proposed wind turbines are shown in Table 4-1. The final Project parameters will be defined by a number of factors, including the choice of floating foundation solution.

*Table 4-1. Proposed wind turbine parameters*

| Feature | Indicative parameter |
|---|---|
| Number of blades | 3 |
| Tower type | Tubular steel |
| Orientation | Upwind |
| Direction of rotation | Clockwise |
| Maximum rotor diameter | 255 m |
| Maximum tip height above sea level | 290 m |
| Minimum blade clearance above sea level | 22 m |
| Capacity | Up to 20 MW |
| Swept Area | 51,071 $m^2$ |
| Number of turbines | Up to 8 per project |
| Design life | 25 years |
| Maintenance and operational access | Boat and helicopter |

It is envisaged that the bottom end of the wind turbines will be painted yellow (RAL 1004 Golden Yellow). Above 15 m, the structure, turbine and blades will be painted grey (RAL 7035 Light Submarine Grey). The final wind turbine markings will be agreed in a Lighting and Marking Plan (LMP) that will be developed and agreed with relevant stakeholders prior to construction.

Offshore wind technology is developing rapidly. This means the anticipated technology may be outdated or unavailable at the time of commissioning and construction. Whilst this Scoping Report aims to propose future-proof parameters and a reasonable description of the Project, a flexible approach is required to enable the use of the more appropriate and efficient technology at the time of construction. In the meantime, and to ensure that the realistic worst-case scenario is considered in this scoping document, estimated design parameters presented here seek to reflect those options that may be anticipated to result in a 'worst case' environmental impact. The ES will present a clearly defined description of the proposed Project and assessment of the worst-case scenario, as detailed in Chapter 5.

#### 4.2.1.1 Array Layout

Each array will follow either a grid, an offset grid (see Figure 4-2) or straight line layout:

- **Grid layout** – where the rows of turbines are located downwind and crosswind; or
- **Offset grid layout** – where the turbines are positioned offset to the crosswind rows, perpendicular to the prevailing wind direction.

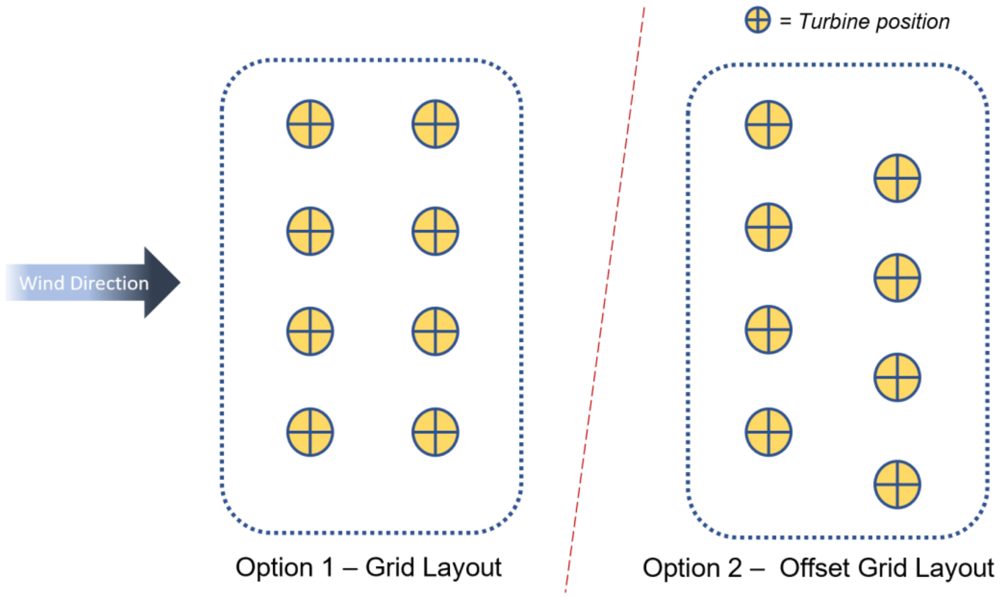



*Figure 4-2. Turbine array layout options*

The turbines operate by facing the rotor blades into the predominant wind direction, rotating to maximise power output depending on wind speed. Each turbine operates independently and will be monitored and controlled through a remote computer system. Array layout options will be defined in the ES including minimum and maximum spacing for turbines and the boundary within which all wind farm infrastructure will be located.

### *4.2.2 Floating Offshore Wind Platforms*

An offshore floating wind structure provides a platform base for a wind turbine in deep offshore waters as an alternative to fixed bottom foundations. Each wind turbine will be mounted to a floating platform, which has three key components:

1. A **mooring** system – which anchors the structure to the seabed;
2. A **substructure** – a floating structure made from concrete and/or steel that supports the wind turbine; and
3. A **transition piece** – that provides the connection between the substructure and wind turbine tower.

The floating platform technologies being considered consist of three design concepts (Figure 4-3):

- Barge;
- Semi-submersible; and

- Tension-leg platform (TLP).

Development of National Significance (DNS) consent

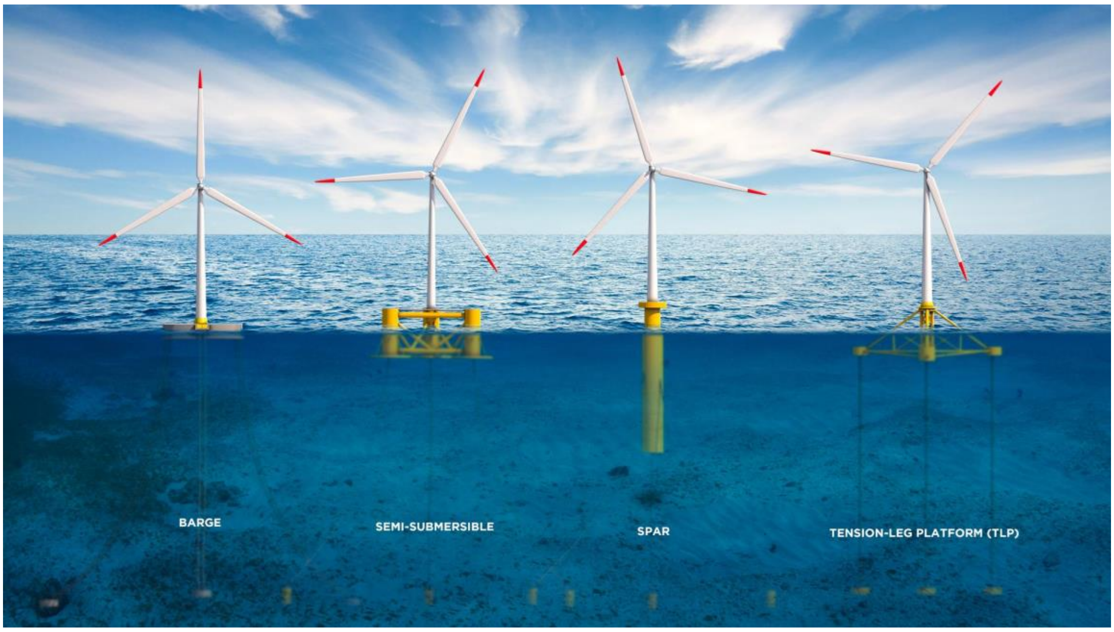



*Figure 4-3. Floating wind platform technologies*

The proposed Project location is not suitable for the spar design, as water depths are not sufficiently deep.

Both barges and semi-submersible platforms achieve their stability through the buoyancy of the semi-submerged platforms. The buoyant stable platforms are anchored to the seabed with catenary mooring lines. The platforms have a relatively large footprint compared to the TLP solution.

A TLP is a semi-submerged buoyant structure that achieves stability through line tension on mooring lines. Structures are typically smaller and lighter than barge or semi-submersible platforms.

It should be noted that floating offshore wind platforms, irrespective of design, are not stationary like fixed bottom offshore wind turbines. The platforms move with the water conditions, although the mooring systems restrain the platform excursions and motion within certain allowable limits. In addition to the pitch and roll platform motions, movement from its natural neutral position can be offset by around 25 m depending on the type of floating platform employed.

#### 4.2.2.1 Mooring System

The following mooring systems are under consideration:

- Tensioned moorings;
- Catenary spread moorings; and
- Catenary single point moorings.

The mooring system will be selected following additional design and technical studies, and will be defined in the ES. This will include details of the proposed mooring configuration and the proposed distance between each anchor, the anchor clumps (if used), mooring lengths and any chains on the seabed. Potential impacts of all of the potential mooring solutions are presented in Volumes 2 to 4.

#### 4.2.2.2 Tensioned Moorings

Tensioned (or taut) moorings will consist of a bundle of at least three tensioned moorings, each linking to one anchor. The buoyancy of the floating platform and the firm anchor to the seabed maintain tension to provide stability for the platform. Tensioned moorings have a smaller mooring footprint and require certain anchor types to withstand the uplift force. The mooring line can incorporate synthetic fibres or steel wire.

#### 4.2.2.3 Catenary Spread Moorings

With catenary moorings the weight and curved shape of the mooring line holds the floating platform in place. The mooring lines can be made from steel chains/ wires or synthetic fibres. The lower section of the mooring system rests on the seabed, supporting the anchor and acting as a counterweight in stormy conditions. Buoyancy elements (typically weighing a net 20 tonnes) could also form part of the mooring leg mainly to prevent the synthetic rope touching the seabed. Catenary mooring configurations are used for semi-submersible platforms and commonly use drag embedment anchors, though other anchor types can be used. More information on anchor types is provided in Section 4.2.2.4. In a catenary mooring arrangement each mooring line grouping are attached to each extremity of the floating platform.

#### 4.2.2.4 Catenary Single Point Moorings

Although using the same type of catenary mooring configuration, a 'single point mooring' system consists of a turret assembly that is integrated into the vessel through beam frames (Figure 4-4.). The turret system contains a bearing system that allows the vessel to rotate around the fixed geostatic point of the platform, where all mooring lines converge. This allows the platform weathervane to rotate until its principal axis is self-aligned to the wind direction. This arrangement is commonly used in the turret elements of Floating Production Storage and Offloading units in the oil and gas industry.

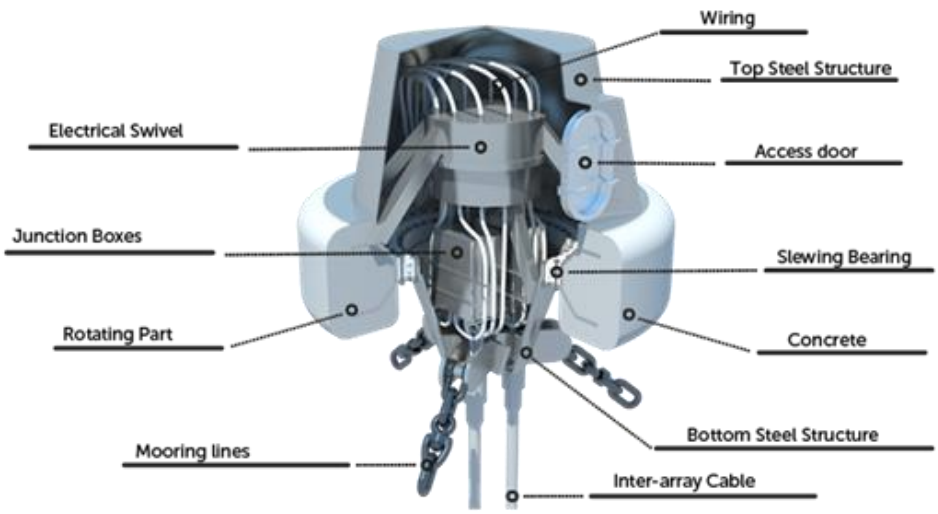



*Figure 4-4. Catenary mooring configuration*

#### 4.2.2.5 Anchor Types

The selected anchor solution will depend on the mooring configuration, seabed conditions and the required holding capacity.

Anchors being considered are as follows:

- Drag embedment;
- Suction bucket;
- Vertical loaded;
- Gravity;
- Dynamically installed;

- Pile driven;
- Pile drilled and grouted;
- Micro piles (acting as a group with a pile cap); and
- Screw pile.

#### 4.2.2.6 Drag Embedment Anchors

Drag embedment anchors use a drag and penetration arrangement, where the anchor is installed by being dragged along the seabed until it reaches the required depth and holding capacity. The anchor is then held in place by soil resistance.

#### 4.2.2.7 Suction Bucket Anchors

Suction bucket anchors comprise of a steel cylinder skirt, shaped like an upturned bucket. The weight of the structure allows the anchor to penetrate the seabed, from which a suction vacuum is applied until the bucket is fully submerged. The vacuum is created by pumping out the water from inside the bucket, creating a negative pressure which pulls the anchor to the ground. The size and diameter of the suction bucket varies according to the soil and sediment conditions of the seabed.

#### 4.2.2.8 Vertical Loaded Anchors

Vertical loaded anchors are similar to drag embedment anchors, but allow uplift at the anchor point to increase the holding capacity.

#### 4.2.2.9 Gravity Anchors

Gravity anchors use a heavy structure to secure a mooring to the seabed, such as cast iron.

#### 4.2.2.10 Dynamically Installed Anchors

Dynamically penetrating anchors that embed themselves into the seabed by free-fall, which typically consist of a thick-walled, steel, tubular shaft filled with scrap metal or concrete and fitted with a conical tip.

#### 4.2.2.11 Driven Piles

Driven piles are typically steel tube or H sections, which are driven mechanically by a hammer or vibrated into the ground. Various types of hammers are available with different impact energy, frequency, noise and vibration profiles.

#### 4.2.2.12 Drilled and Grouted Piles

Drilled and grouted piles are inserted into an oversized borehole constructed with a rotary drill and then grouted with cement.

#### 4.2.2.13 Micro Piles

At each anchor location a number of small diameter (less than 300 mm) are bored or drilled and grouted into the seabed and the top of the pile group there is a solid concrete cap that ties the piles together so they act as a group to carry the mooring line loads.

#### 4.2.2.14 Screw Pile Anchors

Screw pile anchors are screwed into the ground and consist of a hollow steel shaft with one or more thin plates in the shape of a spiral.

### *4.2.3 Offshore Inter-Array Cables*

Inter-array electrical cables (i.e. the cables linking the turbines) will transmit electricity between the turbines, with each turbine delivering electricity at 66 kilovolts (kV). The number, dimensions and configuration of inter-array cables will be determined through additional design studies, and included in the ES.

It is intended that the inter-array cables will be installed to form a 'string' from each turbine to a central collecting offshore substation (Figure 4-5). The installation of the dynamic inter-array cable is similar to that of other fixed base wind farms with the only difference in the inter array cables strings, that have one section of dynamic cable at each end to connect with the floating platforms. The dynamic cables also use distributed buoyancy modules and clump weights to obtain Lazy Wave shapes with a higher flexibility to avoid over-stressing. The touchdown part of the dynamic cable is provided with a special protection cover.

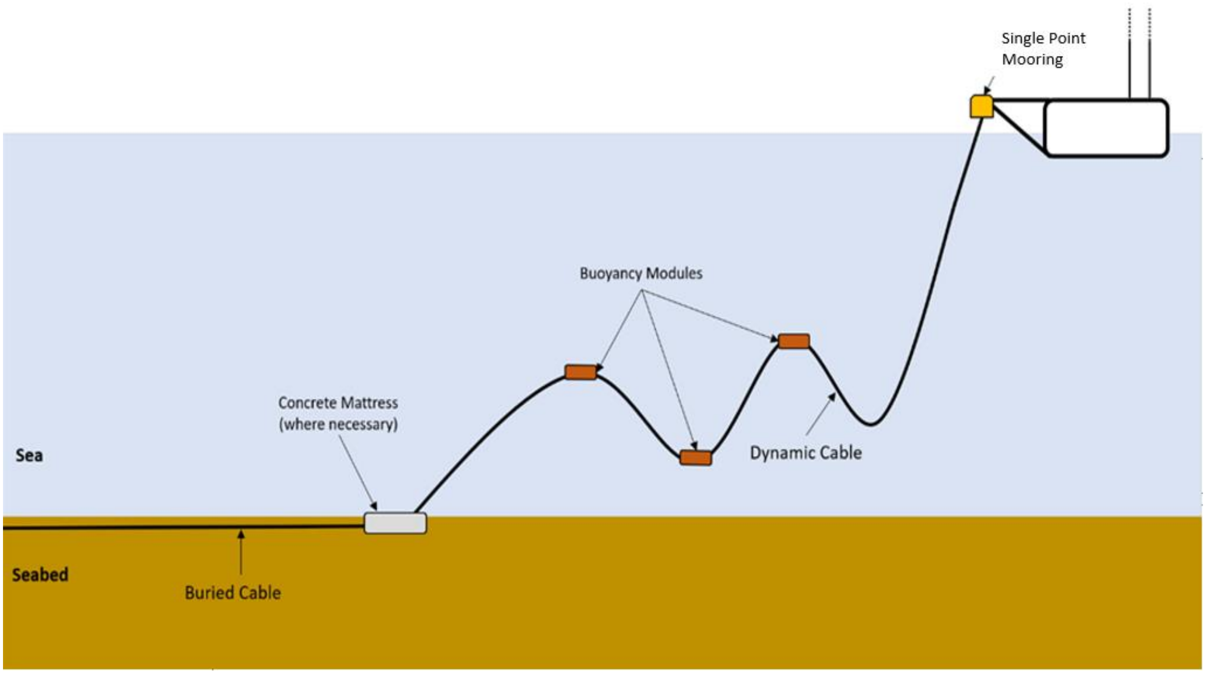



*Figure 4-5. Example cable configuration*

Two offshore substations will be required to transmit energy to shore, serving Llŷr 1 and Llŷr 2 respectively. The offshore substations will combine the output from the turbines.

### *4.2.4 Navigational Buoys*

The offshore arrays will be marked with appropriate navigational buoys to indicate the presence of the proposed Project, once operational. Navigation aids such as buoys may also be used during construction. The type, number and location of the navigational buoys will be informed by engagement with relevant stakeholders and the results of a navigational safety risk assessment (NSRA) which will be undertaken as part of the ES. Each floating platform structure may also be marked with navigation lights, signage, fog signals and other markings, as appropriate.

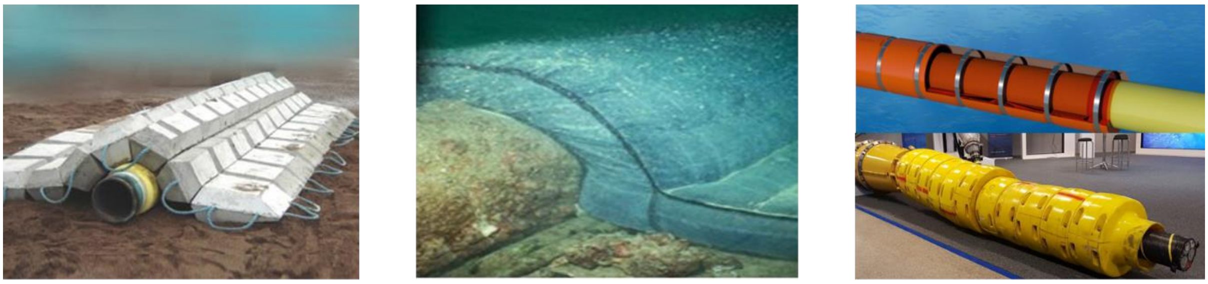
The site will be marked on the UK hydrographic charts and notification provided to local fisheries through the Kingfisher Information Service – Offshore Renewable & Cable Awareness (KIS-ORCA).

### *4.2.5 Electricity Export Cable*

Up to two 132 kV export cables per project will transmit electricity from the wind turbines to the shore. The same route will be used for both export cables (see Figure 1-1 for Offshore Cable Scoping Boundary), and the preferred route follows the same route envisaged for project Erebus. The two cables for the Projects will be laid in separate trenches with a cable separation of around 50 m. A greater separation distance is anticipated between the proposed Project's cables and that of project Erebus. The cables will be buried to a target depth of 1.5 m below the seabed. This depth may vary depending on local seabed conditions. A fibreoptic communications cable will run alongside the export cables to link each wind turbine to the remote computer system.

Burying the cable largely protects against accidental contact from fishing activity or anchors. However, burial requires a minimum sediment depth which may not be achievable for the full length of the cable route. Where the minimum cable burial depth cannot be achieved, rock placement will be used to protect the cables (see Section 4.4.1.3). Additional cable protection measures may be considered for specific localised areas, as appropriate and as identified through the pre-installation cable burial risk assessment (Figure 4-6):

- **Articulated ducting/ armoured cable** (a manufactured product that provides a protective 'sleeve' around the cable);
- **Grout bags** (bags of hardened gravel, sand/ cement grout or concrete placed over the cable); or
- **Concrete mattresses** (pre-formed mattresses comprising a mesh of concrete block that are placed across the cables).



Concrete Mattress | Grout Bag | Articulated Ducting / Armoured Cable

*Figure 4-6. Examples of cable protection measures*

### *4.2.6 Scour Protection*

There may be a need for scour protection to prevent the anchor from being undermined by sediment movement or seabed erosion. The potential use of scour protection will be determined during the design process (depending on the type of anchor used) and a maximum amount of scour protection assessed and presented in the ES. The design process will follow the mitigation hierarchy to avoid and reduce potential impacts of the proposed route as far as possible.

Should the need for additional scour protection be identified from post-installation inspections, further environmental assessment and consultation will be undertaken to determine the appropriate licencing or other requirements prior to installation.

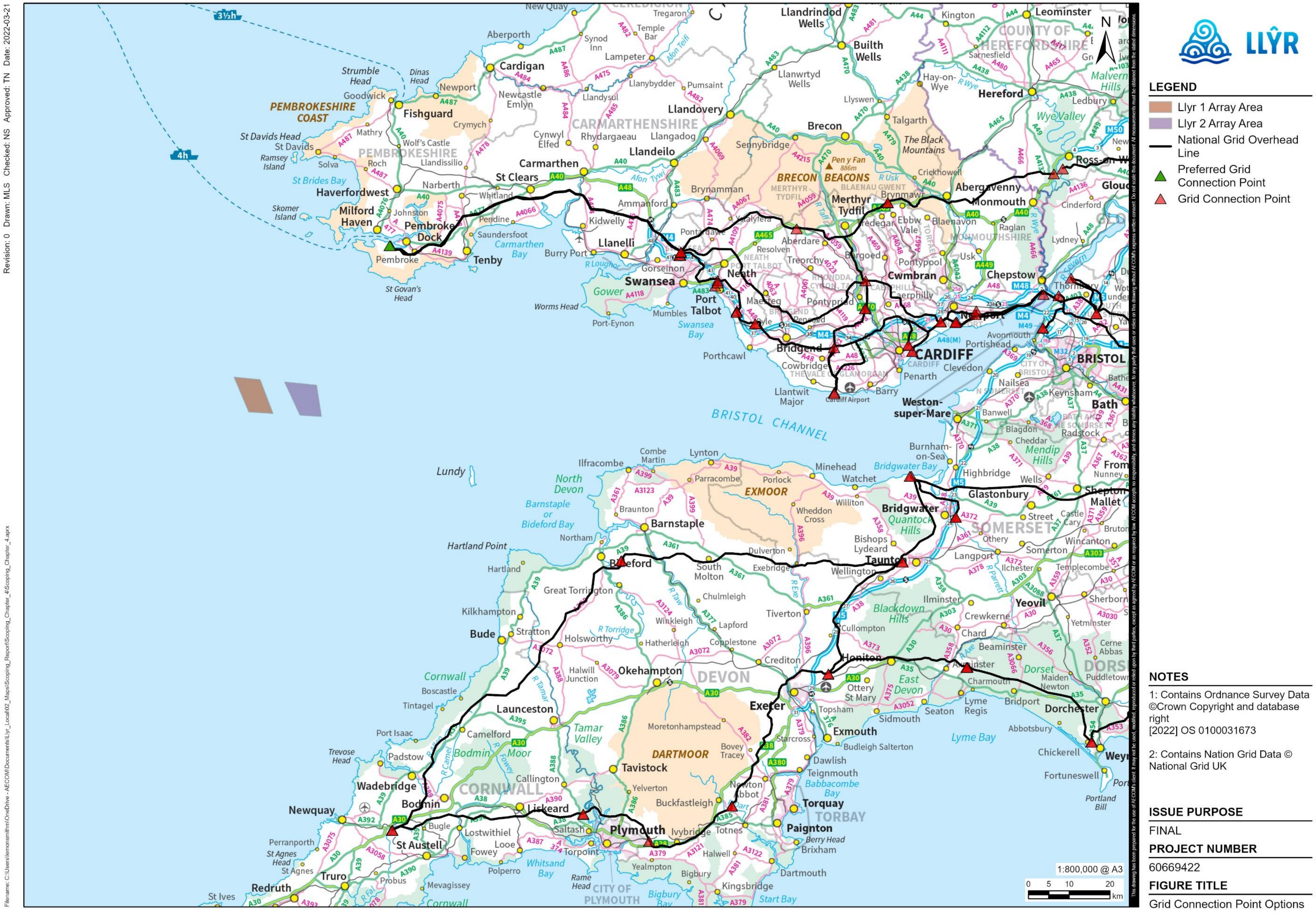



*Figure 4-7. Grid connection point options*

## 4.3 Onshore Infrastructure

The offshore export cables come onshore at the landfall and a connection is made between the offshore export cable and the onshore export cable at the transition joint bay / riser. The onshore export cable connects the riser to the onshore substation and control station and then the grid connection point.

### *4.3.1 Landfall*

The landfall will be selected in conjunction with the grid connection options available. The preferred grid connection location for the proposed Project is the National Grid operated Pembroke 132 kV Substation adjacent to Pembroke Power Station (Figure 4-7), and a Project grid connection application for connection at this location has been submitted by the Applicant (see Section 1.2.3). The following Pembroke landfall options are under consideration:

- West Angle Bay;
- Angle Bay; and
- Freshwater West Beach.

The landfall selection will be further refined based on engagement with stakeholders, discussions with the National Grid ESO and feedback from the Scoping Opinion.

### *4.3.2 Transition Joint Bay / Riser*

The transition joint bays or risers are located near to the landfall and house the connection between the onshore and offshore cables. The riser will be located close to Mean High Water. The depth of burial will be dependent on ground conditions and location and access will be required for maintenance. There will be up to two risers.

### *4.3.3 Onshore Export Cable*

There will be up to two onshore export cables. These will be laid in separate trenches. The cables will run from the riser to the onshore substation and from the substation to the point of connection. Onshore cable routes will be developed in conjunction with the landfall options, the outcomes of stakeholder engagement activities and in line with the intention to minimise construction disruption and cumulative environmental impacts with the Erebus project.

### *4.3.4 Onshore Substation / Control Building*

The onshore substation and control building will be located near the grid connection point. It is intended that these two functions will be housed in one building. Up to two buildings may be required for the proposed Project. Typical substation components may include transformer(s), electrical switchgear, harmonic filters, a control interface, power quality management equipment, welfare facilities and security arrangements.

## 4.4 Construction, Commissioning and Decommissioning Activities

This section provides an overview of the proposed construction methodology and commissioning activities for the offshore and onshore infrastructure. Key decommissioning activities for the proposed Project are also set out.

### *4.4.1 Construction of Offshore Infrastructure*

#### 4.4.1.1 Preparation and Assembly of Turbines and Platforms

The turbine and floating platforms to be deployed are demonstration units and they will be designed for site specific conditions. The details of the preparation, assembly and load out of the turbines and floating platforms are going through an early evaluation stage and discussions with local ports to determine suitability and potential upgrades is ongoing. Typically, there are three logistical hubs required for floating offshore wind; FAH (floater assembly), TIH (turbine integration) and ALH (anchor logistics). These three hubs may or may not be co-located. However, at this early stage the following activities are anticipated.

**Turbines**

The turbines will be secured from an established offshore wind turbine manufacturer. It is likely that the turbines will need to be imported from an established manufacturing facility in Europe. The turbine, nacelle, and blades components will be transported by sea to a central assembly facility with direct access to waterways suitable for onward transportation to the installation site. As far as is practicable the components of the turbine will be delivered to the assembly site as pre-tested modules. The assembly of the turbines will be carried out in a predetermined sequential manner by a suitably qualified and experienced contractor under the direction of the installation contractor. Prior to shipping, systems will be commissioned and tested as much as practical, to de-risk offshore activities and minimize commissioning time.

**Floating Platforms**

The manufacturing, assembly and launching of the floating platforms will be designed as far as is practicable to be flexible to accommodate the constraints of local infrastructure. It is anticipated that the floating platform technologies deployed will be of a modular design, enabling the main significant elements to be manufactured and transported prefabricated to a central assembly site. The design intent is to limit the work in the final assembly yard to only final assembly work such as: lifting, scaffolding, fit-up, welding, and painting touch up. For concrete platform solutions casting of components may also be undertaken at the assembly yard. Where practical standard construction techniques will be employed to maximize compatibility with the local supply chain and port infrastructure. The completed modules / sub-assemblies are transported to the assembly location, for assembly, load-out and turbine integration.

**Turbine and Floating Platform Integration**

Once the floating platforms are completed, they will be launched and prepared for turbine integration, which will be completed sequentially. It is anticipated that the integration process will be as follows:

- A heavy lift crane will be mobilised at the assembly port to be used in the integration process;
- The wind turbine modular components will be unloaded and stored in preparation for the assembly activities at the port;
- The floating platform will be berthed securely so that the blades will be parallel to the quay. For some floating platforms a preference may be to ‘ground’ the platform on the seabed to eliminate motions. In this instance, this would require some form of seabed preparation / modification or use of a supporting frame / concrete blocks;
- Assembly activities of integrating the tower to the floating platform are completed before the turbine nacelle and wind turbine rotors are installed port side;
- Once completed, the internal wind turbine components will be installed, integrated and tested (e.g. generator / hub mechanical, hydraulic and electrical interface, High Voltage cable

installation and connection and completion of all electrical and mechanical interfaces in the tower);

- Prior to installation a sequence of testing and pre-commissioning activities of the fully assembled floating platform and turbine will be competed at quayside; and
- The complete floating platform will then be stored at a temporary anchorage point in a sheltered location while the other platform integration activities are completed.

#### 4.4.1.2 Pre-Installation Activities

The following surveys and activities will be undertaken before the turbines and cables are installed:

1. **Unexploded Ordnance (UXO) survey** along the cable route and turbine locations. These surveys will be used to identify potential obstructions such as boulders and fishing debris;
2. **Route clearance activities, which may include a pre-lay grapnel run, boulder clearance and pre-sweeping of sand waves**. Depending on a review of site data along the export cable route, a pre-lay grapnel run will be undertaken by a fishing vessel (or similar) to confirm the complete clearance of any abandoned fishing equipment or other debris. Where boulders are present within the cable route, dedicated boulder grab equipment will be used to move larger boulders (more than 30 cm) approximately 15 m perpendicular to the cable route. The boulders would be relocated within the Offshore Cable Scoping Boundary and no boulders will be removed from the sea bed during this operation. Pre-sweeping of sand waves is usually required in order to level the seabed;
3. **Onshore cable duct installation**. Where Horizontal Directional Drilling (HDD) is used (see below).

#### 4.4.1.3 Landfall

Cable installation at the landfall may be by trench and / or with the use of Horizontal Directional Drilling (HDD):

- **Trenching:** In this case a trench is excavated, the cable laid in the trench and then buried. Burial is required to protect the cable in the surf-zone. A cable plough is used to bury the cable into the trench as it moves along. Once the export cable is successfully secured at the landfall, the remainder of the cable can be laid out to the wind farm; and / or
- **HDD:** Where HDD is used for the cable installation in the shore / intertidal area, a cable duct will be installed by HDD from onshore, with an exit point below the extreme low water mark. The cable can then be pulled through the duct at the time of cable installation. The duct will be made from High Density Polyethylene (HDPE) material with a design life of 50 years. HDD is used if minimum burial depths cannot be achieved with trenching for example if the beach is too narrow or there is a high cliff. A specialist drilling tool is required.

#### 4.4.1.4 Installation of Offshore Electricity Export Cable

The final detailed location of the turbines and route of the export cables from each turbine will be determined following geophysical, geotechnical and benthic surveys. Indicative locations have been identified to aid identification of the key issues.

Following route preparation activities described in Section 4.4.1.2, the electrical cable is installed using a dedicated cable laying vessel, which is supported by a remotely operated vehicle. The remotely operated vehicle will perform a pre-lay survey once the loaded vessel has arrived onsite, to verify if any changes have occurred since the previous surveys that could affect the cable installation.

Wire cable pulling grips and messenger wires will be installed to facilitate pulling the cable to shore and to the wind farm, as required. Once the cable end is secured onshore, the cable is then paid out to the seabed from a cable laying vessel. The vessel is set up as close to shore as possible, ideally during highest tide to maximise the working depth. The messenger wire (attached to a winch onshore) is towed out to the cable laying vessel by a rigid-hulled inflatable boat and then connected to the first end of the cable. The cable is over-boarded and pulled into the beach using floats or roller stands as required.

A second vessel may be used to support the cable in shallower waters and to help feed the cable in the approach to the shore. The cable will be pulled through the installed duct / along the trench to the onshore area, allowing the cable laying vessel to move off and start laying the remaining cable to the wind farm.

The cable will be installed using either a cable plough or trenching tool, which will employ either mechanical cutting or jetting depending on the seabed material encountered. Jet trenching burial and ploughing techniques are described in more detail below. The cable is then laid within the trench and buried to the required depth. Where possible, sediment will be re-deposited in locations that enable it to remain within the same sediment system, for example depositing upstream of cable trenches to encourage natural backfill (where appropriate). Post cable lay surveys will be undertaken to ensure that the installation has not created unintentional berms from a build-up of seabed material. Where identified, restorative action will be taken to remove any unintentional berm.

*Jet Trenching Burial*

The preferred cable burying method is jet trenching burial, where soil conditions allow (Figure 4-8). Jet trenching burial is carried out by a remote operated tracked trenching machine which buries the cable to a target depth of 1.5 m using water jetting. This technique minimises seabed disturbance, reduces the risk of cable damage, offers a relatively efficient installation process and allows the cable width route to be narrowed to a smaller window than the ploughing method (about 300-400 mm instead of 3 m).

Jet trenching machines use nozzles to inject water at high pressure into the sediment surrounding the cable, which fluidises the seabed in the immediate vicinity and allows the cable to sink under its own weight before the sediment resettles on top. Monitoring will be undertaken to minimise sediment disturbance away from the trench and maximise cable cover once operations are complete. Once the first trenching operation is complete, depressor depth data is evaluated to determine whether the target burial depth has been reached. If necessary, a second trenching operation is completed to ensure the cable is adequately buried. A hybrid tool capable of both chain cutting and jet trenching may be used in stiffer sediments where jet trenching is not possible.

*Figure 4-8. Example jet trenching machinery*

### *Ploughing*

A common electrical burial method in offshore wind farms is the use of a subsea cable plough towed on the seabed behind the cable laying vehicle (or by a remotely operated vehicle as a separate activity). See Figure 4-9 for an example of a typical cable plough. The electrical cable is laid in a single pass from the HDD exit point to the central turbine. As the cable is laid it passes through the plough, which lifts a wedge of sediment allowing the cable to be inserted below and buried into the seabed. Burial speeds can vary depending on the type of cable and seabed conditions, but typically reach 0.2 km/hr for an armoured cable. Once complete, a post-lay inspection is carried out in areas the plough was unable to bury.

*Figure 4-9. Typical cable plough*

### *External Cable Protection Measures*

Where the minimum cable burial depth cannot be achieved, rock placement will be used to protect the cables. Rocks are selected based on rock size and the desired side slopes and placed over the cable under highly controlled conditions. The created rock berm is designed to minimise risk to fishing gear and to protect the electrical cables. The rock placement process is illustrated in Figure 4-10. Additional cable protection measures are discussed in Section 4.2.5.

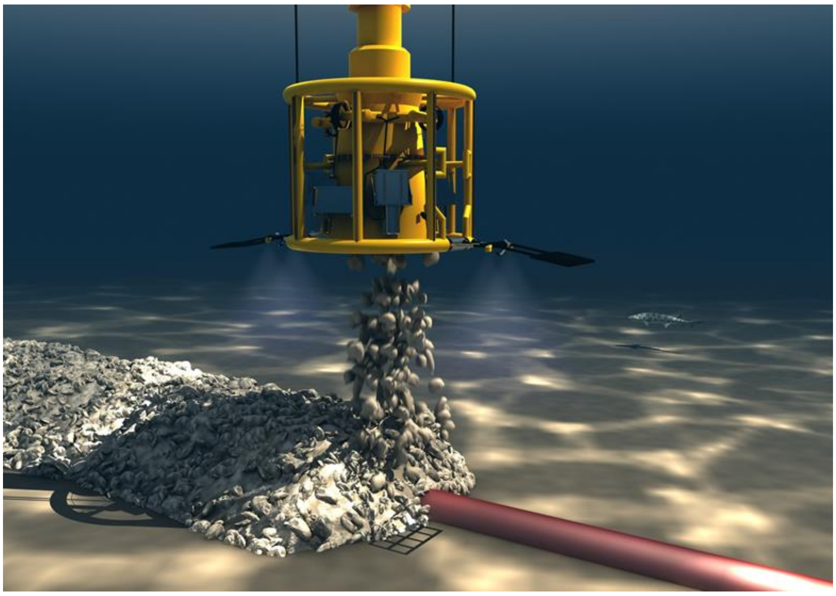


*Figure 4-10. Illustration of rock placement over a cable*

**Installation of Inter-Array Cables**

The inter-array cables (Figure 4-11) will be installed to form a ‘string’ from each turbine to a central collecting turbine. The inter-array cables are not planned to be trenched / buried, unless required for physical stabilisation on the seabed, however, to provide a worst-case scenario, an allowance will be given to burial of the inter-array cables between each turbine.


*Figure 4-11. Example composition of inter-array cables*

Wire armour reinforcement (bend stiffeners) surrounds the core of the cables connecting to the floating platform, to protect the cables from the bending and twisting forces caused by the currents. Buoyancy modules and weights are also used to create a specific shape, known as the Lazy Wave shape, which protects the cables from over-stressing.

The installation of the offshore floating turbines requires an anchor handling vessel supported by a tugboat and support vessel.

**Minimising Turbidity during Excavation**

The following measures and guidance will be incorporated into the cable layout design (including the OSPAR Commission Guidelines on Best Environmental Practice (BEP) in Cable Laying and Operation[6]) to minimise potential seabed disturbance and associated turbidity during the construction period:

[6] OSPAR 12/22/1, Annex 14. Agreement 2012-2

- Connecting the turbines to one another to string a single export cable back to shore (rather than a cable per turbine);
- Minimising the cable route to shore as far as possible;
- Selecting installation techniques which minimise seabed disturbance as far as possible;
- Designing the cable area to avoid sensitive habitats (such as protected marine areas) where practical and providing appropriate buffers to protect sensitive areas from accretion of suspended sediment;
- Developing the construction schedule to avoid sediment disturbance during particular life stages (e.g. migration and spawning) of sensitive fish and shellfish species that are known to be present in the Array Area and Offshore Cable Scoping Boundary.

Further investigation, including an appropriate level of site investigation and a cable burial risk assessment will be undertaken to ensure optimal burial methods are selected for the cable installation activities (from the techniques described above).

#### 4.4.1.5 Offshore Site Preparation

All marine installations are limited by weather conditions. The maximum criteria for marine operations are described below:

- Maximum wave height (Hs): 3 m;
- Maximum wind speed: 30 knots; and
- Maximum current speed: 2 knots.

Lower criteria may be set for specific activities or operating equipment.

The following section provides an overview of the installation methodology for typical anchor types and moorings. The final methodology will depend on the type of anchors and moorings selected, as discussed in Section 4.2.2.

#### 4.4.1.6 Anchor Installation

**Drag Anchors and Dynamically Installed Anchors**

The following main steps describe the installation of the anchors and chains (Figure 4-12):

1. The anchors and chains are lifted using an onshore crane onto the deck of the anchor handling vessel, and fastened for transport;

2. Once at site, the anchor is connected to the chain line and lowered from the back of the boat. To ensure that the anchor reaches the seabed in the right orientation a supporting second line may be used, which is later disconnected from the anchor. Note, for the dynamically installed anchors they will be dropped, with the falling energy embedding then into the seabed;

3. Once the weight of the anchor penetrates the seabed, the vessel moves forward to further embed the anchor into the seabed. Tension is applied to the anchor, typically by using a reaction anchor with a tensioner. The tension in the line is monitored, and before the line is paid out completely an anchor proof test undertaken using the pulling power of the anchor handling vessel. This allows the anchor to penetrate and reach the correct position; and

4. Finally, the end of the line is connected using an auxiliary rope and a buoy to allow for easy connection. It is anticipated that the mooring lines could consist of a combination of steel bridle, chain and/or synthetic rope, to be determined as the detailed design progresses.

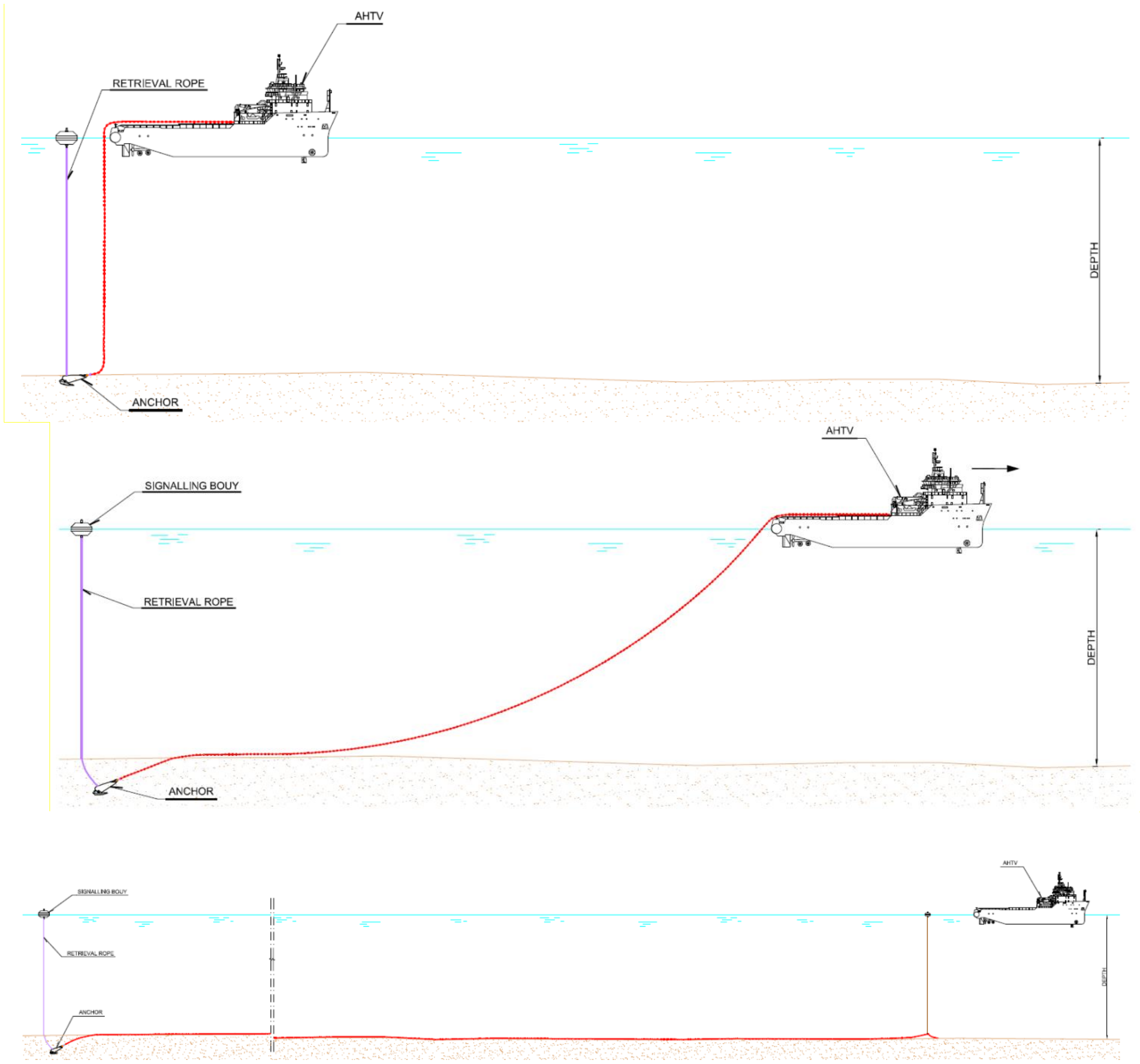



*Figure 4-12. Overview of installation process for anchors and moorings*

**Driven Pile Anchors**

**The following main steps describe the installation of driven piles:**

1. Driven piles are typically steel tube or H Sections, which are driven mechanically by a hammer or vibrated into the ground from a specialised vessel;
2. The driving hammer picks up the pile and lowers it into position on the seabed;
3. Various types of hammers are available with different impact energy, frequency, noise and vibration profiles; and
4. The exact driving methodology and hammer type will be selected to fit the environmental requirements for noise and vibrations and the soil condition to which the piles will be installed.

**Drilled and Grouted Anchors**

**The following main steps describe the installation of drilled and grouted pile anchors and chains:**

1. A tubular casing is lowered to the seabed and driven / vibrated into the soft deposit surface material;
2. The drilling apparatus is then lowered into the casing which is used as a guide and drills through the soft deposits into the solid ground material / rock to the required level. The

drilling apparatus is removed, and the casing prevents the loose soft deposits falling into the drill hole;

3. The tubular pile is lowered into the casing and drilled hole. Once the pile is in place the annulus (gap between the drilled hole and the outside of the pile) is grouted. This forms a strong frictional bond between the pile and the ground material; and
4. The pile is connected to the mooring lines.

**Micro Pile Group Anchors**

**The following main steps describe the installation of the micro pile anchors and chains (Figure 4-13):**

1. Template is lowered to the seabed;
2. The boring / drilling and grouting of the micro piles is controlled remotely and provides a low noise and low vibration solution;
3. The top of the piles are secured to the pile template / pile cap to allow the piles to act as a group; and
4. Mooring lines are connected to the pile caps.

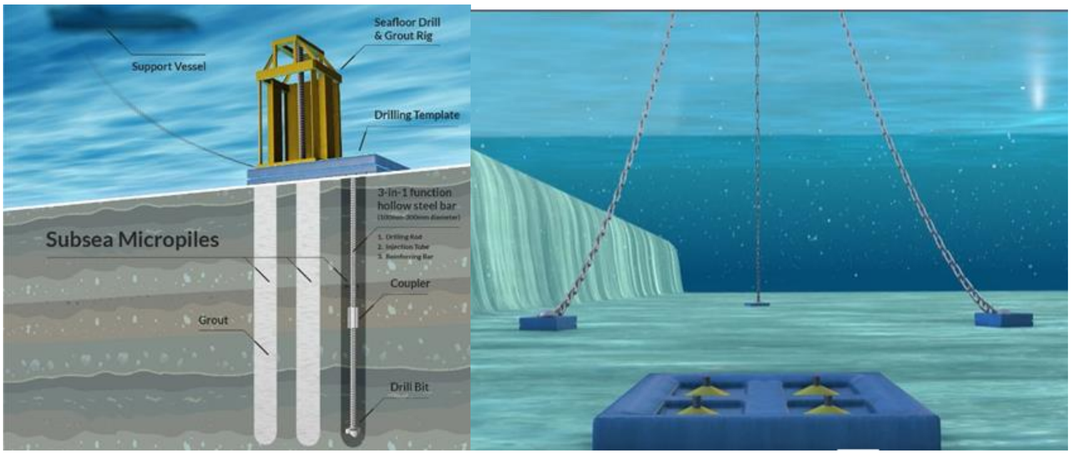



*Figure 4-13. Overview of installation process for micro piles*

#### 4.4.1.7 Mooring Installation

Installation of the moorings will follow the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (Health and Safety Executive & Maritime and Coastguard Agency, 2017) guidance, or equivalent as recommended by the regulator, with the principle of prevention of unplanned incidents being used throughout the construction process. The following steps will be undertaken, irrespective of the floating technology used:

1. **Pre-lay survey** to identify and remove any debris along the route of the mooring lines;
2. **Deployment of mooring lines** by connecting the chain to the anchor on the deck of the anchor handling vessel. The anchor is lowered, using the mooring chain, to the seabed and orientated to face the proposed offshore wind turbine location. The location of the anchor on the seabed is recorded for comparison with the post embedment location. The chain is then deployed and, once the laying operation is complete, the chain end is transferred to the main winch wire;
3. **Anchor embedment and laydown**. The anchor laying vessel applies a large force to the mooring line to pull the anchor into the seabed. The load is applied gradually and held for a period of time to prevent further movement of the anchor. The final embedment depth is

measured by monitoring the movement of the mooring line at a pre-defined point, and the length of chain can then be adjusted to compensate for the drag distance of the anchor.

#### 4.4.1.8 Installation of Floating Wind Turbines

The following steps will be followed to install the floating wind turbines, following the experience and best practice from other sectors such as oil and gas exploration and production:

4. **Preparation and tow.** A Marine Warranty Surveyor will undertake the following checks (as a minimum) and provide a certificate for worthiness for sailing:
   - Towing calculations;
   - Specification of towing equipment;
   - Towing vessel audits and assessment of suitability;
   - Towage route and safe havens/ sheltered locations;
   - Necessary permits and notifications for the towing operations;
   - Contingency and emergency procedures;
   - Checks of all hook-up equipment (e.g. winches); and
   - Confirmation of a suitable weather window.

   As the wind turbine will be on a platform during towing, a tow is unlikely to take place when wind speeds are greater than 17 m/s, wave heights more than 5 m or if there is a wind force of more than 7 on the Beaufort Scale. A conventional transport vessel/ tugboat and auxiliary tugboat will be used to tow the assembled floating platform.
5. **Connection**. Prior to arriving onsite, the mooring system and cabling is surveyed by a remotely operated vehicle to confirm no damage has occurred prior to connection. The connection operation will generally immediately follow the towing operation and require a conventionally sized anchor handling vessel to link the pre-laid mooring chains with the section of the chain that hangs from the floating platform. The main vessel maintains the required position in each installation phase, and the auxiliary tugboat is used to control the orientation of the platform.

The following steps describe the connection process:

- The floating platform is placed close to the signal buoy;
- The anchor handling vessel recovers the pre-laid mooring line from the seabed;
- The end of the top chain section is transferred to the anchor handling vessel;
- Both ends are connected on the deck of the anchor handling vessel;
- The connected mooring line is released; and
- The process is repeated for the remaining mooring lines 1, 3 and 5 (Figure 4-14) in order to ensure appropriate control of the platform. Mooring lines 2, 4 and 6 are then connected using the same process.

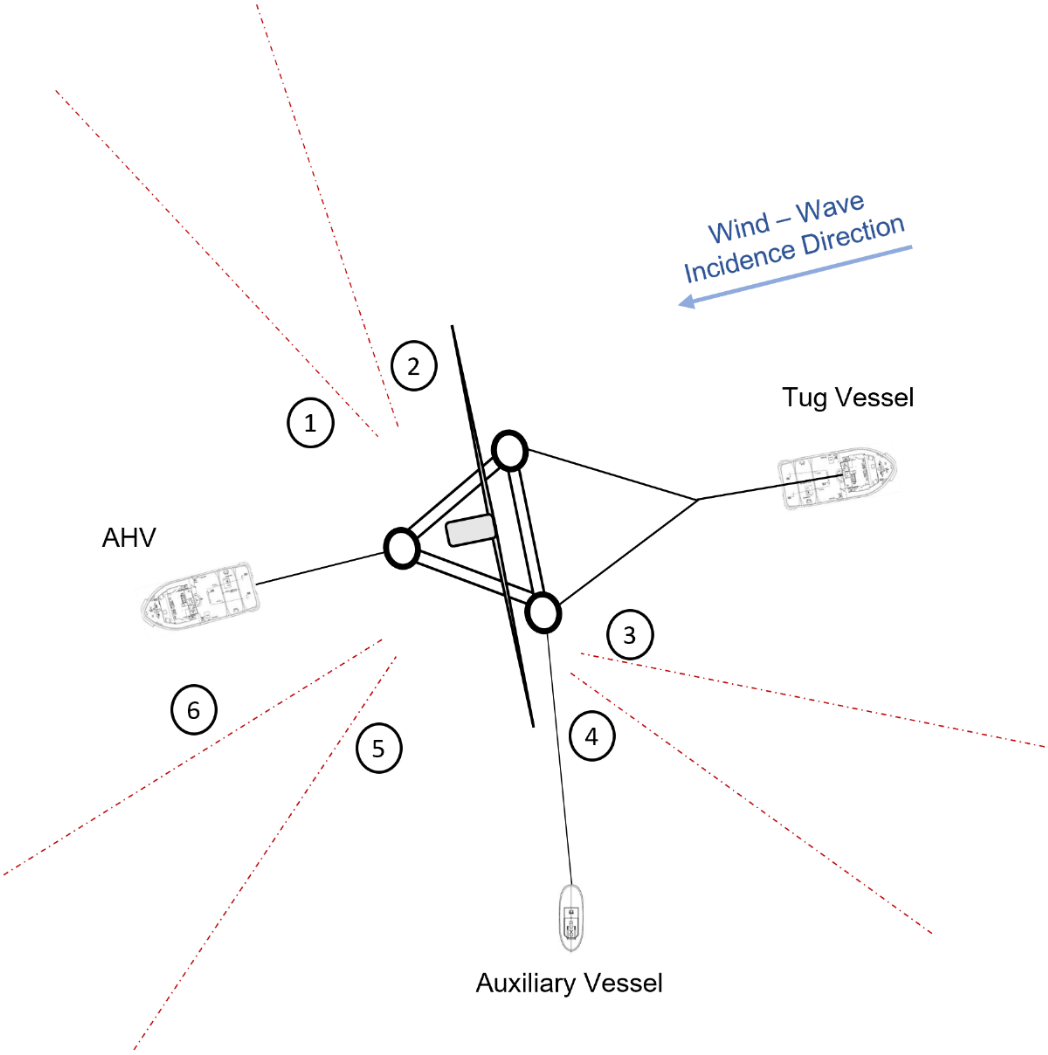



*Figure 4-14. Overview of floating wind turbine installation*

For a Tension Leg Platform (TLP), the connection process is similar. However, once the TLP is stationed above the hook up point, the TLP will be lowered to the target water depth in a controlled manner using temporary pulling lines. The pulling will be done either by dedicated devices on the floater or from installation vessels. Finally, the permanent mooring lines, that were previously pre-laid on the seabed are recovered and hooked up to the platform before removing the temporary pulling lines.

#### 4.4.1.9 Commissioning

After the turbines have been installed offshore, the turbines will undergo testing and commissioning. The commissioning period is expected to be complete within six months. The proposed Project will be operational for a period of 25 years from final commissioning.

### *4.4.2 Construction of Onshore Infrastructure*

The onshore cables will be laid in trenches, in sections and jointed. Where possible the cable will be direct buried. Where the cable crosses roads, it will be installed in ducts.

The substation / control building is built, equipment installed and tested. It can then be commissioned and connected to the grid connection point.

Once the onshore cable is installed to the landfall and the substation is commissioned and connected, the offshore cable laying can commence.

### *4.4.3 Operation and Maintenance*

#### 4.4.3.1 Turbine and Floating Platform Maintenance

The Project O&M programme, in common with O&M processes used on other offshore windfarms across the UK, is expected to include a boat landing platform at the base of the turbine structure to enable access for maintenance. Workers would be transported on a Crew Transfer Vessel and access the turbine using a ladder. O&M activities, such as servicing equipment or replacing parts and machinery, would be enabled through hoisting on to a landing platform from the deck of the boat below. Consideration will also be given to alternative routes, which may include helicopter access.

Each turbine will have an internal crane system to enable components to be changed onsite. For major repairs, there may be a requirement to tow an individual turbine back to port. The floating foundation, moorings and electrical cables will be designed to allow safe disconnection of the structure. Disconnection and towing activities would largely mirror the installation process, in reverse order.

The floating platform will also undergo regular corrective, condition based and/or calendar-based maintenance activities including visual inspection, fault finding inspection, component exchange and marine growth cleaning.

#### 4.4.3.2 Cable Maintenance

Once buried, submarine cables do not require routine maintenance. However, it is likely that regular inspection surveys will be undertaken. An assessment of the potential future risk of cable exposure will be completed to define the frequency and location of O&M inspections to be undertaken by a qualified contractor. The inspections will include visual inspections of the integrity and condition of the subsea cables, using an underwater remotely operated vehicle along the cable route to the duct entry point close to shore.

In the event of cable failure or exposure, the cable would be reburied or additional protection installed to maintain the burial condition of the cable and meet the cable burial risk assessment parameters. Where cable failure or exposure has been identified, NRW will be notified in advance of any maintenance or rectification work.

### *4.4.1 Indicative Timescales*

Indicative timescales for the development programme and installation activities are provided in Table 4-2.

*Table 4-2. Indicative development programme*

| Activity | Indicative Date |
|---|---|
| Environmental baseline surveys complete | Q3 2022 |
| Concept Design Complete | Q4 2022 |
| Section 36 and Marine Licence Application | Q4 2022 |
| Consent and Licence determination | Q4 2023 |
| Consent and Licence compliance arrangements complete | Q1 2026 |
| Fabrication | Q4 2024 – Q1 2026 |
| Offshore installation activities start | Q3 2025 |
| Array commissioning | Q4 2026 |

#### *4.4.2 Decommissioning*

The decommissioning process will largely mirror the installation process, in reverse, with platforms and moorings removed from the proposed Project and returned to local ports for disassembly and disposal. The decommissioning phase is expected to be complete within 12 months.

It is acknowledged that NRW has previously expressed a preference for buried cabling to be removed on decommissioning, however, there remain strong technical and environmental arguments to retain the cable in-situ. The case for cable recovery will be the subject of an environmental and economic assessment in the years leading up to decommissioning, including discussions with relevant stakeholders and a review of industry best practice at the time to determine the most appropriate approach for the proposed Project.

Details of the proposed decommissioning will be agreed towards the end of the 25 year operational life of the proposed Project, in line with the applicable legislation and guidelines at that time. This will include the decommissioning programme, activities involved and the arrangements for post-decommissioning monitoring, maintenance and management of the site. Engagement with regulators and stakeholders will also be undertaken prior to decommissioning.

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# 5 EIA APPROACH AND METHODOLOGIES

## 5.1 Role of the EIA Process

### *5.1.1 Introduction*

EIA is the process of compiling, evaluating and presenting information about the likely significant environmental effects, both adverse and beneficial, of a proposed project. The assessment is designed to help produce an environmentally sympathetic scheme and to provide decision makers and statutory consultees with the environmental information they require during determination of an application for consent. The early detection of likely significant adverse environmental effects enables appropriate mitigation (i.e. measures to avoid, reduce or offset likely significant adverse effects) to be identified and incorporated into the design of a scheme, or commitments to be made, for example to environmentally sensitive construction methods and practices. The approach is iterative and involves close working between the undertaker, the EIA team and the designers.

This chapter sets out the overarching approach to the EIA, with a detailed technical methodology included within each technical chapter (Volumes 2 and 3).

The EIA process will drive the development of the proposed Project by:

- Embedding environmental mitigation in its design, construction and operation;
- Engagement with key stakeholders, statutory consultees and local communities to ensure their concerns are understood and addressed as far as possible; and
- Preparing a comprehensive application for consent which minimises consenting risk as far as possible and provides the flexibility needed in subsequent stages of the proposed Project.

### *5.1.2 EIA Guidance*

As well as legislative requirements, various guidance documents have been developed by decision makers, developers and professional institutions to guide the EIA process and preparation of the ES. Any relevant topic specific technical assessment guidelines will be detailed within the technical chapters.

With respect to relevant EIA guidance, the EIA will take full account of key policies, legislation, guidance and advice, including but not limited to the following:

- Environmental Impact Assessment for Offshore Renewable Energy Projects (British Standards Institute, 2017);
- Welsh Government planning policy guidance (Welsh Government, 2022);
- Guidance on Environmental Impact Assessment from the Ministry for Housing, Communities and Local Government (MHCLG, 2017);
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017);
- Institute of Environmental Management & Assessment (IEMA)'s Guidelines for Environmental Impact Assessment (2004, as amended);
- Planning Policy Wales (Welsh Government, 2018);
- Welsh National Marine Plan (Welsh Government, 2019);
- Future Wales: the national plan 2040 (Welsh Government, 2021);
- NRW Marine and Coast guidance, including Guidance Note GN13 on Scoping an Environmental Impact Assessment for Marine Developments (2017);
- The Wildlife and Countryside Act 1981; and
- The Planning Series: 10 – Environmental Impact Assessment (National Assembly for Wales, 2017).

#### *5.1.3 EIA and Flexibility in Design*

Flexibility in the design and consent is critical. The underground cable route will require flexibility to allow for minor route changes to account for issues like unforeseen ground conditions.

By developing a realistic worst case scenario (i.e. a Rochdale Envelope) in response to critical technical and engineering parameters, as well as the emerging findings of the EIA and feedback from stakeholders, it is possible to strike a balance between the level of design information needed for the purpose of EIA and the application for consent and while still retaining the level of design flexibility needed as the proposed Project moves into detailed design and construction.

Through the EIA process our objective will be to aid and inform the design process and support the identification of a design freeze that is flexible enough to accommodate change in future stages but not so flexible that it could over-state or unnecessarily amplify the potential environmental impacts of the proposed Project and increase consenting risk.

### 5.2 Scoping

#### *5.2.1 Introduction*

Scoping sets the tone for the EIA process which follows and when done right, it makes the subsequent phases more straightforward. The process of scoping helps to ensure that the topics covered, the baseline information used, and the methods of assessment are suitable, and have taken into account the views of decision makers and consultees where appropriate.

There are two main stages in the scoping process. Firstly the undertaker compiles information to inform their view as to the scope of issues that should be covered in the main ES; this usually takes the form of a Scoping Report and is based on initial consultation, data searches and baseline surveys. The Scoping Report is submitted to the decision maker. The second stage in the scoping process is for the decision maker to issue a Scoping Opinion, outlining what they expect to be covered in the ES, having consulted a range of statutory bodies, and taken into account the information provided by the applicant in their Scoping Report.

The scoping process aims to:

- Identify the topics and issues to be the focus of the EIA;
- Eliminate any topics and issues not requiring further consideration (i.e. those that are not likely to lead to significant effects and which would therefore not be considered further in the EIA);
- Define the technical, spatial and temporal scope of the study for each of the topics and issues to be considered;
- Define the approach and methodologies for conducting baseline studies;
- Define the approach and methodologies for predicting environmental effects and for evaluating the significance of environmental effects; and
- Identify the methods to be adopted for incorporating mitigation and other environmentally driven modifications into the design.

A robust scope based on the potential for 'significant' environmental effects is required in order to ensure the EIA is focused and proportionate.

#### *5.2.2 Scoping Out*

Ensuring that ESs are appropriately focused on aspects and matters where a likely significant effect may occur is essential.

The scoping process should be used effectively, ensuring that the EIA process is proportionate and seeking to 'scope out' aspects and matters from the need for further assessment, where it is appropriate to do so.

In order to 'scope out' the Scoping Report needs to include sufficient justification for scoping aspects and matters out. This justification should be evidence based and have reference to the assessment process.

Key questions to be addressed when scoping out aspects / matters from the EIA include:

- Is there an impact pathway from the proposed Project to the aspect / matter?
- Is the aspect / matter sensitive to the impact concerned?
- Is the impact likely to be on a scale that may result in significant effects to the aspect / matter?
- Could the impact contribute cumulatively with other impacts to result in significant effects to the aspect / matter?
- Is there a method of avoidance or mitigation that would reduce the impact on the aspect/matter to a level where significant effects would not occur?
- Is there sufficient confidence in the avoidance or mitigation method in terms of deliverability and efficacy to support the request?
- Is there empirical evidence available to support the request?
- Do relevant statutory consultees agree with the request?

### *5.2.3 Approach to Scoping and Methodologies*

A 'Study Area' has been defined in each individual technical assessment. This Study Area encompasses all locations that may potentially be impacted upon by the proposed Project – in some cases this will be the Array Area, Offshore Cable and Onshore Scoping Boundary, but there is no single Study Area which is applicable to all topic areas. Instead, the Study Areas for each topic vary according to the environmental resource potentially affected. The individual Study Areas for each environmental topic are defined in each technical assessment (Volumes 2 to 4).

There is no statutory definition of what constitutes a 'significant' effect within the EIA Regulations and whilst the determination of the significance of effects is important to informing the decision-making process, defining what is significant is not a simple task. The process typically involves consideration of two aspects of a potential effect, namely the sensitivity or value of the receptor or resource, and the magnitude of the effect that is occurring. The following are examples of the criteria that will be used (where appropriate to the issue being addressed) to inform the assessment of the significance of an effect:

Aspects relating to the receptor or resource:

- The value of the resource, based upon both empirical and intrinsic factors, and taking into account any legal or policy protection afforded, which is indicative of its value nationally or locally; and
- The sensitivity of the receptor or resource to change, for example if the receptor is likely to acclimatise to the change, or return once the proposed Project is decommissioned, or will it be irretrievably affected or lost. This will take into account legal and policy thresholds which are indicative of the ability of the resource to absorb change.

Aspects relating to the magnitude of effects:

- The physical / geographical scale of the effect, though this will be relative to the scale of the receptor or resource.

- The duration of the effect – will it be temporary, lasting for a few days or weeks, or long term, lasting many years?
- The frequency of the effect – will it be permanent, or will it occur daily, monthly or annually?
- The reversibility of the effect – can it be reversed after construction or following decommissioning?
- Effectiveness of mitigation – is the mitigation proven to be effective?
- Is the effect direct or indirect? Although unlikely to affect significance, it is sometimes important to differentiate between direct effects (e.g. loss of habitat under the footprint of a new tourist attraction) or indirect effects (damage to habitat caused by additional visitors to the attraction, though outside the development footprint).

The detailed methodology taken for each of the separate topics varies, however a common format should be applied where possible. Therefore unless otherwise stated the following generic criteria has been used in this Scoping Report. Table 5-1 defines the proposed sensitivity criteria for the ES and Table 5-2 the proposed magnitude criteria.

*Table 5-1. Proposed sensitivity criteria*

| Value / Sensitivity | General Criteria |
|---|---|
| Very High | Very high importance and rarity, international scale and limited potential for substitution |
| High | High importance and rarity, national scale and limited potential for substitution |
| Medium | Medium or high importance and rarity, regional scale, limited potential for substitution |
| Low | Low or medium importance and rarity, local scale |
| Negligible | Very low importance and rarity, local scale |

*Table 5-2. Proposed magnitude criteria*

| Magnitude | General Criteria |
|---|---|
| Large | Adverse: Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements<br>Beneficial: Large scale or major improvement of resource = quality; extensive restoration; major improvement of attribute quality |
| Medium | Adverse; Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements<br>Beneficial: benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality |
| Small | Adverse: Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements<br>Beneficial: Minor benefit to, or in addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk or negative impact occurring |
| Negligible | Adverse: Very minor loss of detrimental alteration to one or more characteristics, features or elements.<br>Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements |

A combination of the magnitude of the effect under consideration and the sensitivity or value of the receiving environment can be used in considering the overall significance of an effect. To aid transparency in the assessment process, the matrix shown below (Table 5-3) will be used as the basis for assigning significance to an effect. As an illustration, a high sensitivity receptor subject to a large magnitude of change would experience a major significance effect, and a low sensitivity receptor subject to a small magnitude of change would experience a minor or neutral significance effect (Figure 5-1).

*Table 5-3. Significance matrix*

| | | Value / Sensitivity | | | | |
|---|---|---|---|---|---|---|
| | | Very High | High | Medium | Low | Negligible |
| Magnitude | Large | Major | Major/ Moderate | Major/ Moderate/ Minor | Moderate/ Minor | Minor/ Negligible |
| | Medium | Major/ Moderate | Major/ Moderate | Moderate/ Minor | Minor/ Negligible | Negligible |
| | Small | Major/ Moderate/ Minor | Moderate/ Minor | Moderate/Min or | Minor/ Negligible | Negligible |
| | Negligible | Minor/ Negligible | Minor/ Negligible | Minor/ Negligible | Negligible | Negligible |

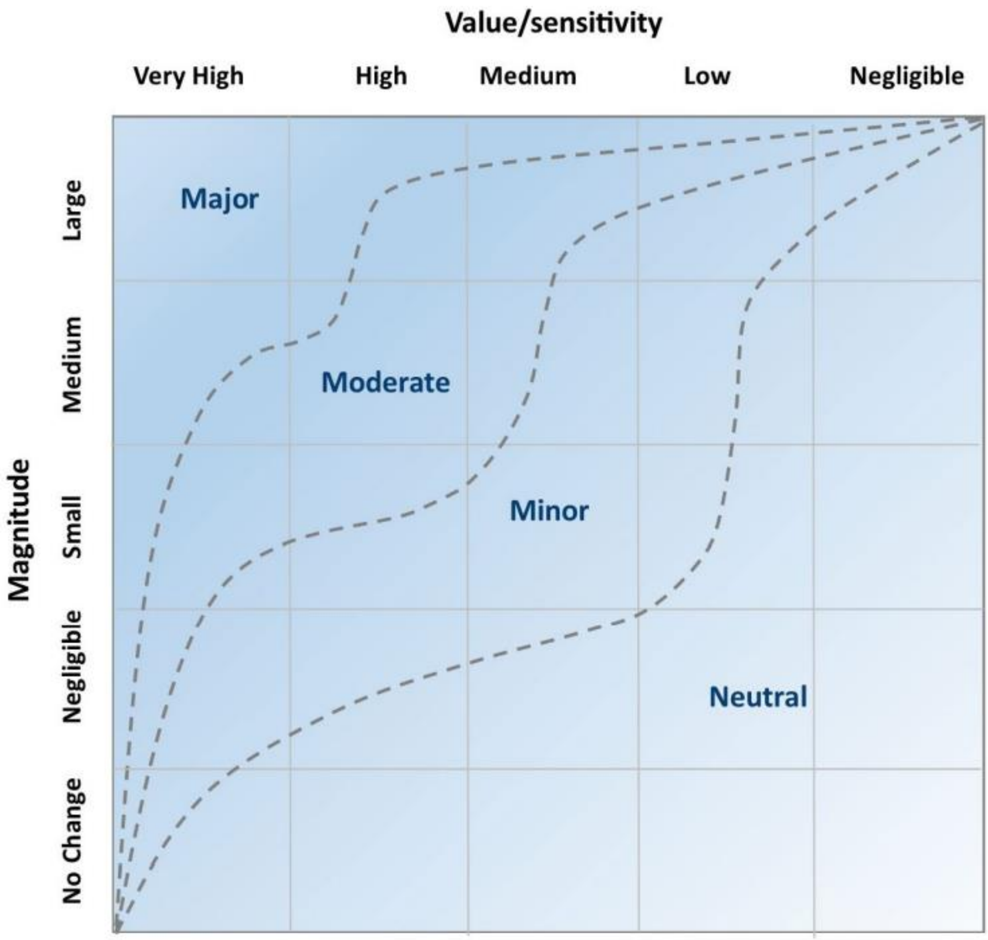


*Figure 5-1. Illustration of the significance matrix*

Following the classification of an effect using this methodology, a clear statement is then made in the ES as to whether that effect is significant or not significant. As a general rule, major and moderate effects are considered to be significant, whilst minor and negligible effects are considered to be not significant. However, professional judgement will also be applied in reaching conclusions as to significance of effects. Generic definitions for the classification of effects are shown in Table 5-4.

*Table 5-4. Definitions for the classification of effects*

| Significance Category | Typical Description | Significant effect? |
|---|---|---|
| Major | A large and detrimental change to a valuable/sensitive receptor; likely or apparent exceeding of accepted (often legal) threshold.<br>A large and beneficial change, resulting in improvements to the baseline result in previously poor conditions being replaced by new legal compliance or a major contribution being made to national targets.<br>These effects may represent key factors in the decision making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to resources or features which are unique and which, if lost, cannot be replaced or relocated. | Yes |
| Moderate | A medium scale change which, although not beyond an accepted threshold, is still considered to be generally | Yes (typically) |

| Significance Category | Typical Description | Significant effect? |
|---|---|---|
| | unacceptable, unless balanced out by other significant positive benefits of a project. Likely to be in breach of planning policy, rather than legal statute.<br>These effects, if adverse, are likely to be important at a local scale and on their own could have a material influence on decision making. A positive moderate effect is a medium scale change that is significant in that the baseline conditions are improved to the extent that guideline targets (e.g. UK BAP targets) are contributed to. | |
| Minor | A small change that, whilst adverse, does not exceed legal or guideline standards. Unlikely to breach planning policy.<br>A small positive change, but not one that is likely to be a key factor in the overall balance of issues.<br>These effects may be raised as local issues and may be of relevance in the detailed design of a project, but are unlikely to be critical in the decision making process. | No |
| Negligible | A very small change that is so small and unimportant that it is considered acceptable to disregard.<br>Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, these effects are unlikely to influence decision making, irrespective of other effects. | No |

Each discipline will have further refined the above typical criteria for assessing significance based on relevant standards / guidance for the particular topic.

A detailed explanation of the specific criteria used for the assessment of each individual topic is set out in the relevant chapters of this Scoping Report.

Likely significant effects will be assessed for all phases of the development (construction, operation & maintenance and decommissioning). Construction effects will often be temporary, short term effects limited to the construction phase only. Permanent effects are those that may start during construction, but would then continue beyond the construction period, into the medium or long term. Operational effects are those which occur once the development is in operation. Decommissioning effects would also include temporary, short term effects.

**Approach to Mitigation**

A standard hierarchical approach to identifying mitigation requirements will be used:

- *Avoid or Prevent:* In the first instance, mitigation should seek to avoid or prevent the adverse effect at source for example, by routeing the cables away from a sensitive receptor.
- *Reduce*: If the effect is unavoidable, mitigation measures should be implemented which seek to reduce the significance of the effect.
- *Offset*: If the effect can neither be avoided nor reduced, mitigation should seek to offset the effect through the implementation of compensatory mitigation.

Mitigation measures fall into two categories: 'mitigation by design' which form part of the proposed Project; and 'Project Specific Mitigation' which are additional to the design commitments and which are identified as a result of the assessment of the proposed Project:

- *Mitigation by Design:* The proposed Project is being developed through an iterative process which involves seeking to avoid or reduce potential environmental effects through the appropriate routeing and siting of Project infrastructure; and

- *Project Specific Mitigation:* Project specific mitigation refers to measures which will be identified and proposed as a result of the assessment. These will be presented within each of the topic chapters. These will be identified to further avoid or reduce identified potentially adverse environmental effects where they cannot be in the design of the proposed Project.

## 5.3 Approach to the ES

The overarching approach to the ES aims to:

- Provide a clear description of the proposed Project through all phases of the development;
- Clearly explain the processes followed to develop the ES including the established scope for the assessment;
- Explain the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the proposed Project on the environment;
- Detail the forecasting methods for the assessment and the limitations (as relevant);
- Assess in an open and robust way the assessment of likely significant effects explaining where results are uncertain;
- Provide sufficient details of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects, the likely efficacy of such measures and how they are secured;
- Detail the need for any ongoing monitoring or remediation; and
- Demonstrate that the information is sufficient to enable a reasoned conclusion to be reached.

### *5.3.1 Provision of Flexibility*

By developing a realistic worst case scenario in response to critical technical and engineering parameters, as well as the emerging findings of the EIA and feedback from stakeholders, it is possible to strike a balance between the level of design information needed for the purpose of EIA and the application for consent and while still retaining the level of design flexibility needed as the proposed Project moves into detailed design and construction.

The flexibility inherent in the proposals is referred to as the ‘Rochdale Envelope’ after the legal cases which established its precedent. The ‘Rochdale Envelope’ is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted.

### *5.3.2 Baseline*

The baseline scenario is the point from which the impacts of the proposed Project are measured. The baseline scenario should be relevant and up to date and clearly explained in the ES, including any dates of surveys used to inform it.

For each environmental aspect, the data source(s) used to establish the baseline should be explained along with details of any survey work undertaken. The timing and scope of all surveys should be agreed with the relevant statutory bodies and appropriate consultees, wherever possible.

The description of the proposed Project and the baseline scenario should be established taking into account the context of the site and any other proposals in the vicinity. Paragraph 3 of Schedule 4 to the EIA Regulations also identifies the need to consider the future baseline in the absence of the development within the assessment, where relevant.

In order to establish the baseline, Study Areas should be identified by all topics and be sufficiently robust in order to undertake the assessment as well as being based on recognised professional guidance where available. Study Areas may be different for different elements of the proposed Project, as discussed in Section 5.2.3.

Baseline sections should avoid mentioning any specific baseline features that are not then considered as receptors in the remainder of the relevant ES chapter, as the reader may be left not knowing if they are affected or not.

### *5.3.3 Assessment of Effects*

The EIA Regulations require the ES to include a description of the 'likely significant effects of the project on the environment'. The assessment should take into account the nature of the impact(s) including whether they are direct and indirect, secondary, cumulative (see Volume 4), transboundary, short-, medium- or long-term, permanent and temporary.

As a matter of principle, the precautionary approach should be followed in judging 'significant effects'. In other words 'likely to affect' will be taken as meaning that there is a probability or risk that the proposed Project will have an effect, and not that a development will definitely have an effect.

The ES needs to define the meaning of 'significant' in the context of each of the aspects assessed and for significant effects to be clearly identified. The criteria used to determine 'significance' for each aspect should also be clearly explained. Quantitative criteria should be used where available, including for the consideration of cumulative impacts and impact interrelationships.

The way in which each aspect of the environment may be affected by the proposed Project can differ. However, it considers that it would be helpful, in terms of ease of understanding and in terms of clarity of presentation, to consider the impact assessment in a similar manner for each of the aspects assessed. A common format should be applied where possible.

An overview of the proposed structure of the ES is provided in Section 6.1.

## 5.4 Approach to the Habitats Regulations, Marine Conservation Zone and Water Framework Directive Assessments

The overarching approach and technical methodology proposed for the HRA, MCZ and WFD Assessments is presented below.

### *5.4.1 Habitats Regulations Assessment Methodology*

As part of the assessment of a proposed scheme it is necessary to consider whether the scheme is likely to have a significant effect on areas that have been internationally designated for nature conservation purposes (known as European sites: SACs, SPAs and, as a matter of government policy, Ramsar sites). A HRA Assessment refers to the several distinct stages of assessment which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) to determine if a plan or project may affect the protected features of a habitats site before deciding whether to undertake, permit or authorise it. The need for and legislative background to the HRA Assessment is described in more detail in Section 2.4.

In general, the methodology for undertaking an HRA involves a step by step process which determines Likely Significant Effects (LSE) and (where appropriate) assesses adverse impact on the integrity of a European site, examines alternative solutions, and provides justification of Imperative Reasons of Overriding Public Interest (IROPI). This constitutes a four-stage process as summarised below:

- HRA Stage 1 – Screening: Screening for LSE (alone or in-combination with other projects or plans). This is essentially an initial high-level assessment intended to ascertain whether there is any potential for effects on European sites that may need fuller investigation;

- HRA Stage 2 – Appropriate Assessment: this is the fuller assessment of the implications of identified potential (likely) significant effects on the conservation objectives of a European site to ascertain if the proposal will adversely affect the integrity of a European site;
- HRA Stage 3 – Assessment of Alternative Solutions (where it cannot be ascertained that the proposal will not adversely affect the integrity of a European site); and
- HRA Stage 4 – Assessment of Imperative Reasons of Overriding Public Interest (where no alternative solutions are identified).

If likely significant effects on European sites can be dismissed, we will document the assessment as a No Significant Effects Report. If such effects cannot be dismissed, then the HRA report will be used to define the scope of the Appropriate Assessment (AA) and set out those issues that do not need to be carried forward. If sufficient scheme information and technical analysis from other disciplines has been undertaken to enable an AA to be produced, then a draft AA report can be produced at that point. For the consent applications the HRA will be completed by updating the reports produced at the draft assessment stage to account for further data or consultee responses. If an AA has not been produced at draft assessment stage (because, for example, essential design work or data collation is still ongoing at that point) then it will be produced for the full application. If an IROPI / No Alternatives case (Stages 3 and 4) needs to be made, and compensatory provision identified, then this will also be undertaken for the full application.

It is anticipated that the following key impact pathways will need considering as part of HRA, potentially including appropriate assessment: water quality sediment process effects, underwater noise disturbance from pile driving in relation to marine mammals and displacement and barrier effects and collision mortality in respect of ornithological species. The key European sites of relevance will be the Severn Estuary SAC, SPA and Ramsar site, Lundy SAC, Carmarthen Bay SAC/SPA, Skomer, Skokholm and the Seas off Pembrokeshire SPA, West Wales Marine SAC, Pembrokeshire Marine SAC and Bristol Channel Approaches SAC. See Volume 4 for further information on designated sites.

The HRA will be carried out with reference to relevant guidance and due regard will be given to all relevant case law relating to the 2017 Regulations, the Habitats Directive and Birds Directive. This includes the ruling by the Court of Justice of the European Union in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17). This case held that; "*it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*" (paragraph 40). This establishes that bespoke mitigation measures cannot be taken into account at the LSEs stage and instead must be considered in an Appropriate Assessment. Additional case law is relevant, including the Holohan ruling which was also handed down by the European Court of Justice in 2018. Among other provisions, the ruling underlined the need to consider effects on functionally linked habitat (i.e. habitat outside the boundaries of a European site but which are essential for achieving the conservation objectives of that European site). This is relevant for European designated for highly mobile species.

A standalone HRA Report will be prepared and included as an appendix to the ES.

#### *5.4.2 Marine Conservation Zone Assessment Methodology*

As described in Section 2.5 above, specific consideration of the potential for impact on MCZs is required for any marine licence application in English and Welsh Waters. MCZs are designated under the Marine and Coastal Access Act 2009 in order to protect a range of important marine habitats, species and geological formations in English and Welsh Waters. Specific duties relating to MCZs and marine licence decision making are set out in Section 126 of the Marine and Coastal Access Act 2009. To ensure compliance with the obligations of the Marine and Coastal Access Act, the MCZ assessment process has been integrated into the existing marine licence decision making process and there is a requirement for specific information relating to potential Project interactions with MCZs to be presented as part of the application process.

In the absence of formal guidance from Natural Resources Wales, the Marine Management Organisation (MMO) guidance document 'Marine conservation zones and marine licensing' will be applied (MMO, 2013). The MMO guidelines recommend a staged approach to assessment, involving three sequential stages: screening, stage 1 assessment and stage 2 assessment. The MCZ Assessment process applies to all features and conservation objectives of both designated MCZs and proposed MCZs.

If sites, activities or impacts are screened into the MCZ Assessment process, these are taken forward to consideration within the stage 1 assessment. If significant risks to the achievement of MCZ conservation objectives are identified in the stage 1 assessment, these are then taken forward to stage 2 assessment. At this stage a screening assessment is presented. The results of the MCZ Assessment process will be presented in the ES.

### *5.4.3 Water Framework Directive Assessment*

As discussed in Section 2.6, consideration of the WFD is required for projects which have the potential to detrimentally impact the chemical and/or ecological status of a waterbody or to prevent improvements that may otherwise result in a waterbody meeting its WFD objectives. In Wales, Natural Resources Wales is the competent authority for implementing the WFD. The relevant competent authorities must make sure that development does:

- Not result in a deterioration of status of the waterbody;
- Not prevent the achievement of 'good' status by 2027;
- Not infringe other legislation; and
- Where possible, enhance the environment.

New developments that therefore have the potential to impact the current or targeted WFD status of a waterbody are required to assess their compliance against the WFD objectives of the potentially affected waterbodies.

In accordance with relevant guidance for coastal and transitional waters (Environment Agency, 2017), a three-stage approach is proposed to be adopted for the WFD assessment:

- Stage 1: WFD Screening – Identification of the Project activities that are to be assessed and determination of which WFD waterbodies could potentially be affected through identification of a zone of influence. This step also provides a rationale for any waterbodies screened out of the assessment. This stage identifies the waterbodies which may potentially be affected by the proposed Project;
- Stage 2: WFD Scoping – For each waterbody identified in Stage 1, an assessment is carried out to identify the effects and potential risks to quality elements from all activities. The assessment is made taking into consideration embedded mitigation (measures that can reasonably be incorporated into the design of the proposed Project) and good practice mitigation (measures that would occur with or without input from the WFD Impact Assessment process). This stage identifies the WFD parameters which need to be considered to inform WFD Impact Assessment (Stage 3);
- Stage 3: WFD Impact Assessment – A detailed assessment of the waterbodies and activities carried forward from the WFD screening and scoping stages. It involves:
    i. The baseline conditions of the concerned water bodies;
    ii. An assessment of the risk of deterioration (either in isolation or cumulatively);

iii. A description of any additional mitigation that is required (if applicable) and how it will be implemented; and
iv. An explanation of any positive contributions to the RBMP objectives proposed, and how they will be delivered.

A standalone WFD Assessment will be prepared and included as an appendix to the ES.

## 5.5 References


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# 6 APPROACH TO THE ENVIRONMENTAL STATEMENT

## 6.1 Proposed Environmental Statement Structure

The ES is expected to be structured into four volumes and a standalone Non-Technical Summary:

- Non-Technical Summary;
- Volume 1 – The Proposed Project;
- Volume 2 – Terrestrial;
- Volume 3 – Marine; and
- Volume 4 – Project-Wide Effects.

An indicative structure for the ES is set out below. This will be confirmed following receipt of any scoping representations.

- **Non-Technical Summary**

- **Volume 1 – The Proposed Project**
  1. Introduction – provides a general overview of the proposed Project;
  2. Regulatory and Planning Policy Context – sets out relevant national and local planning policy and consenting requirements;
  3. Alternatives – describes the main Project alternatives considered;
  4. Description of the Project – provides a description of the main components of the proposed Project;
  5. EIA Approach and Methodologies – explains the overall approach and proposed methodology to be followed in this EIA;
  6. Consultations and Stakeholder Engagement – summarises the stakeholder engagement undertaken to date including how outcomes have informed the proposed Project;

- **Volume 2 – Terrestrial Environment**
  7. Seascape, Landscape and Visual;
  8. Ecology and Biodiversity;
  9. Historic Environment and Cultural Heritage;
  10. Water Environment;
  11. Geology and Hydrogeology;
  12. Agriculture and Soils;
  13. Traffic and Transport;
  14. Aviation and Radar;
  15. Air Quality;
  16. Noise and Vibration;
  17. Socio-economics, Recreation and Tourism;

- **Volume 3 – Marine Environment**
  18. Physical Environment;
  19. Benthic Ecology;
  20. Fish and Shellfish Ecology;
  21. Marine Mammals;
  22. Ornithology;
  23. Marine Archaeology;
  24. Shipping and Navigation;
  25. Commercial Fisheries;
  26. Other Sea Users;

- **Volume 4 – Project-Wide Effects**

  27. Climate Change;
  28. Major Accidents and Disasters;
  29. Combined Effects and Cumulative Effects Assessment; and
  30. Residual Effects.

The structure of the ES and associated consenting application documents will be set out to ensure clarity and ease of reference to the components, associated potential impacts and any mitigation measures within the respective authoritative areas of PCC and PCNPA.

### 6.2 Habitats Regulations Assessment

A separate standalone HRA report will be produced and included as an appendix to the ES.

### 6.3 Marine Conservation Zone Assessment

A separate standalone MCZ report will be produced and included as an appendix to the ES.

### 6.4 Next Steps

The proposed Project is in the process of data collection, engaging with key stakeholders and regulators, and undertaking the necessary engineering and environmental surveys to inform the development of the design and the EIA. The Applicant will formally engage in public consultation events in summer 2022 to introduce the proposed Project, the components, emerging preferred location and alignment.

Environmental and engineering surveys and assessment will continue throughout 2022, working towards a preferred design in summer 2022. S.36 and Marine Licence applications are proposed to be submitted late 2022.

FLOVENTIS ENERGY

# LLYR FLOATING OFFSHORE WIND PROJECT

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# SCOPING REPORT

## Volume 2 – Terrestrial Environment

Prepared by: AECOM Ltd

**April 2022**

## Acronyms and Abbreviations

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| AADT | Average Annual Daily Traffic | DMRB | Design Manual for Roads and Bridges |
| AEZ | Archaeological Exclusion Zones | DP | Decommissioning Plan |
| ALC | Agricultural Land Classification | EA | Environment Agency |
| AOD | Above Ordnance Datum | EcIA | Ecological Impact Assessment |
| AQMA | Air Quality Management Area | ECoW | Ecological Clerk of Works |
| AQO | Air Quality Objectives | EIA | Environmental Impact Assessment |
| AQS | Air Quality Standards | ELC | European Landscape Convention |
| ASIDOHL2 | Assessment of the Significance of the Impact of Development on Historic Landscapes | EMF | Electromagnetic Field |
| ATC | Air Traffic Control | ES | Environmental Statement |
| ATCs | Automated Traffic Counts | EU | European Union |
| BAP | UK Biodiversity Action Plan | FCA | Flood Consequences Assessment |
| BEIS | Business, Energy and Industrial Strategy | FIR | Flight Information Register |
| BGL | Below Ground Level | GCR | Geological Conservation review |
| BGS | British Geological Survey | GLVIA | Guidelines for Landscape and Visual Impact Assessment |
| BMV | Best and Most Versatile | GWDTE | Groundwater Dependent Terrestrial Ecosystem |
| CBD | Convention of Biological Diversity | HDV | Heavy Duty Vehicles |
| CEMP | Construction Environment Management Plan | HGV | Heavy Goods Vehicle |
| CRTN | Calculation of Road Traffic Noise | HIA | Health Impact Assessment |
| CSM | Conceptual Site Model | HLC | Historic Landscape Character |
| CSZ | Core Sustenance Zones | HRA | Habitat Regulation Assessment |
| DAM | Development Advice Map | IAQM | Institute of Air Quality Management |
| DBA | Desk-Based Assessment | INNS | Invasive Non-Native Species |
| DEFRA | Department for Environment, Food and Rural Affairs | LAQM | Local Air Quality Management Plan |

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| LCRM | Land Contamination Risk Management | PIA | Personal Injury Accident Data |
| LDP2 | Local Development Plan 2 | PPW | Planning Policy Wales |
| LLFA | Lead Local Flood Authority | PRoWs | Public Right of Way |
| LSOAs | Local Super Output Areas | PSRs | Primary Surveillance Radars |
| LWS | Local Wildlife Site | PWS | Private Water Abstractions |
| MAGIC | Multi-Agency Geographic Information Centre | RAF | Royal Air Force |
| MCA | Marine Character Areas | RBMP | River Basin Management Plan |
| META | Marine Energy Test Area | RIGS | Regionally Important Geological and Geomorphological Sites |
| MHPA | Milford Haven Port Authority | SAC | Special Areas of Conservation |
| MoD | Ministry of Defence | SAR | Search and Rescue |
| MSZ | Mineral Safeguarding Zones | SHSP | Soil Handling and Storage Protocol |
| NATS | National Air Traffic Services | SPA | Special Protection Areas |
| NCA | National Character Areas | SPG | Supplementary Planning Guidance |
| NDTLP | North Devon and Torridge District Local Plan | SPG | Supplementary Planning Guidance |
| NHBC | National House Building Council | SPZ | Source Protection Zones |
| NLCA | National Landscape Character Areas | SSR | Secondary Surveillance Radar |
| NMCA | National Marine Character Areas | SSSI | Site of Special Scientific Interest |
| NNR | National Nature Reserve | SuDS | Sustainable Drainage Systems |
| NPSs | National Policy Statements | TANs | Technical Advice Notes |
| NRMM | Non-Road Mobile Machinery | TDC | Torridge District Council |
| NRW | Natural Resources Wales | WAP | Working Age Population |
| NSRI | National Soil Resources Institute | WFD | Water Framework Directive |
| NVC | National Vegetation Classification | WIMD | Welsh Index of Multiple Deprivation |
| PCC | Pembrokeshire County Council | WMP | Water Management Plan |
| PCCLDP | Pembrokeshire County Council Local Development Plan | WSI | Written Scheme of Investigations |
| PCNP | Pembrokeshire Coast National Park | WTG | Wind Turbine Generators |
| PCNPA | Pembrokeshire Coast National Park Authority | WWBIC | West Wales Biodiversity Information Centre |
| PFRR | Preliminary Flood Risk Assessment Report | ZTV | Zone of Theoretical Visibility |

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# 7. SEASCAPE, LANDSCAPE AND VISUAL

## 7.1. Introduction

The seascape, landscape and visual impact assessment (SLVIA) will consider the potentially significant effects on seascape and landscape character and on visual amenity that may arise from the construction and operation of the proposed Project. This chapter of the Scoping Report describes the methodology to be used within the assessment, the datasets to be used to inform the assessment, an overview of the baseline conditions, the likely significant effects to be considered within the assessment, and how these likely significant effects will be assessed for the purpose of an EIA.

## 7.2. Regulatory and Planning Policy Context

The overall regulatory and planning context for the proposed Project is set out in Chapter 2 of Volume 1 of this scoping report. The following provides a summary of the legislation and national planning policy most relevant to seascape, landscape and visual considerations.

### *7.2.1. International Legislation*

The European Landscape Convention (ELC) focuses specifically on the importance of integration of landscape issues into areas of policy, to promote protection, management, and planning of all landscapes in Europe. The ELC defines landscape as *"an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors"*. The ELC considers landscape as a whole (land or marine), from urban to rural areas, and whether special or degraded. The ELC was signed by the UK Government in 2006 and became binding from the 1st March 2007.

### *7.2.2. National Legislation*

The National Park and Access to the Countryside Act 1949 provided the basis for establishment of National Parks. The statutory purposes of National Park designation are:

- Conservation and enhancement: "to conserve and enhance the natural beauty, wildlife and cultural heritage of the National Parks."
- Understanding and enjoyment: "to promote opportunities for the understanding and enjoyment of the special qualities (of the Parks) by the public."

The Environment Act 1995, Section 66, places a duty on National Park Authorities to prepare a Management Plan for the delivery of National Park purposes.

### *7.2.3. National Planning Policy*

Future Wales: The National Plan 2040 (2021) is the national development framework for Wales. Although it is highlighted that off-shore proposals do not fall within the remit of Future Wales, a number of policies are relevant to landscape and visual considerations. These highlight that all renewable energy developments should demonstrate that they will not have unacceptable impact on the environment, including landscapes and visual amenity of communities and dwellings.

Planning Policy Wales (PPW) (Edition 11, February 2021) sets out the land use planning policies of the Welsh Government. PPW highlights that the landscapes of Wales are valued and requires local authorities to protect and enhance the special characteristics of landscapes, whilst paying due regard to the social, economic, environmental and cultural benefits they provide, and to their role in creating valued places.

PPW is supplemented by topic-based Technical Advice Notes (TANs). TANs considered to be relevant to landscape and / or visual matters include: TAN 12: Design; and TAN 24: The Historic Environment.

TAN 12 provides advice on how developments should promote sustainability through good design. Specifically, in relation to landscape, it states *"appraisal of the landscape should focus on its quality in terms of geology and geomorphology, vegetation and habitats, visual and sensory quality and historic and cultural quality."*

TAN 24 provides advice on development in relation to the historic environment. Specifically, in relation to landscape it sets out the need for developers to understand the significance and assess the potential impact upon registered historic parks and gardens.

#### *7.2.4. Local Planning Policy*

Pembrokeshire County Council Local Development Plan (PCCLDP), adopted in 2013, sets out the strategy and policy to guide development in Pembrokeshire, excluding the area within the Pembrokeshire Coast National Park. The policies most relevant to landscape and visual considerations include the following:

- SP 16: Countryside; and
- GN 1: General Development Policy.

In addition to the main policies outlined above, draft Supplementary Guidance: Landscape Character Assessment is also relevant to the SLVIA.

PCNP Local Development Plan 2 (LDP2), adopted in 2020 provides guidance and details of policy for development within the PCNP area. The policies most relevant to landscape and visual considerations include the following:

- Policy 8: Special Qualities;
- Policy 9: Light Pollution;
- Policy 14: Conservation and enhancement of the Pembrokeshire Coast National Park; and
- Policy 33: Renewable and Low Carbon Energy.

The following Supplementary Planning Guidance (SPG) which support the policies set out in LDP2 are relevant to landscape, seascape and visual considerations of the Project (PCNPA, 2020a b c d and e):

- Landscape Character;
- Renewable Energy;
- Cumulative Impact of Wind Turbines on Landscape and Visual Amenity; and
- Seascape Character Assessment.

In addition to the policies and SPG set out above, the following policies defined in PCNPA Management Plan 2020-2024 are also relevant to seascape and landscape considerations:

- L1: Conserve and enhance National Park landscapes and seascapes; and
- L2: Protect and enhance dark night skies.

The North Devon and Torridge Local Plan 2011-2031 (NDTLP) was adopted by Torridge District Council (TDC) in 2018. NDTLP is a joint development plan between TDC and North Devon Council and provides guidance and policy to help plan and manage future development across both local authority areas. The policies most relevant to landscape and visual considerations include the following:

- ST09: Coast and Estuary Strategy;
- ST14: Enhancing Environmental Assets; and
- DM08A: Landscape and Seascape Character.

## 7.3. Study Area

The Study Area for assessing potential seascape, landscape and visual effects has been informed by a review of the maximum parameters of the proposed Project, mapping and desk-based research, professional judgement and good practice guidance, including *Visual Representation of Wind Farms* (Scottish Natural Heritage, 2017).

The extent of the Study Area, as shown on Figure 7-1, has been defined by the following offset distances from the different components of the proposed Project:

- 45 km from the outermost proposed Wind Turbine Generators (WTGs);
- 3 km offset from the proposed onshore substation / control building; and
- 1 km from the proposed onshore cable underground cable routes.

The above offset distances, and therefore the Study Area extent, is considered to be the outer limit of potential significant seascape, landscape and visual effects. As the final onshore underground cable route is not yet known the initial Study Area shown on Figure 7-1 is based on the Onshore Scoping Boundary. The Study Area will be reviewed and refined at the detailed assessment stage to relate to the final alignments and locations of the proposed Project and ensure a proportional approach, focussed on potential significant effects.

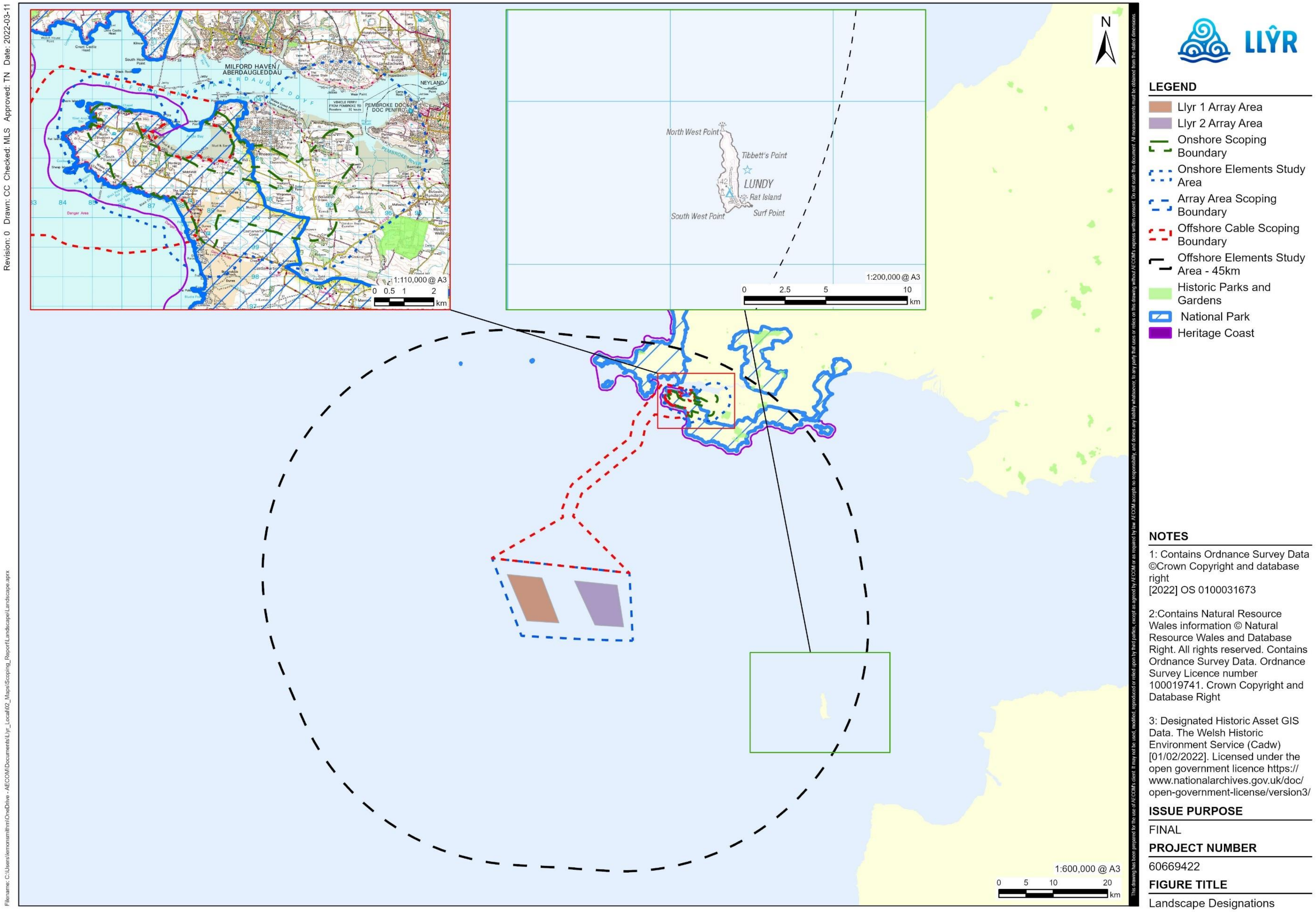


*Figure 7-1. Landscape designations*

## 7.4. Baseline

An initial review of the baseline environment has been undertaken through desk-based research to establish the existing conditions of the landscape and visual resource of the Study Area. This has involved review and analysis of mapping and aerial photography, planning and policy documents, landscape character assessments, LANDMAP data, and other sources of information relevant to the baseline environment. The following provides a summary of the baseline, listing likely key landscape, seascape and visual receptors identified within the Study Area. A detailed description of the landscape, seascape and visual baseline will be provided within the assessment.

### *7.4.1. Landscape Designations*

Landscapes can be recognised as of international, national, or local importance and designated through statute, development plans or other documents. The following landscape designations have been identified within the Study Area, as shown on Figure 7-2:

- Pembrokeshire Coast National Park (PCNP);
- Marloes and Dale Heritage Coast;
- South Pembrokeshire Heritage Coast;
- Lundy Island Heritage Coast; and
- Several Registered Historic Parks and Gardens, including:
    - 111 Main Street, Pembroke;
    - Castle Hall;
    - Cosheston Hall;
    - Great Harmeston;
    - Lamprey Bishop's Palace and Lamprey Court;
    - Monkton Old Hall and Vicarage;
    - Orielton;
    - Stackpole;
    - St Brides Castle; and
    - Trewarren.

Analysis of Zone of Theoretical Visibility (ZTV) mapping and site survey will be undertaken at the assessment to identify the landscape designation with potential visibility of the proposed Project. Landscape designations located outside the ZTV will be scoped out of the detailed assessment.

The Heritage Coasts identified within the Study Area largely coincide with and have a similar purpose to the PCNP. These areas, with the exception of Lundy Island Heritage Coast, will therefore be considered as part of the assessment of the PCNP, rather than as separate receptors.

In addition to the above landscape designations, the following five Dark Sky Discovery Sites have been identified within the Study Area:

- Martins Haven;
- Kete;
- Broad Haven;
- Skrinkle Haven; and
- Lundy Island.

Whilst not landscape designations, the presence of these sites and dark sky characteristics will be considered as part of evaluation of the landscape and visual baseline of the Study Area. The proposed Project is likely to include aviation obstruction lighting on some or all of the proposed WTGs and therefore has the potential to impact on dark skies. However, due to the distant nature of the WTGs at approximately 30 km from the nearest point on the coast, and the low position of the lights towards the horizon, the proposed Project is considered unlikely to have a strong influence on the view of stars in the night sky or on the overall impression of dark skies. It is therefore not proposed that a separate assessment of night-time landscape and visual effects would be undertaken, or night-time visualisations provided. However, the presence of dark sky characteristics will be taken into account in sensitivity judgements and proposed lighting considered as part of the overall evaluation of magnitude of change, where relevant.

### *7.4.2. Landscape and Seascape Character*

Landscape and seascape character can be defined and described at different levels of scale and detail. At the national level the Study Area for the proposed Project is covered by the following broad landscape and coastal seascape character units:

- National Landscape Character Areas (NLCA) and National Character Areas (NCA):
    - Milford Haven NLCA;
    - South Pembrokeshire Coast NLCA;
    - Taf and Cleddau Vales NLCA;
    - West and North Pembrokeshire Coast NLCA; and
    - Lundy NCA.
- National Marine Character Areas (NMCA) and Marine Character Areas (MCA):
    - Milford Haven NMCA;
    - South Pembrokeshire Coastal and Inshore Waters NMCA;
    - West and North Pembrokeshire Coastal Waters and Islands NMCA;
    - Lundy MCA.

The national level character descriptions help to inform the landscape context of the Study Area but are considered too broad to act as the basis for defining the baseline for the assessment. The SLVIA will therefore be undertaken on the basis of the smaller scale local landscape and seascape units identified within the following publications, in combination with relevant LANDMAP aspect areas:

- Pembrokeshire Coast National Park Landscape Character Assessment (2020);
- Pembrokeshire County Landscape Character Assessment, Consultation Draft (2019);
- Joint Landscape Character Assessment for North Devon & Torridge Districts (2010);
- Pembrokeshire Coast National Park Seascape Character Assessment (2013); and
- North Devon and Exmoor Seascape Character Assessment (2015).

Analysis of ZTV mapping will be undertaken as part of the assessment stage and those LCAs and SCAs outside the ZTV, and therefore with no theoretical visibility of the proposed Project, will be scoped out of the assessment. The remaining LCAs and SCAs will then be reviewed, and an initial assessment undertaken to identify those with the potential for significant effects and therefore included in the detailed assessment. Clear justification will be provided for any LCAs and SCAs scoped out at the assessment stage.

There is a degree of overlap between the SCAs and LCAs and therefore rationalisation of these areas may be required to ensure the assessment remains focused and proportionate. Assessment of effects on seascape character will focus on SCAs that include coasts or islands, with those which are entirely offshore scoped out of the assessment.

### *7.4.3. Visual Receptors*

Visual receptors with the potential to experience views of the offshore elements of the proposed Project would largely be located along the closest sections of the Pembrokeshire coast and on Lundy Island. Views of onshore elements of the proposed Project are likely to be experience over shorter distances from nearby locations.

Potential visual receptors are likely to include:

- Residents and visitors to coastal settlements;
- Users of recreational routes, including the Wales/Pembrokeshire Coastal Path and ferry to Skomer Island;
- Visitors to Pembrokeshire beaches and other outdoor visitor attractions, including Lundy Island; and
- Users of the road network.

The visual assessment will be based on a series of representative viewpoints, selected to provide a representative cross section of receptor types and locations within the Study Area. Table 7-1 and Table 7-2, below, provide details of the proposed viewpoint locations for the onshore and offshore elements of the proposed Project. The locations of the proposed viewpoints are shown on Figure 7-2. Viewpoints for the onshore elements will be reviewed and refined at the detailed assessment stage once the final locations of the proposed onshore substation / control building, landfall and onshore underground cable route are known.

*Table 7-1. Representative viewpoint locations for onshore elements of the proposed Project*

| Viewpoint Reference | Location | Receptor Type | Reason for Inclusion |
|---|---|---|---|
| VP A | B4320, Rocket Cart House | Residential and road users | Elevated location on the B4320, selected to provide an overview of the underground cable route. |
| VP B | Minor road, Green Hill/ Wallaston Cross | Recreational and road users | Slightly elevated location on the minor road near Wallaston Cross, selected to provide an overview of the eastern section of the underground cable route. |
| VP C | Pembroke Coastal Path, Lambeeth | Residential and recreational | Slightly elevated location on the Pembroke Coastal Path, selected to provide assessment of potential impacts of the onshore substation / control building from the recreational route and nearby residential property. |
| VP D | Pennar | Residential and recreational | Elevated location on the edge of a settlement, selected to provide assessment of potential impacts of the onshore substation / control building from the north east. |
| VP E | Bentlass | Residential | Coastal location on the edge of a small settlement, selected to provide assessment of potential impacts of the onshore substation / control building from the east. |
| VP F | To be confirmed | Recreational | Additional viewpoint located close to the final landfall location, e.g. West Angle Bay, Gupton Burrows or Sawden. |

*Table 7-2. Representative viewpoint locations for offshore elements of the proposed Project*

| Viewpoint Reference | Location | Receptor Type | Reason for Inclusion |
|---|---|---|---|
| VP 01 | Skomer Island | Recreational | Local high point, representative of views experienced by visitors to Skomer Island. |
| VP 02 | Marloes Beacon | Recreational and Residential | Local high point, representative of views from nearby recreational routes and the settlement of Marloes. |
| VP 03 | St Ann's Head | Recreational and Residential | Southernmost point on the peninsula, representative of views from the Pembrokeshire Coastal Path and adjacent residential properties. |
| VP 04 | Castles Bay/ Sheep Island | Recreational | Representative of views from the Pembrokeshire Coastal Path south of Angle. |
| VP 05 | Freshwater West Beach | Recreational | Representative of views from the beach and the adjacent Pembrokeshire Coastal Path. |
| VP 06 | Castlemartin Range Trail | Recreational and Residential | Representative of views from inland locations on recreational routes (including Pembrokeshire Coastal Path) and nearby residential properties. |
| VP 07 | Elegug Stacks | Recreational | Representative of views from the south Pembrokeshire coast between Linney Head and St Govan's Head. |
| VP 08 | Manorbier Beach | Recreational | Representative of views from the beach, adjacent coastline and nearby settlement. |
| VP 09 | Beacon Hill, Lundy Island | Recreational | Elevated location, selected to be representative of views from Lundy Island. |

### *7.4.4. Visualisations*

The visual assessment will be supported by a range of figures, including visualisations from each of the identified representative viewpoints. Outline photomontages of the onshore substation / control building will be provided from two of the representative viewpoint locations, with annotated baseline photography provided from the remaining representative viewpoints for the onshore elements of the proposed Project. No visualisations are proposed for the landfall and underground cable routes because of the temporary nature of impacts predicted to arise from these elements of the proposed Project.

Visualisations for the offshore elements, primarily the proposed wind turbines, will consist of a baseline panorama and corresponding wireline from each viewpoint. Photomontages will also be provided from five of the representative viewpoint locations to aide understanding of how the wind turbines would appear in the view.

The methodology for the preparation and presentation of the visualisations will follow good practice guidance set out in Technical Guidance Note 06-19: *Visual Representation of Development Proposals* (Landscape Institute, 2019) and *Visual Representation of Wind Farms* (Scottish Natural Heritage, 2017).

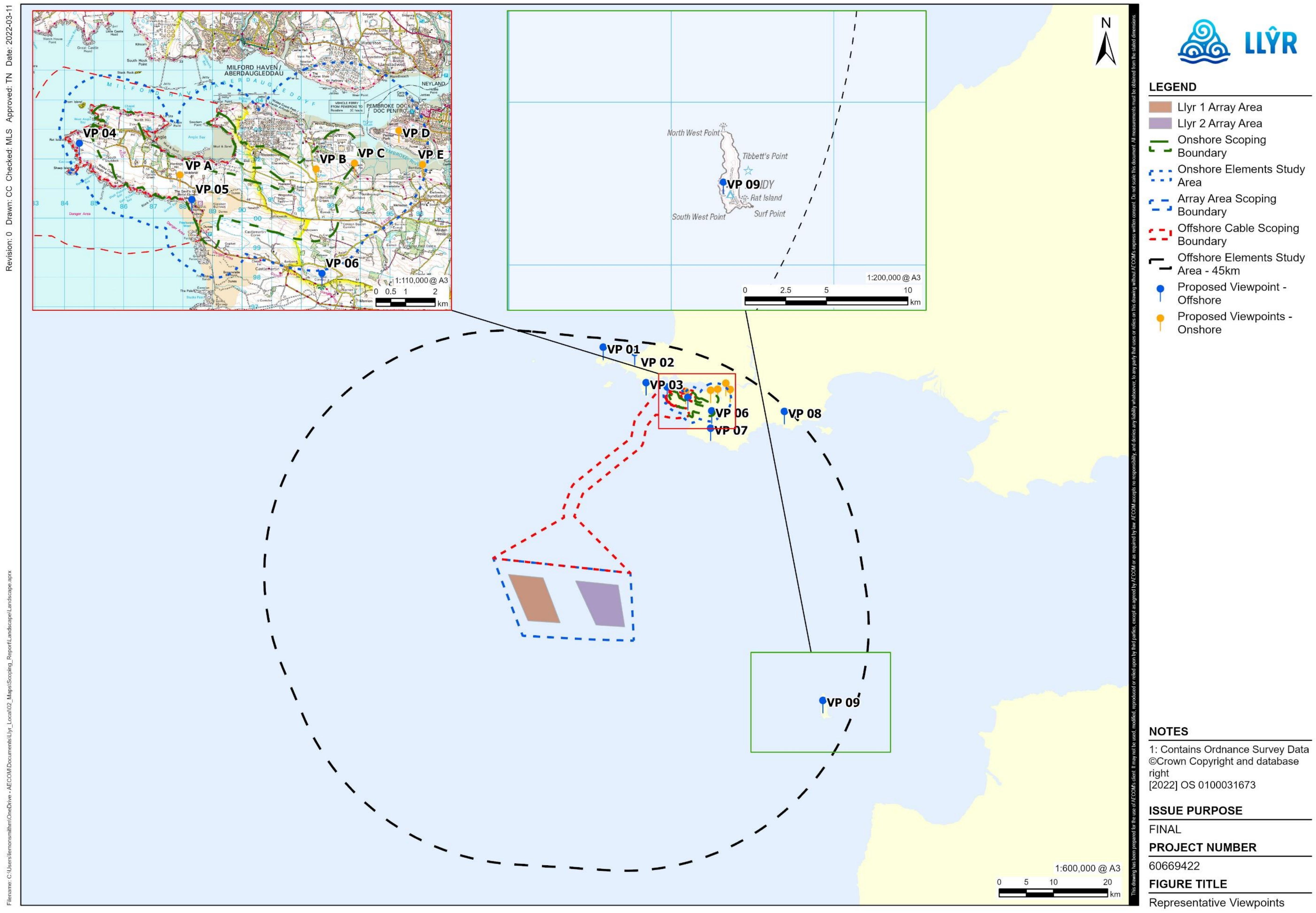


*Figure 7-2. Proposed viewpoint locations*

### 7.5. Embedded and Good Practice Measures

The following measures will be considered as part of the design process for the proposed Project in order to minimise the potential for significant seascape, landscape and visual effects:

- Layout and positioning of the wind turbines to be designed to minimise potential visual effects from land as far as possible, while recognising the need to balance this with other technical and environmental considerations;
- Routeing of the onshore underground cable to minimise adverse effects on key landscape features, and particularly those which could not be readily replaced;
- Consider potential landscape and visual effects in the site selection process for the onshore substation / control building;
- Where siting alone cannot design out potential landscape and visual effects, mitigation measures such as earthworks profiling, and planting will be considered; and
- Use of appropriate colours and materials for wind turbines and other elements of the proposed Project.

### 7.6. Likely Significant Effects

The assessment of the landfall and underground cable route will be focussed on the construction phase as once operational these areas would be reinstated and residual long-term effects are not considered to be significant. This is underpinned by professional judgement and past experience of similar projects. Potential effects during decommissioning are likely to be similar to the construction phase. Effects on the landscape and visual resource as a result of the introduction of the wind turbines and onshore substation / control building will be assessed both at construction and operation (including maintenance and repair). Potential effects resulting from the onshore substation / control building will be assessed at year 1 of operation and year 15 of operation to demonstrate the influence of any mitigation planting on longer term, residual effects.

Potential effects on seascape and landscape character and visual amenity which will be considered within the SLVIA include the following (Table 7-3).

*Table 7-3. Potential effects on seascape and landscape character and visual amenity*

| Topic or Receptor | Project Phase(s) | Justification |
|---|---|---|
| Landscape fabric. | Construction<br>Decommissioning | Temporary physical effects as a result of the introduction of construction compounds, temporary accommodation, and access tracks, movement of plant and other activities associated with the construction of the landfall, onshore underground cables and onshore substation / control building. |
| PCNP and other landscape designations. | Construction<br>Decommissioning | Temporary direct and or indirect effects on the special landscape qualities of the PCNP and other landscape designations as a result of the construction operations. |
| Seascape and landscape character units. | Construction<br>Decommissioning | Temporary effects on the seascape and landscape character areas identified within the Study Area as a result of the construction operations. |

| Topic or Receptor | Project Phase(s) | Justification |
|---|---|---|
| Residential and recreational receptors and road users. | Construction Decommissioning | Temporary disruption to views due to introduction of construction compounds, temporary accommodation, and access tracks, movement of construction plant and watercraft, and other activities associated with the construction of the wind turbines, offshore cable, landfall, onshore underground cable and onshore substation / control building. |
| Physical landscape fabric. | Operation | Long term effects including loss of existing landscape elements due to the introduction of the onshore substation / control building. |
| PCNP and other landscape designations. | Operation | Long term effects on the special landscape qualities of the PCNP and other landscape designations as a result of the introduction of the wind turbines and onshore substation / control building. |
| Seascape and landscape character units. | Operation | Long term effects, including perceptual changes, on the identified landscape and seascape character units within the Study Area as a result of the introduction of the wind turbines and onshore substation / control building. |
| Residential and recreational receptors and road users. | Operation | Long term changes to views due to the introduction of the wind turbines and onshore substation / control building. |

## 7.7. Assessment Methodology

The SLVIA will be carried out in accordance with good practice guidance documents, including:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA), The Landscape Institute and Institute of Environmental Management and Assessment (2013).

The assessment will first establish and describe the existing baseline conditions and value of each identified seascape, landscape and visual receptor before making judgements on the sensitivity, magnitude of change and significance of effects resulting from the proposed Project.

GLVIA places a strong emphasis on the importance of professional judgement in identifying and defining the significance of landscape and visual effects. The SLVIA will be undertaken by Chartered Landscape Architects with experience in the assessment of similar types of projects. Professional judgement will be used in combination with structured methods and criteria to evaluate landscape and visual value and susceptibility, the resulting sensitivity, magnitude, and significance of effect. For clarity and in accordance with good practice, the assessment of potential effects on landscape character and visual amenity, although closely related, are undertaken separately.

### *7.7.1. Sensitivity of Seascape and Landscape Receptors*

The sensitivity of a seascape or landscape receptor is a combination of the value of the seascape / landscape (undertaken as part of the baseline study) and the susceptibility to change of the receptor to the specific type of development being assessed.

Seascape and landscape value is frequently addressed by reference to designations, determined by statutory bodies and planning agencies. However, a range of other factors such as accessibility and local scarcity, condition and quality are also considered.

Seascape and landscape susceptibility relates to the ability of a particular landscape to accommodate the proposed Project and is appraised through consideration of the baseline characteristics, and in particular, the scale or complexity of a given seascape/landscape.

The overall sensitivity assessment is made by employing professional judgement to combine and analyse the identified value and susceptibility, guided by defined criteria with overall levels given from high, medium to low.

#### *7.7.2. Sensitivity of Visual Receptors*

Sensitivity of visual receptors is defined through appraisal of the viewing expectation, or value placed on the view as identified in the baseline study, and its susceptibility to change.

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey or tourist maps and in guidebooks, literature or art or identified in policy. Value can also be indicated by the provision of parking or services, signage, and interpretation. The nature and composition of the view and its scenic quality is also an indicator.

The susceptibility of visual receptors is a function of the occupation or activity of people experiencing the view and the extent to which their attention or interest is focussed on the view.

The overall sensitivity assessment of the visual receptor is determined by employing professional judgement to combine and analyse the identified value and susceptibility and described on a scale from high, medium to low.

#### *7.7.3. Seascape and Landscape Magnitude of Change*

Magnitude of seascape/landscape change refers to the extent to which the proposed Project would alter the existing characteristics of the seascape / landscape. It is an expression of the size or scale of change, the geographical extent of the area influenced and its duration and reversibility. The overall magnitude of change is determined by combining the above considerations using evidence and professional judgement, guided by defined criteria with levels described as being large, medium, small or negligible.

#### *7.7.4. Visual Magnitude of Change*

Visual magnitude of change relates to the extent to which the proposed Project would alter the existing view and is an expression of the size or scale of change in the view, the geographical extent of the area influenced, the angle of view and its duration and reversibility. The overall magnitude of visual change is determined by combining the above considerations using evidence and professional judgement, guided by defined criteria, with levels described as being large, medium, small, or negligible.

#### *7.7.5. Significance of Effects*

Determination of the significance of seascape, landscape and visual effects will be undertaken by employing professional judgement and experience to combine and analyse the magnitude of change against the identified sensitivity of the receptor. The assessments will take account of direct and indirect change on existing landscape elements, features, key characteristics. The visual assessment will consider likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure, or focus of the existing view.

The levels of landscape and visual effects will be described with reference to a set of predefined criteria which will be set out in the detailed methodology provided in the SLVIA. The Significance of effect will be described using a four-point scale from major, moderate, minor to negligible, with effects of moderate or greater generally considered to be significant.

#### *7.7.6. Cumulative Effects*

Assessment of cumulative seascape, landscape and visual effects will be undertaken based on applications for schemes of a similar type, nature and scale agreed in advance with consultees.

The cumulative assessment will be based on the addition of the proposed Project in combination with the cumulative schemes (consented and application schemes) where there is likely to be intervisibility. A targeted approach will be taken to the cumulative assessment, focusing on those receptors with the potential for significant cumulative seascape, landscape, and visual effects.

### 7.8. Conclusion

The SLVIA will be undertaken in accordance with GLVIA and current good practice guidance. The seascape and landscape assessment will consider potential effects on recognised seascape and landscape character areas and landscape designations. The visual assessment will be based on a series of representative viewpoint locations which will be informed by detailed baseline study and defined in consultation with statutory consultees. The SLVIA will also consider the potential for cumulative effects during the operation phase, resulting from the addition of the proposed Project in relation to other similar developments. Mitigation measures will also be developed and informed by the detailed baseline and assessment stages and will seek to minimise potential adverse effects. This will focus on the reinstatement of the onshore underground cables and integrating and partially screening views of the onshore substation / control building.

As there is the potential for long term seascape, landscape and visual effects associated with the WTGs and onshore substation / control building, the SLVIA will be included within the main ES. However, given the temporary and reversible effects associated with the onshore underground cables, it is proposed that operational phase effects associated with this element will be scoped out of the SLVIA.

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# 8. ECOLOGY AND BIODIVERSITY

## 8.1. Introduction

The terrestrial ecology scoping assessment will consider the potential effects on terrestrial ecology receptors that may arise from the construction and operation (including maintenance and repair) of the Project. This chapter of the Scoping Report describes the methodology to be used within the assessment, the datasets to be used to inform the assessment, an overview of the baseline conditions, the potential for significant effects to be considered within the assessment, and how any such significant effects will be assessed for the purpose of an Environmental Impact Assessment (EIA).

## 8.2. Regulatory and Planning Policy Context

Chapter 2 of Volume 1 describes and sets out the overall regulatory and planning policy context for the Project. This chapter briefly summarises the legislation and policy relevant to terrestrial ecology.

*Summary of Legislation*

Several legally protected ecological receptors have the potential to be impacted by the Project. A summary of the legislation considered during this Scoping Report is provided in Table 8-1 and Table 8-2.

The UK is no longer a member of the European Union (EU). EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation. EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'.

The Secretary of State for the Environment, Food and Rural Affairs and Welsh Ministers have made changes to parts of the Conservation of Habitats and Species Regulations 2017 (referred to as the 2017 Regulations) so that they operate effectively. Most of these changes involve transferring functions from the European Commission to the appropriate authorities in England. All other processes or terms in the 2017 Regulations remain unchanged and existing guidance is still relevant.

*Table 8-1. Summary of legislation relating to designated sites*

| Designation | Brief Description |
|---|---|
| Special Areas of Conservation (SAC) | SACs are sites selected to conserve the natural habitat types and species of wild flora and fauna as stated in the Conservation of Habitats and Species Regulations. They are the best areas to represent the range and variety of habitats and species within the European Union (EU). These sites in the UK no longer form part of the EU's Natura 2000 ecological network. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (referred to as the 2019 Regulations) have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. Any references to Natura 2000 in the 2017 Regulations and in guidance now refers to the new national site network. |
| Special Protection Area (SPA) | SPAs are strictly protected sites for the most important habitats for rare and migratory birds within the EU. These sites in the UK no longer form part of the EU's Natura 2000 ecological network. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (referred to as the 2019 Regulations) have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK.Any references to Natura 2000 in the 2017 Regulations and in guidance now refers to the new national site network. |
| Ramsar Sites | Ramsar Sites are wetlands of international importance. Ramsar Sites are protected, through the planning system, under the Wildlife and Countryside Act 1981 (as amended), and the Countryside and Rights of Way Act 2000 through their notification as SSSIs and through other regulatory systems addressing water, soil and air quality. |
| National Nature Reserve (NNR) | NNRs are nationally important areas of wildlife habitat and geological formations in Britain. NNRs are designated and protected under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended). They receive additional protection under the Countryside and Rights of Way Act 2000. They are managed for the benefit of nature conservation. |
| Site of Special Scientific Interest (SSSI) | A SSSI is a site of at least national importance for nature conservation designated under the Wildlife and Countryside Act 1981 (as amended) due to its special interest in terms of flora, fauna or geological or physiographical features. Protection afforded to SSSI's was strengthened by the Countryside and Rights of Way Act 2000. It should be noted that under the Countryside and Rights of Way Act 2000 owners of SSSIs must give Natural Resources Wales (NRW) written notice before they begin any of the operations listed in the notification as likely to damage the special interest features, or if they allow others to carry out these activities. None of the listed operations can be carried out without NRW's consent. |
| County Wildlife Site (Local site) | A County Wildlife Site is a non-statutory site designated by a local authority as being of local nature conservation value. |

| Designation | Brief Description |
|---|---|
| Ancient Woodland Inventory | Ancient Woodland is a term applied to woodlands which have existed from at least Medieval times to the present without ever having been cleared for uses other than wood or timber production. A convenient date used to separate ancient and secondary woodland is about the year 1600. In special circumstances semi-natural woods of post-1600 but pre-1900 origin are also included. |
| Wildlife Trust Reserve | These non-statutory sites are managed by the Wildlife Trusts with the purpose of conserving wildlife. |

*Table 8-2. Summary of legislation relating to protected species*

| Legislation | Brief Description |
|---|---|
| Conservation of Habitats and Species Regulations, 2017 | The Conservation of Habitats and Species Regulations 2017 are intended to remain in place for some time. This is due to the Government ceasing to have the power of consolidating regulations derived from EU law after the date of exit from the European Union.<br><br>The Regulations are designed to transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive), into national law. Additionally, they transpose elements of the EU Wild Birds Directive in England and Wales.<br><br>The Conservation of Habitats and Species Regulations 2017 extend to England and Wales, including the adjacent territorial sea (12 nautical miles from the mean low-water mark of a coastal state), to a limited extent in Scotland in respect of reserved matters and Northern Ireland in respect of excepted matters.<br><br>The Conservation of Habitats and Species Regulations 2017 protects habitat sites supporting vulnerable and protected species, as listed within the Directive. The need for an assessment of impacts on Natura 2000 sites (the collective name for European designated sites, including SPAs and SACs); and provides a framework for the protection, management and control of all species of naturally occurring wild birds in the European territory of EU Member States. |
| Wildlife and Countryside Act (1981) (as amended) | The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in Great Britain. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and (partially) the Birds Directive and the Habitats Directive are implemented in the UK. The Countryside and Rights of Way Act 2000 has strengthened this legal protection (see below).<br><br>A small number of plant species are listed under Schedule 9 of the Wildlife and Countryside Act 1981, as amended, which includes species such as Japanese knotweed (*Reynoutria japonica*), Himalayan balsam (*Impatiens glandulifera*), montbretia (*Crocosmia x crocosmiiflora*), giant hogweed (*Heracleum mantegazzianum*) and some cotoneaster species (Cotoneaster sp.). It is illegal to plant or to cause these plants to grow in the wild, and legal disposal methods for vegetation and soil subject to disturbance or clearance from a site must be used. |

| Legislation | Brief Description |
|---|---|
| Convention on Biological Diversity and the Countryside and Rights of Way Act 2000 | The Countryside and Rights of Way Act 2000 provides a statutory framework for biodiversity conservation. The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.<br><br>Schedule 9 of the Act amends SSSI provisions of the Wildlife and Countryside Act 1981, including provisions to change SSSIs and providing increased powers for their protection and management. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increases penalties on conviction where the provisions are breached; and introduce a new offence whereby third parties can be convicted for damaging SSSIs.<br><br>Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable' and create a new offence of reckless disturbance.<br><br>The UK Biodiversity Action Plan (BAP) was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992. It provides the framework for fulfilling the UK's responsibilities towards the Convention on Biological Diversity. Conservation of biodiversity (the variety of life on earth) is an essential element of sustainable development. |
| Environment (Wales) Act 2016 | The Environment (Wales) Act puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and joined-up way. Part 1 relates to the sustainable management of natural resources. This ensures that the way in which the use of and the impacts on natural resources do not result in long term decline. The aim is to sustainably manage natural resources in a way and rate that meets the needs of present and current generations without compromising the needs of future generations.<br><br>The Act also contains at section 7, a duty for the Welsh Ministers prepare and publish a list of the living organisms and types of habitat which in their opinion are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. This section replaces the duty in section 42 of the NERC Act 2006. |
| Protection of Badgers Act 1992 | The Protection of Badgers Act 1992 makes it an offence to wilfully take, kill, injure or ill-treat a badger, possess a dead badger or any part of a badger. Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural England takes this definition to include seasonally used setts.<br><br>Work that may disturb badgers or their setts is illegal without a development licence from the relevant statutory body (in this case Natural Resources Wales). |
| The Hedgerow Regulations 1997 | The Hedgerow Regulations (1997) make provision for the protection of important hedgerows in England and Wales. The regulations affect hedgerows which are 20m or more in length, or connected at both ends to another hedgerow of any length.<br><br>They relate to hedgerows which are on, or adjoining land used for the following purposes: agriculture or forestry; the breeding or keeping of horses, ponies or donkeys; common |

| Legislation | Brief Description |
|---|---|
| | land; village greens; and SSSIs (They do not include hedges that are attached to, or marking the boundaries of a private house.<br><br>It is an offence to intentionally or recklessly remove or cause or permit another person to remove a hedgerow or intentionally or recklessly remove, or cause or permit another person to remove, a hedgerow which is the subject of a hedgerow retention notice. |

*8.2.2. Planning Policy*

#### 8.2.2.1. National Planning Policy

**Planning Policy Wales (11th Ed. February 2021)**

Planning Policy Wales (PPW) sets out the land use planning policies of Welsh Government. Chapter 6, Distinctive and Natural Places, outlines government objectives for the environmental and cultural components of placemaking. Section 6.4 addresses Biodiversity and Ecological Networks. The policy includes the duties and requirements set out in Section 6 of the Environment Wales Act (2016) and pays due regard to the State of Natural Resources Report (Natural Resources Wales, 2020) by taking all reasonable steps to maintain and enhance biodiversity. There is a focus on ecosystem services and the benefits of protecting and enhancing biodiversity.

**Technical Advice Note 5 (TAN5) Nature Conservation and Planning**

The Planning Policy Wales (PPW) is supplemented by a series of Technical Advice Notes. TAN 5 provides guidance on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. It provides advice on areas including the key principles of positive planning for nature conservation, nature conservation in Local Development Plans and development management procedures. It also provides advice on development affecting designated sites and habitats, in addition to Protected or Priority Habitats and Species.

Key principles include that the town and country planning system in Wales should integrate nature conservation into all planning decisions; that the town and country planning system should look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally and that they should ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions.

#### 8.2.2.2. National Infrastructure Projects – National Policy Statements

The government has produced a series of National Policy Statements (NPSs) which give reasons for policies and an explanation of how a policy will take account of mitigation of, and adaptation to, climate change. They are in place to identify government objectives for the contribution to sustainable development, integration to other government policies and identification of circumstances where adverse impacts of a development should be addressed. There are a total of 12 NPSs, these are categorised according to the type of national infrastructure development they relate to: Energy, Transport and Water, Waste Water and Waste. A summary of those bearing relevance to this Project is provided below, for further details refer to the whole text.

**Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a)**

The Overarching National Policy Statement for Energy provides high level objectives, policy and regulatory framework for new nationally significant infrastructure projects. It outlines key principles to be followed in the examination and determination of applications and policy on good design and assessment of generic impacts. Section 5.3 of the statement sets out generic biodiversity effects of energy infrastructure projects. This describes the need for developments subject to EIA to ensure that the Environmental Statement clearly details any effects on:

- internationally, nationally and locally designated sites of ecological importance;
- protected species; and,
- habitats and other species of principal importance for the conservation of biodiversity.

In relation to designated sites, the NPS states that '*where a proposed development on land within or outside an SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted*'. Exceptions may be made only where the benefit and need of the development clearly outweighs the impacts on the designation. Regional and local sites will also be given consideration in the granting of permission to develop, though in themselves should not be used to refuse development consent. The NPS also describes that ancient woodland cannot be recreated once lost, and as a result new infrastructure should not be permitted where loss or deterioration of ancient woodland is anticipated unless the benefits and need of the development outweighs the loss of the woodland.

In relation to protected species, this NPS refers to legislative requirements to protect individual wildlife species and states that infrastructure developments should '*ensure that these species and habitats are protected from the adverse effects of development by using requirement or planning obligations*'. Substantial weight should be given to the detriment of biodiversity features of national or regional importance when making decisions regarding the development of new infrastructure.

This NPS requires appropriate mitigation measures for developments, including the demonstration that:

- activities during construction will seek to ensure that a minimum area is utilised for the works;
- best practice will be followed during construction and operation to minimise risk of disturbance or damage to species or habitats;
- habitats will be restored after construction works where practicable; and,
- opportunities will be taken to enhance existing habitats and create new habitats of value where practicable.

**National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change, 2011b)**

This NPS provides the basis for decisions on applications for nationally significant renewable energy infrastructure. When considering the impact of the offshore wind projects, the onshore element (including grid connections, lines and substation / control buildings) should be determined in accordance with the Electricity Networks Infrastructure NPS.

Paragraph 2.6.37 of the NPS for Renewable Energy Infrastructure sets out the requirement for an EIA to assess the impacts of cable routes from wind farms to onshore substation / control buildings. Where a route is not confirmed, a corridor should be selected within which the cable is likely to be located and the EIA should assess the potential effects within the entire corridor.

**National Policy Statement for Electricity Networks Infrastructure (EN-5) (Department of Energy and Climate Change, 2011c)**

This NPS provides the basis for decisions on applications for changes to the electricity network, including those connected to offshore wind. The statement sets out technology-specific considerations on biodiversity and geological conservation, landscape and visual and noise and vibration. In relation to ecology, this NPS outlines the requirement for development to consider the potential impacts on large birds, the likelihood that they will collide with overhead lines associated with the development and the potential for them to be electrocuted by overhead lines.

#### 8.2.2.3. Local Planning Policy

Several local planning policies have relevance to the proposed development, a summary of the Pembrokeshire County Council Local Development Plan (Pembrokeshire County Council, 2013) Pembrokeshire Coast National Park Local Development Plan (Pembrokeshire Coast National Park Authority, 2020), Pembrokeshire Local Biodiversity Action Plan (Pembrokeshire Biodiversity Partnership, 2011) and Nature Recovery Action Plan for Pembrokeshire (Pembrokeshire Nature Partnership, 2018) is provided in Table 8-3. For the precise wording of each policy, please refer to the source documents.

*Table 8-3. Summary of local planning policy*

| Document | Planning Policy | Summary of Policy Text |
|---|---|---|
| Pembrokeshire County Council Local Development Plan Planning Pembrokeshire's Future (up to 2021)<br><br>Adopted February 2013 | SP.1. Sustainable Development | An overarching strategic policy that relates to all proposals. It aims to ensure that all development is sustainable. |
| | GN.1.General Development Policy | Provides a framework for the evaluation of potential development impacts. Criterion 4 ensures that development will respect and protect the natural environment, including protected habitats and species. Any development proposal must demonstrate that it protects the natural environment and, where possible, enhances it. |
| | GN.3. Infrastructure and New Development | Makes provision for contributions to be sought, where appropriate and necessary, in conjunction with development proposals including for biodiversity. |
| | GN.37 Protection and Enhancement of Biodiversity | Requires all new developments to demonstrate a positive approach to maintaining and, where possible, enhancing biodiversity. It aims to ensure that species and their habitats as well as wildlife and landscape features, in both countryside and urban environments, are protected from the potentially adverse effects of development. This policy requires that where any such effects are anticipated, appropriate mitigation and/or enhancement should be made. |
| Pembrokeshire Coast National Park Local Development Plan 2 (end date 2031)<br><br>Adopted September 2020 | Policy 1. National Park Purposes and Duty | The overarching policy of the Plan fundamental to conserving and enhancing the wildlife National Park. |
| | Policy 8. Special Qualities | Identifies the need for development to positively enhance the National Park's ecosystems and components that underpin them. This policy emphasises the importance of links between sites. |
| | Policy 9. Light Pollution | Seeks to ensure the minimal impact of lighting on the night sky. |

| Document | Planning Policy | Summary of Policy Text |
|---|---|---|
| | Policy 10. Sites and Species of European Importance | Development likely to have a significant effect on a European Site, when considered alone or in combination with other projects, will only be permitted where:<br>a) the proposal is directly connected with or necessary for the protection, enhancement and positive management of the site for conservation purposes;<br>b) following an appropriate assessment, the proposal will not adversely affect the integrity of the site; or,<br>c) there is no alternative solution and there are reasons of overriding public interest and appropriate compensatory measures are secured.<br>Development likely to have an adverse effect on a European protected species will only be permitted where:<br>a) there are reasons of overriding public interest;<br>b) there is no satisfactory alternative; and,<br>c) the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range. |
| | Policy 11. Nationally Protected Sites and Species | Development likely to have an adverse effect either directly or indirectly on the conservation value of nationally protected sites will only be permitted where it is demonstrated that:<br>a) there is no suitable alternative to the proposed development;<br>b) the benefits from the development clearly outweigh the special interest of the site;<br>c) appropriate compensatory measures are secured; and,<br>d) the proposal contributes to the protection, enhancement or positive management of the site.<br>Development likely to have an adverse effect on nationally protected species will only be permitted where it is demonstrated that:<br>a) the population range and distribution of the species will not be adversely impacted;<br>b) there is no suitable alternative to the proposed development;<br>c) the benefits of the development clearly outweigh the adverse impacts on the protected species; and,<br>d) appropriate avoidance, mitigation and compensation measures are provided. |
| | Policy 12. Local Sites of Nature Conservation | This policy provides protection to areas of local importance, including habitats and species of principal importance to Wales and areas providing connectivity. |

| Document | Planning Policy | Summary of Policy Text |
|---|---|---|
| | Policy 29. Sustainable Design | All proposals for development will be expected to demonstrate an integrated approach to design and construction and will be required to be well designed in terms of the following features:<br>a) place and local distinctiveness;<br>b) environment and biodiversity;<br>c) community cohesion and health;<br>d) accessibility;<br>e) efficient use of energy;<br>f) energy generation;<br>g) materials and resources;<br>h) water and drainage;<br>i) waste; and,<br>j) resilience to climate change. |
| Pembrokeshire Local Biodiversity Action Plan 2011 | The main function of the Pembrokeshire Local Biodiversity Action Plan is to provide a framework to conserve and enhance biodiversity in Pembrokeshire, taking account of local and national priorities. The plan is made up of two parts, part one provides the background to the biodiversity within Pembrokeshire and also the role of the Pembrokeshire Biodiversity Partnership, part two details habitat and species action plans for key features in Pembrokeshire. The plan outlines nine grouped habitat action plans and eight grouped species action plans with a further nine specific species action plans. | |
| Nature Recovery Action Plan for Pembrokeshire | The Nature Recovery Action Plan is intended to highlight the key pressures on nature in Pembrokeshire and direct partners to suggested themes of action to address them, set within the legislative context. It can be used to stimulate project ideas, direct conservation effort, or provide a rationale for local action to achieve national objectives. | |

### 8.3. Study Area

The following terms will be used throughout:

- Onshore Scoping Boundary: Land within the confirmed cable route. Shown on Figure 1-1, Volume 1;
- Desk Study Area: Land within 2 km of the Onshore Scoping Boundary, extended to 10 km for sites designated for bats;
- Species Specific Survey Area (*e.g.* Otter Survey Area, Badger Survey Area): The land surveyed to inform the presence or likely absence of ecological features within a species-specific zone of influence or buffer distance of the Onshore Scoping Boundary. These will be specified for each report within the survey methodologies.

A desk study was undertaken in February 2022 by AECOM to obtain records of designated sites, notable habitats and protected and notable species within 2 km of the Onshore Scoping Boundary, extended to 10 km for sites designated for bats.

An Environmental Statement for Project Erebus (ITPEnergised, 2021a) was consulted to inform this Scoping Report, as described below since the proposed onshore construction area is the same for each project and so information collected to inform Project Erebus is directly relevant to this scoping report. This included a preliminary ecological assessment of 1795 ha of land along a 250 m buffer on either side of four potential cable routes and several potential substation / control building sites near Pembroke Power Station. As part of this Environmental Statement, surveys for protected species were completed following the confirmation of a chosen cable route which was the southern-most option. These surveys were only conducted on the confirmed route with species-appropriate buffers as described in Table 8-8 (maximum 300 m for breeding bird surveys). For figures identifying the exact areas surveyed, please refer to the Environmental Statement (ITPEnergised, 2021a) and appropriate appendices.

## 8.4. Baseline

This assessment is based on a desk-based assessment, taking into account information from the following sources:

- West Wales Biodiversity Information Centre (WWBIC) was contacted to obtain the following data:
    - Records of non-statutory designated sites within 2 km of the Onshore Scoping Boundary; and,
    - Records of legally protected and notable species within 2 km of the Onshore Scoping Boundary, including species of principal importance for the conservation of biodiversity under Section 7 of the Environment (Wales) Act.
- The Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk) was reviewed for the following information:
    - Designated sites of nature conservation importance within 2 km of the Onshore Scoping Boundary;
    - Designated sites (SACs and SSSIs) within 10 km of the Onshore Scoping Boundary designated for bats; and,
    - Waterbodies within 500 m of the Onshore Scoping Boundary.
- Ancient woodland within and directly adjacent to the Site identified on the Ancient Woodland Inventory (Natural Resources Wales (2021)
- A Scoping Report for Project Erebus (MarineSpace Ltd, 2019)
- A Scoping Report for Project Valorous (MarineSpace Ltd, 2021)
- The Environmental Statement for Project Erebus (ITPEnergised, 2021a), including appendices for preliminary ecological assessment and protected species surveys (breeding birds, wintering birds, badger, reptiles, hazel dormouse and bats)

### *8.4.1. Designated Sites*

There are ten designated sites within 2 km of the Onshore Scoping Boundary, these are summarised in Table 8-4.

There are seven internationally and nationally designated sites which describe bats as a reason for their designation, these are summarised in Table 8-5. The Location of each designation and relation to the Onshore Scoping Boundary including Core Sustenance Zones (CSZ) is noted. A CSZ refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence of the resilience and conservation status of the colony using the roost (Collins, 2016).

*Table 8-4. Summary of designated sites within 2 km of the Onshore Scoping Boundary*

| Designated Site | Reason for Designation | Location of Designation and Relation to Site |
|---|---|---|
| Limestone Coast of South Wales / Arfordir Calchfaen De Orllewin Cymru Special Area of Conservation SAC | Coastline primarily designated for Annex I habitat types and Annex II species: vegetated sea cliffs, fixed dunes, greater horseshoe bat (*Rhinolophus ferrumequinum*) and early gentian (*Gentianella anglica*).<br><br>Annex I habitats that are a primary reason for selection of this site:<br>Vegetated sea cliffs of the Atlantic and Baltic Coasts<br>"Fixed coastal dunes with herbaceous vegetation ("grey dunes")" *Priority feature<br>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:<br>European dry heaths<br>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)<br>Caves not open to the public<br>Submerged or partially submerged sea caves<br>Annex II species that are a primary reason for selection of this site:<br>Greater horseshoe bat<br>Early gentian<br>Annex II species present as a qualifying feature, but not a primary reason for site selection:<br>Petalwort (*Petalophyllum ralfsii*) | Within the Onshore Scoping Boundary. Approximately 1.4 km of the cable route passes through this designation. |
| Pembrokeshire Marine / Sir Benfro Forol SAC | Marine, tidal and salt marsh area designated for Annex I habitats and Annex II species: estuaries, large shallow inlets and bays, reefs, grey seal (*Halichoerus grypus*) and shore dock (*Rumex rupestris*).<br>Annex I habitats that are a primary reason for selection of this site:<br>Estuaries<br>Large shallow inlets and bats<br>Reefs<br>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:<br>Sandbanks which are slightly covered by sea water all the time | Within the Onshore Scoping Boundary. Approximately 200 m east of Pembroke Power Station in the east of the Onshore Scoping Boundary. |

| Designated Site | Reason for Designation | Location of Designation and Relation to Site |
|---|---|---|
| | Mudflats and sandflats not covered by seawater at low tide<br>Coastal lagoons *Priority feature<br>Atlantic salt meadows (Glauco-Puccinellietalia maritimae)<br>Submerged or partially submerged sea caves<br>Annex II species that are a primary reason for selection of this site:<br>Grey seal<br>Shore dock<br>Annex II species present as a qualifying feature, but not a primary reason for site selection:<br>Sea lamprey (*Petromyzon marinus*)<br>River lamprey (*Lempetra fluviatilis*)<br>Allis shad (*Alosa alosa*)<br>Twaite shad (*Alosa fallax*)<br>Otter (*Lutra lutra*) | |
| West Wales Marine / Gorllewin Cymru Forol SAC | A designation off the coast of Wales from the Llŷn peninsula to Pembrokeshire designated for harbour porpoise (*Phocoena phocoena*), an Annex II species. | Approximately 760 m west of the Onshore Scoping Boundary. |
| Castlemartin Coast SPA | The Castlemartin Coast SPA is designated for chough (*Pyrrhocorax pyrrhocorax*). | Within the Onshore Scoping Boundary. Approximately 300 m of the cable route passes through this designation. |
| Broomhill Burrows SSSI | One of Pembrokeshire's largest dune systems with the most extensive and most diverse dune slack vegetation. Provides good conditions for invertebrates, including two rare moths, the scarlet tiger (*Callimorpha dominula*) and the white colon (*Sideridis albicolon*). Other species of interest include lapwing (*Vanellus vanellus*) breeding in the dune slacks and reptiles recorded include adder (*Vipera berus*), grass snake (*Natrix helvetica*), slow-worm (*Anguis fragilis*) and common lizard (*Zootoca vivpara*). Palmate newt (*Lissotriton helveticus*) and common toad (*Bufo bufo*) are present within the designation. | Within the Onshore Scoping Boundary. Approximately 1.2 km of the cable route passes through this designation. |
| Angle Peninsula Coast / Arfordir | The Angle Peninsula coast supports a small breeding population (usually one to two pairs a year), and roosting areas for a significant | Approximately 100 m south of |

| Designated Site | Reason for Designation | Location of Designation and Relation to Site |
|---|---|---|
| Penrhyn Angle SSSI | proportion of the South Pembrokeshire non-breeding population of chough. Feeding peregrine (*Falco peregrinus*) are regularly seen and have been recorded breeding on this site, along with feeding and over wintering greater and lesser horseshoe bats (*Rhinolophus hipposideros*). | the Onshore Scoping Boundary. |
| Milford Haven Waterway SSSI | Milford Haven Waterway is of special interest for its ancient woodland, marine biology, saltmarsh, swamp, saline lagoons, rare and scarce plants and invertebrates, nationally important numbers of migratory waterfowl, greater and lesser horseshoe bats and otter. | Approximately 150 m east of Pembrokeshire Power Station in the east of the Onshore Scoping Boundary. |
| Gweunydd Somerton Meadows SSSI | Of special interest for grassland fungi and unimproved neutral grassland, the designation is made up of 16 fields which also include marshy grassland. Swamp, standing water, woodland, scrub and thick hedges are also present. The designation supports several locally uncommon plants as well as marsh fritillary butterfly (*Euphydryas aurinia*), the shrill carder bee (*Bombus sylvarum*) and a rich assemblage of dragonfly. | Approximately 420 m south of the Onshore Scoping Boundary. |
| Castlemartin Corse SSSI | This site is of special interest primarily for its swamp and calcareous fen meadow habitats. Other habitats which contribute to the special wildlife interest include neutral grassland, scrub and open water. The ditches within the site support a range of plants including fen pondweed (*Potamogeton coloratus*). | Approximately 950 m south of the Onshore Scoping Boundary. |
| Castlemartin Range SSSI | Castlemartin Range is of special interest for its marine biology, sand dunes, wetland habitats, calcareous grassland, cliff and coastal grassland and heath, together with the most extensive area of species-rich neutral grassland in Wales. The designation supports rare and scarce plants, invertebrates, seabirds, greater and lesser horseshoe bats, otter and grey seal. At the north-western end of the site the cliffs give way to an extensive calcareous dune system, including a natural transition to fen. | Approximately 1.2 km south of the Onshore Scoping Boundary. |

*Table 8-5. Summary of internationally and nationally designated sites for bats within 10 km of the Onshore Scoping Boundary*

| Designated Site | Reason for Designation | Location of Designation and Relation to Onshore Scoping Boundary |
|---|---|---|
| Limestone Coast of South Wales / Arfordir Calchfaen De Orllewin Cymru SAC | Greater horseshoe bat is listed as an Annex II species that are a primary reason for selection of this site. No other bat species are listed within the designation.<br>This site in south-west Wales contains the main hibernation site for the population associated with Pembrokeshire Bat Sites SAC. It may thus be used by up to 5.5% of the UK population of greater horseshoe bat. | Within the Onshore Scoping Boundary.<br>Approximately 1.4 km of the cable route passes through this designation.<br>The Onshore Scoping Boundary is within the Core Sustenance Zone (CSZ) for bats at this SAC. |
| Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC | Greater horseshoe bat is listed as an Annex II species that are a primary reason for selection of this site. Lesser horseshoe bat is listed as an Annex II species present as a qualifying feature, but not a primary reason for site selection. No other bat species are listed within the designation.<br>This site in south-west Wales supports approximately 9.5% of the UK greater horseshoe bat population. It represents the species at the north-western extremity of its range. The site contains a mixture of maternity, transitory and hibernation sites and so demonstrates good conservation of features required for survival.<br>It is made up eight component SSSIs:<br>1. Stackpole SSSI<br>2. Stackpole Courtyard Flats and Walled Garden SSSI<br>3. Slebech Stable Yard Loft, Cellars and Tunnels SSSI<br>4. Felin Llwyn-gwair SSSI<br>5. Carew Castle SSSI<br>6. Beech Cottage Waterwynch SSSI<br>7. Orielton Stable Block and Cellars SSSI<br>8. Park House Outbuildings SSSI | Nearest component SSSI is 2.9km south-east at the eastern end of the Onshore Scoping Boundary.<br>The Onshore Scoping Boundary is within the CSZ for bats at this SAC. |
| Orielton Stable Block and Cellars SSSI | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC. | Approximately 2.9km south-east at the eastern end of the |

| Designated Site | Reason for Designation | Location of Designation and Relation to Onshore Scoping Boundary |
|---|---|---|
| | One of the largest nursery roosts of lesser horseshoe bat in Pembrokeshire with records dating back to the 1960s and a maximum count of 130 individuals in June 2000.<br><br>Small numbers of brown long-eared bats (*Plecotus auratus*) and whiskered bats (*Myotis mystacinus*) have also been recorded emerging from the stable building.<br>The largest colony of soprano pipistrelle (*Pipistrellus pygmaeus*) known in Pembrokeshire breeds in a property in the same grounds and, noctule bats (*Nyctalus noctule*) are known to roost in bat boxes within the woodland on the estate. | Onshore Scoping Boundary.<br><br>The Onshore Scoping Boundary is within the CSZ for bats at this SSSI. |
| Stackpole SSSI | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC.<br><br>Known to provide an important sheltered flight corridor for greater and lesser horseshoes bats to connect sites adjacent to the designation.<br><br>Noctule bats have bred in the designation and at least 40-50 Daubenton's bats (*Myotis daubentonii*) have a nursery roost under the bridge over Bosherton Lake. | Approximately 6.1 km south east of the Onshore Scoping Boundary.<br><br>The Onshore Scoping Boundary is outside the CSZ for bats at this SSSI. |

| Designated Site | Reason for Designation | Location of Designation and Relation to Onshore Scoping Boundary |
|---|---|---|
| Stackpole Courtyard Flats and Walled Garden SSSI | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC.<br><br>The clocktower is known to support a breeding colony of at least 350 greater horseshoe bats. The loft is considered crucially important in concentrating the dispersed population into a single breeding site.<br><br>The lofts immediately adjacent to the clocktower also support a nursery roost of 85 – 110 lesser horseshoe bats, probably one of the largest lesser horseshoe colonies in Pembrokeshire. Small numbers of lesser horseshoe bats are known to hibernate in the lofts, cellars and heating ducts complex during the winter months.<br><br>A common pipistrelle (*Pipistrellus pipistrellus*) nursery roost of over 500 individuals has been recorded in the loft space. Other species of bat regularly occurring in this designation include brown long-eared bat, Natterer's bat (*Myotis nattereri*), Daubenton's bat and whiskered bat. | Approximately 6.1 km south east of the Onshore Scoping Boundary.<br><br>The Onshore Scoping Boundary is outside the CSZ for bats at this SSSI. |
| Park House Outbuildings, Stackpole SSSI | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC.<br><br>One of the largest known nursery roosts of lesser horseshoe bat in Pembrokeshire. Smaller numbers of greater horseshoe bats have been recorded using the outbuildings for roosting. Common pipistrelle and brown long-eared bat have also been recorded emerging from the roost site. | Approximately 6.1 km south east of the Onshore Scoping Boundary.<br><br>The Onshore Scoping Boundary is outside the CSZ for bats at this SSSI. |
| Newgale to Little Haven / Arfordir Niwgwl Aber Bach SSSI | Overwintering greater horseshoe bat have been recorded within the site. | Approximately 9.9 km north of the Onshore Scoping Boundary.<br><br>The Onshore Scoping Boundary is outside the CSZ for bats at this SSSI. |

### *8.4.2.Habitats*

#### 8.4.2.1. Phase 1 Habitat

A Phase 1 Habitat survey was conducted in 2020 by ITPEnergised to identify habitats within 250 m of four potential cable routes following the methodology described in the JNCC Handbook for Phase 1 Habitat Survey (Joint Nature Conservation Committee, 2010). A summary of the habitats recorded is provided in Table 8-6. Full details of the Phase 1 Habitat survey results can be found in the Preliminary Ecological Assessment (ITPEnergised, 2021b) in Technical Appendix 20.2 of the Erebus Environmental Statement (ITPEnergised, 2021a).

*Table 8-6. Summary of Phase 1 habitats within the Onshore Scoping Boundary*

| Habitat | Description (Summarised from the Preliminary Ecological Assessment) (ITPEnergised, 2021b) | Habitat of Principal Importance* |
|---|---|---|
| Lowland meadows | An area of lowland meadows is described in a horse-grazed pasture to the east of a farmhouse in Lambeeth. The report describes this grassland as '*widespread but uncommon'*… '*of high conservation interest, and this is a locally-significant example'*. | ✓ |
| Semi-natural broadleaved woodland | Woodlands within the site are described as compromising a mixture of species including sycamore (*Acer pseudoplatanus*), ash (*Fraxinus excelsior*) and hawthorn (*Crataegus monogyna*). The ground flora was typically dominated by ferns, other species include bluebell (*Hyacinthoides non-scripta*), wood avens (*Geum urbanum*) and enchanter's nightshade (*Circaea lutetiana*). The woodlands are described as '*of minor or local ecological significance'*. | ? |
| Dense scrub | Dominant species recorded within dense scrub include blackthorn (*Prunus spinosa*), with patches of gorse (*Ulex europaeus*). | x |
| Mixed plantation woodland | Small areas of plantation woodland were recorded near the Pembroke Power Station and Valero refinery. | ? |
| Semi-improved neutral grassland | Several areas of grassland are described by the report, typically near Pembroke Power Station. | x |
| Poor semi-improved grassland | This habitat is described as grassland which is more modified than that mentioned above, lacking the indicator species of neutral grassland. | x |
| Improved grassland | Agriculturally-improved grasslands were recorded throughout the Site. | x |
| Marshy grassland | A relatively species-rich marshy grassland was recorded near Lambeeth where horse grazing has produced an open structure. | x |
| Purple moor-grass and rush pastures | This habitat was recorded in patches throughout the marshy grassland described above though it is small, modified and species-poor. | ✓ |

| Habitat | Description (Summarised from the Preliminary Ecological Assessment) (ITPEnergised, 2021b) | Habitat of Principal Importance* |
|---|---|---|
| Continuous bracken (*Pteridium sp.*) | An area of continuous bracken was recorded near Neath and Lambeeth. | x |
| Tall ruderal | The report describes patches of tall ruderal to the south of Pembroke Power Station which were dominated by great willowherb (*Epilobium hirsutum*). | x |
| Swamp | Swamp vegetation was recorded in the valley west of Rhoscrowther. The description for this habitat states the swamp was '*difficult to assess and was not surveyed in detail*'. | ? |
| Open water | Several small ponds and irrigation reservoirs were recorded, some with good water quality. | ✓ |
| Marginal vegetation | The inundation zone of several irrigation reservoirs was recorded to feature great reedmace (*Typhya latifolia*), watercress (*Nasturtium officinale*) and fool's watercress (*Apium nodiflorum*). | x |
| Running water | Shallow streams were recorded within woodland and other dense vegetation. The report describes these as '*not thoroughly surveyed*'. | ? |
| Saltmarsh | Vegetation recorded was atypical and considered a transition between saltmarsh and marshy grassland.<br><br>Intertidal habitats are described as '*outside the scope of this assessment'* and were not assessed. | ✓ |
| Strandline vegetation/sand dune | The fixed dune grassland is described as '*in generally good condition here, although there are more modified areas immediately landward of the road'*. | ✓ |
| Maritime cliff and slope | Coastal grassland was surveyed to the south of West Angle Bay, these fall within the Angle Peninsula Coast SSSI. | ✓ |
| Arable | Arable fields were recorded as the most extensive habitat, including crops of wheat, oats, barley, rape and potatoes. These were managed conventionally but the margins of arable weeds are described as '*of conservation interest*'. | ? |
| Hedgerows | Almost all hedgerows within the Site were recorded as species-poor and several are defunct. Thicker, intact hedgerows were also recorded within the survey area. | ✓ |
| Urban areas | Abandoned buildings and a World War Two bunker were recorded. The report states '*caravan sites and built-up areas in and around villages were not investigated closely'*. | x |

| Habitat | Description (Summarised from the Preliminary Ecological Assessment) (ITPEnergised, 2021b) | Habitat of Principal Importance* |
|---|---|---|
| *As listed on Section 7 of the Environment (Wales) Act. ✓ = yes, x = no, ? = potential/unconfirmed, existing data does not provide sufficient information for AECOM assessment. | | |

#### 8.4.2.2. National Vegetation Classification (NVC)

National Vegetation Classification (NVC) surveys were conducted in May-June 2021 by ITPEnergised (ITPEnergised, 2021c) following the procedure described in the British Plant Communities Volumes 1 (Rodwell, 1991a), 2 (Rodwell, 1991b), 3 (Rodwell, 1992) and 5 (Rodwell, 2000). The survey was conducted on the confirmed cable route from West Angle Beach to Pembroke Power Station (the 'NVC Survey Area'). A total of 20 NVC communities were recorded, many of which correspond to habitats of principal importance as listed on Section 7 of the Environment (Wales) Act. The NVC communities present within the NVC Survey Area, their extent and corresponding Habitat of Principal Importance are listed in Table 8-7. For full details of the NVC surveys, refer to the National Vegetation Classification Survey Report (ITPEnergised, 2021c).

*Table 8-7. NVC communities and corresponding habitat of principal importance within the Onshore Scoping Boundary*

| NVC Community | NVC Sub-community | Habitat Extent (ha) | Corresponding Habitat of Principal Importance* |
|---|---|---|---|
| **Maritime communities** | | | |
| MC1 *Crithmum maritimum* – *Spergularia rupicola* maritime rock-crevice community | MC1a Typical sub-community | 0.03 | Maritime Cliff and Slope |
| MC8 *Festuca rubra* – *Armeria maritima* maritime grassland | MC8a Typical sub-community | 0.03 | Maritime Cliff and Slope |
| | MC8f *Anthyllis vulneraria* sub-community | 0.04 | Maritime Cliff and Slope |
| MC9 *Festa rubra* – *Holcus lanatus* maritime grassland | MC9e *Anthoxanthum odoratum* sub-community | 0.01 | Maritime Cliff and Slope |
| MC12a *Festa rubra* – *Hyacinthoides non-stripta* maritime bluebell community | MC12a *Ranunculas ficaria* sub-community | 0.08 | Maritime Cliff and Slope |
| SD8 *Festuca rubra* - *Galium verum* fixed dune grassland | SD8a Typical sub-community | 0.29 | Coastal Sand Dunes |
| | SD8b *Luzula campestris* sub-community | 6.06 | Coastal Sand Dunes |

| NVC Community | NVC Sub-community | Habitat Extent (ha) | Corresponding Habitat of Principal Importance* |
|---|---|---|---|
| SD9 *Ammophila arenaria – Arrhenatherum elastius* dune grassland | SD9a Typical sub-community | 2.28 | Coastal Sand Dunes |
| **Grassland communities** | | | |
| MG1 *Arrhenatherum elatius* grassland | MG1a *Festuca rubra* sub-community | 2.53 | None |
| MG5 *Cynosurus cristatus – Centaurea nigra* grassland | MG5a *Lathyrus pratensis* sub-community | 1.66 | Lowland Meadow |
| | MG5c *Danthonia decumbens* sub-community | 0.02 | Lowland Meadow |
| MG6 *Lolium perenne – Cynosurus cristatus* grassland | MG6b *Anthoxanthum odoratum* sub-community | 23.71 | None |
| **Mire communities** | | | |
| M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture | M23a *Juncus acutiflorus* sub-community | 1.94 | Purple Moor Grass and Rush Pastures |
| | M23b *Juncus effusus* sub-community | 1.87 | Purple Moor Grass and Rush Pastures |
| M25 *Molinia caerulea – Potentilla erecta* mire | M25c *Angelica sylvestris* sub-community | 0.18 | Purple Moor Grass and Rush Pastures |
| **Woodland and scrub communities** | | | |
| W1 *Salix cinerea – Galium palustre* woodland | No sub-communities in the NVC | 5.02 | Wet Woodland |
| W6 *Alnus glutinosa – Urtica dioica* woodland | W6d *Sambucus nigra* sub-community | 4.24 | Wet Woodland |
| W9 *Fraxinus excelsior – Sorbus aucuparia – Mercurialis perennis* woodland | W9a Typical sub-community | 2.82 | Lowland Mixed Deciduous Woodland |
| W21 *Crataegus monogyna – Hedera helix* scrub | Not mapped to sub-community level | 8.27 | None |
| W22 *Prunus spinosa – Rubus fruticosus* scrub | Not mapped to sub-community level | 5.88 | Coastal Stands – Maritime Cliff and Slope |

| NVC Community | NVC Sub-community | Habitat Extent (ha) | Corresponding Habitat of Principal Importance* |
|---|---|---|---|
| W23 *Ulex europaeus – Rubus fruticosus* scrub | Not mapped to sub-community level | 0.65 | None |
| W24 *Rubus fruticosus – Holcus lanatus* scrub | Not mapped to sub-community level | 7.89 | None |
| W25 *Pteridium aquilinum – Rubus fruticosus* scrub | Not mapped to sub-community level | 1.95 | Coastal Stands – Maritime Cliff and Slope |
| **Additional vegetation which does not clearly fit the NVC framework** | | | |
| Other wet dune vegetation | N/A | 0.4 | Coastal Sand Dunes |
| Other mire vegetation | N/A | 0.12 | Possible Lowland Fen |
| *Oenanthe crocata* dominated vegetation | N/A | 0.44 | Possible Lowland Fen |
| Other neutral grassland | N/A | 0.70 | None |
| *As listed on Section 7 of the Environment (Wales) Act. ✓ = yes, x = no, ? = potential/unconfirmed - existing data does not provide sufficient information for AECOM assessment. | | | |

#### 8.4.2.3. Ancient Woodland

The desk study conducted by AECOM in February 2022 identified no ancient woodland within or adjacent to the Onshore Scoping Boundary.

### *8.4.3. Protected and Notable Species*

A suite of surveys for protected and notable species were carried out by ITPEnergised in 2020 and 2021, surveys for protected species took place within a species-specific buffer of the southern-most cable route from West Angle Bay to Pembroke Power Station ('the confirmed cable route'). A summary of the methodology and findings of these surveys is provided in Table 8-8. For full details regarding the methodology and results of these surveys, refer to the full reports, provided as appendices to the Environmental Statement (ITPE, 2021a).

Table 8-8 also includes data obtained from by AECOM in February 2022 from WWBIC regarding records for protected species in the last ten years.

*Table 8-8. Summary of protected species baseline data*

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| Protected and Notable Plants | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 2010), including identification of broad habitat types and species of interest.<br>A list of any Red Data Book rare and locally rare plants were recorded during the Phase 1 habitat survey (JTPEnergised, 2021b).<br>The survey was conducted by ITPEnergised in June-July 2020. | The following notable plant species were identified during the survey:<br>rye brome (*Bromus secalinus*) - Red Data Book Vulnerable;<br>corn spurrey (*Spergula arvensis*) - Red Data Book Vulnerable;<br>field woundwort (*Stachys arvensis*) - Red Data Book Near Threatened;<br>round-fruited rush (*Juncus compressus*) - Red Data Book Near Threatened;<br>fen pondweed – Locally Rare; and,<br>sea kale (*Crambe maritima*) – Locally Scarce. |
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br>Conducted by AECOM in February 2022. | The desk study returned records of three plant species listed on Schedule 8 of the Wildlife and Countryside Act bluebell (*Hyacinthoides non-scripta*); least lettuce (*Lactuca saligna*); and, petalwort. |
| Invertebrates | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 2010), including identification of broad habitat types | Habitats within the survey area were identified as potentially suitable to support shrill carder bee (*Bombus sylvarum*) and large scabious mining bee (*Andrena hattorfiana*). However, these were described as small in size and of low potential. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | and assessment for their potential to support protected and notable species.<br>The survey was conducted by ITPEnergised in June-July 2020. | |
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br>Conducted by AECOM in February 2022. | The desk study returned six records of marsh fritillary butterfly approximately 550 m east of the Onshore Scoping Boundary and one record of small blue (*Cupido minimus*) approximately 500 m north of the Onshore Scoping Boundary. Both these species of butterfly are fully protected under schedule 5 of the Wildlife and Countryside Act. |
| Amphibians | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 2010), including identification of broad habitat types and assessment for their potential to support protected and notable species.<br>The survey was conducted by ITPEnergised in June-July 2020. | Several areas of standing water were recorded during the survey, all of which were assessed as suitable for breeding amphibians. Grasslands surrounding the waterbodies were considered suitable for dispersing and hibernating individuals, but these are likely to be of low importance.<br>Great crested newt (*Triturus cristatus*) were concluded likely absent from the Onshore Scoping Boundary due to a lack of records in Pembrokeshire. |
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species. | The desk study returned two records of common toad within the Onshore Scoping Boundary. There are also three records of palmate newt approximately 100 m from the Onshore Scoping Boundary and nine records of common frog, the closest of which is approximately 300 |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | Conducted by AECOM in February 2022. | m north of the Onshore Scoping Boundary. No records of great crested newt were returned. The Onshore Scoping Boundary is typically considered to be outside the known distribution of great crested newts in the UK. |
| Reptiles | The Extended Phase 1 Habitat Survey Area:<br><br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey(Joint Nature Conservation Committee, 2010), including identification of broad habitat types and assessment for their potential to support protected and notable species. Reptiles were looked for in suitable places, including basking sites and under items such as boards and sheet material laying on the ground.<br><br>The survey was conducted by ITPEnergised in June-July 2020. | One habitat feature (stone pile) was recorded as suitable for basking reptiles during extended Phase 1 habitat survey. Much of the agricultural habitat is not suitable for reptiles but there is potential for reptiles to be present in boundary habitats and small features. The dune systems at Broomhill and Kilpaison Burrows are likely of high importance for reptiles.<br><br>The Environmental Statement concludes that adder, grass snake, common lizard and slow-worm are likely present within the Onshore Scoping Boundary, though targeted surveys for these species have not been completed. Targeted surveys for reptiles were concluded not required to inform Project Erebus following consultation with NRW (ITPEnergised, 2021d). |
| | The Reptile Survey Area:<br><br>A 50 m buffer from the confirmed cable route. | Habitats were assessed for their suitability for reptiles and search for reptiles during other surveys. Items of sheet materials were turned over and suitable basking locations were scanned during surveys for other protected species (Rodwell, 1991b).<br><br>The survey was conducted by ITPEnergised in February-March 2021. | Following consultation with NRW, a targeted survey for reptiles was considered not necessary. No reptiles were recorded within the site during other ecological surveys. When assessed for their suitability to support reptiles, 22 habitat areas were considered to be of high to medium suitability for reptiles. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br>Conducted by AECOM in February 2022. | The desk study returned five records of adder within the south of the Onshore Scoping Boundary, near Freshwater West, there are also 19 records of common lizard in this area of the scoping boundary. To the north, near West Angle Bay, there are two records of grass snake within the Onshore Scoping Boundary. Six records of slow worm were returned by the desk study, the closest of which is approximately 690 m south-east of the Onshore Scoping Boundary. |
| Birds | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 20, including identification of broad habitat types and assessment for their potential to support protected and notable species (ITPEnergised, 2021c). Birds were observed and listened for during the Phase 1 habitat survey, habitats were assessed for their potential as nesting sites and foraging habitat for chough was assessed (ITPEnergised, 2021b).<br>The survey was conducted by ITPEnergised in June-July 2020. | The following was recorded during the extended Phase 1 habitat survey:<br>territories in use by skylark (*Alauda arvensis*) and yellowhammer (*Emberiza citrinella*);<br>linnet (*Carduelis cannabina*) and yellowhammer breeding in thick hedgerows within the survey area;<br>several birds of conservation concern were seen or heard and considered likely breeding in the area; and,<br>a potential barn owl (*Tyto alba*) roost site in a ruined farmstead. |
| | The Breeding Bird Survey Area: | The survey for breeding birds comprised of three visits in the spring | The following birds were identified as breeding within the Breeding Bird Survey Area: |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | Three transects to survey for breeding birds were completed to survey the confirmed cable corridor and 300 m survey buffer. Surveys for breeding chough and peregrine were conducted at the cliffs between West Angle Bay and Freshwater West. | and summer of 2021 to identify the location of breeding pairs of birds following an adapted Common Bird Census survey method (Gilbert et al., 2011, ITPEnergised, 2021e). A check was also completed to identify sites suitable for nesting barn owl and the cliffs were surveyed using walkover and vantage point watches to map all nest sites and record flight lines or feeding areas for chough (Rodwell, 2000). | bullfinch (*Pyrrhula pyrrhula*);<br>dunnock (*Prunella modularis*);<br>house sparrow (*Passer domesticus*);<br>linnet;<br>mallard (*Anas platyrhynchos*);<br>meadow pipit (*Anthus pratensis*);<br>mistle thrush (*Turdus viscivorus*);<br>reed bunting (*Emberiza schoeniclus*);<br>skylark;<br>song thrush (*Turdus philomelos*);<br>stonechat (*Saxicola torquata*);<br>willow warbler (*Phylloscopus trochilus);* and,<br>yellowhammer.<br>The coastal transect survey identified two pairs of breeding chough and a pair of peregrine were recorded holding a territory though the breeding attempt is thought to have failed.<br>The species recorded during the breeding bird surveys form a broad assemblage of red and amber bird of conservation concern species which are typical for lowland and farmland habitats in this area of Wales (ITPEnergised, 2021a). |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | The Wintering Bird Survey Area:<br><br>Wintering birds were surveyed for within the confirmed cable route and a 250 m buffer as well as the tidal area along the Pembroke River estuary. | A survey for wintering birds comprised six visits between October 2020 and March 2021 to identify approximate numbers and locations of wintering birds. Vantage point surveys were conducted at four intertidal areas and three landfall option areas (ITPEnergised, 2021f). | Wintering bird surveys identified the following species:<br><br>chough;<br><br>oystercatcher (*Haematopus ostralegus*);<br><br>ringed plover (*Charadrius hiaticula*);<br><br>golden plover (*Pluvialis apricaria*);<br><br>herring gull (*Larus argentatus*);<br><br>black-headed gull (*Chroicocephalus ridibundus*);<br><br>common gull (*Larus canus*);<br><br>great black-backed gull (*Larus marinus*);<br><br>lesser black backed gull (*Larus fuscus*); and,<br><br>cormorant (*Phalacrocorax carbo*).<br><br>The species recorded during the wintering bird surveys include species which are typical of coastal, lowland and farmland habitats in this area of Wales. |
| | The Desk Study Area:<br><br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br><br>Conducted by AECOM in February 2022. | The desk study returned records of over 100 bird species, several of these are listed on Schedule 1 of the Wildlife and Countryside Act. The following are listed on Schedule 1 of the Wildlife and Countryside Act and records are present within the Onshore Scoping Boundary:<br><br>• chough;<br><br>• goldeneye (*Bucephala clangula*); |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | | • hen harrier (*Circus cyaneus*);<br>• Lapland bunting (*Calcarius lapponicus*);<br>• merlin (*Falco columbarius*);<br>• snow bunting (*Plectrophenax nivalis*);<br>• bittern (*Botaurus stellaris*);<br>• Cetti's warbler (*Cettia cetti*);<br>• fieldfare (*Turdus pilaris*);<br>• common loon (*Gavia Immer*);<br>• Eurasian whimbrel (*Numenius phaeopus*);<br>• western marsh harrier (*Circus aeruginosus*);<br>• black redstart (*Phoenicurus ochruros*); and,<br>• barn owl (*Tyto alba*). |
| Bats | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 2010), including identification of broad habitat types and assessment for their potential to support protected and notable species (ITPEnergised, 2021b).<br>A preliminary assessment of the suitability of the site for roosting and | The Extended Phase 1 habitat survey identified abandoned buildings and a bunker with potential suitability to support roosting bats. The desk study for the preliminary assessment (ITPEnergised, 2021d) also describes a known greater and lesser horseshoe bat roost within the gun battery near Freshwater West. Woodland trees within the Study Area were concluded to have High and Moderate suitability to support roosting bats.<br>Hedgerows identified are expected to provide flight lines and foraging opportunity for bats. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | foraging bats was undertaken using standard guidelines (Collins, 2016), potential roost sites were identified and evidence of use by bats was looked for.<br><br>The survey was conducted by ITPEnergised in June-July 2020. | |
| | The Roosting Bat Survey Area:<br><br>Areas within 50 m of the confirmed cable route which were considered most likely to contain features suitable for roosting bats. | A preliminary roost assessment was completed in February and March 2021. Areas considered most likely to contain features suitable for roosting bats were assessed following standard guidelines (Joint Nature Conservation Committee, 2010). Features were classified as Negligible, Low, Moderate or High roosting suitability. | The preliminary roost assessment identified 34 Moderate or High roosting suitability and seven Low roosting suitability trees.<br><br>2018 surveys for the Greenlink project identified the war memorial gun battery located on B4319 north of Freshwater West Beach as a frequently used greater horseshoe roost and infrequently used lesser horseshoe roost. Other bat surveys for the same project identified presence of lesser horseshoe, greater horseshoe, common pipistrelle, soprano pipistrelle, myotis (*Myotis sp.*), noctule, barbastelle (*Barbastella barbastellus*), Leisler's bat (*Nyctalus leisleri*), Nathusius' pipistrelle (*Pipistrellus nathusii*) and serotine (*Eptesicus serotinus*). |
| | The Roosting Bat Survey Area:<br><br>Areas within 50 m of the confirmed cable route which were considered most likely to contain features suitable for roosting bats. | A potential roost feature inspection of trees previously identified as being of Moderate or High roosting suitability following accepted bat survey guidance (Joint Nature Conservation Committee, 2010). All features fully inspected using endoscope and torch. | No evidence of bats was found in any features inspected (ITPEnergised, 2021g). |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | The survey was conducted by BSG Ecology in August 2021. | |
| | The Desk Study Area:<br><br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br><br>Conducted by AECOM in February 2022. | The desk study returned records for roosting lesser horseshoe bat in the east of the Onshore Scoping Boundary, this is described as a 'night roost in an old toilet block' and was identified by droppings and remote monitoring. The desk study also returned one record of roosting greater horseshoe bat approximately 1.3 km east of the Onshore Scoping Boundary in a barn. Another describes 'bats seen in torpor in tower' approximately 1.1 km south of the Onshore Scoping Boundary. Other bat species recorded roosting within 2 km of the Onshore Scoping Boundary include brown long-eared bat, common pipistrelle, noctule and serotine.<br><br>The desk study returned four field records of greater horseshoe bat within 2 km of the Onshore Scoping Boundary, the closest of which is approximately 580 m from the Onshore Scoping Boundary. Field records for other species include common pipistrelle, soprano pipistrelle, Daubenton's bat, noctule, Natterer's bat and whiskered bat. |
| Badger (*Meles meles*) | The Extended Phase 1 Habitat Survey Area: | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Joint Nature Conservation Committee, 2010), including | Evidence of badger was recorded during Extended Phase 1 habitat survey, including two active setts, runs and latrines (IPTEnergised, 2021b). Some thicker hedgerows within the survey area were concluded to have potential for badger setts in the banks but the Preliminary |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | identification of broad habitat types and assessment for their potential to support protected and notable species. In relation to badger, the presence of setts with evidence of badger activity (footprints, discarded hair, presence of dung or latrines, well-used runs etc.) was recorded (Joint Nature Conservation Committee, 2010).<br><br>The survey was conducted by ITPEnergised in June-July 2020. | Ecological Assessment report states these areas '*were not thoroughly assessed*' due to access constraints. |
| | The Badger Survey Area:<br><br>A 100 m buffer from the confirmed cable route. | Targeted surveys for badger were conducted by ITPEnergised in February and March 2021 (ITPEnergised, 2021b). This was based on the methods described by Scottish Badgers (Scottish Badgers, 2018) and included a search for badger setts, dung, latrines, discarded hair and footprints. Where found, setts were classified into both type (main, annexe, subsidiary, outlier) and activity level (well-used, partially used, disused). | Signs of badger were recorded frequently during survey including setts, latrines, trails and footprints. A total of 27 confirmed setts and 10 possible sett locations were recorded during the survey as well as latrines, trails and signs of badger feeding activity.<br><br>Badger activity identified by this survey identified four distinct clusters (ITPEnergised, 2021e). Bait marking surveys to identify potential clan boundaries have not been carried out. |
| | The Desk Study Area:<br><br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species. | The desk study returned four records of badger within the site boundary, three of which are for dead badger on the road, the remaining one is for latrines and a day nest. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | Conducted by AECOM in February 2022. | The closest record of a sett is approximately 500 m east of the Onshore Scoping Boundary. |
| Otter | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (Gilbert et al., 2011), including identification of broad habitat types and assessment for their potential to support protected and notable species. In relation to otter, field signs including footprints, spraint, feeding signs and holts were looked for (ITPEnergised, 2021e).<br>The survey was conducted by ITPEnergised in June-July 2020. | The woodland adjacent to the watercourse within the survey area was considered suitable for otter and the swamp habitat forms suitable foraging habitat for otter (ITPEnergised, 2021e). |
| | The Otter Survey Area:<br>A 250 m buffer from the confirmed cable route. | Targeted surveys for otter were conducted by ITPEnergised in February and March 2021 (ITPEnergised, 2021a). This included a search for otter spraints, footprints, runs, trails, slides, feeding remains, holts and resting sites. | No holts were identified during the survey. The survey identified four spraints and one incidence of feeding remains left by otter.<br>When assessed for habitat suitability for otter, 21 areas were concluded to be of high potential for otter holt/resting sites and seven areas were of low to medium potential for otter holt/resting sites. |
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species. | The desk study returned records of otter in all directions from the Onshore Scoping Boundary. The closest record is a sighting approximately 100 m west of the Onshore Scoping Boundary. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | | Conducted by AECOM in February 2022. | |
| Hazel dormouse (Muscardinus avellanarius) | The Hazel Dormouse Survey Area:<br>A 50 m buffer from the confirmed cable route. | Habitats within the Hazel Dormouse Survey Area were assessed for their potential to support hazel dormouse following consultation with NRW which confirmed thorough assessment for hazel dormouse presence, including nest tube deployment and survey, was not required (ITPEnergised, 2021h). | The survey area contains thicker hedgerows which may be used by hazel dormouse. A total of three areas of low potential dormouse habitat were recorded (ITPEnergised, 2021d) within the Hazel Dormouse Survey Area. However, the hedgerows and woodlands are suboptimal as they contain little hazel (*Corylus avellana*) and lack bramble, honeysuckle (*Lonicera spp.*) and rose (*Rosa spp.*). |
| | The Desk Study Area:<br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br>Conducted by AECOM in February 2022. | There are no records for hazel dormouse within 2 km of the Onshore Scoping Boundary. |
| Invasive Non-Native Species (INNS) | The Extended Phase 1 Habitat Survey Area:<br>A 250 m buffer from four potential cable route options from Angle Bay, West Angle Bay and Freshwater West. | The Extended Phase 1 habitat survey followed the methodology set out in the Handbook for Phase 1 habitat survey (ITPEnergised, 2021b). Incidents of INNS were recorded during the Phase 1 habitat survey.<br>The survey was conducted by ITPEnergised in June-July 2020. | The Extended Phase 1 habitat survey identified Japanese knotweed, rhododendron and giant hogweed (Joint Nature Conservation Committee, 2010) within the Extended Phase 1 Habitat Survey Area. The Preliminary Ecological Assessment report does not provide exact locations. |

| Ecological Receptor | Study Area* | Methodology | Baseline Information |
|---|---|---|---|
| | The Desk Study Area:<br><br>A 2 km buffer from the Onshore Scoping Boundary. | Interrogation of WWBIC data for recent records (in the last ten years) for protected and notable species.<br><br>Conducted by AECOM in February 2022. | The desk study returned six records of Japanese knotweed within the Onshore Scoping Boundary. These are in the east towards West Angle Bay. There is also one record of wakame (*Undaria pinnatifida*) within the north of the Onshore Scoping Boundary and three records of wireweed (*Sargassum muticum*) in the east of the Onshore Scoping Boundary.<br><br>There is one record for Himalayan balsam, approximately 500 m south of the Onshore Scoping Boundary. |

### *8.4.4. Requirement for Further Surveys*

To provide further information regarding the baseline of the site, further targeted surveys for protected and notable species should be undertaken as described below. This should be completed prior to the completion of the EIA.

#### 8.4.4.1. Requirement for Further Survey: Designated Sites

Where designated sites have potential to be impacted by the Project, this will be assessed by an HRA. To inform the HRA, surveys for the following features are recommended:

- Habitats: Dunes and vegetated cliffs in Broomhill Burrow SSSI and the Limestone Coast of South Wales SAC
- Chough: designated within the Castlemartin Coast SPA and Angle Peninsula Coast SSSI
- Bats: greater horseshoe bats designated within Limestone Coast of South Wales SAC, greater and lesser horseshoe bats designated within Pembrokeshire Bat Sites and Bosherton Lakes SAC (and component SSSIs) and in Angle Peninsula Coast SSSI and Mildford Haven Waterway SSSI. The Onshore Scoping Boundary is within the CSZ of all designations listed in Table 8-4, and the two SACs in Table 8-5.
- Otter: designated within Pembrokeshire Marine SAC.

The survey methodology for each ecological receptor listed is described below.

#### 8.4.4.2. Requirement for Further Survey: Habitats

The Onshore Scoping Boundary falls within the boundary of the Limestone Coast of South Wales SAC and Broomhill Burrows SSSI, both of which are designated for habitats including dunes and vegetated sea cliffs. Further detailed assessment for their habitat condition and NVC survey of the designations should be conducted prior to HRA.

As the Extended Phase 1 Habitat Survey conducted by ITPEnergised was completed in 2020, it is recommended that this survey is updated. This should include a walkover survey of the Onshore Scoping Boundary, broadly following the Phase 1 habitat survey methodology as set out in the JNCC guidance (Joint Nature Conservation Committee, 2010). This survey method records information on habitat types and is 'extended' to record any evidence of and potential for protected or notable species to be present.

Further survey is required to identify the ecological value of hedgerows within the Onshore Scoping Boundary. This should pay due regard to the methodology in the Hedgerow Survey Handbook (DEFRA, 2007) and record features such as hedgerow length, adjacent land use, trees, ground flora species and hedgerow management. The data obtained during the survey should be assessed against the Ecological Criteria of the Hedgerow Regulations 1997 to ascertain whether the hedgerow is ecologically 'Important'.

#### 8.4.4.3. Requirement for Further Survey: Protected and Notable Plants

As the Onshore Scoping Boundary falls within the boundary of the Limestone Coast of South Wales SAC, designated for early gentian, further survey should be conducted to identify the presence and extent of early gentian within the Onshore Scoping Boundary. This should include a habitat suitability assessment, based on the existing habitat information and updated Extended Phase 1 Habitat Survey, to identify suitable areas for early gentian within the Onshore Scoping Boundary. Following this, individual plants should be mapped by identifying early gentian when it is in flower (April-June). Quadrats may be utilised to sample the population size where surveys are required on a large scale.

#### 8.4.4.4. Requirement for Further Survey: Bats

**Roosts**

It is recommended that a preliminary roost suitability assessment for roosting bats be conducted on all suitable structures, buildings and trees within 50 m of the Onshore Scoping Boundary. This should include the toilet block in the east of the Onshore Scoping Boundary, identified as a lesser horseshoe bat roost within data provided by WWBIC. Additional emergence/re-entry surveys may be required following this assessment, to inform the EIA and the need for any licences.

Survey data will also be used to support the HRA.

**Activity**

To provide a baseline to inform a Habitat Regulations Assessment of Likely Significant Effects on the Limestone Coast of South Wales SAC and Pembrokeshire Bat Sites and Bosherton Lakes SAC component SSSI Orielton Stable Block and Cellars bat survey are required to assess the activity level of greater horseshoe and lesser horseshoe bats within the Onshore Scoping Boundary, including the presence of any important flight lines.

Surveys should be undertaken during a full bat active season (April to October inclusive) following standard guidelines (Collins, 2016). This will include the walking of a transect route(s) and deployment of static bat detectors. This will comprise at least two transects per month and at least one of these should comprises a dusk and pre-dawn (or dusk to dawn) transect within one 24hr period. At least three static detector locations per transect will be required with data to be collected on 5 consecutive nights each month. Should flight lines be identified in any habitat requiring removal, crossing point surveys may also be required.

#### 8.4.4.5. Requirement for Further Survey: Badger

Previous surveys by ITPEnergised identified confirmed badger setts within the Badger Survey Area (ITPEnergised, 2021d). As badger is a highly mobile species, and may have created new setts since the time of the survey, an update survey is recommended. All habitats with suitability for badger sett creation should be surveyed for, where setts are identified they should be classified by their type (main, annexe, subsidiary, outlier) and activity levels (active, partially used, disused) as described in the accepted best practice guidance (Harris et al., 1989, Wilson et al., 1998). Should impacts to badger setts be identified during the survey, NRW should be consulted regarding the requirement for a badger licence and sett closure.

#### 8.4.4.6. Requirement for Further Survey: Otter

Previous surveys by ITPEnergised identified several areas with high suitability for otter resting and breeding sites, though no holts were identified (ITPEnergised, 2021d). As otter is a highly mobile species, and may have created new resting and breeding sites since the time of the survey, an update survey is recommended. All watercourses and habitats with suitability for resting and breeding sites creation should be surveyed following the methodology provided in Monitoring the Otter *Lutra lutra* (Chanin, 2003). Where the Onshore Scoping Boundary crosses watercourses with suitability for otter, 100 m upstream and downstream of the crossing location should be surveyed. Should an otter resting and breeding sites with potential to be impacted by the Project be identified during the survey, consultation with NRW will be required regarding the potential requirement for a European Protected Species Mitigation Licence. Survey data will also be used to support the HRA.

#### 8.4.4.7. Requirement for Further Survey: Hazel Dormouse

In 2021, NRW confirmed that hazel dormouse surveys would not be required due to a lack of records and optimal habitat, where habitat removal would be required for Project Erebus this was deemed minimal and mitigation through a Precautionary Method of Working is considered sufficient (ITPEnergised, 2021h). As the Phase 1 Habitat Survey was undertaken in 2020, an update to this survey including a Dormouse Habitat Suitability assessment should be conducted as described above. During this survey, the hedgerows within the Onshore Scoping Boundary should be reassessed for their suitability to support hazel dormouse. This should include an assessment of plant species present and the structure and connectivity of the habitat. Should the hedgerows be concluded suitable for hazel dormouse, further consultation with NRW may be required.

#### 8.4.4.8. Requirement for Further Survey: Invasive Non-Native Plant Species

At the time of writing, no targeted surveys or management plan have been completed for INNS within the Onshore Scoping Boundary. As a result, the potential impact of the Project cannot be accurately assessed for this ecological receptor. Thorough surveys for invasive non-native species within the Onshore Scoping Boundary and a 30 m buffer should be completed to inform an Invasive Non-Native Species Management Plan. Further information regarding any requirements for mitigation, including biosecurity measures and disposal of waste at a licensed facility, will be informed by the survey.

## 8.5. Embedded and Good Practice Measures

This section describes the typical measures that will be considered to mitigate for any potential adverse ecological effects that could arise from the Project.

The mitigation hierarchy has been considered and will be taken into consideration when assessing the EIA. A summary is provided below.

Mitigation Hierarchy:

1. Avoidance – Seek options that avoid harm to ecological features (for example, by locating on an alternative site or use of technology, or timing to eliminate impact);
2. Mitigation – Negative effects should be avoided or minimised through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed – for example, through a condition or planning obligation;
3. Compensation – Used as last resort to offset impacts; and,
4. Enhancement – Seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

Mitigation measures cannot be detailed in full as further requirements may be identified following the completion of surveys and may be required for protected species licencing. However, initial concepts are outlined in this section.

### *8.5.1. Mitigation by Design*

#### 8.5.1.1. Avoidance of Ecological Receptors

The design process will actively minimise the number of watercourse crossings required, and buffer strips around sections of workings adjacent to watercourse crossings and bund and embankment features will be implemented. This will avoid impacts on watercourses, including their hydrological and habitat linkages.

Wherever possible, habitats will be retained during construction.

Following completion of the works, hedgerows will be replanted with locally native species to maintain the ecological function of the hedgerow and connectivity to the wider landscape.

The results of proposed surveys for bat activity will be used to inform design of the Project, its construction and mitigation requirements, to avoid and reduce impacts on bats present in the Onshore Scoping Boundary and within the Limestone Coast of South Wales SAC and Pembrokeshire Bat Sites and Bosherton Lakes SAC.

### *8.5.2. Control and Management Measures*

A Construction Environment Management Plan (CEMP) will be produced prior to the commencement of works, this will provide detailed methodology regarding the following mitigation:

- nuisance management to include measures in place to reduce the impacts of construction activities such as dust, noise, vibration and lighting;
- surface and ground water protection measures and a pollution prevention plan;
- landscape and visual impact mitigation to include retention of existing trees where possible;
- a protocol for the restoration of land which will be temporarily used for construction;
- a biosecurity plan for the prevention of spread of invasive non-native species potentially present within the site;
- environmental training requirements and identification of responsibilities of personnel; and,
- ecological mitigation measures including the avoidance of sensitive features.

An Ecological Clerk of Works (ECoW) will be employed for the duration of the works to ensure that valued receptors are adequately protected and the measures set out in the CEMP are adhered to. Responsibilities of the ECoW will be finalised in the CEMP and may include:

- the delivery of a Toolbox Talk ahead of works;
- pre-construction surveys (for example, checks for breeding birds, badger setts, otter holts *etc*.) requiring specialised skills;
- watching briefs or observations of construction/site preparation activities;
- monitoring the effectiveness of mitigation measures;
- responding to situations arising, and potentially updating the working methods, to avoid harm to valued ecological receptors; and,
- auditing or monitoring requiring specialised skills.

Where habitat suitable for reptiles requires removal, this will follow a precautionary working method statement. This is likely to include staged vegetation cutting in a directional manner to displace reptiles away from the working area and towards suitable retained habitat. This will avoid killing or injury of reptiles.

Where possible, habitat suitable for breeding birds, including woodland, scrub and grassland, will be removed outside of the breeding bird season (March-August, inclusive) (*i.e*. clearance works will be undertaken between September and early February). Where this is not possible, the assigned ECoW will undertake a thorough check for the presence of breeding birds prior to the commencement of works. If an active nest is encountered, a species-appropriate protective buffer will be erected around the nest and will remain in place until all young have fully fledged. This can be up to eight weeks, no works should take place within the buffer during this time.

Habitat with suitability to support future sett or holt creation by badger and otter should also be checked prior to any works by the ECoW, this includes woodland, scrub and grassland.

Where INNS are identified by the ECoW during works, biosecurity measures, as identified in the CEMP, will be followed to minimise the potential spread of INNS.

## 8.6. Likely Significant Effects

The potential impacts of the Project will be assessed in the EIA, those which have been identified at this stage are summarised in Table 8-9.

The loss and severance of terrestrial habitats could adversely affect protected species dependent upon them, several of which are listed as European Protected Species. An assessment of the presence of, and the extent of which the site is used by, bats will provide further information regarding the potential impacts on European Protected Species. Should the permanent loss of bat roosting features result from the proposed development, further consultation with a suitably qualified ecologist, including further surveys, will be required.

It is anticipated that all habitats impacted by the works will be reinstated following completion of construction. Where replanting is required, this should incorporate an appropriate mix of native species as identified by a suitably experienced ecologist. Impacts as a result of the proposed development will therefore be temporary.

### *8.6.1. Sources and Impacts*

*Table 8-9. Sources and impacts*

| Ecological Receptor | Potential Impacts | Likelihood of Significant Impacts | Scoped in/ out |
|---|---|---|---|
| All receptors | General Construction Activity - Damage to ecological features through dust deposition, noise, vibration and lighting. | Not likely to result in a significant impacts due to the inclusion of nuisance management measures in CEMP. | Scoped out |
| All receptors | General Construction Activity - Damage to ecological features (including waterbodies and watercourses) through pollution. | Not likely to result in a significant impacts due to the inclusion of pollution prevention measures in CEMP. | Scoped out |
| Designated sites | Onshore Scoping Boundary runs through Limestone Coast of South Wales SAC (for 1.4 km), Broomhill Burrows SSSI (for 1.2 km) and Castlemartin Coast SPA (for 0.3 km) and near others.<br><br>Habitat loss will occur.<br><br>Priority plant species cited as a reason for designation may be destroyed at an individual level.<br><br>Disturbance to species features of the SAC or SPA that may impair their ability to survive, to breed or reproduce, or to rear or nurture their young; In the case of animals of a hibernating or migratory species, to hibernate or migrate; or, | Habitat Regulation Assessment (HRA) required for impacts to SACs and SPAs. Major adverse impacts possible.<br><br>Moderate adverse impacts to Broomhill Burrows SSSI possible. It is not clear at this stage whether priority plants and particularly sensitive habitats (sand dunes) can be avoided and restored effectively through protocols outlined in CEMP.<br><br>Further survey is required to identify the potential impacts of the Project on designated sites. | Scoped in |

| Ecological Receptor | Potential Impacts | Likelihood of Significant Impacts | Scoped in/ out |
|---|---|---|---|
| | to affect significantly the local distribution or abundance of the species to which they belong. | | |
| Priority habitats | Temporary loss of habitat. | Moderate adverse impacts to priority habitats possible.<br>Further survey is required to identify the presence, and extent, of priority habitats within the Onshore Scoping Boundary. | Scoped in |
| Protected and notable plants | Destruction of plants and loss of supporting habitat. | Moderate adverse impacts to Protected and notable plants possible. It is not clear at this stage whether Protected and notable plants and their supporting habitats can be avoided and/ or restored effectively through protocols outlined in CEMP.<br>Further survey is required to identify the presence, and extent, of protected and notable plants within the Onshore Scoping Boundary. | Scoped in |
| Protected and priority invertebrates | Temporary habitat loss and fragmentation. | Limited suitable habitat in the Onshore Scoping Boundary. Not likely to result in significant impacts to protected and priority invertebrates through avoidance and habitat restoration protocols outlined in CEMP. | Scoped out |
| Amphibians, including common toad | Temporary habitat loss and fragmentation. | Not likely to result in significant impacts to amphibians, including common toad as a result of protocols to be outlined in the PWM statement and CEMP. | Scoped out |
| Reptiles | Temporary habitat loss and fragmentation.<br>Killing or injury of reptiles. | Not likely to result in significant impacts to reptiles as loss of suitable habitat will be temporary and minimal. | Scoped out |

| Ecological Receptor | Potential Impacts | Likelihood of Significant Impacts | Scoped in/ out |
|---|---|---|---|
| | | Protocols to be outlined in the PWM statement and CEMP will avoid killing or injury of reptiles. | |
| Birds (excluding SPA features, which will be assessed under designated sites) | Disturbance to Schedule 1 birds.<br>Destruction of nests.<br>Killing or injury of birds. | Not likely to result in significant impacts if works can be timed to avoid breeding bird season/ or pre-works checks and implementation of species-specific buffers (outlined in CEMP) and habitat restoration protocols are followed. | Scoped out |
| Bats, including greater and lesser horseshoe bats (excluding SAC features which will be assessed under designated sites) | Killing, injury or disturbance of bats.<br>Destruction or damage of roosts.<br>Temporary habitat loss and fragmentation. | Moderate adverse impacts to bats possible. Further survey is required to understand impacts to foraging/ commuting and roosting bats. | Scoped in |
| Badger | Potential for disturbance to/ obstruction of badger setts.<br>Temporary habitat loss and fragmentation. | Pollution, vibration, noise and lighting protocols outlined in CEMP should also be followed.<br>Badger are highly mobile species that readily establish new setts, pre-works survey for continued absence of setts required. | Scope in |
| Otter (excluding SAC features which will be assessed under designated sites) | Disturbance to/ obstruction of otter breeding, sheltering and resting places.<br>Temporary habitat loss and fragmentation. | Avoidance measure should include sensitive habitats and sensitive timing of works (i.e. avoiding works around dusk and dawn). Pollution, vibration, noise and lighting protocols outlined in CEMP should also be followed.<br>Otter are a mobile species that can readily establish new breeding or resting sites particularly if previous sites have become unsuitable, pre-works survey for continued absence of breeding and resting sites required. | Scoped in |

| Ecological Receptor | Potential Impacts | Likelihood of Significant Impacts | Scoped in/ out |
|---|---|---|---|
| Dormouse | Killing, injury or disturbance of dormouse.<br><br>Temporary habitat loss and fragmentation. | Not likely to result in significant impacts to reptiles through PWM statement and habitat restoration protocols outlined in CEMP. Habitat suitability assessment, will inform the requirement for further survey or mitigation. | Scoped in |
| INNS | Causing spread of Invasive non-native plant species into the wild. | Moderate adverse impacts are possible without further survey and control options. Without survey data, biosecurity measures are only partially effective on the landscape scale of this project. | Scoped in |

## 8.7. Assessment Methodology

The following methodology will be used to undertake the EIA, the results of which will be presented in the Environmental Statement.

In line with the CIEEM approach to Ecological Impact Assessment (EcIA) (CIEEM, 2018), data received through consultation, desk-based investigations and field-based investigations will be used to allow relevant ecological features (including designated sites, ecosystems, habitat and species) of value (or potential value) to be identified, and the main factors contributing to their value described and related to available guidance. Field-based investigations have been undertaken, as described in Table 8-8, the results of which will be used as the baseline for the EIA. Where an appropriately experienced ecologist deems necessary, further surveys will be completed to assess any further impacts of the Llŷr Project.

The assessment will describe the methods used to identify and assess the potential significant effects of the Project, during the construction, operational and decommissioning phases. Baseline conditions will be described, including a summary of legislation/policy relevant to the baseline conditions, and subsequently the impact assessment will be undertaken, taking into account embedded avoidance and mitigation measures, including the use of best practice construction methods (e.g. implementation of methods to avoid pollution of watercourses).

Additional mitigation, compensation and enhancement measures will then be described, followed by an assessment of the significance of residual effects. A summary of the assessment will then be described, together with relevant conclusions.

For each phase of the Project (e.g. construction, operation and decommissioning), the assessment will be structured and reported by ecological receptor with relevant potential impacts on that feature described in turn, and then the overall effect arising from those impacts reported. For example, any impacts on crayfish habitat, and disturbance to existing populations, will be documented before a conclusion is reached on the overall effect on the conservation status of the local population concerned.

### *8.7.1. Establishing the Baseline*

The Environmental Statement will be based on the following related activities:

available survey data for protected species (ITPEnergised, 2021a) including wintering birds, breeding birds, badger, reptiles, hazel dormouse and bats;

- consultation with statutory and non-statutory consultees throughout the planning application process;
- consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to EIA;
- consideration of technical standards for the Project of significance criteria;
- review of secondary information, previous environmental studies and publicly available information and databases;
- physical surveys and monitoring, including targeted surveys for protected species within the Onshore Scoping Boundary; and,
- expert opinion.

The Environmental Statement will set out the process followed during the EIA including the methods used for the collection of data and for the identification and assessment of impacts. Any assumptions made will be clearly identified.

The EIA process is designed to be capable of, and sensitive to, changes that occur as a result of design development, including any mitigation measures that are incorporated during the EIA. This will be particularly important for this EIA as the design and layout of the development is being refined, and changes are likely to be made following submission of this Scoping Report. Where potentially significant adverse environmental effects are identified in the assessment process, measures to mitigate these effects will be put forward in the form of recommendations to be undertaken as part of the development as far as practicable.

### *8.7.2. Significance Criteria*

Potential impacts on relevant ecological features will be assessed and a judgement reached on whether or not the resultant effect on conservation status or structure and function is likely to be significant. This process will take into consideration the characteristics of the impact, the sensitivity of the ecological feature concerned, and the geographic scale at which the feature is considered important.

The CIEEM guidelines state that 'for the purpose of EcIA a 's*ignificant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' (i.e. key receptors) or for biodiversity in general'… 'in broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).*'

Conclusions on the significance of effects will be related to the concepts of 'structure and function' or 'conservation status' as being either:

- not-significant (*i.e*. no effect on structure and function, or conservation status); or,
- significant (*i.e*. structure and function, or conservation status is affected).

### *8.7.3. Assessment Criteria*

#### 8.7.3.1. Determining Impacts

The potential ecological effects of the development will be identified and characterised. This will take into consideration the following criteria:

- positive or negative – whether the effect will result in net loss or degradation of an important ecological feature or whether it would improve or enhance it;
- magnitude – the size and intensity of the effect measured in relevant terms, *e.g.* number of individuals lost or gained, area of habitat lost or created, the degree of change to existing conditions;
- extent – the spatial scope of the effect;
- reversibility – the extent to which effects are reversible either spontaneously or through active mitigation;
- duration – the length of time over which the effect may occur; and,
- time and frequency – consideration of the timing of events in relation to ecological change, some effects might be of greater significance if they take place at certain times of year.

Potential impacts will be characterised initially in the absence of any mitigation, except where this embedded or is integral to the design of the development. A sequential process will be applied to avoid, mitigate, and compensate for any significant impacts. Any additional mitigation or compensation proposed will be subsequently identified and its likely effectiveness assessed.

#### 8.7.3.2. Sensitivity of Receptor

Data received through consultation and desk- and field-based investigations will be used to allow relevant ecological features (including designated sites, ecosystems, habitats and species) of value (or potential value) to be identified, and the main factors contributing to their value described and related to available guidance.

Relevant reasons for which an ecological feature is important will be described and considered in order to assign each relevant ecological feature an overall value in accordance with the following geographical frames of reference:

- International (*i.e.* European);
- National (*i.e*. Wales);
- Regional (*i.e*. south Wales);
- County (*i.e*. Pembrokeshire);
- District;
- Local/Parish;
- Site; and,
- Negligible (used where the value is lower than the Site level).

In determining the value of relevant ecological features, the social and economic values will be considered separately. Where appropriate the significance of relevant social and economic effects will be defined and reported within separate community and/or socio-economic population and health assessments.

#### 8.7.3.3. Magnitude of Change

When describing potential impacts (and where relevant, the resultant effects) reference will be made to the following characteristics:

- beneficial/adverse;
- magnitude;
- spatial extent;
- duration;
- reversibility; and,
- timing and frequency.

For each receptor only those characteristics relevant to understanding the ecological effect and determining the significance will be described.

#### 8.7.3.4. Classification and Significance of Effect

Such judgements will be based, wherever possible, on quantitative evidence. However, where necessary the professional judgement of an experienced ecologist will be applied.

For those effects considered significant, the effect will be characterised as appropriate (e.g. adverse or beneficial) and qualified with reference to the geographic scale at which the effect is significant (e.g. an adverse effect significant at a national level).

In order to provide consistency of terminology in the conclusions of the assessment, the residual effects of the Project will be translated to a significance level on a scale of Negligible, Minor, Moderate and Major, comparable to that used in other Environmental Statement chapters as outlined in Table 8-10. These conclusions will be provided in each case in brackets following the equivalent CIEEM assessment conclusion.

*Table 8-10. Relating CIEEM assessment terms to those used in other Environmental Statement chapters*

| Effect Classification | Terminology Used in Other Environmental Statement Chapters | Equivalent CIEEM Assessment |
|---|---|---|
| Significant (Beneficial) | Major Beneficial | Beneficial effect on structure/function or conservation status at regional, national or international level. |
| | Moderate Beneficial | Beneficial effect on structure/function or conservation status at County or Borough level. |
| Non-significant | Minor Beneficial | Beneficial effect on structure/function or conservation status at Site or local level. |
| | Negligible | No effect on structure/function or conservation status. |
| | Minor Adverse | Adverse effect on structure or conservation status at Site or local level. |

| Effect Classification | Terminology Used in Other Environmental Statement Chapters | Equivalent CIEEM Assessment |
|---|---|---|
| Significant (Adverse) | Moderate Adverse | Adverse effect on structure/function or conservation status at County or Borough level. |
| | Major Adverse | Adverse effect on structure/function or conservation status at regional, national or international level. |

*8.7.4. Habitats Regulations Assessment*

As part of the assessment of the Project, it is necessary to consider whether the Project is likely to have any Likely Significant Effects on areas that have been internationally designated for nature conservation purposes (SACs, SPAs and Ramsar sites). Internationally designated sites are protected under the Conservation of Habitats and Species Regulations 2017 (as amended). The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020. However, the most recent amendments to the Conservation of Habitats and Species (amendment) (EU Exist) Regulations 2019 make it clear that the need for habitat regulations assessment (HRA) continues to apply.

## 8.8. Conclusion

Ecological receptors have been considered in connection with the Project, as detailed in Section 8.4. Those with potential to be impacted by the works are summarised in Table 8-9; several of these may be impacted by the Project despite the mitigation measures described in Section 8.5. Where this is the case, the ecological receptors must be further considered in the EIA. For a suitable assessment of the baseline this may require further survey as detailed in Section 8.4.4. Those receptors scoped into the assessment are summarised in Table 8-11, it is assumed that the maintenance and operation of the Project will have minimal impacts given the underground nature of the construction.

*Table 8-11. Matters to be scoped in*

| Ecological Receptor | Potential Significant Effects | Project Phase(s) | Scoping |
|---|---|---|---|
| Designated sites | Cable route runs through Limestone Coast of South Wales SAC (for 1.4 km), Broomhill Burrows SSSI (for 1.2 km) and Castlemartin Coast SPA (for 0.3 km) and runs close to others.<br><br>Temporary habitat loss will occur.<br><br>Priority plant species cited as a reason for | Construction and decommissioning | Scoped in |

| Ecological Receptor | Potential Significant Effects | Project Phase(s) | Scoping |
|---|---|---|---|
| | designation may also be lost. | | |
| Priority habitats | Temporary loss of habitat. | Construction and decommissioning | Scoped in |
| Protected and notable plants | Destruction of plants and loss of supporting habitat. | Construction and decommissioning | Scoped in |
| Bats, including greater and lesser horseshoe bats | Killing, injury or disturbance of bats.<br>Destruction or damage of roosts.<br>Temporary habitat loss and fragmentation. | Construction and decommissioning | Scoped in |
| Badger | Disturbance to/ obstruction of badger setts.<br>Temporary habitat loss and fragmentation. | Construction and decommissioning | Scoped in |
| Otter | Disturbance to/ obstruction of otter breeding, sheltering and resting places.<br>Temporary habitat loss and fragmentation. | Construction and decommissioning | Scoped in |
| Hazel dormouse | Killing, injury or disturbance of hazel dormouse.<br>Temporary habitat loss and fragmentation. | Construction and decommissioning | Scoped in |
| Invasive non-native species | Causing spread of Invasive non-native plant species into the wild. | Construction and decommissioning | Scoped in |

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## 9. HISTORIC ENVIRONMENT AND CULTURAL HERITAGE

### 9.1. Introduction

The terrestrial archaeology assessment will consider the potentially significant effects on heritage assets within the onshore and inter-tidal region (above mean low water mark) of the proposed Project that may arise from the construction, operation (including maintenance and repair) and decommissioning of the Project. This chapter of the Scoping Report describes the methodology and datasets used to inform the scoping assessment, it provides an overview of the baseline conditions, the likely significant effects that may arise as a result of the proposed Project, and how these likely significant effects will be assessed for the purpose of an EIA.

Terrestrial archaeological and cultural heritage receptors located within the Onshore Scoping Boundary comprise the following assets:

- Designated heritage assets;
- Non-designated heritage assets; and
- Historic landscapes.

### 9.2. Regulatory and Planning Policy Context

The potential effects of the Llyr Project on terrestrial archaeology have been considered with respect to the requirements of the relevant policy, legislation and guidance, including national and local planning policy and other guidance.

*9.2.1. National Planning Policy*

The following national planning policy is relevant to the terrestrial archaeology assessment:

- Ancient Monuments and Archaeological Areas Act 1979;
- Planning (Listed buildings and Conservation Areas) Act 1990;
- Historic Environment (Wales) Act 2016;
- Welsh Government (2018) Planning Policy Wales (PPW); and
- Welsh Government (2017) Technical advice note (TAN) 24: the historic environment.

*9.2.2. Local Planning Policy.*

The following local planning policy is relevant to the terrestrial archaeology assessment:

- Pembrokeshire County Council Local Development Plan 1 2013, Policy GN.38 Protection and Enhancement of the Historic Environment; and
- Pembrokeshire Coast National Park Local Development Plan 2, 2021 Historic Environment (Archaeology) Supplementary Planning Guidance.

*9.2.3. Other Policies and Guidance*

The following guidance is relevant to the terrestrial archaeology assessment:

- Conservation Principles for the sustainable management of the historic environment in Wales Cadw (2011));
- Setting of Historic Assets in Wales; Cadw (2017);
- Heritage Impact Assessment in Wales; Cadw (2017);
- Managing Historic Character in Wales; Cadw (2017);
- Managing Lists of Historical Assets of Special Local Interest; Cadw (2017);
- Managing Change to Registered Historic Parks and Gardens in Wales; Cadw (2017);
- Managing Listed Buildings at Risk in Wales; Cadw (2017);
- Managing Change to Listed Buildings in Wales; Cadw (2017);
- Managing Conservation Areas in Wales; Cadw (2017);
- Guide to the Assessment of the Significance of the Impact of Development on Historic Landscapes Areas – ASIDOHL (Cadw, 2017)
- Chartered Institute for Archaeologists (2019) Code of Conduct;
- Standard and guidance for historic environment desk-based assessment; CIfA (2020); and
- The Welsh Archaeological Trusts (WAT) Code of Practice for provision of archaeological advice (WAT, 2017).

## 9.3. Study Area

The Study Area for the scoping assessment can be seen in Volume 1, Figure 1-1 and comprises: landfall, onshore cable routes and associated onshore substation / control building, adjacent to Pembroke Power Station, and a 500 m buffer from the Onshore Scoping Boundary.

## 9.4. Baseline

*9.2.4. Existing Baseline Data*

The baseline data reviewed to inform the overview of cultural heritage baseline conditions includes:

- A Research Framework for the Archaeology of Wales (IFA Wales, 2016);

- Lle, Geo-Portal for Wales (Lle, 2022);
- National Monuments Record of Wales (NMRW; Royal Commission on the Ancient and Historical Monuments of Wales; RCAHW, 2022);
- Dyfed HER data from Archwilio Historic Environment Records of Wales website (Dyfed Archaeological Trust, 2022);
- Project Erebus EIA Scoping Report (MarineSpace, 2019); and
- Project Valorous EIA Scoping Report (MarineSpace, 2020).

### *9.2.5. Designated Heritage Assets*

The northern cable routes pass through the Milford Haven Waterway Registered Historic Landscape (Cadw Ref. HLW (D) 3), with one of the potential routes passing through the Angle Conservation Area.

The Milford Haven Waterway is a ria or drowned valley flooded after the end of the last glacial maximum; its deep yet sheltered waters extend 30km inland of its mouth, before dividing into the Eastern and Western Cleddau which continue as tidal rivers for some distance. Tributaries such as the Pembroke, Carew and Cresswell Rivers and several smaller watercourses flow into the Haven, significantly increase the length of its meandering and incised shore and coastline. The chronological range of maritime conquest, settlement, commerce, fishing and defence from the 11th century to the late 20th century are represented. It is a highly articulate and distinctive land and seascape, and its legibility as an historic landscape is its most significant factor.

The settlement of Angle dates from the medieval period, a good example of a Norman settlement of a long village street flanked by burgage plots and outlying strip fields. The village with its sea access and fertile land was of clear economic importance and a moated castle was established by the de Angelo family, superseded in the 15th century by a fortified tower house. The conservation area contains a number of surviving medieval buildings, as well as 19th century fortifications associated with the Napoleonic Wars.

In the vicinity of potential landfall sites are a number of designated sites, including scheduled monuments (Lle, 2022). These include, but are not limited to:

- Eastington Manor House (Cadw Ref. PE263) – medieval manor, located south-west of Valero Pembroke Refinery within the Onshore Scoping Boundary (northern cable);
- Gravel Bay anti-aircraft battery (Cadw Ref. PE494) – Second World War anti-aircraft battery, located north of Freshwater West within the Onshore Scoping Boundary (southern cable);
- Wallaston Round Barrows (Cadw Ref. PE064) – prehistoric round barrows located north of Axton Hill within the Onshore Scoping Boundary (southern cable);
- West Pickard Camp (Cadw Ref. PE167) – Prehistoric Promontory Fort, located south of Angle, approximately 540 m north of the Offshore Cable Scoping Boundary (southern cable);
- Promontory Fort at Sheep Island (Cadw Ref. PE411) – Prehistoric Promontory Fort, located south of Angle, approximately 1 km north and east of the Offshore Cable Scoping Boundary (southern and northern cables routes respectively);
- West Angle Bay Early Medieval Settlement (Cadw Ref. PE554) – medieval cemetery located on the cliff top overlooking West Angle Bay immediately adjacent to the south side of the second northernmost landfall site;
- Chapel Bay Fort (Cadw Ref. PE333) – post-medieval fort, located north-west of Angle, approximately 130 m south of the Offshore Cable Scoping Boundary (northernmost cable route) and approximately 600 m north-east of the second northernmost landfall site;
- Angle Dovecot (Cadw Ref. PE067) – medieval dovecote, located within Angle, approximately 600 m west of the Onshore Scoping Boundary (southern cable);

- The Tower (Cadw Re. PE068) – medieval tower, located within Angle, approximately 570 m west of the Onshore Scoping Boundary (southern cable);
- Angle Castle (Cadw Ref. PE069) – medieval tower house, located within Angle, approximately 47 0m west of the Onshore Scoping Boundary (southern cable);
- Fort Popton (Curtain Walls and Gun Emplacements only) (Cadw Ref. PE446) – post medieval fort approximately 120 m north of the northernmost landfall site;
- Enclosure & Earthworks at Lewiston Hall (Cadw Ref. PE400) – prehistoric promontory fort located east of Valero Pembroke Refinery, approximately 1 km north-west of the Onshore Scoping Boundary (cable route terminal); and
- West Pennar Camp (Cadw Ref. PE262) – prehistoric enclosure located east of Valero Pembroke Refinery, approximately 480 m north of the Onshore Scoping Boundary (cable route terminal).

A large number of listed buildings are located within the scoping Study Area including nine listed buildings within proposed cable routes. These comprise:

- The Tower at Eastington Manor House (Grade I ; Cadw Ref 6594);
- Eastington Farmhouse including range of outbuilding to SE (Grade II, Cadw Ref. 6595);
- 35 Angulo Bank (Grade II; Cadw Ref. 17160);
- Windmill adapted as machine-gun post (Grade II; Cadw Ref. 5926);
- Rocket Cart House(Grade II; Cadw Ref. 17166);
- Lookout Tower (Grade II; Cadw Ref. 17167);
- War Memorial (Grade II; Cadw Ref. 17162);
- Corse Bridge and attached Walled Channel (Grade II; Cadw Ref. 5954); and
- Seaweed Hut on foreshore (Grade II; Cadw Ref. 16583).

There are a number of further listed buildings in close proximity to cabling routes. These include, but are not limited to:

- Pele Tower (Grade I; Cadw Ref. 5923), located within Angle, approximately 570 m west of the Onshore Scoping Boundary (southern cable);
- Sailors' Chapel (Grade I; Cadw Ref. 16068), located within Angle, approximately 570 m west of the Onshore Scoping Boundary (southern cable);
- Church of St Decumanus (Grade I; Cadw Ref 6591), located within Rhoscrowther, approximately 50 m south of the Onshore Scoping Boundary (northern cable);
- The Almshouse (Grade II*; Cadw Ref. 17149), located within Angle, approximately 470 m west of the Onshore Scoping Boundary (southern cable);
- Dovecote (Grade II*; Cadw Ref. 5922), located within Angle, approximately 600 m west of the Onshore Scoping Boundary (southern cable);
- Thorne Island Fort (Grade II*; Cadw Ref. 17169), located west of the Angle headland, approximately 200 m south and west of the Onshore Scoping Boundary (northern cable), and approximately 830 m north-west of the Onshore Scoping Boundary (second northernmost landfall site); and
- Former Church of Saint Mary (Grade II*; Cadw Ref. 6587), located within Pwllcrocan, approximately 750 m north of the Onshore Scoping Boundary (northern cable).

#### *9.2.6. Non-designated Heritage Assets*

In addition to designated heritage assets, there are a large number of non-designated heritage assets recorded by the Dyfed Historic Environment Record on the Archwilio Historic Environment Records of Wales website. These assets provide evidence of human activity from the early prehistoric through to the modern period, and a full desk-based assessment of these will be required as part of the EIA.

#### *9.2.7. Historic Landscapes*

The Onshore Scoping Boundary (northern cable route) pass through the Milford Haven Waterway Registered Historic Landscape (Cadw Ref. HLW (D) 3).

The Cadw *Guide to Good Practice on Using The Register of Landscapes of Historic Interest in Wales in the Planning and Development Process* (2007) notes that, "*All landscape areas identified on the Register are of national importance in the Welsh context*", and recommends that an Assessment of the Significance of the Impact of Development on Historic Landscapes (ASIDOHL2) exercise be undertaken, "*when EIA is required for a development within a historic landscape area on the Register*". As such, an ASIDOHL2 exercise should be undertaken as part of the EIA process.

### 9.5. Embedded and Good Practice Measures

The following standard mitigation practices, will be applied where necessary:

- Avoidance of known heritage assets (preservation in situ):
  - Implementation of Archaeological Exclusion Zones (AEZ) around identified terrestrial heritage assets;
  - Micro-siting of design to avoid known, onshore heritage assets;
- Further investigation and excavation of heritage assets which cannot be avoided (preservation by record):
  - Geoarchaeological assessment and the production of a Quaternary sedimentary deposit model; and
  - Onshore fieldwork / excavation including set-piece (open-area) excavation, strip, map and record (or sample) excavation and watching briefs (targeted and general).

All mitigation measures would be set out in a draft Written Scheme of Investigations (WSI) to reflect the proposed approach to archaeological mitigation for onshore, intertidal and offshore works associated with the proposed Project. Fieldwork would include subsequent post excavation assessment, and analysis, publication and archiving (where appropriate).

### 9.6. Likely Significant Effects

#### *9.6.1. Key Receptors*

The key receptors for terrestrial and inter-tidal archaeology and cultural heritage include:

- Milford Haven Waterway Registered Historic Landscape (Cadw Ref. HLW (D) 3);
- Angle Conservation Area;
- Scheduled monuments;
- Listed buildings (Grades I, II* and II);
- Historic Landscape Character (HLC) areas and areas of Ancient Woodland identified as sensitive to change;
- Non-designated built heritage assets; and
- Known and previously undiscovered non-designated archaeological remains.

#### *9.6.2. Potential Impacts*

These receptors can be impacted directly or indirectly by the proposed Project. Direct impacts on heritage assets involve permanent damage or destruction of building fabric or archaeological material or its physical setting (context), with no ability to replace what has been lost. This would include impacts from the construction, operation, maintenance and decommissioning of the proposed Project, as well as its associated activities. This type of impact would likely result in adverse effects which would be significant.

Indirect impacts occur when direct impacts have effects beyond their primary footprint, which can affect archaeological sites or materials some distance away. This may be caused by disturbance of buried remains by compression, vibration, and changes in ground water caused by caused by installation of infrastructure or associated activities, as well as alteration of the surrounding environment such that the significance of the receptor is affected. These processes can trigger either a negative effect by degradation of the heritage asset or context, by physical, biological or chemical processes, or a positive effect e.g., by preservation of the heritage asset via burial.

Key sensitivities and potential impacts associated with the proposed Project to be considered as part of the full EIA are listed in Table 9-1 below.

#### 9.6.2.1. Construction

Potential temporary construction impacts that would last for all or part of the construction phase of the Project could include the following:

- Presence of construction plant altering the setting of receptors during the construction of the Project;
- Presence of temporary construction compounds and cable laydown areas altering the setting of receptors ; and
- Creation of dust, noise and light across the Project;

Potential permanent construction impacts lasting beyond the construction phase could include:

- Impact through permanent change to the significance of the historic setting of receptors especially those in closer proximity to potential landfall sites;
- Permanent impact on potential archaeological remains as a result of construction groundworks associated with the Project; and
- Impact through permanent change to a Registered Historic Landscape as well as HLC areas and areas of Ancient Woodland identified as sensitive to change with the introduction of built form into the landscape.

#### 9.6.2.2. Operation

Potential impacts during the operation of the Project could include:

- Change to the setting of heritage assets as a result of an increased traffic to the potential landfall sites and terminal site; and
- Change to the setting of heritage assets as a result of increased noise, light, and dust.

#### 9.6.2.3. Decommissioning

Potential impacts lasting beyond the decommissioning phase could include:

- Temporary impact through change to the significance of the historic setting of receptors especially those in closer proximity to potential landfall sites; and
- Temporary impact through permanent change to a Registered Historic Landscape as well as HLC areas identified as sensitive to change with the removal of or alteration to built form into the landscape.

*Table 9-1. Key receptors and potential impacts for terrestrial historic environment and cultural heritage*

| Topic/Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact/ Scoped |
|---|---|---|---|---|
| Onshore and inter-tidal designated and non-designated archaeological and built heritage assets. | Impacts to the setting of heritage assets. | Construction<br>Operation<br>Decommissioning | Yes | High potential for introduction of a new development, with associated activities, to negatively affect the setting of designated and non-designated archaeological and built heritage, assets without mitigation. |
| Buried archaeological/(Palaeo) environmental remains | Direct impacts on sites within the Onshore Scoping Boundary causing destruction or damage of the assets.<br>Impacts to the setting of heritage assets. | Construction<br>Operation<br>Decommissioning | Yes | Direct, physical impacts to heritage assets would result in the total loss of their heritage. This would constitute a medium or high impact which, without mitigation, would likely result in a significant effect. Exposure of buried remains could result in increased degradation. Conversely, preservation of remain *in* situ, and opportunities for public interpretation, signage etc. could be considered positive. |
| Historic Landscapes | Changes to the historic character of the area. | Construction<br>Operation | Yes | High potential for introduction of a new development, with associated activities, to negatively affect the integrity and setting of assets without mitigation. |

| Topic/Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact/ Scoped |
|---|---|---|---|---|
| Current Archaeological Research in Wales | Potential positive impact of publishing fieldwork results and archaeologically assessed geophysical and geotechnical data, as well as any archaeological remains identified. | Construction | Yes | The acquisition of new information of the onshore and intertidal historic environment and cultural heritage resource of the Project. through geophysical, geotechnical, fieldwork surveys, and excavation exercises could significantly contribute to the understanding of archaeology in the region. |

## 9.7. Assessment Methodology

Assessment of effects related to impact and setting change will be undertaken using the staged approach laid out in the Cadw (2017) Setting Guidance and articulated with reference to Cadw's 2011 Conservation Principles. This will be used in conjunction with national planning policy and the relevant policies from Local Development Plans as well as guidance published by the Chartered Institute for Archaeologists.

### *9.7.1. Establishing the Baseline*

Archaeology, built heritage and historic landscapes will be scoped into the EIA due to the potential for the Project to affect designated and non-designated heritage assets. A cultural heritage desk-based assessment (DBA) will be produced to establish the baseline conditions for the archaeological resource and assess the significance of the heritage assets within the Onshore Scoping Boundary as well as an appropriate Study Area.

A 1 km Study Area is proposed for the proposed landfall site(s), and grid connection point where above ground elements may be installed; a 500 m Study Area is proposed for the cable routing. The baseline will provide sufficient cultural heritage information to inform the impact assessment.

In accordance with requirements specified in Planning Policy Wales, Note 24 (Cadw, Welsh Government, 2017a), the DBA will be compiled using data from the following sources;

- Records held by Cadw on designated heritage assets;
- Information held by Pembrokeshire County Council and Pembrokeshire Coast National Park on conservation area and assets of local interest;
- Records from the Historic Environment Record (HER) maintained by Dyfed Archaeological Trust;
- Records from the National Monuments Record of Wales, held by RCAHMW;
- Historic and current Ordnance Survey mapping;
- Historic and recent digital aerial photography;
- LIDAR data; and
- Borehole and geological data from online data (British Geological Society website).

Subject to the results of the DBA, there may be an additional requirement for proportionate field evaluation, including geophysical survey and / or trial trenching, in order to provide a sufficiently detailed baseline to inform the impact assessment.

### *9.7.2. Assessment Criteria*

The value of a heritage asset is guided by its designated status, but is derived also from its heritage interest, which is defined by Cadw as its evidential, historical, aesthetic or communal. The setting of a heritage asset can also contribute to its value. Using professional judgment and the results of consultation, heritage assets are also assessed on an individual basis and regional variations and individual qualities are considered where applicable. In articulating effects, an overall judgement will be made on the level of harm or benefit a heritage asset will experience as a result of the Project, supported by an appropriate narrative linking this to how the asset will have its significance change.

Each heritage asset relevant to the assessment will be assigned a value in accordance with the criteria in Table 9-2 below. This table provides guidance, but professional judgment will be applied in all cases regarding the appropriate category for individual heritage assets. Where it is assessed that an asset is of greater or lower value than noted in the guidance table, justification will be provided.

*Table 9-2. Key receptors and sensitivity for terrestrial historic environment and cultural heritage*

| Value | Criteria |
|---|---|
| High | World Heritage Sites.<br>Scheduled Monuments.<br>Grade I and II* Listed Buildings.<br>Registered battlefields.<br>Grade I and II* registered parks and gardens.<br>Conservation areas of demonstrable high value.<br>Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens, or landscapes) that can be shown to have demonstrable national or international importance.<br>Well preserved historic landscape character areas, exhibiting considerable coherence, time-depth, or other critical factor(s). |
| Medium | Grade II Listed Buildings.<br>Conservation areas.<br>Grade II registered parks and gardens.<br>Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens, or landscapes) that can be shown to have demonstrable regional importance.<br>Averagely preserved historic landscape character areas, exhibiting reasonable coherence, time-depth, or other critical factor(s).<br>Historic townscapes with historic integrity in that the assets that constitute their make-up are clearly legible. |
| Low | Locally Listed Buildings.<br>Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens, or landscapes) that can be shown to have demonstrable local importance.<br>Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade.<br>Historic landscape character areas whose value is limited by poor preservation and/ or poor survival of contextual associations. |
| Negligible | Assets identified on national or regional databases, but which have no evidential, historical, aesthetic and communal value.<br>Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade.<br>Landscape with no or little significant historical merit. |

### *9.7.3. Assessing the Magnitude of Impact*

Once the value of the heritage asset has been identified, the magnitude of impact to the asset as a result of the Project will be assessed. Impacts may arise during construction or operation of the Project and could be temporary or permanent. Impacts may occur to the physical fabric of an asset or may arise from changes within its setting. Table 9-3 below presents the heritage asset magnitude matrix.

*Table 9-3. Heritage asset magnitude matrix*

| Value | Criteria |
|---|---|
| High | Changes such that the heritage value of the asset is totally altered or destroyed.<br>Comprehensive change to elements of setting that would result in harm to the asset and our ability to understand and appreciate its heritage significance. |
| Medium | Change such that the heritage value of the asset is significantly altered or modified.<br>Changes such that the setting of the asset is noticeably different, affecting significance changes in our ability to understand and appreciate the heritage value of the asset. |
| Low | Changes such that the heritage value of the asset is slightly affected.<br>Changes to the setting that have a slight impact on significance resulting in changes in our ability to understand and appreciate the heritage value of the asset. |
| Negligible | Changes to the asset that hardly affect heritage value.<br>Changes to the setting of an asset that have little effect on significance and no real change in our ability to understand and appreciate the heritage value of the asset |

### *9.7.4. Assigning the Significance of Effect*

An assessment to classify the significance of the effect, having taken into consideration any embedded mitigation, will be determined using the matrix at Table 9-3, which takes account of the value of the asset (Table 9-4) and the predicted magnitude of impact (Table 9-3). The ES will report on the significance of effect in accordance with EIA methodology. Major and moderate effects will be considered significant.

*Table 9-4. Significance criteria*

| | | Magnitude of impact | | | |
|---|---|---|---|---|---|
| | | **Negligible** | **Low** | **Medium** | **High** |
| Value of Heritage Asset | High | Negligible/ Minor | Moderate | Major | Major |
| | Medium | Negligible | Minor | Moderate | Major |
| | Low | Negligible | Negligible | Minor | Moderate |
| | Negligible | Negligible | Negligible | Negligible | Negligible/ Minor |

## 9.8. Potential Mitigation

Owing to the nature of the Project, it is envisaged that mitigation is likely to focus on addressing adverse effects to heritage assets, particularly buried archaeological assets. The approach to mitigation will be guided by industry common practice and appropriate procedures as laid out in the relevant standards and guidance documents from the Chartered Institute for Archaeologists.

The following mitigation measures may be considered in relation to the Project:

- Informed by the results of the DBA and any field evaluation, mitigation comprising the preservation of archaeological remains through limited re-design or, where this is not possible or appropriate, archaeological excavation.

### 9.9. Conclusion

The northern potential cable routes pass through the Milford Haven Waterway Registered Historic Landscape (Cadw Ref. HLW (D) 3), with one of the potential routes passing through the Angle Conservation Area. A number of other registered historic landscapes, conservation areas, scheduled monuments and listed buildings (Grade I, II* and II) are located within the scoping Study Area.

There is the potential for as yet undiscovered terrestrial and intertidal archaeology receptors within the Onshore Scoping Boundary. These include in situ archaeological sites and finds of all periods.

Archaeology, built heritage and historic landscapes will be scoped into the EIA.

### 9.10. References


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# 10. WATER ENVIRONMENT

## 10.1. Introduction

This chapter presents an initial baseline for the water environment for the Onshore Scoping Boundary, an overview of the assessment methodology to be followed for the environmental assessment, identifies the potential effects of the Project and likely embedded and good practice mitigation.

The Onshore Scoping Boundary is defined as extending to the extreme Low Water Mark. Refer to Volume 3 of the Scoping Report for consideration of the marine area beyond this (i.e. the Array Area and Offshore Cable Scoping Boundary).

After defining the Study Area, this chapter provides a review of the baseline surface water and groundwater environment, water resources, areas of flood risk, and any designations that apply to them. The surveys and assessment methodology proposed to assess potential impacts on the water environment are presented. It also sets out the requirements and proposed approach to the Flood Consequences Assessment (FCA) and a Water Framework Directive (WFD) compliance assessment. This chapter concludes by setting out the receptors and matters to be assessed in further detail by the EIA and ultimately presented in the Environmental Statement.

This chapter is supported by Figure 10-1 and Figure 10-2. The chapter includes assessment of impact on groundwater resources and quality, but only insofar as it relates to operational drainage from the Project. Scoping of potential effects to hydrogeology including contamination of controlled water during construction are considered in Chapter 11: Geology and Hydrogeology.

## 10.2. Regulatory and Planning Policy Context

### *10.2.1. Legislative Context*

The following key legislation is relevant to this scoping assessment:

- Environment Act 2021;
- Environment (Wales) Act 2016;
- Well-being of Future Generations Act (Wales) 2015;
- Water Act 2014;
- Flood and Water Management Act 2010;
- Water Resources Act (England and Wales) 1991 (Amended 2009);
- Conservation of Habitats and Species Regulations 2017;
- Climate Change Act 2008;
- Land Drainage Act 1991 (as amended);
- Salmon and Freshwater Fisheries Act 1975 as amended;
- The Groundwater (Water Framework Directive) (Wales) Directions 2016;
- Control of Pollution (Oil Storage) (Wales) Regulations 2016;
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015;
- Environmental Permitting (England and Wales) Regulations 2016;
- Groundwater (England and Wales) Regulations 2009;

- Flood Risk Regulations 2009;
- Environmental Damage (Prevention and Remediation (Wales)) Regulations 2009;
- Water Resources (Abstraction and Impounding) Regulation 2005; and
- Control of Substances Hazardous to Health Regulations 2002 (as amended).

### *10.2.2. National Policy Context*

#### 10.2.2.1. Future Wales: The National Plan (2040)

Future Wales – the National Plan 2040 (Welsh Government, 2021) is Wales' national development framework. Published in February 2021 it sets the direction for development in Wales to 2040. It includes policies on flooding (Policy 8) and resilient ecological networks and green infrastructure (Policy 9).

#### 10.2.2.2. The National Strategy for Flood and Coastal Erosion Risk Management in Wales (2020)

This Strategy (Welsh Government, 2020) sets out how the Welsh Government intends to manage the risks from flooding and coastal erosion across Wales. It sets objectives and measures for all partners to work towards over the next 10 years. The strategy aims to a) improve understanding and communication of risk; b) build preparedness and resilience to flooding; c) prioritise investment to the most at risk communities; d) prevent more people from becoming exposed to risk; and e) provide an effective and sustained response to events.

#### 10.2.2.3. Planning Policy Wales (2021)

Planning Policy Wales (Welsh Government, 2021) sets out the land use policies of the Welsh Government and is supplemented by a series of Technical Advice Notes (TANs). Planning Policy Wales states that planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding. It states that development should reduce, and must not increase, flood risk arising from the river and/or coastal flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.

#### 10.2.2.4. TAN 15: Development and Flood Risk (2004)

TAN15 Development and Flood Risk 2004 (Welsh Government, 2018) provides guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding. A precautionary framework is set out which advises caution in respect of new development in areas at high risk of flooding and this is used as a guide for planning decisions. The overall aim of the precautionary framework is to direct new development away from those areas that have a high risk of flooding; and development will only be justified in these areas if it meets the criteria and tests specified in this guidance. To note, an update to TAN15 is due to occur on 1st June 2023 to ensure the planning systems plays a full part in adaptation to climate change.

### *10.2.3. River Management Plans*

#### 10.2.3.1. Western Wales River Basin District Management Plan (RBMP)

At a regional level, and under the Water Framework Directive (WFD), water management is coordinated through 10 RBMPs across Wales and England. RBMPs are prepared by Natural Resources Wales and the Environment Agency for six-year cycles and set out how organisations, stakeholders and communities will work together to improve the water environment. The most recent plans were published in 2015 (the second cycle) and will remain in place until after 2021. The waterbodies within the Study Area fall under the Western Wales RBMP (Natural Resources Wales, 2021). Please note that the third cycle RBMP and latest waterbody classification data is expected to be published soon.

#### 10.2.3.2. Local Planning Policy

Below lists the relevant local planning policies which will be consulted as part of the Water Environment impact assessment and to inform the development of the design of the Project and suitable mitigation measures:

- Pembrokeshire County Council Local Development Plan 2013 (Pembrokeshire County Council, 2013). The Local Development Plan was adopted in 2013 with an end date of 2021. The Authority is working on a replacement Local Development Plan; it is anticipated that this plan will be adopted in 2022 and will run until 2033. Emerging policies from the Replacement Local Development Plan will be considered as the Project progresses.
- Carmarthenshire and Pembrokeshire Stage 1 Strategic Flood Consequence Assessment 2019 (Carmarthenshire and Pembrokeshire, 2019).
- Pembrokeshire County Council Preliminary Flood Risk Report 2011 (Pembrokeshire County Council, 2011).
- Pembrokeshire County Council Local Flood Risk Management Strategy 2015 (Pembrokeshire County Council, 2015).
- Lavernock Point to St. Ann’s Head Shoreline Management Plan SMP2 2012 (Halcrow Group, 2012).

The Pembrokeshire County Council flood risk documents are likely to be updated alongside the Replacement Local Plan and will be kept under review as the Project progresses.

### *10.2.4. Statutory Guidance*

Activities associated with the Project will need to conform to the following Statutory Guidance:

- Sustainable Drainage Statutory Guidance 2019 (Welsh Government, 2019) which Local Authorities must have regard to in relation to their SuDS Approval Board (SAB) function as required under Schedule 3 of the Flood and Water Management Act 2010. The guidance states that for every new development, it is expected that SABs seek an overall reduction in, or significant attenuation of, surface water volumes reaching public sewers and combined systems in a sustainable way.
- The Building Regulations Approved Document G (Building Regulations, 2015) which will be consulted when designing the control building.

## 10.3. Study Area

The Study Area has been defined as a 1 km buffer around the Onshore Scoping Boundary within which all hydrological receptors that may be directly impacted can be identified. Given the nature of the Project significant adverse impacts on the water environment are unlikely beyond this distance. However, this will be kept under review as more design information becomes available. In addition, for the purposes of setting importance levels for potentially impacted receptors, the baseline will also consider attributes of watercourses within a few kilometres downstream, as is relevant.

The Onshore Scoping Boundary is defined as extending to the extreme Low Water Mark. Refer to Volume 3 of the Scoping Report for consideration of the marine area beyond this (i.e. the Array Area and Offshore Scoping Boundary).

The Project will include up to two marine export cables sharing one onshore cable route. The location of landfall has not yet been determined and therefore the Study Area for the Water Environment assessment will include all potential landfall locations (see Volume 1, Section 4.3.1). The Study Area is shown in Figure 10-1.

## 10.4. Baseline

The baseline information for this Scoping Report has been derived from:

- Blue Gem Wind (2021) Project Erebus Environmental Statement (Blue Gem Wind, 2021);
- British Geological Survey Geoindex website (accessed February 2022);
- DEFRA (2022) Department for Environment, Food and Rural Affairs (Defra) Multi Agency Geographical Information for the Countryside (MAGIC) website (including Ordnance Survey mapping) (accessed February 2022) ;
- Halcrow (2012) South Wales Shoreline Management Plan – Appendix H WFD assessment;
- Intertek Ltd (20198) Greenlink Interconnector Marine Environmental Statement Scoping Report – UK Marine Route. Rev 2Wales;
- Met Office (2021) Met Office average climate data (accessed February 2022);
- Natural Resources Wales (2022) Flood Risk Assessment Maps website (accessed February 2022);
- Natural Resources Wales (2022) Water Watch Wales website (accessed February 2022);
- Natural Resources Wales and Welsh Government (2022). Lle: A Geo-Portal for Wales (accessed February 2022);
- RPS Energy (2018) Marine Energy Test Area (META) Environmental Impact Assessment Scoping Report; and
- Wave Hub Ltd (2018) Pembrokeshire Demonstration Zone Feasibility Study Environmental Scoping Report.
- Natural Resources Wales (2016) Cleddau and Pembrokeshire Coastal Rivers Management Catchment Summary 2016.
- Pembrokeshire County Council (2011) Pembrokeshire County Council Preliminary Flood Risk Report (PFRR) 2011.

This section of the report is supported by Figure 10-1.

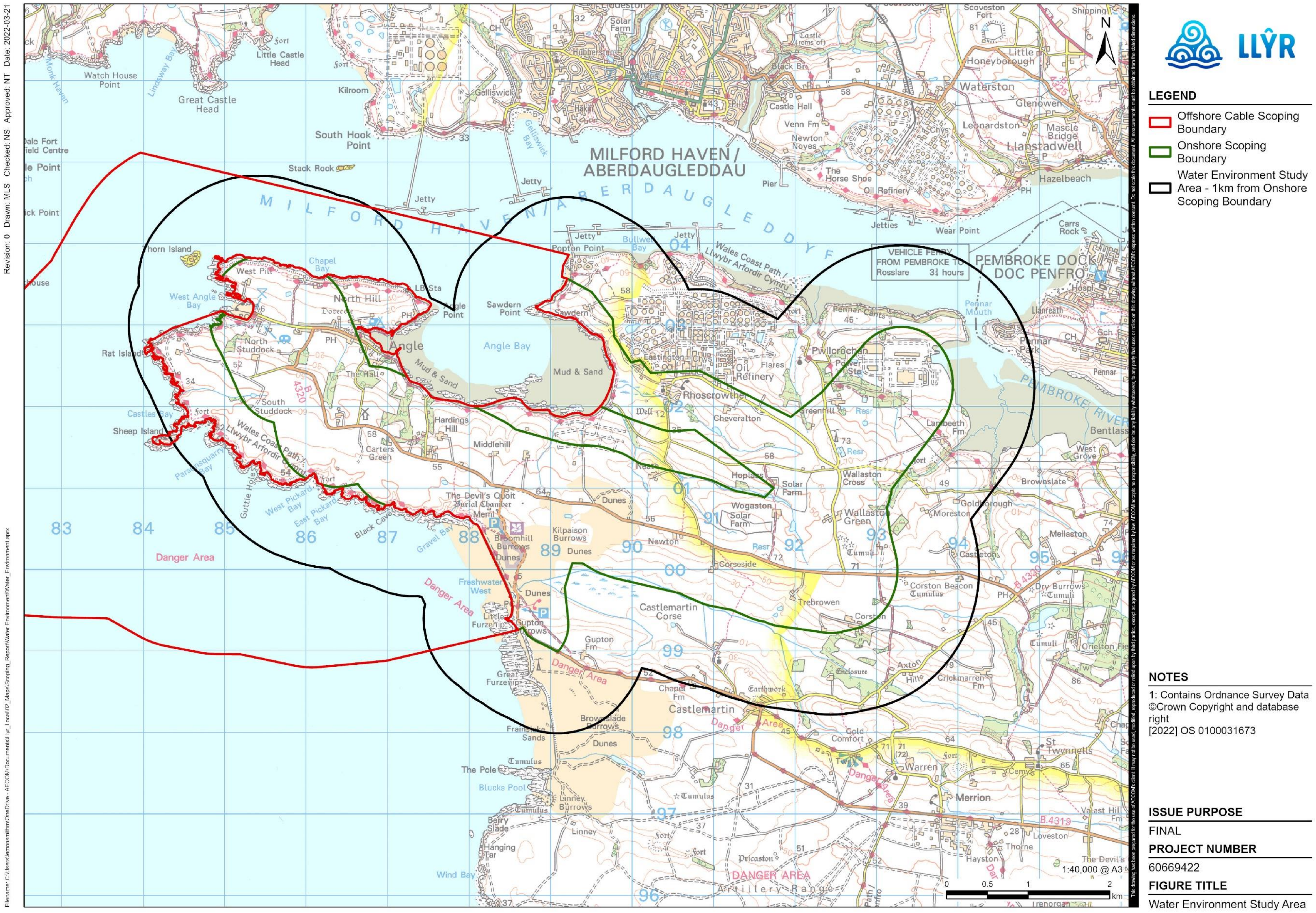


*Figure 10-1. Water environment Study Area*

### 10.4.1. Topography, Rainfall and Land Use

The Study Area for the water environment is located west of Pembroke on the Angle Peninsula. It stretches between Pembroke Power Station in the east and West Angle Bay and Freshwater West to the west. Milford Haven estuary is located to the north.

Ordnance Survey mapping (DEFRA, 2022) indicates that the topography of the inland areas is undulating with steep slopes in places, particularly along the coastline. The high point is approximately 70m above ordnance datum (AOD) at Wollaston Cross to the south of Pembroke Power Station. The land generally slopes away from this point towards the coast to the north, west and southwest.

Land use across the Study Area is predominantly a mixture of arable and pastoral agriculture. However, the north of the Study Area includes heavy industry with the presence of a large oil refinery, disused oil terminal and Pembroke Power Station. There are small patches of woodland across the area, with significant expanses of sand dunes at Freshwater West, and the coastline includes numerous bays, beaches, small inlets and rocky escarpments.

The nearest weather station with average climate data on the Met Office website is at Milford Haven Conservancy Board. Average rainfall is summarised in Plate 10-1.

Annual average rainfall at Milford Haven for the period 1991-2020 was 1080 mm per year, which is around the average for the UK, with it raining on an average of 155 days per year. Most rainfall falls between October and January with May tending to be the driest month of the year.

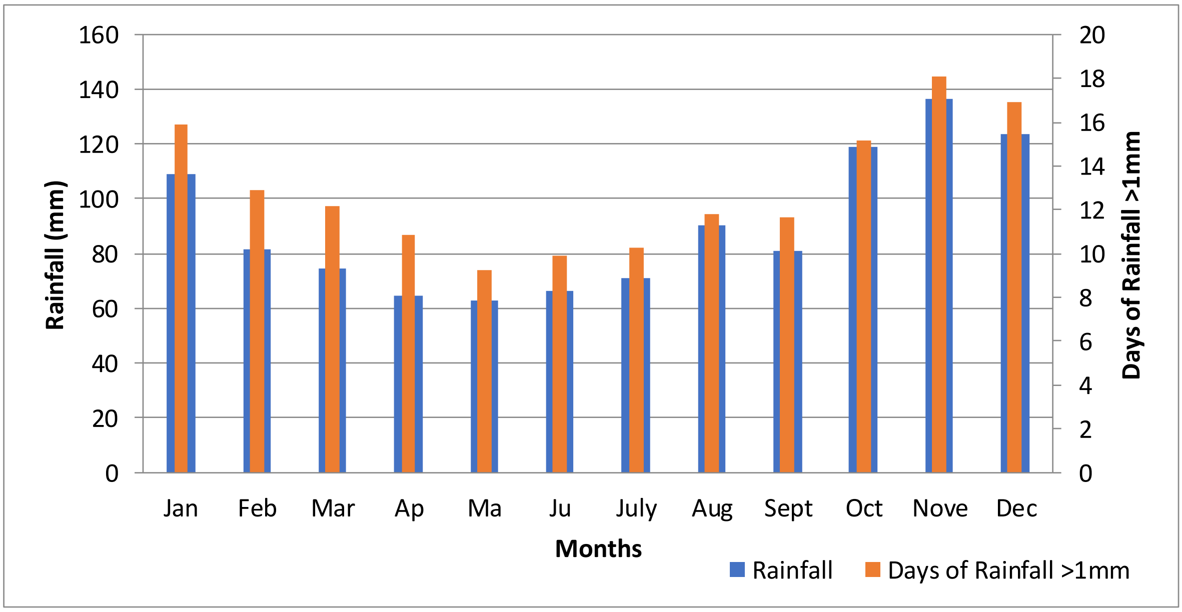


*Plate 10-1. Milford Haven Conservancy Board annual monthly rainfall and days of rainfall >1mm (1991-2020) (Met Office, 2021)*

### 10.4.2. Geology, Groundwater and Soils

The onshore geology in the Study Area shows the outcropping of rock strata trends northwest- south east, with Devonian age rocks to the south and the north of the peninsular – with Carboniferous rocks within the central area. Carboniferous rocks are younger than Devonian, and the outcropping on a landscape scale of these within the centre of the Devonian illustrates a structural fold of the rocks, with the axis of the fold being approximately located from West Angle Bay to Angle and onto Pembroke and beyond to the east. (Halcrow, 2012).

The BGS Geoindex website (British Geological Survey, 2022) indicates that bedrock deposits from Freshwater West transition in bands in a northeasterly direction towards Pembroke and broadly consist of Llanvirn Rocks (undifferentiated) (mudstone, siltstone and sandstone), Ludlow Rocks (undifferentiated) (mudstone, siltstone and sandstone), Pridoli Rocks (undifferentiated) (mudstone, siltstone and sandstone), Lower Devonian Rocks (undifferentiated) (sandstone and interbedded conglomerate), Upper Devonian Rocks (undifferentiated) (sandstone and interbedded conglomerate) and Dinantian Rocks (undifferentiated) (limestone with subordinate sandstone and argillaceous rock).

Large areas of the Study Area have no superficial deposits. However, there are extensive patches of Marine Beach Deposit (sand) at the coast, Blown Sand (sand) northeast of Freshwater West, small patches of Raised Beach deposit south of Angle Bay, Alluvium around watercourses (particularly around the Castlemartin Corse watercourse) and Tidal Flat Deposits (sand, silt and clay) northeast of the oil refinery. An isolated small patch of glaciofluvial sand and gravel deposits is located east of West Angle Bay (British Geological Survey, 2022).

Defra's MAGIC map (DEFRA, 2022) indicates that the bedrock is largely classified as Secondary A aquifer and Secondary B aquifer. There are small patches of Principal Aquifer south of Angle and around the Pembroke Power Station. Principal aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers. Secondary B aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through fissures and openings or eroded layers.

The Study Area is underlain by the 'Pembrokeshire Carboniferous Limestone' groundwater body (GB41002G206000). The Cycle 2 data indicates this waterbody is at Good Status with Good Quantitative and Chemical Status (Natural Resources Wales, 2022).

The Cranfield University Soilscapes website (Natural Resources Wales, 2016) indicates that the natural, undisturbed soils in the Study Area should be generally a mix of freely draining slightly acid loamy soils and freely draining slightly acid but base-rich soils. There are sand dune soils to the northeast of Freshwater West.

### *10.4.3. Surface Watercourses and Waterbodies*

The Project (onshore and offshore elements) would interact with two WFD coastal waterbodies and one WFD transitional (estuary) waterbody (Natural Resources Wales, 2022). The coastal WFD waterbodies are described fully within the Offshore Physical Environment (including water quality) chapter of the EIA but are also included here given that the boundary between the onshore and offshore elements of the Project extends to extreme Low Water, and therefore includes the margins of the WFD coastal waterbodies which could be crossed by the cable route (depending on the landfall option taken forward). Furthermore, they are hydrologically connected to inland watercourses in the Study Area.

The coastal waterbodies are firstly the Milford Haven Outer WFD waterbody (WFD ID: GB641008220000) which spans Milford Haven from Penna Mouth to St Anne's Head. This waterbody is at Moderate Overall Status, with Moderate Ecological Status and a Chemical Status of Fail under the Cycle 2 (2018) classifications. The waterbody is failing to achieve good status because of high concentrations of dissolved inorganic nitrogen, mercury, and mercury-containing compounds (Natural Resources Wales, 2022).

Beyond Milford Haven Outer is the Pembrokeshire South WFD coastal waterbody (WFD ID: GB611008590003). This waterbody spans the coastline from St David's Head to the north, extending south and east to Manorbier Bay. This waterbody is at Good Overall Status, Good Ecological Status and Good Chemical Status (Natural Resources Wales, 2022).

Further details on coastal processes (including tidal information, water levels, waves, and geomorphology) as well as water quality data for the coastal WFD waterbodies is provided in Volume 3, Chapter 19 Physical Environment.

The transitional waterbody is the Milford Haven Inner waterbody (WFD ID: GB531006114100). This is considered within the onshore chapter given that it is over 4km from any offshore works, but is within 1km of onshore works, and there may be potential for impacts from the Project. The Milford Haven Inner transitional waterbody incorporates the Western Cleddau and Eastern Cleddau rivers south of their tidal limits at Haverfordwest and Canaston Bridge, respectively. The designation extends downstream to the mouth of the Pembroke River (Pennar Mouth) where the waterbody becomes the Milford Haven Outer WFD waterbody. The Milford Haven Inner WFD waterbody is at Moderate Status overall with Moderate Ecological Status and Fail for Chemical Status (Natural Resources Wales, 2022).

The 'Castlemartin Corse – headwaters to Tidal Limit' WFD watercourse is located immediately south of the onshore works for the Project and may be crossed by the cable route should the cable landfall be made at Freshwater West Beach. The watercourse is surrounded by expansive wetlands. None of the other landfall options would directly cross this watercourse. However, the wider WFD catchment would also interact with the landfall option from West Angle Bay.

Castlemartin Corse is approximately 9.5 km in length and rises at St Petrox (8.5km southeast of Angle Bay, NGR SR 94694 98117) from a series of springs. It flows in a westerly direction to discharge to the sea at Freshwater West (NGR SR 88532 99720). The watercourse is not designated as heavily modified and is at Moderate Overall Status, Moderate Ecological Status and Good Chemical Status under the Cycle 2 (2018) classifications. The Moderate Status is due to a Moderate macrophyte and phytobenthos classification, and a Bad dissolved oxygen classification (Natural Resources Wales, 2022). Any monitored flow data for this watercourse and others in the Study Area will be requested from NRW to inform the impact assessment. Imagery available online (Building Regulations, 2015) indicates that at its downstream extent at the B4319 off Freshwater West the watercourse is approximately 4 m wide with substantial sand accumulations on the bed, which relate to the surrounding beach and dunes. Emergent macrophytes are abundant within the channel and there is bank reinforcement in places using stone gabion baskets.

Other watercourses in the Study Area appear to be minor watercourses which drain directly to the WFD transitional and coastal waters, but which are not designated as reportable reaches themselves. The most significant of these is Goldborough Pill which rises from springs close to the B4320 at Sommerton (NGR SM 92951 00033) and Lightapipe (NGR SR 94563 99952) in the eastern extent of the 1km Study Area and flows in a northerly direction to meet the Milford Haven Inner transitional waterbody (WFD ID: GB531006114100) at NGR SM 94475 01774. As these watercourses are not WFD designated in their own right and the waterbody they drain into is of a substantially different type/character (i.e. large estuary or coastal waterbodies), they will not be considered by the WFD assessment for the Project (details of which are provided in Section 10.7).

There are also springs throughout the Study Area, which give rise to the numerous unnamed small watercourses which drain to the coast at regular intervals around the Angle peninsula (DEFRA, 2022).

The Castlemartin Corse watercourse and a small tributary immediately south of it are classified by Natural Resources Wales (NRW) as a Main River where flood risk is managed by NRW. A section of the Milford Haven Inner transitional waterbody is also designated as a Main River. This is the mouth of Pembroke River as it flows towards Pennar Mouth. All other watercourses in the Study Area are ordinary watercourses where the responsibility for flood risk management is by the Lead Local Flood Authority (i.e. Pembrokeshire County Council) (Natural Resources Wales, 2022).

There are no WFD classified Lake Waterbodies in the Study Area. However, there are small reservoirs at Green Hill (Green Hill Reservoir, NGR SM 92572 01470, approximately 9,400 m2 in area), immediately south of the Pembroke Power Station (NGR SM 92848 02088, approximately 3,000 m2 in area) and near Broomhill (NGR SM 89339 01488, approximately 3,600 m2 in area). There are numerous other artificial waterbodies associated with the oil refinery site to the north of the Study Area, Pembroke Power Station and Fort Popton. Aside from these there are small ponds across the Study Area, several of which are online to the small watercourses while others are associated with topographic depressions (DEFRA, 2022).

### *10.4.4. Water Resources*

There are no Drinking Water Protected Areas for rivers or lakes in the Study Area (Natural Resources Wales, 2022).

There are no Nitrate Vulnerable Zones in the Study Area (Natural Resources Wales, 2022).

There are no groundwater Source Protection Zones in the Study Area (Natural Resources Wales, 2022).

Details on consented discharges, licenced abstractions to surface and groundwater, and pollution incidents will be requested from NRW to support the full impact assessment stage. Details on registered Private Water Abstractions (PWS) will also be requested from the local authority. It should be noted that Project Erebus ES includes a PWS assessment, with much of the Study Area overlapping with the Project. This indicated presence of ten PWS in the vicinity of their Project, the majority of which would be located within the Study Area for this Project.

### *10.4.5. Designated Ecological Sites*

There are numerous designated ecological sites within the onshore Study Area, and these are listed in Table 10-1. This includes marine designations where they fall within the Study Area of the onshore works. The designated sites are shown on Figure 10-2.

*Table 10-1. Designated dites in the Study Area (source DEFRA, 2022)*

| Statutory Site Name | Potential Impact Route | Reference NGR | Reason(s) for Designation |
|---|---|---|---|
| Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru Special Area of Conservation (SAC) | Intersects potential options for cable route from West Angle Bay and Freshwater West, and so could be directly impacted. | SR 89086 98041 | Designated primarily for great horeshoe bat *Rhinolophus ferrumequinum* and early gentian *Gentianella anglica*, and vegetated sea cliff habitat and fixed coastal dunes with herbaceous vegetation |
| Pembrokeshire Marine / Sir Benfro Forol SAC | Hydrologically connected to the onshore works via numerous small coastal streams which discharge into the designated area (for all landfall options). | SM 92305 04138 | Designated primarily due to presence of grey seal *Halichoerus grypus* and shore dock *Rumex rupestris*.and for estuary, large shallow inlet and bays and reef habitat |

| Statutory Site Name | Potential Impact Route | Reference NGR | Reason(s) for Designation |
|---|---|---|---|
| Castlemartin Coast Special Protection Area (SPA) | Hydrologically connected to the onshore works via numerous small coastal streams which discharge into the designated area (West Angle Bay and Freshwater West Beach landfall options). | SR 89086 98041 | Notable for breeding birds (chough) |
| Milford Haven Waterway Site of Special Scientific Interest (SSSI) | Hydrologically connected to the onshore works via numerous small coastal streams which discharge into the designated area for the Angle Bay and West Angle Bay landfall options. | SM 88168 02769 (but SSSI is widespread along the coastline) | Designated as an exceptional example of a ria (a system of valleys drowned by post-glacial rise in sea level) that consists of a number of estuaries, embayments and inlets |
| Broomhill Burrows SSSI | Would intersect the onshore works for the Angle Bay and Freshwater West Beach landfall options, and so could be directly impacted. | SM 88859 00286 | Designated due to providing valuable exposures demonstrating some important structural characteristics of one of the major zones of the Variscan orogenic belt in Pembrokeshire. It is also One of Pembrokeshire's largest dune systems with the most extensive and most diverse dune slack vegetation |
| Castlemartin Corse SSSI | Hydrologically connected to the onshore works via small unnamed watercourses intersected by the Freshwater West Beach landfall option. | SR 89916 99806 | The site is designated as the best example of a calcareous fen in Pembrokeshire. The 20 hectare reed-bed is also the largest and most diverse in the county. Calcareous flushes support rare plants and there are numerous scarce fen plants in this SSSI. Rare species include the yellow-sedge *Carex elata*, the fen pondweed *Potamogeton coloratus*, the short-winged conehead cricket *Conocephalus dorsalis* and the ground-hopper *Tetrix subulata*. |

| Statutory Site Name | Potential Impact Route | Reference NGR | Reason(s) for Designation |
|---|---|---|---|
| Castlemartin Range SSSI | Would intersect the onshore works for the Freshwater West Beach landfall option and so could be directly impacted. | SR 88847 98365 | Designated for noted for geology and coastal, cliff, maritime grassland and heath habitats and species. |
| Gweunydd Somerton Meadows SSSI | No direct impacts anticipated. The SSSI is separated from the closest works (south of Pembroke Power Station) by a watercourse which is anticipated to provide a barrier to impact. | SM 93131 00131 | Designated for grassland fungi. |
| Angle Peninsula Coast / Arfordir Penrhyn Angle SSSI | Would intersect the onshore works for the West Angle Bay landfall option and so could be directly impacted. | SM 84177 02725 | Designated for its geology, its wide range of intertidal rock, sand, and gravel habitats and communities, particularly rockpools, caves, tide-swept and under-boulder communities, and for its population of roosting and feeding chough. |

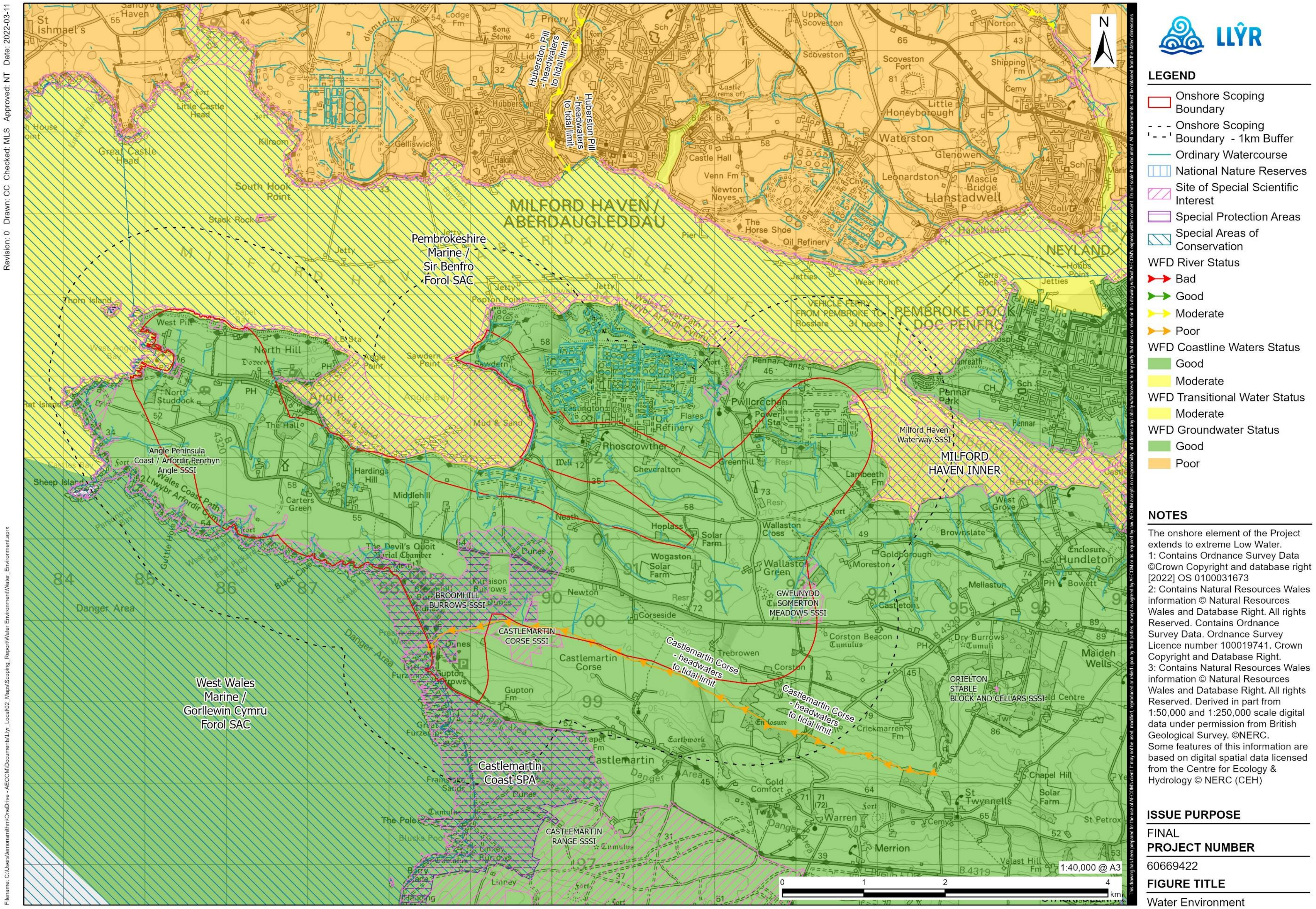


Figure 10-2. Designated sites – water environment

### *10.4.6. Flood Risk*

The Study Area is sparsely populated and is generally used for agriculture which is of medium importance. There are some further pockets of medium to very important receptors including the Pembroke Power Station which the impact to in terms of flood risk will be assessed in the FCA once the cable route has been decided. As outlined above there is one fluvial Main River in the Study Area; this is Castlemartin Corse (although we note that a section of the Milford Haven Estuary is also technically a Main River). There is an area of high to medium flood risk surrounding this river. NRW mapping (Natural Resources Wales, 2022) shows there is generally low risk of flooding from surface water and ordinary watercourses in the Study Area. There are some areas with risk of flooding from ordinary watercourses which the cable route may cross and also adjacent to Pembroke Power Station where the substation / control building will be located. The PFRR mapping does not show any historic surface water flooding areas in the Study Area. NRW mapping indicates that areas of tidal flood risk are generally confined to the coastline with an area of tidal flood risk confined to the Pembroke Power Station site and shows that the Study Area does not benefit from any flood defences.

NRW mapping (Natural Resources Wales, 2022) indicates that the Study Area is generally located within Development Advice Map (DAM) Zone A which is defined in TAN15 as having little or no fluvial/tidal flood risk. There are some areas located within DAM Zone B which is defined in TAN15 as areas known to have flooded historically, and DAM Zone C2 which is defined in TAN15 as areas without significant flood defence infrastructure. These areas are generally confined to the areas at risk of tidal flooding and fluvial flooding as described above.

### *10.4.7. Future Baseline*

#### **10.4.7.1. Construction (2025)**

The future baseline has been determined qualitatively by considering the likelihood of changes in the attributes that are considered when deciding the importance of water bodies in the Study Area.

Generally, there is an improving trend in water quality and the environmental health of waterways in the UK through the action of new legislative requirements and ever more stringent planning policy and regulation, although there are challenges such as adapting to a changing climate and pressures of population growth that could have a retarding impact (as has been exemplified by the debate around discharges of untreated sewerage from sewers and sewerage treatment works) as well as emerging issues associated with micro-plastics and unusual chemical compounds. However, importance criteria places greater emphasis on designations and holistic attributes of waterbodies that reflect general water quality changes over the longer term. Thus, overall in terms of water quality impacts, the future baseline assumes that all WFD water bodies achieve their planned target status by 2027. it is also likely that the health of the water environment will continue to improve post-2027as new interventions associated with the Environment Act 2021 etc. begin to take effect.

Where waterbodies are currently at their target overall status, there must be no deterioration from this, and there are also objectives for individual elements of the WFD classification that are to be achieved (e.g. biological quality elements, physico-chemical parameters). It is assumed that these objectives will be achieved.

The assessment of the importance of waterbodies within the EIA assessment takes into account a large range of attributes and does not focus solely on water quality. This assessment takes into account other attributes such as scale, nature conservation designations, fish habitat type, the presence of protected species, social and economic uses. For some of these attributes, it is unlikely that they will change in the future (e.g. waterbody size, whether a river is likely to support cyprinid or salmonid fish populations, the presence of a designated nature conservation site or bathing water).

#### 10.4.7.2. Operation (2026)

The same future baseline conditions expected during construction will apply to the operation phase (i.e. all WFD targets are met, improving water quality, no change in the presence and status of designated sites).

In terms of flood risk, this could change over the 25 year lifetime of the Llŷr Project as a result of changes in climate and land use. These factors will be taken into account as part of the assessment. Based on information available at this stage, no significant differences to the baseline are envisaged.

## 10.5. Embedded and Good Practice Measures

### *10.5.1. Construction Phase*

The greatest risk to waterbodies during construction would be during works close to, under, over or even within watercourses. However, through the iterative design process it is intended to design out as many risks as possible. This will include determining the most appropriate way to install cables beneath watercourses and ensuring a minimum depth of cable below the bed so that they will not be exposed by bed scour. NRA and the LLFA will be consulted on proposals as part of the EIA.

In addition to the above, during the construction phase, standard pollution prevention and construction best practices would be adopted to mitigate potential impacts upon the water environment where required and reasonably practicable. Such measures would be included in a Draft Construction Environmental Management Plan (CEMP).

The draft CEMP will be prepared and submitted as part of the planning application. The CEMP would be implemented by the Principal Contractor and would detail the types of risks pertinent to the construction works and the mitigation measures that would be required to avoid, minimise and reduce impacts of activities as far as practicable. Given the nature and scale of the Project, it is also recommended that in addition to the Draft CEMP a Water Management Plan (WMP) is also prepared. The WMP would include more detail on the measures to manage excess fine sediment in runoff, spillage risk and spills, emergency response, and flood risk management. Specific examples of the types of mitigation likely required will be detailed within the ES. The WMP will also set out the scope of any water quality monitoring to be undertaken during the works.

The CEMP and WMP will comprise good practice methods that are established and effective measures to which the development will be committed through the development consent. The measures include:

- Setting out details of any water quality monitoring to be undertaken during construction.
- Controlling and minimising the risk of pollution to surface waters and groundwater by managing construction site runoff and the risk of chemical spillages;
- During construction an Incident Response Plan would be implemented to deal with any issues as soon as they occur for a particular site and to ensure that works are undertaken with the utmost care where they have the potential to lead to contamination of any watercourse.
- Measures to control the storage, handling and disposal of potentially polluting substances during construction;
- The management of activities within floodplains including storing materials outside of the floodplain as far as reasonably practicable and production of a Flood Risk Management Plan with floodplain control measures and contingency actions;
- Management of water removed from excavations. Managing the risk from groundwater flooding through appropriate working practices (during excavations) and with adequate plans and equipment in place for de-watering to ensure safe dry working environments; and

- Appropriate methods and mitigation measures when undertaking works within, over, under and adjacent to waterbodies (including risk of 'frack-out' of drilling fluids for any non-intrusive cable installation beneath watercourses).

During the construction phase, discharges from the works to surface waterbodies or to ground containing potentially polluting substances may require an Environmental Permit from NRW. Works undertaken above, below or within 8m of a watercourse or flood defence or on the floodplain may also require a Flood Risk Activity Permit from NRW, unless a defined exemption applies. Furthermore, dewatering operations, watercourse diversions and realignments may require abstraction, transfer or impoundment licences from NRW, again unless an exemption applies. In additional any temporary or permanent works that may affect the flow in an Ordinary Watercourse may require a Land Drainage Consent from the LLFA (Pembrokeshire County Council) and the design compliant with any byelaws. Compliance with these regulatory processes provides additional confidence in the application of appropriate mitigation measures on site.

It is anticipated that monitoring of watercourses at risk of pollution during the construction phase will be required. This will need to include a period of baseline data collection in advance of the works which may involve a combination of in-situ measurements using a handheld probe and visual/olfactory observations, or possibly water quality sampling for laboratory testing. Further details will be provided in the Environmental Statement and draft CEMP/WMP.

During construction there will be a requirement to protect construction plant, materials, and construction workers from impacts due to flooding. Such measures may include, for example, locating construction compounds and material/ plant storage areas outside of areas susceptible to flooding if possible, and having in place emergency flood response procedures. The management and subsequent implementation of such measures will also seek to avoid any potential pollution of local watercourses by construction materials in the event of flooding.

The full suite of appropriate mitigation measures will be developed at the full impact assessment stage and set out in detail in the final ES.

#### *10.5.2. Operation Phase*

The design of above ground infrastructure (i.e. the Substation and Control Building) would include an appropriately designed surface water collection and treatment system, as well as design measures to ensure that the Project does not generate any adverse flood risks to adjacent areas (e.g. siting of the installation to avoid the worst areas of flood risk and potential floodplain compensation provisions). Option-specific mitigation measures have not been identified at this stage but will be detailed in the ES and following consultation with NRW and the LLFA. A preliminary Drainage Strategy Report will be produced for the Project and suitability considered as part of the operational phase impact assessment.

Sustainable drainage systems (SuDS) would provide a way to attenuate runoff from the Project to a rate agreed with NRW and / or the LLFA to avoid increasing flood risk. They will also be important in reducing the quantities and concentration of diffuse urban pollutants found in runoff (e.g. the roofs of new buildings and car park areas etc.). Their design and use would depend on factors, such as site-specific constraints. Ponds, wetlands, and swales are preferred sustainable solutions, as these options mimic natural drainage and can be used to deliver other environmental benefits. However, in some situations where space is constrained or there is a particularly high risk, sustainable measures may be proposed in a treatment train with proprietary measures such as vortex flow separators.

At this stage it is assumed that only minor field drains and ditches would be potentially crossed using an open cut method, with the principal watercourses crossed using a non-intrusive method with cables drilled / bored beneath the bed at a sufficient depth to avoid future exposure. If required, the sensitive design of watercourse crossing points is an essential part of minimising this impact and would be considered as the Project's design progresses. Consultation with NRW and the LLFA is proposed to agree the design of any required watercourse crossing methods.

Any increases in hardstanding within the surface water drainage catchment may increase surface water runoff and may impact on flood risk to and from the Project. An FCA and Drainage Strategy will be developed alongside the ES. Any heightened flood risk must be mitigated through design or compensatory storage.

#### *10.5.3. Decommissioning Phase*

Post consent, a Decommissioning Plan (DP) will be developed, outlining the programme for decommissioning, the activities involved and the arrangements for post decommissioning monitoring, maintenance, and management of the site, in line with the Department for Business, Energy and Industrial Strategy (BEIS) Guidance (Department for Business, Energy and Industrial Strategy, 2019). The DP will undergo consultation with stakeholders before being formally submitted to the Secretary of State for approval. The DP will be subject to internal review every 5 years and will be formally updated and consulted upon again 2 years prior to undertaking decommissioning activities.

### 10.6. Likely Significant Effects

The Project has the potential to generate adverse impacts on local and catchment wide hydrological processes, flood risk and water quality unless appropriate mitigation is included. This section sets out the likely significant effects of the Project. The scoping assessment has been undertaken using a Source-Pathway-Receptor model to identify which receptors could be impacted by a given action. For an impact on the water environment to exist the following is required:

An impact source (e.g. such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body, or the change to water volume or flow rate within a watercourse);
A receptor that is sensitive to that impact (i.e. waterbodies and the services they support); and
A pathway by which the two are linked.

Table 10-2 describes the sources and potential impact pathways that could lead to a likely significant effect during each stage of the Project.

*Table 10-2. Sources and impacts*

| Source | Impact | Likelihood of significant effect | Scoped in/out |
|---|---|---|---|
| **Construction** | | | |
| Construction activities: Cable installation and construction of the onshore substation and control building | Pollution of surface waterbodies due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off and any dewatering operations. | Likelihood dependent on construction methodology, extent of excavations, location, and nature of the hydrological features in the development area. | **Scoped In** |
| Construction activities: Cable installation and construction of the | Temporary impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, | Likelihood dependent on construction methodology, extent of excavations, location, and | **Scoped In** |

| Source | Impact | Likelihood of significant effect | Scoped in/out |
|---|---|---|---|
| onshore substation and control building | especially where watercourses need to be crossed by the cable or access tracks. | nature of the hydrological features in the development area. | |
| Construction activities (e.g. excavating trenches general site clearance, creation of site compounds, temporary storage facilities including for storage of soil, earth and other materials on the floodplain, which could alter surface water runoff) | Potential increase in flood risk as result of altering floodplain mechanisms if construction activities occur in areas of known flood risk. | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area. | **Scoped in** |
| Construction activities | Potential impacts on local water supplies. | During construction it is currently assumed that a temporary potable water supply will be provided for workers. Water for construction will similarly not be anticipated to use a mains supply. As there will not be a new formal supply required for construction, assessment of water supply during construction has not been considered further. | Scoped Out |
| **Operation (including maintenance and repair)** | | | |
| Operational discharges and the risk of chemical spillages from Substation and Control building | Potential impacts on water quality in waterbodies that may receive operational surface water runoff or be at risk of chemical spillages from above ground facilities. | Likelihood dependent on development of a suitable drainage strategy incorporating treatment for operational runoff and containment and appropriate disposal routes for chemical spillages | **Scoped In** |
| Watercourse crossings (e.g. for cable route) & outfalls | Hydromorphological impacts to waterbodies including changes to physical form which underpin habitats. | Likelihood dependent on crossing methodology and reinstatement proposals (e.g. non-intrusive), location of launch and receive pits for trenchless approaches, and | **Scoped In** |

| Source | Impact | Likelihood of significant effect | Scoped in/out |
|---|---|---|---|
| | | appropriate design of outfalls to watercourses. | |
| Foul water use from the Project | Impact on water quality of surface or groundwater receptors and / or increased demand on Wastewater Treatment Works | Given the nature of the development (i.e. low occupancy in any of the above ground infrastructure) foul water generation would be negligible and generally this would either connect under trade effluent consent to public sewer or otherwise would be managed by a specialist company. This will be scoped out currently, however will be kept under review. | Scoped out |
| Location of substation and control building | Potential flooding of the substation or control building if located in an area of known flood risk. | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area | **Scoped In** |
| Changes in surface water flood risk as a result of potential increased areas of impermeable land where the substation and control building are located | Increase in surface water runoff where there is a potential increase in impermeable land area. | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area | **Scoped In** |
| Installing landfall cables in areas of known tidal flood risk | People at risk when working in areas of known tidal flood risk when installing cables at landfall. | Not likely to result in significant effect as best practice methods will be used when installing cables | Scoped Out |
| Buried cable or footings of the substation and control building could increase groundwater flood risk | Potential increase in groundwater flood risk. | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area | **Scoped In** |

Table 10-3 identifies which receptors within the Study Area might be affected where there is a potential impact pathway as a result of the sources identified in Table 10-2. It also identifies during which stage of the project the potential effect could occur.

*Table 10-3. Impact pathways and receptors*

| Impact/pathway | Receptors | Likelihood of significant effect | Scoped in/out |
|---|---|---|---|
| Pollution of surface waterbodies due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off | All onshore watercourses or waterbodies interacting with / down gradient of construction works (including Castlemartin Corse WFD waterbody).<br><br>Downstream waterbodies (including transitional / coastal WFD waterbodies - Milford Haven Inner, Milford Haven Outer, Pembrokeshire Coastal).<br><br>Pembrokeshire Carboniferous Limestone WFD groundwater body.<br><br>All water dependent designated sites that are hydrologically connected to the works via watercourses. | Likelihood dependent on construction methodology (extent of excavations, location, etc). Receptors impacted will depend on the cable route that is taken forward. | **Scoped In** for construction and decommissioning only |
| Temporary impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, especially where watercourses need to be crossed by the onshore cable or access tracks | All onshore watercourses or waterbodies interacting with / down gradient of construction works (including Castlemartin Corse WFD waterbody).<br><br>Downstream waterbodies (including transitional / coastal WFD waterbodies - Milford Haven Inner, Milford Haven Outer, Pembrokeshire Coastal).<br><br>All water dependent designated sites that are hydrologically connected to the works via watercourses. | Likelihood dependent on construction methodology (extent of excavations, location, etc). Receptors impacted will depend on the cable route that is taken forward. | **Scoped In** for construction and decommissioning only |
| Construction activities could increase flood risk | People, property, and infrastructure | Likelihood dependent on construction methodology, location, and nature of the | **Scoped In** for construction and |

| Impact/pathway | Receptors | Likelihood of significant effect | Scoped in/out |
|---|---|---|---|
| | | hydrological features in the development area | decommissioning phases only |
| Potential impacts on water quality in waterbodies that may receive operational surface water runoff or be at risk of chemical spillages from above ground facilities. | Watercourses to which routine runoff / spillages from the Substation and Control Building are directed.<br><br>Downstream waterbodies (including transitional / coastal WFD waterbodies - Milford Haven Inner, Milford Haven Outer, Pembrokeshire Coastal).<br><br>Pembrokeshire Carboniferous Limestone WFD groundwater body if any discharges are made to ground.<br><br>All water dependent designated sites that are hydrologically connected to the works via watercourses. | Likelihood dependent on development of a suitable drainage strategy incorporating treatment for operational runoff and containment and appropriate disposal routes for chemical spillages | **Scoped In** for operation phase only |
| Hydromorphological impacts to waterbodies including changes to physical form which underpin habitats. | Any surface watercourse that is to be physically altered and disturbed by any of the Project options (e.g. for potential crossings and outfalls) | Likelihood dependent on crossing methodology (e.g. non-intrusive), location of launch and receive pits for trenchless approaches, and appropriate design of outfalls to watercourses. | **Scoped In** for operation phase only |
| Flooding of the substation and control building | People, substation, and control building | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area | **Scoped In** all Project phases |
| Surface water runoff from potential increased area of impermeable land causing an increase in flood risk | People, substation, control building, and third party land | Likelihood dependent on construction methodology, location, and nature of the hydrological features in the development area | **Scoped In** for all Project phases |
| Tidal flood risk at landfall locations | People and Project equipment | Not likely to result in significant effect as best practice methods will be used when installing cables | Scoped out for all Project phases |
| Buried cable or footings of the | People, property, and infrastructure | Likelihood dependent on construction methodology, | **Scoped In** for all Project phases |

| Impact/pathway | Receptors | Likelihood of significant effect | Scoped in/out |
| --- | --- | --- | --- |
| substation and control building could increase groundwater flood risk by impeding flow or providing a preferential flow path | | location, and nature of the hydrological features in the development area | |

## 10.7. Assessment Methodology

This section provides a description of the tools and techniques used to undertake the water environment impact assessment. It also outlines the significance criteria used in the assessment.

The assessment of impacts will be undertaken using a source-pathway-receptor model as described above.

### *10.7.1. Consultation*

Consultation with relevant parties will be required to discuss potential impacts, mitigation and possible enhancement opportunities that the Project may be able to support. Key stakeholders to be consulted include:

- NRW;
- Pembrokeshire County Council (as LLFA).

Key items that will be discussed and agreed through technical stakeholder engagement are:

- Provision of baseline data (hydrology, flood risk, water quality and water resources);
- Confirmation of Study Area (e.g. how far downstream to consider fresh surface water dependent nature conservation sites or the risk from chemical spillages);
- Scope of FCA and WFD assessments;
- Management and maintenance of any future drainage ditches or SuDS facilities installed for Above Ground Installations;
- Mitigation measures; and
- Confirmation of other schemes to be considered in the assessment of cumulative effects.

### *10.7.2. Planned Surveys*

Subject to the results of the desk based assessment, including any relevant data made available from the Erebus ES, there may be an additional requirement for proportionate field survey data collection. A combined water quality and hydromorphological walkover survey will be carried out of the cable route options taken forward in the EIA and the sites where above ground infrastructure would be located. The survey will ground truth waterbodies and make observations about current land use and topography. It is anticipated that many potential risk locations, such as surface water drainage extents shown by online mapping, can be screened out of detailed assessments by this reconnaissance. For example, many smaller channels may be intermittent or ephemeral and will not support aquatic habitats, thus will not need further WFD assessment.

The survey will cover all significant watercourses to be crossed by the onshore cable route, preferably at the location of each crossing (access permitting) and for a minimum 100 m upstream and downstream. All surveys will be subject to feasible safe working and land access. The survey will focus only on the main crossings and key risk areas, given the large number of crossings. However, where access to the crossing location is not possible or visibility is poor, the assessment will be based on proxy information from nearby locations and desk study. A pre-works survey will be recommended that can be used to inform detailed design prior to any works starting on site.

The survey will identify hydromorphological features, processes and potential risks, in order to advise the design team on preferred methods to cross each watercourse, which will also be discussed with relevant statutory consultees. For larger channels on the route it is likely that the onshore cable would be installed at a suitable depth beneath the bed by non-intrusive techniques (e.g. horizontal direction drilling). Some watercourses may have significant thickness of bed substrate and potential scour depths so drilling depths will need to be agreed with NRA and LLFA (as appropriate). For smaller channels, risks and habitat values may be lower, and it may be possible to cross the watercourse using an intrusive technique, providing the bank and beds are reinstated. The survey will also serve as an initial record of the watercourses condition should it be ultimately decided to cross using an intrusive technique. The results of the survey will be included in a Watercourse Crossing Report that would be a technical appendix to the impact assessment chapter.

At this stage, it is not envisaged that other surveys, water quality monitoring or field investigations are required (given the availability of background data and the nature of the Project). Nonetheless, walkover surveys may identify further requirements for other type of surveys (i.e. flow monitoring and water quality surveys), which if required will be agreed with the relevant statutory consultees.

### *10.7.3. Identification of Receptors, Magnitude of Impact and Significance of Effect*

#### 10.7.3.1. Water Resources Receptors

The potential receptors associated with the Project have been identified to include:

- Surface watercourses (including those that are WFD designated, Main Rivers, and Ordinary Watercourse (including drains);
- Standing waterbodies (i.e. reservoirs and ponds);
- Groundwater and where it springs at the surface;
- Water dependent designated and non-designated sites;
- Any licenced and unlicenced (PWS) Water abstractions (to be confirmed);
- Flood risk receptors.

The importance and / or where appropriate, the sensitivity of the receptors will be defined during the development of the ES using the criteria outlined in Table 10-4.

The potential impacts to groundwater resources, and pollution potentially caused by site drainage (construction or operation) will be considered within this chapter of the ES. However, this should be developed alongside Chapter 11 (Geology and Hydrogeology), which will include further hydrogeological impacts, including contamination of controlled waters.

#### 10.7.3.2. Significance Criteria

The classification and significance of effects has been determined using the principles of the guidance and the criteria set out in Design Manual for Roads and Bridges (DMRB) LA113 (National Highways, 2020) adapted to take account of hydromorphology. Although these assessment criteria were primarily developed for road infrastructure projects, they are suitable for any development project (particularly linear projects) and provide a robust and well tested method for assessing the likely significance of effects.

Approaches to mitigating potential significant effects during construction, operational and decommissioning phases have been described with reference to good practice guidance and design.

Following the DMRB LA 113 (National Highways, 2020) guidance, the importance of the receptor (Table 10-4) and the magnitude of impact (Table 10-5) are determined and then used to determine the overall classification of effects (Table 10-6). Where significant adverse effects are predicted, options for mitigation are considered and proposed where reasonably practicable. The residual effects of the Proposed Development with identified mitigation in place are then assessed.

Whilst other disciplines may consider 'receptor sensitivity', 'receptor importance' is considered here. This is because when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water body. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes, is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects. Irrespective of importance, all controlled waters in Wales are protected by law from being polluted.

*Table 10-4. Criteria for determining importance of receptor*

| Importance | General criteria | Surface Water | Hydromorphology[2] | Flood Risk |
|---|---|---|---|---|
| Very High | The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. | EC Designated Salmonid / Cyprinid fishery; Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m3/s; site protected / designated under EC or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site. Critical social or economic uses (e.g., public water supply and navigation). | Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type. | Essential Infrastructure or highly vulnerable development. |
| High | The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. | Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0m3/s; Major Cyprinid Fishery; Species protected under EC or UK habitat legislation. Critical social or economic uses (e.g., water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction. | Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures. | More vulnerable development. |
| Medium | The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance. | Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small / limited population of protected species. Limited social or economic uses. | Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category. | Less vulnerable development. |

| Importance | General criteria | Surface Water | Hydromorphology[2] | Flood Risk |
|---|---|---|---|---|
| Low | The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. | Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses. | Substantially modified by past land use, previous engineering works or flow / water level regulation. Watercourses likely to possess an artificial cross-section (e.g., trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category. | Water compatible development. |
| Negligible | The receptor is resistant to change and is of little environmental value | Not applicable. | Not applicable. | Not applicable. |

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor, and, in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2010, and future WFD targets also need to be considered.

Note 2: Based on the waterbody 'Reach Conservation Status' presently being adopted for a major infrastructure project (and developed originally by Atkins) and developed from Environment Agency conservation status guidance as LA113 (National Highways, 2020) does not provide any criteria for morphology.

*Table 10-5. Criteria for Determining Magnitude of Impact*

| Impact | Criteria | Description and Examples |
|---|---|---|
| Major Adverse | Results in a loss of attribute and/ or quality and integrity of the attribute | Loss or extensive change to a fishery.<br>Loss of regionally important public water supply.<br>Loss or extensive change to a designated Nature Conservation Site.<br>Reduction in water body WFD classification<br>Increase in peak flood level (>100mm)[1]<br>Major disruptions to navigation or risks posed to navigable craft |
| Moderate Adverse | Results in effect on integrity of attribute, or loss of part of attribute | Partial loss in productivity of a fishery.<br>Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.<br>Contribution to reduction in water body WFD classification.<br>Increase in peak flood level (>50mm).<br>Delays to navigation as a result of a reduction in navigable channel extent |
| Minor Adverse | Results in some measurable change in attribute's quality or vulnerability | Minor effects of water supplies.<br>Increase in peak flood level (>10mm).<br>Minor reductions to wetted width of the channel and at the edge of what is navigable |
| Negligible | Results in effect on attribute, but of insufficient magnitude to affect the use or integrity | No risk identified to surface water quality or hydromorphology or navigation<br>Negligible change in peak flood level (≤+/- 10mm). |
| Minor Beneficial | Results in some beneficial impact on attribute or a reduced risk of negative effect occurring | Contribution to minor improvement in water quality, but insufficient to raise WFD classification.<br>Creation of flood storage and decrease in peak flood level (>10mm).<br>Removal of an in channel structure at edge of or outwith of the navigable channel, which may lead to small improvements to travel times. |
| Moderate beneficial | Results in moderate improvement of attribute quality | Contribution to improvement in waterbody WFD classification.<br>Creation of flood storage and decrease in peak flood level (>50mm). |

[1] All references to peak flood level in this table are for a 1% annual probability event, including climate change.

| Impact | Criteria | Description and Examples |
|---|---|---|
| | | Removal of in channel structure increasing width of navigable channel leading to a reduction of travel times. |
| Major beneficial | Results in major improvement of attribute quality | Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse.<br>Improvement in water body WFD classification.<br>Creation of flood storage and decrease in peak flood level (>100mm).<br>Removal of an in channel structure leading to a significant reduction in collision risk to vessels. |

Once the magnitude of impact and the receptor importance have been defined, the classification and significance of the potential effect can be derived by combining both assessments in a simple matrix as shown in Table 10-6. Effects classed as moderate or greater are considered significant in EIA terms (i.e. shaded cells). Where there is a range of effects (e.g. large/ very large) professional judgement has been used to determine the residual effect.

*Table 10-6. Classification and Significance of Effect*

| Magnitude of Impact | Importance of Attribute | | | |
|---|---|---|---|---|
| | Very High | High | Medium | Low |
| Major | Very Large | Large / Very Large | Moderate / Large | Slight / Moderate |
| Moderate | Large / Very Large | Moderate / Large | Moderate | Slight |
| Minor | Moderate / Large | Slight / Moderate | Slight | Neutral / Slight |
| Negligible | Slight | Slight | Neutral / Slight | Neutral / Slight |
| No change | Neutral | Neutral | Neutral | Neutral |
| *Note: adapted from DMRB LA104 (National Highways, 2020)* | | | | |

### *10.7.4. Water Quality Assessment (Operation Phase)*

For the majority of the Project, once the cable has been installed and the ground reinstated there will be no significant new impermeable areas or change to the existing runoff regime. However, where new above ground infrastructure is required this will contain new impermeable surfaces that will generate additional runoff. This runoff may contain pollutants derived from impermeable surfaces (e.g. inert particulates, litter, hydrocarbons, metals, nutrients and de-icing salts). This mixture of pollutants is collectively known as 'urban diffuse pollutants,' and although each pollutant may itself not be present in harmful concentrations, the combined effects over the long term can cause chronic adverse impacts. Changes in impermeable surfaced area within the Onshore Scoping Boundary may lead to increases in the rate and quantities of these pollutants being runoff to receiving watercourses.

An assessment is therefore needed to determine the potential risk to the receiving waterbodies and to inform the development of suitable treatment measures. Thus, the appropriateness of the surface water drainage measures in terms of providing adequate treatment of diffuse pollutants will be assessed with reference to the Simple Index Assessment method described in the C753 SuDS Manual (CIRIA, 2016).

The Simple Index Approach follows three steps:

- Step 1 – Determine suitable pollution hazard indices for the land use(s);
- Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index (for three key types of pollutants - total suspended solids, heavy metals and hydrocarbons). Only 50% efficiency should be applied to second, third etc. treatment train components; and
- Step 3 – If the discharge is to a water body protected for drinking water, consider a more precautionary approach.

The outcome of the Simple Index Approach will inform the source-pathway-receptor model, and the significance of effects will be determined based on the criteria in Table 10-4 to Table 10-6Table 10-6.

#### *10.7.5. Hydromorphology*

Potential hydromorphological impacts will be qualitatively appraised based on a desk study, a site walkover and a review of the proposed development that may affect the physical form of waterbodies.

Consideration has been given to how the Project is likely to impact upon the WFD objectives for the relevant watercourses within the WFD assessment. Effects are described according to the method for determining effect significance as outlined in this chapter already.

#### *10.7.6. WFD Assessment*

The overarching aim of the WFD is to protect and enhance waterbodies at a catchment scale.

There is no fixed method for WFD assessment: the nature of the water environment and the breadth of the legislation mean that assessments are tailored on a case-by-case basis. However, a stepwise approach consisting of Screening, Scoping, and Impact Assessment is generally followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD.

Screening identifies the project’s zone of influence, and if the activities associated with the Project represent a threat to the water environment, or if they do not require further consideration for WFD objectives. Scoping follows on from this by identifying the impacts of these activities on specific WFD receptors and their water quality elements. This involves the identification of WFD impact pathways, and the WFD waterbodies that may be affected, as well as the specific WFD quality elements within these waterbodies with the potentially to be adversely impacted. The Impact Assessment, which involves a rationalised assessment of elements identified within the scoping stage to identify any areas of WFD non-compliance, can then be conducted.

An extended WFD screening and scoping assessment will be prepared at the ES stage to include some qualitative appraisal based on the site walkover and existing data. As outlined above, small watercourses not WFD designated in their own right that drain into coastal waterbodies are not considered. This is because the coastal WFD waterbodies are substantially different in scale and character to the small onshore streams and so do not enable direct comparison against WFD classifications and objectives.

### *10.7.7. Flood Consequences Assessment*

A detailed FCA for the onshore components of the Project will be produced to outline any flood risk posed to the Study Area, the impact on flood risk elsewhere as a result of the Project, and the proposed measures to mitigate any identified flood risk. To inform the FCA, it is proposed to undertake consultation with Pembrokeshire County Council as LLFA and NRW. A drainage strategy will be produced for the Project and summarised within the FCA to manage the surface water runoff during all project phases. The requirement for hydraulic modelling is unlikely, however this will be reviewed following the evaluation of further information as the Project develops.

## 10.8. Conclusion

This chapter has identified baseline conditions and the potential effects of the Project on the water environment and flood risk including:

- The cable route options may cross three WFD designated waterbodies – the 'Milford Haven Outer' WFD coastal waterbody, the 'Pembrokeshire South' WFD coastal waterbody, and the 'Castlemartin Corse – headwaters to Tidal Limit' waterbody (also Main River) depending on the final cable route option. Numerous other ordinary watercourses could also be crossed depending on the option chosen, and some of these are in hydrological connectivity with the transitional Milford Haven Inner waterbody and the coastal WFD waterbodies (Milford Haven Outer and Pembrokeshire Coastal waterbodies).
- The Study Area overlies the Pembrokeshire Carboniferous Limestone WFD groundwater body, which could be impacted should any pollution drain to ground untreated, or if drainage of the Substation or Control Building was to ground.
- Nine designated sites including SACs, SSSIs and an SPA have been identified in the Study Area, including onshore and offshore sites. The offshore designated sites have the potential to be impacted through hydrological connectivity to the onshore works.
- Tidal and fluvial flood risk is generally low in the Study Area (DAM Zone A). There are some areas located within DAM Zone B (known to have flooded historically), and DAM Zone C2 which is defined as areas without significant flood defence infrastructure. NRW mapping indicates that areas of tidal flood risk are generally confined to the coastline but with an additional area of tidal flood risk at the Pembroke Power Station site. There is also an area of medium fluvial flood risk around the Castlemartin Corse watercourse; and
- There is generally low surface water flood risk associated with ordinary watercourses in the Study Area. However, there are some areas at higher risk of flooding that might be crossed by the cable route (depending on the chosen option) and also adjacent to Pembroke Power Station where the substation / control building will be located.

Further assessment of baseline conditions, including water resources, will be undertaken as part of the ES through more detailed desk study, site walkovers, and consultation as the Project's design progresses. A full database of the watercourses and standing waterbodies will be developed during the ES stage, based on OS data, aerial imagery and site visits. Impacts to groundwater are largely considered in Chapter 11 (Geology and Hydrogeology), except where the impact relates to groundwater resources and operational Project drainage.

The principal potential effects identified at this stage that could occur during the construction phase are those associated with:

- Deposition or spillage of soils, sediment, oils, fuels, or hydrostatic testing fluid, resulting in pollution of surface water features, local water supplies, hydromorphology, or flood risk;
- Temporary watercourse crossings that could impact on hydromorphology and flood risk; and

- Temporary changes in surface water runoff due resulting in changes to flood risk.

During the construction phase, standard pollution prevention and construction best practices would be adopted to mitigate potential impacts upon the water environment, which would be included in a CEMP. In addition, a WMP will also prepared, which would include more detail on the measures to manage water quality and flood risk. Specific examples of the types of mitigation likely to be required will be detailed within the ES. The WMP will also set out the scope of any water quality monitoring to be undertaken during the works.

During operation, there are unlikely to be any effects on water quality or hydromorphology, assuming that the principal watercourse crossings will be non-intrusive and drilled / bored beneath the bed at a sufficient depth to avoid exposure. The key potential effects at the operational phase are associated with above ground infrastructure (including the Substation and Control Building). Above ground infrastructure could provide a source of surface water pollution, alter surface water flow paths and increase flood risk.

Above ground infrastructure would be designed to include an appropriately designed surface water collection and treatment system, and would take account of SuDS, and be documented in the Drainage Strategy. Infrastructure would include design measures to ensure that the Project does not generate any adverse flood risks to adjacent areas (e.g. appropriate design of watercourse crossings and potential floodplain compensation provisions if applicable). Any heightened flood risk must be mitigated through design or compensatory storage.

A separate WFD Assessment will be carried out in order to ensure compliance by further assessing the impacts of the Project on geomorphology, water quality and ecological elements during the EIA stage of the project.

A separate FCA will be undertaken to establish the level of flood risk from all sources of flooding in the baseline and which remain after mitigation.

The following topics are scoped out of the assessment:

- Foul drainage – at this scoping stage it is not considered to be a significant issue (i.e. low occupancy in the operational site), and generally this would either connect under trade effluent consent to public sewer or otherwise would be managed by a specialist company. This will be scoped out currently, however will be kept under review.
- Potable water supplies – not considered to be a significant issue, as the site will require few staff during operation.
- Water Quality monitoring – No water quality sampling is proposed to inform the assessment as we will use existing NRW routine monitoring data for classifying watercourse importance.

Issues to be scoped into the assessment are summarised in Table 10-7.

*Table 10-7. Issues scoped into EIA assessment*

| Receptor | Potential significant effect | Project phase(s) | Scoping |
|---|---|---|---|
| Watercourses (including fluvial, transitional and coastal | Pollution due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off; | All | Scoped In |

| Receptor | Potential significant effect | Project phase(s) | Scoping |
|---|---|---|---|
| WFD waterbodies) | Temporary impacts on sediment dynamics and hydromorphology, especially where watercourses need to be crossed by the onshore cable or access tracks;<br>Potential impacts on water quality from operational surface water runoff or chemical spillages from above ground facilities;<br>Hydromorphological impacts including changes to physical form which underpin habitats. | | |
| Groundwater | Pollution due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off;<br>Potential impacts on water quality from operational surface water runoff or chemical spillages from above ground facilities. | All | Scoped In |
| Water dependent designated sites that are hydrologically connected to the works via watercourses | Pollution of water entering designated site from construction, operational or decommissioning pollutants could impact ecological quality and conservation objectives. | All | Scoped In |
| Flood Risk: People, property, and infrastructure | Construction activities could increase flood risk | Construction<br>Decommissioning | Scoped In |
| Flood Risk: People, substation, and control building | Flood risk to people, substation, and control building if the substation and control building are located in an area of known flood risk | All | Scoped In |
| Flood Risk: People, substation, control building and third party land | Increase in surface water runoff/flood risk due to potential increase in impermeable land area | All | Scoped In |

| Receptor | Potential significant effect | Project phase(s) | Scoping |
|---|---|---|---|
| Flood Risk: People, property, and infrastructure | Buried cable or footings of the substation and control building could increase groundwater flood risk | All | Scoped In |

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# 11. GEOLOGY AND HYDROGEOLOGY

## 11.1. Introduction

This chapter details the scope of the assessment for geology and hydrogeology, which focusses on, but is not limited to, on-shore geology, geological designated sites, soils, mineral resources, hydrogeology and land contamination of the proposed Project. The geology and hydrogeology assessment will consider the potentially significant effects on receptors sensitive to land contamination, that may arise from the construction / decommissioning and operation (including maintenance and repair) of the proposed Project.

This chapter of the Scoping Report describes the methodology to be used within the assessment, the datasets to be used to inform the assessment, an overview of the baseline conditions, the likely significant effects to be considered within the assessment, and how these likely significant effects will be assessed for the purpose of an EIA.

Groundwater, surface water and ecological receptors are discussed within this chapter as they will be assessed as potential receptors to any land contamination or pollution related impacts from construction / decommissioning of the proposed Project. However, groundwater and surface water as strategic resources and/or discharge points and flooding are considered in Chapter 10 Water Environment and ecological receptors considered in more detailed in Chapter 8 Ecology and Biodiversity.

## 11.2. Regulatory and Planning Policy Context

The assessment will be undertaken in accordance with European Union (EU) Directives, national Acts, regulations, policy and guidance and local policy, legislation and guidance. Those which are considered relevant to this chapter are as follows:

### *11.2.1. Retained European Directives*

- Environmental Liability Directive (2004/35/EC) (European Union, 2004)
- Water Framework Directive (2000/60/EC) (European Union, 2000);
- The Groundwater Directive (2006/118/EC) (European Union, 2006); and
- The Environmental Quality Standards (EQS) Directive (2008/105/EC) (European Union, 2008).

### *11.2.2. National Legislation*

- Environment Act 2021 (HM Government, 2021);
- The Environmental Protection Act 1990 and Part 2A (the Contaminated Land Regime) (HM Government, 1990);
- The Water Act 2003 (HM Government, 2003);
- The Water Resources Act 1991 (HM Government, 1991);
- The Building Act 1984 and the Building (Amendment) Regulations 2016 (HM Government, 2016);
- The Environment Act 1995 (HM Government, 1995);
- The Town and Country Planning Act 1990 (HM Government, 1990);
- Environmental Permitting (England and Wales) Regulations 2016 (HM Government, 2016);
- Hazardous Waste (England and Wales) (Amendment) Regulations 2016 (HM Government, 2016);
- Contaminated Land (Wales) (Amendment) Regulations 2006 (HM Government, 2006);
- Contaminated Land Statutory Guidance for Wales 2012 (Welsh Government, 2012);

- Environmental Damage (Prevention and Remediation) Regulations 2009 (HM Government, 2009);
- Anti-Pollution Works Regulations 1999 (HM Government, 1999); and
- Planning Policy Wales (PPW) Edition 11 (2021) (Planning Policy Wales (PPW) Edition 11 (2021), 2021).

#### *11.2.3. Local Planning Policy*

- Pembrokeshire Coast National Park Local Development Plan 2, September 2020 (Pembrokeshire Coast National Park, 2020), including the Local Development Plan Proposals Map (Pembrokeshire Coast National Park Authority, 2020); and
- Pembrokeshire County Council Local Development Plan, adopted February 2013 (Pembrokeshire County Council, 2013), including the Proposal Maps PM26 and PM30 (Pembrokeshire County Council, 2013).

#### *11.2.4. Guidance / Best Practice*

- Environment Agency's online guidance for the management of land contamination 'Land contamination: risk management' (LCRM) (gov.uk);
- Welsh Land Contamination Working Group: The Development of Land Affected by Contamination: A Guide for Developers (Welsh Local Government Association and Environment Agency);
- BS 10175 (2011 +A2 2017), Investigation of Potentially Contaminated Sites - Code of Practice (British Standard Institute (BSI), 2017);
- BS 8576 (2013), Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs) (BSI, 2013);
- BS 8485 (2019), Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI, 2019);
- CIRIA C665, Assessing risks posed by hazardous ground gases to buildings, 2007 (CIRIA, 2007);
- CIRIA C692 3rd Edition 'Environmental Good Practice On Site' 2010 (CIRIA, 2010);
- Environment Agency 'Guidance Note on Piling/Penetrative Ground Improvement Methods on Land Affected by Contamination' NC/99/73, 2001 (Environment Agency, 2001);
- Construction Design Management (CDM) Regulations 2015 (Health and Safety Executive (HSE), 2015);
- Design Manual for Roads and Bridges (DMRB), LA109 Geology and Soils (2019) (Highways England and Welsh Government, 2019);
- DMRB, LA104 Environmental assessment and monitoring (2020) (Highways England and Welsh Government, 2020);
- DMRB, LA110 Material assets and waste (2019) (Highways England and Welsh Government, 2019);
- DMRB, LA113 Road drainage and the water environment (2020) (Highways England and Welsh Government, 2020); and
- National House Building Council (NHBC), Environment Agency report R&D66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (National House Building Council (NHBC), 2008).

### 11.3. Study Area

The landfall options for the baseline study consideration are described in Volume 1, Section 4.3.1.

As the landfall location has yet to be determined, for the purposes of this chapter, the Onshore Scoping Boundary is outlined with a green dashed line in Figure 11-1 below, and encompasses all potential landfall locations, along with the potential cable route, indicated in solid green colour.

For the purposes of determining the local baseline conditions with respect to geology and land contamination, a Study Area extending 250 m from the Onshore Scoping Boundary will be adopted. This will be extended for hydrogeology to 1 km from the boundaries.

This Study Area is appropriate to assess the local geological and hydrogeological setting, and any influence that potential land contamination may have on the proposed Project or local sensitive receptors.

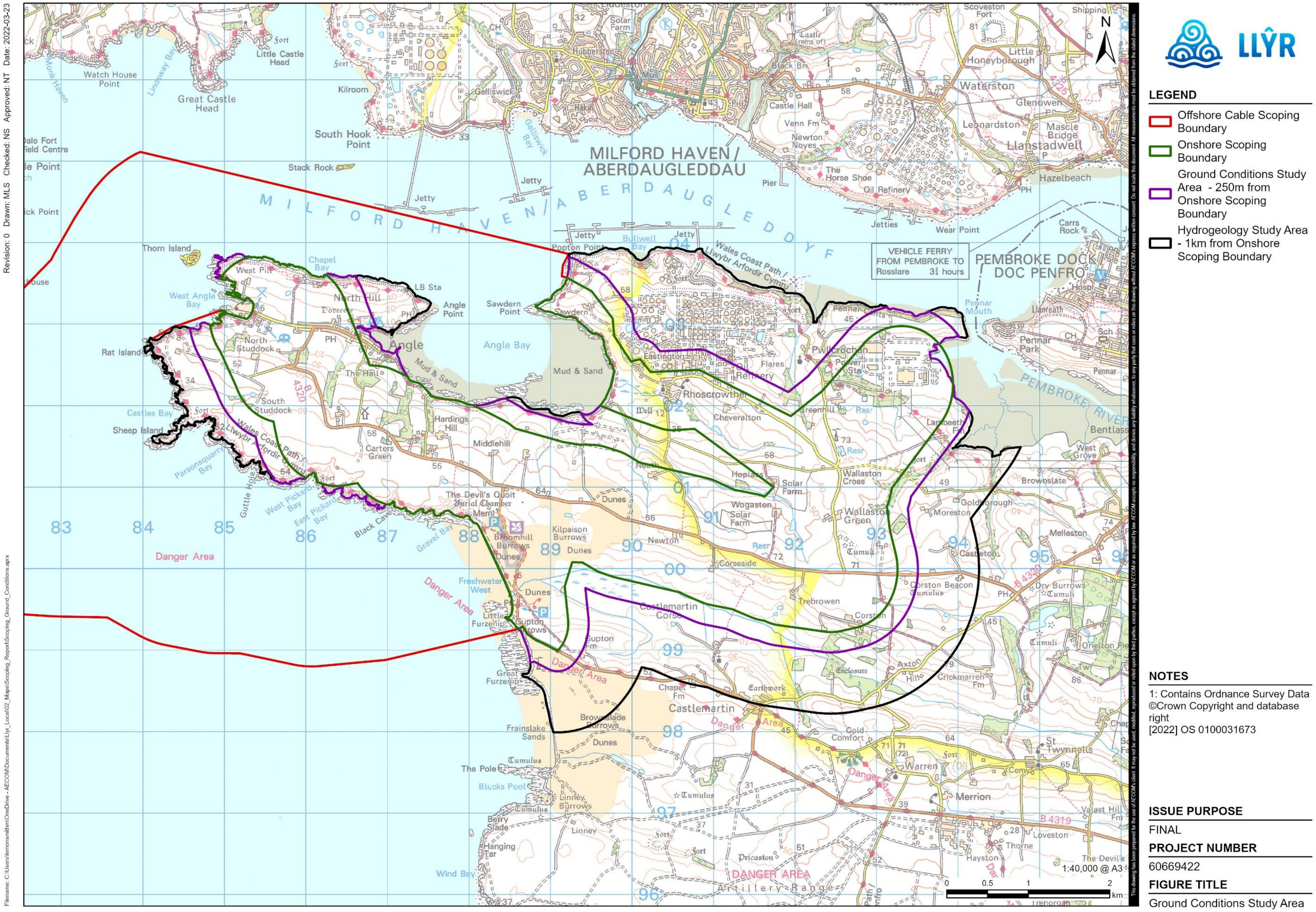


*Figure 11-1. Geology and hydrogeology Study Area*

## 11.4. Baseline

### *11.4.1. Geology*

The British Geological Survey (BGS) Wales Map Sheets 244 & 245 (Pembroke and Linney Head, 1:50,000) (British Geological Survey (BGS), 1983), 226 & 227 (Milford, 1:50,000) (British Geological Survey (BGS), 1978), and 228 (Haverfordwest, 1:50,000) (British Geological Survey (BGS), 1976) along with online freely available geological mapping tools provided by the BGS (British Geological Survey (BGS), 2022) indicates a complex geological structure underlying the area within the Study Area.

#### 11.4.1.1. Made Ground

BGS mapping does not indicate the presence of Made Ground/artificial ground within the Study Area. However, it is likely to exist in areas around more developed areas like the Pembroke Power Station and Refinery.

#### 11.4.1.2. Superficial Deposits

The extent of mapped superficial deposits within the Study Area is mostly concentrated at the following locations: areas east of Freshwater West beach and Frainslake Sands, which extend inland; around Angle Bay; and in proximity of the Refinery and the Pembroke Power Station, along the northern coastline. A more detailed description of superficial deposits in the area is as described in Table 11-1.

*Table 11-1. Superficial deposits*

| Name | Location | Described by the BGS as… |
|---|---|---|
| Marine beach deposits - sand | Mostly located along beaches including Angle Bay, Freshwater West beach, Frainslake Sands. | Shingle, sand, silt and clay |
| Blown sand | Located east of Freshwater West beach and Frainslake Sands | Sand that has been transported by wind, or sand consisting predominantly of wind-borne particles |
| Raised beach deposits – sand and gravel | Located in proximity of Angle Bay and north of Pembroke Power Station | Isostatically uplifted beach deposits which crop out in part above high water mark. Shingle, sand, silt and clay … |
| Alluvium | Present in areas north of Castlemartin, south-east of Angle Bay, adjacent to the Pembroke Refinery and underlying the Pembroke Power Station | Clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water … |
| Tidal flat deposits – sand, silt and clay | Along the coastline east of the Pembroke Power Station and north-east of the Pembroke Refinery | Mud flat and sand flat deposits, deposited on extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide |
| Glaciofluvial deposits – sand and gravel | Small area in proximity of West Angle Bay | Sand and gravel |

<u>Bedrock</u>

The mapped bedrock underneath the Study Area and surrounding areas consists of a complex sequence of strata, summarised below.

Interbedded argillaceous rocks and sandstone of the Milford Haven Group outcrop along the north-eastern, central, south-western and south-eastern areas of the Study Area. In the northern part of the Study Area, there is a band comprising outcrops of the Ridgeway Conglomerate Formation, Skrinkle Sandstone Formation, Avon Group (limestone and mudstone), and Black Rock Subgroup and Gully Oolite Formation (limestone). In the southern part of the Study Area, there is a band comprising outcrops of Ludlow Rocks (sandstone) and Aber Mawr Shale Formation (mudstone).

A number of faults trending generally north-south are located across the Study Area.

#### 11.4.1.3. Historical Borehole Records

A brief review of selected historical boreholes has been undertaken to give a broad overview of the geology in areas across the Study Area. Very limited records are available within the Study Area, however there are several records situated within the footprint of the Pembroke Refinery and one record in the north-west of the Study Area.

A borehole (BGS reference SM80SE17) located approximately 400m south of the village of Angle (in the north-west) indicates potential superficial deposits (stones and red clay), (referred to as ‘drift’ on the borehole record) of approximately 1.5m thickness. This strata overlies approximately 9.75m thickness of yellow and red hard stone (identified as possible Skrinkle Sandstone Formation) and lower limestone shales and main limestone to the maximum investigated depth of 50.6m below ground level (bgl); potentially the Ridgeway Conglomerate Formation overlying the Milford Haven Group, although the boundaries between the strata aren’t obvious from the log descriptions.

Selected boreholes located within the footprint of Pembroke Refinery and in its proximity indicate the occasional presence of up to 2.0m of superficial deposits (described as clay), underlain by a highly variable bedrock formation, comprising highly fragmented laminated shale, grey conglomerate, siltstone, marl and sandstone, up to the maximum investigated depth of 15m bgl. This is interpreted as either the Skrinkle Sandstone or Avon Ground (limestone and mudstone). Made Ground was encountered in at least two boreholes located within the Power Station footprint, with a thickness of up to 1.25m.

### *11.4.2. Geological Designated Sites*

DEFRA’s (Department for Environment, Food & Rural Affairs) MAGIC Map application (Department for Environment, Food & Rural Affairs, n.d.) and NRW (National Resources Wales, n.d.) were reviewed to identify Special Scientific Interest Sites (SSSI) safeguarded for their geological features located within the Study Area. These include:

- Milford Haven Waterway: comprising Angle Bay and the entire northern coastline up to Thorn Island;
- Arfordir Penrhyn Angle/Angle Peninsula Coast: comprising the western coastline from Thorn Island to Gravel Bay and the western-most spur of the peninsula; and
- Broomhill Burrows: comprising the coastline in proximity of Freshwater West beach and extending inland.

The Geo-portal for Wales (NRW, 2022) indicates that the following Regionally Important Geological and Geomorphological Sites (RIGS) are located within the Study Area:

- West Angle Bay (category: educational/scientific, stratigraphy/structure);

- Angle Bay (category: scientific, stratigraphy);
- Sawdern Point (category: scientific, stratigraphy); and
- East Pickard Bay (category: scientific, stratigraphy/igneous).

The following Geological Conservation Review (GCR)[2] sites are located within the Study Area:

- West Angle Bay and West Angle Bay (North); and
- Freshwater West, Freshwater West (South) and Freshwater West (North).

### *11.4.3. Soils*

Details listed on the Cranfield Soil and Agrifood Institute's Soilscapes website (Cranfield Soil and Agrifood Institute, n.d.) indicates that there are varying soil types across the Study Area.

It is indicated that the majority of the north-western, northern and eastern areas of the Study Area have *"freely draining slightly acid loamy soils"*, with a strip of land between West Angle Beach and Angle Bay, an area to the south of the Pembroke Refinery and around the Pembroke Power Station having *"freely draining slightly acid but base-rich soils"*.

*"Sand dune soils"* are located across the Study Area that extends between Angle Bay and Freshwater West beach. *"Loamy and clayey floodplain soils with naturally high groundwater"* and *"slowly permeable seasonally wet acid loamy and clayey soils"* are mapped east of the sand dune soils (in the south of the Study Area).

See Chapter 14: Agriculture and Soils for more information regarding Agricultural Land Classification and agricultural soils.

### *11.4.4. Mineral resources*

The Study Area falls under both the Pembrokeshire Coast National Park and Pembrokeshire County Council with regards to Local Development.

The Pembrokeshire Coast National Park Local Development Plan (Pembrokeshire Coast National Park, 2020) was adopted in 2020 with an end date of 2031. The western portion of the Study Area, including the western coast, Angle Bay and the villages of Angle and Castlemartin are included in the plan. The plan defines several Mineral Safeguarding Zones (MSZ) located within the Study Area for;

- Sand and Gravel; extending between Angle Bay, Freshwater West beach and Castlemartin, and in proximity of West Angle Bay; and
- Hard Rock; across the majority of the north-western area of the Study Area, and in two areas to the east of Freshwater West beach.

The remainder area of the Study Area is in the Pembrokeshire County Council Local Development Plan (Pembrokeshire County Council, 2013), adopted in 2013 and valid until 2021. The Local Development Plan is currently under review. It is anticipated that the Replacement Local Development Plan will be adopted in 2022 and will run until 2033. The currently adopted Local Development Plan defines MSZ located within the Study Area for;

- Sand and Gravel in proximity of the Pembroke Refinery and Power Station and north of Castlemartin; and
- Hard Rock in proximity of the Pembroke Refinery and Power Station.

[2] GCR sites: the sites selected provide the basis of statutory geological and geomorphological site conservation in Britain. Pembrokeshire has a rich geological diversity that needs protection from development that would damage it, including several GCR sites [19] [21].

The Coal Authority Interactive Map (The Coal Authority) indicates Pembrokeshire is not within an area affected by coal mining.

### *11.4.5. Hydrogeology*

#### **11.4.5.1. Historical Borehole Records – Groundwater Levels**

A brief review of selected historical boreholes has been undertaken to provide an indication of expected groundwater levels in the area. However, it should be noted that there are very limited records, except for historical boreholes within the footprint, and in proximity of, the Pembroke Refinery (north of the Study Area) and a borehole (BGS reference SM80SE17) located in the north-west of the Study Area.

It is suggested that groundwater within and around Pembroke Refinery is discontinuous, with some of the reviewed boreholes recorded as dry. When encountered, water strikes were recorded around 14.0-15.0m below ground level (bgl) and 25.0-30.0m bgl, with resting levels at 0.6-2.20 m bgl which suggests the presence of a confined aquifer.

Borehole reference SM80SE17 recorded a water strike at 13.7m bgl and 24.7m bgl and had a rest level at 0.6m bgl, again suggesting the presence of a confined aquifer.

#### **11.4.5.2. Aquifer Designations**

The Natural Resources Wales (NRW) Interactive Map Viewer (BETA) (Natural Resources Wales, n.d.) has been reviewed to determine designated aquifers beneath the Study Area.

In terms of superficial aquifers, the Environment Agency (EA)/NRW classifies the underlying superficial deposits, where present, as Secondary A aquifers except for the tidal flat deposits, which are classified as a Secondary (undifferentiated) aquifer.

Secondary A aquifers are defined as "*permeable layers that can support local water supplies, and may form an important source of base flow to rivers*". Secondary (undifferentiated) aquifers are those "*where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value*" (Environment Agency, n.d.).

In terms of bedrock aquifer, the vast majority of the Study Area is underlain by Secondary A aquifers. The Ludlow Rocks (sandstone) and the Aber Mawr Shale Formation (mudstone), which extend inland from Freshwater Bay Beach are mapped as Secondary (undifferentiated) aquifers.

The Black Rock Subgroup and Gully Oolite Formation (limestone) are classified as a Principal aquifer, which is defined as "*rocks that provide significant quantities of water for people and may also sustain rivers, lakes and wetlands.*" (Environment Agency, 2013). It is noted that this Principal aquifer has a limited extent, and is shown as narrow bands between West Angle Bay and Angle Bay and from the Pembroke Power Station to the east of the Study Area.

There are no groundwater Source Protection Zones (SPZ) within the extended Study Area of 1 km from the Project boundaries for hydrogeology.

### *11.4.6. Land Contamination*

#### **11.4.6.1. Historical Land Use**

The historical use of the site and surrounding area has been determined using freely available historical maps and internet research, and an assessment has been carried out in order to understand whether historical land use has the potential to have caused a legacy of contamination which may pose a risk to the proposed Project or surrounding sensitive receptors during construction/decommissioning and operation.

According to the earliest available mapping (c. 1888) held by Historic Wales (Historic Wales, n.d.) the area mostly comprised agricultural and undeveloped land with sporadic settlements, including the villages of Angle, Rhoscrowther, and Pwllcrochan. Brick works with associated kiln and a burial ground can be observed on the coast at West Angle Bay, in the north-westernmost area of the Study Area.

The area north-east of the proposed Project, which comprises Pembroke Power Station, was characterised by low-lying areas of land covered by the sea during high tide. This suggests that the land at, and around, the Pembroke Power Station is likely to have been modified/raised and that Made Ground is to be expected.

Online resources indicate that a RAF airfield, known as RAF Angle, was located within the Study Area, approximately 850 m south of Angle village (Airfields of Britain Conservation Trusts, n.d.).

Publicly available aerial photographs from Google Earth Pro (Google Earth Pro, n.d.) show that the oil-fired Pembroke Power Station and the Pembroke Refinery had already been constructed by 1985; online research suggests they were both constructed in the 1960s (Valero, n.d.; RWE).

In the same aerial photograph, some above-ground structures, possibly tanks, are visible approximately 1 km south-west of Pembroke Refinery and in close proximity to the Study Area. The structures are not visible in the subsequent photograph, dated 2006.

In the 2006 aerial photograph, the Power Station appears to have been decommissioned. Online research suggests the oil-fired Power Station was decommissioned in 2000, and then redeveloped as a gas-fired power station in 2012 (BBC, n.d.), also visible in the photograph from the same year.

#### 11.4.6.2. Current Land Use

The Study Area predominantly comprises agricultural and undeveloped land. Angle village is located in the north-western portion of the Study Area; other minor settlements are located mostly along the B4320, which crosses the Study Area in a west-east direction. No significant industrial areas are located within the Study Area or in the immediate surroundings, except for Pembroke Power Station, partially within the Study Area, and Pembroke Refinery, adjacent to the Study Area northern boundary.

#### 11.4.6.3. Landfills

According to the Lle online viewer (Natural Resources Wales, 2022), there is a historical landfill site (*Cheveralton Farm*) located within the Study Area, south-east of the Refinery. This was licenced to receive inert, industrial, commercial and household waste between December 1992 and October 1995.

### *11.4.7. Outline Conceptual Site Model*

#### 11.4.7.1. Potential Sources of Contamination

The following sources of contamination have been identified in the Study Area:

- Agricultural land, across the whole Study Area;
- Historical landfill;
- Historic military land (RAF Angle, including an airfield); and
- Industrial land (Pembroke Refinery, Pembroke Power Station).

#### 11.4.7.2. Potential Sensitive Receptors

In terms of sensitive receptors surrounding the proposed Project, these can be divided into controlled waters, human health, development infrastructure and ecological/geological designated sites.

- Controlled waters receptors including:
  - Surface water features (including: rivers, including Castlemartin Corse, unnamed streams and ponds), Milford Haven and the Celtic Sea;
  - The underlying groundwater aquifers including the Secondary A and Secondary (undifferentiated) superficial deposits aquifers and the Secondary A, Secondary (undifferentiated) and Principal bedrock aquifers.
- Human health receptors including:
  - nearby residents and commercial workers;
  - future site staff and maintenance workers; and
  - construction/maintenance workers undertaking the site works.
- Future and current development infrastructure, including foundations, onshore cables and services.
- Ecological sites ( (National Resources Wales, n.d.) (Natural Resources Wales, n.d.) (Department for Environment, Food & Rural Affairs, n.d.)) including:
  - Milford Haven Waterway, Arfordir Penrhyn Angle/Angle Peninsula Coast, Broomhill Burrows, Castlemartin Corse, Gweunydd Somerton Meadows (geological and ecological SSSI);
  - Pembrokeshire Marine/Sir Benfro Forol and West Wales Marine/Gorllewin Cymru Forol (SAC);
  - Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cymru and Castlemartin Coast Special Protection Areas (SPA);
  - Pembrokeshire Coast National Park.

#### 11.4.7.3. Potential Pathways

The following potential pathways are considered to be present in the Study Area:

- Direct contact, dermal absorption or ingestion of contaminated soil;
- Inhalation of soil particulates derived from soils and inhalation of soil vapour derived from soils/groundwater;
- Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/explosion);
- Leaching of chemicals and vertical migration via permeable unsaturated strata to the shallow aquifer and vertical migration of impacted shallow groundwater to the deeper aquifer;
- Spillage/loss/run off from surface water to receiving water;
- Lateral migration of impacted shallow groundwater towards surface water baseflow;
- Migration via underground utilities to surface water;
- Contact of services and concrete with contaminated soils and aggressive ground conditions.

### 11.5. Embedded and Good Practice Measures

The proposed Project will be designed to avoid important geological features or resources, and sources of contamination, through careful routeing and site selection. The establishment of baseline conditions has included to date and will continue to include a desk study and site inspections.

The main mitigation measure to prevent adverse effects on soils, geology and hydrogeology, during all phases of the development of the proposed Project will be to ensure good site practice and management through the development and adherence to a Construction Environmental Management Plan.

Desk study work may identify areas of soil and/or groundwater contamination and there may be a requirement to undertake ground investigation and risk assessment of potential contaminant linkages. If unacceptable risks are identified or encountered during construction, and routeing through these areas is unavoidable, then remedial measures will be implemented.

An understanding of groundwater throughout the proposed Project will be obtained from ground investigation and monitoring. A more detailed hydrogeological assessment will be undertaken where trenchless techniques or dewatering is required in high sensitivity groundwater environments or where dewatering is required to facilitate open cut installation. Where dewatering is required, a dewatering scheme will be developed prior to construction to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any such assessment will consider the effects of any draw down or impacts on nearby abstractions or resources.

## 11.6. Likely Significant Effects

This section will set out the likely significant effects of the proposed Project, assuming that the relevant embedded measures and good practice measures are in place.

### *11.6.1. Step 1 Sources and Impacts*

#### 11.6.1.1. Ground Disturbance Sources

In the event of ground disturbance occurring, there is the potential for construction/ decommissioning and future operations to adversely impact geological receptors and MSZ. Construction and decommissioning activities can also result in physical damage to soil, including soil compaction as a result of heavy construction vehicle movements or the exacerbation of soil erosion through handling and storage of soils. Furthermore, during dewatering as part of the construction/ decommissioning phases, there may be a potential reduction of flow to surface water bodies and change in hydrogeological and hydrological setting locally.

#### 11.6.1.2. Land Contamination Sources

In the locations of the identified potentially contaminative land uses, there is the potential for construction/decommissioning and future operations to impact on human health, controlled waters, buildings and infrastructure, and ecological receptors.

It is anticipated (prior to the full risk and impact assessment, as detailed in Section 11.7), that there may be some adverse effects during the construction/decommissioning phases. These impacts are more likely in areas where significant contamination may be encountered, such as the Pembroke Refinery, Pembroke Power Station and landfills. Further assessment would be required to determine whether these could be significant effects, or if they could be mitigated by the embedded and good practice measures.

During the post-construction/operation phase, it is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Study Area, there will, in most instances, be overall beneficial effects, which depending on specific circumstance may be assessed to be significant. If required, and subject to ground investigation being completed across the proposed Project, site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will be designed to reduce risks to human health, controlled waters, ecological receptors, and property from contamination, gas and vapours in the ground, to an acceptable level. Any remediation works associated with the construction of the proposed Project would be expected to result in the enhancement of the local environment.

It is anticipated that there will be no significant effects during the actual operation of the Project as maintenance and operation of the proposed Project will be in accordance with all relevant environmental legislation and good practice. Therefore, impacts from the operation phase have been scoped out of the assessment.

Potential impacts during the construction / decommissioning and operation phase of the proposed Project include, but are not limited to, the ones reported in Table 11-2.

*Table 11-2. Sources and likely impacts – geology and hydrogeology*

| Project Phase and Impact Source | Impact and Receptor | Likelihood of Significant Effect | Scoped in/out |
|---|---|---|---|
| **Geology / Geological Designated Sites** | | | |
| Construction/decommissioning phase - general construction/decommissioning activity | Damage, disturbance or removal of geological features of interest (RIGS and GCR). | As the exact cable route is currently unknown, there is potential for disturbance of geological features of interest (permanent adverse effects) and these are therefore scoped in for assessment. These impacts are unlikely to be mitigated by the embedded and good practice measures, if not avoided. | Scoped in |
| **Soils** | | | |
| Construction/decommissioning phase - general construction/decommissioning activity | Compaction and degradation of soils. | Excavation works during installation of the onshore cable route is likely to disturb surface soils. This can result in compaction and degradation of excavated soils, particularly topsoil and in particular along haul routes. The extent of significance would be influenced by the final locations and construction/decommissioning methodology used. In addition, construction plant activities may also cause compaction of soils in the surrounding working area. Installation in areas of Made Ground are less likely to result in impacts to surface soils. | Scoped in |
| **Mineral Resources** | | | |
| Construction/decommissioning phase - general construction/decommissioning activity | Mineral severance or sterilisation. | There may be some adverse effects during the construction period to the identified MSZ. These impacts are unlikely to be mitigated by the embedded and good practice measures, if not avoided. | Scoped in |
| **Hydrogeology** | | | |
| Construction/decommissioning phase – dewatering | Potential reduction of flow to surface water bodies and change in hydrogeological and hydrological setting locally. | There may be some adverse effects during the construction/decommissioning phases due to dewatering. | Scoped in |

| Project Phase and Impact Source | Impact and Receptor | Likelihood of Significant Effect | Scoped in/out |
|---|---|---|---|
| | | These impacts can be mitigated through control of dewatering discharges. | |
| **Land Contamination** | | | |
| Construction/decommissioning phase – ground disturbance during excavation | Mobilisation and migration of contamination to unsaturated soils, groundwater and surface water courses. | There may be some temporary/permanent adverse effects during the construction/decommissioning phases. These impacts are more likely in areas where significant contamination may be encountered, such as the Pembroke Refinery, Pembroke Power Station and landfills. Further assessment is required to determine whether these could be significant effects, or if they could be mitigated by the embedded and good practice measures. | Scoped in |
| Construction phase – construction of underground structures/piling/drilling | Potential impacts on groundwater as a pathway may be created for drilling fluids or other fluids to reach sensitive groundwater receptors (e.g. the Principal/Secondary aquifers). Drilling too close to the surface for any horizontal directional drilling techniques adopted could create a contamination pathway to sensitive surface water receptors via a break-out of drilling fluids or other fluids used during construction through to river or stream beds. | | Scoped in |
| Construction/decommissioning phase – open excavations | Potential for contaminants in unsaturated soils to be exposed to surface water run-off and to leach to groundwater in open excavations. | | Scoped in |
| Construction/decommissioning phase – uncovered stockpiles | Potential impacts from migration of contaminants from uncovered stockpiles to surface water and groundwater receptors. | | Scoped in |
| Construction/decommissioning phase – dewatering | Creation of preferential pathways for the migration of soil contamination and gases. | | Scoped in |
| Construction/decommissioning phase - introduction of new sources of contamination, such as fuels and oils used in construction plant | Migration of contamination to unsaturated soils, surface water and groundwater. | There may be some temporary adverse effects during the construction/decommissioning phases. These impacts are temporary and will likely be mitigated by the embedded and good practice measures; mitigation measures dealing with the risk of accidental spills or contaminants are also suggested, with risks managed through the implementation | Scoped in |

| Project Phase and Impact Source | Impact and Receptor | Likelihood of Significant Effect | Scoped in/out |
|---|---|---|---|
| | | of industry standard best practice guidelines, for example, appropriate use of chemicals, spill response and pollution contingency plans. | |
| Construction/decommissioning phase - general construction/decommissioning activity | Impacts from potential contamination in dust and fine particulate matter may impact ecological receptors. | Ecological receptors, including features of designated sites that are sensitive to nitrogen or acid deposition, may be impacted by significant increases in dust. Further assessment will be required once the full extent of the proposed Project is confirmed to understand the level of impact. | Scoped in |
| Construction/decommissioning phase - general construction/decommissioning activity | Impacts on human health from contamination within unsaturated soil (dust and fine particulate matter) and groundwater – construction workers. | There may be some temporary adverse effects during the construction/decommissioning period due to the introduction of human health receptors (construction/decommissioning workers). However, these receptors will be protected by H&S legislation and are therefore scoped out. | Scoped out |
| Construction/decommissioning phase - general construction /decommissioning activity | Impacts on human health from contamination within unsaturated soil (dust and fine particulate matter) and groundwater – adjacent land users. | Potential temporary adverse impacts to nearby residents and commercial workers. These impacts are more likely in areas where significant contamination may be encountered. Further assessment will be required to determine whether these could be significant effects. | Scoped in |
| Post construction/operation phase – remediation | Any contamination removed, remediated, or mitigated leading to removal of contaminant sources from the source – pathway – receptor linkage; may result in potential beneficial impacts on human health, controlled waters, property receptors and ecological receptors. | There may be some permanent beneficial effects post-construction/operation phase due to the removal of contaminant sources during construction works. Further assessment required to determine whether these could be significant effects. | Scoped in |
| Operation phase - contamination within unsaturated soil and groundwater | Impacts on human health from contamination within shallow unsaturated soil and groundwater. | Not likely, as maintenance and operation of the proposed Project will be in accordance with environmental legislation and good practice. | Scoped out |

| Project Phase and Impact Source | Impact and Receptor | Likelihood of Significant Effect | Scoped in/out |
|---|---|---|---|
| Operation phase – pollutants bypassing the drainage system (e.g. spills) | The potential for impacts on unsaturated soil and groundwater deriving from pollution events bypassing the drainage system | Not likely, as maintenance and operation of the proposed Project will be in accordance with environmental legislation and good practice. | Scoped out |

### *11.6.2. Step 2 Impact Pathways on Receptors*

Potential pathways and receptors which have the potential to lead to a significant impact include, but are not limited to, those listed in Table 11-3.

*Table 11-3. Receptors and potential pathways*

| Impact | Receptors | Likelihood of Significant Effect | Scoped In / Out |
|---|---|---|---|
| Construction phase – general construction activities, including vehicle moving | Soils/geological formations/geological sites<br>MSZ | Excavation works during installation of the onshore cable route is likely to disturb surface soils. This can result in compaction and degradation of excavated soils, particularly topsoil and in particular along haul routes. The extent of significance would be influenced by the final locations and construction methodology used. In addition, construction plant activities may also cause compaction of soils in the surrounding working area. Installation in areas of Made Ground are less likely to result in impacts to surface soils. As the exact cable route is currently unknown, there is potential for disturbance of geological features of interest (permanent adverse effects) and these are therefore scoped in for assessment. There may be some adverse effects during the construction period to the identified MSZ.<br>These impacts are unlikely to be mitigated by the embedded and good practice measures, if not avoided. | Scoped in |
| Construction phase - dewatering | Bedrock and superficial aquifers | There may be some adverse effects during the construction phase due to dewatering. These impacts can be mitigated through control of dewatering discharges. | Scoped in |
| Construction phase - mobilisation and migration of contamination to unsaturated soils, and groundwater of contamination to unsaturated soils, surface water and groundwater deriving from ground disturbance | Controlled Waters receptors (surface water features, and bedrock and superficial aquifers)<br>Human health receptors<br>Ecological sites | There may be some temporary/permanent adverse effects during the construction period. These impacts are more likely in areas where significant contamination may be encountered, such as the Pembroke Refinery, Pembroke Power Station and landfills. Further assessment is required to determine whether these could be significant effects, or if they could be mitigated by the embedded and good practice measures. | Scoped in |
| Construction phase - potential impacts on groundwater from construction of underground structures/piling | Bedrock and superficial aquifers<br>Ecological sites | | Scoped in |

| Impact | Receptors | Likelihood of Significant Effect | Scoped In / Out |
|---|---|---|---|
| Construction phase - leaching from uncovered stockpiles and open excavations | Controlled Waters receptors (surface water features, and bedrock and superficial aquifers)<br>Ecological sites | | Scoped in |
| Construction phase - Creation of preferential pathways for the migration of soil contamination and gases through the construction of cables, ground services and dewatering | Controlled Waters receptors (surface water features, and bedrock and superficial aquifers)<br>Human health receptors<br>Ecological sites | | Scoped in |
| Construction phase - introduction of new sources of contamination, such as fuels and oils used in construction plant | Controlled Waters receptors (surface water features, and bedrock and superficial aquifers)<br>Ecological sites | There may be some temporary adverse effects during the construction period. These impacts are temporary and will likely be mitigated by the CoCP; mitigation measures dealing with the risk of accidental spills or contaminants are also suggested, with risks managed through the implementation of industry standard best practice guidelines, for example, appropriate use of chemicals, spill response and pollution contingency plans. | Scoped in |
| Construction phase - general construction activity | Ecological Receptors | Ecological receptors, including features of designated sites that are sensitive to nitrogen or acid deposition, may be impacted by significant increases in<br>dust. Further assessment will be required once the full extent of the proposed Project is confirmed to understand the level of impact. | Scoped in |
| Post-construction/operation phase - any contamination being removed, remediated, or mitigated leading to removal of contaminant sources from the source – pathway – receptor linkage | Controlled Waters receptors (surface water features, and bedrock and superficial aquifers)<br>Human health receptors<br>Ecological/geological sites | There may be some permanent beneficial effects post-construction/operation phase due to the removal of contaminant sources during construction works. Further assessment required to determine whether these could be significant effects. | Scoped in |

| Impact | Receptors | Likelihood of Significant Effect | Scoped In / Out |
|---|---|---|---|
| Construction phase - Impacts on human health (nearby residents and commercial workers) from contamination within unsaturated soil and groundwater | Human health receptors | Potential temporary adverse impacts to nearby residents and commercial workers. These impacts are more likely in areas where significant contamination may be encountered. Further assessment will be required to determine whether these could be significant effects. | Scoped in |

## 11.7. Assessment Methodology

### *11.7.1. Establishing the Baseline*

The baseline description for the Environmental Statement will be established through the completion of a Phase 1 desk study report (inclusive of a Stage 1, Tier 1 assessment as defined under LCRM) for the whole of the proposed Project, in addition to site walkover survey of selected key areas of the Project.

Engagement will be undertaken with the following stakeholders as part of the geology and hydrogeology assessment; NRW, Pembrokeshire Coast National Park, Pembrokeshire County Council and local geological groups.

A desk-based (Phase 1) assessment will be completed to identify and provide an assessment of any potential hazards and constraints to the proposed Project deriving from the ground conditions, including the potential for land contamination and ground hazards. It will include a ground model based on available geological and hydrogeological information.

The results of the desk-based assessment, development of the ground model, and preliminary conceptual site model (CSM) will be used to assess data gaps and uncertainties and this will form the basis of an initial scope for ground investigation. Ground investigation would be intended to support the development of the design, confirm the ground model and also to quantitatively assess any potential land contamination risk to the proposed Project. This tiered approach to assessment is consistent with the Environment Agency guidance for the management of land contamination 'Land contamination risk management (LCRM)' (Environment Agency) adopted by NRW in 2021.

An assessment of potential impacts on existing ground conditions will be undertaken as part of the EIA, including the potential for the proposed Project to result in land contamination, as defined in the Part 2A of the Environmental Protection Act (1990). Consideration will also be given to potential impacts associated with the construction, operation and decommissioning of the proposed Project and how these will be prevented or minimised.

### *11.7.2. Assessment Criteria*

The approach to assessing the potential impacts of the proposed Project from, and to land contamination, will be undertaken following a risk based approach, which is consistent with LCRM. The assessment will be based on comparing the risk levels at baseline via the preliminary CSM (developed in the Phase I desk study) and the perceived risk levels for the construction/decommissioning and operation (post-construction) stages respectively, to determine the change in risk at each stage. Potential risks are determined and assessed based on the likelihood (or probability) and consequence using the principles given in the NHBC, Environment Agency report R&D66 (National House Building Council (NHBC), 2008), and LCRM. This provides guidance on development and application of the consequence and probability matrix to risk assessment and broad definitions of consequence and is widely used for a range of developments.

The significance of the effects of land contamination is assessed by comparing the difference in risk of each contaminant linkage at baseline to those at construction/decommissioning and operation stages. Where there is shown to be a decrease in contamination risk, the proposed Project is assessed as having a beneficial effect on the environment in the long term. Reference will be made to DMRB LA109, LA104, LA110 and LA113 (Highways England and Welsh Government, 2019) (Highways England and Welsh Government, 2020) (Highways England and Welsh Government, 2019) (Highways England and Welsh Government, 2020), which although applicable to road schemes, does provides a suitable framework within which to conduct EIA for ground conditions on linear schemes (including this Project).

The sensitivity of the receptor reflects the quality of receptor and its ability to absorb an effect without perceptible change. Sensitivity is defined in Table 11-4.

*Table 11-4. Criteria to determine the sensitivity of potential effect to receptors*

| Sensitivity / Value | Description / Criteria | Typical Examples |
|---|---|---|
| High | Geology<br>Very rare and of international importance with no potential for replacement.<br>Hydrogeology<br>Nationally significant attribute of high importance | Geology<br>UNESCO World Heritage Sites;<br>SSSIs of international importance; or<br>Global Geoparks.<br>Contamination<br>Very high sensitivity land use (e.g. residential).<br>Hydrogeology<br>Principal aquifer providing a regionally important resource and/ or supporting site protected under European and UK habitat legislation;<br>Source Protection Zone 1; or<br>Groundwater supports Groundwater Dependent<br>Terrestrial Ecosystem (GWDTE). |
| Medium | Geology<br>Rare and of national importance with little potential for replacement.<br>Hydrogeology<br>Locally significant attribute of high importance. | Geology<br>SSSIs; or<br>National Nature Reserves.<br>Contamination<br>High sensitivity land use (e.g. public open space).<br>Hydrogeology<br>Principal aquifer providing a locally important resource or supporting a river ecosystem;<br>Source Protection Zone 2; or Groundwater supports Groundwater Dependent Terrestrial Ecosystem (GWDTE). |
| Low | Geology<br>Of regional importance with limited potential for replacement.<br>Hydrogeology<br>Of moderate quality and rarity. | Geology<br>RIGS<br>Contamination<br>Medium sensitivity land use (e.g. commercial).<br>Hydrogeology |

| | | |
|---|---|---|
| | | Aquifer providing water for agricultural or industrial use with limited connection to surface water; or<br>Source Protection Zone 3. |
| Negligible | <u>Geology</u><br>Of local importance /interest with potential for replacement or little/ no local interest.<br><u>Hydrogeology</u><br>Lower quality. | <u>Geology</u><br>Non-designated geological exposures;<br>No geological exposures; or<br>Former quarries / mining sites.<br><u>Contamination</u><br>Low sensitivity land use (e.g. highways and rail); or<br>No sensitive land use proposed.<br><u>Hydrogeology</u><br>Unproductive strata. |

The magnitude of a potential effect considers the scale of the predicted change to the baseline condition taking into account its duration (i.e. the magnitude may be moderated by the effects being temporary rather than permanent, short term rather than long term). Definitions for effect magnitude are described in Table 11-5. The examples of magnitude all relate to adverse effects.

*Table 11-5. Criteria to determine the magnitude of receptors*

| Magnitude | Criteria | Typical Examples |
|---|---|---|
| High | <u>Geology</u><br>Loss of feature/ designation and/ or quality and integrity, severe damage to key characteristics.<br><u>Hydrogeology</u><br>Loss of attribute and/or quality and integrity of the attribute. | <u>Geology</u><br>Destruction of features at a protected site; i.e. SSSIs of international importance;<br>or Global Geoparks.<br><u>Contamination</u><br>Significant contamination identified;<br>Contaminant concentrations significantly exceed background levels and relevant screening criteria; Potential for significant harm to human health; or<br>Contamination heavily restricts future use of land.<br><u>Hydrogeology</u><br>Loss of, or extensive change to, an aquifer;<br>Loss of regionally important water supply;<br>Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies; Reduction in water body WFD classification; or<br>Loss or significant damage to major structures through subsidence or similar effects. |

| Magnitude | Criteria | Typical Examples |
|---|---|---|
| Medium | Geology<br><br>Partial loss of feature /designation, potentially adversely affecting integrity; partial loss of/damage to key characteristics, features or elements.<br><br>Hydrogeology<br><br>Results in effect on integrity of attribute, or loss of part of attribute. | Geology<br><br>Partial loss of features at a protected site; i.e. SSSIs;<br><br>National Nature Reserves.<br><br>Mineral Safeguarding areas.<br><br>Contamination<br><br>Contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria;<br><br>Significant contamination can be present; or<br><br>Control/remediation measures are required to reduce risks to human health / make land suitable for intended use.<br><br>Hydrogeology<br><br>Partial loss or change to an aquifer;<br><br>Degradation of regionally important public water supply or loss of significant commercial/industrial/ agricultural supplies; Partial loss of the integrity of GWDTE;<br><br>Contribution to reduction in water body WFD classification; or<br><br>Damage to major structures through subsidence or similar effects or loss of minor structures. |
| Low | Geology<br><br>Minor measurable change in<br><br>geological feature /designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.<br><br>Hydrogeology<br><br>Results in some measurable change in attributes, quality or vulnerability. | Geology<br><br>Minor change of features at Geological sites; i.e. RIGS<br><br>Contamination<br><br>Contaminant concentrations are below relevant screening criteria;<br><br>Significant contamination is unlikely with a low risk to human health; or<br><br>Best practice measures can be required to minimise risks to human health.<br><br>Hydrogeology<br><br>Minor effects on an aquifer, GWDTEs, abstractions and structures. |
| Negligible | Geology<br><br>Very minor loss or detrimental alteration to one or more | Geology |

| Magnitude | Criteria | Typical Examples |
|---|---|---|
| | characteristics, features or elements of geological feature /designation. Overall integrity of resource not affected.<br><br>Hydrogeology<br><br>Results in effect on attribute, but of insufficient magnitude to affect the use or integrity. | Very minor change of features at sites of local importance, i.e. former mining sites or non-designated geological sites.<br><br>Contamination<br><br>Contaminant concentrations substantially below relevant screening criteria; or<br><br>No requirements for control measures to reduce risks to human health/make land suitable for intended use.<br><br>Hydrogeology<br><br>No measurable impact upon an aquifer and/or groundwater receptors. |

The significance of environmental effect is typically a function of the sensitivity of a receptor and the magnitude of an impact. Effects can be beneficial, adverse or negligible and their significance Major, Moderate, Minor or Negligible. Any effect predicted to be Minor is considered to be 'Not Significant'. Effects assessed as Moderate or Major are considered to be 'Significant'.

As geological designations and MSZ are present, the assessment of significance considers the sensitivity or importance of the asset/resource and the magnitude of potential impact that might occur. The assessment of impacts to hydrogeology (groundwater) will be in terms of groundwater as a receptor to potential contamination or pollution. Groundwater in terms of its resource potential will be considered in Chapter 10: Water Environment.

Based on the assessment of the baseline conditions and the identification of any potential impacts, the Environmental Statement will make recommendations for mitigation measures. These may include the recommendation for an initial intrusive investigation (to address residual data gaps or better delineate identified potential contamination hotspots or plumes), quantitative risk assessment, remediation and validation. It will also make recommendations for possible mitigation measures to be employed by contractors, should any previously unidentified contamination be encountered during the construction/decommissioning phases.

### 11.8. Conclusion

This chapter has set out the initial baseline conditions for the onshore and intertidal portion of the proposed Project, which comprises the onshore cables, the onshore substation / control building and the control building. Based on the available baseline data, the likely significant effects which are to be scoped in the assessment are summarised in Table 11-6.

Other than the potential beneficial effects resulting from remediation of contaminated land (post-construction/operation), it is anticipated that there will be no significant effects during the actual operation of the Project, as maintenance and operation of the proposed Project will be in accordance with environmental legislation and good practice.

It is anticipated (prior to the full risk and impact assessment, as detailed in Section 11.7), that there may be some temporary adverse effects during the construction/decommissioning phases from ground disturbance, the significance of which will be subject to further assessment.

*Table 11-6. Potential significant effects scoped in for the assessment*

| Receptors | Potential Significant Effect | Project Phase | Scoped In / Out |
|---|---|---|---|
| Soils and geological sites | - Physical damage to soil such as soil compaction or soil erosion<br>- Damage, disturbance or removal of geological features of interest (RIGS and GCR) | Construction/decommissioning | Scoped In |
| Mineral Safeguarding Zones | - Mineral severance or sterilisation | Construction/decommissioning | Scoped In |
| - Bedrock and superficial aquifers: Principal, Secondary A and Secondary (undifferentiated)<br>- Surface water features, including: Castlemartin Corse, Pembroke River, unnamed streams and ponds<br>- Ecological Receptors | - Mobilisation and migration of contamination to unsaturated soils and groundwater to surface water and groundwater from ground disturbance<br>- Potential contamination in dust and fine particulate matter<br>- Potential impacts on groundwater from, leaching and run off from stockpiles, open excavations, and introduction of new sources of contamination<br>- Migration of contamination to unsaturated soils, surface water and groundwater deriving from the creation of preferential pathways for the migration of soil contamination and gases through the construction of underground structures/piling, cabling, ground services, and dewatering.<br>- Potential reduction of flow to surface water bodies and change in hydrogeological and hydrological setting locally due to dewatering. | Construction/decommissioning | Scoped In |
| | Any contamination removed, remediated, or mitigated leading to removal of contaminant sources from the source – pathway – receptor linkage. | Post construction/operation phase | Scoped In |
| Human health receptors | Impacts on human health (off-site residential and commercial users) from contamination within shallow unsaturated soil and groundwater. | Construction/decommissioning | Scoped In |
| | Any contamination being removed, remediated, or mitigated leading to removal of contaminant sources from the source – pathway – receptor linkage | Post construction/operation phase | Scoped In |

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# 12. AGRICULTURE AND SOILS

## 12.1. Introduction

This chapter describes the methodology to be used within the EIA, the datasets to be used to inform the EIA, an overview of the baseline conditions within the Study Area, the likely significant effects to be considered within the EIA, and how these likely significant effects will be assessed for the purpose of an EIA. Where required, appropriate Project specific mitigation will also be discussed.

Agriculture and Soils interfaces with many other aspects and as such, should be considered alongside these:

- Chapter 8: Ecology and Biodiversity;
- Chapter 10: Water Environment
- Chapter 11: Geology and Hydrogeology; and
- Chapter 17: Socio-economics, Recreation and Tourism.

## 12.2. Regulatory and Planning Policy Context

### *12.2.1. Agricultural Land Classification*

The Agricultural Land Classification (ALC) system in England and Wales provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system. The ALC system classifies land into five grades based on the potential productivity, cropping, flexibility and ease of management of an area: the grades range from 1 (excellent) to 5 (very poor). The best and most versatile (BMV) land is defined as Grades 1, 2 and 3a (Welsh Government, 2021).

Further details of the ALC system are provided in Natural England's Technical Information Note (TIN049) (Natural England, 2019).

It is the Welsh Government's policy, as set out in Technical Advice Note 6 (Welsh Assembly Government, 2010), to consider the quality of agricultural land and to bear in mind that, once land is built on, restoration is rarely possible.

The Agricultural Land Classifications present within the Study Area will be identified using the ALC map of England and Wales.

#### *12.2.2. Soils*

Soils are an important natural resource and exert a strong influence on ecosystems. They play an important part in determining the pattern of land uses such as agriculture and forestry in Wales. Soil mapping has been carried out in the UK over many decades and there are a broad range of soil information maps, reports and surveys available. Cranfield University's National Soil Resources Institute (NSRI) has responsibility for retaining and disseminating soils information in England and Wales. The most comprehensive soil mapping for England and Wales is contained within the National Soils Map (NATMAP Vector), which displays the 300 mapped soil associations at a scale of 1:250,000.

The Soilscapes viewer contains a simplified soils dataset for England and Wales (based on NATMAP Vector) and can be interrogated for information on the soilscapes and soil descriptions. The Soilscapes dataset also contains generic details of a range of soil characteristics, including: soil texture, drainage status, soil fertility, and commonly associated habitat and landcover.

Soil classification in England and Wales is based on the observable and measurable characteristics of the soil profile, including the characteristics of the parent material and alterations of the soil caused by soil forming processes.

### 12.3. Study Area

The Study Area for the scoping of the Agriculture and Soils assessment is the Onshore Scoping Boundary as defined in Volume 1, Chapter 1 and shown in Figure 1-1; excluding areas considered to be marine or intertidal which do not have the potential to contain soils or agricultural land. No buffer was applied as the impacts to soils and agricultural land only occur on the land that is directly impacted by the Project and is thus likely to be only a small fraction of this overall area.

It is noted that as the cable route becomes more defined and an alignment is developed, the Study Area will become more refined. The Study Area is therefore likely to change and evolve between scoping and final submission of the ES. It is expected that for the assessment of baseline conditions within the ES, two Study Areas will be considered with the same methodologies applied to both. Firstly, data will be presented for the proposed working areas (cable installation route, landfall, compounds and other associated works areas, etc.) to provide an indication of the actual area of soil disturbance and land take due to the Project. Secondly, data will be presented for the whole of the consenting redline boundary to provide baseline conditions for the wider area in which the works (disturbance) could be located, should changes to the agreed design be required.

### 12.4. Baseline

The ALC data identify the land within the Study Area as comprising Grade 2 (good quality), Grade 3a (good to moderate quality), Grade 3b (moderate quality), Grade 4 (poor quality) and Grade 5 (very poor quality) agricultural land; as well as non-agricultural classifications (as shown in Figure 12-1). Table 12-1 identifies the proportion per ALC Grading within the Study Area.

The spatial distribution of the ALC grades (based on the data as shown in Table 12-1, and outlined in Figure 12-1) identifies that 41.64% of the Study Area is classified as Grade 2 agricultural land, 18.76% of the Study Area is classified as Grade 3a agricultural land and 30.47% of the Study Area is classified as Grade 3b agricultural land.

No areas of Grade 1 were identified and small areas of Grade 4 (1.23%), Grade 5 (1.51%) Non-Agricultural (3.44%) and Urban land (2.94%) are also identified.

Approximately 60% of the land within the Study Area is classified as BMV. Hence, there is a clear indication that the proposed Project will likely impact on some BMV land. As the route becomes more defined the total area of BMV land likely to be affected will become apparent and will be set out in the ES.

However, it is important to note, it is likely the agricultural land permanently lost and the disturbance and/or loss of soil resources throughout the proposed Project will be considerably less than the Study Area; this is primarily due to the temporary nature of the cable installation works and the areas of soil disturbance being largely restricted to a set working area within the Onshore Scoping Boundary.

*Table 12-1. ALC grading within the Study Area*

| ALC Grade | Area within the Study Area (ha) | Percentage within the Study Area (%) |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 804.25 | 41.64 |
| 3a | 362.28 | 18.76 |
| 3b | 588.5 | 30.47 |
| 4 | 23.77 | 1.23 |
| 5 | 29.19 | 1.51 |
| Non-agricultural | 66.52 | 3.44 |
| Urban | 56.87 | 2.94 |
| Total BMV | 1,166.54 | 60.4 |

Revision: 0 Drawn: MLS Checked: LC Approved: TN Date: 2022-03-21


LLŶR

**LEGEND**

- Onshore Scoping Boundary

Agricultural Land Classification

- Good quality agricultural land
- Good to moderate quality agricultural land
- Moderate quality agricultural land
- Non-agricultural
- Poor quality agricultural land
- Very poor quality agricultural land
- Urban

**NOTES**

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**ISSUE PURPOSE**

FINAL

**PROJECT NUMBER**

60669422

**FIGURE TITLE**

Agricultural Land Classification

*Figure 12-1. Agricultural Land Classification*

Within the Study Area six broad soil types have been identified, as shown in Figure 12-2 and Table 12-2. Approximately three quarters of the Study Area (74.93%) is comprised of either dune sand or deep sandy soil, which is free draining to groundwater. Sands form the weakest aggregates or clods and thus are most susceptible to erosion.

*Table 12-2. Soil types within the Study Area*

| Soil Type | Area within the Study Area (ha) | Percentage within the Study Area (%) |
|---|---|---|
| Seasonally wet deep silty | 0.69 | 0.04 |
| Dune sand | 395.78 | 20.72 |
| Seasonally wet silty over shale | 98.6 | 5.16 |
| Deep sandy | 1035.45 | 54.21 |
| Loam over shale | 53.36 | 2.79 |
| Deep loam | 323.79 | 16.95 |

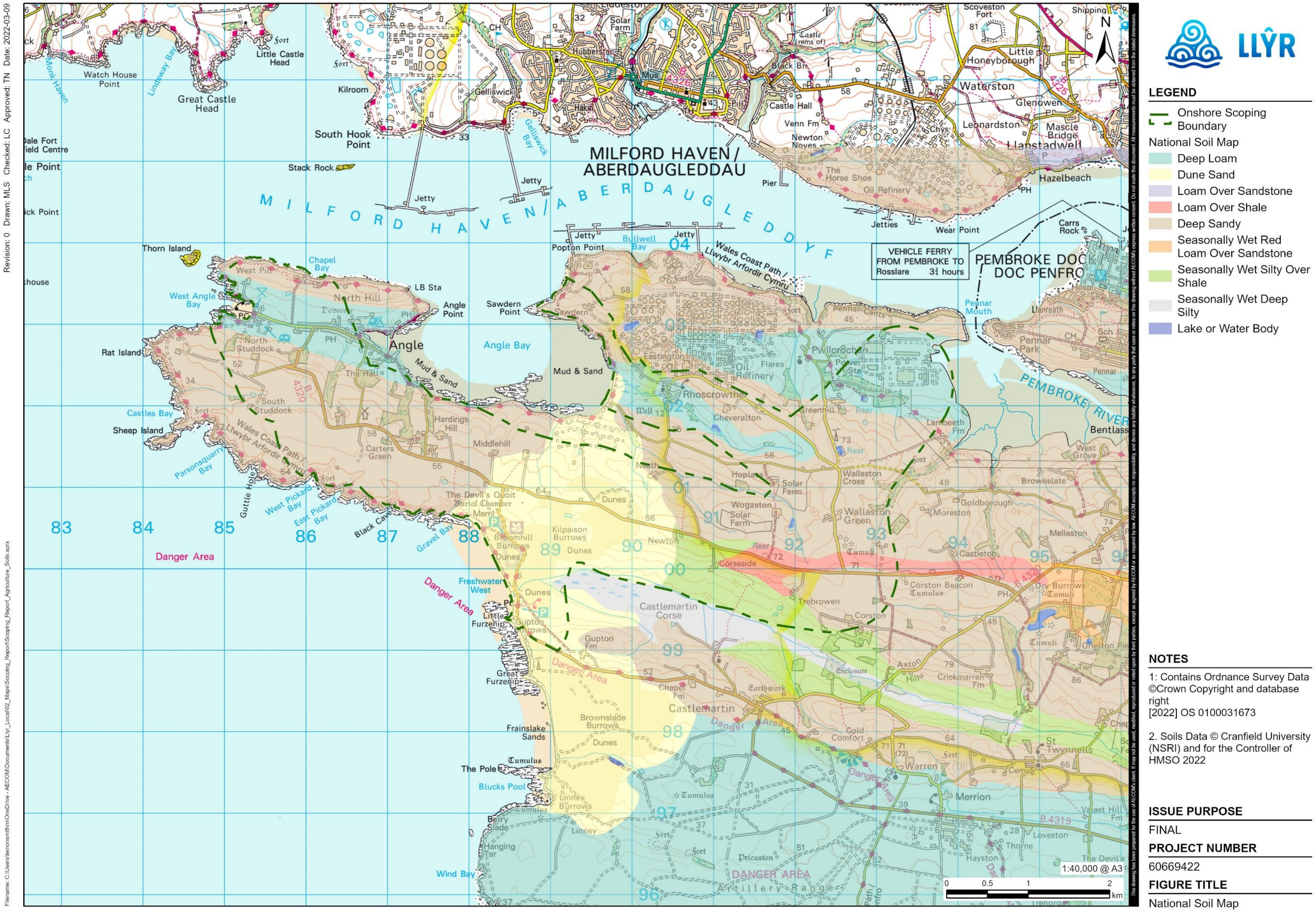


*Figure 12-2. National soil map*

## 12.5. Embedded and Good Practice Measures

Wherever practicable the identified effects will be mitigated or 'designed out' through the iterative design process (mitigation by design). Where this is not possible Project specific mitigation measures will be implemented (see Section 12.7).

## 12.6. Likely Significant Effects

The proposed Project is considered to have the potential to impact on Agriculture and Soils, both temporarily and permanently (see Table 12-3). Temporary effects will arise from the construction and decommissioning phases and permanent effects when the Project is operational (including maintenance and repair activities).

*Table 12-3. Potential effects on agriculture and soils*

| Topic or Receptor | Project Phase(s) | Rationale |
|---|---|---|
| Agricultural land and land use in terms of the loss of BMV land. | Construction | The proposed Project is likely to encounter BMV land and, therefore, there is the potential for this land to be significantly affected. |
| Soil resources in terms of potential damage and loss. | Construction | A review of the published soils information within the Study Area indicates the Study Area is primarily comprised of sands, which are likely to be at either a high or very high risk of erosion. Soils may be damaged or lost during the proposed Project due to inappropriate handing, storage and reinstatement. |
| Agricultural operations. | Operation | Potential impacts to agricultural operations will be mitigated as far as is practicable through consultation between the Project's Lands Team and landowners / farmers. It is therefore considered that significant effects to agricultural operations are very unlikely to occur and this receptor is not taken forward for further consideration. |

### *12.6.1. Potential Receptors*

The assessment will consider the following receptors within the Study Area:

- Agricultural land and land use in terms of the loss of BMV land; and
- Soil resources in terms of potential damage and loss.

As described in Section 12.4, a review of the available published ALC data for the Study Area indicates that BMV land is likely to be widespread. The proposed Project is likely to encounter BMV land and, therefore, there is the potential for this land to be significantly affected. In consequence, this receptor is to be taken forward for further consideration.

A review of the published soils information within the Study Area indicates the Study Area is primarily comprised of sands, which are likely to be at either a high or very high risk of erosion. Soils may be damaged or lost during the proposed Project due to inappropriate handing, storage and reinstatement. Therefore, there is potential for Soils to be significantly affected through damage or loss and this receptor is to be taken forward for further consideration.

As described in Section 12.7, potential impacts to agricultural operations will be mitigated as far as is practicable through consultation between the Project's Lands Team and landowners / farmers. It is therefore considered that significant effects to agricultural operations are very unlikely to occur and this receptor is not taken forward for further consideration.

## 12.7. Mitigation Measures

Possible opportunities for mitigation are provided within the following sections.

### *12.7.1. Loss of Agricultural Land to Development*

Some permanent loss of agricultural land will occur as a result of the proposed Project (due to permanent built infrastructure – substation / control building and any permanent accesses) and this cannot be mitigated. However, the majority of land take for the proposed Project (temporary access tracks, compound sites, cable installation route etc.) will be temporary, with land excluded from agricultural use for the duration of construction operations only. Temporary land-take areas will be reinstated to agricultural use. The temporary loss of agricultural land and the impact of this loss can be reduced through appropriate mitigation.

Mitigation by design, where practicable and taking into account technical and other environmental considerations, is likely to include, but will not be limited to:

- Avoidance of development in arable land (including mixed use and silage fields) in preference of permanent pasture;
- Informed and sensitive positioning of cable routing and access tracks to the edge of fields, in field boundaries, or through less productive areas of individual fields, should ensure that the maximum area of productive land remains in agricultural use during the construction period (micro-siting);
- Avoidance of higher quality agricultural land (if land of varying grade is present within the chosen permanent facility sites);
- Mitigation of indirect effects such as field severance and separation of livestock from water supplies through informed route design; and
- Appropriate management of soil resources to prevent loss / lowering of ALC grade between pre- and post-construction.

With mitigation measures such as those described above; the permanent loss of agricultural land during the construction phase should be restricted to areas of permanent development, with BMV land avoided as far as is practicable.

### *12.7.2. Damage to and Loss of Soil Resources*

Soil resources will be protected against damage and loss by the adoption of industry standard methods for the handling and storage of soils appropriate to the soil types identified. The current guidelines (Defra, 2009) promote standard working methods and techniques to protect soil resources which include, but are not limited to, the following:

- Handling of soil resources only when sufficiently dry to prevent compaction and damage to soil structure, generally limiting soil operations to the months April to September (although this period may be extended during dry periods);
- Stripping, handling, storage and transportation of topsoil separately from subsoil;
- Appropriate seeding of soil storage mounds if required for a period longer than six months, to prevent erosion and to maintain soil structure, nutrient content and biological activity;
- Decompaction of the subsoil before topsoil re-instatement; and
- Minimising the number of machine movements across topsoil to reduce compaction and retain soil structure.

Should further study, such as site-specific information from the Project's Lands Team, identify areas of high sensitivity soil resource which cannot be avoided through mitigation by design; and for which the industry standard soil management methods will not be sufficient to ensure protection, bespoke mitigation will be put in place.

As discussed in Section 12.8, soil surveys will be conducted during the planning process (at areas of permanent development); and post-consent / pre-commencement (at areas of the temporary development). It is anticipated that these Project-specific soils data will be used to inform a Project Soil Handling and Storage Protocol (SHSP). The SHSP will be produced by the appointed contractor prior to the commencement of soil handling activities. Delivery of this document could be secured through planning condition.

## 12.8. Assessment Methodology

As explained in Volume 1, Chapter 5: EIA Approach and Methodologies, the early detection of significant adverse environmental effects enables appropriate mitigation (e.g. measures to avoid, reduce or offset significant adverse effects) to be identified and incorporated into the design of a project (mitigation by design), or commitments to be made to environmentally sensitive construction methods and practices (Project specific mitigation). The potential effects of the proposed Project will therefore be identified and assessed, appropriate mitigation will be put forward (where required) and the residual (post-mitigation) effects reassessed to ensure that the overall effect of the proposed Project on Agriculture and Soils is acceptable.

### *12.8.1. Planned Surveys*

Following completion of the Scoping stage, further information will be gathered to inform the EIA. For areas of permanent development (for example, the substation / control building and any permanent access roads) baseline data will be collated as described for areas of temporary development until such a time as their final locations are agreed.

Subject to the results of a desk based assessment, there may be an additional requirement for proportionate field surveys in order to provide a sufficiently detailed baseline to inform the impact assessment. Once locations of permanent development are agreed, targeted standard soil survey would be undertaken in line with standard guidelines as necessary. These data will be used to confirm the agricultural land quality within the survey locations (using the ALC guidelines).

It is anticipated soil surveys to inform the construction soil management planning for areas of temporary development (for example, cable route and temporary accesses) would be completed post-consent / pre-commencement when the precise routing and placement of infrastructure are known, ensuring the surveys are targeted to areas directly impacted by the proposed Project. Where required, the surveys will be undertaken following standard sampling procedures as set out in the ALC guidelines. Site specific data from these pre-commencement surveys will be used to inform soil management planning for the proposed Project.

Further baseline data will be gained through consultation with the Project's Lands Team. This information is likely to include site specific data gained from the Project Lands Team's discussions with farmers and landowners which will assist in defining the routing and micrositing of infrastructure; and in describing Project specific mitigation, if required, to ensure that the impact of construction and operation of the proposed Project on soils and agriculture and agricultural operations are minimised. For example, information on high sensitivity soils which are too small to be mapped, but which should be avoided if practicable; preferred locations for designated crossing points to minimise disruption to the movement of livestock and machinery; or details of how works could be programmed to avoid specific locations (for example lambing sheds) during sensitive times in the farming calendar (for example during lambing season).

### *12.8.2. Agricultural Land*

BMV agricultural land (Grades 1, 2, and Subgrade 3a) is considered to be a finite national resource and is given special consideration under the Welsh planning system. However, there are no defined criteria for the assessment of effects on agricultural land (understood as a permanent land use change to a built development), and no threshold given for BMV loss (permanent land use change) which should be regarded as significant within an EIA.

Statutory Instrument 2015 No. 595, The Town and Country Planning (Development Management Procedure) (England) Order 2015, Schedule 4, Part (y), requires that the local planning authority consults the Secretary of State for Wales if the area of a proposed permanent development exceeds 20 ha of BMV land. Although the guidance does not state that this threshold should be used to determine the significance of loss, for the purpose of EIA, it is a guide to consider significance where 20 ha or more of BMV is affected by a development. To determine the level of significance, other factors are considered, including whether the development is temporary or permanent and the extent of BMV in the locality.

Therefore, the loss of agricultural land will be assessed by estimating the amount and quality of land that may be affected by the proposed Project, with a threshold of 20 ha of permanent BMV loss used to determine whether the loss is significant or not. Magnitude of effect and receptor sensitivity classifications are not assigned. Rather, any permanent BMV loss that exceeds 20 ha is assessed as significant, whilst any that is temporary or occupies less than 20 ha is assessed as not significant.

The assessment of the loss of agricultural land therefore does not take into account temporary land use change, as this land will be returned to agricultural use once construction is complete. Within the loss of agricultural land assessment, the areas of temporary land use change will be reported for illustrative purposes only.

### *12.8.3. Soil Resources*

There are no defined criteria, or policy guidance on the assessment of the effects of development on soil resources. Therefore, the assessment of the effect of permanent and temporary development as a consequence of the proposed Project will be assessed in terms of the identified soil resources, their sensitivity, and the degree of loss of soil resource. The assessment criteria will be based on professional experience and which have been adopted in other assessments that have previously been agreed and accepted as best practice on other infrastructure projects.

The disturbance of soil resources will be assessed by reporting the workability of topsoils and their suitability for reinstatement, and effects assessed on the assumption that good working practice is followed.

Assessing the sensitivity of soil resources to damage (i.e. resistance and resilience of the soil environment, not the importance of the land for agricultural use) is complicated, as soil resources provide a range of functions, such as supporting plant growth (including food and other crops), water filtration and regulation (role in flood control), nutrient transformation (e.g. role in the nitrogen cycle), carbon storage and sequestration, and supporting biodiversity. The sensitivity criteria for soil resources are based on the erodibility of soils or the presence of ecologically important soils, such as peat. The soil resources assessment will consider both temporary and permanent damage. The receptor sensitivity criteria are provided in Table 12-4. The magnitude of change from the baseline will be defined in terms of the damage to soil resource and loss of soil resources, as provided in Table 12-4.

Soil erodibility is a measure of the susceptibility of soils to loss both in-situ (i.e. as an undisturbed soil profile) and during soil stockpiling, due to wind or water erosion (natural erosion potential). Soil erodibility is considered in the rating of soil sensitivity, with the sensitivity classification of the different soils encountered based upon data compiled by Knox et al. Therefore, as a general rule, heavy (clay rich) soils are classified as low sensitivity (low soil erodibility), whilst light sandy soils are classified as high sensitivity (high soil erodibility).

However, it is important to note that soils of differing texture and structural development may be subject to a range of potential impacts during and following reinstatement. For example, the incorrect handling / reinstatement of a heavy (clay rich) soil whilst in a plastic state may result in a reinstated soil profile with a reduced natural drainage compared to the natural soil profile and a subsequent increased risk of soil loss (erosion) due to surface water run-off. Whereas the permeable nature of light sandy soils means that the natural structural recovery and drainage potential of the soils is more easily maintained upon reinstatement. However, as standard good practice measures for soil handling will mitigate against any potential adverse impacts during reinstatement regardless of the soil texture or prevailing structure, only soil erodibility (i.e. the sensitivity of the undisturbed soil profile or soil stockpiles) is considered in the sensitivity criteria of the soil assessment.

*Table 12-4. Receptor sensitivity (Soils)*

| Receptor (Soil Resources) | Sensitivity | Justification |
|---|---|---|
| Soils with very high to high risk of erosion and organic soils (peat). | High | Development on those soils should be avoided, however if this is not possible, they require special consideration and careful planning of construction methods, e.g. use of temporary working surfaces, careful storage, protection from drying out, in order to preserve their functions. Soils of high biodiversity value. High importance as a carbon store and active role in carbon sequestration, which have little capacity to tolerate change. |
| Soils with moderate risk of erosion. | Medium | Standard soil management measures will provide appropriate protection to these soils; however, damage is likely to occur if worked in less than ideal conditions, e.g. when wet. These soils should be given appropriate consideration because of their importance for agricultural production. |
| Soils with small or very small risk of erosion. | Low | These soils are generally more resistant to damage. Standard soil management measures will provide appropriate protection to these soils (except peat soils). |
| Poor quality soils with no risk of erosion. | Negligible | These soils are generally more resistant to damage. Standard soil management measures will provide appropriate protection to these soils (except peat soils). |

The magnitude of effect will be assessed in terms of the change from baseline conditions, as defined in Table 12-5.

*Table 12-5. Criteria to assess the magnitude of impact (Soils)*

| Magnitude | Damage to Soil Resources | Loss of Soil Resources |
|---|---|---|
| Large | Permanent irreversible or long-term reversible damage to soil quality through handling, and stockpiling. Storage for more than 2 years. | <25% of soil resources suitable for reuse and retained onsite |
| Medium | Medium-term (6 months to 2 years) temporary disturbance. Reversible damage to soil quality through handling, stockpiling, machinery traffic, etc. | 25-50% of soil resources suitable for reuse and retained onsite |
| Low | Short-term (<6 months) disturbance of soil resources. Reversible damage to soil quality through handling, stockpiling, machinery traffic, etc. | 51-95% of soil resources suitable for reuse and retained onsite |
| Negligible | No damage or very small scale surface damage equivalent to that done by a typical farm machinery traffic. | >95% of soil resources suitable for reuse and retained onsite |

The classification of effects for loss and damage of soil resources will be assessed as a function of the sensitivity of the receptor and the magnitude of an impact. Where effects are determined as Major Adverse or Moderate Adverse, the effect will be considered Significant. Where effects are determined as Minor Adverse or Negligible, the effect will be considered Not Significant.

## 12.9. Conclusion

This Scoping Report sets out the high-level baseline data for the proposed Project; the baseline data collected at ES stage will identify the soils and agricultural land in greater detail and will allow robust assessment of the impacts on Soils and Agriculture.

A review of the available published ALC data within the Onshore Scoping Boundary indicates that BMV land is very likely to be widespread and that therefore the proposed Project is very likely to encounter BMV land. In the absence of appropriate mitigation (both mitigation by design and Project specific mitigation) there is the potential for this land to be significantly affected. In consequence, this receptor is to be taken forward for further consideration.

The proposed Project has the potential to result in the damage or loss of soil resources at both the construction and operational (maintenance works) phases. Therefore, there is potential for Soils to be significantly affected through damage or loss and this receptor is to be taken forward for further consideration.

Appropriate mitigation measures will be implemented either during the iterative design process (mitigation by design) or through Project specific mitigation measures. The mitigation measures proposed will ensure that impacts to soils and agricultural land are reduced as far as is practicable.

Potential impacts to agricultural operations will be mitigated as far as is practicable through consultation between the Project’s Lands Team and landowner(s) / farmer(s) to the agreement of both parties. It is therefore considered that significant effects to agricultural operations are very unlikely to occur and this receptor is not taken forward for further consideration.

### 12.10. References

Natural England, 2019. *Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049).* [Online]. Available at: http://publications.naturalengland.org.uk/publication/35012 [Accessed: 18 February 2022].

Welsh Assembly Government, 2010. *Technical Advice Note 6: Planning for Sustainable Rural Communities.* [Online]. Available at: https://gov.wales/sites/default/files/publications/2018-09/tan6-sustainable-rural-communities.pdf [Accessed: 18 February 2022].

Welsh Government, 2021. *Agricultural Land Classification: Frequently Asked Questions.* [Online]. Available at: https://gov.wales/sites/default/files/publications/2021-05/agricultural-land-classification-frequently-asked-questions.pdf [Accessed: 18 February 2022].

## 13. TRAFFIC AND TRANSPORT

### 13.1. Introduction

This chapter sets out the proposed scope of the environmental assessment for traffic and transport. The objectives of the chapter are to:

- Describe the baseline environment in relation to traffic and transportation;
- Outline the methods and assessment to be undertaken for inclusion within the ES; and
- Identify any potential effects on users of the local transport network that may arise as a result of the proposed Project and any potential mitigation measures

This chapter should be read in conjunction with Chapter 15: Air Quality, Chapter 16 Noise & Vibration, Chapter 17: Socio-economics, and Chapter 18: Health & Wellbeing.

### 13.2. Regulatory and Planning Policy Context

#### *13.2.1. Planning Policy Wales*

PPW 11 (Welsh Government, 2021) sets out the land use planning policies of the Welsh Government. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.

PPW 11 is supplemented by numerous documents, including Technical Advice Notes (TANs) including TAN 18: Transport (Welsh Government, 2007).

#### *13.2.2. Pembrokeshire County Council Local Development Plan Pembrokeshire County Council (PCC) (adopted Feb 2013)*

The LDP provides development strategy and policies to guide development and land use in Pembrokeshire up to 2021. The Authority is currently working on a Replacement Local Development Plan for Pembrokeshire. It is anticipated that this Plan will be adopted in 2022 and will run until 2033. This Plan will cover the area of Pembrokeshire, excluding the Pembrokeshire Coast National Park Authority. The LDP is supported by Supplementary Planning Guidance (SPG).

### *13.2.3. Pembrokeshire Coast National Park Local Development Plan*

The Pembrokeshire Coast National Park LDP 2 was adopted in September 2020 (Pembrokeshire Coast National Park Authority, 2021). It provides a legal framework for the development and use of land within the National Park to 2031.

A full policy review relating to Traffic and Transport will be undertaken as part of the EIA.

## 13.3. Study Area

The Study Area for this section focuses on the Onshore Scoping Boundary, see Figure 13-1.

The Study Area includes the proposed landfall options, recognising the requirement for access during construction, maintenance and potentially for decommissioning works. The proposed Project has a preferred grid connection location adjacent to Pembroke Power Station and have submitted a project grid connection application for connection at this location. The grid route will follow the adjacent Erebus project onshore and offshore grid route where possible. There remains the potential that the National Grid ESO may determine an alternate connection point (with potential considerations including but not limited to the offshore Celtic Sea Power offshore connection proposal, Alverdiscott, Swansea Bay, etc). The Section 36 and Marine Licence application will identify the point of connection and associated cable route at the time of application.

Floventis will work with other developers, TCE and the Electricity System Operator to share infrastructure, share infrastructure routes or minimise construction disruption through coordinated approaches such as the deployment of cable conduit for later projects where possible and minimise environmental impacts both for the Llŷr Project , Project Erebus and other relevant developments on a cumulative basis.

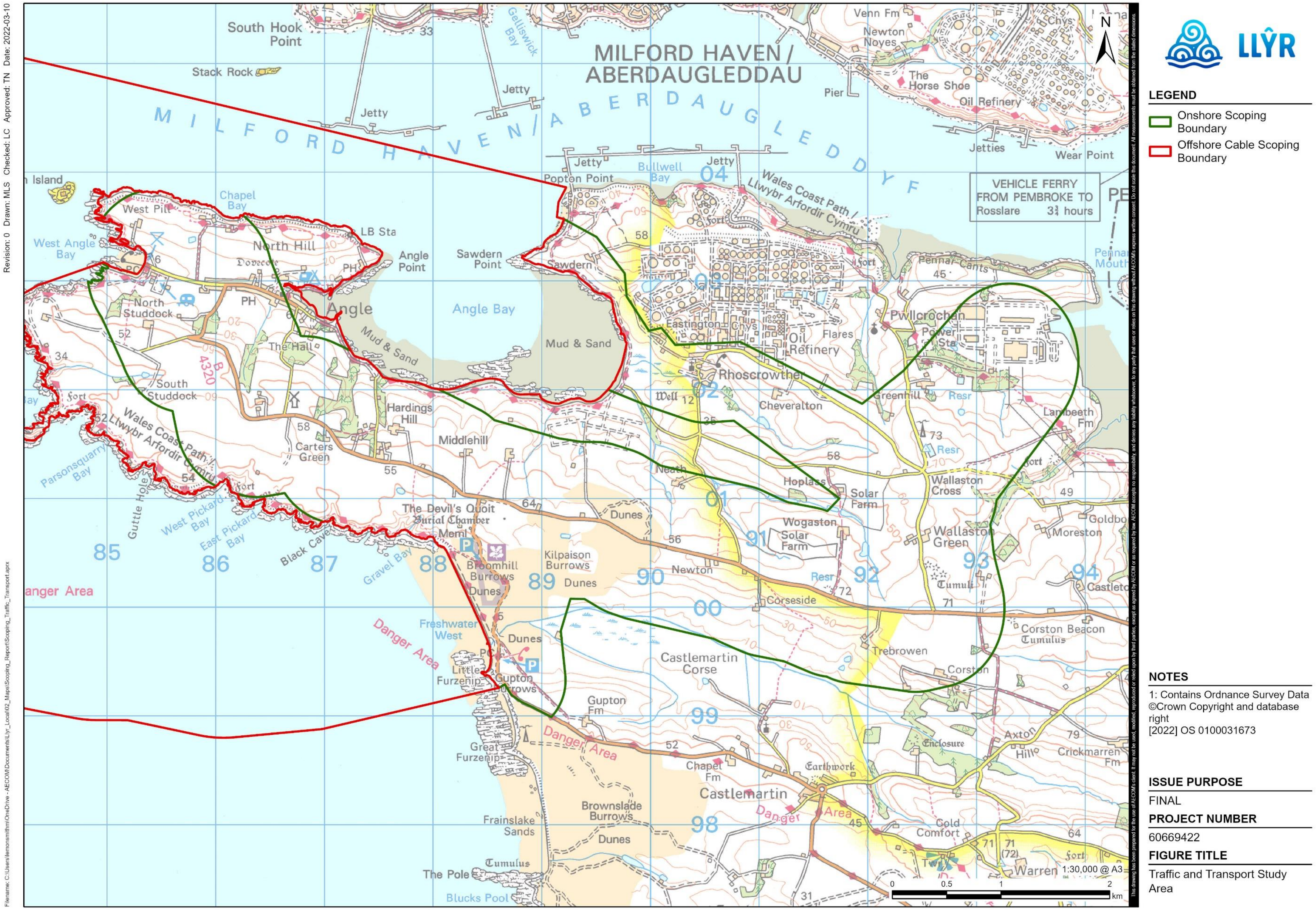


*Figure 13-1. Traffic and transport Study Area*

The landfall will be selected in conjunction with the grid connection options available, as shown in Figure 4-5, Volume 1. The landfall options for the base case consideration are described in Volume 1, Section 4.3.1.

The onshore cable route has therefore not yet been finalised, however, it is anticipated that the preferred option will be from the proposed landfall to the substation / control building location as shown in Figure 13-2.

In the absence of a final agreed onshore cable route, a strategic assessment of the road network has been undertaken for this Scoping Report based on the assessment within the Erebus EIA and it is acknowledged that further assessments will be required once the onshore cable route is confirmed. The Study Area also includes the areas around the proposed onshore substation / control building location and the onward connection from the proposed substation / control building to the grid connection at Pembroke Power Station.

It is the intention of the developer, Floventis Energy, to support the local supply chain so it is anticipated that completed turbines and floating foundations will be readied for assembly and then transported by road/rail/sea to a central assembly facility (most likely at a Port with sufficient infrastructure) that has direct access to waterways suitable for onward transportation to the installation site, potentially Pembroke Port.

There may be elements of infrastructure delivered to Pembroke Port by road, however it is not expected that these would require specialist transportation, instead utilising standard HGVs. The delivery of the transformer to the substation / control building is the only anticipated abnormal load. Due to the uncertainty in respect of delivery to Pembroke Port more detailed planning will be required as the specifics of the proposed Project are finalised.

As a minimum, it is anticipated that the following strategic/primary links will likely be used by construction vehicles to provide access:

- B4319;
- Clay Lane;
- B4320.


*Figure 13-2. Traffic Corridor*

## 13.4. Baseline Data

This section describes the main data sources from which information will be obtained to inform the traffic and transportation baseline and subsequent assessment of environmental effects. It has also been informed via initial pre-application consultation with key local stakeholders including Milford Haven Port Authority (MHPA), Pembrokeshire Coast National Park Authority (PCNPA) and Pembrokeshire County Council (PCC).

The main data considered fundamental to the assessment of traffic and transport effects will be traffic flow data and personal injury accident data (PIA).

The PIA data will be obtained from the relevant highway authority for the most recent five-year period this will provide information on each collision including severity as well as factors which attributed the collision.

It is anticipated that Automated Traffic Counts (ATCs) will be required to obtain traffic flow data, which will be undertaken on the roads identified in 13.3 (see Section 13.5.1 Planned Surveys for more information). However, this may be subject to change as more detail comes forward regarding the proposed Project including grid connection and cable location which will affect the part of the highway network needing to be accessed by construction vehicles.

Average Annual Daily Traffic (AADT) flows will be derived from the ATC data. Traffic generation at Construction compounds and other relevant sites for construction staff will be obtained from Floventis Energy with a profile of daily light and Heavy Goods Vehicle (HGV) arrivals and departures across the construction period.

A review of the planning portal will also be undertaken to identify planning applications which may include representative traffic data collected prior to the COVID-19 pandemic.

## 13.5. Baseline Environment

The primary access route to the Study Area is via the A477, part of the Welsh trunk road network and the main road from St Clears to Pembroke Dock. This route would service transportation to Pembroke Port, the proposed landfall and substation / control building locations, and the proposed onshore cable routes.

Access to the proposed onshore substation / control building locations benefits from a direct route for traffic to Pembroke Power Station. This route is from the A477, via the A4075, A4139 around Pembroke, turning onto the B4319 which becomes Clay Lane before joining the B4320, to the turn off at Wallaston Green. Continuing along the B4320 would provide access to West Angle Bay, Angle Bay, Freshwater West Beach, and other options within the Haven Waterway.

The onshore cable route will either be cross country or follow the road network. The options will affect the B4319, B4320 and smaller access roads depending on the location of the infrastructure.

### *13.5.1. Planned Surveys*

Subject to the results of the desk based assessment, there may be an additional requirement for field surveys. It is anticipated that ATCs will be undertaken during a neutral month during 2022 and will provide two- way traffic flows and be classified by vehicle type, including HGVs. In line with TAG Unit M1.2 (Department for Transport, 2020) neutral periods are defined as Monday to Thursday from March through to November (excluding August) and avoiding the weeks before / after Easter, surveys may be carried out outside these months if the conditions being surveys are representative. The locations and timings of the surveys will be agreed with the relevant highway authority. The ATC locations that have been selected will provide a basis for the analysis and incorporates local routes within the Onshore Scoping Boundary close to potential sensitive receptors and also routes along key strategic links to provide a robust baseline for assessment.

The proposed ATC locations will be determined once the cable route and grid connection are confirmed but are expected to be as a minimum on the B4319, Clay Lane, and B4320.

Due to proximity to the coast further data could potentially also be collected during the peak tourist season as well as during a non-school holiday period to account for seasonal tourism. This will be confirmed with the relevant local highway authorities.

### 13.6. Assessment Methodology

As discussed above further assessment is required once the final Project designs are confirmed. Throughout the EIA process key stakeholders such as the Highways Authority (PPC), Pembrokeshire Coast National Park Authority (PCNPA) and local communities will be consulted with to inform the development of Transport Plans and mitigation options.

The starting point for the assessment methodology is a desktop transport review of the proposed Study Area to collect data on the affected highway network in terms of road status, main routes to be impacted, traffic movement and volumes.

The methodology for assessing the impact of development-generated traffic will be based on that outlined in Institute of Environmental Assessment's (IEA, now known as the Institute of Environmental Management and Assessment) 'Guidelines for the Environmental Assessment of Road Traffic' (1993). The IEA guidelines state that a link on the highway network should be included within the study if one of the following criteria is met:

- Traffic flows increase by more than 30% (or HGV flows increase by more than 30%); or
- Traffic flows in sensitive areas increase by more than 10%.

The IEMA guidelines recommend that several environmental effects may be considered important when considering traffic from an individual development. This chapter will consider the following effects:

- Impact of HGV Construction Traffic;
- Severance;
- Pedestrian delay;
- Pedestrian amenity; and
- Accidents and safety.

The type of traffic which is anticipated to be generated by the proposed Project will be categorised as follows; primarily general traffic, LGVs, HGVs and Abnormal Indivisible Loads (AILs). Note that it is currently unknown if any AILs will be required as part of the construction process.

The vehicle routeing and movement associated with the scheme construction will be considered in detail and will be discussed through consultation with the Highways Authority (PPC) and Pembrokeshire Coast National Park Authority (PCNPA).

Once the locations and volumes of the proposed traffic have been identified it will be necessary to identify those receptors that may be impacted upon, due to the increase in vehicle movements. This will be done by identifying the percentage increase in vehicular activity along the identified construction routes following the collection of traffic data. The ATCs will be used to derive AADT for individual links, subdivided into 24 hour and 18 hour counts for total traffic and HGVs.

In order to calculate the trip distribution of workers travelling to and from the proposed substation / control building and converter station site and the construction compounds along the cable alignment each day, a simple gravity model will be developed. Construction traffic associated with the proposed Project will be distributed onto the local highway network to calculate the resultant percentage increase on each link.

Assessments will be undertaken for one or several years throughout the construction period. Currently, it is anticipated that the on site construction will take one year with a large proportion of the construction activities involving pre-fabrication. Base traffic flows will be growthed to the identified peak year(s) of construction. Growth factors derived from TEMPro v7.2 with MSOA area adjusted for relevant areas impacted by the proposed Project. The peak construction traffic flows will be derived by analysing construction traffic data and construction programmes provided by the Applicant.

An AIL report will be needed to assess the delivery of a transformer to the converter station. This will be supported by desk based swept path analysis and a record of consultation and agreement with the key highway authorities.

The IEMA guidelines provide a framework for assessment, which is considered in the following table, Table 13-1. The framework includes accidents and safety; noise and vibration; air quality; driver delay and pedestrian severance.

*Table 13-1. Assessment framework*

| Topic / Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact Scoped In / Out |
|---|---|---|---|---|
| Pedestrians, other road users and local communities | As a result of increased traffic there is potential for an associated increase in accidents and a reduced level of safety for road users and pedestrians. | Construction<br>Operation<br>Decommissioning | Yes | The potential for highway safety to be impacted may be significant and further assessment is required to understand the potential levels of traffic, duration of presence and the associated impact. |
| Pedestrians, other road users and local communities | An increased level of noise and vibration would be expected if traffic levels were to increase significantly. | Construction<br>Operation<br>Decommissioning | Yes | Noise and vibration are likely to be worse in built up areas, although the levels of traffic are unknown. Due to the potential routes through Pembroke and Pembroke Dock further assessment is required to understand the level of impact. |

| Topic / Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact Scoped In / Out |
|---|---|---|---|---|
| Pedestrians, other road users and local communities | Air quality may be impacted if traffic levels were to increase significantly. | Construction<br>Operation<br>Decommissioning | Yes | Although the levels of traffic are unknown, due to the potential impact on air quality further assessment is required to understand the significance of the impact. |
| Pedestrians, other road users and local communities | Delays are likely to arise due to the installation of the onshore cable route and the landfall location. | Construction<br>Operation<br>Decommissioning | Yes | The installation of the onshore cable route could cause significant delays and disruption particularly if the cables lies in or adjacent to the highway network. The road network from the potential landfall locations to potential substation / control building is predominantly narrow, in some places single carriageway, and although the area is not heavily populated it is a busy tourist destination. Further assessment is required once the final onshore cable route is confirmed. |
| Pedestrians, other road users and local communities | Severance, of local communities to services and facilities may arise. | Construction<br>Operation<br>Decommissioning | Yes | The impact the Project would have will depend on the final onshore cable route and proposed landfall and substation / control building locations. Further assessment is required once finalised to assess the level of impact. |

### 13.7. Identification of Key Sensitivities and Potential Impacts

The general criteria for defining the importance or sensitivity of receptors are set out in Table 13-2. Key factors influencing this include:

- The value of the receptor or resource based upon empirical and/or intrinsic factors, for example considering any legal or policy protection afforded which is indicative of the receptor or resources' value internationally, nationally or locally; and
- The sensitivity of the receptor or resource to change, for example is the receptor likely to acclimatise to the change. This will consider legal and policy thresholds which are indicative of the ability of the resource to absorb change.

*Table 13-2. Receptor sensitivity criteria (Traffic and Transport)*

| Sensitivity | Description |
|---|---|
| Very High | Schools, colleges, playgrounds, hospitals, retirement homes |
| High | Heavily congested junctions, residential properties very close to carriageway. |
| Medium | Congested junctions, shops/businesses, areas of heavy pedestrian / cycling use, areas of ecological/nature conservation, residential properties close to carriageway. |
| Low | Tourist/visitor sites, places of worship, residential areas set back from the highway with screening. |
| Negligible | Those people and places located away from the affected highway link. |

The link sensitivity will be based upon an average sensitivity of the whole link with a separate assessment of high/very high receptors. Some links will be broken down into sensible sections where appropriate e.g. between two main junctions or villages.

### 13.8. Magnitude of Change

General criteria for defining the magnitude of an impact are set out in Table 13-3. Key factors influencing this include:

- The physical or geographical scale of the impact, (note that this will be relative to the scale of the receptor or resource affected);
- The duration of the impact - will it be short term, lasting for a few days or weeks, or long term, lasting for several years;
- The frequency of the impact - will it occur hourly, daily, monthly or will it be permanent lasting for the duration of the proposed Project; and
- The reversibility of the effect - can it be reversed following completion of construction of the proposed Project.

*Table 13-3. Impact magnitude definitions (Traffic and Transport)*

| Magnitude | Description |
|---|---|
| High | Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed. |

| Magnitude | Description |
|---|---|
| Medium | Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed. |
| Low | Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline condition will be similar to the pre-development situation. |
| Negligible | Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation. |

Information provided in Table 13-4 expands on the information from Table 13-3 and shows further details of the individual aspects of the assessment and the thresholds to be applied for each.

*Table 13-4. Impact magnitude criteria (Traffic and Transport)*

| Magnitude | Description | Illustrative Change |
|---|---|---|
| High | HGV Construction Traffic | High number of construction vehicles using roads over a protracted period of time. More than a 40% increase for more than 6 months. |
| | Pedestrians/Cyclists delay | As a result of construction related activities, Limited or no facilities for pedestrians and cyclists with limited crossing facilities and low-quality linkages to the local facilities. |
| | Severance | Increase in total traffic flows of 90% and above (or increase in HGV flows over 10% based on the sensitivity of the receptors). |
| | Road Safety | High increase in traffic at known collision locations. |
| Medium | HGV Construction Traffic | Moderate number of construction vehicles using roads over a protracted time period.<br>16-39% increase for more than 6 months; or<br>More than 40% increase for 3-6 months |
| | Pedestrians/Cyclists | As a result of construction related activities, Few facilities for pedestrians and cyclists with limited crossing facilities and linkages to the local facilities. |
| | Severance | Increase in total traffic flows of 60-89% (or increase in HGV flows over 10% based on the sensitivity of the receptors). |
| | Road Safety | Moderate increase in traffic at known collision locations. |

| Magnitude | Description | Illustrative Change |
|---|---|---|
| Low | HGV Construction Traffic | Small number of construction vehicles using roads over a short period of time.<br>6-15% increase for more than 6 months;<br>31-39% for 3-6 months; or<br>>40% increase for less than 3 months. |
| | Pedestrians/Cyclists | Despite construction related activities, Facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities. |
| | Severance | Increase in total traffic flows of 30-59% (or increase in HGV flows over 10% based on the sensitivity of the receptors). |
| | Road Safety | Minor increase in traffic at known collision locations. |
| Negligible | HGV Construction Traffic | Occasional construction vehicles using roads over a short period of time.<br>Less than 5% Increase for more than 6 months; or<br>Between 6-30% increase for 3- 6 months; or<br>Between 31-40% for less than 3 months. |
| | Pedestrians/Cyclists | Despite construction related activities, Dedicated facilities for pedestrians and cyclists with safe and convenient crossing facilities and good linkages to the local facilities. |
| | Severance | Increase in total traffic flows of 29% or under (or increase in HGV flows under 10%). |
| | Road Safety | Negligible increase in traffic at known collision locations. |

## 13.9. Significance of Effect

The significance of environmental effect is typically a function of the sensitivity of a receptor and the magnitude of an impact. An indicative matrix for the determination of significance is provided in Table 13-5. Effects predicted to be 'major' or 'moderate' are considered significant whilst effects predicted to be 'minor' or 'neutral' are considered not significant.

*Table 13-5. Significance of effects matrix*

| | | Magnitude of Change | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Medium | High |
| Sensitivity of Receptor | Very High | Negligible/ Minor | Moderate | Major | Major |
| | High | Negligible/ Minor | Moderate | Major | Major |
| | Medium | Negligible | Minor | Moderate | Major |
| | Low | **Negligible** | **Negligible** | **Minor** | **Moderate** |
| | Negligible | **Negligible** | **Negligible** | **Negligible** | **Negligible/ Minor** |

### 13.10. Embedded and Good Practice Measures

The development of potential mitigation options will be an iterative process, developed as the proposed Project's final design is confirmed and as further assessments are undertaken to understand the significance of impact on local communities, pedestrians and other road users.

Options such as scheduling work around busy times of year, to avoid coinciding with visitor traffic, and busy times of the day to avoid school times; utilising construction techniques to reduce the need for road closures; and the development of Construction Traffic Management Plan, are likely to be adopted.

Based on the potential for significant effects generated by the proposed Project on traffic and transport, it is not likely that mitigation will be required to reduce the predicted impacts.

Design mitigation and enhancement measures including travel planning and HGV management will be incorporated into the Construction Environmental Management Plan.

Programming of HGV movements will be subject to restricted periods of the day and working week. It is envisaged that such periods could be restricted to 08:30-16:00 Monday to Friday and 09:00-13:00 Saturday with no working on Sundays or Public Bank Holidays.

Other minor highway improvements could potentially be carried out in sensitive locations in order to reduce the impact of the construction traffic.

The assessment of routes from the Welsh Trunk Road network to individual construction compounds and sites will determine the feasibility of routes and where mitigation works are required. The impact of construction activities, particularly the cable routing will be assessed to determine whether traffic light-controlled shuttle working, or full road closure is required on the local highway network, dependant on the location of the cable route.

It is anticipated that all mitigation required will be set out within the outline designs where required for route improvements between the trunk road network and compounds and any compound access junctions.

Swept path analysis will be presented to support these designs. Temporary diversion or other mitigation measures for footpaths and cycle paths will be proposed where necessary.

## 13.11. Likely Significant Effects

### *13.11.1. Construction Phase*

Potential effects relevant to traffic and transport are presented in Table 13-6

*Table 13-6. Potential effects – Traffic and Transport*

| Topic | Project Phase | Rationale |
|---|---|---|
| Temporary increases in traffic flows. | Construction | During construction there will be temporary increases in traffic flows on the road network that will be used by construction vehicles to access the onshore substation / control building and cable route site compounds. The network of roads affected will be relatively limited as described in Section 13.2, plus any wider routes that could potentially be used to deliver construction equipment.<br>Other aspects of the construction phase could lead to a significant effect, such as:<br>• Significant severance to communities caused by a large increase in traffic for a longer period;<br>• Increased risk of road traffic accidents caused by a large increase in traffic for a longer period;<br>• Temporary road closures, diversions and widening; and<br>• Construction traffic using temporary bell mouths and site entrances for access to construction areas; and<br>• Temporary closures or diversions of Public Rights of Way and other public access routes. |
| Operational traffic. | Operation | It is anticipated that the operational traffic will be discounted from the assessment as this is likely to be negligible and associated with periodic maintenance. |
| Decommissioning phase | Decommissioning | It is anticipated that the decommissioning of the facility will follow a similar process to construction but in reverse and therefore the identified impacts of construction are likely to be replicated during decommissioning and as such will be covered within the assessment. |

## 13.12. Conclusion

This chapter of the Scoping Report sets out the traffic and transport assessment methodology and discusses potential mitigation measures to reduce any significant effects of the proposed Project during the construction period. The assessment will be undertaken within the IEA guidelines.

Subject to the results of the desk based assessment, there may be an additional requirement for field surveys. It is anticipated that ATCs will be undertaken during a neutral month during 2022 and will provide two-way traffic flows and be classified by vehicle type along the anticipated construction routes serving the proposed Project screening boundary. These will provide the baseline for the assessment and are still yet to be determined until further information is available on the location of landfall and the predicted cable route.

The ATCs will be used to derive AADT for individual links, subdivided into 24 hour and 18 hour counts for total traffic and HGVs as part of the assessment to be included within the ES.

As part of the ES, the trip distribution of workers will also be included travelling to and from the proposed substation / control building and converter station site and the construction compounds along the cable alignment each day. This will be achieved by development of a simple gravity model. Construction traffic associated with the proposed Project will be distributed onto the local highway network to calculate the resultant percentage increase on each link.

It is anticipated that the operational traffic phase will be scoped out and not included in the ES.

Furthermore, to reduce the potential for significant effects generated by the proposed Project on traffic and transport, a number of mitigation measures have been built into the design including a CTMP. Detailed mitigation measure descriptions will be provided within the ES.

### 13.13. References

Department for Transport, 2020. *TAG unit M1-2 data sources and surveys.* [Online]. Available at: https://www.gov.uk/government/publications/webtag-tag-unit-m1-2-data-sources-and-surveys [Accessed: 11 February 2022].

Institute of Environmental Assessment, 1993. *Guidelines for Environmental Assessment of Road Traffic.*

Pembrokeshire County Council Local Development Plan, 2013. *Pembrokeshire County Council Local Development Plan: Planning Pembrokeshire's Future*. [Online]. Available at: https://www.pembrokeshire.gov.uk/local-development-plan [Accessed: 11 February 2022].

Pembrokeshire Coast National Park Authority, 2021. *Pembrokeshire Coast National Park Local Development Plan 2*. [Online]. Available at: https://www.pembrokeshirecoast.wales/wp-content/uploads/2020/09/LDP-Text-for-Adoption.pdf [Accessed: 11 February 2022].

Welsh Government, 2021. *Planning Policy Wales*. [Online]. Available at: https://gov.wales/planning-policy-wales [Accessed: 11 February 2022].

Welsh Government, 2007. *Technical Advice Note 18: Transport*. [Online]. Available at: https://gov.wales/technical-advice-note-tan-18-transport [Accessed: 11 February 2022].

## 14. AVIATION AND RADAR

### 14.1. Introduction

The aviation and radar assessment will consider the potentially significant effects on aviation and radar receptors that may arise from the construction and operation (including maintenance and repair) of the proposed Project. This chapter of the Scoping Report describes the methodology to be used within the assessment, the datasets to be used to inform the assessment, an overview of the baseline conditions, the likely significant effects to be considered within the assessment, and how these likely significant effects will be assessed for the purpose of an EIA.

## 14.2. Regulatory and Planning Policy Context

The aviation and radar assessment will be prepared in consultation with the Ministry of Defence (MoD), Civil Aviation Authority, National Air Traffic Services (NATS) and the Haverfordwest and Swansea Aerodromes. The assessment will identify the potential effects on civil and military aerodromes, aviation technical sites and other defence assets and identify mitigation measures, as appropriate, to minimise adverse impacts on the operation and safety of aerodromes.

## 14.3. Study Area

The extent of the Study Area for the assessment of impacts on aviation and radar is set out in Figure 14-1, encompassing the Array Area Scoping Boundary. Identified aviation and radar receptors are included to illustrate any potential interactions with the 54 air-ground-air communication stations, 55 navigation aids and 20 secondary surveillance radars operated by NATS En Route plc (NERL) in the UK (NATS, 2022a).

## 14.4. Baseline

Information on the location and type of aviation and radar receptors that may be impacted by the proposed Project has been collated from NATS and MoD sources.

### *14.4.1. Airports*

The closest commercial airport to the proposed Project is Newquay, approximately 95 km south of the Study Area. Other commercial airports are located at Bristol (approximately 170 km east of the Study Area), Exeter (approximately 135 km south-east of the Study Area) and Cardiff (approximately 130 km east of the Study Area). Aerodromes that support light aircraft traffic also exist at Haverfordwest (approximately 48 km north of the Study Area) and Swansea (approximately 68 km east of the Study Area).

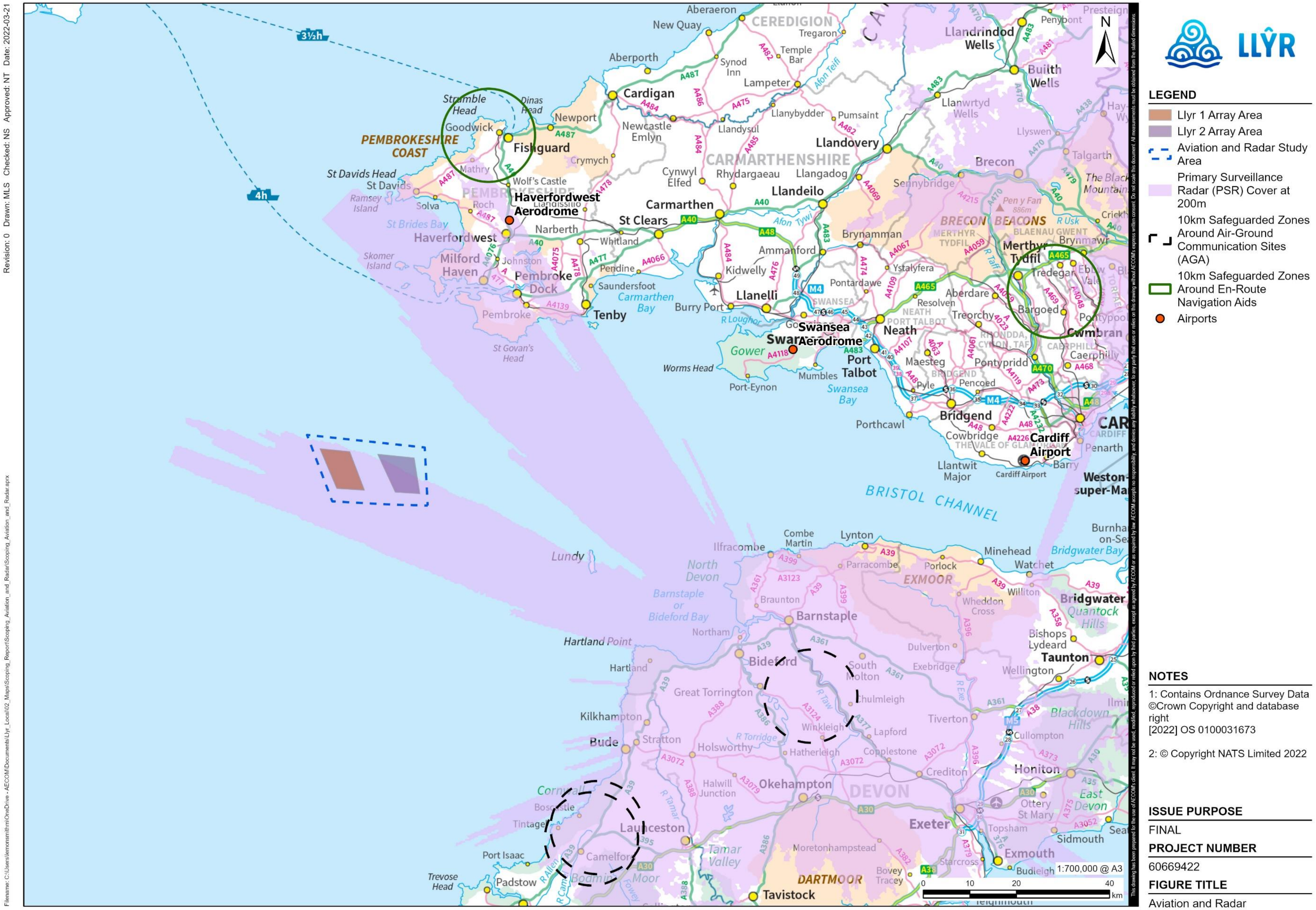


*Figure 14-1. Aviation and radar Study Area*

### 14.4.2. Military Airfields

The closest operational Royal Air Force (RAF) base to the Study Area is MoD St Athan in the Vale of Glamorgan (approximately 135 km east of the Study Area). MoD St Athan is home to a training facility for personnel and MoD civilian staff, along with the University of Wales Air Squadron.

RAF Valley, on Anglesey, is located approximately 205 km north of the Study Area. RAF Valley is home to a fighter pilot training facility and the Mountain Rescue Service, an all-weather search and rescue asset for aircraft post-crash management. Whilst these RAF stations are more than 100 km from the Study Area, aircraft operating from these bases may transit through the airspace above the Array Area Scoping Boundary, where the wind turbines will be located.

### 14.4.3. International Air Traffic Services

International commercial flights are controlled by national air traffic control (ATC) centres who control their respective Flight Information Regions (FIR). The London FIR covers England and Wales, including the Array Area Scoping Boundary. The London FIR is split into UK Airspace Sectors, two of which cross the Study Area along their boundary (Brecon and Berryhead) (NATS, 2022b).

The UK Civil Aviation Authority is the regulatory authority for the London FIR and NERL provide air traffic services. NERL has extensive infrastructure across the UK to ensure that aircrafts fly safely and efficiently; comprising of radars, communication systems and navigational aids.

### 14.4.4. Primary and Secondary Surveillance Radars

There are three primary surveillance radars (PSRs) in the wider region, all located in North Devon (including Hartland Point PSR), which provide en-route services to civil and military aircraft. There is also an important aviation navigation beacon located at Strumble Head, north Pembrokeshire. The maximum tip height for the proposed Project wind turbines is up to 290 m, which is likely to be within the line of sight of the PSRs operated or used by NERL. Further consultation will be undertaken with NATS to establish the potential for adverse impacts on PSRs and any mitigation measures that may be required.

NATS advises that effects of wind turbines on secondary surveillance radars (SSRs) are only relevant within 10 km of the SSR. As shown on Figure 14-1, the Study Area lies outside the area of interaction with any SSR.

### 14.4.5. Aviation Navigational Aids and Communication Systems

Installation and operation of the proposed offshore floating wind turbines has the potential to impact a wide range of aviation navigation aids and communication systems, including air-ground communications facilities. The Project will adhere to guidance issued by the UK Civil Aviation Authority (2019).

### 14.4.6. Offshore Helicopter Operations

Unlike locations in other parts of the UK, where there are oil and gas facilities that require regular crew transfers, commercial offshore helicopter operations in this region are limited to Search and Rescue (SAR) operations. The closest SAR helicopter bases to the Study Area are St Athan (Vale of Glamorgan) and Newquay (Cornwall). SAR operations often involve flying at less than 1,500 ft (457 m). Assessment of potential impacts on SAR operations will be assessed within the Navigation Risk Assessment and will adhere to guidance set out in MGN 654 (Maritime and Coastguard Agency, 2021).

#### *14.4.7. MoD Flying Areas*

The Offshore Cable Scoping Boundary is located approximately 3 km outside the MoD Castlemartin Firing Range practice area. The Array Area Scoping Boundary is within a low priority military low flying training area.

### 14.5. Embedded and Good Practice Measures

Mitigation measures will be discussed and agreed with relevant stakeholders at the earliest opportunity. Proposed mitigation will adhere to the guidance documents listed above, and may include the use of aviation warning lighting and the marking of wind turbines on aeronautical and nautical charts (as required by navigational and aviation safety requirements, including the Air Navigation Order 2016, as amended). Other offshore windfarms in the UK have mitigated impacts using technologies that remove clutter (the Non-Auto Initiation Zone) from radar signal.

### 14.6. Likely Significant Effects

Table 14-1 outlines the potential impacts of the Project on aviation and radar receptors. All impacts are relevant to the construction, operation and decommissioning phases.

*Table 14-1. Potential impacts of the Project on aviation and radar*

| Receptor | Potential Impacts | Scoped Into ES? | Rationale for Scoping In / Out |
|---|---|---|---|
| All aircraft | Increased collision risk due to offshore wind infrastructure. | Yes | Risk of collision due to interference with radar and communications systems. |
| Primary Surveillance Radars | Physical obstruction of wind turbines; the generation of unwanted returns (returns that are not aircraft) to radar; interference. | Yes | Risk of collision due to interference with radar. |
| Secondary Surveillance Radars | | No | The Project are outside the area of interaction with any SSR. |
| Aeronautical navigation aids and communication systems | Risk of interference with radio communication between Air Traffic Controllers and aircraft under their control. | Yes | Risk of aircraft collision due to interference with communications systems. |
| Offshore helicopter operations (SAR) | Risk of interaction between SAR helicopter service and offshore wind infrastructure. | Yes | Offshore SAR helicopter operations could be adversely affected by the operation of the wind turbines. |
| MoD Flying Areas | Risk of interaction between MoD areas and offshore wind infrastructure. | No | The Project are located outside any high risk areas. |

### 14.7. Assessment Methodology

Consultation with NATS and the MoD will be undertaken as soon as possible to undertake a pre-planning assessment. The assessment will determine the scope for the proposed Project to raise concerns from NATS and airport authorities, the two main aviation stakeholders.

At many UK airports, NATS provides ATC and select safeguarding services. It is often the ATC provider who delivers technical and operational advice on offshore wind applications, however, the airport authority will make the ultimate decision.

The following assessments will be required:

- Airport Technical: This will assess the radar line of sight to determine whether or not the proposed Project are likely to produce returns on any radars. It will also assess the potential impact on communications and navigation equipment;
- Operational: This will take the results of the technical assessment and pass them to the operational units that use the assets. The unit assessors will then decide if the Project might have an impact on the specific operational criteria in place at that unit;
- Obstacle Limitation Surface assessment: This examines the physical safeguarding of any local airport and the protection of various surfaces. In general, the Obstacle Limitation Surface assessment considers surfaces up to 15 km from a runway. It is designed to ensure that obstacles do not prevent normal airport operations; and
- Instrument Flight Procedures and ATC Surveillance Minimum Altitude Chart: This assessment will check the effect that obstacles might have on the Instrument Flight Procedures and the minimum levels that can be allocated under radar control at the airport.

Once key potential impacts are identified, they will be assessed using the standard EIA matrix set out in Volume 1, Chapter 5.

No project-specific surveys are proposed with respect to aviation and radar.

### 14.8. Conclusion

There is potential for the Project to result in adverse effects on aircraft, primary surveillance radars, aeronautical navigation aids and communication systems and offshore search and rescue helicopter operations. Consultation with NATS and any other relevant aviation and radar stakeholders will be undertaken as soon as possible.

The aviation and radar assessment will assess the radar line of sight, identify any potential impact on communications and navigation equipment, determine the operational implications on identified aviation and radar receptors, examine the physical safeguarding of relevant receptors and confirm the potential effects of the Project on instrument flight procedures. The results will be documented in the ES.

### 14.9. References

Maritime and Coastguard Agency, 2021. *MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response.* [Online]. Available at: https://www.gov.uk/government/publications/mgn-654-mf-offshore-renewable-energy-installations-orei-safety-response [Accessed: 21 February 2022].

NATS, 2022a. *Self-assessment Maps.* [Online]. Available at: https://www.nats.aero/services-products/catalogue/n/wind-farms-self-assessment-maps/ [Accessed: 15 February 2022].

NATS, 2022b. *Introduction to Airspace.* [Online]. Available at: https://www.nats.aero/ae-home/introduction-to-airspace/ [Accessed: 15 February 2022].

UK Civil Aviation Authority, 2019. *Air Traffic Services Safety Requirements, CAP 670*. [Online]. Available at: https://publicapps.caa.co.uk/docs/33/CAP670%20Issue3%20Am%201%202019(p).pdf [Accessed: 21 February 2022].

# 15. AIR QUALITY

## 15.1. Introduction

This chapter sets out the proposed scope of the environmental assessment for air quality, which will consider the potential for effects on human and ecological receptors that may arise from the proposed Project.

## 15.2. Regulatory and Planning Policy Context

### *15.2.1. Legislation*

A summary of the relevant legislation is given in Table 15-1. Table 15-2 provides the Air Quality Standards (AQS) and Air Quality Objectives (AQO) relevant to this assessment

*Table 15-1. Legislation relevant to air quality*

| Legislation | Legislation Context |
|---|---|
| The Environment Act 1995 (UK Government, 1995) | The Environment Act 1995 and subsequent amendments relates to a wide range of environmental issues. The Act covers the control of pollution and lays out the responsibility of the governing bodies in the UK responsible for the enforcement of environmental laws. |
| The Air Quality Regulations 2000, United Kingdom (UK Government, 2000) | Part IV of the Environment Act 1995 requires that Local Authorities periodically review air quality within their individual areas. This process of Local Air Quality Management (LAQM) is an integral part of delivering the Government's Air Quality Objectives (AQOs). |
| The 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (DEFRA, 2007) | Provides UK Air Quality Objectives (AQOs) for a range of different pollutants, unlike Air Quality Standards, there is no statutory obligation to meet AQOs; AQOs are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, over a specified averaging period. |
| The Air Quality Standards (Wales) Regulations 2010 (Statutory Instrument (SI) 2010/1443 (National Assembly for Wales, 2010) | The Environment Act 1995 required the adoption of an Air Quality Strategy containing standards, objectives and measures for improving ambient air quality. |
| The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764) (UK Government, 2018) | The 2007 Air Quality Strategy is designed to meet that requirement and provides a framework for improving air quality at a national and local level and supersedes the previous strategy published in 2000. It imposes a number of obligations on local authorities to manage air quality. |

*Table 15-2. Relevant air quality standards and objectives*

| Pollutant | Averaging Period | Value (µg/m3) |
|---|---|---|
| $NO_2$ | Annual mean | 40 |
| | 1-hour mean (not to be exceeded more than 18 times per year) | 200 |
| $PM_{10}$ | Annual mean | 40 |
| | 24-hour mean (not to be exceeded more than 35 times per year) | 50 |

| Pollutant | Averaging Period | Value (µg/m3) |
|---|---|---|
| $PM_{2.5}$ | Annual mean | 25 |

### *15.2.2. Planning Policy*

A summary of the relevant planning policy is given in Table 15-3.

*Table 15-3. Planning policy relevant to air quality*

| Policy Reference | Policy Context |
|---|---|
| National Policy | |
| Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011) | Paragraph 5.2.6 in Section 5.2 Air Quality and Emissions states<br><br>*"Where a project is likely to have adverse effects on air quality, an assessment of such impacts must be considered in the Environmental Statement."*<br><br>Paragraph 5.2.7 further states that the ES should describe:<br>*"any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*<br>*the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;*<br>*existing air quality levels and the relative change in air quality from existing levels; and any potential eutrophication impacts."* |
| Planning Policy Wales (Welsh Government, 2021) | Section 6.7 of the Policy document considers air quality:<br>*"The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should*<br>*consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so."*<br>*"the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments"*<br><br>The assessment will carefully consider the potential impact of the Project and establish whether it might constitute an obstacle to the achievement of strategic objectives that are set out within the air |

| Policy Reference | Policy Context |
|---|---|
| | quality action plans of administrative authorities to bring about improvements in air quality within their areas. |
| Clean Air Strategy 2019 (UK Government, 2017) | Defra's Clean Air Strategy outlines the Government's proposed ambitions relating to reducing air pollution in order to protect health and nature, whilst boosting the economy. The strategy sits alongside three other UK government strategies: the Industrial Strategy, the Clean Growth Strategy and the 25 Year Environment Plan. Amongst others, the Clean Air Strategy proposes to halve the number of people living in locations where concentrations of particulate matter are above the World Health Organization (WHO) guideline limit of 10 $\mu g/m^3$ by 2025 and work in close collaboration with industry to explore further opportunities for industrial emissions reductions by developing a series of sector roadmaps to set standards aimed at making UK industry world leaders in clean technology.<br>The Project will not conflict with Government's aims of reducing exposure to $PM_{2.5}$ below the WHO guideline as appropriate mitigation will be implemented where necessary. |
| **Local Policies** | |
| Pembrokeshire Local Development Plan (LDP) 2013 (Pembrokeshire County Council, 2013) | The Pembrokeshire Local Development Plan was adopted in 2013 by PCC. Policy Chapter 6 states that:<br>*"Development will be permitted where the following criteria are met:*<br>*It would not result in a significant detrimental impact on local amenity in terms of visual impact, loss of light or privacy, odours, smoke, fumes, dust, air quality or an increase in noise or vibration levels."* |

### *15.2.3. Technical Guidance*

A summary of relevant technical guidance is provided in Table 15-4.

*Table 15-4. Technical guidance relevant to air quality*

| Technical Guidance Document | Context |
|---|---|
| Defra Local Air Quality Management (LAQM) Technical Guidance LAQM.TG16 (DEFRA, 2018) | Provides guidance for governmental and private sectors to discharge their obligations under the LAQM regime. It contains guidance on numerous areas including, for example, screening tools and methodologies, air quality monitoring, estimating emissions and dispersion modelling. |
| Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction v1.1 (2016) (IAQM, 2014) | Provides a four-step process for evaluating the risk associated with dust emissions from construction and demolition sites on different types of receptor with respect to dust soiling, health effects and ecological effects. |

| Technical Guidance Document | Context |
|---|---|
| Environmental Protection UK & IAQM Land-Use Planning and Development Control: Planning for Air Quality (2017) (IAQM, 2017) | Provides guidance for governmental and private sectors to discharge their obligations under the LAQM regime. It contains guidance on numerous areas including, for example, screening tools and methodologies, air quality monitoring, estimating emissions and dispersion modelling. |
| IAQM Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites v.1.1 (2020) (IAQM, 2019) | Provides guidance on the air quality impacts of development on designated nature conservation sites but establishes that the assessment of the effects that air quality impacts may have on habitats and species should be the responsibility of a suitability qualified and experienced ecologist. |
| Highways England Design Manual for Roads and Bridges (DMRB) LA 105 (Highways England, 2019) | Highways England Design Manual for Roads and Bridges (DMRB) LA 105 |

## 15.3. Study Area

The methodological approach to defining the spatial extent of the onshore Study Area for air quality has been informed by Institute of Air Quality Management (IAQM) (2014, 2017 and 2019) guidance documents (IAQM, 2014, IAQM, 2017, IAQM, 2019). These guidance documents will be used in the screening process to consider for the requirement to undertake a detailed air quality modelling assessment and to inform the construction dust assessment.

Construction activities associated with the Project will include construction of the substation / control building, trench works associated with underground cabling and access road construction, as appropriate.

The following Study Areas will be used where an assessment of dust emissions produced by construction activities is required:

- A human receptor within:
    - 350 m of the construction works boundary; or
    - 50 m of site access points (in relation to trackout); and
    - Vehicles on the public highway, up to 500 m from the site entrance(s).
- An ecological receptor within:
    - 50 m of the construction works boundary; or
    - 50 m of the route(s) used by construction vehicles; and
    - On the public highway, up to 500 m from the site entrance(s).

As the design and consultation processes progress and the Project is refined, the exact geographical scope of Study Areas may continue to evolve to accommodate any changes. To overcome this, the construction boundary will be used to define the Study Area.

## 15.4. Baseline

The study is desktop based and uses publicly available monitored pollution data collected by Pembrokeshire County Council (PCC) (Pembrokeshire County Council, 2020).

### *15.4.1. Air Quality Management*

In the commercial main street areas of Haverfordwest and Pembroke, PCC has declared statutory Air Quality Management Areas (AQMAs) for exceedances of the annual mean nitrogen dioxide ($NO_2$)

objective. Road traffic is the principal contributor of emissions, as both the locations are subject to the “canyon effect”, where are high sided buildings on either side of a narrow road results in a low available dispersion of the local air. The Haverfordwest AQMA is located over 8 km northeast of the air quality Study Area and is not anticipated to be affected by the development. The Pembroke AQMA has been declared for a stretch of the A413 within Pembroke town centre, and this is within the current extent of the Air Quality Study Area.

### *15.4.2. Air Quality Monitoring*

Under the Local Air Quality Management (LAQM) regime, PCC carries out air quality monitoring. The methods employed for monitoring include passive diffusion tubes, active samplers and real-time automatic analysers. The nearest automatic air quality monitor is located at Narbeth and is operated by Defra as part of the Automatic Urban and Rural Network (AURN). It is located approximately 17 km northeast of the Air Quality Study Area.

The 2020 Progress Report (Pembrokeshire County Council, 2020), which is the latest publicly available Local Air Quality Management report for PCC, states that diffusion tube monitoring is undertaken where there are concerns over public exposure to pollutants from road vehicles. The monitoring is mainly focused around Haverfordwest and Pembroke. As Pembroke is located within the Air Quality Study Area, the monitoring data from this area were evaluated to provide an overview of air quality. Monitoring data for 2015 – 19 are detailed in Table 15-5.

*Table 15-5. Pembroke air quality monitoring data 2015-2019*

| Tube Location ID | Annual Mean $NO_2$ level (µg/m3) | | | | | |
|---|---|---|---|---|---|---|
| | AQMA | 2015 | 2016 | 2017 | 2018 | 2019 |
| PCC40 (Main St Pembroke) | Yes | 20.2 | 20.1 | 20.5 | 20.7 | 21 |
| PCC41 (Main St Pembroke) | Yes | 22.7 | 23.4 | 23.8 | 24.4 | 24.5 |
| PCC42 (Main St Pembroke) | Yes | 23 | 20.6 | 19.4 | 19.7 | 22.1 |
| PCC43 (Main St Pembroke) | Yes | 29.3 | 31.5 | 31.9 | 31.7 | 32.5 |
| PCC44 (Main St Pembroke) | Yes | 33.7 | 33.7 | 33.3 | 36.4 | 35.4 |
| PCC45 (Main St Pembroke) | Yes | 37.3 | **40.5** | 38.2 | **41.2** | 39.3 |

| Tube Location ID | AQMA | Annual Mean $NO_2$ level (µg/m3) 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| PCC47 (Main St Pembroke) | Yes | 22.4 | 24.3 | 24.8 | 23.6 | 23.9 |
| PCC48 (Main St Pembroke) | Yes | 13 | 13 | 12.5 | 12.1 | 12.6 |

Generally, annual mean concentrations of $NO_2$ within Pembroke were below the annual mean Air Quality Objective (AQO) of 40 µg/m$^3$, between 2015 and 2019. There were slight exceedances of the AQO at 1 roadside diffusion tube location within the AQMA in 2016 and 2018. Since 2019, annual mean $NO_2$ concentrations have been below the AQO.

There is 1 currently operational automatic $NO_2$ monitor within 10 km of the Air Quality Study Area, situated at Narbeth. There were no exceedances of the AQOs for $NO_2$ at this monitoring location. $PM_{10}$ and $PM_{2.5}$ is also monitored at Narbeth. There were no exceedances of the annual mean and 24-hour AQOs for $PM_{10}$ or the annual mean AQO for $PM_{2.5}$ at this monitoring location. The greatest $PM_{10}$ annual mean concentration recorded at Narbeth was in 2015, 2016 and 2018 at 12 µg/m$^3$. There were no exceedances of the daily mean of 50 µg/m$^3$ against the short-term AQO of 35 exceedances.

The UK-AIR website provides data for background concentrations of $NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ (DEFRA, 2022). These background concentrations represent 1 km$^2$ grid squares. As expected for all pollutants, background concentrations in the Study Area are low, due to the predominantly rural nature of the area, when compared to larger urban centres.

#### *15.4.3. Dust deposition*

A background level of dust exists in all urban and rural locations in the UK. Dust can be generated on a local scale from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity. The concentrations of dust can vary depending on a range of parameters, such as meteorological conditions and time of year.

Ambient dust deposition rates are not monitored extensively in the UK. Monitoring that is undertaken is usually connected with specific activities such as mining and mineral extraction operations or specific large-scale construction programmes. Dust monitoring may also be undertaken to investigate specific complaints received by local authorities, who are then required to investigate dust nuisance under the Environmental Protection Act 1990 (UK Government, 1990). Therefore, there is not any baseline information for dust deposition available in the Study Area.

### 15.5. Embedded and Good Practice Measures

All onshore construction and decommissioning works will adhere to best practice and industry guidance to reduce the potential impacts to air quality. Furthermore, where possible, the proposed Project will minimise vehicle movement during the construction and decommissioning phases and avoid sensitive ecological receptors.

## 15.6. Likely Significant Effects

The key air quality constraints that will require attention within the ES are set out in Table 15-6.

*Table 15-6. Potential air quality constraints*

| Topic | Project Phase | Rationale |
|---|---|---|
| Dust. | Construction | Construction dust associated with the construction of the cable route and associated construction compounds. |
| Vehicle emissions. | Construction | Vehicle emissions associated with the movement of construction materials, particularly on the approach to and from construction compounds, where the number of vehicle movements are likely to be greatest. |
| Plant emissions. | Construction | Plant emissions from construction phase site plant, energy generation plant, and non-road mobile machinery. |
| Construction traffic movements. | Construction | It is not expected that there will be any significant adverse effects on local air quality as a result of construction traffic movements associated with the Project, therefore it is proposed to scope out a consideration of road traffic from the main ES. This will be confirmed by review of construction traffic in relation to potentially sensitive receptors and sensitive areas (as determined by local authority monitoring data) when it is made available, then agreed with the relevant local authorities as necessary. |

The above subjects will be assessed in the ES, using a qualitative methodology and the assessment will recommend the level of control measures required to mitigate impacts to the extent that any effect would be not significant.

## 15.7. Assessment Methodology

The Air Quality Study Area shows that the route alignment currently avoids passing in close proximity to the more densely populated communities and conservation sites in the area. Inevitably, however, there are some dust and air quality sensitive receptors close enough to the Onshore Scoping Boundary that could be adversely impacted by the construction works.

An assessment of construction phase dust and particle matter ($PM_{10}$) emissions will be undertaken in line with the appropriate Institute of Air Quality Management dust from demolition and construction guidance. The assessment will identify the likelihood of dust and $PM_{10}$ impacts occurring, based on the scale of the works and the activities to be undertaken, and the sensitivity of the area to dust and $PM_{10}$ impacts, based on the number and proximity of sensitive receptors (including those susceptible to amenity, human health and ecological impacts) and baseline $PM_{10}$ concentrations. From this work, the assessment will recommend the level of dust control measures required to mitigate impacts to the extent that any effect would be not significant.

The same guidance will also be referred to for the consideration of site plant and Non-Road Mobile Machinery (NRMM) emissions, which will be dealt with in a qualitative manner based on the number of plant, the likely duration of their operation at any one area, the number and proximity of sensitive receptors and the baseline pollutant concentrations experienced there.

At this time, specific information about construction vehicle movements is not available. However, based on professional judgement of similar infrastructure projects, as well as liaison with the transport specialists for the Project, it is considered unlikely that a detailed air quality assessment will be required based on the screening criteria provided by IAQM and shown in Table 15-7.

*Table 15-7. Screening criteria for detailed air quality assessment of road traffic emissions*

| Nature of Impact | Screening criteria for Detailed Air Quality Assessment |
|---|---|
| Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors (LDV = cars and small vans <3.5t gross vehicle weight). | A change of LDV flows of: more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; or more than 500 AADT elsewhere. |
| Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight). | A change of HDV flows of: more than 25 AADT within or adjacent to an AQMA; or more than 100 AADT elsewhere. |
| Realign roads, i.e. changing the proximity of receptors to traffic lanes. | Where the change is 5m or more and the road is within an AQMA. |
| Introduce a new junction or remove an existing junction near to relevant receptors. | The introduction of a new junction or removal of a junction will lead to a detailed air quality assessment when this addition or removal causes traffic to significantly change vehicle acceleration or deceleration, for example, traffic lights, or roundabouts. |
| Introduce or change a bus station. | Where bus flows will change by: more than 25 AADT within or adjacent to an AQMA; or more than 100 AADT elsewhere. |

Note: Taken from IAQM guidance Land-Use Planning and Development Control: Planning for Air Quality (IAQM, 2017)

With regard to sensitive ecological receptors, screening criteria provided by DMRB of a change in AADT flows of 1,000 vehicles or 200 HDV, when considered in-combination with other committed proposed developments in the vicinity may mean a detailed assessment is required.

Subject to confirmation that construction traffic volumes will not exceed the threshold for detailed air quality assessment using dispersion modelling no further assessment will be undertaken. Should it be determined a detailed air quality assessment is required, incremental changes to concentrations of $NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ associated with construction phase road traffic movements will be predicted at receptors within 200 m of affected roads using the ADMS-Roads dispersion model and the latest emission factors from Defra’s Emissions Factor Toolkit (EFT) that are available at the time of the assessment. The output from the model will be verified using the results from roadside diffusion tube monitoring, either undertaken by local authorities in the vicinity of the Project, or through a programme of project specific monitoring.

It is not expected any further assessment will be required in terms of air quality based on the information available at the scoping stage, knowledge of similar projects and professional judgement. During operation (including maintenance and repair activities), emissions would be restricted to those associated with road traffic movements during occasional inspection and maintenance activities. Similarly, it is not expected that decommissioning would require vehicle movements of a scale sufficient to trigger a detailed air quality assessment as set out in Table 15-6, or large-scale earthworks or demolition.

## 15.8. Conclusion

Existing air quality within the Air Quality Study Area is generally of a good standard, with pollutant concentrations well within the limit values set for the protection of human health. There were slight exceedances of the AQO for annual mean $NO_2$ at 1 roadside diffusion tube location within the Pembroke AQMA in 2016 and 2018, however it is remote from the construction route and it is not known at the current time if any construction traffic would be routed through this area. Since 2019, annual mean $NO_2$ concentrations have been below the AQO.

Much of the land within and around the construction route is rural in nature and the alignment currently avoids close proximity to the more densely populated communities and conservation sites in the area. Inevitably, however, there are some dust and air quality sensitive receptors close enough to the Onshore Scoping Boundary that could be adversely impacted by the construction of the Project.

The key air quality constraints that will require attention within the ES are:

- Construction dust associated with the construction of the cable route and associated construction compounds.
- Vehicle emissions associated with the movement of construction materials, particularly on the approach to and from construction compounds, where the number of vehicle movements are likely to be greatest.

Plant emissions from construction phase site plant, energy generation plant, and non-road mobile machinery.

The above subjects will be assessed in the ES, using a qualitative methodology and the assessment will recommend the level of control measures required to mitigate impacts to the extent that any effect would be not significant.

The effects scoped out from further assessment in the ES are:

- Effects of pollutant emissions from road-going construction vehicles on both human and ecological receptors, as based on professional judgement and previous experience, it is unlikely that screening criteria in the IAQM's Land-Use Planning & Development Control: Planning for Air Quality will be met;
- All effects relating to operation of the Project, as emissions during this phase would be restricted to occasional maintenance activities with little traffic generated; and
- All effects related to decommissioning.

## 15.9. References


Department for Environment Food and Rural Affairs (Defra), 2007. *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.* London: The Stationary Office, 2007.

Defra, 2018. *Air Quality Management Technical Guidance (TG16).*

Defra, 2022. *UK-AIR Background Mapping data for local authorities*. [Online]. Available at: https://uk-air.defra.gov.uk/data/laqm-background-home [Accessed: 16 February 2022].

Department of Energy and Climate Change, 2011. *Overarching National Policy Statement for Energy (EN-1).* London: The Stationary Office, 2011.

Highways England, 2019. *Design Manual for Roads and Bridges (DMRB): LA 105 Air quality*.

IAQM, 2014. *Guidance on the assessment of dust from demolition and construction*.

IAQM, 2017. *Land-Use Planning and Development Control: Planning For Air Quality.*

IAQM, 2019. *A guide to the assessment of air quality impacts on designated nature conservation sites.*

Pembrokeshire County Council Local Development Plan, 2013. *Pembrokeshire County Council Local Development Plan: Planning Pembrokeshire's Future*. [Online]. Available at: https://www.pembrokeshire.gov.uk/local-development-plan [Accessed: 11 February 2022].

Pembrokeshire County Council, 2020. *2020 Air Quality Progress Report.* Pembrokeshire County Council.

UK Government, 2017. *The Clean Growth Strategy: Leading the way to a low carbon future.* [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf [Accessed: 11 February 2022].

Welsh Government, 2021. *Planning Policy Wales, Edition 11.* [Online]. Available at: https://gov.wales/planning-policy-wales [Accessed: 11 February 2022].

# 16. NOISE AND VIBRATION

## 16.1. Introduction

This section presents the scope and approach to the assessment of onshore noise and vibration effects potentially resulting from the proposed Project.

This chapter provides an initial overview of the baseline context, potential for onshore noise and vibration effects, scope and methodology of assessment, policy context, and scope for mitigation.

## 16.2. Regulatory and Planning Policy Context

The following national, regional and local planning legislation and guidance related to noise and vibration will be referenced in the assessment:

### *16.2.1. Legislation*

- Control of Pollution Act 1974.
- Environmental Protection Act 1990.

### *16.2.2. Policy*

- Planning Policy Wales (HM Government, 2021).
- Pembrokeshire County Council Local Development Plan 2013 (Pembrokeshire County Council, 2013).

### *16.2.3. Standards and Guidance*

- Planning Guidance (Wales), Technical Advice Note (TAN) 11, Noise (0 Government, 1997).
- BS 7445-1:2003 - Description and Measurement of Environmental Noise (British Standards Institute, 2003).
- BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites (British Standards Institute, 2014a).
- BS 5228-2: 2009+A1:2014 – Code of practice for Noise and Vibration control on construction and open sites. Vibration (British Standards Institute, 2014b).

- Calculation of Road Traffic Noise (CRTN) (Department of Transport, 1998).
- Design Manual for Road and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration (DMRB) (Highways England, 2020).
- BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (British Standards Institute, 2019).

### 16.3. Study Area

The Study Area of the assessment is defined by the locations of nearby noise and vibration sensitive receptors within 500 m of the Onshore Scoping Boundary.

### 16.4. Baseline

Baseline noise data will be referenced from Chapter 22 of the Project Erebus Environmental Statement (ES), which provides noise data from the locations illustrated in Figure 16-1. The locations that are relevant to the Project are SSR1 to SSR4. This noise data was measured from 7th to 21st July 2021. Noise data from the Project Erebus ES that will be used in the assessment of noise is presented in Table 16-1.

*Table 16-1. Project Erebus baseline noise data*

| Location | Daytime $L_{Aeq,T}$ dB | Night-time $L_{Aeq,T}$ dB | Representative Night-time $L_{A90,15min}$ dB |
|---|---|---|---|
| SSR1 | 55 | 50 | 32 |
| SSR2 | 55 | 38 | 32 |
| SSR3 | 47 | 42 | 32 |
| SSR4 | 43 | 41 | 34 |

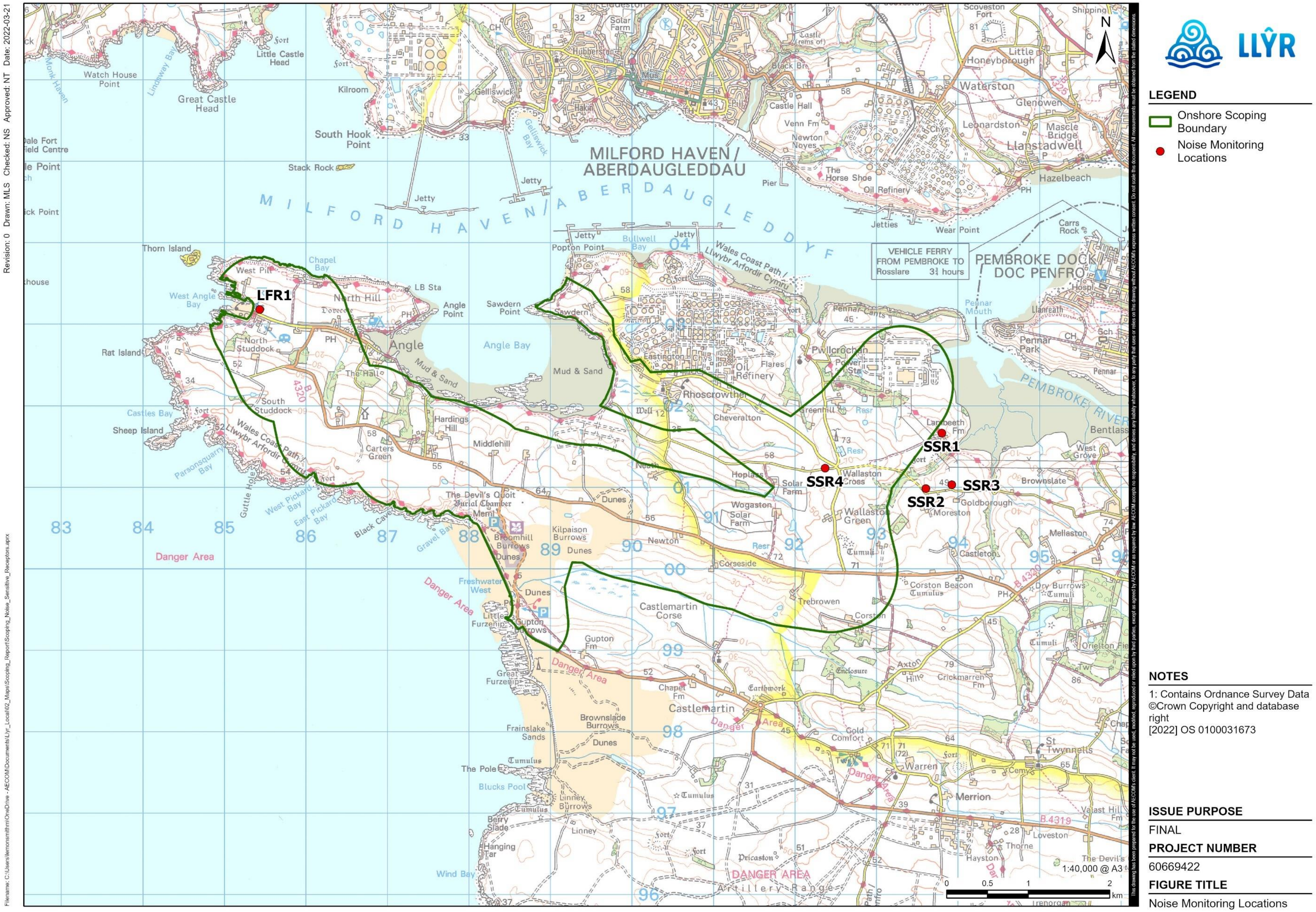


*Figure 16-1. Noise monitoring locations*

### 16.5. Embedded and Good Practice Measures

The Proposed Development has the potential to give rise to noise and vibration impacts during construction and operational phases. Where appropriate, mitigation measures will be proposed to minimise the impact of the Proposed Development. The residual noise and vibration impacts, after the implementation of the mitigation measures, will be identified and their significance established.

BS 5228-1 and BS 5228-2 provides practical information on construction noise and vibration reduction measures and promotes a 'Best Practicable Means' approach to noise control. Mitigation measures will help to further reduce the scale of construction phase noise effects at surrounding noise-sensitive receptors. BS 5228-1 does not state absolute limits for construction noise; therefore, the preferred approach is to reduce noise levels (where possible), but with due regard to practicality. Sometimes, a greater noise level may be acceptable if the overall construction time and therefore length of disruption is reduced.

In order to control plant and activity noise emissions, proposed installations will be subject to meeting suitable operational noise limits. Details on outline mitigation measures to achieve noise limits will be defined; however, specific plant noise assessments and mitigation requirements will be undertaken during detailed design.

### 16.6. Likely Significant Effects

Likely significant effects that will be assessed in the noise and vibration chapter are set out in Table 16-2. Operational effects include maintenance and repair activities, and potential effects during decommissioning are likely to be similar to the construction phase.

*Table 16-2. Potential noise and vibration effects*

| Topic | Project Phase(s) | Scoped In / Out? | Rationale |
|---|---|---|---|
| Construction / decommissioning noise emissions. | Construction Decommissioning | ✓ | Noise emissions from proposed construction activities and construction traffic. |
| Construction / decommissioning vibration emissions. | Construction Decommissioning | ✓ | Vibration emissions from proposed construction activities. |
| Operational noise emissions. | Operation | ✓ | Noise emissions from the proposed substation / control building. |
| Operational traffic. | Operation | X | No significant levels of operational traffic are expected so an assessment of operational road traffic noise impacts is scoped out. |
| Cable noise emissions. | Operation | X | As the cables will be underground, it is unlikely that any noise emissions from cables will be perceptible, so an assessment of cable noise has been scoped out. |
| Operational vibration emissions. | Operation | X | There are no sources of operational vibration associated with the onshore infrastructure of the proposed Project. |

## 16.7. Assessment Methodology

TAN 11 provides guidance on assessing impacts from noise generating development and references guidance documents for assessing specific sources of noise. Reference will be made to the latest iterations of guidance documents in TAN 11 when defining assessment criteria.

Noise due to construction works will be calculated and assessed using the data and procedures given in BS 5228-1. The ABC method will be used as a basis to define criteria that constitutes a potential significant effect at residential receptors. The ABC method is reproduced in Table 16-3.

*Table 16-3. BS5228-1 ABC method*

| Assessment category and threshold value period | Threshold values in dB LAeq,T | | |
|---|---|---|---|
| | Category A A) | Category B B) | Category C C) |
| Night-time (23:00-07:00) | 45 | 50 | 55 |
| Evening and weekends D) | 55 | 60 | 65 |
| Daytime (07:00-19:00) and Saturdays (07:00-13:00) | 65 | 70 | 75 |
| NOTE 1 A potential significant effect is indicated if the LAeq,T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.<br>NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq,T noise level for the period increases by more than 3 dB due to site noise.<br>NOTE 3 Applied to residential receptors only. | | | |
| A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.<br>B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.<br>C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.<br>D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays. | | | |

BS 5228-2 provides specific methods for calculating and assessing vibration from construction activities. The assessment will make reference will be made to Table B.1 of BS 5228-2, which provides information on the human response to Peak Particle Velocity vibration levels. Table B.1 of BS 5228-2 is reproduced in Table 16-4.

*Table 16-4. BS5228-2 guidance on vibration effects*

| Vibration level | Effect |
|---|---|
| 0.14 mm/s | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |
| 0.3 mm/s | Vibration might just be perceptible in residential environments. |
| 1.0 mm/s | It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents. |

| Vibration level | Effect |
|---|---|
| 10.0 mm/s | Vibration is likely to be intolerable for any more than a very brief exposure to this level. |

Changes in existing sources of noise (i.e. road traffic) due to construction traffic will be assessed based on short-term magnitude of impact criteria from Table 3.54a DMRB, as reproduced in Table 16-5. Noise increases at sensitive receptors due to any construction traffic on public roads will be calculated according to the methods given in CRTN.

*Table 16-5. Noise impacts due to short-term changes in road traffic noise*

| Magnitude of impact | Short-term noise change (dB LA10,18h) |
|---|---|
| Major | Major Greater than or equal to 5.0 |
| Moderate | Moderate 3.0 to 4.9 |
| Minor | Minor 1.0 to 2.9 |
| Negligible less than | Negligible less than 1.0 |

The impact of the proposed substation / control building plant will be assessed following guidance from BS 4142, based on information on the operating conditions and the levels of noise generated by the plant. If a schedule of plant is not yet available, suitable criteria for operational noise limits will be defined based on baseline noise measurements. Criteria will be defined from BS 4142, which states that plant noise emissions with a rating level that does not exceed the background noise level at sensitive receptors is an indication of a low impact and a rating level exceeding the background noise level by 10 dB is an indication of a significant effect. It is proposed to adopt a minimum rating noise limit for plant noise of 30 dB LAr,Tr where measured background noise levels are very low. For night-time noise, context will be provided through consideration of internal noise levels in properties.

### 16.8. Conclusion

The noise and vibration assessment will be undertaken in the defined Study Area for construction and operational noise. The assessment will be supplemented by baseline noise monitoring to define representative noise conditions at receptors within the Study Area. The assessment topics scoped into the noise and vibration assessment are summarised in Table 16-6.

*Table 16-6. Noise and vibration assessment scope*

| Receptor | Potential significant effect | Project phase | Onshore Scoping Boundary |
|---|---|---|---|
| Residential | Noise emissions from construction activities | Construction | Scoped in |
| Residential | Vibration emissions from construction activities | Construction | Scoped in |
| Residential | Noise emissions from construction traffic | Construction | Scoped in |
| Residential | Noise emissions from the proposed substation / control building | Operation | Scoped in |

### 16.9. References


British Standards Institute, 2003. *BS 7445 - Description and Measurement of Environmental Noise*.

British Standards Institute, 2014a. *BS 5228-1:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites. Part 1: Noise.*

British Standards Institute, 2014b. *BS 5228-2:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites. Vibration.*

British Standards Institute, 2019. *BS 4142 - Methods for Rating and Assessing Industrial and Commercial Sound.*

Department of Transport / Welsh Office, 1998. *Calculation of Road Traffic Noise*.

Highways England, 2020. *Design Manual for Road and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration.*

Pembrokeshire Coast National Park Authority, 2021. *Pembrokeshire Coast National Park Local Development Plan 2*. [Online]. Available at: https://www.pembrokeshirecoast.wales/wp-content/uploads/2020/09/LDP-Text-for-Adoption.pdf [Accessed: 11 February 2022].

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## 17. SOCIO-ECONOMICS, RECREATION AND TOURISM

### 17.1. Introduction

The socio-economic, tourism and recreation assessment will identify the economic impact from onshore activities, including identifying any negative social and cultural impacts associated with the proposed Project, and considering any impacts on tourism and recreation amenities or users. The onshore scope of the proposed Project covers the cable route from transition pit to substation / control building. This socio-economic section of the scoping report includes a baselining section, which is a desktop study using publicly available data from the Office for National Statistics and Stats Wales to show local and regional trends in Pembrokeshire and South Wales respectively, as well as the Study Area, approach, and possible impacts.

### 17.2. Regulatory and Planning Policy Context

Policy relevant to socio-economics, tourism and recreation will be considered in the EIA chapter. This is anticipated to include the following:

- UK Government Policy
  - Build back better: Our plan for growth (HM Treasury, 2021);
  - Ten Point Plan for a Green Industrial Revolution (HM Government, 2020a);
  - Energy White Paper: Powering our Net Zero Future (HM Government, 2020b);

- Welsh Government Policy
  - Net Zero Wales Carbon Budget 2 (2021-2025) (Welsh Government, 2021);
- Pembrokeshire Policy
  - Pembrokeshire County Council Local Development Plan (2013); and
  - Pembrokeshire County Council Action Plan (2019) towards becoming a net zero carbon local authority by 2030.

### 17.3. Study Area

For the purpose of the baseline section, the Study Area includes data for the following geographies, to compare statistical information for:

- Pembrokeshire County Council;
- South Wales[3];
- Wales; and
- England and Wales.

### 17.4. Baseline

The socioeconomic chapter provides an assessment of Pembrokeshire and the wider area to accompany the wider assessment for offshore and onshore wind capacity. The chapter will underpin the evidence base for the intervention and provide useful context of the driving factors of the local and regional area.

#### *17.4.1. Population*

Pembrokeshire is situated in south-west Wales, bordered by Carmarthenshire to the east and Ceredigion to the north-east. In the latest Mid-year population estimates from the ONS in 2020, Pembrokeshire district local authority has a population of circa 127,00 (ONS, 2020a). This represents 6% of the population of South Wales and 4% of Wales respectively.

In terms of the population structure (Table 17-1), Pembrokeshire has a substantially smaller working age population (WAP) than its comparators, at 57% of the total population, compared to 62% for South Wales and 61% for Wales. Conversely, the 65+ age cohort is much larger in Pembrokeshire (26%) than regionally in South Wales (20%) or nationally in Wales (21%) or England and Wales (19%). Child age cohorts (0-15) are relatively similar across all comparator areas.

*Table 17-1. Population and age cohorts, 2020*

| | Pembrokeshire | South Wales | Wales | England and Wales |
|---|---|---|---|---|
| Total population | 126,751 | 2,260,300 | 3,169,586 | 59,719,724 |
| *Age as a % of total* | | | | |
| 0-15 | 17% | 18% | 18% | 19% |

[3] South Wales is defined as the following local authorities; Blaenau Gwent, Bridgend, Caerphilly, Cardiff, Carmarthenshire, Merthyr Tydfil, Monmouthshire, Neath Port Talbot, Newport, Pembrokeshire, Rhondda Cynon Taff, Swansea, Torfaen and Vale of Glamorgan.

| | Pembrokeshire | South Wales | Wales | England and Wales |
|---|---|---|---|---|
| 16-64 | 57% | 62% | 61% | 62% |
| 65+ | 26% | 20% | 21% | 19% |

*Source: Mid-year Population Estimates, ONS, 2020a.*

### *17.4.2. Economic Activity / Employment / Unemployment*

Table 17-2 details the current levels of economic activity in the Study Area. In Pembrokeshire, among the labour force, the economic activity rate is relatively high, at 79% (ONS, 2021). This is higher than regionally and nationally (both 76%) in Wales, and in line with averages for England and Wales. This also corresponds to high employment rates in the Pembrokeshire labour force. The unemployment rate is 5% in Pembrokeshire, however, this is not dissimilar to rates seen in South Wales and Wales (both 4%), and in line with England and Wales levels (5%).

*Table 17-2. Economic activity, September 2021*

| | Pembrokeshire | South Wales | Wales | England and Wales |
|---|---|---|---|---|
| Economic activity rate | 79% | 76% | 76% | 79% |
| Employment rate | 75% | 72% | 73% | 75% |
| Unemployment rate | 5% | 4% | 4% | 5% |
| Economic inactivity rate | 21% | 24% | 24% | 21% |

*Source: Annual Population Survey (ONS, 2021).*

### *17.4.3. Employment by Industry / Occupation*

Figure 17-1 shows the most recent employment data grouped by industry from the ONS (2020b). In Pembrokeshire, the three largest employment sectors are the Public Sector (O-Q, 30%), Accommodation and Food (16%) and Wholesale and Retail trade (13%). Employment is highly concentrated in these sectors, accounting for a cumulative 59% of all employment, and no other sector has employment of more than 7%.

Comparatively, employment in the Public Sector and Wholesale and Retail trade sectors are largely in line with comparator areas. However, Pembrokeshire has a much larger proportion of employment in Accommodation and food, at over double the next largest proportion, in Wales (8%). Conversely, Pembrokeshire has lower proportions of employment in Information and Communication (J) and Financial and insurance activities (K), which account for 1% each in Pembrokeshire, but 5% and 3% respectively in England and Wales. This trend can also be seen in other knowledge intensive sectors such and Professional, scientific, and technical (M) and Administrative and support service activities (N).

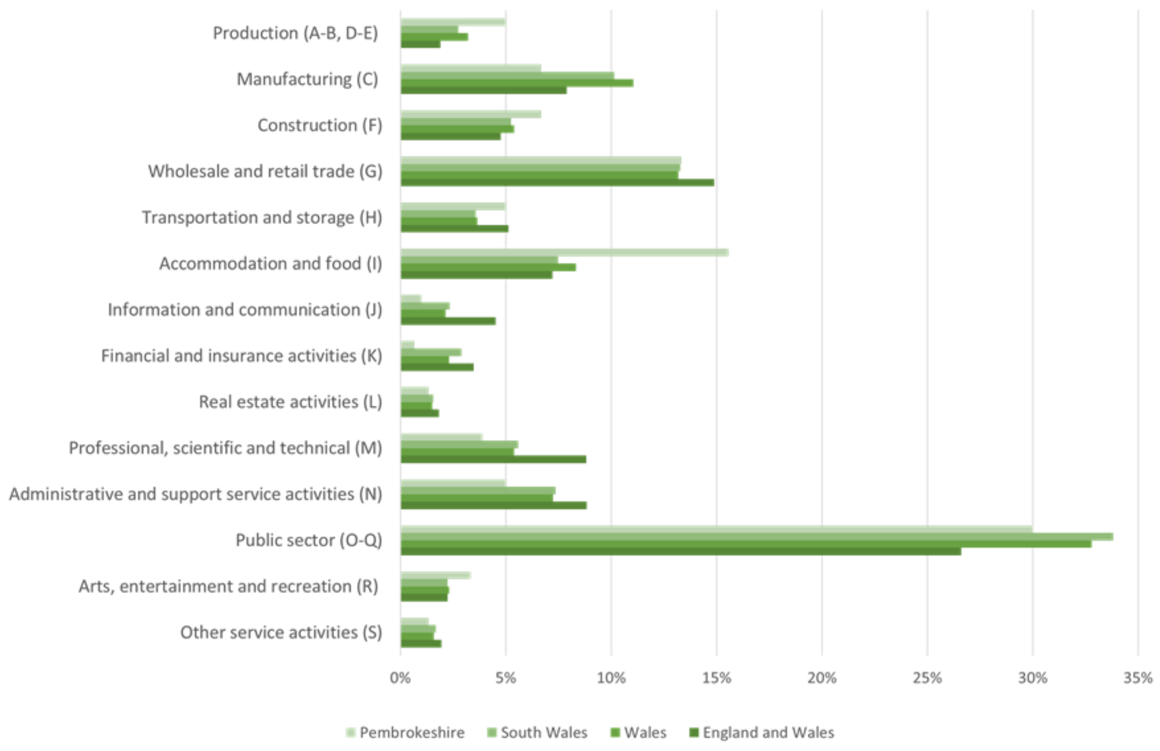


*Figure 17-1. Employment by industry, 2020*

*Source: BRES, ONS, 2020.*
*Note: Some industries have been grouped for clarity, and are annotated on the data point.*

In terms of employment by occupation (ONS, 2021), as shown in Figure 17-2, Pembrokeshire has a smaller proportion of higher skilled occupations[4], at 39%, compared to 46% in South Wales, 45% in Wales and 50% in England and Wales. Conversely, the proportion in low skilled occupations[5] is marginally higher than in other comparator areas. Looking at individual SOC codes, employment in Skilled Trade Occupations (5) and Caring, Leisure and Other service occupations (6) are higher than other comparator areas, by at least 4.9%% and 2.8% respectively.

[4] Classed SOC 1-3 occupations.
[5] Classed as SOC 7-9 occupations.

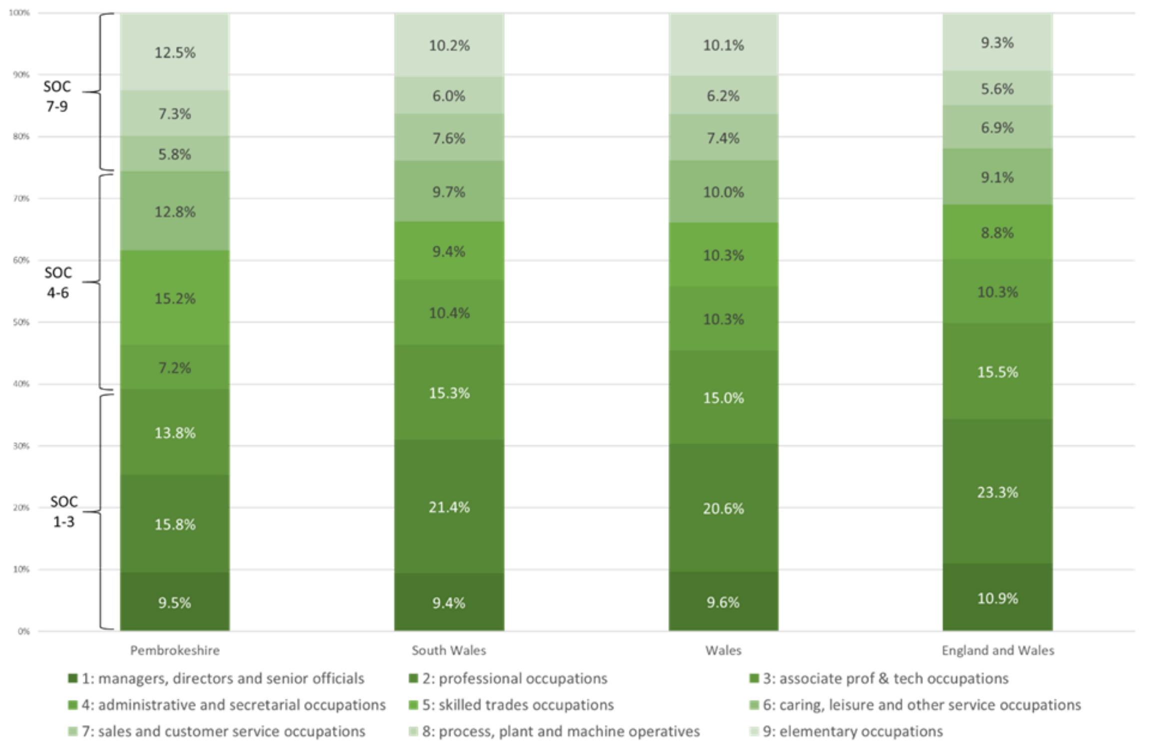


*Figure 17-2. Employment by occupation, 2020*

*Source: APS, ONS, 2020.*

### *17.4.4. Business Survival Rates*

In Pembrokeshire, the business survival rate among new businesses is higher than at national levels, as shown in Table 17-3 (ONS, 2019). This is true at every year up to five years, with the survival rate in the fifth year (46%) showing the biggest difference from Wales and England and Wales (both 40%). This highlights that there may be lower barriers to entry and setup in Pembrokeshire than elsewhere nationally.

*Table 17-3. Business survival rates, 2015-2019*

| Proportion of Survival, % | Pembrokeshire | Wales | England and Wales |
|---|---|---|---|
| 1 year | 94% | 91% | 90% |
| 2 years | 73% | 71% | 71% |
| 3 years | 58% | 56% | 55% |
| 4 years | 51% | 47% | 46% |
| 5 years | 46% | 40% | 40% |

*Source: Business births and deaths, ONS, 2015-2019*

### *17.4.5. Gross Value Added per industry*

In terms of output, Pembrokeshire contributed £2.3bn to the Wales economy in 2018, which represented 5% of the South Wales and 4% of the Wales economies. Figure 17-3 shows that in

Pembrokeshire, the key output sectors are in Manufacturing (C, 26%), Real estate activities (L, 14%) and Wholesale and retail trade (G, 10%)[6]. In particular, Manufacturing is a large component of output in Pembrokeshire, to a greater extent than South Wales and Wales, despite the sector only being the 5th largest for employment. Other notable sectors include the Production sector (A), which contributes to 9% of output, compared to 5% in South Wales and in Wales.

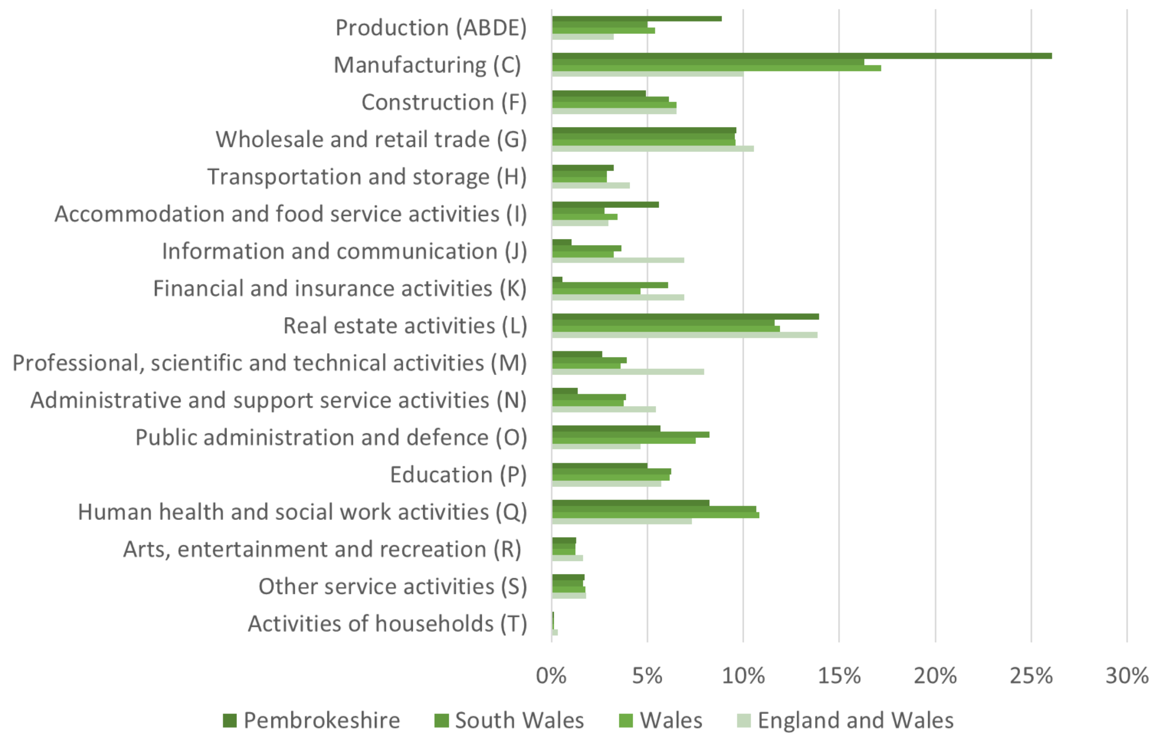


*Figure 17-3. GVA by industry, 2018*

*Source: Regional gross value added by industry, ONS, 2018.*

### *17.4.6. Deprivation (WIMD)*

The Welsh Government produces the Welsh Index of Multiple Deprivation (WIMD), a measure that was most recently produced in 2019 to analyse the relative deprivation for small areas in Wales (Welsh Government, 2019). In 2019, 4 of the 71 Local Super Output Areas (LSOAs) in Pembrokeshire were in the most deprived decile in Wales, which accounted for 5.6% of those in the Pembrokeshire Local Authority. Through looking at the domains for deprivation[7], LSOAs in Pembrokeshire perform poorest in the domains of Access to Services (27 LSOAs in the most deprived decile), Education (6) and Community Safety (6).

### *17.4.7. Onshore Tourism and Recreation*

Pembrokeshire is a popular tourist destination that attracts visitors from all of the UK and overseas. In 2019, Pembrokeshire's Tourism sector was valued at £590 million, as a result of 6.0 m total day trips and 1.0 m total overnight stay trips (Visit Pembrokeshire, 2019). The tourism sector is also a key

[6] An important caveat of this data is that it was collected prior to the COVID-19 pandemic and fails to reflect any changes in the employment base since then.

[7] Income, Employment, Health, Education, Access to Services, Community Safety, Physical Environment and Housing.

employment base, and is estimated to support approximately 12,400 jobs in the area, which accounts for 21% of all employment in Pembrokeshire.

The Pembrokeshire Coast National Park is the only fully coastal National Park in the UK. The Pembrokeshire Coastal Path is a 186-mile path encompassing 58 beaches and 14 harbours that starts in St Dogmaels in north Pembrokeshire and ends in Amroth, south Pembrokeshire. The Coastal Path's highlights include Neolithic tombs on St Davids Head, castles at Manorbier and Pembroke and Celtic chapels near Bosherton (Visit Wales, 2021). The National Park Authority (2022) estimates that the Coastal Path attracts around 1 million user days annually, representing one of the county's most important economic assets.

Pembrokeshire contains a large number of small coastal towns and villages that play a key role in the local tourism industry. All the proposed landfall locations occur within the National Park Boundary and the Coastal Path also runs through these areas. Across Pembrokeshire, 12 beaches had Blue Flag Award status in 2017, the highest number of any county in the country. 14 beaches were also awarded the prestigious Green Coast Award in 2017.

Cycling is also a popular tourist activity across Pembrokeshire and, in recent years, Ironman Wales has been held at Tenby, attracting over 2,000 competitors and tens of thousands of spectators. The bike course element of this popular triathlon event includes roads on the Angle peninsula, including some around Freshwater West.

## 17.5. Embedded and Good Practice Measures

Mitigation measures will be included in the design where practicable to help avoid, prevent or reduce effects on the environment. The underground nature of the cables aims to reduce the land take and accessibility effects.

Additionally, during construction, appropriate measures will be implemented to ensure accessibility to recreational routes and PRoWs, community facilities, and recreation facilities in the Study Area is maintained. This should be achieved through the use of best practice measures, regard to phasing of works and if necessary, providing diversions for users.

Severance can also be reduced through careful siting of construction compounds and lay down areas, and careful planning of construction activities through consultation with landowners. Where temporary disruption to PRoWs, or other recreational routes during construction is unavoidable, suitable diversions will be agreed with the relevant local authorities and implemented where temporary closures are required.

The permanent closure of PRoWs, or other recreational routes is deemed avoidable.

## 17.6. Likely Significant Effects

The possible significant effects are considered in Table 17-4 below. These will be assessed in the EIA chapter. Operational effects include maintenance and repair activities, and potential effects during decommissioning are likely to be similar to the construction phase.

*Table 17-4. Possible significant effects*

| Receptor | Potential Impacts | Phase | Scoped In? | Rationale |
|---|---|---|---|---|
| Employment creation | The proposed Project could create direct and indirect jobs via the Project, in terms of | Construction<br><br>Operation | Yes | Job security and the creation of new jobs would be considered a positive socio- |

| Receptor | Potential Impacts | Phase | Scoped In? | Rationale |
|---|---|---|---|---|
| | employment and supply chain opportunities, as well as safeguarding jobs in of existing areas of supply chain, ports and marine services. | Decommissioning | | economic contribution |
| Skills and Training | The proposed Project will offer temporary employment opportunities both in terms of direct construction jobs and opportunities in the supply chain. | Construction<br>Operation<br>Decommissioning | Yes | This is a potential beneficial impact and is very relevant to marine energy aspirations and strategy in Pembrokeshire and South Wales |
| Recreation amenities | Disruption / reduced access to beaches at proposed landfall locations. | Construction<br>Decommissioning | Yes | Proposed landfall works will create temporary disruption on beach users or visitors to the Pembrokeshire National Park |
| Access to Public Rights of Way or other paths | Disruption / reduced access to Pembrokeshire Coast Path or other paths for users | Construction<br>Decommissioning | Yes | Construction of the onshore infrastructure, including the onshore cable, and onshore substation / control building could potentially create impacts on users of the Pembrokeshire Coast Path or other PRoWs if temporary disruption / diversions are required. Severance will also be considered in relation to this. |

### 17.7. Assessment Methodology

A common approach will be used for the assessment of socio-economics; namely:

- Establishing the baseline conditions through a desk review

- Assessment of the level of significance of all residual effects (adverse and beneficial, short-term and long-term, permanent and temporary) taking account of committed mitigation measures. Standard EIA methodology (receptor sensitivity and effect magnitude) will be used to determine significance of impacts. This approach is comparable to the EIA for the Erebus floating off-shore wind project.

Where possible, socio-economic impacts have been appraised against relevant national standards, such as those provided by HM Treasury, and the Department for Business, Energy and Industrial Strategy. Where relevant standards do not exist, professional experience and expert judgement will be applied.

The on-shore socio-economic, tourism and recreation assessment determines the:

- sensitivity of receptors;
- magnitude of impacts; and
- the consequent significance of effects.

The sensitivity of socio-economic receptors is assessed as high, medium, low or very low. The socio-economic receptors include those who will potentially benefit from employment generation (either directly, indirectly or induced (secondary impacts, for example due to construction workers spending money at local businesses).

The magnitude of the impacts of the proposed Project is assessed as being high, medium, low, or very low. This is determined by:

- extent of change – the absolute number of people affected and the size of area in which effects will be experienced (i.e. the level of change to baseline conditions including the proportion of the existing workforce); and
- scale of the impact – more weight is given to long-term, permanent changes than to short-term, temporary ones, where temporary and short-term impacts are considered to be those associated with the construction works, and medium to long-term impacts are those associated with the operation of the proposed Project.

The effects of the proposed Project are defined as either:

- beneficial – an advantageous or beneficial effect on an impact area;
- negligible – an imperceptible effect on an impact area; or
- adverse – a disadvantageous or negative effect on an impact area.

Where an effect is assessed as being beneficial or adverse, the effect has been classified as minor, moderate, major or negligible. The assessment of significance is informed by the sensitivity of the receptor and the magnitude of impact as set out in Table 17-5 below. For the purposes of this assessment, ‘significant’ effects are those identified as being moderate or major (adverse or beneficial). Effects identified as being negligible or minor are ‘not significant’.

*Table 17-5. Classification of effects on socio-economics*

| | | Sensitivity / Importance of Receptor | | | |
|---|---|---|---|---|---|
| | | High | Medium | Low | Very Low |
| Magnitude of Impact | High | Major | Major | Moderate | Minor |
| | Medium | Major | Moderate | Minor | Negligible |
| | Low | Moderate | Minor | Negligible | Negligible |
| | Very Low | Minor | Negligible | Negligible | Negligible |

## 17.8. Conclusion

Potential effects (temporary and permanent) on employment, skills and training, recreational amenities, access to PRoWs or other paths (such as the Pembrokeshire Coast Path), may occur as a result of the construction of the proposed scheme. The assessment will focus on these likely effects and mitigation measures will be proposed to minimise significant adverse effects. Where significant effects are identified, mitigation measures to minimise any disturbance to sensitive receptors will be set out and the residual effect with these in place will be assessed.

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# 18. HEALTH AND WELLBEING

## 18.1. Introduction

This chapter presents an initial baseline for health and wellbeing, an overview of the assessment methodology to be followed during the environmental assessment and identifies the potential effects of the proposed Project.

This chapter should be read in conjunction with the following chapters:

- Air Quality;
- Noise and Vibration; and
- Traffic and transport.

## 18.2. Regulatory and Planning Policy Context

The amended The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 require the consideration of the likely significant direct or indirect effects of projects on 'population and human health'. This chapter aims to consider the potential for health impacts to the local and wider population as a result of the proposed Project during the construction and operational phases. Construction activities associated with the proposed Project will include construction of the substation / control building infrastructure, and trenching and enabling works associated with the cable route.

A Health Impact Assessment (HIA) assesses the likely effects of proposed projects, both positive and negative, on the health and wellbeing of the population. With no statutory guidance for assessing health impacts, the approach to HIA remains flexible and scalable to meet individual project requirements which will be determined by the nature of the proposal, timescales involved and resources available.

## 18.3. Study Area

The Study Area relevant to Health varies by the specialist topic considering health receptors. Study Area are stated in the respective chapters of Air Quality, Noise and Vibration, and Traffic and Transport.

## 18.4. Baseline

There is currently limited information on the human health baseline environment within the proposed Study Area. A summary of health provision and health issues is provided below. In Pembrokeshire, health provisions include 15 GP practices (Pembrokeshire County Council, 2022). Pembrokeshire's general hospital is Withybush Hospital in Haverfordwest to the north of the on-shore elements of the scheme. There are also two community hospitals in Pembroke Dock (which is closer to the proposed Project), and Tenby.

Data from the 2011 Census indicates that 22.3% of the population of Pembrokeshire have long-term illnesses, equating to 25,477 people and covers any long-term illness, health problem or disability that limits daily activities or work (Stats Wales, 2011).

The primary health issues in Pembrokeshire are considered to be obesity, 59% of the adult population in Pembrokeshire are considered to be overweight or obese (West Wales Care Partnership, 2017). It also has one of the higher populations of over-65s in the country, with an estimated 25% of the population falling into this category.

## 18.5. Embedded and Good Practice Measures

Mitigation relevant to impacts arising from traffic and transport; airborne noise and vibration; and air quality are considered further in the relevant sections, set out above. The electrical infrastructure will be designed to comply with current guidelines on levels of public exposure and design of electrical infrastructure.

## 18.6. Assessment Methodology

Assessment of potential impacts on human health via traffic and transport; airborne noise and vibration; and air quality will be assessed via methodologies set out in other sections of the scoping report. These will then be addressed in the respective chapters. Possible health impacts that could be considered include:

- Noise and Vibration (during construction and operation) - Elevated environmental noise has the potential to cause health impacts, and as such these will be considered in the construction and operation impact assessments. The chapter will consider the impact on residential receptors of the following: noise and vibration emissions from construction activities, noise emissions from construction traffic; and noise emissions from the proposed substation / control building during operation.
- Air Quality (during construction) – The Air Quality impact assessment will consider the following constraints: Construction dust associated with the construction of the cable route and associated construction compounds; and vehicle emissions associated with the movement of construction materials, particularly on the approach to and from construction compounds, where the number of vehicle movements are likely to be greatest. There are anticipated to be limited air quality impacts during the operation phase, as such only construction impacts are being considered in the assessment.
- Traffic and Transport (during construction) – Transport generated by the construction of the scheme could result in health impacts. As such, elements that will be considered include: severance to communities caused by a large increase in traffic for a longer period; increased risk of road traffic accidents caused by a large increase in traffic for a longer period; temporary road closures, diversions and widening; construction traffic using temporary bell mouths and site entrances for access to construction areas; and temporary closures or diversions of PRoW and other public access routes. There are anticipated to be limited transport impacts during

the operation phase, as such only construction impacts are being considered in the assessment.

Operational effects include maintenance and repair activities, and potential effects during decommissioning are likely to be similar to the construction phase. As considered above, there are not anticipated to be any EMF impacts, with the design intended to keep any maximum voltage within acceptable levels from industry guidelines and standards. This is consistent with other off-shore wind projects, such as Blue Gem Wind's Erebus project (2021), that did not consider any direct health impacts from EMF, and concluded that there would be negligible impacts on people's health from any perceived impact from EMFs from residents. As such, considerations of EMF impacts from a health perspective are proposed to be scoped out of the assessment.

## 18.7. Conclusion

Given that individual topic chapters, namely Noise and Vibration, and Traffic and Transport will form part of the EIA and will consider and assess potential impacts to human receptors at an appropriate geographical scale, it is not proposed to include a standalone chapter relating specifically to human health within the ES. This is considered to provide a proportional approach. The design of the scheme will ensure that EMFs will remain compliant with any regulatory limits so as such EMF impacts from a health perspective are proposed to be scoped out of the assessment.

*Table 18-1. Health and wellbeing conclusions*

| Topic | Project Phase(s) | Scoped In or Out? | Justification |
|---|---|---|---|
| Potential impacts on human health from traffic and transport, airborne noise and vibration and air quality. | Construction<br>Operation<br>Decommissioning | X | Given that individual topic chapters, namely Noise and Vibration, and Traffic and Transport will form part of the EIA and will consider and assess potential impacts to human receptors at an appropriate geographical scale, it is not proposed to include a standalone chapter relating specifically to human health within the ES. |
| Potential impacts on human health from electrical infrastructure. | Operation | X | The design of the scheme will ensure that electromagnetic field (EMF) emissions will remain compliant with any regulatory limits so as such EMF impacts from a health perspective are proposed to be scoped out of the assessment. |

## 18.8. References


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# LLYR FLOATING OFFSHORE WIND PROJECT

# SCOPING REPORT

## Volume 3 – Marine Environment

Prepared by: AECOM Ltd

**April 2022**

**Acronyms and Abbreviations**

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| AEZ | Archaeological Exclusion Zones | LGM | Last Glacial Maximum |
| ALARP | As Low as Reasonably Practicable | MCAA | The Marine and Coastal Access Act |
| BEP | Best Environmental Practice | MCZ | Marine Conservation Zone |
| BGS | British Geological Survey | META | Marine Energy Test Area |
| CEMP | Construction Environment Management Plan | MHWN | Mean High Water Neat |
| CFP | Common Fisheries Policy | MLWN | Mean Low Water Neat |
| CIEEM | Chartered Institute of Ecology and Environmental Management | MLWS | Mean Low Water Spring |
| CIS | Celtic and Irish Sea | MMMU | |
| CRM | Collision Risk Modelling | MMO | Marine Mammal Organisation |
| DAS | Digital Aerial Surveys | MNR | Mean Neap Range |
| DBA | Desk-based Assessment | MPS | Marine Policy Statement |
| EEZ | Exclusive Economic Zone | MSL | Mean Sea Level |
| EIA | Environmental Impact Assessment | MSR | Mean Spring Range |
| EIA | Environmental Impact Assessment | MTS | Marine Traffic Survey |
| EMF | Electromagnetic Field | MUs | Management Units |
| ENVID | Environmental Issues Identification | MWHS | Mean High Water Spring |
| EQS | Environmental Quality Standard | NFFO | National Federation of Fisherman's Organisations |
| ES | Environmental Statement | NM | Nautical Mile |
| ESCA | European Subsea Cable Association | NMRW | National Monuments Record of Wales |
| EU | European Union | NNR | National Nature Reserve |
| FSA | Formal Safety Assessment | NPSfP | National Policy Statement for Ports |
| HAT | Highest Astronomical Tide | NRA | Navigational Risk Assessment |
| HDD | Horizontal Direction Drilling | NRW | Natural Resources Wales |
| HRA | Habitat Regulations Assessment | NRW | Natural Resources Wales |
| IAMMWG | Inter Agency Marine Mammal Working Group | ORPAD | Offshore Renewables Protocol for Archaeological Discoveries |
| ICES | International Council for the Exploration of the Sea | PCH | Potential Collision Risk Height |
| ICPC | International Cable Protection Committee | PDE | Project Design Envelope |
| IHLS | International Herring Larvae Surveys | PNEC | Point of No Effect Concentrations |
| IMO | International Maritime Organisation | PSA | Particle Size Analysis |
| INNS | Invasive Non-native species | RYA | Royal Yachting Association |
| JNCC | The Joint Nature Conservation Committee | SAC | Special Area of Conservation |
| LAT | Lowest Astronomical Tide | SD | Standard Deviation |

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| SHP | Shoreline Management Plan | UWS | Underwater Sound |
| SNCB | Statutory Nature Conservation Body | WCPS | West Coast Palaeolandscapes Survey |
| SPA | Special Protection Area | WFA-CPC | Welsh Fisherman's Association – Cymdeithas Pysgotwyr Cymru |
| SPM | Suspended Particle Matter | WFD | Water Framework Directive |
| SSC | Suspended Sediment Concentration | WSI | Written Scheme of Investigations |
| SSSI | Site of Special Scientific Interest | ZoI | Zone of Influence |
| UKSIA | UK Single Issuing Authority | | |

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# 19. PHYSICAL ENVIRONMENT

## 19.1. Introduction

This chapter of the scoping report describes the methodology to be used within the Environmental Impact Assessment (EIA), it identifies the datasets to be used to inform the assessment, provides an overview of the baseline conditions by identifying the interconnected elements of the physical environment, and lists the potential impacts on the physical environment from installation, operation (including maintenance and repair) and decommissioning phases of the proposed Project.

The physical processes and associated marine coastal processes are defined as encompassing the following elements:

- Meteorological and oceanographic conditions (wind, waves and tides);
- Coastal geomorphology;
- Seabed geomorphology;
- Sediments and geology (including seabed sediment distribution and sediment transport); and
- Water quality.

The offshore element of the proposed Project refers to the marine environment up to Mean High Water Springs (MWHS). There is therefore a degree of overlap with the onshore element of the proposed Project which considers areas above Mean Low Water Springs (MLWS).

## 19.2. Regulatory and Planning Policy Context

The physical processes assessment will follow the following guidance specific to marine physical processes:

- Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guide (ABPmer, 2010);
- Suspended sediment climatologies around the UK (CEFAS, 2016);
- Environmental impact assessment for offshore renewable energy projects (BSI, 2015);
- Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms (Marine Management Organisation, 2014);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (CEFAS, 2011);
- Offshore wind, wave and tidal energy applications: consenting and licensing manual (Scottish Government, 2018);
- Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm industry (BERR, 2008);
- UK Climate Projections (UKCP, 2021): sea level rise;
- EA Flood Risk Assessments (2021): Climate Change Allowances;
- Natural Resources Wales (NRW) Databases, including access to the WIMS and/or the Environment Agency Water Quality Sampling Data pool where appropriate;
- Historical sedimentological data, including analysis of material adjacent to the Offshore Cable Scoping Boundary submitted for neighbouring marine consents;
- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to Inform EIA of Major Development Projects (Natural Resources Wales, 2018);
- Relevant data relating to relevant designated Bathing waters and Shellfish waters Statutory EQS limits / Point of No Effect Concentration (PNEC) Values); and
- UK Government Guidance (used by NRW) on undertaking WFD assessment in estuarine and coastal waters (Environment Agency, 2017).

## 19.3. Study Area

The proposed Project is located in the north-east Celtic Sea, with the landfall areas potentially located in Milford Haven and surrounding the Angle Peninsula, currently identified as West Angle Bay, Angle Bay, and Freshwater West Beach . The components of the proposed Project include the array areas comprising the turbines, the inter-array cables, and the export cable route and cable landfall areas.

Assessment will also consider more distant (far-field) impacts on the surrounding marine environment and coastal habitats, due to the potential for far-reaching environmental impacts. A wider Study Area of up to 10 km is considered (Figure 19-1).

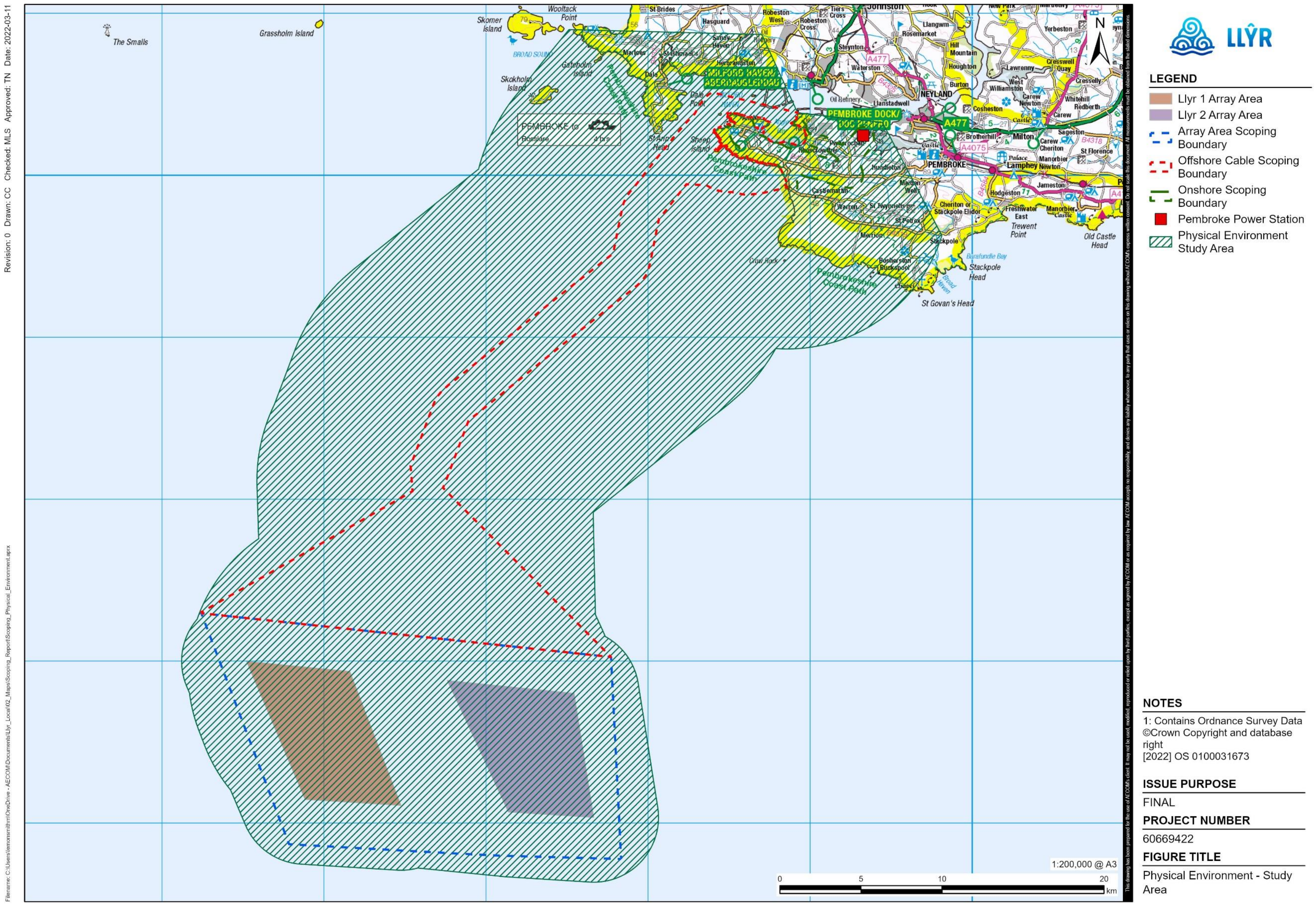


*Figure 19-1. Physical environment Study Area*

## 19.4. Baseline

In order to assess the potential impacts of the proposed Project on the physical environment, it is important to establish the environmental baseline conditions in the Study Area and the likely evolution of the baseline conditions over the lifespan of the proposed Project. In order to establish the baseline conditions, reference is made to the Project Erebus Environmental Statement (Blue Gem Wind, 2021) and the Project Valorous Environmental Impact Assessment Scoping Report (MarineSpace Ltd and ITP Energised). Both projects are for floating offshore windfarms to be built within the vicinity of the proposed Project.

### *19.4.1. Metocean Conditions*

Metocean conditions provided by the Atlas of UK Marine Renewables Resources have been used for this scoping stage, as well as information from investigations associated offshore wind farm and coastal process studies adjacent to the proposed Project. It is anticipated that the physical conditions will vary across the Study Area, in particular from the offshore to nearshore and coastal environment.

### *19.4.2. Tidal Currents*

Tidal currents in the area are directed from west-northwest to east-southeast on the flood tide and in reverse on the ebb. Based on the site specific metocean survey in the Erebus array area and other hindcast data, the Project Erebus Environmental Statement explains that the peak depth averaged current speed for a mean spring tide is approximately 0.6 – 0.8 m/s. Towards the coastline, current speeds gradually increase on the approach to Milford Haven to approximately 1.0 – 1.4 m/s. Current speeds decrease within Milford Haven Estuary to between 0.4 – 0.6 m/s on a mean spring tide. Within Angle Bay and West Angle Bay, the peak current speed (mean spring tide) reduces further to between 0.1 – 0.4 m/s, and 0.1 – 0.6 m/s, respectively. The nearshore setting at Freshwater West Beach experiences peak current speeds (mean spring tide) between 0.1 – 0.5 m/s.

Based on the data presented in ABPmer (2008), the tidal excursion ellipses for a mean tide in the proposed array location are approximately 6 – 8 km in length. The tidal ellipses 20 km offshore representing the location of the Offshore Cable Scoping Boundary are approximately 8 – 10 km long. The length of the nearshore (6.5 km offshore of Freshwater West Beach) tidal ellipses are approximately 14 km.

### *19.4.3. Water Levels*

The Study Area is known for having a large tidal range due to its proximity to the Celtic Sea and Severn Estuary and their natural influence of amplifying tidal variations. Table 19-1 shows the standard tidal planes taken from the UKHO Admiralty tide tables (2020) for Milford Haven. The mean spring tidal range at Freshwater West, Angle Bay and West Angle Bay is approximately 6.01 – 7 m (ABPmer, 2008). At the proposed sites for the location of offshore windfarms, the mean spring tidal range is approximately 5.01 – 7 m (ABPmer, 2008).

Tides in the region flow from the west-northwest to east-southeast on the flood and reverse in direction on the ebb and are semi-diurnal.

Tidal water levels can be modified by storm surges. Uncles and Stephens (2007) suggest that storm surges in the area, for a 50-year return period, may increase water levels by over 1.0 m.

*Table 19-1. Tidal water levels at Milford Haven*

| Tidal level | Elevation (mCD) | Elevation (mODN) |
|---|---|---|
| Highest Astronomical Tide (HAT) | 7.8 | 4.09 |
| Mean High Water Spring (MHWS) | 7.0 | 3.29 |
| Mean High Water Neap (MHWN) | 5.2 | 1.49 |
| Mean Sea Level (MSL) | 3.85 | 0.14 |
| Mean Low Water Neap (MLWN) | 2.5 | -1.21 |
| Mean Low Water Spring (MLWS) | 0.7 | -3.01 |
| Lowest Astronomical Tide (LAT) | 0 | -3.31 |
| Astronomical Tide Range | 7.8 | |
| Mean Spring Range (MSR) | 6.3 | |
| Mean Neap Range (MNR) | 2.7 | |

*Source: UKHO 2020*

### *19.4.4. Waves*

Waves within the Celtic Sea result from a combination of swell waves and locally generated winds. The largest waves are associated with the longest fetch length from the south-westerly direction. Data from a project-specific metocean study, for nearby Project Erebus (Wave Venture, 2020), indicate that long term mean significant wave height is 1.91 m and most frequent significant wave height is between 1.0 – 2.0 m. Dominant wave direction is 252° (south-westerly), which correlates with the main wind direction (Figure 19-2).

Annual wave height data have been obtained from ABPmer (2008), which provide an estimate of the 1-year return period condition. Wave heights recorded in the vicinity of the proposed sites for the floating wind farms are between 1.8 – 2 m. At the mouth of the Milford Haven Waterway, annual wave heights are between 1.52 – 1.78 m, and at Freshwater Beach, the annual wave height is 1.63 m.

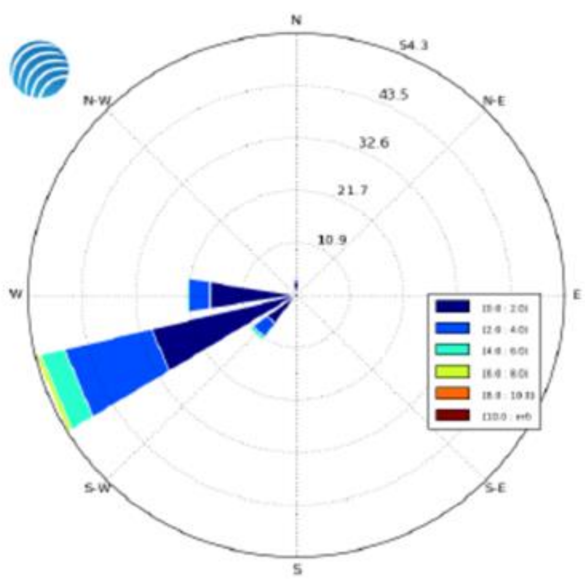


*Figure 19-2. Wave rose of long-term wave directions and significant wave heights (Wave Venture, 2019)*

### *19.4.5. Wind*

Average wind speeds in the Celtic Sea are high, typically greater than 8 m/s in water depths of 50 m and above. The coastal region in the vicinity of the Study Area is one of the windiest in the UK, experiencing mean hourly coastal wind speeds that exceed approximately 3.5 m/s for 75% of the time, and exceed 19 m/s for approximately 0.1% of the time (Uncles and Stephens, 2007). Uncles and Stephens (2007) further show that dominant south-westerly winds blow for approximately 20% of the time, and winds from the east blow for about 9% of the time.

### *19.4.6. Climate Change*

By 2050 sea levels at Milford Haven may rise by up to 0.19 m above 2022 levels. Taken from United Kingdom Climate Projections 2018 (UKCP18) for a high emissions scenario (RCP 8.5).

### *19.4.7. Bathymetry*

The Intertek (2019) report for the Erebus Project, details that water depths over the greater Study Area range from 0 – 85 m below Lowest Astronomical Tide (LAT). Figure 19-3 shows that water depths in the vicinity of the Study Area range from 65 – 75 m below LAT (EMODnet Bathymetry Portal, 2022). Towards the coast and towards the east (towards the Celtic Sea), water depths decrease.

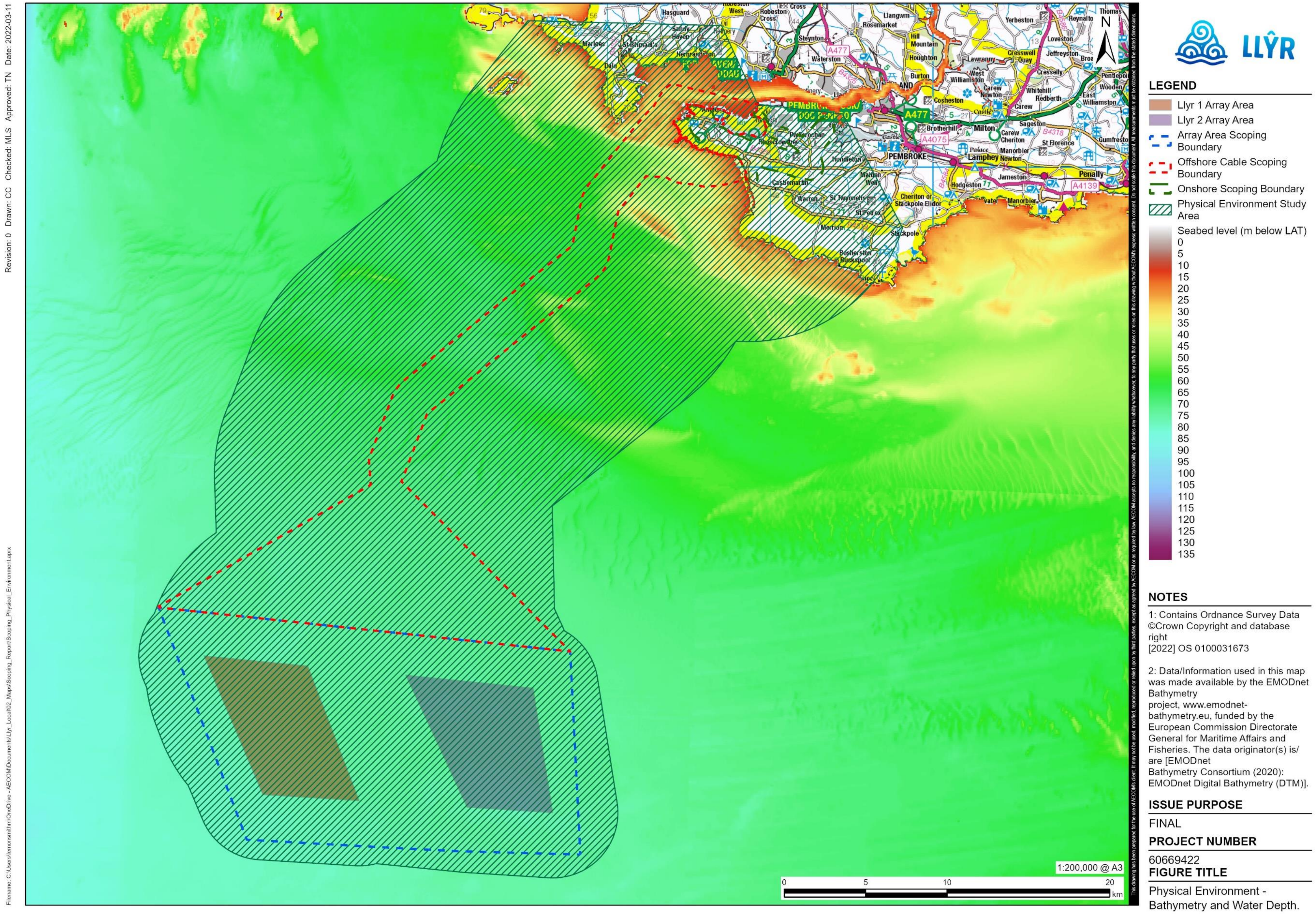


*Figure 19-3. Bathymetry in the vicinity of the proposed Project and wider Study Area*

### 19.4.8. *Geology*

Quaternary sediments in the Outer Celtic Sea and into the St George's Channel, exceed 300 m in depth (Tappin *et al.*, 1994).

The dominant bedrock types in the vicinity of the Study Area are shown in Figure 19-4 and Figure 19-5. The bedrock geology in the vicinity of the Array Area Scoping Boundary comprises chalk in the northern half and mudstone and sandstone in the southern half of Llŷr array 1. Llŷr array 2 bedrock geology is mainly mudstone and sandstone, but the south-west segment of the Study Area is mudstone, sandstone and lignite (Figure 19-4).

The cable approach to shore passes over chalk, interbedded mudstone and limestone near the array sites. Then the bedrock geology is mainly mudstone and sandstone from offshore into the Milford Haven Waterway (Figure 19-5).

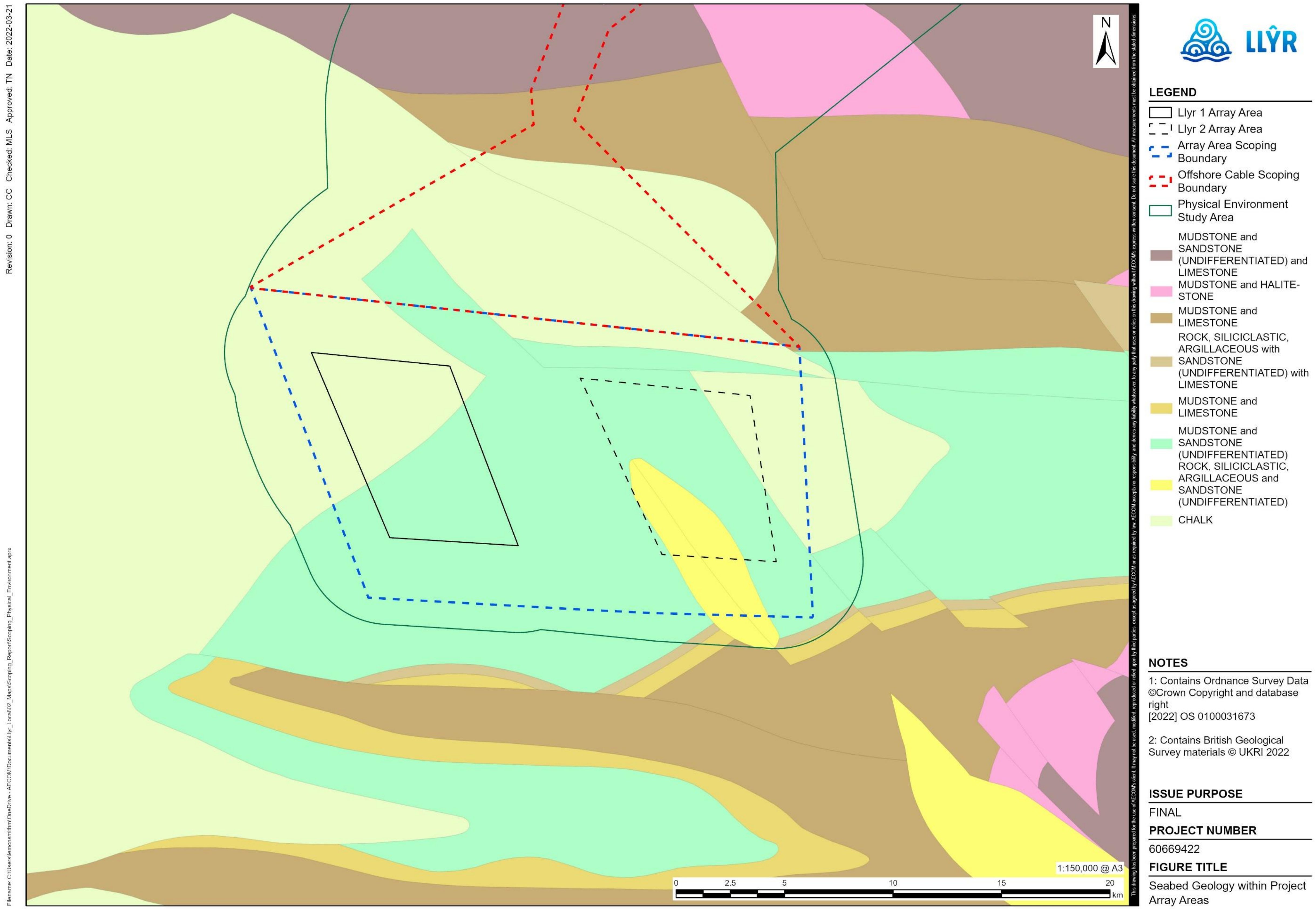


*Figure 19-4. Bedrock geology in the vicinity of the Array Area Scoping Boundary (BGS, 2020)*

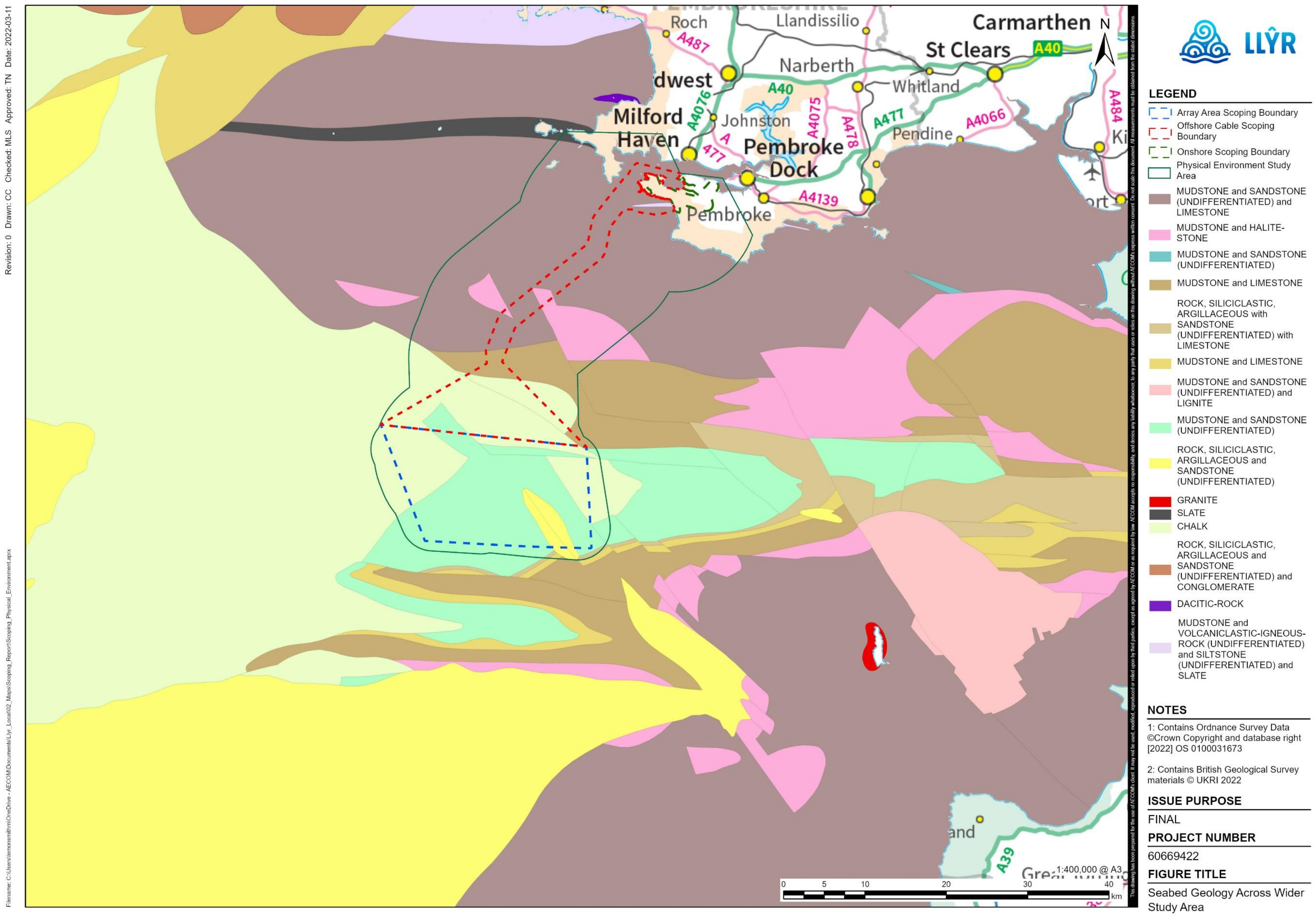


*Figure 19-5. Bedrock geology in the vicinity of the wider Study Area associated with the proposed Project*

### *19.4.9. Geomorphology and Seabed Sediments*

Seabed sediments off the west coast of Wales are predominantly muddy sandy gravel (BGS, 2022). The seabed sediment inshore around the south Pembrokeshire coast is characterised by rocky reefs, shoals and sandbanks, defined as ‘hard substrate’ by the BGS. Substrates within the Milford Haven Waterway are characterised by hard substrates within central areas which are flanked by sheltered thick mudflats supplied by river accumulations (RPS, 2018).

BGS seabed sediment data presented in Figure 19-6, shows that the seabed in the vicinity of the Array Area Scoping Boundary primarily consists of sand, and towards the western half of Llŷr array 2, the sediment layer is slightly gravelly sand. Nearer the coast towards the Milford Haven Waterway, seabed sediments are characterized by gravelly sand. Very fine muds are present in sheltered areas of the Milford Haven Waterway (MarineSpace Ltd, 2019).

The unconsolidated sediment that characterizes much of the inshore setting in the vicinity of the proposed Project, is likely to be formed into bedform fields. The Intertek (2019) report explains that, subaqueous dunes are situated to the north and northeast of the proposed sites, with crests typically oriented from southwest-northeast to north-south. Their asymmetry would suggest sediment transport is towards the east. Intertek (2019) show that dunes heights are between 10 – 15 m and wavelengths of several hundreds of metres.

To the south of Carmarthen Bay in deeper water in association with a more central part of the Celtic Sea, there is an extensive sand wave field oriented towards the west (Mackie et al., 2007; Intertek, 2019).

In the inshore environments, subaqueous banks were found to have different sediment transport systems. Bedform asymmetry indicated sediment transport was circulatory around the banks which RWE (2012) linked to the presence of headlands along the coast.

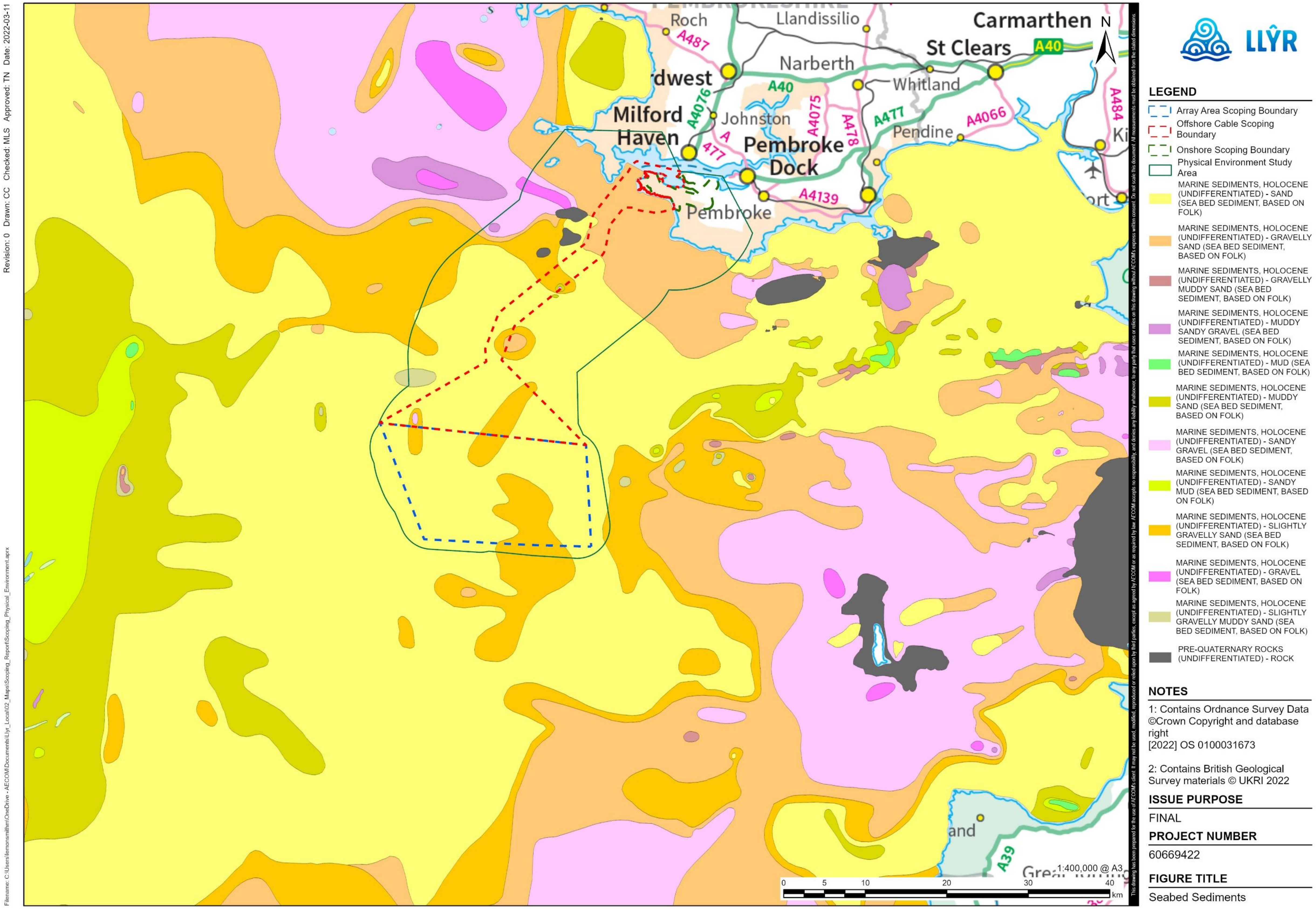


*Figure 19-6. Seabed sediments in the vicinity of the proposed Project and wider Study Area (BGS, 2020)*

### *19.4.10. Suspended Sediment*

Figure 19-7 (Cefas, 2016) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) between 1998 and 2015 for the majority of the UK continental shelf. The largest plume concentrations are associated with large estuaries where the mean values of SPM are above 30 mg/l. Based on the available data (Cefas, 2016), the SPM associated with the proposed Project has been estimated as approximately 2 – 5 mg/l at the turbine array sites with generally higher levels of approximately 5 mg/l in the nearshore regions along the Welsh coast.

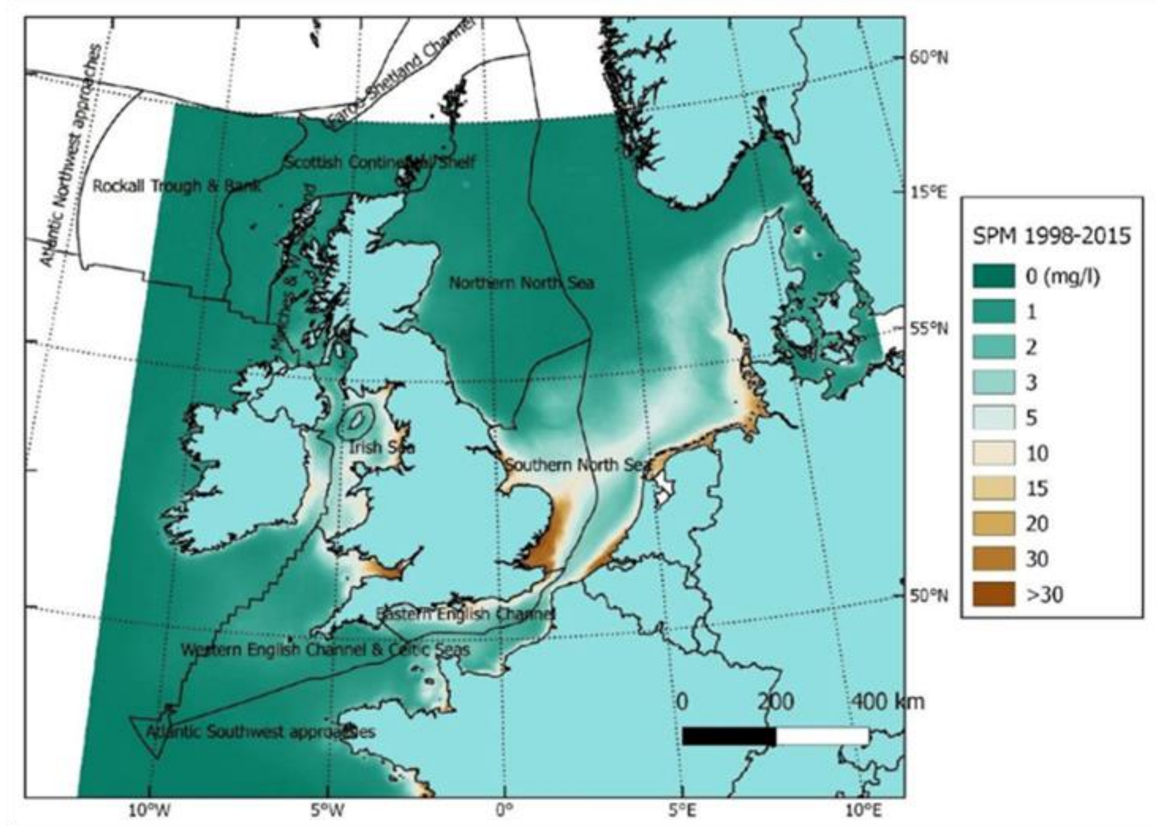


*Figure 19-7. Average suspended sediment around the UK (Cefas, 2016)*

### *19.4.11. Marine Water Quality*

The proposed Project would interact with two Water Framework Directive (WFD) coastal waterbodies. Firstly, the Milford Haven Outer WFD waterbody (WFD ID: GB641008220000) which spans Milford Haven from Penna Mouth to St Anne's Head. This waterbody is at Moderate Overall Status, with Moderate Ecological Status and a Chemical Status of Fail. The waterbody is failing to achieve good status because of high concentrations of dissolved inorganic nitrogen, mercury, and mercury-containing compounds.

Beyond Milford Haven Outer is the Pembrokeshire South WFD coastal waterbody (WFD ID: GB611008590003). This waterbody spans the coastline from St David's Head to the north, extending south and east to Manorbier Bay. This waterbody is at Good Overall Status, Good Ecological Status and Good Chemical Status.

Water quality, defined in terms of bacterial concentration, is monitored in Bathing Waters and many of the beaches within the vicinity of the Offshore Cable Scoping Boundary (at West Angle, Freshwater West, Sandy Haven, Marloes Sands and Dale) which have been assessed as having excellent water quality for the last four years (NRW, 2022). The Upper Cleddau Shellfish Water is also approximately 8.5 km east of the Offshore Cable Scoping Boundary, being located east of the A447 road crossing of Milford Haven estuary.

The Environmental Statement for the Greenlink Interconnector Scheme (2019) details that dissolved contaminants off of the Pembrokeshire coast are low. The coastal waters around south Pembrokeshire have higher concentrations of contaminants but are within environmental quality standards for metals and Maximum Allowable Concentrations for alkylphenolic chemicals.

Water quality samples from the marine environment were collected to support the Environmental Statement for Project Erebus. Samples were collected from 26 sampling stations across the portion of the Offshore Cable Scoping Boundary that intersects WFD waterbodies. Stations were positioned along the centre of the Offshore Cable Scoping Boundary at approximately 500 m intervals with three samples collected per station (2 m above the bed, mid-water depth and 2m below surface). These were analysed to assess concentrations of chlorophyll, suspended solids, dissolved oxygen, nutrients, hydrocarbons and metals.

In all but one case, chlorophyll concentrations were below the limits of detection. Suspended solid concentrations were low to moderate (range <5 mg/l – 23 mg/l). Note that the WFD (Standards and Classifications) Directions classify concentrations <10 mg/l as clear and 10-100 mg/l as intermediate in terms of their clarity. All suspended solid samples could therefore be considered clear to intermediate.

All dissolved oxygen samples were above the standard corresponding to 'high' under the WFD environmental quality standards (EQS). Maximum concentrations of nutrients recorded in the Project Erebus sampling were 0.55 mg/l ammoniacal nitrogen, 0.4 mg/l nitrate, <0.01 mg/l nitrite and 0.13 mg/l phosphate.

Heavy and trace metal concentrations were consistently low and below the limit of detection in most cases. However, zinc levels were found to exceed the WFD EQS (long term mean 6.8 µg/l) within 3 of 78 samples and cadmium was found to exceed WFD EQS (long term mean 0. 02 µg/l) in one sample. All Polycyclic Aromatic Hydrocarbons (PAHs) were found to be below the laboratory limits of detection.

The sampling exercise for Project Erebus indicates that based on the sampling exercise undertaken, baseline marine water quality is generally good with low levels of chemical contamination. This was consistent with other nearby projects including the Greenlink Interconnecter and Atlantic Array, which report that dissolved contaminants off the Pembrokeshire coast and in the Celtic Sea are low or below limits of detection for current analytical tools (RWE, 2013; Intertek, 2018).

NRW undertake regular water quality monitoring for the Pembrokeshire coastal and transitional water bodies. The nearest monitoring points are Station 39683 at the mouth Milford Haven Estuary) and Station 39684 (approximately 2 km from the landfall site upstream within Milford Haven estuary). Data will be requested from NRW and reviewed to support the full impact assessment.

#### *19.4.12. Marine Sediment Quality*

The physical properties of different sediment types are associated with varying levels of contaminants that might be contained within them. Fine muddy sediments have an increased risk due to their relatively large surface area and greater cation exchange capacity compared to coarser sediments.

Sediment quality data was collected to inform the EIA for the Atlantic Array Offshore Wind Farm (RWE, 2013). The results indicated that chemical contaminant concentrations were low; and no samples exceeded Cefas Action Level 1 values for metal contamination used in the assessment. This was also the case for the hydrocarbon content levels.

Concentrations of hydrocarbons such as polycyclic aromatic hydrocarbons vary between sites across the south Pembrokeshire coast (MarineSpace Ltd and ITP Energised, 2020). Overall, the measured levels are considered to have no adverse biological effects for an indefinite period of exposure (MMT, 2019) (based on the Canadian Council of Ministers of the Environment Interim Sediment Quality Guidelines (ISQG)).

#### *19.4.13. Coastal Geomorphology*

The proposed Project will include an offshore export cable which will make landfall at a location to be determined. Therefore, the Study Area for the intertidal and coastal geomorphology (hereafter referred to as the 'Study Area') encompasses all potential landfall locations including: West Angle Bay, Angle Bay and Freshwater West Beach.

The St Govan's Head to Thorn Island frontage is characterised by limestone cliffs to the south and sandstone cliffs to the north, separated by the dunes at Frainslake Sands and Freshwater West.

West Angle Bay is a defended frontage, with a short length of seawall reducing the risk of coastal erosion and flooding. The recommended policy along much of this coastline is for "no active intervention" to allow the coastline to evolve naturally.

The Thorn Island to Cleddau Bridge frontage comprises the southern bank of Milford Haven and includes Angle Bay (and the Pembroke river). Milford Haven is constrained by the resistant geology which provides the main influence on its structure and shape.

#### *19.4.14. Designated Sites*

The following marine and coastal designated sites are within a 1 km Study Area around the Array Area and Offshore Cable Scoping Boundary. Refer to Chapter 28, Volume 4 for more information:

- Skomer, Skokholm and the Seas off Pembrokeshire Special Protection Area (SPA) – notable for breeding seabirds and coastal birds (including puffins *Fratercula* sp. and chough *Pyrrhocorax* sp.);
- Castlemartin Coast SPA – notable for breeding birds (chough);
- Bristol Channel Approaches Special Area of Conservation (SAC) – designated as an area of importance for marine mammals (harbour porpoise *Phocoena phocoena*);
- West Wales Marine SAC – designated as an area of importance for marine mammals (harbour porpoise);
- Pembrokeshire Marine SAC – designated primarily due to presence of grey seal *Halichoerus grypus* and shore dock *Rumex rupestris* and for estuary, large shallow inlet and bays and reef habitat;
- Limestone Coast of South West Wales SAC – designated primarily for great horeshoe bat *Rhinolophus ferrumequinum* and early gentian *Gentianella anglica*, and vegetated sea cliff habitat and fixed coastal dunes with herbaceous vegetation;
- Dale and South Marloes Coast Site of Special Scientific Interest (SSSI) – designated for rocky and sandy shore marine communities, including rock pool and overhang communities, and several species including nationally scarce species including red alga *Gigartina pistillata*, grey seals *Halichoerus grypus*;

- Angle Peninsula Coast SSSI – designated for its geology, its wide range of intertidal rock, sand, and gravel habitats and communities, particularly rockpools, caves, tide-swept and under-boulder communities, and for its population of roosting and feeding chough;
- Broomhill Burrows SSSI – designated due to providing valuable exposures demonstrating some important structural characteristics of one of the major zones of the Variscan orogenic belt in Pembrokeshire. It is also One of 'Pembrokeshire's largest dune systems with the most extensive and most diverse dune slack vegetation; and
- Milford Haven Waterway SSSI – designated as an exceptional example of a ria (a system of valleys drowned by post-glacial rise in sea level) that consists of a number of estuaries, embayments and inlets.

The Limestone Coast of South West Wales SAC, Castlemartin Coast SPA and Broomhill Burrows SSSI are terrestrial designations for which the qualifying features would not be impacted by marine physical processes and so can be scoped out of the marine physical environment chapter (but are considered under the onshore element of the Project and within other relevant technical chapters). There is potential for the remainder of the sites to be impacted.

## 19.5. Embedded and Good Practice Measures

### *19.5.1. Best Management Practices, Design and Mitigation Measures to Minimize Seabed Disturbance and Turbidity, and Reduce its Environmental Impact*

Subsea cable installation has the potential to create seabed disturbance with an associated increased in turbidity during the construction period. However, it should be noted that unlike conventional offshore turbines these will only be anchored rather than fixed to the seabed. The design of the proposed Project will incorporate advice from the OSPAR Commission Guidelines on Best Environmental Practice (BEP) in Cable Laying and Operation, to ensure the following environmental control measures and strategies have been built into the cable layout design to minimize the risk of turbidity during construction:

- The aim is to use the shortest possible cable route distance back to shore, subject to other constraints.
- During cable installation, it is anticipated that installation vessels will primarily use dynamic positioning at water depths of around >10m to maintain vessel position during installation operations. Dynamically positioned vessels will not disturb the seabed in water > 20 m deep (National Grid NSN Link, 2014). Therefore, there will be no disturbance of the seabed by anchors for the majority of the route.
- For cable protection measures, is expected that detailed design will satisfy hydrodynamic stability parameters, including under the climate change scenario. Further, good practice will be used in the layout design of the scour protection to minimise scour and the associated increase in suspended sediment.

### *19.5.2. Best Management Practices, Design and Mitigation Measures to Minimise Water Contamination and Reduce its Environmental Impact*

A Construction Environment Management Plan (CEMP) will be produced for each of the relevant parts of the proposed Project. The CEMP would outline the best practice mitigation measures required to be implemented during construction to ensure that no significant adverse impacts to the marine water environment would occur. This would include measures to prevent accidental spillages from occurring and to minimise disturbance of sediments.

Drilling fluids required for HDD operations will be carefully managed to minimise the risk of breakouts into the marine environment. Specific avoidance measures would include:

- The use of biodegradable drilling fluids (PLONOR substances) where possible;

- Drilling fluids will be tested for contamination to determine possible reuse or disposal; and
- If disposal is required, drilling fluids would be transported by a licensed courier to a licensed waste disposal site.

There is potential for ships and hydraulic equipment to discharge contaminants into the sea during cable laying processes. However, the quantity of dissolved contaminants discharged from vessels or hydraulic equipment will be small thus any impact offshore would be temporary and localized. Further, the discharging of contaminants is not permitted within 12 NM of the coast to preserve bathing waters. All vessels used will be compliant with IMO MARPOL regulations and will be equipped with waste disposal facilities onboard.

#### *19.5.3. Best Management Practices, Design and Mitigation Measures Relating to Waste*

The proposed Project will maintain compliance with the high-level principles of the Waste Hierarchy, as enacted through The Waste (England and Wales) Regulations 2011 (HMSO, 2011). On this basis, waste associated with the proposed Project does not require further assessment and will be subject to appropriate control via existing best-practice and regulatory control under the Marine Licensing regime.

### 19.6. Likely Significant Effects

The following section considers the potential for significant effects arising from the activities of the proposed Project.

- Increases in suspended sediment concentrations as a result of seabed disturbance during installation, maintenance activities during operation and potentially during decommissioning;
- Disturbance to coastal morphology / processes at landfall locations;
- Effects on water quality during construction (e.g. through drilling and disposal of drill arisings, accidental release of chemicals or disturbance of potentially contaminated sediment during construction), which may affect WFD water quality status;
- Effects on water quality during operation (e.g. during cable repair or other maintenance activities), which may affect WFD water quality status;
- Effects on water quality during decommissioning (e.g. accidental release of fluids, sediment resuspension during removal of export cabling and drilled piles) which may affect WFD water quality status;
- Scour of benthic sediments related to turbine foundations, anchor points and cable protection;
- Impact of changes in metocean conditions and shoreline erosion at landfall sites as a result of climate change

Table 19-2 provides a summary of the potential impacts arising from the proposed Project on physical process receptors.

*Table 19-2. Key sensitivities and potential impacts to marine coastal processes, and sediment and water quality*

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Installation<br>- Surveys | Temporary seabed disturbance and increase in suspended sediment concentrations | ✓ | | Temporary seabed disturbance and increase in suspended sediment concentrations as a result of trialling of cable burial tools in harder seabed (clay and chalk) or very soft seabed.<br><br>Temporary seabed disturbance as a result of vibrocore and Cone Penetration Test samples. All other survey techniques will not interact with the seabed and therefore are scoped out of further assessment. |
| Installation<br>- Route clearance (various methods depending on seabed) | Seabed disturbance | ✓ | | Temporary seabed disturbance due to:<br>• The total destruction and partial disturbance of sandwaves and sandwave fields by ploughs and Mass Flow Excavator activities.<br>• Displacement and removal of debris and boulders by grapple lay runs and boulder clearance.<br>• Removal of Out of Service cables using a de-trenching grapnel will temporarily leave an open trench<br><br>Possible localized permanent seabed disturbance due to:<br>• Displacement and removal of boulders |

| Project Phase | Potential impact pathway | Further assessment required in EIA<br>Scoped<br>In | <br>Scoped<br>Out | Rationale |
|---|---|---|---|---|
| Installation | Water quality –chemical contamination | ✓ | | There is potential for ships and hydraulic equipment to discharge contaminants into the sea during construction, maintenance and decommissioning activities. E.g., fluid discharges from HDD, including drilling fluid such as bentonite and/or other comparable slurry<br>There is also potential that water quality may be impacted by the re-dissolution of contaminants in disturbed soils.<br>Changes in water quality has potential to cause non-compliance with WFD requirements. |
| Installation<br>- Cable laying | | | ✓ | Cable laying is thought to have no significant impact on the seabed or any associated physical processes, therefore it is scoped out of further assessment. |
| Installation<br>- Cable burial | Increase in suspended sediment concentration and alteration of seabed morphology as suspended sediment is deposited. | ✓ | | Cable burial techniques in water >10 m deep, will cause the sediment to become suspended, increasing turbidity and potentially smothering sensitive habitats and altering the seabed bathymetry once the sediment is re-deposited having been transported in suspension. |
| Installation<br>- Cable protection<br>(various methods depending on seabed including rock placement) | Seabed profile artificially raised<br>Risk of scour development about protection | ✓ | | The seabed profile will be raised due to the placement of material which will remain in place for at least the lifetime of the cables. Scour may develop about the rock placement and concrete mattressing.<br>Scour can lead to small increases to the amount of sediment becoming suspended.<br>Adverse impacts on water quality have potential to cause non-compliance with WFD requirements. |

| Project Phase | Potential impact pathway | Further assessment required in EIA<br>Scoped In | <br>Scoped Out | Rationale |
|---|---|---|---|---|
| Installation<br>- Anchor deployment | Seabed disturbance | ✓ | | During cable installation in waters < 20 m deep, anchors will likely be used which will impact various points of the seabed up to 1 km from the vessel. |
| Installation at Landfall | Water contamination | | ✓ | **HDD installation**<br>Water contamination:<br>Fluid discharges will be released to the sea during HDD activities. However, biodegradable drilling fluids (PLONOR substances) will be used, drilling fluids will be tested for contamination to determine possible reuse or disposal; and if disposal is required, drilling fluids would be transported by a licensed courier to a licensed waste disposal site. As such the impact of water contamination by drilling fluids is scoped out of further assessment |
| | Nearshore seabed disturbance | ✓ | | If HDD is used for cable installation at landfall there will be minimal seabed disturbance in the intertidal zone. However, the excavation of the exit pit at the breakout point will likely cause localized seabed disturbance and cause sediment suspension.<br>If trenching is used for landfall cable installation, there is potential for a sediment to become suspended and transported.<br>Significant impacts of sediment plume arising from the cable laying activities are not anticipated; however, further desktop study through the EIA will be carried out to confirm this expectation, including estimation of the extent of sediment transport before deposition. |

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Operation and Maintenance<br>- Physical presence of cable and cable protection | Possibility for an impact on to the metocean and sediment transport regime. | ✓ | | For at least the lifespan of the proposed Project the seabed morphology will be raised where cable protection is emplaced and will inevitably interact with metocean and sediment transport regimes. |
| Decommissioning<br>- Cable/ cable protection removal | | ✓ | | The impacts described for cable installation are applicable to the decommissioning phase of the proposed Project. |

## 19.7. Assessment Methodology

This section describes the approach that will be applied to assess the potential effects on the physical environment associated with the proposed Project. The assessment will be based on a Project Design Envelope (PDE) which is subject to confirmation. The worst-case scenarios will be identified for the installation, operation and decommissioning phases of the proposed Project. The environmental assessment will identify potentially significant adverse environmental effects and, propose project specific mitigation measures to avoid, reduce or offset the effects or maximise environmental benefits. These measures should then be incorporated into the post-consent configuration refinement of the Project.

The EIA will be carried out using a range of evaluation techniques including desk-based studies, reference to standards/guidelines and best practice established from assessment work for similar schemes in the marine and coastal environment. It is proposed to undertake the assessment using the approach described without a requirement for numerical modelling, which is consistent with the approach applied in similar studies where the footprint of the area of seabed directly affected is relatively small.

### *19.7.1. Data Sources*

It is not proposed to undertake any Project specific modelling studies, instead, the assessment will make use of results from studies previously undertaken near the proposed Project. The following key desktop reports and metocean datasets have been identified which will be used to inform the understanding of present-day (baseline) conditions:

- Atlas of UK Marine Renewable Energy Resources – information on wind, waves and tides (ABPmer, 2008);
- Project Erebus Environmental Statement (MarineSpace Ltd, 2019);
- Project Valorous Environmental Impact Assessment Scoping Report (MarineSpace Ltd and ITP Energised, 2020);
- United Kingdom Hydrographic Office (UKHO, 2022) – Published Charts and Tide tables: tidal diamonds with current stream data;
- British Geological Survey (BGS, 2022) – geological units, Quaternary deposits and seabed sediments;
- EMODnet (2022) – Sea Floor Geology and seabed substrate information;
- UKHO and Admiralty Charts (2022) – Bathymetry and Tidal Diamond data;
- The Outer Bristol Channel Marine Habitat Study (Mackie et al., 2006);
- Marine Energy Test Area (META) Environmental Impact Assessment Scoping Report (RPS Energy, 2018);
- Erebus Stage 1 Floating Windfarm Geological Desk Top Study (Intertek, 2019);
- West of Wales Shoreline Management Plan (Pembrokeshire County Council, 2012); and
- South Wales Shoreline Management Plan (Swansea and Carmarthen Bay Coastal Engineering Group, 2012).

Further to the above, a request will be made to Natural Resources Wales for the latest water quality monitoring data that they may hold, as well as details on WFD waterbodies and their objectives, and any investigations that may have been undertaken relating to them. Subject to the results of the desk-based assessment of the available data, including any relevant data made available from the Erebus ES, there may be an additional requirement for proportionate field survey data collection.

### *19.7.2. Assessment Method*

The assessment methodology that will be used to identify potential impacts to the marine and coastal physical environment from the proposed Project is as follows:

- Review of existing baseline data, information and guidance (to include Shoreline Management Plans (including the West of Wales SMP, South Wales SMP); Regional Marine Processes data/reports; relevant local publicly available data and guidance (see Section 19.7.1);
- Acquisition of additional data to fill any gaps, such as obtaining water quality or sediment data (subject to findings of the desk based assessment (see Section 19.7.3);
- Formulation of a conceptual understanding of baseline conditions (see Section 19.4);
- Consultation and agreement with the regulators regarding proposed assessment approaches;
- Determination of the worst-case scenarios based on the agreed Project Design Envelope;
- Consideration of mitigation measures; and
- Adherence to the Environmental impact assessment methodology set out in Volume 1, Chapter 5. It explains that Project activities and known environmental sensitivities within the Study Area should be recorded in a simple form using the Environmental Issues Identification (ENVID) matrix to establish the significance of an impact. This involves establishing the magnitude of any change to the physical environment and the sensitivity of the receptor to change. This assessment is carried out prior to any mitigation and re-evaluated following the incorporation of appropriate mitigation measures.
- Table 19-3 indicates the criteria to be used to determine the sensitivity of a marine physical environment receptor. Table 19-4 indicates the magnitude of impact criteria that will be applied for the project. Finally, the significance of effect is determined following the matric approach (combining sensitivity and magnitude) as shown in Table 19-5. Effects that moderate and above are considered significant.
- An extended WFD screening and scoping compliance assessment will be prepared at the ES stage to include both the onshore and offshore elements of the proposed Project. Methodology details are given in Volume 2, Chapter 10 Water Environment.

*Table 19-3. Sensitivity criteria for marine receptors[1]*

| Sensitivity | Description |
|---|---|
| High | The marine environment receptor (e.g. sediment or water quality receptor) provides key supportive contribution to the designation.<br>Receptor has little or no ability to absorb change without fundamentally altering its character.<br>Receptor has low/no capacity to return to baseline condition within Project life, e.g. low tolerance to change and low ability to recover, such as a physical feature formed over a geological time scale. |
| Medium | Receptor has moderate capacity to absorb change (e.g. water quality impact) without significantly altering its character.<br>The marine sediment or water quality receptor supports high biodiversity.<br>Medium capacity to return to baseline condition, e.g. >5 of up to 10 years. |
| Low | The receptor is tolerant to change without significant detriment to its character<br>The marine sediment or water quality receptor has reasonable capacity for change to status, due, for example, to fast current speeds or relatively large size of the receiving water body leading to increased capacity for dilution and flushing. |

[1] Sensitivity and Magnitude criteria developed based on those used in the Environmental Statements for Project Erebus (Marinespace Limited, 2019) and Greenlink Interconnector (RWE, 2013).

| Sensitivity | Description |
|---|---|
| Negligible | The receptor is tolerant to change with no effect on its character. |

*Table 19-4. Magnitude of impact criteria*[1]

| Magnitude | Description |
|---|---|
| High | Extensive alterations to key characteristics of the physical environment (e.g. marine sediment or water quality status); water or sediment quality status degraded to a level that causes permanent or long term (>5 years) or regional change. |
| Medium | Medium scale (1-5 years, local level) alterations to key characteristics of the marine physical environment (e.g. sediment or water quality status). Associated expectation that marine sediment or water quality status likely to require extensive time for recovery to baseline conditions. |
| Low | Site-specific and short term (<1 year) alterations to marine physical environment (e.g. sediment or water quality status) expected to be measurable above background concentrations, but not considered to be substantial changes. Activity not likely lead to compromise of water or sediment Environmental Quality Standard (EQS). The underlying character/composition of the baseline condition will be similar to the pre-development situation. |
| Negligible | Any changes to marine physical environment (e.g. sediment or water quality) will extend for short periods of time and are expected to be quickly reversed once activity ceases, approximating to a 'no change' situation. |

*Table 19-5. Matrix for determining significance of effect*

| | | Magnitude of Change | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Medium | High |
| Sensitivity of Receptor | High | Negligible / Minor | Moderate | Major | Major |
| | Medium | Negligible | Minor | Moderate | Major |
| | Low | Negligible | Negligible | Minor | Moderate |
| | Negligible | Negligible | Negligible | Negligible | Negligible / Minor |

The above tables summarise the approaches that will be used to assess the effects on coastal and marine physical processes, and water and sediment quality for each parameter.

### 19.7.3. *Proposed Surveys*

The description of baseline conditions for the physical marine environment will make use of bathymetric geophysical surveys undertaken to support a range of Project requirements. The identification of bedforms such as sand waves, and characterisation of the seabed material will be of particular relevance.

It is not proposed to undertake any site-specific deployment of instruments to measure currents and/or waves. As an alternative, reference will be made to previous studies where such information is available within the public domain.

### 19.8. Conclusion

In summary:

- A number of potential impacts have been identified associated with the installation, maintenance and operation, and decommissioning stages of the proposed Project;
- A detailed assessment of the potential impacts identified above will be completed, forming part of the ensuing EIA; and
- Water contamination from HDD installation and cable laying have been scoped out of further consideration for its impact on the physical environment.

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# 20. BENTHIC ECOLOGY

## 20.1. Introduction

This chapter of the scoping report provides a high-level overview of relevant baseline information for benthic habitats and communities, as well as a summary of the potential interactions between the proposed Project and this receptor group. Any survey work that will be completed to help characterise the benthic ecology baseline, and the assessment methodology that will be used for the impact assessment.

## 20.2. Regulatory and Planning Policy Context

A number of legislative instruments, policies and plans require decision makers to consider the environmental impacts of a project. For detailed information regarding the legislative context of the proposed Project see Volume 1, Chapter 2: Regulatory and Planning Policy Context. The key legislation, policy, and guidance relevant to the assessment of the potential effects on the benthic receptors associated with the installation, operation and decommissioning phases of the proposed Project include:

- **The Conservation of Habitats and Species Regulations 2017** transposes the Habitats Directive (92/43/EEC) into UK legislation out to the 12 nautical mile (NM) limit.
- **The Conservation of Offshore Marine Habitats and Species Regulations 2017,** that apply within UK Offshore Marine Area (beyond 12nm limit) as defined in the Marine and Coastal Access Act 2009.
- **Marine and Coastal Access Act 2009**, which provides the legal mechanism to help ensure clean, healthy, safe and productive and biological diverse oceans and seas.
- **Environment (Wales) Act 2016,** Section 7 lists the habitats and species of Principle Importance which supersedes the duty of Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006 (as amended). The habitats and species included within this list can be regarded as 'threatened or declining' under OSPAR.
- **The Marine Strategy Regulations 2010,** which transpose the Marine Strategy Framework Directive (2008/56/EC) into UK legislation.
- **The Wildlife and Countryside Act 1981 (as amended),** which includes provisions relating to nature conservation.
- **The Access to the Countryside (Coastal Margin) (England) Order 2010** under The Countryside and Rights of Way (CRoW) Act 2000 (as amended).
- The Water Environment (Water Framework Directive (England and Wales)) Regulations 2017, which transposes the EU Water Framework Directive (2000/60/EC) in UK legislation.

Key national and local plans and policies relevant to the assessment of impacts from the proposed Project on benthic ecology include:

- **Welsh National Marine Plan** - which sets out a single framework for sustainable development within Wales marine area, including the requirement to maintain seafloor integrity and safeguard benthic ecosystems (Welsh Government, 2019).
- **UK Marine Policy Statement** - which aims to achieve sustainable development in the UK marine area;
- **Nature Recovery Action Plan Wales** - A strategy for Wales which aims to address declining biodiversity, including marine habitats, ecosystems and fisheries;
- **Planning Policy Wales** - highlights the importance of biodiversity for natural services, sustainability and the Welsh economy. It includes objectives to achieve efficient use and protection of natural resources and enhancing biodiversity.

## 20.3. Study Area

The proposed Project is located in the north-east Celtic Sea , with the landfall areas potentially located in Milford Haven and surrounding the Angle Peninsula, currently identified as West Angle Bay, Angle Bay, and Freshwater West Beach (Figure 20-1). The components of the proposed Project in the marine environment comprise the turbines, inter-array cables, export cable route and cable landfall area.

The Study Area for benthic ecology takes a precautionary approach, as detailed below, to ensure the assessment incorporates all areas where significant effects could occur throughout the life of the proposed Project.

For intertidal ecology, a nominal 2 km distance has been considered either side of the Offshore Cable and Onshore Scoping Boundary, adjusted as required based on the maximum zone of influence (ZoI) of potential impact pathways which also reflects any coastal morphology, the presence of a bay for example, that could affect the ZoI.

For subtidal benthic ecology, a buffer distance of 10 km of the proposed Project has been considered, which encompasses all likely ZoI to benthic receptors within the subtidal. These distances have also been used to screen for potential designated and protected sites.

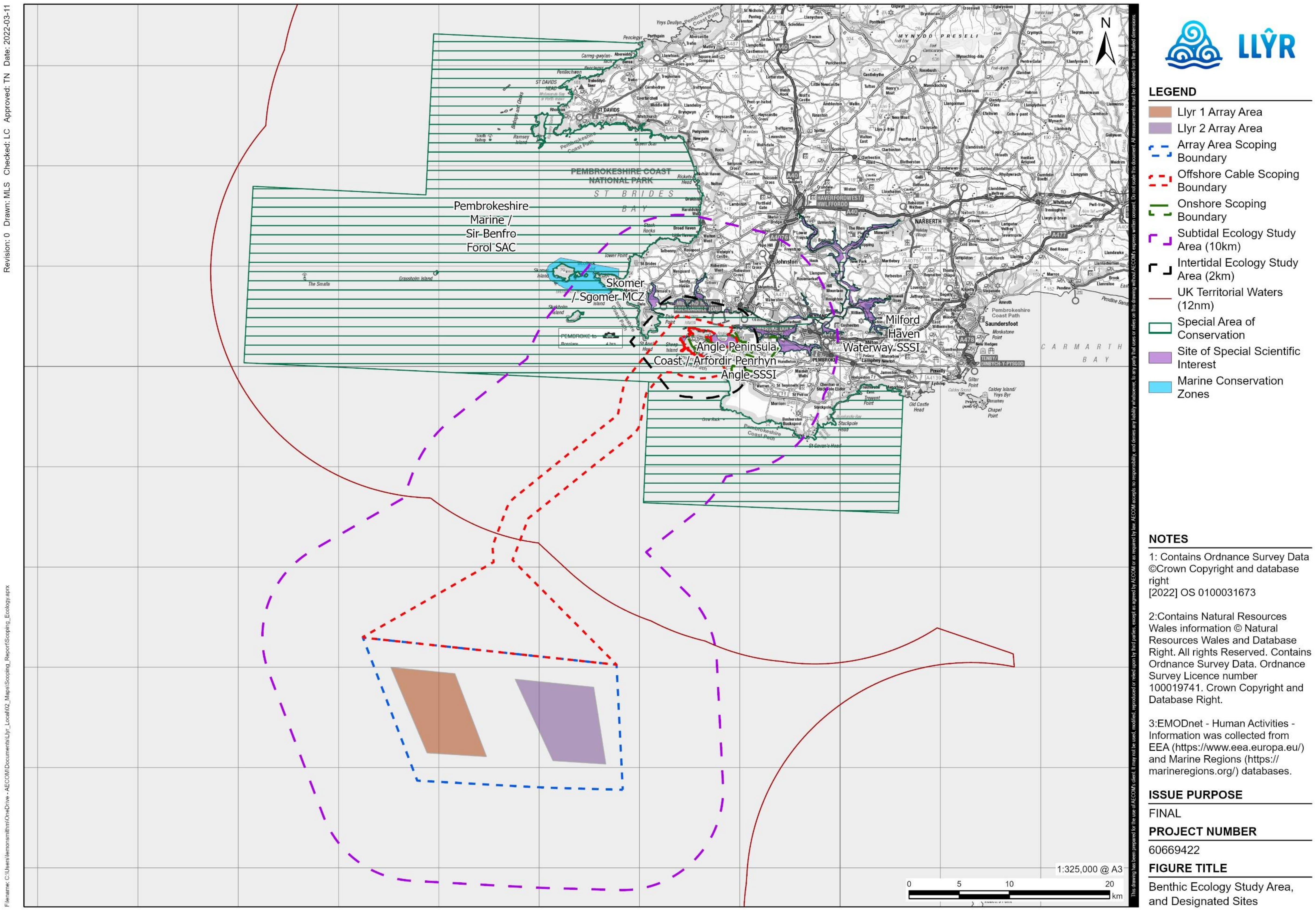


*Figure 20-1. Benthic ecology Study Area and designated sites*

## 20.4. Baseline

Benthic ecology refers to the diversity, abundance, and function of organisms living on (epifauna) or in (infauna) the seabed. Benthic communities are found in all marine habitats, from the deepest parts of the ocean to the intertidal. Physical factors such as water depth, sediment type, and supply of organic matter determine habitat types and species present, and therefore the composition of benthic communities.

The Study Area includes a diverse range of intertidal and subtidal benthic habitats and communities from the offshore area in the Celtic Sea to the Pembrokeshire coast. To determine the broadscale baseline conditions of benthic ecology within the Study Area, this chapter has been informed using predictive broad-scale seabed habitat maps (EUSeaMap 2021) provided by EMODnet Seabed Habitat (EMODnet, 2021) and a range of data collected by Natural Resources Wales (NRW), including intertidal Phase I habitat mapping surveys undertaken between 1996 and 2005 (NRW, 2021).

### *20.4.1. Intertidal*

The intertidal habitat surrounding Angle Peninsula, which falls within the Offshore Cable Scoping Boundary (Figure 20-1), has been identified as comprising predominantly 'littoral rock and other hard substrata' (EUNIS A1). This rocky shore consisted of low to high energy littoral rock, depending on the vertical location on the shore and the varying exposure. Biotopes consisting of fucoids (Fucus sp.), mussels and barnacles were common, particularly 'Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock' (EUNIS A1.2141), as well as 'Himanthalia elongata and red seaweeds on exposed lower eulittoral rock' (EUNIS A1.123). This habitat can be found within West Angle Bay, Angle Bay, and Freshwater West.

Of the potential landfall sites for the proposed Project the intertidal habitat within the centre of West Angle Bay and Freshwater West (further south) are areas of fine, clean, littoral sand, identified as the biotope 'polychaetes in littoral fine sand' (EUNIS A2.231) and 'Eurydice pulchra in littoral mobile sand' (EUNIS A2.2232). On the upper littoral fringe of West Angle Bay are small areas of 'barren littoral shingle' (EUNIS A2.111).

The remaining potential landfall site, at Angle Bay, mainly consists of low/moderate energy littoral rock biotopes with the presence of fucoids (Fucus sp.), knotted wrack (Ascophyllum nodosum), mussels, and barnacles. Surrounding this habitat were areas of littoral sand, including 'Lanice conchilega in littoral sand' (EUNIS A2.245) and 'barren littoral coarse sand' (EUNIS A2.221). Further south, within Angle Bay itself, sand and rocky shore habitats were also found; including small areas of intertidal seagrass beds (EUNIS A2.61).

### *20.4.2. Subtidal*

Subtidal benthic communities are those found on or in the seabed below the low water mark. A variety of physical factors contribute to the formation of habitat type, including depth, sediment type, and supply of organic matter, all of which contribute to influencing benthic community composition.

Benthic habitats identified in the Array Area and Offshore Cable Scoping Boundary are sediment based habitats including 'deep circalittoral sand' (EUNIS A5.27) with small, occasional patches of 'deep circalittoral coarse sediment' (EUNIS A5.15) and 'deep circalittoral mud' (EUNIS A5.37).

The habitats in the Offshore Cable Scoping Boundary change along the export cable route transitioning to 'circalittoral fine sand'/ 'circalittoral muddy sand' (EUNIS A5.25/ A5.26) in the region close to the Study Area and then 'circalittoral coarse sediment' (EUNIS A5.14). The latter habitat extends up to the intertidal within West Angle Bay and Angle Bay. The subtidal habitat surrounding Angle Peninsula also comprised extensive areas of high energy infralittoral and circalittoral rock (EUNIS A3.1/ A4.1), which can be found in West Angle Bay and within Freshwater West. These habitats (with the exception of high energy infralittoral and circalittoral rock (EUNIS A3.1/ A4.1) which are representative of the Annex I habitat, reefs (1170)) are all representative of Habitats of Principle Importance listed under Section 41 of the NERC Act (2006). Of these, 'deep circalittoral mud' (EUNIS A5.37) is representative of the habitat of Principle Importance, also listed under Section 7 of the Environmental Wales Act (2016), 'mud habitats in deep water'.

Subtidal surveys for the Erebus Floating Offshore Wind Project identified areas of definite and potential Annex I reef, in the nearshore areas of the export cable both within and without the Pembrokeshire Marine/Sir Benfro Forol SAC (Marine Space, 2019).

### *20.4.3. Designated Sites and Protected Species*

A number of habitats which are of Principle Importance, listed under Section 7 of the Environmental Wales Act (2016), have been identified (NRW, 2022) as potentially overlapping with the Array Area and Offshore Cable Scoping Boundary. These include: 'intertidal underboulder', '*Musculus Discors* green crenella beds', 'saltmarsh', 'estuarine rock', 'mud habitats in deep water' and six habitats also listed under OSPAR, 'fragile sponge and anthozoans', 'subtidal mix mud sediments', 'intertidal mudflats', 'maerl beds live and dead', 'seagrass beds', 'sheltered muddy gravel', and 'tide swept channels'.

Within the Study Area, the following habitats of Principle Importance (listed under Section 7 of the Environmental Wales Act (2016)) were also noted (all of which are also listed under OSPAR): 'blue mussel beds', '*Sabellaria spinulosa* reef', 'saline lagoons', and 'peat clay exposures'.

Key designated sites for the protection of benthic features within 10 km of the proposed Project (Figure 20-1) are:

- Pembrokeshire Marine/Sir Benfro Forol Special Area of Conservation (SAC);
- Skomer Marine Conservation Zone (MCZ);
- Angle Peninsula Coast/Arfordir Penrhyn Angle Site of Special Scientific Interest (SSSI); and
- Milford Haven Waterway SSSI.

**Pembrokeshire Marine/Sir Benfro Forol SAC**

The Offshore Cable Scoping Boundary passes through this designated site which covers intertidal and subtidal marine and estuarine habitats over an area of approximately 138,039 ha. The site is designated for the protection of the Annex I habitats (which are a primary reason for selection of the site) estuaries (1130), large shallow inlets and bays (1160), and reefs (1170). It is also designated for the secondary protection of sandbanks which are slightly covered by sea water all the time (1110), mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (1150), Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330), and submerged or partially submerged sea caves (8330).

The Pembroke Marine/Sir Benfro Forol SAC includes the Daugleddau estuary and Milford Haven, the species richness of the sediment communities within this area being high (JNCC, 2021). The Milford Haven is one of the best representations of the Annex I habitat, large shallow inlets and bays (1160), where intertidal sandy/muddy areas support extensive beds of narrow-leaved eelgrass *Zostera angustifolia*. The Pembrokeshire coastline and Milford Haven comprises extensive areas of sublittoral rocky reef. This habitat is found within West Angle Bay and Freshwater West where the rocky reef supports areas of subtidal kelp beds (identified as 'kelp with cushion fauna and/or foliose red seaweeds' EUNIS A3.11). The Annex I habitat, submerged or partially submerged sea caves (8330) also occur within the Pembrokeshire Marine SAC, and are common around the Angle Peninsula, including West Angle Bay and to the north and south of Freshwater West.

Sandbanks which are slightly covered by seawater all the time (1110) are another Annex I habitat which is a qualifying feature of the Pembrokeshire Marine SAC, with an area of this habitat identified as occurring 4 km south from the Castlemartin coast/ mouth of the Milford, having the potential to overlap with proposed Project.

**Skomer MCZ**

This site is located 6.5 km away from the Offshore Cable Scoping Boundary and is designated for the protection of benthic habitats and species within the site, such as kelp forests, rocky shores, and turfs.

**Angle Peninsula Coast/ Arfordir Penrhyn Angle SSSI**

The Offshore Cable Scoping Boundary passes through this designated site, which affords protection to West Angle Bay and the surrounding area, including the sandy beach and the rocky shore habitat and associated species in the bay.

**Milford Haven Waterway SSSI**

The Offshore Cable Scoping Boundary passes through this designated site, which encompasses Angle Bay. This site affords protection of a range of benthic habitats including mixed substrata, moderately exposed rock, moderately exposed sand, and rock pools, as well as the benthic species, the tentacled lagoon worm (*Alkmaria romijni*) which is listed under Section 7 of the Environmental Wales Act (2016) as a species of Principle Importance.

## 20.5. Embedded and Good Practice Measures

Given that many design elements of the proposed Project have yet to be confirmed, the embedded and good practice measures have not been finalised at this stage. However, any measures will be discussed with statutory consultees and stakeholders throughout the EIA process. The following measures have been proposed at this stage, on the basis that they represent standard practice on an international regulatory basis:

- All Project vessels shall adhere to the International Convention for the Control and Management of Ships' Ballast Water and Sediments with the aim of preventing the spread of marine INNS (IMO, 2017); and
- All Project vessels shall adhere to the International Maritime Organisation (IMO) Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (Biofouling Guidelines) (IMO, 2011).

## 20.6. Likely Significant Effects

The potential impact pathways for all stages of the proposed Project (construction, operation (including maintenance and repair) and decommissioning) on benthic ecology, scoped into the EIA are outlined in Table 20-1.

*Table 20-1. Potential impacts to intertidal and subtidal benthic habitats and species as a result of the proposed Project*

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Direct loss and physical disturbance to benthic habitats and species | ✓ | | Construction activities associated with the route preparation and array and cable installation phases of the Project may include horizontal direction drilling (HDD), cable burial by ploughing, trenching or excavating, and vessel and turbine anchor placement. These activities can result in temporary physical disturbance to and/or loss of intertidal and subtidal benthic habitats and species.<br>Construction activities associated with route preparation (e.g. clearance) and cable installation can also lead to direct physical disturbance (i.e. reworking) of substrate which may lead to disturbance and/or loss of benthic habitats and species within the footprint and immediate vicinity of the intertidal and subtidal works.<br>Furthermore, cable installation may require protection, such as rock placement, concrete mattresses, or grout bags, at some locations. Introduction of hard substrate would replace otherwise soft substrates, leading to permanent loss of these habitats and species. |
| Construction | Temporary increase in SSC and sediment deposition leading to contaminant mobilisation, turbidity and smothering effects | ✓ | | Construction activities associated with the Project have the potential to increase suspended sediment concentration (SSC) by creating plumes in the water column. Increased SSC results in elevated turbidity, which can affect rates of photosynthesis via a reduction in light availability and an increase in particles in the water may affect feeding efficiency of filter feeders if clogging of filtering systems occurs.<br>Suspended sediment may also settle out, resulting in increased deposition which can smother the seabed and sessile benthic organisms. The resuspension of sediment can also release any sediment-bound contaminants, which can impact benthic communities. |
| Construction | Changes to marine water quality from the use of HDD drilling fluids | ✓ | | Changes to marine water quality arising from the use of drilling fluids and additives has the potential to degrade water quality and harm benthic habitats and species through toxicity. The drilling fluid will be inert (non-toxic) but this pathway scoped in to ensure all potential sources of elements that could affect water quality are considered. |

| Project Phase | Potential impact pathway | Further assessment required in EIA Scoped In | Further assessment required in EIA Scoped Out | Rationale |
|---|---|---|---|---|
| Construction | Changes to marine water quality from accidental leaks and spills from vessels, including loss of fuel oils | ✓ | | Changes to marine water quality arising from accidental leaks and spills from vessels has the potential to degrade water quality and harm benthic habitats and species through toxicity and bacteriological contamination. |
| Construction | Introduction and spread of Invasive Non-native Species (INNS) via vessel hull or ballast water | ✓ | | Vessels may inadvertently transport INNS, which can have significant impacts on local fauna. INNS are capable of spreading rapidly, and the effects may not be constrained to the Array Area and Offshore Cable Scoping Boundary. The introduction of structures to the seabed may also allow for localised spread of any existing INNS populations. |
| Construction | Underwater Sound Impacts on Marine invertebrates | | ✓ | There has been very little research into the impact of underwater sound on marine invertebrates (including shellfish) which are believed to be sensitive to particle motion rather than to sound pressure (Popper and Hawkins, 2018). At present there are no published sensitivity thresholds for this receptor group. However, effects to invertebrates have been recorded in some studies such as Solan et al. (2016) where a number of species tested, including the crustacean *Nephrops norvegicus* and the bivalve *Ruditapes philippinarum*, demonstrated behavioural responses to impact pile driving sound source levels in a controlled laboratory environment. It is worth noting that not all species tested demonstrated any behavioural response to underwater sound (e.g. the brittlestar *Amphiura filiformis*) although sound did compromise physiological processes in a number of individuals and the authors suggest an increased variability between individuals does not exclude the possibility that responses to environmental sound can be subtle and may take extended periods of time to be expressed across a population or become detectable at an ecosystem level. In other laboratory experiments, Wade et al (2013) found some evidence for a stress response in green shore crab *Carcinus maenas* subject to ship playback sound, particularly in larger individuals. However, repeated exposure responses indicated that the crabs habituated or become tolerant to it.<br>Therefore, there is currently very limited evidence to suggest that the type and duration of underwater sound that will be generated by the Project such as from geophysical surveys, dredging, ploughing and jetting and associated vessel movements, will have any significant effect on benthic invertebrates or benthic communities. |

| Project Phase | Potential impact pathway | Further assessment required in EIA Scoped In | Further assessment required in EIA Scoped Out | Rationale |
|---|---|---|---|---|
| | | | | Thus, underwater noise disturbance in relation to benthic ecology is scoped out from requiring further consideration. |
| Operation | Disturbance to benthic habitats and species due to subsea cable thermal emissions | ✓ | | Operation of the cables generates heat due to resistance in the conductor components, which can warm the cable surface and adjacent environment (i.e. sediments). Temperature increases near the cable can modify chemical and physical properties of the substrate, such as oxygen concentration, microorganism communities, and/or bacterial activity. Physiological changes in macrobenthic organisms living at the water-sediment interface and in the top sediment layers can also potentially occur. |
| Operation | Maintenance potential effects the same as route preparation and cable installation | ✓ | | As above. |
| Operation | Introduction and spread of Invasive Non-native Species (INNS) | ✓ | | Due to the floating design of turbines, there is expected to be little infrastructure installed on the seabed within the array other than the anchors for the floating substructure; however, the use of cables is expected to require protection, at some locations, which introduces hard substrates to otherwise soft seabed. This could provide additional habitat for any existing INNS populations, but may also create habitat for many endemic species, increasing local biodiversity. Studies have indicated that the introduction of hard substrate in otherwise barren areas are quick to be colonised and used by local species. |

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Operation | Effects of electromagnetic field (EMF) emissions | | ✓ | There is evidence that some benthic invertebrates are able to detect EMF. For example, in laboratory test conditions the brown crab *Cancer pagurus* showed a clear attraction to EMF and reduced their time spent roaming (Scott, 2018). However, the test used an EMF strength of 2.8 mT (millitesla) which is higher than that produced by active subsea DC cables. Scientific experiments around an active cable in Puget Sound found the cable had no impact on crab behaviour, including when they were moving across the cable (Love *et al.,* 2017). Other studies also indicate that invertebrates do not have a notable sensitivity to EMF. For example, there was no impact observed on crustaceans *Crangon crangon*, the round crab *Rhithropanopeus harrisii*, the isopod *Saduria entomon*, and edible mussel *Mytilus edulis* exposed to EMF for several weeks and there was no reduction in gonad index and condition in mussels exposed for three months during the reproductive season (Bochert and Zettler, 2006).<br>Therefore, there is considered to be no realistic significant interaction between EMF emitted during the operation of the Project and benthic invertebrates or communities; thus, EMF disturbance has been scoped out from requiring further consideration. |
| Decommissioning | Potential effects the same as route preparation and cable installation | ✓ | | Impact pathways as above for construction phase. |

## 20.7. Assessment Methodology

The assessment methodology for intertidal and subtidal benthic ecology will follow the standard methodology outlined in Volume 2, Chapter 8 for ecological receptors, which is in line with CIEEM guidance for ecological impact assessments (CIEEM, 2018).

Key data sources used for the assessment will include, but not be limited to:

- Project-specific survey data;
- European Marine Observation Data Network (EMODnet, 2021) Seabed Habitats Project for broad-scale habitat maps of the Study Area;
- European Union Nature Identification System (EUNIS) (EEA, 2012) for classifying benthic habitats;
- Academic papers and online reports as available for Study Area;
- Designated sites condition assessments etc. as available; and
- Relevant Environmental Statements.

Consultation with stakeholders including Natural Resources Wales, JNCC, Pembrokeshire County Council, Pembrokeshire Coast National Park Authority (amongst others where relevant) will take place.

## 20.8. Conclusion

In summary:

- A range of potentially sensitive intertidal and subtidal habitats representative of Annex I habitats or listed as habitats of Principle Importance under Section 7 of the Environment and Wales Act (2016) may occur within proximity to the proposed Project;
- The proposed Project passes directly through Pembrokeshire Marine/ Sir Benfro Forol SAC, the Arfordir Penrhyn Angle / Angle Peninsula Coast SSSI, and the Milford Haven Waterway SSSI;
- The Offshore Cable Scoping Boundary is located 6.5 km away from the Skomer MCZ;
- Project specific intertidal and subtidal benthic surveys will be completed to ensure the full range of habitats and any potentially sensitive and / or protected species located within proximity to the Project are identified;
- A detailed assessment of the potential impacts identified above will be completed, forming part of the ensuing Environmental Appraisal; and
- Underwater sound disturbance and EMF disturbance are scoped out of further consideration for benthic ecology.

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## 21. FISH AND SHELLFISH ECOLOGY

### 21.1. Introduction

This chapter of the scoping report provides a high-level overview of relevant fish and shellfish baseline information as well as a summary of the potential impact pathways between the proposed Project and this receptor group. The fish and shellfish chapter relates to the distribution and ecology of the relevant species identified as potentially present in the Study Area. Whilst many of these species will be of commercial importance, this chapter is concerned with their ecology. Information related to the fishing methods, catch rates and social aspects and potential impacts of fishing activity can be found in Chapter 26: Commercial Fisheries.

### 21.2. Regulatory and Planning Policy Context

This section outlines legislation, policy and guidance relevant to the appraisal of the potential effects on the fish and shellfish ecology associated with the proposed Project. The overall regulatory and planning context is described in Volume 1, Chapter 2 of this Scoping Report. The following legislation is considered relevant to the proposed Project in respect of fish and shellfish ecology:

- **Conservation of Habitats and Species Regulations (as amended) 2017,** which transposes the Habitats Directive (92/43/EEC) into UK legislation, covering the marine environment to 12 NM offshore;
- **Conservation of Offshore Marine Habitats and Species Regulations 2017** also transposes the Habitats Directive (92/43/EEC) into UK legislation, covering the marine environment beyond 12 NM;
- **Marine and Coastal Access Act 2009**, which provides the legal mechanism to help ensure clean, healthy, safe and productive and biological diverse oceans and seas;
- **The Wildlife and Countryside Act 1981** (as amended), which includes provisions relating to nature conservation;
- **The Marine Strategy Regulations 2010,** which transpose the Marine Strategy Framework Directive (2008/56/EC) into UK legislation;
- **The Eels (England and Wales) Regulations 2009** – which implement Council Regulation (EC) No 1100/2007 (EC) No 1100/2007 establishing measures for the recovery of the stock of European eel including providing for the free passage of eels;
- **Environment Act (Wales) (2016) –** Section 7 of the Act includes a list of Species of Principal Importance for the purpose of maintaining and enhancing biodiversity in relation to Wales replacing the duty in Section 42 of the NERC Act 2006; and
- **The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ('WFD') -** provides for the establishment of environmental objectives for water bodies, including in relation to fish.
- **Shellfish Waters Directive (2006).**

The key national and local plans and policies relevant to the assessment of the proposed Project impacts on fish and shellfish include:

- **Welsh National Marine Plan** - which sets out a single framework for sustainable development within Wales marine area, including the requirement to maintain seafloor integrity and safeguard benthic ecosystems (Welsh Government, 2019).
- **UK Marine Policy Statement** - which aims to achieve sustainable development in the UK marine area;
- **Nature Recovery Action Plan Wales** - A strategy for Wales which aims to address declining biodiversity, including marine habitats, ecosystems and fisheries;
- **Welsh National Marine Plan** – which sets out a single framework for sustainable development within Wales marine area, including the requirement to maintain seafloor integrity and safeguard benthic ecosystems (Welsh Government, 2019);
- **South West Wales Area Statement** – identifies the key risks, opportunities and priorities needed to build the resilience of our ecosystems and support sustainable management of the natural resources; and
- **Planning Policy Wales** - highlights the importance of biodiversity for natural services, sustainability and the Welsh economy. It includes objectives to achieve efficient use and protection of natural resources and enhancing biodiversity

## 21.3. Study Area

The Study Area for fish and shellfish ecology is determined in order to encompass all likely Project ZoI for this receptor group (Figure 21-1). The most far-reaching Project related effect that could impact on fish is expected to be the propagation of underwater sound caused by activities such as geophysical surveys and the potential for impact piling or drilling. For this reason, the Study Area includes a buffer of 50 km area around the Array Area Scoping Boundary and Offshore Cable Scoping Boundary . This spatial extent is somewhat arbitrary but is considered likely to be sufficient to encompass any potential effects, particularly for underwater sound. It also reflects the fact that the spatial resolution of much of the available baseline information on fish and shellfish in this region relates to the wider Celtic Sea area.

A 50 km distance is also adopted as an initial screening distance for any sites designated for migratory fish, ensuring any fish that may pass through the Study Area are considered.

Revision: 0 Drawn: MLS Checked: LC Approved: TN Date: 2022-03-11

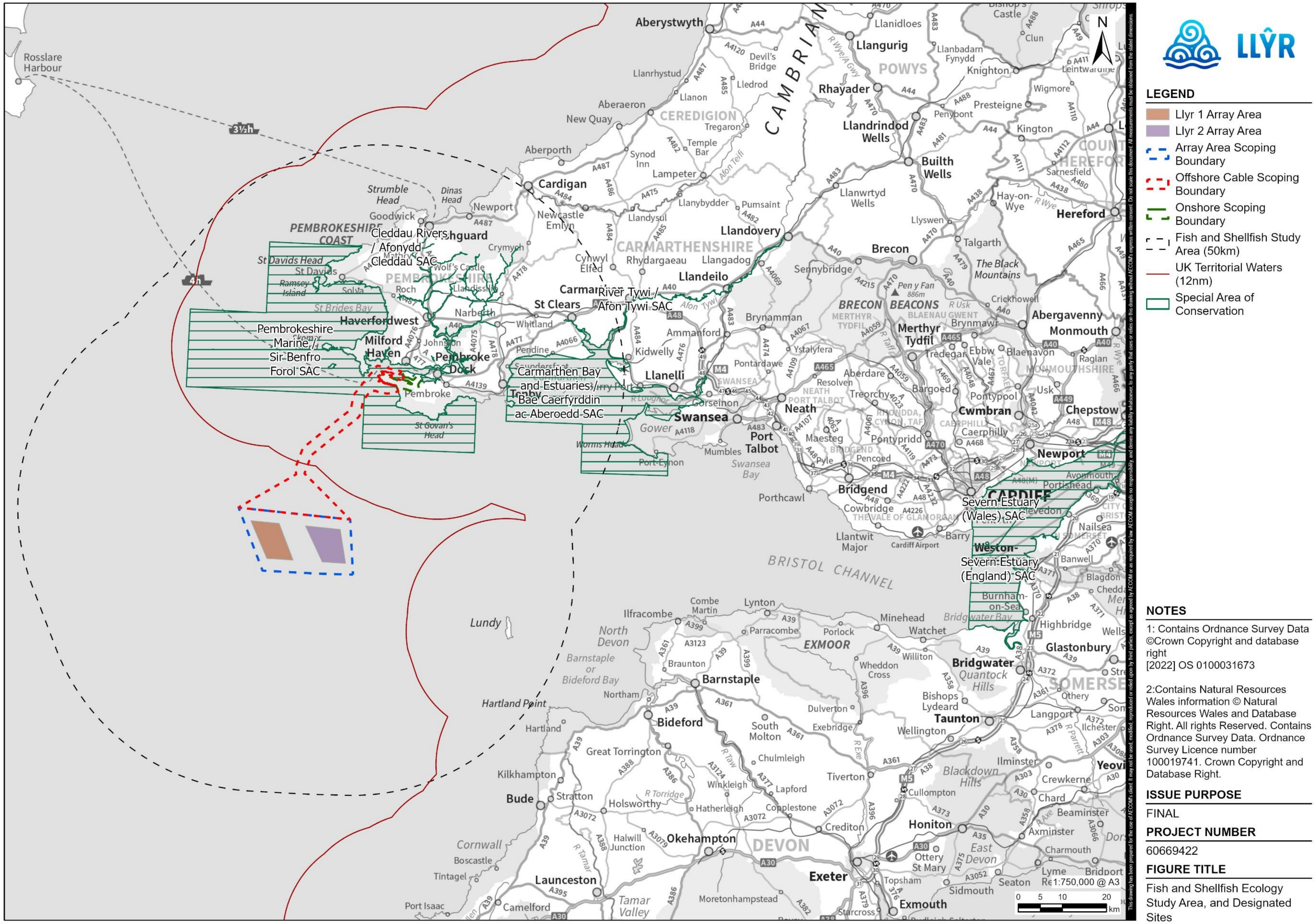


Figure 21-1. Fish and shellfish ecology Study Area and designated sites

## 21.4. Baseline

The fish and shellfish ecology baseline will be described using several data sources, which will inform the understanding of the relative importance and functionality of the Study Area in the regional context of the wider Celtic Sea.

### *21.4.1. Pelagic Species*

A number of species of commercial importance are found within the Study Area. This is discussed in detail in Chapter 26: Commercial Fisheries. Whilst the presence of benthic species may change with location, pelagic species are highly mobile and may be changeable throughout the Project ZoI. In general, species of key importance include cod *Gadus morhua*, European hake *Merluccius merluccius*, mackerel *Scomber scombrus*, and whiting *Merlangius merlangus*. Non-commercial species will also be assessed in the Environmental Impact Assessment (EIA).

### *21.4.2. Demersal Species*

A number of demersal species, including the anglerfish Lophius piscatorius and flat fish such as plaice Pleuronectes platessa and sole Solea solea are commercial species also known to be present in the *Study Area.*

### *21.4.3. Diadromous Species*

Estuarine transitional habitats, such as Milford Haven, Angle Bay, and the Severn Estuary occur close to the proposed Project location. Therefore, it is possible for diadromous species such as Atlantic salmon Salmo salar, sea trout (brown trout) Salmo trutta, sea lamprey Petromyzon marinus, river lamprey Lampetra fluviatilis, allis shad Alosa alosa, twaite shad Alosa fallax, and European eel Anguilla anguilla to migrate through the Project ZoI as part of their annual life cycles.

### *21.4.4. Elasmobranchs*

Elasmobranchs found within the Study Area comprise thornback ray Raja clavata, spotted ray Raja montagui, and tope shark Galeorhinus galeus (Ellis *et al*., 2012). Basking shark are also known to occur within the Celtic Sea and have been recorded close to Milford Haven (Witt et al., 2012). Further assessment of the presence of other elasmobranchs will be provided in the ES baseline.

### *21.4.5. Spawning and Nursery Grounds*

Fisheries sensitivity maps (Coull *et al*., 1998; Ellis *et al*., 2012) indicate that spawning and nursery grounds for a number of fish species are known to occur within the north east Celtic Sea , and fall within the Study Area. This includes high-intensity spawning grounds[2] of cod, plaice, sandeel, and sole (Table 21-1) (Ellis *et al*., 2012). As per Coull *et al*. (1998) spawning grounds of sprat (Sprattus sprattus) and Nephrops (Nephrops norvegicus) were also identified within the Study Area. Low intensity spawning grounds included in Ellis et al. (2012) will be considered at the baseline stage. No high-intensity nursery grounds[3] were identified within the Study Area (Table 21-2).

Defining spawning and nursery grounds are useful in identifying sensitive areas for particular species. However, it is also important to consider aggregations of 0 group fish[4] and or larvae of key commercial

[2] High intensity spawning grounds are considered to be areas for which the highest aggregation of fish for spawning are likely to occur, indicated by high catch rates of eggs and larvae (Ellis et al., 2012).
[3] High intensity nursery grounds are considered to be areas where the highest density of juveniles are likely to occur, indicated by high catch rates of juveniles (Ellis et al., 2012).
[4] 0 group fish are defined as juvenile fish in the first year of their lives, who do not yet possess a winter (hyaline) otolith ring. Aggregations refers to areas containing large abundances of these individuals.

species. Aires et al. (2014) provides fish sensitivity maps showing the areas with the highest probability of aggregations of 0 group fish. This will be considered further in the EIA.

*Table 21-1. Important spawning grounds which fall within the Study Area*

| Common name | Species name | High-intensity spawning grounds Ellis *et al.*, 2012) | Spawning grounds (Coull *et al.*, 1998 |
|---|---|---|---|
| Atlantic cod | *Gadus morhua* | ✓ | |
| Plaice | *Pleuronectes platessa* | ✓ | ✓ |
| Sandeels | Ammodytidae | ✓ | |
| Sole | *Solea solea* | ✓ | ✓ |
| Horse mackerel | *Trachurus trachurus* | | ✓ |
| Ling | *Molva molva* | | ✓ |
| Nephrops | *Nephrops norvegicus* | | ✓ |
| Sprat | *Sprattus sprattus* | | ✓ |

*Table 21-2. Important nursery grounds which fall within the Study Area*

| Common name | Species name | Nursery grounds (Ellis *et al.*, 2012) | Nursery grounds (Coull *et al.*, 1998) |
|---|---|---|---|
| Atlantic Cod | *Gadus morhua* | ✓ | |
| Plaice | *Pleuronectes platessa* | ✓ | ✓ |
| Sandeels | Ammodytidae | ✓ | |
| Sole | *Solea solea* | ✓ | ✓ |
| Mackerel | *Scomber scombrus* | ✓ | |
| Nephrops | *Nephrops norvegicus* | | ✓ |
| Whiting | *Merlangius merlangus* | ✓ | ✓ |
| Anglerfish | *Lophius piscatorius* | ✓ | |
| Herring | *Clupea harengus* | ✓ | |
| Spotted ray | *Raja montagui* | ✓ | |
| Thornback ray | *Raja clavata* | ✓ | |
| Tope shark | *Galeorhinus galeus* | ✓ | |

Due to their ecological importance as prey items, further assessment of herring spawning grounds and preferred sand eel habitat will be conducted as part of the ecological EIA. This will use data from sediment particle size analysis (PSA) (from the proposed Project benthic characterisation survey results). For herring the classifications from Reach et al., 2013 will be used. Generally, data from the International Herring Larvae Surveys ((IHLS) 1967-2015) would also be considered, however data for the Celtic Sea is not available within this data set. This is likely due to the area not being of high importance for herring spawning and nursery grounds (Ellis *et al.*, 2012). For sandeel, the classification of Latto *et al*. (2013) will be used, which considers the work by Greenstreet *et al*. (2010) and Holland *et al*. (2005).

### *21.4.6. Shellfish*

Fisheries data from the Marine Mammal Organisation (MMO) annual statistics show the presence of multiple shellfish species, particularly in nearshore areas (MMO, 2020).

Crustaceans include the edible crab *Cancer pagurus*, velvet swimming crab *Necora puber*, spider crab *Maja squinado*, Nephrops and the European lobster *Homarus gammarus.*

Molluscs include the scallop *Pecten maximus*, and whelk *Buccinum undatum* known to be present in the region. The harvesting of bivalve molluscs such as mussels *Mytilus edulis*, razor clams *Ensis spp*, and cockles *Cardiidae* spp. are also recognised fisheries in intertidal regions of the Pembrokeshire coastline (e.g. see Pembrokeshire County Council, 2021).

Nephrops and scallops, in particular, are considered important commercial shellfish species and Nephrops spawning grounds are known to occur within the Study Area. The potential grounds of other species within the Study Area, will be identified at the EIA stage, and will also be informed by the baseline data collected for Chapter 26: Commercial Fisheries.

### *21.4.7. Designated Sites and Protected Species*

Designated species within the Study Area comprise the Annex II listed species sea lamprey, river lamprey, allis shad, and twaite shad. Additionally, European eel are may enter the Project ZoI. They are also an IUCN Red List critically endangered species (Pike et al., 2020) and protected under the Eels (England and Wales) Regulations (2009). There is also the potential for basking shark *Cetorhinus maximus,* a species listed under Schedule 5 of the Wildlife and Countryside Act (1981), to occur within the Study Area.

The key sites designated for the protection of fish and shellfish within 50 km of the Project are the Pembrokeshire Marine/Sir Benfro Forol SAC and the Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd SAC. Given that migratory fish species are known to migrate over large distances, consideration has also been given to the Cleddau Rivers/ Afonydd Cleddau SAC, the River Tywi/ Afon Tywi SAC, and the Severn Estuary/ Môr Hafren SAC, which is beyond the 50 km screening distance.

#### 21.4.7.1. Pembrokeshire Marine / Sir Benfro Forol SAC

This site is located approximately 22 km from the Array Area Scoping Boundary. The export cable will then enter and make landfall within this designated site. The Annex II sea lamprey*,* river lamprey*,* allis shad, and twaite shad are qualify features of this SAC though they are not a primary reason for site selection (JNCC, 2021).

#### 21.4.7.2. Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC

Located 23.5 km from the Offshore Cable Scoping Boundary of the proposed Project, this SAC protects an area important for the migration of the twaite shad *Alosa fallax*, which also use the area as spawning, nursery, and feeding grounds. As such, twaite shad are the primary qualifying feature for site selection. Other Annex II qualifying features (which are not a primary reason for site selection) include sea lamprey, river lamprey, and Allis shad (JNCC, 2021).

#### 21.4.7.3. Cleddau Rivers / Afonydd Cleddau SAC

This site is located 13.1 km from the Offshore Cable Scoping Boundary. The Annex II species river lamprey is a primary reason for site selection, with adults of this species present during the spawning season, whist ammocoetes are widespread throughout the SAC. Sea lamprey is also a qualifying feature of this site, but not a primary reason for site selection.

#### 21.4.7.4. River Tywi / Afon Tywi SAC

The River Tywi SAC is located 53.0 km from the Offshore Cable Scoping Boundary. This site is connected to the Carmarthen Bay and Estuaries SAC. Twaite shad is a primary qualifying feature for the selection of this site, whilst sea lamprey, river lamprey, and Allis shad are secondary qualifying features of this site.

#### 21.4.7.5. Severn Estuary / Môr Hafren SAC

The Severn Estuary SAC is located 135 km from the Offshore Cable Scoping Boundary but the primary qualifying features are the migratory species of sea lamprey, river lamprey, and twait shad (JNCC, 2021). The European eel is also known to be present within the Severn Estuary (Aprahamian and Wood, 2020). Due to the location of the proposed Project within the Celtic Sea, it is possible that fish migrating from the River Severn will pass through the Project Study Area and so this site has been scoped into the assessment for screening.

### 21.5. Embedded and Good Practice Measures

Given that many design elements of the proposed Project have yet to be confirmed, the embedded and good practice measures have not been finalised at this stage. However, any identified measures will need to be discussed with statutory consultees and stakeholders throughout the EIA process.

The following measures have been proposed at this stage, on the basis that they represent standard practice on an international regulatory basis:

- All Project vessels shall adhere to the International Convention for the Control and Management of Ships’ Ballast Water and Sediments with the aim of preventing the spread of marine INNS (IMO, 2017); and
- All Project vessels shall adhere to the International Maritime Organisation (IMO) Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (Biofouling Guidelines) (IMO, 2011).

### 21.6. Likely Significant Effects

The potential impact pathways to fish and shellfish are present during the construction, operation (including maintenance and repair) and decommissioning phases of the Project. These are summarised below in Table 21-3.

*Table 21-3. Scoping matrix of potential impact pathways in relation to fish and shellfish during construction, operation and decommissioning of the proposed Project*

| Project Phase | Potential Impact Pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Direct loss and physical disturbance to fish habitats | ✓ | | There is a potential for the loss of areas of seabed that could be important for fish and shellfish habitat, including spawning grounds, from construction methods including the installation of mooring and anchoring systems for turbines on the seabed, any necessary pre-sweep preparation and installation of the cable. It may also be necessary for the placement of hard substrates on the seabed for cable protection. |
| Construction | Physical disturbance to fish and shellfish habitats and species from increased suspended sediment concentrations and sediment deposition | ✓ | | Project construction methods have the potential to disturb the seabed leading to the creation of sediment plumes with increased suspended sediment concentration (SSC) and the deposition of sediments to the seabed which could affect areas important for fish habitat, foraging and spawning. |
| Construction | Changes to marine water quality from the use of drilling fluids at HDD break-out points and resuspension of sediment contamination during seabed installation works | ✓ | | The use of drilling fluids at the HDD breakout points could result in decreased water quality that can have effects on the health of fish and shellfish populations, though the drilling fluid used will be inert (i.e. non-toxic) and no significant effects are anticipated.<br><br>Many of the construction methods used will disturb the seabed. If present, contaminants within the sediment could be released during these works, which could affect water quality and marine ecological receptors including fish and shellfish. |

| Project Phase | Potential Impact Pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Changes to marine water quality as a result of accidental leaks and spills from vessels, including loss of fuel oils | ✓ | | Accidental leaks and spills from vessels, including loss of fuel oils, could result in decreased water quality that can have indirect effects on the health of fish and shellfish populations. |
| Construction | Underwater sound and vibration | ✓ | | Underwater sound and vibration will be generated by a range of Project construction activities including geophysical pre-installation surveys, the potential for impact piling or drilling for the installation of piles in the seabed and cable lay activities such as dredging, ploughing and jetting. Man-made sound sources, particularly if of high intensity or long duration have the potential to result in permanent and temporary injury and auditory effects and can result in masking and behavioural disturbance in fish (including eggs and larvae) (Popper et al., 2014). This includes the potential for underwater sound to act as a barrier to the movement of diadromous fish during key migratory periods.<br><br>Invertebrate species, which includes shellfish. have been scoped out for this impact pathway (see Chapter 20: Benthic Ecology).<br><br>UXO have the potential to physically harm (possibly fatally) fish or shellfish within the blast radius or resulting pressure wave. An explosion could also pose risk to receptors similar to that of underwater noise. Underwater sound impacts from UXO detonation are excluded from the assessment as the determination of the presence of UXO will not be undertaken until a later stage of the proposed Project. Should UXO be found and detonation required this will be subject to a separate assessment and application for consent. |

| Project Phase | Potential Impact Pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Operation | Increase in thermal emissions from cable operation | ✓ | | Electricity cables are known to produce heat during operation and where they are buried within sediment, research indicates that there may be some increase in substratum temperature which could affect marine receptors within the sediment (Taormina et al, 2018). NRW has also suggested that such increases in temperature may have an impact on temperature responsive bacteria. Whilst sediments may be exposed to temperature increases, it is though that the cables have negligible capacity to heat the overlying water column due to the high thermal capacity and movement of surrounding seawater. Therefore, whether buried or not, pelagic or demersal fish and shellfish species or life stages which remain in direct contact with the overlying water column are expected to be at lower risk of thermal effects from the buried cable as any heat would be instantly dissipated by currents. All potential thermal effects are scoped into the assessment for detailed consideration. |
| Operation | Effects of electromagnetic field (EMF) emissions | ✓ | | EMF emissions from subsea cables have the potential to affect the foraging and migratory success and behaviour of electro-receptive (such as elasmobranchs), migratory fish (such as salmon), and shellfish. Therefore, the worst-case scenario of cables in separate trenches will be appraised. Despite this, it is likely that the HVDC cable may be installed in a bundled bi-pole configuration and most EMF emissions beyond background geomagnetic levels would be cancelled out by the close proximity of the cables. Therefore, no significant impact pathways expected. |
| Operation | Aggregation of fish and associated effects such as barrier effects, collision and entanglement from the presence of floating offshore structures and | ✓ | | Floating platforms and infrastructure on the seabed may act as fish aggregating devices, changing species composition and abundance at localised scales and foraging pressure for example, from seals (e.g. see Farr et. al., 2021). The physical presence of floating offshore wind infrastructure also have the potential, depending on design, to cause barrier effects, entanglement or collisions either directly or indirectly. For example, tethering systems may entangle fishing gear that could result |

| Project Phase | Potential Impact Pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| | associated tethering systems | | | in ghost fishing. The potential effects of the physical presence of the infrastructure on fish and shellfish has been scoped in for consideration. |
| Operation | Underwater sound and vibration | ✓ | | Underwater sound resulting from the operation of existing, fixed-bottom OWF are typically low in frequency and level, within regulatory thresholds, and considered to have a low risk to marine receptors (see Farr et. al., 2021 and references therein). However, floating turbines may have cables that 'snap' as cable tension is released in the mooring system though this depends on the mooring system design. This tensioning has the potential to generate underwater sound that could affect fish and so will be scoped into the assessment.<br><br>Back-and-forth cable tension release in the turbine mooring system will also generate particle motion, which is known to be a key acoustic stimulus in fish, including larvae and juveniles (Popper et al., 2014). This impact pathway is also scoped in. |
| Operation | Effects to fish and shellfish from maintenance activities | ✓ | | Maintenance potential effects of lower magnitude or the same as installation. |
| Decommissioning | Potential effects the same cable installation | ✓ | | Potential effects the same as construction. |

## 21.7. Assessment Methodology

The assessment methodology for fish and shellfish will follow the standard methodology outlined for ecological receptors, outlined in Volume 2, Chapter 8. The method is in line with CIEEM guidance for ecological impact assessments (CIEEM, 2018).

Key data sources to be used for the baseline and assessment of impacts in fish and shellfish will include, but not be limited to, the following:

- TraC Fish Count data (Environment Agency, 2021);
- Updated Fisheries Sensitivity Maps in British Waters (Aires et al., 2014);
- Spawning and nursery grounds for UK waters (Coull et al., 1998; Ellis et al., 2012);
- Salmon Stocks and Fisheries in England and Wales (Cefas, 2020);
- Salmonid and fisheries statistics for England and Wales (Environment Agency, 2021);
- Fish landings data for the period 2016-2020 (MMO, 2020);
- International Council for the Exploration of the Seas (ICES) publications and data (ICES, 2022);
- Rod catch data for Milford Haven and the Cleddau rivers (NRW, 2018);
- Shellfish classification zones of England and Wales (Cefas, 2022);
- Environmental Statements from relevant projects including the Pembrokeshire Demonstration Zone (Wave Hub, 2018); Greenlink Interconnector (Greenlink, 2019); Erebus FLOW (Marine Space, 2019; 2021); and
- Publicly available and relevant academic journal papers and reports.

Consultation with the relevant stakeholders will take place, including with the following, as a minimum:

- Natural Resources Wales (NRW);
- National Federation of Fisherman's Organisations (NFFO);
- The Joint Nature Conservation Committee (JNCC);
- The Marine Management Organisation (MMO); and
- Welsh Fishermans Association – Cymdeithas Pysgotwyr Cymru (WFA-CPC).

Project-specific fish and shellfish surveys will not be completed for the proposed Project due to the relatively plentiful data on fish and shellfish populations in the Celtic Sea combined with the likely limited potential for adverse effects to this receptor group as a result of the proposed Project.

## 21.8. Conclusion

In summary:

- A range of potentially sensitive fish species, including those that are protected by legislation and designated sites, or are species of commercial importance, occur within proximity to the proposed Project;
- The Study Area overlaps with spawning and nursery grounds for a variety of fish species, particularly several of commercial importance;
- The proposed Project is located within the Pembrokeshire Marine SAC, designated for the protection of fish receptors;
- The Offshore Cable Scoping Boundary is located 23.5 km from the Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd SAC, additionally, the Cleddau Rivers/ Afonydd Cleddau SAC, the River Tywi/ Afon Tywi SAC, and the Severn Estuary/Môr Hafren SAC have been considered despite being beyond the 50 km screening distances;
- No Project specific surveys for fish and shellfish will be undertaken as available data are considered sufficient to undertake an assessment of the identified impact pathways; and

- A detailed assessment of the potential impacts identified above will be completed, forming part of the ensuing EIA.

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# 22. MARINE MAMMALS

## 22.1. Introduction

This chapter of the scoping report provides a high-level overview of relevant marine mammal baseline information as well as a summary of the potential interactions between the proposed Project and this receptor group. Any data used to help characterise the marine mammal baseline is identified, and the assessment methodology that will be used for the impact assessment is highlighted.

## 22.2. Regulatory and Planning Policy Context

This section outlines legislation, policy, and guidance relevant to the assessment of the potential effects on marine mammals associated with the installation, operation and decommissioning phases of the proposed Project**.** For more information regarding the legislative context of the proposed Project as a whole see Volume 1, Chapter 2: Regulatory and Planning Policy Context.

Legislation and policies relevant to the appraisal of potential impacts of the proposed Project on marine mammals include:

- **Conservation of Habitats and Species Regulations (as amended) 2017,** which transposes the Habitats Directive (92/43/EEC) into UK legislation, covering the marine environment to 12 nm offshore;
    - All cetaceans were previously listed as Annex IV species of the Habitats Directive
    - Grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) listed as Annex II
- **Conservation of Offshore Marine Habitats and Species Regulations 2017** also transposes the Habitats Directive (92/43/EEC) into UK legislation, covering the marine environment beyond 12 nm;
- **Marine and Coastal Access Act 2009**, which provides the legal mechanism to help ensure clean, healthy, safe and productive and biological diverse oceans and seas;
- **The Wildlife and Countryside Act 1981** (as amended), which includes provisions relating to nature conservation;
- **Conservation of Seals Act 1970,** which provides seasonal protection to seals; and
- **The Marine Strategy Regulations 2010,** which transpose the Marine Strategy Framework Directive (2008/56/EC) into UK legislation.

Key national and local plans and policies relevant to the appraisal of Project impacts on marine mammals include:

- **Welsh National Marine Plan** – which sets out a single framework for sustainable development within Wales marine area, including considering adverse impacts to marine mammals (Welsh Government, 2019);
- **UK Marine Policy Statement** – which aims to achieve sustainable development in the UK marine area with consideration of specific policies set out in the Welsh National Marine Plan (HM Govenment, 2021); and
- **Planning Policy Wales** – highlights the importance of biodiversity for natural services, sustainability and the Welsh economy. It includes objectives to achieve efficient use and protection of natural resources and enhancing biodiversity.

## 22.3. Study Area

The proposed Project is located in the Celtic Sea, which falls within the ICES Celtic Seas Ecoregion (ICES, 2020) (Figure 22-1). The Array Area Scoping Boundary is located approximately 31 km southwest of the Pembrokeshire coastline.

To account for the highly mobile and transient nature of marine mammal species, and potential implications of local impacts on wider populations, the Study Area will take into consideration (where available) species specific marine mammal Management Units (MUs) published by the Inter Agency Marine Mammal Working Group (IAMMWG) (IAMMWG, 2021) and a consideration of the designated sites within.

Both harbour porpoise and bottlenose dolphin can range over a number of kilometres and will move to different habitats depending on the season (Heinänen and Skov, 2015). For the purpose of this assessment, the MUs defined by the IAMMWG (2021) for each of these species have been used to undertake an initial screening of designated and protected sites.

For harbour porpoise, the MU applicable to the survey area is the Celtic and Irish Seas MU (the UK EEZ proportion only), whilst for bottlenose dolphin the Irish Sea MU (the UK EEZ proportion only) is of consideration. These MUs have been defined by the IAMMWG based on their understanding of the biological population structure of these species, and the ecological differentiation of these populations (taking into account political boundaries and the management of human activities).

However, as part of the consultation for a habitats reguilation assessment (HRA) screening exercise for a number of onshore and offshore marine plans, the JNCC advises that a buffer of 15 km around harbour porpoise SACs should be used for geophysical surveys, beyond which likely significant effects would not occur. For pile driving, the JNCC recommend a 50 km buffer distance.

The greatest likely zone of influence from Project activities is likely to be in relation to underwater sound, reflecting potentially extensive propagation of underwater sound energy and the importance of sound to all marine mammals. For sites designated for the protection of harbour porpoise, the marine mammal species with the highest sensitivity to underwater sound the accepted maximum ZOI for significant impacts are considered to be 50 km in relation to impact piling and 15 km for seismic surveys (MMO, 2019). Therefore, an additional buffer of 50 km has been adopted for scoping purposes for all species of cetaceans, within the review of connectivity within the IAMMWG units.

There are currently no MUs for grey seals and so sites within the OSPAR Unit III are identified for initial consideration. The designated sites within this unit to be scoped in are based on established foraging ranges for seals. Grey seals are known to forage over large distances between and away from haul-out sites (where they return to rest, moult, and breed), often travelling over 100 km on trips which can last between 1 and 30 days (SCOS, 2020). To account for these foraging distances, and based on guidance on other projects from regulators, a distance of 135 km has been used to screen in sites designated for grey seal (e.g. see MMO, 2019). In contrast, harbour seals are known to forage much closer to their haul-out sites, typically within 30 km in water depths ranging from 10 - 50 m (Tollit, et al., 1998). The range for consideration of designated sites is the OSPAR unit III as NRW advises there is currently no MU for grey seal.

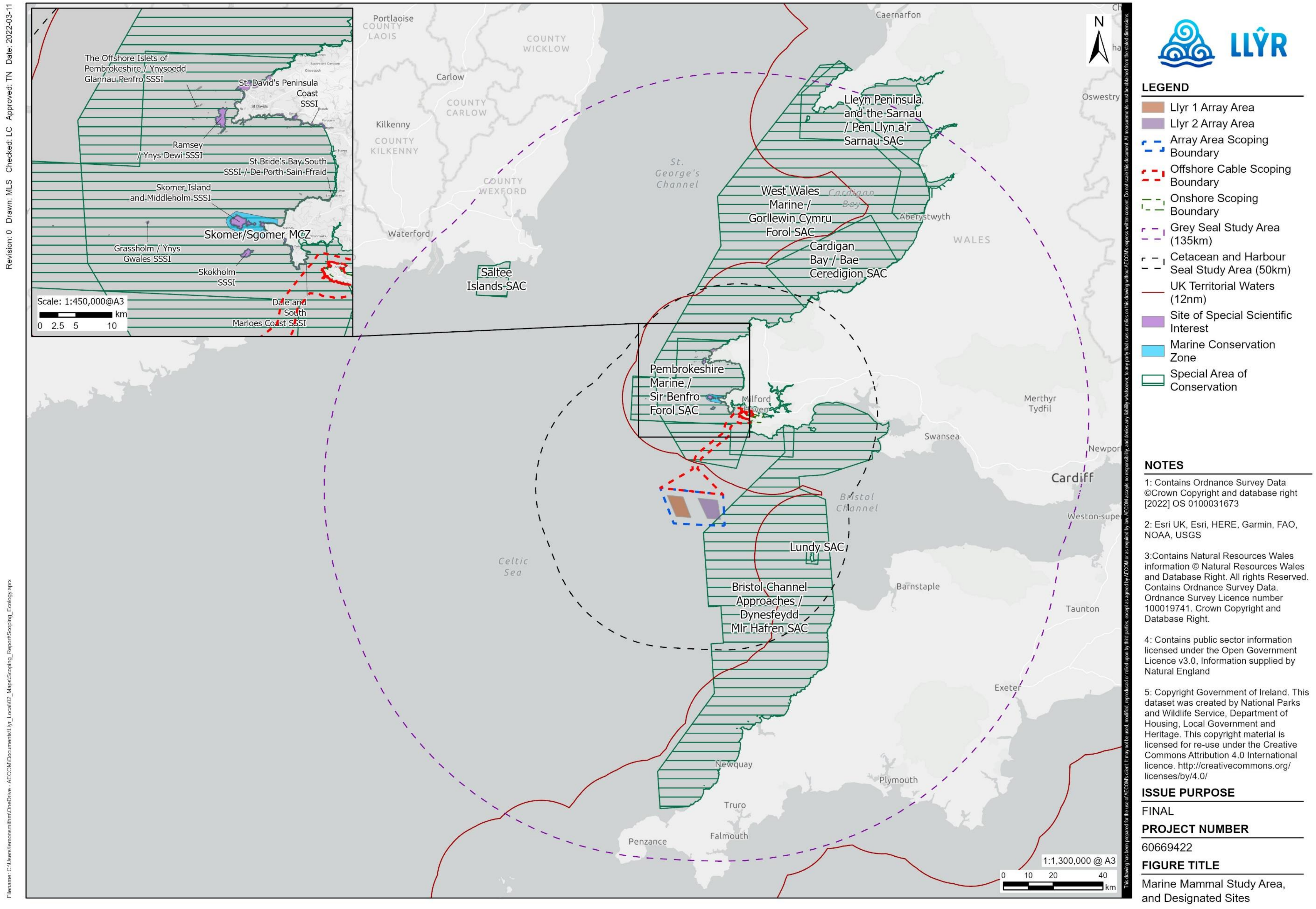


*Figure 22-1. Marine mammal Study Area and designated sites*

## 22.4. Baseline

There is a significant diversity and abundance of cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals) in UK waters. Most marine mammals are wide ranging and those recorded within the Study Area may be individuals from larger populations. This baseline characterises marine mammal species known or likely to be present within the Study Area defined above. All species of cetaceans are European Protected Species (EPS) under Annex IV of the EC Habitats Directive 92/43/EEC (Habitats Directive) and are afforded protection in the UK under the Conservation of Habitats and Species Regulations (as amended) 2017. Seals are listed under Article 17 of the Habitats Directive (Section 0) and are protected in the UK under the Conservation of Seals Act 1970.

### *22.4.1. Cetaceans*

Within the ICES Celtic Seas Ecoregion, thirteen cetacean species occur commonly or are resident (ICES, 2020). These species are: common dolphin (*Delphinus* delphis), harbour porpoise, bottlenose dolphin, minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*), white-beaked dolphin (*Lagenorhynchus albirostris*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), sperm whale (*Physeter macrocephalus*), long-finned pilot whale (*Globicephala melas*), northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*), killer whale (*Orcinus orca*), and Risso's dolphin (*Grampus griseus*).

The IAMMWG (2021) have defined MUs for the seven most common cetacean species found in UK waters. The Study Area falls within the Celtic and Irish Sea (CIS) MU for harbour porpoise, the Offshore Channel and SW England (OCSW) MU for bottlenose dolphin, and the Celtic and Greater North Sea (CGNS) MU for common dolphin and minke whale (as well as white-beaked dolphin, Atlantic white-sided dolphin, and Risso's dolphin).

Cetacean distribution in the UK was surveyed in 2016 as part of the Small Cetaceans in European Atlantic waters and the North Sea (SCANS-III) surveys, involving standard boat-based line transect surveys and aerial transect surveys (Hammond et al., 2021). These surveys provide abundance and density estimates for the UK, divided into SCANS blocks, with the proposed Project located in Block D. Within Block D, five cetacean species were observed in high enough numbers to be able to determine estimates of total abundance and density (Table 22-1). Further density and abundance data for waters surrounding Ireland (including further west in the Celtic Sea) are provided by the Irish ObSERVE project (Rogan, et al., 2018) and will be considered further within the EIA. However, SCANS-III indicate the Study Area is important for some cetacean species.

*Table 22-1. Density and abundance of most common cetaceans observed in SCANS-III survey area Block D*

| Species | Density (individuals/km$^2$) | Abundance |
|---|---|---|
| Common dolphin | 0.374 | 18,187 |
| Harbour porpoise | 0.118 | 5,734 |
| Bottlenose dolphin | 0.061 | 2,938 |
| Minke whale | 0.011 | 543 |
| Striped dolphin | 0.005 | 262 |
| Unidentified common or striped dolphins | 0.655 | 31,800 |

*Source: Hammond et al. (2021)*

### 22.4.2. *Pinnipeds*

The UK supports important populations of both seal species occurring in the North East Atlantic – the grey (*Halichoerus grypus*) and the harbour (*Phoca vitulina*) seal. The majority of the population of both species is found in Scotland. However, there is a breeding population of grey seal on the Pembrokeshire coast, near the proposed landfall site, within the Pembrokeshire Marine/Sir Benfro Forol SAC. This site, for which the grey seal is a primary reason for designation, supports the largest breeding colony on the west coast south of the Solway Firth, representing over 2% of annual UK pup production (JNCC, 2020). According to the most recent available data, there are no harbour seal haul out sites within the Study Area and less than 10 individuals have been recorded in recent surveys in Wales (SCOS, 2020). Recent estimates of seal haul-out population sizes in the countries of the UK are given by the Special Committee on Seals (SCOS, 2020) (Table 22-2).

*Table 22-2. Most recent grey and harbour seal abundances at haul out sites in the UK*

| | Grey Seal | Harbour Seal |
|---|---|---|
| **Wales** | **5,000** | **<10*** |
| Northern Ireland | 500 | 1,000 |
| England | 28,400 | 3,900 |
| Scotland | 115,750 | 26,800 |

** There are no systematic surveys undertaken for harbour seals in Wales* (SCOS, 2020)

Grey seals forage in open seas, frequently travelling >100 km from their haul out sites (SCOS, 2020). Tracking data has indicated that grey seals can forage hundreds up to 135 kilometres offshore and stay out for up to 30 days. Individuals often return to the same foraging areas but can also occasionally move to new haul out sites, thus acquiring new foraging regions (SCOS, 2020).

The main breeding season for grey seals in Wales is reported to be August to November although individual pups have been observed as early as July and as late as December (Langley, et al., 2020) The moulting period is reported to be from December to April (Trust North Wales Wildlife, 2021) . During these seasons grey seals spend most of their time onshore.

Harbour seals normally forage within 40-50 km of their haul out sites and the absence of these in Wales explains the low abundance in the Study Area. Thus, only very occasional individuals are likely to be present in the Study Area, outside their normal breeding and moulting season in mid to late summer when they will be hauled out elsewhere.

### 22.4.3. *Designated Sites*

In the Celtic Sea, there are several protected areas that have been designated with marine mammals as qualifying features, including Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), Marine Conservation Zones (MCZ) and nature reserves. Table 22-3 lists the sites which occur within 50 km of the Study Area designated for cetaceans and harbour seals and within 135 km of the Study Area and designated for grey seals.

The proposed Project will pass through the Pembrokeshire Marine SAC/Sir Benfro Forol, which has been designated for grey seal, and the West Wales Marine SAC/Gorllewin Cymru Forol and Bristol Channel Approaches SAC/Dynesfeydd Môr Hafren which have been designated for harbour porpoise.

*Table 22-3. Designated and protected sites for marine mammals in the Study Area*

| Site | Distance to Array Area / Offshore Cable Scoping Boundary (km) | Qualifying Species | Species specific site summary |
|---|---|---|---|
| West Wales Marine/Gorllewin Cymru Forol SAC | 0.0 | Harbour porpoise | Designated solely for the protection of harbour porpoise.<br>Site supports an estimated 5.4% of the UK Celtic and Irish Seas Management Unit (MU) population. |
| Bristol Channel Approaches/Dynesfeydd Môr Hafren SAC | 0.0 | Harbour porpoise | Species is primary reason for site selection. |
| Pembrokeshire Marine/Sir Benfro Forol SAC | 0.0 | Grey seal | Primary reason for site selection.<br>It is the largest breeding colony on the west coast south of the Solway Firth, representing over 2% of annual UK pup production. |
| Lundy SAC | 34.5 | Grey seal | Secondary reason for site selection. |
| Cardigan Bay/Bae Ceredigion SAC | 46.8 | Bottlenose dolphin<br>Grey seal | Bottlenose dolphin are a primary qualifying feature of this site and consists of approximately 125 individuals which use the inshore waters of Cardigan Bay for both feeding and reproduction. Grey seal is a secondary reason for site selection. |
| Lleyn Peninsula and the Sarnau/Pen Llŷn a'r Sarnau SAC | 97.1 | Grey seal | Gey seal is a secondary reason for site selection. Bottlenose dolphin are also a qualifying feature of this site, but the site is beyond the 50 km screening distance for this species. |
| Saltee Islands SAC | 103.3 | Grey seal | Qualifying feature of this site, which provides habitat for breeding, moulting, resting and social grey seals. The population at this site is estimated to be 571 to 734 individuals. |
| Dale and South Marloes Coast SSSI | 0.5 | Grey seal | Species is a marine feature of this site. |
| St Bride’s Bay South/De Porth Sain Ffraidd SSSI | 6.4 | Grey seal | Species is a marine feature of this site. |
| Skokholm SSSI/NNR | 7.3 | Grey seal | Species is a marine feature of this site. |
| Skomer Island and Middleholm SSSI/Skomer Island NNR | 9.2 | Grey seal | Breeding sites for grey seals with pupping from August-November |
| St David’s Peninsula Coast SSSI | 17.2 | Grey seal | Species is a marine feature of this site. |
| Ramsey/Ynys Dewi SSSI | 21.3 | Grey seal | Species is a marine feature of this site. |

| Site | Distance to Array Area / Offshore Cable Scoping Boundary (km) | Qualifying Species | Species specific site summary |
|---|---|---|---|
| Grassholm/Ynys Gwales SSSI | 21.5 | Grey seal | Species is a marine feature of this site. |
| The Offshore Islets of Pembrokeshire/Ynysoedd Glannau Penfro SSSI | 24.3 | Grey seal | Species is a marine feature of this site. |
| Skomer/Sgomer MCZ | 6.5 | Grey seal | Breeding sites for grey seals with pupping from August-November |

## 22.5. Embedded and Good Practice Measures

Where relevant, embedded and good practice measures will be considered in the EIA to minimise the potential for adverse ecological effects, in accordance with the mitigation hierarchy and relevant planning policy. The design elements of the proposed Project are not yet final, and thus appropriate mitigation approaches need to be discussed with the relevant statutory nature conservation body's (SNCBs) and stakeholders. However, considering the current understanding of Project activities the following measures, specifically for the minimisation of risk to marine mammals, will be included in project design:

- Adherence to JNCC guidelines regarding the minimisation of impacts from underwater sound generated from known Project activities of piling (JNCC, 2010), geophysical surveys (JNCC, 2017) and UXO detonation (JNCC, 2010); and
- All Project vessels shall comply with the International Regulations for Preventing Collisions at Sea (IMO, 1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) (IMO,2021) with the aim of preventing and minimising pollution from ships. All vessels shall have a contingency plan for marine oil pollution (Shipboard Oik Pollution Emergency Plan).

## 22.6. Likely Significant Effects

The potential impact pathways to marine mammals are present during the construction, operation (including maintenance and repair) and decommissioning phases of the proposed Project are summarised below in Table 22-4. A full, detailed assessment of impact pathways and receptors scoped in will be considered in the EIA.

*Table 22-4. Potential impact pathways in relation to marine mammals during construction, operation and decommissioning of the proposed Project*

| Project Phase | Potential Impact Pathway | Scoped In | Scoped Out | Rationale |
|---|---|---|---|---|
| Construction | Effects of underwater sound | ✓ | | Marine mammals are highly sensitive to underwater sound (UWS) and man-made sound can mask communication signals, cause auditory injury (temporary and permanent threshold shifts), and induce behavioural changes. The exact construction methods have yet to be determined but the expected UWS sources include geophysical surveys, UXO clearance, the potential for impact piling or drilling for the installation of piles in the seabed, cable installation and vessel traffic. Given the potential for impacts from impact piling generated UWS, further assessment and sound propagation modelling will be conducted. The works of Southall *et al.* 2007, NMFS, 2018, Southall *et al* 2019 will be closely considered and impacts will be assessed according to the current effects criteria for each of the functional hearing groups of marine mammals occurring in the Study Area. |
| | Collision with Project vessels | ✓ | | Marine mammals may be susceptible to collision with operations vessels, which can result in lethal and sub-lethal injury. However, many factors contribute to the likelihood and severity of vessel collisions with marine mammals (e.g. vessel speed and size, species distribution and behaviour) and a detailed risk assessment will be undertaken in the ES for the species present within the Study Area. |
| | Alteration of water quality due to unplanned, releases, accidental leaks and spills from vessels and plant | ✓ | | Accidental/unplanned release of vessel fuels and pollutants could have a significant impact on marine mammals by altering local water quality. Although the risk of occurrence is low, an Environmental Management Plan (EMP) will be developed for required operations and procedures to minimise the likelihood of occurrence and subsequent impact should it occur. Due to the potentially significant impacts of altered water quality, this impact pathway is scoped into the ES. |
| | Temporary increase in suspended sediment concentrations and sediment deposition leading to contaminant mobilisation | | ✓ | Suspended sediment is expected to be minimal and confined to the lower reaches of the water column, due to the depth at which works will occur. Furthermore, marine mammals are frequent inhabitants of turbid environments with low visibility, and studies have indicated that they do not typically experience severe impact from increased suspended sediment concentrations. |
| | Potential for indirect effects through impacts to prey species | ✓ | | Due to the potential impacts to benthic communities and fish and shellfish species, there remains the possibility of indirect impact to marine mammals through |

| Project Phase | Potential Impact Pathway | Scoped In | Scoped Out | Rationale |
|---|---|---|---|---|
| | | | | disturbance to prey species. This may include impacts that have been scoped out as direct impacts to marine mammals. This pathway has been scoped in to the ES. |
| | Airborne sound and visual disturbance | ✓ | | Air-borne sound from vessels has the potential to affect seals located at coastal breeding sites. Considering the proximity of sites known to host breeding grey seal populations, this impact pathway has been scoped in for assessment. |
| Operation | Barrier effects from installation of mooring lines and cables between platform and anchor | ✓ | | This impact pathway has been scoped in as a precautionary measure to properly assess in the EIA as the final configuration is still to be designed. However, a significant impact is not expected. |
| | Entanglement with mooring lines and cables | ✓ | | The floating configuration of the array requires long mooring lines to connect turbines with their anchors, thus posing an entanglement risk for marine mammals. These lines may also ensnare derelict fishing gear, which may further increase entanglement risk. A recent assessment of entanglement risk with marine renewable energy resources has found that moorings pose a moderate risk to large baleen whales, which expands to a wider range of species if derelict fishing gear becomes attached. Preliminary data indicates that the risk of entanglement for marine mammals with mooring lines is small, although further assessment is required. This pathway has been scoped in for further consideration in the ES. |
| | Effects of electromagnetic field (EMF) emissions | ✓ | | There is potential for EMF from subsea cables to interfere with marine mammal behaviour, as they rely on the Earth's magnetic field for navigation; however, the impacts of EMF are still poorly understood so they have been scoped in for further assessment in the EIA. |
| | Maintenance potential effects same as construction | | | |
| Decommissioning | Potential effects same as construction and operation | | | |

## 22.7. Assessment Methodology

The assessment methodology for marine mammals will follow the standard methodology outlined for ecological receptors outlined in Volume 2, Chapter 8, which is in line with CIEEM guidance for ecological impact assessments (CIEEM, 2018).

The key data sources used for the ES chapter will include, but not be limited to:

- Project-specific survey data (where applicable);
- SCANS (Small Cetacean Abundance in the European Atlantic and North Sea) data (Hammond, et al., 2021);
- Inter-Agency Marine Mammal Working Group (IAMMWG, 2021);
- Sea Mammal Research Unit (SMRU) (2021; http://www.smru.st-andrews.ac.uk/);
- Special Committee on Seals (SCOS) (2020);
- Habitat-based predictions of at-sea distributions for grey and harbour seals in the British Isles (Carter, et al., 2020);
- UK Cetacean Stranding Investigation Programme (2021; http://ukstrandings.org/csip-publications/);
- Irish ObSERVE Programme (Rogan, et al., 2018);
- Distribution models for harbour porpoise within the UK Exclusive Economic Zone (Heinänen and Skov 2015);
- Distribution models for 12 species of cetacean covering the north east Atlantic (Waggit et al. 2019);
- The Sea Watch Foundation marine mammal sightings distribution maps; and
- Relevant Environmental Statements, academic journals and online reports.

Consultation with stakeholders including the Marine Management Organisation, Natural Resources Wales, JNCC, Environment Agency, Pembrokeshire County Council, Pembrokeshire Coast National Park Authority (amongst others where relevant) will take place.

## 22.8. Conclusion

In summary:

- Common dolphin, harbour porpoise, bottlenose dolphin, striped dolphin, minke whale, and grey seal are the most common species likely to occur near the Study Area;
- Two sites designated for harbour porpoise (West Wales Marine / Gorllewin Cymru Forol SAC and Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC ) and one site designated for bottlenose dolphin (Cardigan Bay / Bae Ceredigion SAC) occur within 50 km of the proposed Project;
- Five sites designated for grey seals occurs within 135 km of the proposed Project (Pembrokeshire Marine / Sir Benfro Forol SAC, Lundy SAC, Cardigan Bay / Bae Ceredigion SAC, Saltee Islands SAC, and Skomer / Sgomer MCZ), but there are several other nationally important sites including SSSIs and Nature Reserves which have noted grey seal presence and is a feature of that site;
- A detailed assessment based on the potential impacts identified above will be carried out, forming part of the basis of the ensuing EIA; and
- The only impact pathway to be scoped out at this stage is temporary increases in suspended sediment concentration, deposition, and turbidity

### 22.9. References

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# 23. ORNITHOLOGY

## 23.1. Introduction

This chapter of the Scoping Report provides a high-level overview of the relevant marine ornithology baseline information as well as a summary of the potential interactions between the proposed Project and this receptor group. Any data used to help characterise the marine ornithology baseline is identified, and the assessment methodology that will be used for the impact assessment is highlighted.

## 23.2. Regulatory and Planning Policy Context

For information regarding the legislative context of the proposed Project see Volume 1, Chapter 2: Regulatory and Policy Context. This section outlines legislation, policy, and guidance relevant to the assessment of the potential effects on the ornithological receptors associated with the installation, operation (including maintenance and repair) and decommissioning phases of the proposed Project**.** A number of policies and legislative instruments require decision makers to consider the environmental impacts of a project. Those which provide relevant legislative protection to marine birds include:

- **The Conservation of Offshore Marine Habitats and Species Regulations 2017,** that apply within UK Offshore Marine Area (beyond 12nm limit) as defined in the Marine and Coastal Access Act 2009;
- **Marine and Coastal Access Act 2009**, which provides the legal mechanism to help ensure clean, healthy, safe and productive and biological diverse oceans and seas;
- **Environment (Wales) Act 2016**;
- **The Marine Strategy Regulations 2010,** which transpose the Marine Strategy Framework Directive (2008/56/EC) into UK legislation;
- **The Wildlife and Countryside Act 1981** (as amended), which includes provisions relating to nature conservation;
- **The Countryside and Rights of Way (CRoW) Act 2000** (as amended); and
- **The Natural Environment and Rural Communities (NERC)** Act 2006 (as amended).

Key national and local plans and policies relevant to the assessment of the Project impacts on marine ornithology include:

- **Welsh National Marine Plan** – which sets out a single framework for sustainable development within Wales marine area, including considering cumulative effects on highly mobile seabird species (Welsh Government, 2019).
- **UK Marine Policy Statement** – which aims to achieve sustainable development in the UK marine area;
- **Nature Recovery Action Plan** – the biodiversity strategy for Wales (Wales Biodiversity Partnership 2022);
- **Planning Policy Wales** – highlights the importance of biodiversity for natural services, sustainability and the Welsh economy. It includes objectives to achieve efficient use and protection of natural resources and enhancing biodiversity.

### 23.3. Study Area

The proposed Project is located in the North-east Celtic Sea , with the landfall area potentially located in Milford Haven and surrounding the Angle Peninsula, currently identified as West Angle Bay, Angle Bay and Freshwater West Beach. The marine ornithological Study Area for the purpose of scoping includes all areas currently under consideration for the proposed Project, including the Array Area Scoping Boundary, Offshore Cable Scoping Boundary (i.e. turbines, inter-array cable route and electricity cable route) and Onshore Scoping Boundary (landfall areas) (Figure 23-1).

Recognising the highly mobile and wide-ranging nature of birds in the marine environment and the potential implications of local impacts on wider populations, the Study Area for the baseline encompasses all sites designated for birds with a marine component within 100 km of the Array Area Scoping Boundary and Offshore Cable Scoping Boundary and selected sites designated for far ranging species with a maximum foraging range of +1 Standard Deviation (SD) that is greater than 100 km.

*Table 23-1. Mean maximum foraging range plus 1 standard deviation for species that have a foraging range greater than 100km (Woodward et al. 2019)*

| Species | Mean Maximum Foraging Range plus 1 Standard Deviation (km) |
|---|---|
| Manx shearwater *Puffinus puffinus* | 2,365 |
| Northern Fulmar *Fulmaris glacialis* | 1,200 |
| Northern Gannet *Morus bassanus* | 509 |
| Black-legged Kittiwake *Rissa tridactyla* | 300 |
| Puffin *Fratercula arctica* | 265 |
| Lesser Black-backed Gull *Larus fuscus* | 236 |
| Guillemot *Uria aalge* | 153 |
| European Storm Petrel *Hydrobates pelagicus* | 336 |
| Razorbill *Alca torda* | 164 |
| Leach's Storm Petrel *Oceanodroma leucorhoa* | 657 |
| Great Skua *Stercorarius skua* | 931 |

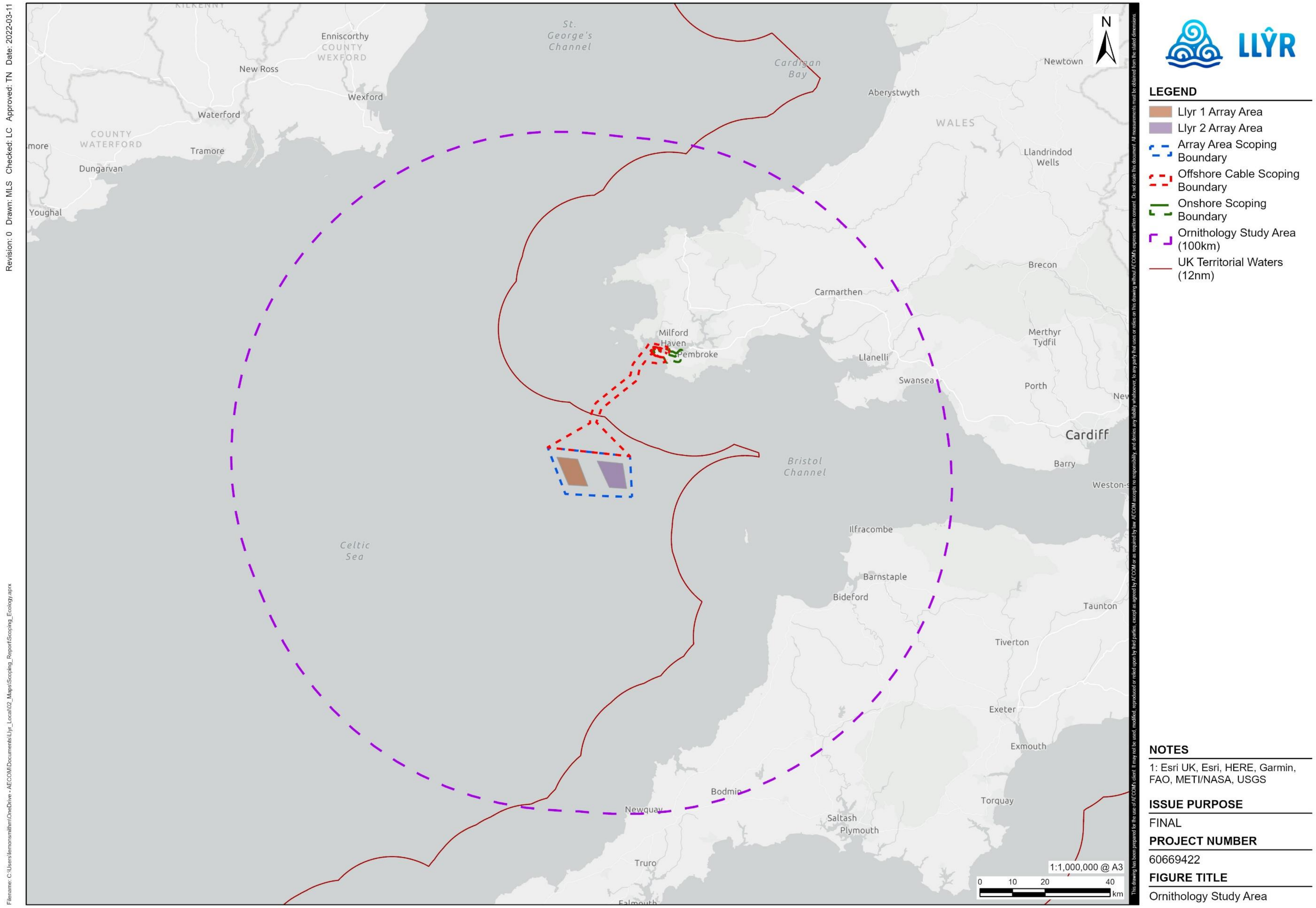


*Figure 23-1. Ornithology Study Area*

### 23.4. Baseline

Birds designated as a qualifying feature of the National Site Network (including Special Protection Areas (SPAs) and Ramsar Sites), otherwise known as European sites, and those species listed as part of nationally designated sites (*e.g.* Sites of Special Scientific Interest (SSSI) and National Nature Reserve (NNR)) (hereafter referred to as 'Designated sites') represent populations of highest conservation importance and sensitivity. Therefore, only qualifying bird species which have the potential to be present in the vicinity of the proposed Project will be considered further within the Scoping Report.

The proposed Project passes directly through the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (hereafter referred to as Skomer, Skokholm and the Seas off Pembrokeshire SPA); a site internationally designated for the protection of seabirds.

The Skomer, Skokholm and the Seas off Pembrokeshire SPA is an extensive site (1,668 $km^2$) located off the extreme south-west tip of Pembrokeshire in Welsh territorial and UK offshore waters. The islands of Skomer, Skokholm and Middleholm are designated as a SSSI, with Skomer Island also designated as an NNR. Both Skomer and Skokholm islands hold the largest concentration of breeding seabirds in England and Wales. This includes the population of Manx Shearwater (*Puffinus puffinus*) which represents the largest breeding colony in the world. The site is also classified for the protection of: European Storm Petrel (*Hydrobates pelagicus*), Atlantic Puffin (puffin) (*Fratercula arctica*), and Lesser Black-backed Gull (*Larus fuscus*) and a wider seabird assemblage (in any season) also forms part of the designation.

Further designated sites for important breeding seabird populations whose foraging ranges overlap with the offshore Study Area are shown in Table 23-2.

*Table 23-2. Sites and relevant designated features that occur within the offshore ornithological Study Area*

| Site Name | Designated Features |
|---|---|
| Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA | Atlantic puffin, European storm-petrel, lesser black-backed gull, Manx shearwater, chough.<br><br>Seabird assemblage including razorbill, guillemot, kittiwake, puffin, lesser black-backed gull, Manx shearwater, and European storm-petrel. |
| Bae Caerfyrddin / Carmarthen Bay SPA | Common scoter. |
| North Cardigan Bay SPA | Red-throated Diver |
| Burry Inlet SPA | Pintail, northern shoveler, Eurasian teal, Eurasian wigeon, turnstone, dunlin, red knot, Eurasian oystercatcher, Eurasian curlew, grey plover, common shelduck, redshank. Waterbird assemblage (of the aforementioned designated bird features). |
| Grassholm SPA | Gannet. |
| Castlemartin Range SSSI | Guillemot, razorbill and kittiwake |

| Site Name | Designated Features |
|---|---|
| Gower Coast: Rhossili to Port Eynon SSSI | Guillemot, razorbill |
| Ynysoedd y Gwylanod: Gwylan Islands SSSI | Puffin |
| Ramsey Island and Bishops and Clerks Island SSSI | Razorbill, guillemot, European storm petrel |
| The Skerries SSSI | Herring gull, lesser black-backed gull, puffin |
| Lundy SSSI | Puffin, Manx shearwater, kittiwake, razorbill, guillemot |

The Digital Aerial Surveys will characterise the ornithological baseline of the Study Area and establish the ornithological receptors taken forward for assessment in the EIA. Once the ornithological receptors have been established, the foraging ranges set out in Table 23-1 will be used to identify any further designated sites, beyond those listed in Table 23-2, that will need to be assessed as part of the EIA.

The marine ornithology baseline will be determined through review of existing datasets and sources and a programme of targeted offshore ornithological surveys of the Study Area.

Establishment of the baseline environment and scope of further surveys will be informed using the following key data sources:

- The Joint Nature Conservation Committee (JNCC) website for details of Special Protection Areas (SPAs) including site information and designation details, including Supplementary Advice on Conservation Objectives (SACOs);
- The British Trust for Ornithology (BTO) website for site specific data from the Wetland Bird Survey (WeBS), a partnership between the BTO, the Royal Society for the Protection of Birds (RSPB) and JNCC (the last on behalf of Natural England (NE), Natural Resources Wales (NRW), Scottish Natural Heritage (SNH) and the Department of the Environment Northern Ireland (DENI)) in association with the Wildfowl and Wetlands Trust (WWT);
- The Joint Nature Conservation Committee (JNCC) atlas of seabird distribution in north-west European waters (Stone, *et al.,* 1995) and Distribution of seabirds in the North-East Atlantic (Waggitt, *et al.,* 2020);
- Relevant Environmental Statements and associated appendices detailing the results of project specific ornithological surveys produced for large infrastructure projects in the vicinity of the Project, including Project Valorous (Marine Space, 2021) and Project Erebus (Marine Space, 2019 and 2022) when published into the public domain;
- Seabird foraging ranges (Thaxter, *et al.,* 2012; Woodward, *et al.,* 2019), including site and specific species studies;
- FAME (Future of the Atlantic Marine Environment) and STAR (Seabird Tracking and Research) seabird tracking projects (Wakefield, *et al.,* 2017);
- Analyses of European Seabirds at Sea (ESAS) data (Kober *et al.,* 2010) and
- Analysis of seabird species sensitivity to offshore wind farm developments (Furness, *et al.,* 2013), and report on biologically defined minimum population scales (BDMPS), used to define seasonality for each species (Furness, *et al.,* 2015).
- Digital Aerial Survey (DAS) will be used to collect project-specific baseline site characterisation data to inform the EIA. This includes the Array Area and Offshore Cable Scoping Boundary, plus a surrounding 4 km buffer, with monthly surveys undertaken to gather seabird species abundance and distribution data over a 24-month period. Survey data will include species,

count, sex (where possible), age (where possible), flight height, flight direction, activity (in flight or on the seas surface), rafting/loafing, etc.), position, and date and timestamp.

### 23.5. Embedded and Good Practice Measures

The mitigation required during the proposed Project will be proportionate to the significance of impact to ornithological receptors. Given that many design elements of the proposed Project have yet to be set, mitigation approaches will need to be informed based on the findings of the project-specific surveys and discussed with statutory consultees and stakeholders throughout the EIA process.

### 23.6. Likely Significant Effects

The potential impacts on marine ornithological receptors will be determined following the completion of the project-specific baseline characterisation surveys and finalisation of the project description elements. The key sensitivities and potential impacts for all stages of the proposed Project (construction, operation (including maintenance and repair) and decommissioning) on marine ornithological receptors are outlined in Table 23-3.

*Table 23-3. Potential impacts of the proposed Project on seabirds*

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction and Decommissioning | Direct disturbance and displacement of birds associated with sound, visual impacts and presence from vessel and construction/decommissioning activity in offshore environments | ✓ | | Various activities associated with the route preparation, array and cable installation phases of the proposed Project may result in disturbance and displacement of marine ornithological receptors, including, construction and decommissioning activities such as vessel movements and increased noise may result in displacement and/or avoidance of birds foraging or loafing in the area.<br>The ongoing Llŷr Project offshore bird surveys being carried out will establish the abundance and spatial and temporal distribution of seabirds in the Study Area. |
| Construction and Decommissioning | Direct loss and disturbance of seabed habitat used by foraging seabirds from construction/decommissioning activities. | ✓ | | There is a potential for direct loss and disturbance of seabird foraging habitat through the placement and removal of offshore project infrastructure. This includes the potential loss of prey items (such as herring and sandeel) for which certain subtidal habitat are important. The loss of benthic habitat will be limited to the locations of the cable installation, anchoring points and at landfall locations. This includes the placement of hard substrates on the seabed for cable protection.<br>The ongoing Llŷr Project offshore bird surveys being carried out will establish the abundance and spatial and temporal distribution of seabirds in the Study Area. |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction and Decommissioning | Direct disturbance and displacement to foraging diving birds from underwater noise (including piling activities and UXO detonation) | ✓ | | Diving seabirds may be temporarily displaced due to underwater noise (e.g. UXO detonations) which could result in behavioural changes such as changes in swimming direction, diving duration and/or avoidance in the area and interfere with their ability to forage successfully.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds and will identify what species are present and the spatial/ temporal distribution of these species within the Study Area. |
| Operation | Barrier effect of offshore arrays to seabird movements to and from breeding/foraging grounds or on migration. | ✓ | | The presence of the offshore arrays may result in a barrier effect to bird movements. cause birds in the vicinity to be displaced.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for seabirds and will identify what species are present and the spatial/ temporal distribution of flight activity within the Study Area. |
| Operation | Injury or mortality due to collision with turbines | ✓ | | Birds in flight are at direct risk of injury or mortality due to collision with the offshore wind turbines if they pass through the turbine arrays.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| | | | | and will identify what species are present and the spatial/ temporal distribution of flight activity within the Study Area. |
| Operation | Displacement or disturbance due to vibration from offshore arrays during operation. | | ✓ | While the operation of the offshore arrays may result in vibration, this is likely to be relatively minor and localised and is therefore not likely to significantly disturb or displace seabirds in the area and is scoped out from further assessment. |
| Operation | Displacement and avoidance of birds from foraging or loafing areas due to effective loss of habitat and presence of offshore arrays and associated activities (e.g. maintenance vessels). | ✓ | | The presence of the offshore arrays may deter birds from using the area to forage and/or commute.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds and will identify what species are present and the spatial/ temporal distribution of these species within the Study Area |
| Operation | Attraction of nocturnal seabirds (e.g. petrels and shearwater) to project infrastructure lighting. | ✓ | | Nocturnal seabirds may be attracted to the offshore project infrastructure lighting causing them to become disorientated and/or increase their risk of collision with the offshore arrays.<br>The ongoing Llŷr Project offshore bird surveys being carried out will provide information to inform which species are present in the area. |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Operation | Direct creation of roosting habitat for birds due to presence of floating platforms and associated infrastructure. | ✓ | | The introduction of floating platforms and associated infrastructure presents the opportunity for new roosting habitat which may be utilised by foraging birds.<br>The Llŷr Project offshore bird surveys will provide information to inform which species are present in the area. |
| Operation | Increased entanglement risk to diving seabirds from ghost fishing gear catching on project infrastructure. | ✓ | | The presence of the offshore arrays may cause ghost fishing gear (*i.e.* any discarded, lost, or abandoned, fishing gear in the marine environment) to get caught on the project infrastructure. This fishing gear then poses a risk that seabirds could get entangled in the fishing gear causing injury and/or mortality. |

## 23.7. Assessment Methodology

The assessment methodology for ornithology will follow the standard methodology outlined in Volume 2, Chapter 8 for ecological receptors, which is in line with Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018, and updated September 2019).

Project-specific aerial marine ornithology surveys are currently being carried out to collect data to inform the EIA which will be submitted as part of the consenting application.

The assessment will be informed by a 24-month period of ornithology survey, the data from which will be used to develop and inform:

- Surface density plots and models;
- Collision Risk Modelling (CRM); and
- Potential displacement modelling.

The Project-specific marine ornithological survey programme data will be presented in an EIA characterisation technical report focusing on the individuals recorded within, and abundance estimates for, within the Array Area Scoping Boundary only:

- Data and abundance estimates will be presented for all species recorded within the buffer area to permit the analysis of potentially displaced individuals;
- Raw counts will be divided by the number of images taken to give mean number of birds per image ($i$). Abundance estimates ($N$) for each survey month will then be generated by multiplying the mean number of birds per image by the total number of images required to cover the entire Study Area ($A$): $N = iA$
- Dividing the monthly abundance estimates by the size of the study site or the 4 km buffer sites will then enable the calculation of density for any given species.

The Project-specific marine ornithological survey programme will also collect flight height data for each of the relevant species recorded within the proposed ornithological Study Area (area of the array plus a 4 km buffer). Data collected from the Digital Aerial Surveys (DAS) will be processed from the digital images captured.

The Potential Collision Risk Height (PCH) will be determined (currently defined as 22-290 m), as this represents the minimum and maximum sweep of the proposed turbine blades. Collision Risk Modelling can also be informed by relevant literature and Models, to supplement and further refine the data collected during surveys.

Where Displacement Modelling is required, it will follow the guidance note from UK SNCBs entitled '*Joint SNCB Interim Displacement Advice Note: Advice on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm developments.*' By following this guidance, an estimate of percentage displacement from the disturbance zone and percentage mortality within displaced birds will be made.

The displacement modelling will also be informed by the results of the site-specific surveys, as these will be used to assess the density of species within the Array Area and Offshore Cable Scoping Boundary (density surface modelling). The survey will be designed to allow for a statistically robust assessment of displacement.

Consultation with stakeholders will take place with the RSPB, Natural Resources Wales, JNCC, Pembrokeshire County Council, and the Pembrokeshire Coast National Park Authority (amongst others where relevant).

### 23.8. Conclusion

In summary:

- Seabirds are highly sensitive species with strong protection under UK legislation. A number of impact pathways have been identified from the proposed Project that could potentially significantly affect seabirds and/or waterbirds. Effects that have been scoped in for further analysis in the EIA are presented in Table 23-3.
- The Project will pass directly through Skomer, Skokholm and the Seas off Pembrokeshire SPA.
- A detailed assessment based on the potential impacts identified above and informed by project-specific marine ornithology characterisation surveys, will be carried out, forming part of the basis of the ensuing EIA (as well as the HRA).

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## 24. MARINE ARCHAEOLOGY

### 24.1. Introduction

The marine archaeology assessment will consider the potentially significant effects on heritage assets within the offshore region of the proposed Project that may arise from the construction, operation (including maintenance and repair) and decommissioning of the proposed Project. This chapter of the Scoping Report describes the methodology and datasets used to inform the scoping assessment, it provides an overview of the marine archaeology baseline conditions, assesses the likely significant effects that may arise as a result of the proposed Project, and how likely significant effects will be assessed for the purpose of an EIA.

Marine archaeological and cultural heritage receptors located within the Array Area and Offshore Cable Scoping Boundary include the following:

- Seabed Prehistory: for example, palaeochannels and other features that contain prehistoric sediment, and derived Palaeolithic artefacts e.g. flint tools;
- Maritime Archaeology: maritime archaeological sites consist broadly of vessel remains, wreckage and submerged vessel/cargo debris; and
- Aviation Archaeology: this comprises all military and civilian aircraft crash sites and related wreckage.

Other themes relevant to the marine archaeological baseline include intertidal heritage receptors and the historic seascape character in and around the area.

### 24.2. Regulatory and Planning Policy Context

There is a distinct set of legislation, policy and guidance relating to marine, maritime and nautical archaeology.

The potential effects of the proposed Project on marine archaeology have been considered with respect to the requirements of the relevant policy, legislation and guidance including:

- The Marine and Coastal Access Act (MCAA) 2009;
- Ancient Monuments and Archaeological Areas Act 1979;

- National Policy Statement for Ports (NPSfP) (DfT, 2012); and
- UK Marine Policy Statement (MPS) (HM Government, 2011) as required by Section 44 of the Marine and Coastal Access Act 2009.

#### *24.2.1. The Marine and Coastal Access Act (MCAA) 2009*

The Marine and Coastal Access Act (MCAA) 2009 is the primary legislation relevant to marine licensing and the preparation of marine development plans. Under this legislation, marine plans must be consistent with the Marine Policy Statement (MPS) and fully reflect the requirements of the MPS at a local level. Marine plans must also be in accordance with other UK national policy.

#### *24.2.2. Ancient Monuments and Archaeological Areas Act 1979*

This legislation defines sites that warrant protection due to being of national importance as 'ancient monuments'. These can be either scheduled monuments or "any other monument which in the opinion of the Secretary of State is of public interest by reason of the historic, architectural, traditional, artistic or archaeological interest attaching to it". The Act states that consent must be obtained from Historic England for works of demolition, repair and alteration that might affect heritage assets which are designated as scheduled monuments or assets being considered for adoption as a scheduled monument. Heritage assets which are not designated as scheduled are protected through the development management process under the Town and Country Planning EIA Regulations 2017.

#### *24.2.3. UK Marine Policy Statement 2011*

Section 2.6.6 of this policy statement (HM Government, 2011) is relevant to the historic environment. The policy recognises that marine activities have the potential to result in adverse effects on the historic environment, both directly and indirectly, including damage to or destruction of heritage assets.

Section 2.6.6.9 of the policy states that "where the loss of the whole or a material part of a heritage asset's significance is justified, the marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost".

#### *24.2.4. Welsh National Marine Plan 2011*

The Welsh National Marine Plan has been developed alongside marine planning in England, Scotland and Northern Ireland. It is guided by the 2011 UK Marine Policy Statement but has a distinct Welsh context including delivering the legislation to support sustainable development (Well-being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016).

#### *24.2.5. Managing the Marine Historic Environment of Wales*

The plan sets out an integrated, evidenced and plan-led approach to achieving its vision of clean, healthy, safe, productive and biologically diverse Welsh seas. It supports the move towards integrated marine governance and sets out both general cross-cutting and sector specific policies relating to the future use of seas within the plan area. The plan covers both Welsh inshore waters (out to 12 nautical miles) and offshore waters (beyond 12 nautical miles) and extends up to the level of mean high-water spring tides. This means that it will overlap physically with terrestrial plans, which generally extend to mean low water spring tides, helping to facilitate integration between land and sea planning. The plan is supported by the Welsh National Marine Plan Implementation Guidance.

### *24.2.6. Other Relevant Policy, Standards and Guidance*

Other policy, standards and guidance that are relevant to and have been followed in this marine archaeological assessment include:

- Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006);
- British Marine Aggregate Producers Association. Marine Aggregate Dredging and the Historic Environment. Guidance note (2003);
- Marine character areas (NRW, 2015); and
- Protection of Wrecks Act 1973.

## 24.3. Study Area

The Study Area for the scoping assessment can be seen in Volume 1, Figure 1-1 and comprises: the Array Area and Offshore Cable Scoping Boundary.

## 24.4. Baseline

### *24.4.1. Existing Baseline Data*

The baseline data reviewed to inform this high-level desk-based assessment includes:

- West Coast Palaeolandscapes Study (Fitch and Gaffney, 2011);
- A Research Framework for the Archaeology of Wales (IFA Wales, 2016);
- Lle, Geo-Portal for Wales (Lle, 2022);
- National Monuments Record of Wales (NMRW; Royal Commission on the Ancient and Historical Monuments of Wales; RCAHW, 2022);
- Project Erebus EIA Scoping Report (MarineSpace, 2019) and Environmental Statement (Blue Gem Wind, 2021);
- Project Valorous EIA Scoping Report (MarineSpace, 2020); and
- Wales Marine Planning Portal (Welsh Government, 2021).

### *24.4.2. Seabed Prehistory*

EMODnet Bathymetry data indicates that the sea floor in the vicinity of the proposed Project is approximately 75 m below sea level, rising steadily along the length of the Offshore Cable Scoping Boundary towards the potential landfall sites.

The Quaternary geology of the marine environment within the offshore region of the proposed Project is identified as till with thin layers of recent marine sediments (Holocene sands and gravelly sands) overlaying the bedrock (BGS, 2022; Intertek, 2019), thickening offshore in the west. There is a high tidal range in the area, described in further detail in Section 19.4.3, indicating potential for the movement of sediment through the region. The presence of exposed bedrock suggests that there is potential for burial and exposure of archaeological remains in localised areas due to movement of sediment.

Ice sheets covered the majority of Britain from the beginning of the last glacial maximum (LGM), *c.* 18,000 years ago, during which period earlier temporary human inhabitants in Britain had retreated to the warmer climate of the European continent. Humans began to rapidly reinhabit Britain from *c.* 13,000 years ago subsequent to environmental warming, via a landbridge from continental Europe. Britain has been continuously inhabited from this period onwards, with successive phases of human migration (Fitch and Gaffney, 2011).

The West Coast Palaeolandscapes Survey (WCPS) is a large regional assessment undertaken by the University of Birmingham (Fitch and Gaffney, 2011), and provides mapping relating to the prehistoric submerged landscapes in selected areas of the Celtic Sea and Irish Sea. While the Study Area of the WCPS is located to the east of the proposed Project, it provides insights into the broader palaeolandscapes of the Celtic Sea and Irish Sea. Findings of the WCPS indicate that palaeochannels and flood plain deposits (peat and organic material) may be present in the vicinity of the proposed Project and further to the west. Peat beds have been identified at Frainslake Sands, near Freshwater West (Site No. 8.43.1; OSPAR) between 1995-2005 (Lle, 2020; Welsh Government, 2020). This may indicate the potential for palaeolandscapes to be present in the region to the west of the Celtic Sea. The WCPS indicates that there is a high potential for surviving deposits. However, with no offshore ground truthing, this potential is unverified.

A previous EIA scoping report for projects Erebus (MarineSpace, 2019) and Valorous (MarineSpace, 2020), located to the west of the proposed Project, predicted that the geology and dynamics of the Study Areas for both projects indicated a low to medium potential for *in situ* palaeoarchaeology, increasing closer to the shore and at potential landfall locations around Angle and the Pembroke Peninsula. Given the proximity of the proposed Project to projects Erebus and Valorous and their respective landfall sites, the potential for *in situ* palaeoarchaeology is likely to be very similar.

### *24.4.3. Maritime Archaeology*

Maritime archaeological sites comprise two broad categories; the remains of seafaring vessels that have been lost as a result of stranding, foundering, collision, military engagement and other causes, and those sites that consist of vessel- and wreck-related debris material. Vessel- and wreck-related debris includes (but is not limited to) equipment and cargo lost overboard or deliberately jettisoned such as fishing gear, ammunition and anchors, or the only surviving remains of a wrecked vessel such as its cargo or a ballast mound.

Shipwrecks on the seabed provide an insight on the types of vessels used in the past, the nature of shipping activity in the wider area and the changing usage of the marine environment through different periods. The survival of wreck remains is considered more likely in sediments which promote the preservation of wreck sites (e.g. finer grained sediments that are not subject to high levels of mobility), particularly where such sediments have seen limited, recent disturbance.

Known maritime archaeology and cultural heritage sites were reviewed from the NMRW. The nearest protected site is The Smalls Designated Wreck (Cadw DW4), located approximately 40km north-west of the proposed Project, where an 11th century Viking sword hilt was located amongst the rocks. A large number of non-designated sites are recorded in the NMRW (identified from documented losses, known and unknown wrecks) within the Study Area (Welsh Government, 2019), including three within the Array Area Scoping Boundary and numerous others within the Offshore Cable Scoping Boundary.

Given the close proximity of the historic port of Milford Haven, and the local conditions of submerged rocks and reef, the distribution of wrecks is to be expected, with a greater cluster around the mouth of the estuary. Further data relating to a full list of records will be reviewed for the EIA, see Section 24.7. Due to the difficulty in identifying the location of the loss of a vessel and potential disturbance of wrecks, the recorded locations are not necessarily precise. It is noted that some non-designated wrecks and their locations have been identified from historic surveys; however, some wreck locations are identified only by the snagging of fishing gear, and as such the positioning is less accurate.

The preservation potential of the marine environment in this region is limited by shallow sediment coverage, meaning a limited potential for burial of archaeological remains. Additionally, the high energy marine environment off the Pembrokeshire coast will likely have resulted in erosion of exposed surfaces and significant disturbance and distribution of remains. The potential for the discovery of previously undiscovered wrecks and maritime debris within the Study Area is therefore low. The potential increases further inshore, within areas of deeper sediment coverage.

#### *24.4.4. Marine Aviation Archaeology*

Marine aviation archaeology receptors comprise the remains or associated remains of military and civilian aircraft that have been lost at sea. Marine aviation sites are divided into three primary time periods based on major technological advances in aircraft design: Pre-1939; 1939-1945; and post-1945.

Although there are currently no known aircraft crash sites recorded by the NMRW within the Study Area, there is the potential for the discovery of previously unknown aircraft-related material to exist on the seafloor within the Study Area, with a higher potential for material dating to the Second World War. As noted above the preservation potential of the marine environment is limited. However, as aircraft are protected under the Protection of Military Remains Act 1986, and maritime aircraft crash sites can retain a significant amount of material, whilst being an ephemeral target to identify, with the potential for burial means that there is a possibility that aircraft material may be present within the Study Area. The potential increases further inshore, within areas of deeper sediment coverage.

### 24.5. Embedded and Good Practice Measures

The following standard mitigation practices, will be applied where necessary:

- Avoidance of known heritage assets (preservation in situ):
  - Implementation of Archaeological Exclusion Zones (AEZ) around identified marine heritage assets;
  - Micro-siting of design to avoid marine geophysical anomalies of possible archaeological interest;
- Further investigation and excavation of heritage assets which cannot be avoided (preservation by record):
  - Geoarchaeological assessment and the production of a Quaternary sedimentary deposit model;
  - Further investigation of marine heritage assets through the acquisition of high-resolution geophysical data, and where necessary Remote Operated Vehicle (ROV) or diver survey (in unavoidable route areas); and

- Adherence to the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Crown Estate, 2010) to address unexpected discoveries of archaeological material during construction offshore.

All mitigation measures would be set out in a draft Written Scheme of Investigations (WSI) to reflect the proposed approach to archaeological mitigation for onshore, intertidal and offshore works associated with the proposed Project. Fieldwork would include subsequent post excavation assessment, and analysis, publication and archiving (where appropriate).

### 24.6. Likely Significant Effects

#### *24.6.1. Key Receptors*

The key receptors for terrestrial and inter-tidal archaeology and cultural heritage include:

- Palaeolandscape features, including submerged peat and organic deposits;
- Maritime wrecks and debris; and
- Aviation wrecks and debris.

### *24.6.2. Potential Impacts*

These receptors can be impacted directly or indirectly from the proposed Project. Direct impacts on heritage assets involve permanent damage or destruction of archaeological material or its physical setting (context), with no ability to replace what has been lost. This would include impacts from the footprint of construction, operation (including maintenance and repair) and decommissioning of the proposed Project, as well as associated activities. This type of impact would likely result in significant adverse effects.

Indirect impacts occur when direct impacts have effects beyond their primary footprint, which can affect archaeological sites or materials some distance away by a change in the hydrodynamic or sedimentary process caused by installation of infrastructure or associated activities. These processes can trigger either a negative effect by degradation of the heritage asset or context, by physical, biological or chemical processes, or a positive effect by preservation of the heritage asset via burial.

Key sensitivities and potential impacts associated with the proposed Project to be considered as part of the full EIA are listed in Table 24-1 below.

#### 24.6.2.1. Construction

Potential temporary construction impacts that would last for all or part of the construction phase of the proposed Project could include the following:

- Presence of maritime vessels and equipment altering the setting of receptors during the construction of the Project.

Potential permanent construction impacts lasting beyond the construction phase could include:

- Impact caused by seabed preparation, including cable route clearance, route preparation and UXO clearance;
- Impact caused by laying and installation of cables;
- Impact through change to the setting of heritage assets especially those in closer proximity to the Project;
- Impact on potential archaeological remains as a result of construction works associated with the proposed Project;
- Impact caused by the presence and activity of maritime vessels and equipment; and
- Impact caused by changes in hydrodynamic or sedimentary processes that would affect the preservation of heritage assets and palaeolandscapes.

#### 24.6.2.2. Operation

Potential impacts during operation of the proposed Project could include:

- Impact caused by changes in hydrodynamic or sedimentary processes by the presence of the proposed Project and any associated maritime traffic, e.g. maintenance vessels.

#### 24.6.2.3. Decommissioning

Potential temporary construction impacts that would last for all or part of the decommissioning phase of the proposed Project could include the following:

- Presence of maritime vessels and equipment altering the setting of receptors during the construction of the proposed Project; and
- Impact caused by temporary changes in hydrodynamic or sedimentary process.

Potential impacts lasting beyond the decommissioning phase could include:

- Impact through change to the significance of the historic setting of receptors especially those in closer proximity to the proposed Project; and

- Impact caused by changes in hydrodynamic or sedimentary processes.

*Table 24-1. Key receptors and potential impacts for marine archaeology*

| Topic / Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact/ Scoped |
|---|---|---|---|---|
| Buried Marine Archaeological/(Palaeo) Environmental Remains | Direct impacts on sites within the Array Area and Offshore Cable Scoping Boundary causing destruction or damage of the assets.<br><br>Indirect impact associated with changes to marine and coastal processes. | Construction<br><br>Operation<br><br>Decommissioning | ✓ | Direct, physical impacts to heritage assets would result in the total loss of their heritage. This would constitute a medium or high impact which, without mitigation, would likely result in a significant effect. Exposure of buried remains following changes to marine or coastal processes could result in increased degradation. Conversely, burial of remains caused by changes to marine or coastal processes could be considered positive. |
| Maritime and Aviation Archaeology | Direct impacts on sites within the Array Area and Offshore Cable Scoping Boundary causing destruction or damage of the assets.<br><br>Indirect impact associated with changes to marine and coastal processes. | Construction<br>Operation<br>Decommissioning | ✓ | High potential for an impact to be of permanent negative effect, and without mitigation would be of major significance. Exposure of buried remains following changes to marine or coastal processes could result in increased degradation. Conversely, burial of remains caused by changes to marine or |

| Topic / Receptor | Potential Impacts | Project Phase | Further Assessment at EIA Stage (Scoped In) | Rationale for Impact/ Scoped |
|---|---|---|---|---|
| | | | | coastal processes could be considered positive. |
| Historic Seascape | Changes to the historic character of the area. | Construction | ✓ | The acquisition of new information of the offshore historic environment and cultural heritage resource of the proposed Project. through geophysical, geotechnical, fieldwork surveys, and excavation exercises could significantly contribute to the understanding of archaeology in the region. |

## 24.7. Assessment Methodology

Assessment of effects related to impact and setting change will be undertaken using the staged approach laid out in the Cadw (2017) Setting Guidance and articulated with reference to Cadw's 2011 Conservation Principles. This will be used in conjunction with national planning policy and the relevant policies from relevant Local Development Plans as well as guidance published by the Chartered Institute for Archaeologists.

## 24.8. Establishing the Baseline

Marine, maritime and marine aviation archaeology, and historic seascapes will be scoped into the EIA due to the potential for the proposed Project to affect designated and non-designated heritage assets.

A marine archaeological desk-based assessment (DBA) will be produced to establish the baseline conditions for the archaeological resource and assess the significance of the known and potential heritage assets within the boundary of the proposed Project.

The Study Area will be 1 km from the Array Area Scoping Boundary and 500 m from the Offshore Cable Scoping Boundary. The baseline will provide sufficient cultural heritage information to inform the impact assessment set out in the Marine Archaeology chapter of the Environmental Statement (ES) for the proposed Project.

In accordance with requirements specified in Planning Policy Wales, Note 24 (Cadw, Welsh Government, 2017a), the marine archaeology DBA will be compiled using data from the following sources;

- Records of wrecks and obstructions held by the UKHO;
- Records of finds from the Receiver of Wreck;
- Information held by Pembrokeshire County Council and Pembrokeshire Coast National Park on conservation area and assets of local interest;
- Records from the Historic Environment Record (HER) maintained by Dyfed Archaeological Trust;
- Records from the National Monuments Record of Wales, held by RCAHMW;
- Historic and current maps and charts;
- Historic and recent digital aerial photography;
- Geological data from online data (British Geological Society website);
- Archaeological assessment of marine geophysical data, existing bathymetry data, existing geoarchaeological data, geotech borehole information and deposit model information;
- Modelling associated with marine geology, geomorphology and sedimentary processes and marine coastal processes.

A programme of marine archaeological geophysical survey may be required in order to enhance the baseline understanding and identify and assess marine anomalies and potential heritage assets within the boundary of the proposed Project.

## 24.9. Assessment Criteria

The value of a heritage asset is guided by its designated status, but is derived also from its heritage interest, which is defined by Cadw as its evidential, historical, aesthetic or communal. The setting of a heritage asset can also contribute to its value. Using professional judgment and the results of consultation, heritage assets are also assessed on an individual basis and regional variations and individual qualities are considered where applicable. In articulating effects, an overall judgement will be made on the level of harm or benefit a historic asset will experience as a result of the proposed Project, supported by an appropriate narrative linking this to how the asset will have its significance change.

Each heritage asset relevant to the assessment will be assigned a value in accordance with the criteria in Table 24-2 below. This table provides guidance, but professional judgment will be applied in all cases regarding the appropriate category for individual heritage assets. Where it is assessed that an asset is of greater or lower value than noted in the guidance table, justification will be provided.

*Table 24-2. Heritage asset value matrix*

| Value | Criteria |
|---|---|
| High | World Heritage Sites.<br>Conservation areas of demonstrable high value.<br>Designated wrecks<br>Non-designated heritage assets (archaeological sites or seascapes) that can be shown to have demonstrable national or international importance.<br>Well preserved historic seascape character areas, exhibiting considerable coherence, time-depth, or other critical factor(s). |
| Medium | Conservation areas.<br>Non-designated heritage assets (archaeological sites or seascapes) that can be shown to have demonstrable regional importance.<br>Averagely preserved historic seascape character areas, exhibiting reasonable coherence, time-depth, or other critical factor(s). |
| Low | Non-designated heritage assets seascapes) that can be shown to have demonstrable local importance.<br>Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade.<br>Historic seascape character areas whose value is limited by poor preservation and/ or poor survival of contextual associations. |
| Negligible | Assets identified on national or regional databases, but which have no evidential, historical, aesthetic and communal value.<br>Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade.<br>Seascape with no or little significant historical merit. |

### 24.10. Assessing the Magnitude of Impact

Once the value of the heritage asset has been identified, the magnitude of impact to the asset as a result of the proposed Project will be assessed. Impacts may arise during construction or operation of the proposed Project and could be temporary or permanent. Impacts may occur to the physical fabric of an asset or may arise from changes within its setting. Table 24-3 below presents the heritage asset magnitude matrix.

*Table 24-3. Heritage asset magnitude matrix*

| Value | Criteria |
|---|---|
| High | Changes such that the heritage value of the asset is totally altered or destroyed. |

| Value | Criteria |
|---|---|
| | Comprehensive change to elements of setting that would result in harm to the asset and our ability to understand and appreciate its heritage significance. |
| Medium | Change such that the heritage value of the asset is significantly altered or modified.<br>Changes such that the setting of the asset is noticeably different, affecting significance changes in our ability to understand and appreciate the heritage value of the asset. |
| Low | Changes such that the heritage value of the asset is slightly affected.<br>Changes to the setting that have a slight impact on significance resulting in changes in our ability to understand and appreciate the heritage value of the asset. |
| Negligible | Changes to the asset that hardly affect heritage value.<br>Changes to the setting of an asset that have little effect on significance and no real change in our ability to understand and appreciate the heritage value of the asset |

### 24.11. Assigning the Significance of Effect

An assessment to classify the significance of the effect, having taken into consideration any embedded mitigation, will be determined using the matrix at Table 24-4, which takes account of the value of the asset (Table 24-2) and the predicted magnitude of impact (Table 24-3). The environmental assessment will report on the significance of effect in accordance with EIA methodology. Major and moderate effects will be considered significant.

*Table 24-4. Significance criteria*

| | | Magnitude of impact | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Medium | High |
| Value of Heritage Asset | High | Negligible / Minor | Moderate | Major | Major |
| | Medium | Negligible | Minor | Moderate | Major |
| | Low | Negligible | Negligible | Minor | Moderate |
| | Negligible | Negligible | Negligible | Negligible | Negligible / Minor |

### 24.12. Potential Mitigation

Owing to the nature of the proposed Project, it is envisaged that mitigation is likely to focus on addressing adverse effects to heritage assets, particularly buried archaeological assets. The approach to mitigation will be guided by industry common practice and appropriate procedures as laid out in the relevant standards and guidance documents from the Chartered Institute for Archaeologists and would be informed by the results of field evaluation.

The following mitigation measures may be considered in relation to the proposed Project:

- Mitigation comprising the preservation of archaeological remains through limited re-design; and
- A protocol for the reporting of finds and unforeseen archaeological discoveries.

### 24.13. Conclusion

- There is one designated marine archaeological receptor within the Study Area.
- There is the potential for as yet undiscovered marine archaeology receptors within the Array Area and Offshore Cable Scoping Boundary. These include maritime and aviation archaeological sites, as well as *in situ* prehistoric sites and finds.
- Marine, maritime and marine aviation archaeology, and historic seascapes will be scoped into the EIA.

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## 25. SHIPPING AND NAVIGATION

### 25.1. Introduction

This chapter of the scoping report provides a high-level overview of baseline shipping activity and key navigational features within the vicinity of the proposed Project before proposing the scope and methodology for the shipping and navigation assessment that will be conducted during the EIA.

Shipping and navigation have been identified as a key receptor for consideration within the EIA due to potential interactions between existing vessel traffic and the proposed Project particularly during installation phase. It is therefore necessary to identify and assess the potential interactions, to understand the impacts, identify possible mitigation measures and ultimately demonstrate that the proposed Project will not adversely affect vessel traffic.

It is noted that the recent COVID-19 pandemic is likely to have affected shipping activity within the Study Area (see Section 25.3). As such, vessel traffic data during the pandemic may underrepresent the true level of baseline shipping activity. In order to mitigate this, the Shipping and Navigation assessment will be based on data predating the pandemic.

### 25.2. Regulatory and Planning Policy Context

A number of legislative instruments, policies and plans require decision makers to consider the environmental impacts of a project. For detailed information regarding the legislative context of the proposed Project see Volume 1, Chapter 2. The key legislation, policy, and guidance relevant to the assessment of the potential effects on the shipping and navigation receptors associated with the installation, operation and decommissioning phases of the proposed Project include:

- **Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (1972),** which includes traffic separation schemes and gives guidance to the conduct of vessels (IMO, 2019a);

- **International Convention for the Safety of Life at Sea (SOLAS) (1974)**, which ensures standards are kept during the operation of ships compatible with safety (IMO, 2019b);
- **Convention on Facilitation of International Maritime Traffic (FAL) (1965/67),** which includes the facilitation of arrival and departure of cargo vessels (IMO, 2019c);
- **Convention on the International Maritime Organisation (1948),** which ensures cooperation of sea users and efficiency of navigation (IMO, 2019d);
- **International Convention for the Prevention of Pollution from Ships (MARPOL) (1983)**, which ensures the preventions of pollution by ships in the marine environment (IMO, 2019e);
- **International Association of Marine Aids to Navigation and Lighthouse Authorities (1957),** which provides guidance on aids to navigation and buoyage, and ensures that mariners have Marine Aids to navigation, resulting in a decrease of marine accidents (IALA, 2022); and
- **Maritime and Coastguard Agency (MCA) Active Marine Guidance Notes (MGNs) (2014),** which provides guidance on UK Navigational Practice, Safety and Emergency Response Issues' (MCA, 2022).

Key national and local plans and policies relevant to the assessment of the impacts on shipping and navigation include:

- **Welsh National Marine Plan**, which sets out a single framework for sustainable development within Wales marine area, including the safeguarding of established shipping routes (Welsh Government, 2019); and
- **UK Marine Policy Statement**, which aims to achieve sustainable development in the UK marine area (Defra, 2011).

### 25.3. Study Area

The proposed Project is located in the north-east Celtic Sea, with the landfall area potentially located in Milford Haven, currently identified as West Angle Bay, on the Pembrokeshire coast (Figure 25-1). The proposed Project in the marine environment comprises the turbines and the inter-array cables and the export cable and cable landfall area.

The shipping and navigation Study Area comprises a 10 NM buffer, centred on the Array Area and Offshore Cable Scoping Boundary. A broader Study Area of the Celtic Sea is also considered.

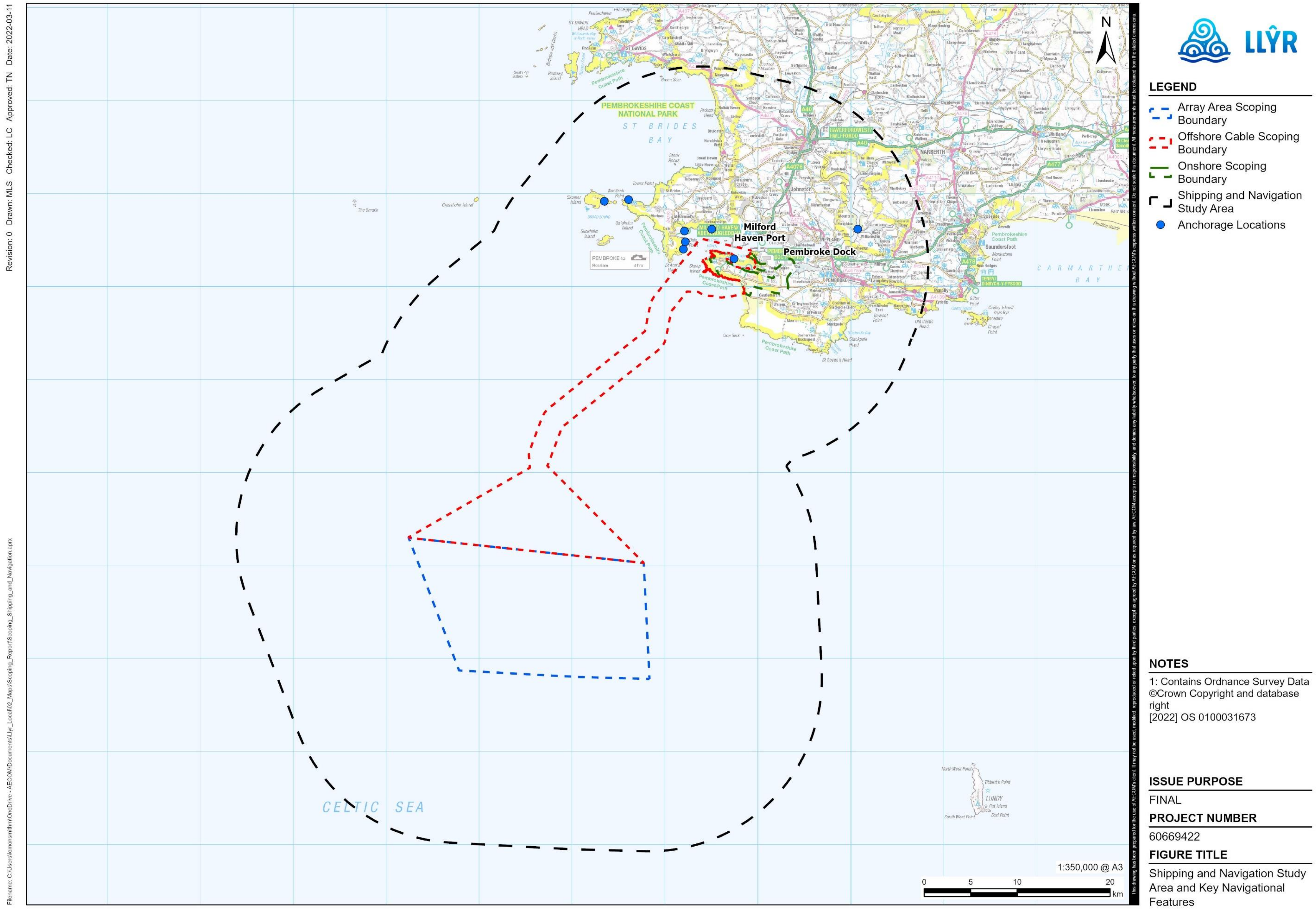


*Figure 25-1. Shipping and navigation Study Area and key navigational feature*

## 25.4. Baseline

### *25.4.1. Key Navigational Features*

As shown in Figure 25-1, Milford Haven Port and Pembroke Dockyard are located within the 10 NM Study Area, approximately 1.0 NM and 1.8 NM from the potential landfall in Angle Bay. Milford Haven Port limits are located approximately 2 km northeast of the Array Area Scoping Boundary. Milford Haven also has a marina which has a Royal Yachting Association (RYA) training centre (RYA, 2022). An additional RYA training centre is located in Gelliswick, to the east of Milford Haven Port, whilst Pembroke Dock has a RYA yacht club. Neyland Marina is also located within the Study Area, approximately 3.7 km from the Onshore Scoping Boundary, which houses Neyland Yacht Club with three RYA training centres.

Within the 10 NM Study Area there are two jetties opposite Angle Bay which supply the South Hook LNG terminal and the area of Gelliswick. The jetties serving Pembroke Refinery and Dragon LNG terminal are also within 50 m and 36 m of the Offshore Scoping Boundary, respectively. Much shipping traffic in the region will route to and from these locations and will intersect the Study Area. Stackpole Quay is also located within the Study Area.

In Milford Haven (starting at the waterway entrance), the 10 NM Study Area encompasses a large RYA General Boating Area, through which the export cable route will pass. This RYA General Boating Area covers the entire Milford Haven waterway, with exception of the southern portion of Angle Bay. There are also several General Boating Areas located along the Celtic Sea, the closest to the proposed Project being the inshore and offshore areas of Tenby and Caldey Island.

There is a Traffic Separation System located approximately 5 NM outside of the Study Area, known as “Off Smalls”. This is located within a north to south navigation route for vessels. For further information, see Section 25.4.2. There are no other routing measures in the vicinity of the proposed Project.

Within the 10 NM Study Area, there is a formal anchorage in Milford Haven, regularly used by oil and chemical tankers, as well as recreational vessels (MarineTraffic, 2022). Milford Haven Port also issues advice to vessels wanting to anchor in Milford Haven. There are several informal anchorage locations for recreational craft within the 10 NM Study Area (Navily, 2022). An informal anchorage is located in Angle Bay, which is within the Offshore Cable Scoping Boundary. There are also three informal anchorages located to the west of Milford Haven entrance. A further informal anchorage is located to the northwest of Angle Bay in Longoar Bay, 1.3 km from the Offshore Cable Scoping Boundary.

### *25.4.2. Shipping Activity*

An overview of the shipping activity in the vicinity of the proposed Project based on shipping density data for 2017 is shown in Figure 25-2. This shows that shipping activity is high throughout the 10 NM Study Area, but particularly concentrated transiting to and from Milford Haven, and in and out of the Celtic Sea via a shipping lane which crosses the Offshore Cable Scoping Boundary. Shipping activity is also concentrated in a principal navigation route transiting north to south, located to the west of the Study Area. This navigation route contains the “Off Smalls” TSS.

Figure 25-3 shows anonymised vessel tracks based on historic Automatic Identification System data for 2017 (ABPmer, 2020). On the approach to Milford Haven, corresponding to the inshore portion of the Offshore Cable Scoping Boundary, high levels of vessel activity are associated with a range of vessel types. However, high vessel activity primarily results from recreational vessels transiting in and out of the bays and marinas in Milford Haven from the Celtic Sea, , and the southwest coast of Wales (ABPmer, 2020). There is also dense activity of passenger vessels transiting between terminals in Milford Haven and southern Ireland, and tankers transiting between Pembroke Dock and the main shipping channels of the Celtic Sea . Milford Haven Port serves several oil companies (MHPA, 2022), explaining the high level of tanker activity. Fishing vessels transiting between Milford Haven and the Celtic Sea, and port service craft transiting between Milford Haven , also represent a high proportion of vessel activity within the Study Area.

Vessel activity is dense in the navigation routes transiting north to south across the Celtic Sea encompassing the Study Area. This is associated with a range of vessel types but predominantly cargo vessels and tankers.

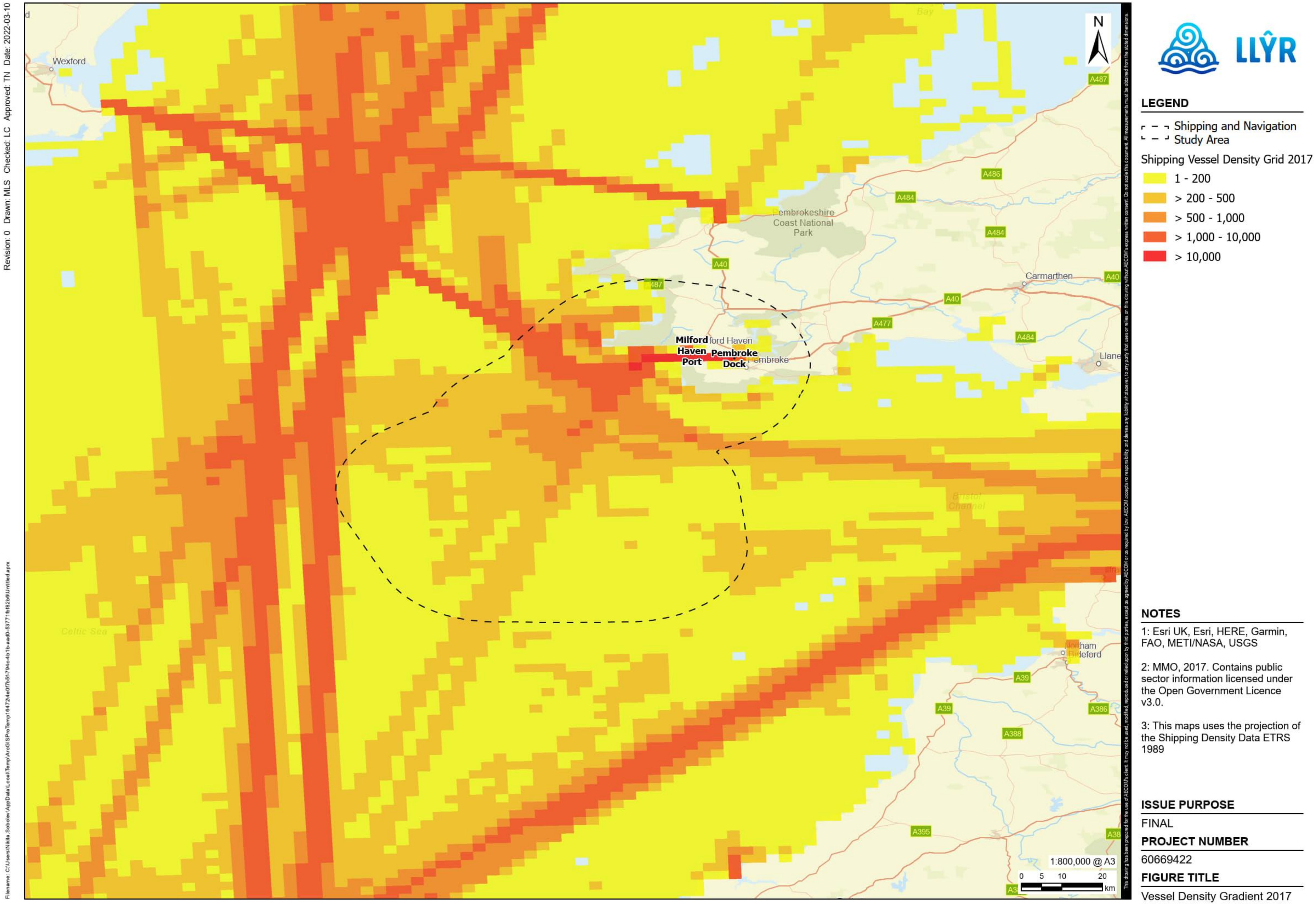


*Figure 25-2. Vessel density gradients 2017*

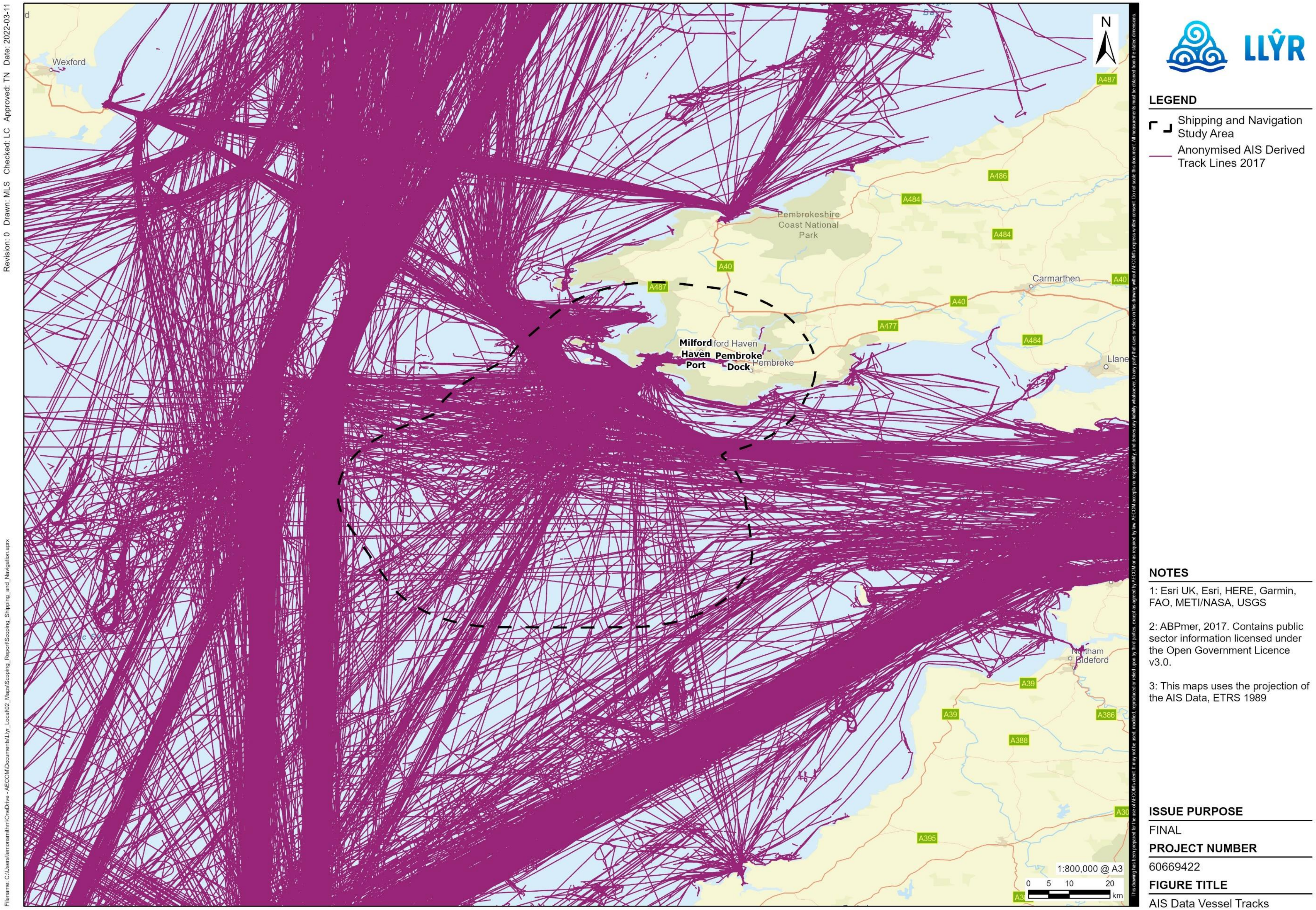


*Figure 25-3. AIS data vessel tracks*

## 25.5. Embedded and Good Practice Measures

Given that many design elements of the proposed Project have yet to be confirmed, the embedded and good practice measures have not been finalised at this stage. However, any measures will be discussed with statutory nature conservation bodies (SNCBs) and stakeholders throughout the EIA process. The below embedded and good practice measures will be considered as part of the EIA, in order to minimise potential for adverse effects, in accordance with the mitigation hierarchy and relevant planning policy:

- All Project vessels must comply with the International Regulations for Preventing Collisions at Sea (1972) (IMO, 2019a) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) (IMO, 2019e) with the aim of preventing and minimising pollution from ships. All vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan).

## 25.6. Likely Significant Effects

The potential impact pathways for all stages of the proposed Project, construction, operation (including maintenance and repair) and decommissioning on shipping and navigation, scoped into the EIA are outlined in Table 25-1.

*Table 25-1. Potential impacts to shipping and navigation due to the proposed Project*

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Visual intrusion and noise pollution caused by Project activities affecting commercial and recreational vessels | ✓ | | The construction of the proposed Project will result in visual and noise pollution. This has the potential to impact commercial and recreational vessels. |
| Construction | Impacts on vessel navigation routes | ✓ | | Although the Array Area Scoping Boundary does not sit in any principal navigation routes, the Offshore Cable Scoping Boundary passes through a principal navigational channel in which vessels transit in and out of Milford Haven. The construction of the proposed Project will temporarily cause the displacement of vessel using this channel, which could result in extended transiting times, particularly affecting fishing and other commercial vessels. Furthermore, the displacement of vessels could result in interaction between larger vessels and smaller vessels using the same route, which has the potential to result in safety concerns. |
| Construction | The impact of the proposed Project on navigational and communication equipment in small vessels | ✓ | | Project vessels during construction could interfere with equipment in smaller vessels, resulting in navigation and communication issues. Construction vessels and plant may also restrict the view of other marine users and marine emergency responses, resulting in poor communication. |
| Construction | Adverse weather conditions resulting in drifting recreational vessels | ✓ | | Storm events and other adverse weather resulting in poor sea and navigational conditions could result in the drifting of small recreational vessels into Project construction vessels resulting in damage to vessels and equipment. |
| Construction | Interference of Project vessels with commercial and recreational vessels | ✓ | | The increase of vessels due to the proposed Project could interfere with other vessels in the area, particularly those transiting in and out of Milford Haven during the construction phase. |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Displacement of anchorages | ✓ | | Anchorages could be displaced during construction of the proposed Project, for example during the export cable route clearance. This has potential to cause implications to the nearby shipping industries which may rely on nearby anchorages within Milford Haven for example. Many large commercial vessels use anchors whilst waiting to enter waterways, suggesting this could interfere with the transit of vessels in and out of Milford Haven. |
| Construction | Impacts to navigational safety | ✓ | | During the construction of the proposed Project, changes in water depth may occur, for example during clearance of the Study Area and potential sweeping of sandwaves. Changes in water depth have the potential to cause navigational issues, particularly for larger vessels. This is most likely to cause effect along the Offshore Cable Scoping Boundary into Milford Haven and could cause safety issues such as grounding or vessel damage.<br>Changes to navigation routes may also encourage smaller vessels to enter shipping routes, resulting in a reduction of space for manoeuvring.<br>This could also cause a considerable interruption to emergency response service vessels (Maritime and Coastguard Agency, 2021) such as the RNLI which has a base in Angle Bay, Milford Haven. |
| Construction | Collision risk with other marine users, passing vessels and Project devices and infrastructure | ✓ | | During construction, there will be an increased presence of Project vessels in the vicinity of the proposed Project. This has potential to cause increased collisions between Project vessels and other marine users such as commercial and recreational craft.<br>Furthermore, the proposed Project devices and infrastructure could also present a collision risk during construction, resulting in damage to both the Project and other marine vessels. |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| | | | | Construction activities may also encourage marine users to deviate from normal routes, leading to the presence of small recreational vessels in main shipping lanes and increased collisions. |
| Construction | Interaction with subsea cables | ✓ | | There is the potential for interaction between the subsea cables and fishing gear, which may become caught on cable infrastructure. The deployment of anchors by other marine users may also interact with the subsea cables. Although mitigation measures such as cable burial and rock placement will be implemented to avoid these interactions, there is potential for subsea cables to be exposed during proposed Project construction. |
| Operation | The impact of the Project on navigational and communication equipment in small vessels | ✓ | | The proposed Project infrastructure and any maintenance required during the operation of the Project has the potential to interfere with equipment in smaller vessels. Studies have found that windfarms can disrupt the detection of smaller vessels on navigation and communication systems if they are very close to the structure (Maritime and Coastguard Agency, 2021). |
| Operation | Adverse weather conditions resulting in drifting recreational vessels | ✓ | | Storm events and other adverse weather resulting in poor sea and navigational conditions could result in the drifting of small recreational vessels, potentially making contact with stationary Project infrastructure during proposed Project operation which could result in damage to both parties. |
| Operation | Interference of Project vessels with commercial and recreational vessels | ✓ | | Work and maintenance vessels could interfere with commercial and recreational craft during the operation of the proposed Project, particularly during any repairs along the Offshore Cable Scoping Boundary which lies in a busy navigation channel, and in the entrance to Milford Haven. |
| Operation | Displacement of anchorages | ✓ | | Anchorages may be displaced during any potential repairs to the export cable or landfall site during the operation of the proposed Project. |

| Project phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Operation | Impacts to navigational safety | ✓ | | Additional rock placement may be required for Project repairs during the operation of the proposed Project, which would result in a depth change. This has the potential to cause long-term navigational issues for the duration of the Project and could cause safety issues such as grounding or vessel damage. This could also encourage deviation from normal routes for some vessels, resulting in the clogging of shipping lanes.<br>Furthermore, changes in water depth may implicate emergency service responses, such as the RNLI based in Angle Bay. |
| Operation | Collision risk with other marine users, passing vessels and Project devices and infrastructure | ✓ | | Given the high density of vessels using navigation channels in the vicinity of the proposed Project, there is an increased likelihood of collision with maintenance and service vessels during the operation of the Project. This is thought to be particularly likely in the entrance to Milford Haven due to use by both commercial and recreational craft, and in some instances inexperienced marine users.<br>Furthermore, the proposed Project infrastructure also presents a collision risk during its operational lifetime, which could result in damage to both the Project and other marine vessels. |
| Operation | Interaction with subsea cables | ✓ | | During the operation of the proposed Project, subsea cables may be exposed during maintenance/repairs or bad weather conditions. This presents a risk of entanglement of fishing gear and anchors on the cable. |
| Decommissioning | Potential effects the same as route preparation and cable installation | ✓ | | Impact pathways as above for construction, operation, and maintenance phases. |

## 25.7. Assessment Methodology

A Navigational Risk Assessment (NRA) including a Marine Traffic Survey (MTS) and Formal Safety Assessment (FSA) will be undertaken to understand and address the effects. The NRA will form the shipping and navigation assessment chapter within the Environmental Impact Assessment.

The assessment methodology for shipping and navigation will be aligned to the following best practice guidance documents:

- International Maritime Organisation (IMO) Guidelines for Formal Safety Assessment (FSA) - MSC-MEPC.2/Circ.12/Rev.2 (9 April 2018); and
- MGN 543 (M+F) Offshore Renewable Energy Installations Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MCA, 2016).

The MTS will identify navigational features and patterns of vessel activity in the vicinity of the proposed Project to provide a detailed understanding of shipping activity. This will be achieved using publicly available data to establish baseline conditions which will inform the subsequent FSA. Stakeholder consultations shall also inform the baseline understanding of shipping in the area. Subsequent risk assessments will identify and log hazardous outcomes, such as collision, snagging and disruption to shipping against risk characterisation, mitigation measures, and ultimately, acceptability.

The FSA process provides a systematic method for evaluating and controlling risk, within a structured framework. Baseline shipping patterns and navigational features along with stakeholder consultations provide the basis for establishing potential hazards, or impacts. These impacts are then characterised in their magnitude and likelihood, which ultimately provides for risk categorisation against a risk matrix.

Additional control or mitigation measures are also identified to provide a reduction in risk. The residual effects are then assessed, which determine risk acceptability in accordance with the principles of ALARP (As Low As Reasonably Practicable). Where necessary or appropriate, mitigation measures are assessed to determine/justify an ALARP position.

An MTS will also be undertaken as part of the NRA which involves the assessment of detailed AIS data around the proposed Project location. This will be used to assess the density and intensity of shipping activity in the vicinity of the proposed Project. Due to the likely under representation of small fishing and recreational vessels in the AIS data, additional data sources including VMS data, the RYA Coastal Atlas, and consultation will be used to validate the findings of the AIS analysis.

Key data sources used for the assessment will include, but not be limited to:

- Historic AIS data;
- Fishing vessel traffic data – VMS and AIS;
- The Royal Yachting Association (RYA) UK Coastal Atlas of Recreational Boating; and
- Relevant studies from nearby developments.

Consultation will include stakeholders from MCA, Trinity House, the RYA, Commercial Fisheries representatives and relevant port and harbour authorities, including Milford Haven Port Authority.

## 25.8. Conclusion

In summary:

- Several principally important navigation routes occur within proximity to the proposed Project including into Milford Haven;

- The Offshore Cable Scoping Boundary will pass directly through the main navigation route into Milford Haven;
- The construction of the proposed Project may interfere with commercial shipping practices and will cross a General Boating Area in Milford Haven;
- A NRA will be assessed with MTS and FSA to address the impacts to shipping and navigation in the Study Area; and

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## 26. COMMERCIAL FISHERIES

### 26.1. Introduction

This chapter of the scoping report provides a high-level overview of relevant commercial fisheries baseline information as well as a summary of the potential impact pathways between the proposed Project and commercial fisheries receptors. The embedded good practice measures, and the assessment methodology that will be used for the impact assessment are also highlighted.

Alongside this chapter, a wider overview of potential impacts associated with fish and shellfish ecology is presented in Chapter 21: Fish and Shellfish Ecology.

### 26.2. Regulatory and Planning Policy Context

For information regarding the legislative context of the proposed Project see Volume 1, Chapter 2: Regulatory and Planning Policy Context. This section outlines legislation, policy, and guidance relevant to the assessment of the potential effects on the commercial fisheries receptors associated with the installation, operation and decommissioning phases of the proposed Project. Several policies and legislative instruments require decision makers to consider the environmental impacts of a project. Those which provide relevant legislative instruments for commercial fisheries are outlined below.

Whilst part of the European Union (EU), fisheries within UK waters were managed as part of the EU Common Fisheries Policy (CFP). Following the UK's exit from the EU and the end of the associated transitional arrangement period on the 1st January 2021, the UK Single Issuing Authority (UKSIA) (as part of the MMO) manages fishing vessel licencing for foreign vessel access to UK waters within the British Fishery Limits on behalf of the UK sea fish licensing authorities of England,Scotland, Wales, and Northern Ireland. The UK fisheries authorities remain responsible for the administration and management of UK vessel licensing within the UK Exclusive Economic Zone (EEZ) (UK Government, 2021).

Within Welsh territorial waters (within 12 NM), fisheries management is the responsibility of the Welsh government. The Welsh National Marine Plan sets out a single framework for sustainable development within the Wales marine area, including: *Plan policies safeguarding a resilient marine ecosystem (including important areas for feeding, breeding and migration) contribute to sustainable commercial fishing, supporting UK Marine Strategy requirements for healthy, productive and sustainable fish stocks* (Welsh Government, 2019). Policies within the Welsh National Marine Plan relevant for (but not limited to) the assessment of impacts on commercial fisheries include:

- FIS_01 a: Proposals that support and enhance sustainable fishing activities will be supported where they contribute to the objectives of this plan. Proposals should comply with the relevant general policies and sector safeguarding policies of this plan and any other relevant considerations.
- FIS_01 b: Relevant public authorities and the sector are encouraged, in liaison with other interested parties, to collaborate to understand opportunities to develop a strategic evidence base to improve understanding of opportunities for the sustainable development of fisheries in order to support the sustainable development of the fisheries sector through marine planning.

### 26.3. Study Area

The proposed Project is located within the International Council for the Exploration of the Sea (ICES) Division VIIg and VIIf (Celtic Sea). Fisheries data are recorded and collated by statistical rectangles within each ICES Division. The commercial fisheries Study Area has therefore been defined with reference to the ICES rectangles within which the proposed Project is located (see Figure 26-1). This includes ICES rectangles 31E4, 32E4, 31E5, 32E5.

The commercial fisheries Study Area defined above has been used to identify fisheries active in areas relevant to the proposed Project. Where relevant, however, data and information has been analysed for wider areas to provide context and describe the wider extent of relevant fisheries activity.

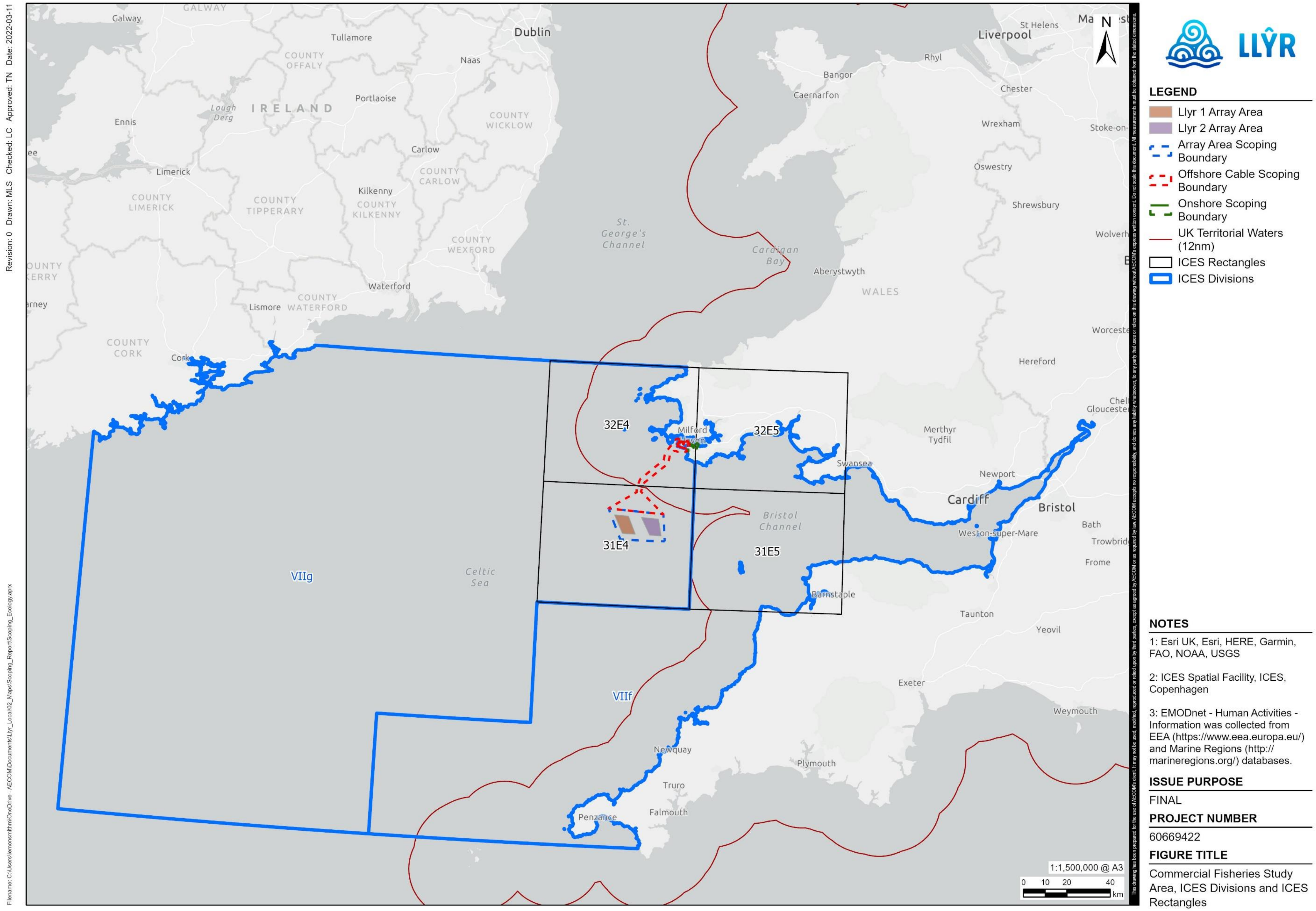


*Figure 26-1. ICES divisions and ICES rectangles*

## 26.4. Baseline

The proposed Project is located within the North-east Celtic sea . Commercial fishing is widely distributed in this body of water, and it is fished by both UK and European Union fishing vessels. The nearshore section of the Offshore Cable Scoping Boundary and proposed landfall sites are located within Milford Haven, Pembrokeshire. This inshore area is known to be important for potting by a local inshore fleet.

To determine the baseline conditions within the Study Area, commercial fisheries data provided by the MMO has been analysed. This includes: 'vessel lists 10 metres and under' (MMO, 2022a); 'vessel lists over 10 metres' (MMO, 2022b); '2021 UK and foreign vessels landings by UK port and UK vessel landings abroad: provisional data' (MMO, 2021a); and 'UK sea fisheries annual statistics report 2020' (MMO, 2021b).

Milford Haven is the closest fishing port to the Study Area and is Wales' largest fishing port. There is no other major fishing port in South Wales. Forty-one vessels under 10 m, and thirteen vessels over 10 m are currently registered to Milford Haven. Average yearly landings at Milford Haven total 686,239 tonnes at a value £1,026,295,194.

UK vessels fishing in ICES rectangles 31E4, 31E5, 32E4 and 32E5 landed an annual average weight of 3,387 tonnes, and annual average value of £6,611,203 between 2016 and 2020. The highest total value of landings during this period was obtained from ICES rectangle 32E4 (£12,331,830), closely followed by 31E5 (£11,420,518); ICES rectangle 31E4 (£1,728,641) provided the lowest total value of landings (Figure 26-2). The highest total landed weight between 2016 and 2020 was obtained from ICES rectangle 31E5 (6,460 tonnes), closely followed by 32E4 (5,520 tonnes); ICES rectangle 31E4 (625 tonnes) provided the lowest total landed weight (Figure 26-3). This indicates that ICES rectangles 31E5 and 32E4 are most important for fishing. Furthermore, more valuable target species appear to be caught in ICES rectangle 32E4.

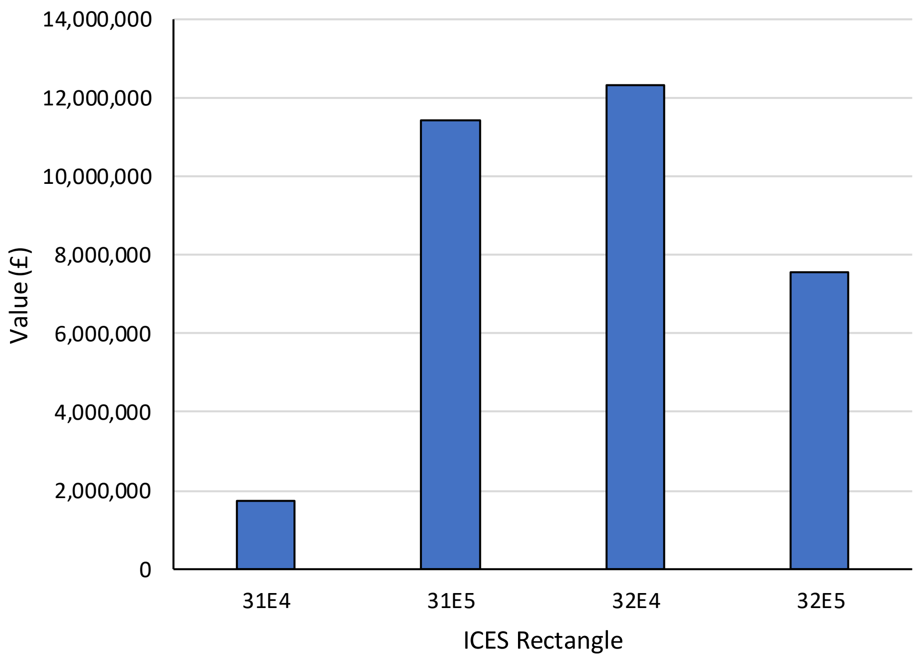


*Figure 26-2. Total landed value of catch (£) by ICES rectangle (2016 – 2020) (MMO, 2021b)*

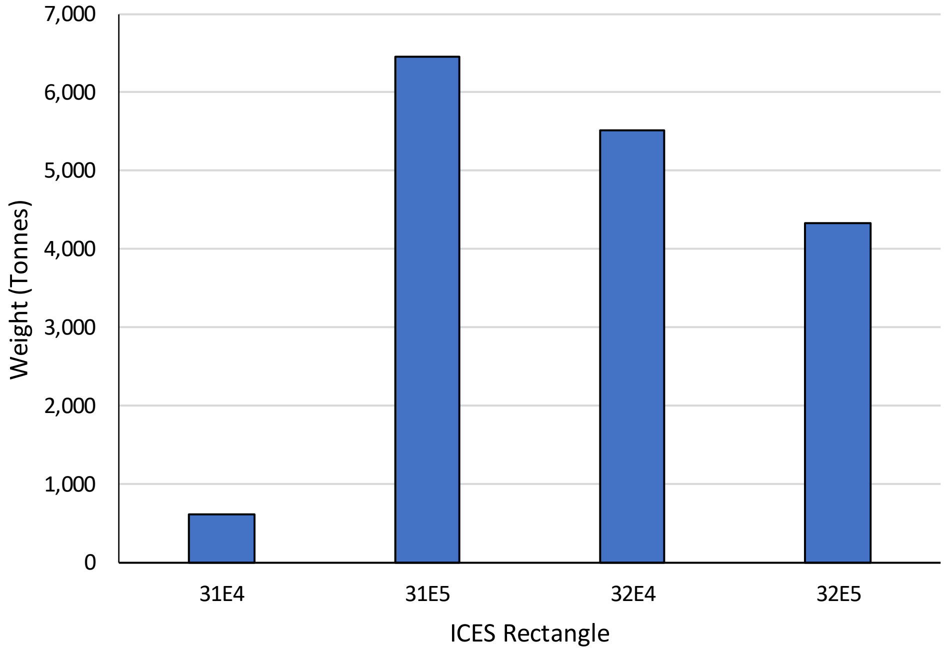


*Figure 26-3. Total landed weight of catch (Tonnes) by ICES rectangle (2016 - 2020) (MMO, 2021b)*

Across all four ICES rectangles, species caught via pots and traps dominated the total landed value of catch. Whelks represented the highest proportion of the total landings value across all ICES rectangles (39.4 %), followed by lobsters (23.1 %) and edible crab (13.2 %). The species with the highest total landed value varied by ICES rectangle with edible crab representing the highest proportion in ICES rectangle 31E4, lobsters in ICES rectangle 32E4, and whelk in ICES rectangles 31E5 and 32E5. Demersal species such as sole, bass, skates and rays, dogfish, and smoothhound also made-up significant portions of the total landed value, particularly in ICES rectangles 31E4, 31E5, and 32E5.

A *Nephrops* fishery is thought to occur within the Study Area, the catch of this taxa representing 0.7% of the total landed value across all four ICES rectangles and the eleventh highest landings value overall. *Nephrops* made up a large proportion of the total landed value from ICES rectangle 31E4 and in ICES rectangle 32E5, but values were not reported for this taxon in ICES rectangle 31E5. Similarly, scallops represented the tenth highest landings value for all four ICES rectangles (0.7 %). Scallops are a key target species within ICES rectangles 31E4 and 31E5, which indicates that grounds for these species may be present within the Study Area.

Pots and traps were the most used gear type across all ICES rectangles, consisting of 75.8 % of the total landed value from 2016 to 2020. Otter trawls were the next most used gear type, particularly in ICES rectangles 31E4 and 31E5 where beam trawls were also indicated to be of importance. Drift and fixed nets were reported to have higher landed values in ICES rectangles 32E4 and 32E5, as were gears using hook in ICES rectangle 32E5.

Marginally higher total landed values were reported for fishing vessels under ten meters in length (54 %) than vessels over ten meters in length (46 %). Excluding UK vessels, the greatest total landed value and weight came from vessels registered in France, Ireland, Belgium, Norway, Spain, and Denmark.

## 26.5. Embedded and Good Practice Measures

Given that many design elements of the proposed Project have yet to be confirmed, the embedded and good practice measures have not been finalised at this stage. However, any measures will need to be discussed with statutory consultees and stakeholders throughout the EIA process.

## 26.6. Likely Significant Effects

Potential impact pathways to commercial fisheries are present during the construction, operation (including maintenance and repair) and decommissioning phases of the proposed Project. These are summarised below in Table 26-1.

*Table 26-1. Scoping matrix of potential impact pathways in relation to commercial fisheries during construction, operation and decommissioning of the proposed Project*

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction | Loss or restricted access to commercial fishing grounds | ✓ | | Works associated with the construction of the proposed Project will require a series of marine vessels transiting and operating within the North-east Celtic sea, and Milford Haven. These have the potential to result in the temporary loss of, or restricted access to, commercial fishing grounds.<br>The timing of the construction activities, when the vessels will be present, and the length of time that they are present will determine the impact on commercial fisheries. If the construction activities coincide with key fisheries seasons (which varies by species), this has the potential to result in the restriction or loss of access to key fisheries grounds.<br>Further, static fishing gear such as pots and traps may cause obstruction to construction activities. Temporary removal, lifting, or replacement may be required at limited and specific locations.<br>Any Project interaction with known *Nephrops* grounds, scallop dredging areas or lobster/crab potting grounds will be specifically considered. |
| Operation | Loss or restricted access to commercial fishing grounds | ✓ | | The installation of rock armouring / concrete mattressing along the Offshore Cable Scoping Boundary may present an obstruction on the seabed which could result in the loss of commercial fishing grounds during the operational phase of the proposed Project.<br>Obstructions on the seafloor may prevent or limit certain types of fishing gear due to the potential for snagging of the equipment. This will predominantly impact mobile demersal fishing gears, such as trawls and drift nets.<br>In addition, static fishing gear such as pots and traps may cause obstruction to maintenance activities. Temporary removal, lifting, or replacement may be required at limited and specific locations. |

| Project Phase | Potential impact pathway | Further assessment required in EIA | | Rationale |
|---|---|---|---|---|
| | | Scoped In | Scoped Out | |
| Construction / operation | Displacement of commercial fishing activities | ✓ | | Any loss or restricted access to commercial fishing grounds could result in increased competition if these vessels are displaced to alternative grounds and fisheries resources. |
| Construction / operation | Obstruction of navigation / steaming routes to commercial fishing grounds | ✓ | | The presence of marine vessels and associated exclusions or safety zones could result in the temporary increase in steaming distances and times for commercial fishing vessels to avoid these. This could lead to increased operational costs of the fishing vessels.<br>Further consideration of Navigational Risk is provided within Chapter 25: Shipping and Navigation. |
| Construction / operation | Indirect effects on commercial fisheries | ✓ | | There is potential for any works associated with the proposed Project to indirectly impact commercial fisheries as a result of impacts on the behaviour and distribution of fish.<br>For example, changes in the underwater soundscape during the construction phase may result in behavioural responses in individuals of fish and shellfish which are of commercial importance and are fished in the vicinity of the proposed Project.<br>For the purpose of this assessment, any impact pathways on the receptor fish and shellfish are also considered to be the same for the receptor commercial fisheries. Further consideration of fish and shellfish is provided in Chapter 21: Fish and Shellfish. |
| Construction / operation | Potential for small scale employment of local boat(s) | | ✓ | Vessels hired to provide guard vessel services will have to meet certain standards. The final decision will be made by the installation contractor, but is not considered to have a significant impact on commercial fisheries. |
| Decommissioning | Potential effects the same cable installation | ✓ | | Potential effects the same as array and cable installation |

Navigation risk and safety issues associated with the interaction between the proposed Project and the operation of fishing vessels including any potential for interference with magnetic compass used by fishing vessels for has been considered under Chapter 25: Shipping and Navigation.

## 26.7. Assessment Methodology

The assessment methodology for commercial fisheries will follow the standard methodology outlined in Volume 1, Chapter 5: EIA Approach and Methodologies. The identification and assessment of effects and mitigation are based on expert judgment and following relevant available guidance (Section 5.1.2).

The potential magnitude of environmental feature sensitivity and potential effects will be assessed using similar terminology outlined in Volume 1, Chapter 5, and tailored with specific reference to aspects of relevance to commercial fishing, as set out below:

- Magnitude:
  - Area affected: Extent of area affected in the context of available grounds and level of fishing activity that the area affected sustains;
  - Duration and frequency: Time and frequency of the effect; and
  - Liaison and management: Range of fisheries liaison and management measures that are implemented.
- Sensitivity:
  - Operational range: Extent of the area over which vessels normally operate relevant to the Study Area;
  - Operational versatility: Ability to deploy different fishing methods/target different species
  - Adaptability: Ability of vessels to adapt to the potential impact. Degree to which fishing vessels can avoid or adapt to changing circumstances, including their capacity to accommodate change; and
  - Importance: The economic value of the fishery at local, national, and international level.

This chapter of the Scoping Report has identified potential impact pathways to commercial fisheries during the construction, operation and decommissioning phases. The determination of significance will be based on expert judgement, considering the factors listed above and guided by the standard impact assessment matrix presented in Volume 1, Chapter 5.

At this stage, the Zone of Influence (ZoI) for commercial fisheries is anticipated to include areas of fishing grounds which the proposed Project is located within and / or passes through. It is these areas which may be directly affected by the Project's construction, operation and decommissioning. The ZoI will also include the commercial fisheries fleet segments (defined by vessel size and gear type, incorporating target species), whose fishing activities may either be directly affected by Project activity or indirectly through potential disruption to steaming routes.

Impacts arising from potential indirect effects e.g., through sedimentation or effects on fish or shellfish as ecological receptors, will be primarily documented in the relevant receptor chapters of the EIA. Any residual effects once mitigation measures have been applied will then, if necessary, be considered for their secondary impact on commercial fishing activity.

### *26.7.1. Data Sources*

To complete a baseline study and inform the impact assessment, further research will be required. As part of a detailed desk-based fisheries assessment, published data and reports will be used to generate an understanding of key fishing grounds, seasonality, fishing effort, and the most prevalent gear types used, relative to the Study Area, and the proposed Project's potential interactions with them. Key data sources will include, but are not be limited to:

- Project-specific survey data (where applicable);
- ICES fisheries survey data (2021 (important species, gear type, spawning and nursery areas, species distribution)) – source: CEFAS, 2021;
- Environmental Impact Assessment Scoping Report - Blue Gem Wind Project – Project Valorous (2021) – source: Marine Space;
- Environmental Impact Assessment Scoping Report – Project Erebus (2019) – source: Marine Space and Environmental Statement (Blue Gem Wind, 2021);
- Fisheries Research & Management Plans – source Devon and Severn Inshore Fisheries and Conservation Authority (D&SIFCA), 2021;
- Greenlink marine environmental statement – Wales (2019) – source: Intertek;
- Non-UK landings by ICES Rectangles (2018) – source: European Commission, Scientific, Technical and Economic Committee for Fisheries (STECF);
- UK Annual fisheries Statistics (2021) – source: MMO;
- UK Fishing Vessel Lists (2022) – source: MMO; UKSIA;
- UK and foreign vessels landings by UK port and UK vessel landings abroad (2021) – source: MMO;
- Vessel Density Grid (2017) – source MMO Vessel Monitoring System data (2021);
- Welsh fisheries commercial fisheries data – source: Wales Marine Planning Portal (2021); and
- Other publicly available reports and information received from consultations.

### *26.7.2. Consultation*

During the EIA process, an appropriate level of engagement with fisheries stakeholders at national, regional, and (if possible) targeted local level, will be undertaken to obtain an understanding of the characteristics of fishing activity and the proposed Project's potential interactions with them. Consultee stakeholders, fisheries organisations, and representatives include, but are not limited to:

- Cornish Fish Producers Association (CFPO);
- Devon and Severn Inshore Fisheries Association (D&SIFCA);
- Interfish Ltd;
- National Federation of Fisherman's Organisations (NFFO);
- Natural Resources Wales (NRW);
- North Devon Fishermans Association (NDFA);
- Representative bodies of non-UK fleets;
- South East Ireland Fish Producers Organisation (SEIFPO);
- South West Ireland Fish Producers Organisation (SWIFPO);
- South West Fish Producers Organisation (SWFPO);
- South & West Wales Fishing Communities (SWWFC);
- The Association of Inshore Fisheries and Conservation Authorities (IFCA);
- The Marine Management Organisation (MMO);
- Welsh Fishermans Association - Cymdeithas Pysgotwyr Cymru (WFA-CPC);
- Welsh Government Fisheries Officer, Milford Haven;
- Welsh Marine Fisheries Advisory Group (WMFAG);
- Western Fish Producers Organisation (WFPO); and
- West Wales Shellfishermans Association (WWSFA).

Project-specific commercial fisheries surveys will not be completed for the proposed Project. However, where ad-hoc data that can inform commercial fisheries assessment are collected during the benthic sampling survey this will be incorporated into the baseline assessment.

## 26.8. Conclusion

In summary:

- The waters off the Pembrokeshire coast of the UK support valuable mixed fisheries. Inshore shellfisheries are of key importance. These fisheries support local communities providing a valuable socio-economic function;
- The cable landfall and part of the cable route will likely interact with the inshore and intertidal fisheries;
- The baseline assessment will include a more detailed review of commercial fisheries within the ZoI of the proposed Project;
- A detailed assessment based on the potential impacts identified above will be carried out, forming part of the basis of the ensuing EIA; and
- The proposed Project, through the proposed scope of the EIA will seek to work with the fishing community to manage potential interactions during installation and to ensure that, once installed, the proposed Project will operate safely and un-intrusively alongside the commercial fisheries activities within the area.

## 26.9. References


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# 27. OTHER SEA USERS

## 27.1. Introduction

This chapter of the scoping report identifies the potential interactions between the proposed Project and other sea users of relevance. It also sets out the approach to the assessment of potential effects resulting from the activities of the proposed Project on these receptors, including offshore infrastructure, tourism and recreational users.

Alongside this wider consideration of other sea users, topic specific assessments are included within this scoping report. This chapter should therefore be read in conjunction with Chapter 25 (Shipping and Navigation) and Chapter 26 (Commercial Fisheries); potential cumulative and in-combination effects arising from the proposed Project are considered within Volume 4, Chapter 30 (Cumulative and In-Combination Effects). Where appropriate, this chapter cross refers to these topic-specific assessments.

## 27.2. Study Area

For the purpose of this scoping report and baseline characterisation, an initial buffer zone of 50 km has been adopted (Figure 27-1). This Study Area has been used to support the identification of other users of the sea who may be directly or indirectly affected by the proposed Project.

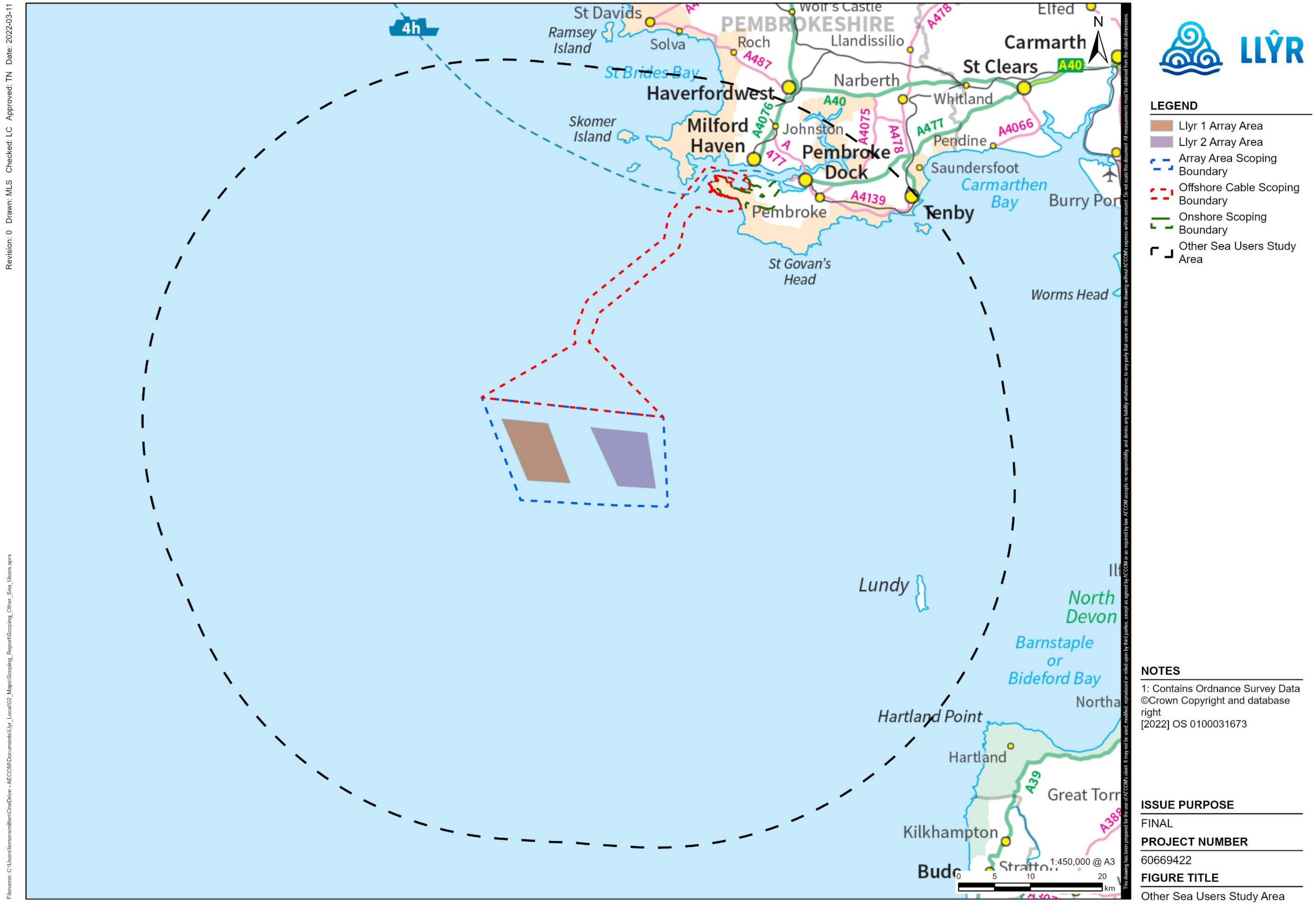


*Figure 27-1. Proposed Project and other sea users Study Area*

## 27.3. Baseline

This section has been informed by a desk-based review of a series of established data sources. These include:

- MMO Interactive Map (MMO, 2020);
- Lle Geo-Portal and the Wales Marine Planning Portal;
- GIS data from The Crown Estate;
- Environmental Report for Greenlink Interconnector (Intertek, 2019);
- Project Erebus EIA Scoping Report (MarineSpace, 2019) and Environmental Statement (Blue Gem Wind, 2021);
- KIS-ORCA; and
- EMODnet.

Figure 27-2 identifies the coastal and marine infrastructure and other user activity in the Study Area as described further below.

### *27.3.1. Military Activity*

The offshore array is located outside of the MoD Castlemartin Practice Areas – see Figure 27-2. Although the route is not yet finalised, the marine export cable may potentially pass through the MoD Castlemartin Danger Area, depending on the identified landfall location. Information from the MoD suggests that for most of the year, only the smaller (nearest to shore) firing templates are used. However, for around two weeks of the year the larger templates are used with the potential of debris up to the boundary of the Danger Area.

However, if the final export cable route does pass through this area it will be necessary to liaise with the MoD on the specific route and level of protection afforded to the cable to ensure no damage arises during firing exercises and other military activities. In addition to routine firing operations at Castlemartin Range, radar, communication and surveillance operations also occur here, as well as occasional Royal Navy operations, including lowflying exercises at times. Consultation with the MoD will be undertaken and this will continue throughout the EIA process.

### *27.3.2. Unexploded Ordnance (UXO)*

There are currently limited data available on the amount, type and distribution of UXO in the Study Area. However, due to the proximity of the inshore part of the Study Area to Castlemartin Range, the potential for UXO is judged to be high. As part of EIA characterisation surveys, magnetometer data will be collected that will be assessed for potential UXO issues.

### *27.3.3. Marine Disposal Sites*

There are several marine disposal sites in this region. Details of these are provided below:

- Milford Haven Three (LU169): OPEN: located 24 km to the north of the Array Area Scoping Boundary;
- Milford Haven Industrial (LU040): CLOSED: intersects with the Array Area Scoping Boundary (Llŷr 1);
- Milford Haven Two (LU168): OPEN: located approximately 17 km to the east of the Array Area Scoping Boundary. Milford Haven Port Authority (MHPA) has predicted that, between 2018 and 2026, 480,000m$^3$ of material will be disposed at LU169, with 88,000 m$^3$ of coarse sand deposited at LU168;
- Milford Haven (LU170): CLOSED: located approximately 32 km to the northwest of the Array Area Scoping Boundary;
- St Anne’s Head (LU180): CLOSED: located approximately 33 km to the northwest of the Array Area Scoping Boundary; and

- Closed ammunitions disposal site (which may contain UXO) that stretches along the Pembrokeshire coast.

### *27.3.4. Ports and Harbours*

A number of ports and harbours exist within the Study Area. Milford Haven is located approximately 2 km from the Array Area Scoping Boundary and is the fifth largest port in the UK. The Milford Haven Port Authority (MHPA) provides port and associated services, as well as the navigational needs of the three major oil refineries in the Haven. Milford Haven Waterway also contains a passenger ferry service. Annually, the Milford Haven ferry terminal handles more than 320,000 passengers for Irish Ferries and can accommodate Ro-Ro and ferry vessels of up to 185 metres in length, with a draft of up to 6.5 metres (MHPA, 2022). A twice daily ferry service runs from Pembroke Dock Ferry Terminal to Rosslare, Southern Ireland.

### *27.3.5. Subsea Cables*

There are several submarine cables of relevance to the proposed Project within the Study Area, these are presented in Table 27-1.

*Table 27-1. Subsea cables in the Study Area*

| Cable Name (Asset Owner) | Status | Distance from Study Area (km) |
|---|---|---|
| Solas (Vodaphone) | Active | Crosses Offshore Cable Scoping Boundary ~6 km north of Array Area Scoping Boundary |
| Atlantic North (VSNL Telecoms) | Active | Within the Array Scoping Boundary approx. 500 m north of Llŷr 2 |
| UK-Ireland Crossing 2 (Level 3 Ltd) | Active | Crosses Scoping Boundary ~1 km south-west of Llŷr 1 |
| PTAT (Vodaphone) | Unknown | Crosses Scoping Boundary ~1 km south of Array Area Scoping Boundary |
| Tata Western Europe UK – Portugal (Tata Telecoms) | Active | Approx. 2 km south of Array Areas |
| Greenlink Interconnector (GIL) | In Planning | Crosses Offshore Cable Scoping Boundary |

### *27.3.6. Oil and Gas Extraction*

There are no existing or proposed oil and gas extraction licences or infrastructure in proximity to the proposed Project, including the Offshore Cable Scoping Boundary. There is also no gas storage or carbon capture storage infrastructure located in the vicinity of the proposed Project. No oil and gas blocks in recent licensing rounds have been offered or awarded in proximity to the Array Area and Offshore Cable Scoping Boundary. There is one abandoned oil and gas wellhead within the Llyr 1 Array Area (discussed in Volume 1, section 3.4).

### 27.3.7. Aggregate Extraction

There are no existing licensed, application or aggregate option areas in proximity to the proposed Project. The closest aggregate area is located approximately 44 km east of the site, in the Bristol Channel. Within the region of the proposed Project there are areas of potential future aggregate resource previous identified by the Crown Estate (The Crown Estate, 2019).

### 27.3.8. Other Renewable Energy

Project Erebus is a 96 MW FLOW development located approximately 1.7 km west of the Study Area. This site is not consented or operational at the time of writing. Application for consent was submitted in late 2021.

Project Valorous is a 300 MW FLOW development located approximately 3 km south west of the Study Area. This site is not consented or operational at the time of writing.

The South Pembrokeshire Demonstration Zone (PDZ) is located adjacent to the east of the proposed Project. This site is not consented or operational at the time of writing. The site is eventually intended to provide a multiple point offshore substation / control building with a single onshore connection to the Pembroke Grid Supply Point, supporting demonstration / pre commercial floating offshore wind and marine development projects. Within the scoping report for the PDZ project, Freshwater West has been identified as a possible export cable landing location.

The Marine Energy Test Area (META) is located to the north of the Array Area Scoping Boundary. The META project consists of eight test sites where marine energy testing activities will be permitted. Five of the sites are defined as Phase 1 sites and are located within the Milford Haven waterway. Of the three remaining Phase 2 sites, one (East Pickard Bay) is located close to one of the potential landfall options for the proposed Project, off Freshwater West. This is the location where the proposed mWave device is being developed by Bombora Wave Power Ltd.

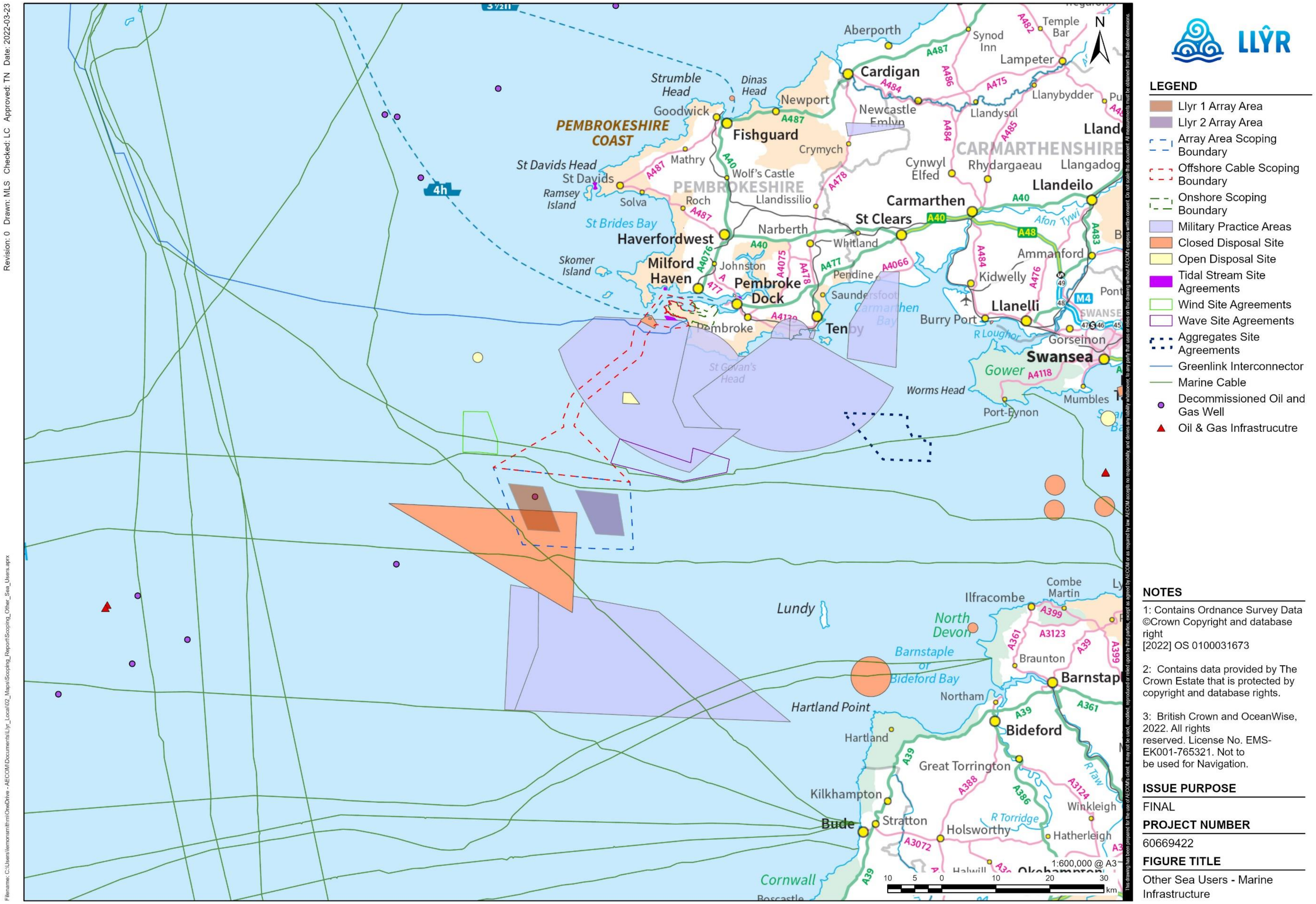


*Figure 27-2. Proposed projects and other sea users*

## 27.4. Embedded and Good Practice Measures

At this early stage in the EIA process, it is not possible to identify all of the individual mitigation measures which will be adopted; as the design – and Environmental Impact Assessment process progresses, embedded mitigation will evolve, as informed by the output from a range of technical and environmental studies. A preliminary list of embedded mitigation measures which have been identified thus-far include:

- The evolution of the route has been informed by consideration of a number of different marine features; where possible, interaction with features such as spoil grounds, extraction areas, harbour limits and military training areas have been minimised where possible.
- Timely and efficient communication will be given to sea users in the area via Notices to Mariners, Kingfisher Bulletins, Navigational Telex (NAVTEX), and NAVAREA warnings;
- A 500 m safety distances around installation vessels will be adopted. Guard vessels will be employed during installation; and
- Relevant stakeholders, owners and operators with existing or proposed infrastructure that may interact with the proposed Project will be consulted. Crossing Agreements will be agreed with cable owners. The Crossing Agreement describes the rights and responsibilities of the parties and also the design of the crossing. Crossing design will be in line with industry standards, using procedures and techniques agreed with the cable owners.

## 27.5. Likely Significant Effects

The potential impact pathways to other sea users present during the construction, operation (including maintenance and repair) and decommissioning phases of the proposed Project are summarised below in Table 27-2. A full, detailed assessment of impact pathways and receptors scoped in will be considered in the EIA.

*Table 27-2. Potential impact pathways in relation to other sea users during construction, operation and decommissioning of the proposed Project*

| Project Phase | Potential Impact Pathway | Scoped In | Scoped Out | Rationale |
|---|---|---|---|---|
| Construction<br>Operation<br>Decommissioning | Disruption to existing MoD and Royal Navy activity in and around the Castlemartin range and surrounding sea area | ✓ | | The exact scope for construction activity and, subsequently, fully operational WTGs to interfere with MoD operations (including radars, communications and surveillance systems) is currently unknown and will require further assessment within the EIA. |
| Construction<br>Decommissioning | Interaction with UXO has the potential to cause risk to life and damage to ecological receptors | ✓ | | Due to the proximity of military activity there is potential for encountering UXO and as such, assessment will be required within the EIA. |
| Construction<br>Operation<br>Decommissioning | Risk of construction works / vessels creating direct impacts (disturbance of spoil material) on known marine disposal sites | | ✓ | The nearest disposal site is Milford Haven Industrial (LU040), which intersects with the Array Area Scoping Boundary (Llŷr 1). As the status of the site is closed, no direct impacts (disturbance of spoil material) are predicted. The next nearest disposal site is located approximately 17 km to the east of the Array Area Scoping Boundary (Milford Haven Two (LU168)). As no Project infrastructure will be located in this disposal site, no direct impacts are predicted. |
| Construction<br>Operation<br>Decommissioning | Disruption to routine port operations via Project related activities. | ✓ | | The exact scope of interference on existing port operations (including vessel movements; maintenance dredging) is not clear and will require further assessment within the EIA. |
| Construction<br>Operation<br>Decommissioning | Damage to existing cables | ✓ | | Depending on export cable routing there is potential for interaction with the Greenlink interconnector cable. |
| Construction<br>Operation<br>Decommissioning | Potential impact on licensed marine aggregate activities | | ✓ | No licensed marine aggregate activities occur within the Study Area so there is no scope for impacts |
| Construction<br>Operation<br>Decommissioning | Potential impact on licensed oil and gas exploration activities | | ✓ | No licensed oil and gas exploration activities occur within the Study Area so there is no scope for impacts. |

| Project Phase | Potential Impact Pathway | Scoped In | Scoped Out | Rationale |
|---|---|---|---|---|
| Construction<br>Operation<br>Decommissioning | Potential adverse impacts on planned marine renewable energy projects in the Study Area | ✓ | | The exact scope of interference on other planned marine renewables energy projects is not clear and will require further assessment within the EIA. |

## 27.6. Assessment Methodology

Potential impacts on other sea users will be assessed using the standard EIA Methodology set out in Volume 1, Chapter 5. The impact assessment will consider the potential for impacts during the construction, operation and decommissioning phases of the proposed Project.

Specific to the other sea users, the following guidance documents will also be considered:

- The European Subsea Cable Association (ESCA) guideline no.6 'The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters' (ESCA, 2016)
- International Cable Protection Committee (ICPC) recommendations:
    - Recommendation No.2. Cable Routing and Reporting Criteria (ICPC, 2015);
    - Recommendation No.3. Telecommunications Cable and Oil Pipeline / Power Cables Crossing Criteria (ICPC, 2014); and
    - Recommendation No.13. The Proximity of Offshore Renewable Wind Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013).

Given the availability of suitable data to inform the baseline, no site surveys are anticipated to inform the Environmental Appraisal. Consultation with relevant stakeholders is proposed to confirm the data available to describe the other sea users' activities and infrastructure are accurate; inform the Project scope; adopted mitigation by design to avoid or minimize effects to other sea users; and anticipate potential conflicts and additional mitigation measures to be evaluated.

## 27.7. Conclusion

In summary:

- A detailed assessment based on the potential impacts identified above will be carried out, forming part of the basis of the ensuing EIA; and
- The impacts to be scoped out at this stage are direct impacts to marine disposal sites, impacts to aggregate activities and impacts to licensed oil and gas exploration activities.

## 27.8. References

Milford Haven Port Authority, 2022. *Industry focus.* [Online]. Available at: https://www.mhpa.co.uk/industry-focus/ [Accessed: 3 March 2022].

# LLYR FLOATING OFFSHORE WIND PROJECT

# SCOPING REPORT

## Volume 4 – Project Wide Effects

Prepared by: AECOM Ltd

**April 2022**

## Acronyms and Abbreviations

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| ALARP | As Low as Reasonably Practicable | MCZ | Marine Conservation Zone |
| CCC | Climate Change Committee | META | Marine Energy Test Area |
| CEMP | Construction Environmental Management Plan | NNR | National Nature Reserve |
| EIA | Environmental Impact Assessment | NRW | Natural Resources Wales |
| EMF | Electromagnetic Field | PWM | Precautionary Working Methods |
| ES | Environmental Statement | WFD | Water Framework Directive |
| INNS | Invasive Non-native Species | WG | Welsh Government |
| MA&D | Major Accidents and Disasters | ZoI | Zone of Influence |

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# 28. DESIGNATED SITES

## 28.1. Introduction

The designated sites assessment will consider the potentially significant effects on designated sites that may arise from the construction and operation of the proposed Project. This chapter of the Scoping Report provides an overview of the baseline conditions considered within the assessment. The methodology and likely significant effects are set out within each technical chapter in Volumes 2 and 3. For example, potential effects on sites designated for marine mammal interest are discussed in Volume 3, Chapter 24.

## 28.2. Study Area

The Study Area for designated sites varies depending on the type and nature of the designated site under consideration. The rationale for scoping each terrestrial and marine designated site into the assessment is provided within each technical chapter.

## 28.3. Baseline

Table 28-1 and Table 28-2 provide a list of relevant terrestrial and marine designated sites (respectively), the reason for designation and a reference to where each site has been considered in this Scoping Report. Sites relevant to both the terrestrial and marine environment are included in Table 28-1 to avoid duplication.

*Table 28-1. Terrestrial environment designated sites*

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| Limestone Coast of South West Wales/ Arfordir Calchfaen De Orllewin Cymru Special Area of Conservation (SAC) | SR 89086 98041 | Designated primarily for great horseshoe bat *Rhinolophus ferrumequinum* and early gentian *Gentianella anglica*, and vegetated sea cliff habitat and fixed coastal dunes with herbaceous vegetation. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 19.4.14 (Physical Environment) |
| Pembrokeshire Marine / Sir Benfro Forol SAC | SM 92305 04138 | Designated primarily due to presence of grey seal *Halichoerus grypus* and shore dock *Rumex rupestris* and for estuary, large shallow inlet and bays and reef habitat. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 19.4.14 (Physical Environment); 20.4.3 (Benthic Ecology); 21.4.7 (Fish and Shellfish Ecology); 22.4.3 (Marine Mammals) |
| Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC | SR 97600 95400 | Greater horseshoe bat is listed as an Annex II species that are a primary reason for selection of this site. Lesser horseshoe bat is listed as an Annex II species present as a qualifying feature, but not a primary reason for site selection. No other bat species are listed within the designation. | 8.4.1 (Ecology and Biodiversity) |
| Castlemartin Coast Special Protection Area (SPA) | SR 89086 98041 | Designated for breeding birds (chough). | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 19.4.14 (Physical Environment) |
| Milford Haven Waterway Site of Special Scientific Interest (SSSI) | SM 88168 02769 | Designated as an exceptional example of a ria (a system of valleys drowned by post-glacial rise in sea level) that consists of a number of estuaries, embayments and inlets. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 11.4.2 (Geology and Hydrogeology); 19.4.14 (Physical Environment); 20.4.3 (Benthic Ecology) |
| Broomhill Burrows SSSI | SM 88859 00286 | Designated due to providing valuable exposures demonstrating some important structural characteristics of one of the major zones of the Variscan orogenic belt in Pembrokeshire. It is also One of Pembrokeshire's largest dune systems with the most extensive and most diverse dune slack vegetation. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 11.4.2 (Geology and Hydrogeology); |

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| | | | 19.4.14 (Physical Environment) |
| Castlemartin Corse SSSI | SR 89916 99806 | The site is designated as the best example of a calcareous fen in Pembrokeshire. The 20 hectare reed-bed is also the largest and most diverse in the county. Calcareous flushes support rare plants and there are numerous scarce fen plants in this SSSI. Rare species include the yellow-sedge *Carex elata*, the fen pondweed *Potamogeton coloratus*, the short-winged conehead cricket *Conocephalus dorsalis* and the ground-hopper *Tetrix subulata*. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment) |
| Castlemartin Range SSSI | SR 88847 98365 | Noted for geology and coastal, cliff, maritime grassland and heath habitats and species (including Guillemot, razorbill and kittiwake). | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 23.4.1 (Ornithology) |
| Gweunydd Somerton Meadows SSSI | SM 93131 00131 | Designated for grassland fungi. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment) |
| Angle Peninsula Coast / Arfordir Penrhyn Angle SSSI | SM 84177 02725 | Designated for its geology, its wide range of intertidal rock, sand, and gravel habitats and communities, particularly rockpools, caves, tide-swept and under-boulder communities, and for its population of roosting and feeding chough. | 8.4.1 (Ecology and Biodiversity); 10.4.5 (Water Environment); 11.4.2 (Geology and Hydrogeology); 19.4.14 (Physical Environment); 20.4.3 (Benthic Ecology) |
| Orielton Stable Block and Cellars SSSI | SR 95391 99104 | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC. One of the largest nursery roosts of lesser horseshoe bat in Pembrokeshire with records dating back to the 1960s and a maximum count of 130 individuals in June 2000. | 8.4.1 (Ecology and Biodiversity) |
| Stackpole SSSI | SR 97851 95081 | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC. Known to provide an important sheltered flight corridor for greater and lesser horseshoes bats to connect sites adjacent to the designation. | 8.4.1 (Ecology and Biodiversity) |
| Stackpole Courtyard Flats and Walled Garden SSSI | SR 97600 95400 | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC. The clocktower is known to support a breeding colony of at least 350 greater horseshoe bats. The loft is considered crucially important in concentrating the dispersed population into a single breeding site. | 8.4.1 (Ecology and Biodiversity) |

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| | | The lofts immediately adjacent to the clocktower also support a nursery roost of 85 – 110 lesser horseshoe bats, probably one of the largest lesser horseshoe colonies in Pembrokeshire. Small numbers of lesser horseshoe bats are known to hibernate in the lofts, cellars and heating ducts complex during the winter months. | |
| Park House Outbuildings, Stackpole SSSI | SR 97600 95400 | A component SSSI of Pembrokeshire Bat Sites and Bosherton Lakes SAC. One of the largest known nursery roosts of lesser horseshoe bat in Pembrokeshire. Smaller numbers of greater horseshoe bats have been recorded using the outbuildings for roosting. Common pipistrelle and brown long-eared bat have also been recorded emerging from the roost site. | 8.4.1 (Ecology and Biodiversity) |
| Arfordir Niwgwl Aber Bach / Newgale to Little Haven SSSI | SM 86052 16796 | Overwintering greater horseshoe bat have been recorded within the site. | 8.4.1 (Ecology and Biodiversity) |
| West Angle Bay Regionally Important Geological and Geomorphological Sites (RIGS) | SM 85441 03059 | Noted for stratigraphy and structure (Carboniferous) Variscan). | 11.4.2 (Geology and Hydrogeology) |
| Angle Bay RIGS | SM 89540 02108 | Category: scientific, stratigraphy. | 11.4.2 (Geology and Hydrogeology) |
| Sawdern Point RIGS | SM 89695 02351 | Noted for stratigraphy (Devonian). | 11.4.2 (Geology and Hydrogeology) |
| East Pickard Bay RIGS | SM 86452 01003 | Noted for stratigraphy (igneous, Devonian). | 11.4.2 (Geology and Hydrogeology) |
| West Angle Bay and West Angle Bay (North) Geological Conservation Review (GCR) site | SM 85441 03059 | Noted for non-marine Devonian geology. | 11.4.2 (Geology and Hydrogeology) |
| Freshwater West, Freshwater West (South) and Freshwater West (North) GCR | SM 88341 00091 | Variscan structures of South Wales and the Mendips. | 11.4.2 (Geology and Hydrogeology) |
| Pembrokeshire Coast National Park (PCNP) | SM 85641 19068 | Primarily designated for the coastal landscape. | 7.4.1 (Seascape, Landscape and Visual) |

*Table 28-2. Marine environment designated sites*

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC and SPA | SS 35700 99100 | The SPA is designated for Common scoter.<br>The SAC protects an area important for the migration of the twaite shad *Alosa fallax*. | 23.4.1 (Ornithology);<br>21.4.7 (Fish and Shellfish Ecology) |
| Cleddau Rivers/ Afonydd Cleddau SAC | SM 93900 25000 | The Annex II species river lamprey is a primary reason for site selection, with adults of this species present during the spawning season, whist ammocoetes are widespread throughout the SAC. | 21.4.7 (Fish and Shellfish Ecology) |
| River Tywi/ Afon Tywi SAC | SN 68600 26300 | This site is connected to the Carmarthen Bay and Estuaries SAC. Twaite shad is a primary qualifying feature for the selection of this site, whilst sea lamprey, river lamprey, and Allis shad are secondary qualifying features of this site. | 21.4.7 (Fish and Shellfish Ecology) |
| Severn Estuary/ Môr Hafren SAC | ST 32100 74800 | The primary qualifying features are the migratory species of sea lamprey, river lamprey, and twait shad. | 21.4.7 (Fish and Shellfish Ecology) |
| West Wales Marine/ Gorllewin Cymru Forol SAC | SN 02923 67328 | A designation off the coast of Wales from the Llŷn peninsula to Pembrokeshire designated for harbour porpoise (*Phocoena phocoena*), an Annex II species. | 8.4.1 (Ecology and Biodiversity);<br>19.4.14 (Physical Environment);<br>22.4.3 (Marine Mammals) |
| Bristol Channel Approaches/ Dynesfeydd Môr Hafren SAC | SR 96092 29555 | Harbour porpoise is the primary reason for site selection. | 19.4.14 (Physical Environment);<br>22.4.3 (Marine Mammals) |
| Lundy SAC and SSSI | SS 13670 44980 | Grey seal is a secondary reason for site selection (SAC).<br>The SSSI is designated for Puffin, Manx shearwater, kittiwake, razorbill and guillemot. | 22.4.3 (Marine Mammals);<br>23.4.1 (Ornithology) |
| Cardigan Bay/ Bae Ceredigion SAC | SN 21400 64100 | Grey seal is a secondary reason for site selection. | 22.4.3 (Marine Mammals) |
| Saltee Islands SAC | SL 85320 56612 | Grey seal is a qualifying feature of this site, which provides habitat for breeding, moulting, resting and social grey seals. The population at this site is estimated to be 571 to 734 individuals. | 22.4.3 (Marine Mammals) |
| Lleyn Peninsula and the Sarnau / Pen Llŷn a'r Sarnau SAC | SH 47973 18621 | Gey seal is a secondary reason for site selection. Bottlenose dolphin are also a qualifying feature of this site, but the site is beyond the 50 km screening distance for this species. | 22.4.3 (Marine Mammals) |

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA | SR 44565 89709 | Atlantic puffin, European storm-petrel, lesser black-backed gull, Manx shearwater, chough.<br>Seabird assemblage including razorbill, guillemot, kittiwake, puffin, lesser black-backed gull, Manx shearwater, and European storm-petrel. | 19.4.14 (Physical Environment); 23.4.1 (Ornithology) |
| North Cardigan Bay / Gogledd Bae Ceredigion SPA | SH 48022 08414 | Designated for Red-throated Diver. | 23.4.1 (Ornithology) |
| Burry Inlet SPA | SS 53710 67262 | Designated for Pintail, northern shoveler, Eurasian teal, Eurasian wigeon, turnstone, dunlin, red knot, Eurasian oystercatcher, Eurasian curlew, grey plover, common shelduck, redshank. Waterbird assemblage (of the aforementioned designated bird features). | 23.4.1 (Ornithology) |
| Grassholm SPA | SM 59805 09331 | Designated for Gannet. | 23.4.1 (Ornithology) |
| Skomer/ Sgomer Marine Conservation Zone (MCZ) | SM 71112 09183 | Designated for the protection of benthic habitats and species within the site, such as kelp forests, rocky shores, and turfs. | 20.4.3 (Benthic Ecology); 22.4.3 (Marine Mammals) |
| Skomer Island and Middleholm SSSI/ Skomer Island NNR | SM 72428 09408 | Breeding sites for grey seals with pupping from August-November | 22.4.3 (Marine Mammals) |
| Skokholm SSSI/ NNR | SM 73586 04889 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| St Bride's Bay South/ De Porth Sain Ffraidd SSSI | SM 81111 13251 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| St David's Peninsula Coast SSSI | SM 76077 25927 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| Dale and South Marloes Coast SSSI | SM 78705 06298 | Grey seal is a marine feature of this site. | 19.4.14 (Physical Environment); 22.4.3 (Marine Mammals) |

| Site Name | Location (NGR) | Reason(s) for Designation | Scoping Report Reference |
|---|---|---|---|
| The Offshore Islets of Pembrokeshire/ Ynysoedd Glannau Penfro SSSI | SM 65586 24831 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| Grassholm/ Ynys Gwales SSSI | SM 59812 09325 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| Ramsey/ Ynys Dewi SSSI | SM 70120 23784 | Grey seal is a marine feature of this site. | 22.4.3 (Marine Mammals) |
| Gower Coast: Rhossili to Port Eynon SSSI | SS 43609 85713 | Designated for Guillemot and razorbill. | 23.4.1 (Ornithology) |
| Ynysoedd y Gwylanod / Gwylan Islands SSSI | SH167263 | Designated for Puffin. | 23.4.1 (Ornithology) |
| Ramsey Island and Bishops and Clerks Island SSSI | SM 68447 25172 | Designated for Razorbill, guillemot, European storm petrel. | 23.4.1 (Ornithology) |
| The Skerries SSSI | SH 26925 94766 | Designated for Herring gull, lesser black-backed gull, puffin. | 23.4.1 (Ornithology) |
| Marloes and Dale Heritage Coast | SM 70649 09371 | Noted for landscape. | 7.4.1 (Seascape, Landscape and Visual) |
| South Pembrokeshire Heritage Coast | SR 96263 92203 | Noted for geology, coastal habitats, landscapes and land use. | 7.4.1 (Seascape, Landscape and Visual) |
| Lundy Island Heritage Coast | SS 13670 44980 | Noted for coastal landscape. | 7.4.1 (Seascape, Landscape and Visual) |

# 29. CLIMATE CHANGE AND MAJOR ACCIDENTS AND DISASTERS

## 29.1. Introduction

The 2017 amendments to the EIA Regulations require that the EIA considers the vulnerability of the proposed Project to climate change, natural disasters and major accidents. This assessment will be included within the EIA; either incorporated into topic chapters, or in a separate section. The scope of this assessment will be informed by NRW's advice on the nature and scope of natural disasters and major accidents that are relevant to the proposed Project.

## 29.2. Climate Change

The UK established a legally binding framework to cut carbon emissions via the Climate Change Act (2008). A recently published paper 'Net Zero – the UK's contribution to Global Warming', May 2019, by the Committee on Climate Change (CCC) commits the UK government by law to reduce emissions by 100% of 1990 levels by 2050 (CCC, 2019a). Monitoring by the CCC, to identify if the UK is on track to meet this target, confirmed the first (2008- 12) and second (2013-17) carbon budgets have been met, and the UK is on target to meet the third (2018-22). The UK is not, currently, on track to meet the fourth (2023-27) target and 2018 records show emissions being 44% below 1990 levels (CCC, 2019b). As a devolved administration the Welsh Government (WG) has created a climate change policy, the Environment (Wales) Act 2016, which sets emission reduction targets for Wales. In response to the CCC May 2019 paper, Wales has accepted the recommendation for a 95% reduction in emissions by 2050, with an ambition to reach net-zero (CCC, 2019b).

UKCP18 provides the most up-to-date assessment of how the climate may change up to 2100 and post-2100. Sea level rise data along the UK coastline can also be downloaded from the Met Office UKCP18 website (Met Office, 2019).

## 29.3. Major Accidents and Disasters

To identify relevant major accident hazards[1] and threats[2] the National Risk Register (HM Government, 2020) and South Wales Community Risk Register (South Wales Local Resilience Forum, 2018) will be reviewed. In addition, a hazard identification workshop will be held to review the vulnerability of the proposed Project to existing major accidents and disasters (MA&D) hazards and threats and identify where the proposed Project have the potential to result in new, or exacerbated, MA&D hazards and threats. It is proposed to document the findings within an Environmental Risk Record (a template for which is provided in Appendix 4-1) to be included within Chapter 4: Description of the Project, in Volume 1 of the ES. The Environmental Risk Record will draw on, and cross refer to, other relevant assessments setting out the relevant mitigation to ensure that all MA&D hazards and threats during construction, operation and decommissioning are reduced to be as low as reasonably practicable[3] (ALARP) and that no significant environmental effects are likely. However, in instances where

[1] A hazard is defined as an event which may cause harm. Hazards for the purposes of MA&D assessment are defined as nonmalicious events including natural disasters, industrial accidents and industrial action.

[2] Threats for the purposes of the MA&D assessment are defined as malicious attacks.

[3] Reasonably practicable involves weighing a risk against the trouble, time and money needed to control it. The ALARP principle is used to describe an expected level of residual risk involved with a system or set of operations, in case it is not possible to eliminate the risk. What this means, is that the Applicant, overseen by regulatory authorities, is responsible for exercising good practice and judgement to ensure that necessary measures have been taken in order to reduce the levels of risk, such that the residual risk levels are 'as low as reasonably practicable'. Risks categorised 'tolerable if ALARP' would generally require further approval of the details for proposed mitigation by a regulatory body.

identified risks cannot be addressed without additional mitigation, or are the focus of another assessment (e.g. geology and hydrology and shipping and navigation), these will be discussed within relevant topic chapters within the ES.

### 29.4. References

CCC, 2019a. *Net Zero – The UK's contribution to stopping global warming*. [Online]. Available at: https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/ [Accessed: 24 February 2022].

CCC, 2019b. *Wales accepts Committee on Climate Change 95% emissions reduction target*. [Online]. Available at: https://gov.wales/wales-accepts-committee-climate-change-95-emissions-reduction-target [Accessed: 24 February 2022].

HM Government, 2020. *National Risk Register*. [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/952959/6.6920_CO_CCS_s_National_Risk_Register_2020_11-1-21-FINAL.pdf [Accessed: 15 February 2022].

Met Office, 2019. *UK Climate Projections (UKCP)*. [Online]. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index [Accessed: 24 February 2022].

South Wales Local Resilience Forum, 2018. *Community Risk Register 2018/19*. [Online]. Available at: http://www.southwaleslrf.co.uk/media/xmbhisjv/swlrf-risk-register-2019-version-10-0.pdf [Accessed: 15 February 2022].

## 30. COMBINED AND CUMULATIVE EFFECTS OF THE PROJECT

### 30.1. Introduction

This chapter provides a summary of the proposed assessment of combined and cumulative effects arising from the proposed Project. The term cumulative effects refers to effects upon receptors arising from the proposed Project when considered alongside other plans and projects that result in an additive impact with any element of the Project. Cumulative effects can be described as the net effect of both direct and indirect cumulative pressures, from different activities. An individual effect alone may be considered insignificant, but the additive effects of more than one effect, from any number of sources, could result in a significant cumulative effect, either beneficial or adverse.

The cumulative effects assessment of the proposed Project will consider the following types of effect:

- Combined Effects: These effects derive from combinations of Project-specific impacts which, when acting together, would result in a new or different likely significant effect or an effect of greater significance than one impact would result in when considered in isolation; and
- Cumulative Effects: These effects derive from Project-specific impacts which, when considered together with the impacts of other planned developments, could result in a new or different significant effect or an effect of greater significance than the Project's effect when considered in isolation.

The assessment will be based on the best available data from other plans, projects and marine activities and associated information which is currently in the public domain or has been provided to the proposed Project. The assessment assumes that publicly available information is accurate; the assessment is also reliant on collaboration with a range of statutory consultees to the Marine Licensing process, neighbouring authorities and other developers to identify changes in information which may be pertinent to the assessment.

Where there are specific limitations associated with data, they will be highlighted as the assessment progresses.

### 30.2. Regulatory and Planning Policy Context

The requirement to consider cumulative effects is set out in the EIA Regulations and reiterated in the UK Marine Policy Statement (Her Majesty's Government, 2011), which states:

*"When considering potential benefits and adverse effects, decision makers should also take into account any multiple and cumulative impacts of proposals, in the light of other projects and activities."*

And:

*"The marine plan authority will need to consider the potential cumulative impact of activities and, using best available techniques, whether for example:*

- *The cumulative impact of activities, either by themselves over time or in conjunction with others, outweigh the benefits;*
- *A series of low impact activities would have a significant cumulative impact which outweighs the benefit; or,*
- *An activity may preclude the use of the same area/resource for another potentially beneficial activity".*

### 30.3. Approach to Cumulative Assessment

In conjunction with professional judgement, Renewable UK's Cumulative Impact Assessment Guidelines (2013) and Welsh Government planning policy guidance (Welsh Government, 2022) will be used to inform the scope of the combined and cumulative effects assessments, and to assist the identification and mitigation of likely significant effects.

#### *30.3.1. Assessment of Combined Effects*

The assessment of combined effects will consider whether an individual environmental receptor or resource will likely be affected by more than one type of impact as a result of the construction and/or operation of the proposed Project. The assessment methodology will involve the identification of impact interactions associated with the Project upon separate environmental receptors and resources, in order to understand the overall environmental effect of the proposed Project.

Potential interactions will be identified by reviewing the topic conclusions within the environmental assessment topics identified in this Scoping Report, in order to establish where individual impacts may combine and result in likely significant effects. The significance of combined effects upon environmental receptors and resources will be determined using professional judgement, with input provided by from those responsible for the production of the individual topic assessments.

#### *30.3.2. Assessment of Cumulative Effects*

The approach to cumulative assessment will follow a staged approach, as summarised in Figure 30-1 and detailed below.


*Figure 30-1. Staged approach to cumulative assessment*

**30.3.2.1. Stage 1: Establishing the long list of 'other existing developments and/or approved developments'**

This stage will involve establishing the proposed Project's Zones of Influence (ZoI) associated with the topic areas assessed, within which a long list of other planned developments and development allocations will be identified. The preliminary list included in this chapter will be issued to the relevant consultees and if any further developments which are likely to result in cumulative effects with the Project are identified, these will be added to the long list for consideration.

**30.3.2.2. Stage 2: Establishing a shortlist of 'other existing developments and/or approved developments'**

This stage will involve a review of the long list of planned developments, in order to identify those to be taken forward for the assessment of cumulative effects.

**30.3.2.3. Stage 3: Information gathering**

This stage will involve reviewing the available information relating to the shortlisted development(s), in order to establish the details of their likely environmental effects.

**30.3.2.4. Stage 4: Assessment**

Those developments which meet the inclusion criteria set out in the above stages shall be incorporated into the final assessment, which will involve identifying where effects are likely to occur and assessing the significance of those effects on environmental receptors and resources, taking into account any mitigation measures.

*30.3.3. Initial Screening of Other Development Projects and Allocations*

The list of other relevant major developments to be considered as part of the inter-project effects assessment will be developed in parallel with undertaking the EIA considering temporal scope, shared receptors or pathways for effects. This will include:

- Developments for which consent applications have been approved and construction has started;

- Developments for which consent applications have been approved, where construction has not yet started but may coincide with the proposed Project;
- Developments for which consent applications have been submitted but have yet to be determined, which may coincide with the proposed Project; and
- Developments which are identified in relevant local plans or other relevant plans and programmes which could reasonably be expected to come forward in a similar timescale to the proposed Project.

As part of the scoping exercise, a preliminary review has been undertaken to identify other development projects and development plan allocations that are likely to require consideration within the assessment of cumulative effects.

An initial review of the following sources has identified an initial list of potential other developments that may be considered as part of the cumulative assessment for the proposed Project:

- National Infrastructure Planning website (National Infrastructure Planning, 2022);
- Lle Geo-Portal (Natural Resources Wales (NRW), 2022);
- The Crown Estate website – offshore wind and aggregate digital data (The Crown Estate, 2022);
- Oil and Gas Authority Interactive Maps (Oil and Gas Authority, 2022); and
- Project Erebus website (Blue Gem Wind, 2021).

These other developments have been identified as they are of such a nature and proximity to the Array Area, Offshore Cable and Onshore Scoping Boundary to have the potential to generate cumulative impacts when considered in context to the development of the proposed Project. Table 30-1 defines the offshore search area extents for the cumulative assessment.

*Table 30-1. Cumulative assessment search area extents*

| Type of Project or Plan | Extent of Search Area |
|---|---|
| Marine aggregate and disposal | Up to 50 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Offshore energy | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Commercial fisheries | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Oil and gas | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Cables and pipelines | Up to 50 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Shipping | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Military, aviation and radar | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Coastal | Up to 200 km from the Array Area Scoping Boundary and Offshore Cable Scoping Boundary |
| Onshore works | Up to 5 km from the Onshore Scoping Boundary |

The production of the long list of other developments is an iterative process and relevant consultees will be approached for comments and suggestions of additional developments which should be considered for inclusion in the final cumulative impacts assessment. Additional data sources, such as the NRW Public Register, may also be reviewed. Once the long list has been completed, consultation will continue to take place to compile information which will enable the shortlisting and assessment process.

A preliminary long list is provided in Table 30-2.

*Table 30-2. Developments with the potential for cumulative impacts ('long list')*

| Development Name | Status | Approximate Distance from the proposed Project |
|---|---|---|
| Greenlink Interconnector | Approved | Within Offshore Cable Scoping Boundary |
| Bombora Wave Energy Project | Approved | Within Offshore Cable Scoping Boundary |
| Milford Haven Ports Authority Maintenance Dredging | Current licence active to June 2023 | Within Offshore Cable Scoping Boundary |
| South Pembrokeshire Demonstration Zone | Pre-application | Adjacent to Offshore Cable Scoping Boundary |
| Pembroke B Power Station Emergency Backup Generator | Active | Within Onshore Scoping Boundary |
| Rhoscrowther Wind Farm | Application to be determined | Within Onshore Scoping Boundary |
| Marine Energy Test Area (META) | Approved | Phase 1 test area – 3 km from Offshore Cable Scoping Boundary<br>Phase 2, Warrior Way – 5 km from Offshore Cable Scoping Boundary<br>Phase 2, Dale Road – 0.8 km from Offshore Cable Scoping Boundary<br>Phase 2, East Pickard Bay – within Offshore Cable Scoping Boundary |
| Valero Energy Corporation's Combined Heat and Power Cogeneration Unit | Planning permission granted | 0.4 km from Onshore Scoping Boundary |
| Project Erebus | Application to be determined | 1.7 km between the Erebus array and the Array Area Scoping Boundary; the Offshore Cable and Onshore Scoping Boundary overlap with Erebus |
| Milford Haven Waterfront Masterplan | In construction | 2 km from Offshore Cable Scoping Boundary |
| Project Valorous | Pre-application | 3 km from Array Area Scoping Boundary |
| Castlemartin Firing Range | Active | 3 km from Array Area and Offshore Cable Scoping Boundary |
| Tenby Harbour dredge and beneficial use disposal | Approved | 20 km from Offshore Cable Scoping Boundary |
| Llanelli Sands dredging area | Approved | 30 km from Offshore Cable Scoping Boundary |

Consultation is a vital element of the cumulative assessment process and feedback on the scope, extent and approach of the assessment would be gratefully received. Consultation responses will be documented in the ensuing assessment.

## 30.4. References

Blue Gem Wind, 2021. *Erebus ES.* [Online]. Available at: https://www.bluegemwind.com/planning/documents/ [Accessed: 16 February 2022].

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# 31. CONCLUSIONS

## 31.1. Summary of Potential Impacts Scoped In and Out

Table 31-1 provides a summary of the potential impacts of the proposed Project that are proposed to be scoped in and out of the ES, as identified throughout this Scoping Report. Commentary is provided for each impact to explain the reasons and justification for scoping the topics in or out the ES.

*Table 31-1. Summary of potential impacts scoped in and out*

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| **Seascape, Landscape and Visual** | | | |
| Landscape fabric. | Construction Decommissioning | ✓ | Temporary physical effects as a result of the introduction of construction compounds, temporary accommodation, and access tracks, movement of plant and other activities associated with the construction of the landfall, onshore underground cables and onshore substation / control building. |
| Pembrokeshire Coast National Park and other landscape designations. | Construction Decommissioning | ✓ | Temporary direct and or indirect effects on the special landscape qualities of the Pembrokeshire Coast National Park and other landscape designations as a result of the construction operations. |
| Seascape and landscape character units. | Construction Decommissioning | ✓ | Temporary effects on the seascape and landscape character areas identified within the Study Area as a result of the construction operations. |
| Residential and recreational receptors and road users. | Construction Decommissioning | ✓ | Temporary disruption to views due to introduction of construction compounds, temporary accommodation, and access tracks, movement of construction plant and watercraft, and other activities associated with the construction of the wind turbines, offshore cable, landfall, onshore underground cable and onshore substation / control building. |
| Physical landscape fabric. | Operation | ✓ | Long term effects including loss of existing landscape elements due to the introduction of the onshore substation / control building. |
| Pembrokeshire Coast National Park and other landscape designations. | Operation | ✓ | Long term effects on the special landscape qualities of the Pembrokeshire Coast National Park and other landscape designations as a result of the introduction of the wind turbines and onshore substation / control building. |
| Seascape and landscape character units. | Operation | ✓ | Long term effects, including perceptual changes, on the identified landscape and seascape character units within the Study Area as a result of the introduction of the wind turbines and onshore substation / control building. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| Residential and recreational receptors and road users. | Operation | ✓ | Long term changes to views due to the introduction of the wind turbines and onshore substation / control building. |
| **Ecology and Biodiversity** | | | |
| General construction activity to all receptors – Damage to ecological features through dust deposition, noise, vibration, lighting and pollution (including pollution to waterbodies and watercourses). | Construction<br>Decommissioning | X | Not likely to result in a significant impacts due to the inclusion of nuisance management and pollution prevention measures in Construction Environmental Management Plan (CEMP). |
| Onshore Scoping Boundary runs through Limestone Coast of South Wales Special Area of Conservation (SAC) (for 1.4 km), Broomhill Burrows Site of Special Scientific Interest (SSSI) (for 1.2 km) and Castlemartin Coast Special Protection Area (SPA) (for 0.3 km) and near others. Habitat loss will occur. Priority plant species cited as a reason for designation may be destroyed at an individual level.<br>Disturbance to species features of the SAC or SPA that may impair their ability to survive, to breed or reproduce, or to rear or nurture their young; in the case of animals of a hibernating or migratory species, to hibernate or migrate; or, to affect significantly the local distribution or | Construction<br>Decommissioning | ✓ | Habitat Regulation Assessment (HRA) required for impacts to SACs and SPAs. Major adverse impacts possible.<br>Moderate adverse impacts to Broomhill Burrows SSSI possible. It is not clear at this stage whether priority plants and particularly sensitive habitats (sand dunes) can be avoided and restored effectively through protocols outlined in CEMP.<br>Further survey is required to identify the potential impacts of the Project on designated sites. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>( ✓ / X ) | Justification |
|---|---|---|---|
| abundance of the species to which they belong. | | | |
| Temporary loss of priority habitat. | Construction<br>Decommissioning | ✓ | Moderate adverse impacts to priority habitats possible.<br>Further survey is required to identify the presence, and extent, of priority habitats within the Onshore Scoping Boundary. |
| Destruction of protected and notable plants and loss of supporting habitat. | Construction<br>Decommissioning | ✓ | Moderate adverse impacts to Protected and notable plants possible. It is not clear at this stage whether Protected and notable plants and their supporting habitats can be avoided and/ or restored effectively through protocols outlined in CEMP.<br>Further survey is required to identify the presence, and extent, of protected and notable plants within the Onshore Scoping Boundary. |
| Temporary habitat loss and fragmentation for protected and priority invertebrates. | Construction<br>Decommissioning | X | Limited suitable habitat in the Onshore Scoping Boundary. Not likely to result in significant impacts to protected and priority invertebrates through avoidance and habitat restoration protocols outlined in CEMP. |
| Temporary habitat loss and fragmentation for amphibians, including common toad. | Construction<br>Decommissioning | X | Not likely to result in significant impacts to amphibians, including common toad as a result of protocols to be outlined in the Precautionary Working Methods (PWM) statement and CEMP. |
| Temporary habitat loss and fragmentation and killing or injury of reptiles. | Construction<br>Decommissioning | X | Not likely to result in significant impacts to reptiles as loss of suitable habitat will be temporary and minimal. Protocols to be outlined in the PWM statement and CEMP will avoid killing or injury of reptiles. |
| Disturbance to Schedule 1 birds, destruction of nests and killing or injury of birds. | Construction<br>Decommissioning | X | Not likely to result in significant impacts if works can be timed to avoid breeding bird season / or pre-works checks and implementation of species-specific buffers (outlined in CEMP) and habitat restoration protocols are followed. |
| Killing, injury or disturbance of bats, including greater and lesser horseshoe bats. Destruction or damage of roosts and temporary habitat loss and fragmentation. | Construction<br>Decommissioning | ✓ | Moderate adverse impacts to bats possible. Further survey is required to understand impacts to foraging / commuting and roosting bats. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>( ✓ / X ) | Justification |
|---|---|---|---|
| Potential for disturbance to/ obstruction of badger setts, temporary habitat loss and fragmentation. | Construction<br>Decommissioning | ✓ | Pollution, vibration, noise and lighting protocols outlined in CEMP should also be followed.<br>Badger are highly mobile species that readily establish new setts, pre-works survey for continued absence of setts required. |
| Disturbance to / obstruction of otter breeding, sheltering and resting places, temporary habitat loss and fragmentation. | Construction<br>Decommissioning | ✓ | Avoidance measure should include sensitive habitats and sensitive timing of works (i.e. avoiding works around dusk and dawn). Pollution, vibration, noise and lighting protocols outlined in CEMP should also be followed.<br>Otter are a mobile species that can readily establish new breeding or resting sites particularly if previous sites have become unsuitable, pre-works survey for continued absence of breeding and resting sites required. |
| Killing, injury or disturbance of dormouse, temporary habitat loss and fragmentation. | Construction<br>Decommissioning | ✓ | Not likely to result in significant impacts to reptiles through PWM statement and habitat restoration protocols outlined in CEMP. Habitat suitability assessment, will inform the requirement for further survey or mitigation. |
| Causing spread of Invasive non-native plant species into the wild. | Construction<br>Decommissioning | ✓ | Moderate adverse impacts are possible without further survey and control options. Without survey data, biosecurity measures are only partially effective on the landscape scale of this Project. |
| **Historic Environment and Cultural Heritage** | | | |
| Impacts to the setting of onshore and inter-tidal designated and non-designated archaeological and built heritage assets. | Construction<br>Operation and Maintenance<br>Decommissioning | ✓ | High potential for introduction of a new development, with associated activities, to negatively affect the setting of designated and non-designated archaeological and built heritage, assets without mitigation. |
| Direct impacts on buried archaeological / (Palaeo) environmental remains within the Onshore Scoping Boundary causing destruction or damage of the assets. Impacts to the setting of heritage assets. | Construction<br>Operation and Maintenance<br>Decommissioning | ✓ | Direct, physical impacts to heritage assets would result in the total loss of their heritage. This would constitute a medium or high impact which, without mitigation, would likely result in a significant effect. Exposure of buried remains could result in increased degradation. Conversely, preservation of remain *in* situ, and opportunities for public interpretation, signage etc. could be considered positive. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| Historic landscapes and changes to the historic character of the area. | Construction Operation and Maintenance | ✓ | High potential for introduction of a new development, with associated activities, to negatively affect the integrity and setting of assets without mitigation. |
| Potential positive impact on current Archaeological Research in Wales of publishing fieldwork results and archaeologically assessed geophysical and geotechnical data, as well as any archaeological remains identified. | Construction | ✓ | The acquisition of new information of the onshore and intertidal historic environment and cultural heritage resource of the Project through geophysical, geotechnical, fieldwork surveys, and excavation exercises could significantly contribute to the understanding of archaeology in the region. |
| **Water Environment** | | | |
| Surface waterbodies. | Construction | ✓ | There is potential for pollution of surface waterbodies due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off and any dewatering operations. |
| Sediment dynamics and hydromorphology. | Construction | ✓ | Temporary impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, especially where watercourses need to be crossed by the cable or access tracks. |
| Flood risk. | Construction | ✓ | Potential increase in flood risk as result of altering floodplain mechanisms if construction activities occur in areas of known flood risk. |
| Local water supplies. | Construction | X | During construction it is currently assumed that a temporary potable water supply will be provided for workers. Water for construction will similarly not be anticipated to use a mains supply. As there will not be a new formal supply required for construction, assessment of water supply during construction has not been considered further. |
| Water quality. | Operation | ✓ | Potential impacts on water quality in waterbodies that may receive operational surface water runoff or be at risk of chemical spillages from above ground facilities. |
| Hydromorphological impacts to waterbodies. | Operation | ✓ | Hydromorphological impacts to waterbodies, including changes to physical form which underpin habitats, as a result of watercourse crossings (e.g. for cable route) and outfalls. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| Foul water use from the Project. | Operation | X | Given the nature of the Project (i.e. low occupancy in any of the above ground infrastructure) foul water generation would be negligible and generally this would either connect under trade effluent consent to public sewer or otherwise would be managed by a specialist company. This will be scoped out currently, however will be kept under review. |
| Flooding. | Operation | ✓ | Potential flooding of the substation or control building if located in an area of known flood risk. |
| Surface water flood risk. | Operation | ✓ | Increase in surface water runoff as a result of potential increased areas of impermeable land where the substation and control building are located. |
| Installing landfall cables in areas of known tidal flood risk. | Operation | X | Not likely to result in significant effect as best practice methods will be used when installing cables. |
| Groundwater flood risk. | Operation | ✓ | Buried cable or footings of the substation and control building could increase groundwater flood risk. |
| **Geology and Hydrogeology** | | | |
| Damage, disturbance or removal of geological features of interest (Regionally Important Geological and Geomorphological Sites and Geological Conservation Review sites). | Construction<br>Decommissioning | ✓ | As the exact cable route is currently unknown, there is potential for disturbance of geological features of interest (permanent adverse effects) and these are therefore scoped in for assessment. These impacts are unlikely to be mitigated by the embedded and good practice measures, if not avoided. |
| Compaction and degradation of soils. | Construction<br>Decommissioning | ✓ | Excavation works during installation of the onshore cable route is likely to disturb surface soils. This can result in compaction and degradation of excavated soils, particularly topsoil and in particular along haul routes. The extent of significance would be influenced by the final locations and construction / decommissioning methodology used. In addition, construction plant activities may also cause compaction of soils in the surrounding working area. Installation in areas of Made Ground are less likely to result in impacts to surface soils. |
| Mineral severance or sterilisation. | Construction<br>Decommissioning | ✓ | There may be some adverse effects during the construction period to the identified Mineral Safeguarding Zone. These impacts are unlikely to be mitigated by the embedded and good practice measures, if not avoided. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>(✓ / X) | Justification |
|---|---|---|---|
| Hydrogeology. | Construction<br>Decommissioning | ✓ | Potential reduction of flow to surface water bodies and change in hydrogeological and hydrological setting locally. There may be some adverse effects during the construction / decommissioning phases due to dewatering. These impacts can be mitigated through control of dewatering discharges. |
| Mobilisation and migration of contamination to unsaturated soils, groundwater and surface water courses. | Construction<br>Decommissioning | ✓ | There may be some temporary / permanent adverse effects during the construction/decommissioning phases. These impacts are more likely in areas where significant contamination may be encountered, such as the Pembroke Refinery, Pembroke Power Station and landfills. Further assessment is required to determine whether these could be significant effects, or if they could be mitigated by the embedded and good practice measures. |
| Potential impacts on groundwater as a pathway may be created for drilling fluids or other fluids to reach sensitive groundwater receptors (e.g. the Principal / Secondary aquifers). | Construction<br>Decommissioning | ✓ | |
| Potential for contaminants in unsaturated soils to be exposed to surface water run-off and to leach to groundwater in open excavations. | Construction<br>Decommissioning | ✓ | |
| Potential impacts from migration of contaminants from uncovered stockpiles to surface water and groundwater receptors. | Construction<br>Decommissioning | ✓ | |
| Creation of preferential pathways for the migration of soil contamination and gases. | Construction<br>Decommissioning | ✓ | |
| Migration of contamination to unsaturated soils, surface water and groundwater. | Construction<br>Decommissioning | ✓ | There may be some temporary adverse effects during the construction / decommissioning phases. These impacts are temporary and will likely be mitigated by the embedded and good practice measures; mitigation measures dealing with the risk of accidental spills or contaminants are also suggested, with risks managed through the implementation of industry |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| | | | standard best practice guidelines, for example, appropriate use of chemicals, spill response and pollution contingency plans. |
| Impacts from potential contamination in dust and fine particulate matter may impact ecological receptors. | Construction Decommissioning | ✓ | Ecological receptors, including features of designated sites that are sensitive to nitrogen or acid deposition, may be impacted by significant increases in dust. Further assessment will be required once the full extent of the proposed Project is confirmed to understand the level of impact. |
| Impacts on human health from contamination within unsaturated soil (dust and fine particulate matter) and groundwater – construction workers. | Construction Decommissioning | X | There may be some temporary adverse effects during the construction / decommissioning period due to the introduction of human health receptors (construction / decommissioning workers). However, these receptors will be protected by health and safety legislation and are therefore scoped out. |
| Impacts on human health from contamination within unsaturated soil (dust and fine particulate matter) and groundwater – adjacent land users. | Construction Decommissioning | ✓ | Potential temporary adverse impacts to nearby residents and commercial workers. These impacts are more likely in areas where significant contamination may be encountered. Further assessment will be required to determine whether these could be significant effects. |
| Post-construction remediation. | Operation | ✓ | There may be some permanent beneficial effects post- construction / operation phase due to the removal of contaminant sources during construction works. Further assessment required to determine whether these could be significant effects. |
| Impacts on human health from contamination within shallow unsaturated soil and groundwater. | Operation | X | Not likely, as maintenance and operation of the proposed Project will be in accordance with environmental legislation and good practice. |
| Potential for impacts on unsaturated soil and groundwater deriving from pollution events bypassing the drainage system. | Operation | X | Not likely, as maintenance and operation of the proposed Project will be in accordance with environmental legislation and good practice. |
| **Agriculture and Soils** | | | |
| Agricultural land and land use in terms of the loss of Best and Most Versatile (BMV) land. | Construction | ✓ | The proposed Project is likely to encounter BMV land and, therefore, there is the potential for this land to be significantly affected. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>( ✓ / X ) | Justification |
|---|---|---|---|
| Soil resources in terms of potential damage and loss. | Construction | ✓ | A review of the published soils information within the Study Area indicates the Study Area is primarily comprised of sands, which are likely to be at either a high or very high risk of erosion. Soils may be damaged or lost during the proposed Project due to inappropriate handing, storage and reinstatement. |
| Agricultural operations. | Operation | X | Potential impacts to agricultural operations will be mitigated as far as is practicable through consultation between the Project's Lands Team and landowners / farmers. It is therefore considered that significant effects to agricultural operations are very unlikely to occur and this receptor is not taken forward for further consideration. |
| **Traffic and Transport** | | | |
| Temporary increases in traffic flows. | Construction | ✓ | During construction there will be temporary increases in traffic flows on the road network that will be used by construction vehicles to access the onshore substation / control building and cable route site compounds. Other aspects of the construction phase could lead to a significant effect, such as:<br>• Significant severance to communities;<br>• Increased risk of road traffic accidents caused by a large increase in traffic for a longer period;<br>• Temporary road closures, diversions and widening; and<br>• Construction traffic using temporary bell mouths and site entrances for access to construction areas; and<br>• Temporary closures or diversions of Public Rights of Way and other public access routes. |
| Operational traffic. | Operation | ✓ | It is anticipated that the operational traffic will be discounted from the assessment as this is likely to be negligible and associated with periodic maintenance. |
| **Aviation and Radar** | | | |
| All aircraft | Construction<br>Operation<br>Decommissioning | ✓ | Risk of collision due to interference with radar and communications systems. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br><br>( ✓ / X ) | Justification |
|---|---|---|---|
| Primary Surveillance Radars | Construction<br>Operation<br>Decommissioning | ✓ | Physical obstruction of wind turbines; the generation of unwanted returns (returns that are not aircraft) to radar; risk of collision due to interference with radar. |
| Secondary Surveillance Radars | Construction<br>Operation<br>Decommissioning | X | The Project is outside the area of interaction with any Secondary Surveillance Radar. |
| Radio communication between Air Traffic Controllers and aircraft under their control. | Construction<br>Operation<br>Decommissioning | ✓ | Risk of aircraft collision due to interference with Aeronautical navigation aids and communication systems. |
| Offshore Search and Rescue helicopter operations. | Construction<br>Operation<br>Decommissioning | ✓ | Risk of interaction between Search and Rescue helicopter operations and offshore wind infrastructure. |
| Ministry of Defence Flying Areas. | Construction<br>Operation<br>Decommissioning | X | The Projects are located outside any high risk areas. |
| **Air Quality** | | | |
| Dust. | Construction | ✓ | Construction dust associated with the construction of the cable route and associated construction compounds. |
| Vehicle emissions. | Construction | ✓ | Vehicle emissions associated with the movement of construction materials, particularly on the approach to and from construction compounds, where the number of vehicle movements are likely to be greatest. |
| Plant emissions. | Construction | ✓ | Plant emissions from construction phase site plant, energy generation plant, and non-road mobile machinery. |
| Construction traffic movements. | Construction | X | It is not expected that there will be any significant adverse effects on local air quality as a result of construction traffic movements associated with the Project, therefore it is proposed to scope out a consideration of road traffic from the main ES. This will be confirmed by review of |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| | | | construction traffic in relation to potentially sensitive receptors and sensitive areas (as determined by local authority monitoring data) when it is made available, then agreed with the relevant local authorities as necessary. |
| Operational activities, including maintenance and repair. | Operation | X | During operation, emissions would be restricted to those associated with road traffic movements during occasional inspection and maintenance activities. |
| Decommissioning activities. | Decommissioning | X | It is not expected that decommissioning would require vehicle movements of a scale sufficient to trigger a detailed air quality assessment |
| **Noise and Vibration** | | | |
| Construction / decommissioning noise emissions. | Construction<br>Decommissioning | ✓ | Noise emissions from proposed construction activities and construction traffic. |
| Construction / decommissioning vibration emissions. | Construction<br>Decommissioning | ✓ | Vibration emissions from proposed construction activities. |
| Operational noise emissions. | Operation | ✓ | Noise emissions from the proposed substation / control building. |
| Operational traffic. | Operation | X | No significant levels of operational traffic are expected so an assessment of operational road traffic noise impacts is scoped out. |
| Cable noise emissions. | Operation | X | As the cables will be underground, it is unlikely that any noise emissions from cables will be perceptible, so an assessment of cable noise has been scoped out. |
| Operational vibration emissions. | Operation | X | There are no sources of operational vibration associated with the onshore infrastructure of the proposed Project. |
| **Socio-economics, Recreation and Tourism** | | | |
| Employment creation. | Construction<br>Operation<br>Decommissioning | ✓ | The proposed Project could create direct and indirect jobs via the Project, in terms of employment and supply chain opportunities, as well as safeguarding jobs in of existing areas of supply chain, ports and marine services. Job security and the creation of new jobs would be considered a positive socio-economic contribution. |
| Skills and training. | Construction<br>Operation | ✓ | The proposed Project will offer temporary employment opportunities both in terms of direct construction jobs and opportunities in the supply chain. This is a potential beneficial impact |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br><br>( ✓ / X ) | Justification |
|---|---|---|---|
| | Decommissioning | | and is very relevant to marine energy aspirations and strategy in Pembrokeshire and South Wales. |
| Recreation amenities. | Construction<br>Decommissioning | ✓ | Proposed landfall works will create temporary disruption / reduce access for beach users or visitors to the Pembrokeshire National Park. |
| Access to Public Rights of Way or other paths. | Construction<br>Decommissioning | ✓ | Construction of the onshore infrastructure, including the onshore cable, and onshore substation / control building could potentially cause disruption or reduce access for users of the Pembrokeshire Coast Path or other Public Rights of Way if temporary disruption / diversions are required. Severance will also be considered in relation to this. |
| **Health and Wellbeing** | | | |
| Potential impacts on human health from traffic and transport, airborne noise and vibration and air quality. | Construction<br>Operation<br>Decommissioning | X | Given that individual topic chapters, namely Noise and Vibration, and Traffic and Transport will form part of the EIA and will consider and assess potential impacts to human receptors at an appropriate geographical scale, it is not proposed to include a standalone chapter relating specifically to human health within the ES. |
| Potential impacts on human health from electrical infrastructure. | Operation | X | The design of the scheme will ensure that electromagnetic field (EMF) emissions will remain compliant with any regulatory limits so as such EMF impacts from a health perspective are proposed to be scoped out of the assessment. |
| **Physical Environment** | | | |
| Temporary seabed disturbance and increase in suspended sediment concentrations. | Construction | ✓ | Temporary seabed disturbance and increase in suspended sediment concentrations as a result of trialling of cable burial tools in harder seabed (clay and chalk) or very soft seabed.<br>Temporary seabed disturbance as a result of vibrocore and Cone Penetration Test samples. All other survey techniques will not interact with the seabed and therefore are scoped out of further assessment. |
| Seabed disturbance. | Construction | ✓ | Temporary seabed disturbance due to:<br>• The total destruction and partial disturbance of sandwaves and sandwave fields by ploughs and Mass Flow Excavator activities;<br>• Displacement and removal of debris and boulders by grapple lay runs and boulder clearance; and |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| | | | • Removal of Out of Service cables using a de-trenching grapnel will temporarily leave an open trench.<br>Possible localized permanent seabed disturbance due to displacement and removal of boulders. |
| Water quality – chemical contamination. | Construction<br>Operation<br>Decommissioning | ✓ | There is potential for ships and hydraulic equipment to discharge contaminants into the sea during construction, maintenance and decommissioning activities, e.g., fluid discharges from horizontal direction drilling, including drilling fluid such as bentonite and / or other comparable slurry.<br>There is also potential that water quality may be impacted by the re-dissolution of contaminants in disturbed soils.<br>Changes in water quality has potential to cause non-compliance with Water Framework Directive (WFD) requirements. |
| Cable laying. | Construction | X | Cable laying is thought to have no significant impact on the seabed or any associated physical processes, therefore it is scoped out of further assessment. |
| Cable burial. | Construction | ✓ | Cable burial techniques in water >10 m deep will cause the sediment to become suspended, increasing turbidity and potentially smothering sensitive habitats and altering the seabed bathymetry once the sediment is re-deposited having been transported in suspension. |
| Cable protection (various methods depending on seabed including rock placement). | Construction<br>Operation | ✓ | The seabed profile will be raised due to the placement of material which will remain in place for at least the lifetime of the cables. Scour may develop about the rock placement and concrete mattressing.<br>Scour can lead to small increases to the amount of sediment becoming suspended.<br>Adverse impacts on water quality have potential to cause non-compliance with WFD requirements. |
| Anchor deployment. | Construction | ✓ | During cable installation in waters < 20 m deep, anchors will likely be used which will impact various points of the seabed up to 1 km from the vessel. |
| Water contamination. | Construction | X | Fluid discharges will be released to the sea during horizontal direction drilling activities. However, biodegradable drilling fluids (PLONOR substances) will be used; drilling fluids will be |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | tested for contamination to determine possible reuse or disposal; and if disposal is required, drilling fluids would be transported by a licensed courier to a licensed waste disposal site. As such the impact of water contamination by drilling fluids is scoped out of further assessment. |
| Nearshore seabed disturbance. | Construction | ✓ | If horizontal direction drilling is used for cable installation at landfall there will be minimal seabed disturbance in the intertidal zone. However, the excavation of the exit pit at the breakout point will likely cause localized seabed disturbance and cause sediment suspension.<br>If trenching is used for landfall cable installation, there is potential for a sediment to become suspended and transported.<br>Significant impacts of sediment plume arising from the cable laying activities are not anticipated; however, further desktop study through the EIA will be carried out to confirm this expectation, including estimation of the extent of sediment transport before deposition. |
| Potential impact of cable and cable protection on the metocean and sediment transport regime. | Operation | ✓ | For at least the lifespan of the project the seabed morphology will be raised where cable protection is emplaced and will inevitably interact with metocean and sediment transport regimes. |
| Removal of cables and cable protection during decommissioning. | Decommissioning | ✓ | The impacts described for cable installation are applicable to the decommissioning phase of the proposed Project. |
| **Benthic Ecology** | | | |
| Direct loss and physical disturbance to benthic habitats and species. | Construction<br>Decommissioning | ✓ | Construction activities associated with the route preparation and array and cable installation phases of the Project can result in temporary physical disturbance to and / or loss of intertidal and subtidal benthic habitats and species.<br>Construction activities associated with route preparation (e.g. clearance) and cable installation can also lead to direct physical disturbance (i.e. reworking) of substrate which may lead to disturbance and / or loss of benthic habitats and species within the footprint and immediate vicinity of the intertidal and subtidal works.<br>Furthermore, cable installation may require protection, such as rock placement, concrete mattresses, or grout bags, at some locations. Introduction of hard substrate would replace otherwise soft substrates, leading to permanent loss of these habitats and species. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>(✓ / X) | Justification |
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| Temporary increase in suspended sediment concentration and sediment deposition leading to contaminant mobilisation, turbidity and smothering effects. | Construction<br>Decommissioning | ✓ | Construction activities associated with the Project has the potential to increase suspended sediment concentration by creating plumes in the water column. Increased suspended sediment concentration results in elevated turbidity, which can affect rates of photosynthesis via a reduction in light availability and an increase in particles in the water may affect feeding efficiency of filter feeders if clogging of filtering systems occurs.<br>Suspended sediment may also settle out, resulting in increased deposition which can smother the seabed and sessile benthic organisms. The resuspension of sediment can also release any sediment-bound contaminants, which can impact benthic communities. |
| Changes to marine water quality from the use of horizontal direction drilling fluids. | Construction<br>Decommissioning | ✓ | Changes to marine water quality arising from the use of drilling fluids and additives has the potential to degrade water quality and harm benthic habitats and species through toxicity. The drilling fluid will be inert (non-toxic) but this pathway scoped in to ensure all potential sources of elements that could affect water quality are considered. |
| Changes to marine water quality from accidental leaks and spills from vessels, including loss of fuel oils. | Construction<br>Decommissioning | ✓ | Changes to marine water quality arising from accidental leaks and spills from vessels has the potential to degrade water quality and harm benthic habitats and species through toxicity and bacteriological contamination. |
| Introduction and spread of Invasive Non-native Species (INNS) via vessel hull or ballast water. | Construction<br>Decommissioning | ✓ | Vessels may inadvertently transport INNS, which can have significant impacts on local fauna. INNS are capable of spreading rapidly, and the effects may not be constrained to the immediate Onshore Scoping Boundary area. The introduction of structures to the seabed may also allow for localised spread of any existing INNS populations. |
| Underwater sound impacts on marine invertebrates. | Construction<br>Decommissioning | X | There has been very little research into the impact of underwater sound on marine invertebrates (including shellfish) which are believed to be sensitive to particle motion rather than to sound pressure. Therefore, there is currently very limited evidence to suggest that the type and duration of underwater sound that will be generated by the Project such as from geophysical surveys, dredging, ploughing and jetting and associated vessel movements, will have any significant effect on benthic invertebrates or benthic communities. Thus, underwater noise disturbance in relation to benthic ecology is scoped out from requiring further consideration. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>( ✓ / X ) | Justification |
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| Disturbance to benthic habitats and species due to subsea cable thermal emissions. | Operation | ✓ | Operation of the HVDC cables generates heat due to resistance in the conductor components, which can warm the cable surface and adjacent environment (i.e. sediments). Temperature increases near the cable can modify chemical and physical properties of the substrate, such as oxygen concentration, microorganism communities, and / or bacterial activity. Physiological changes in macrobenthic organisms living at the water-sediment interface and in the top sediment layers can also potentially occur. |
| Maintenance – potential effects the same as route preparation and cable installation. | Operation | ✓ | As above. |
| Introduction and spread of INNS. | Operation | ✓ | Due to the floating design of turbines, there is expected to be little infrastructure installed on the seabed within the array other than the anchors for the floating substructure; however, the use of cables is expected to require protection, at some locations, which introduces hard substrates to otherwise soft seabed. This could provide additional habitat for any existing INNS populations, but may also create habitat for many endemic species, increasing local biodiversity. Studies have indicated that the introduction of hard substrate in otherwise barren areas are quick to be colonised and used by local species. |
| Effects of EMF emissions. | Operation | X | There is evidence that some benthic invertebrates are able to detect EMF. For example, in laboratory test conditions the brown crab showed a clear attraction to EMF and reduced their time spent roaming. However, the test used an EMF strength of 2.8 mT (millitesla) which is higher than that produced by active subsea DC cables. Scientific experiments around an active cable in Puget Sound found the cable had no impact on crab behaviour, including when they were moving across the cable. Other studies also indicate that invertebrates do not have a notable sensitivity to EMF. For example, there was no impact observed on crustaceans *Crangon crangon*, the round crab *Rhithropanopeus harrisii*, the isopod *Saduria entomon*, and edible mussel *Mytilus edulis* exposed to EMF for several weeks and there was no reduction in gonad index and condition in mussels exposed for three months during the reproductive season.<br>Therefore, there is considered to be no realistic significant interaction between EMF emitted during the operation of the Project and benthic invertebrates or communities; thus, EMF disturbance has been scoped out from requiring further consideration. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| **Fish and Shellfish Ecology** | | | |
| Direct loss and physical disturbance to fish habitats. | Construction<br>Decommissioning | ✓ | There is a potential for the loss of areas of seabed that could be important for fish and shellfish habitat, including spawning grounds, from construction methods including the installation of mooring and anchoring systems for turbines on the seabed, any necessary pre-sweep preparation and installation of the cable. It may also be necessary for the placement of hard substrates on the seabed for cable protection. |
| Physical disturbance to fish and shellfish habitats and species from increased suspended sediment concentrations and sediment deposition. | Construction<br>Decommissioning | ✓ | Project construction methods have the potential to disturb the seabed leading to the creation of sediment plumes with increased suspended sediment concentration and the deposition of sediments to the seabed which could affect areas important for fish habitat, foraging and spawning. |
| Changes to marine water quality from the use of drilling fluids at horizontal direction drilling break-out points and resuspension of sediment contamination during seabed installation works. | Construction<br>Decommissioning | ✓ | The use of drilling fluids at the horizontal direction drilling breakout points could result in decreased water quality that can have effects on the health of fish and shellfish populations, though the drilling fluid used will be inert (i.e. non-toxic) and no significant effects are anticipated.<br>Many of the construction methods used will disturb the seabed. If present, contaminants within the sediment could be released during these works, which could affect water quality and marine ecological receptors including fish and shellfish. |
| Changes to marine water quality as a result of accidental leaks and spills from vessels, including loss of fuel oils. | Construction<br>Decommissioning | ✓ | Accidental leaks and spills from vessels, including loss of fuel oils, could result in decreased water quality that can have indirect effects on the health of fish and shellfish populations. |
| Underwater sound and vibration. | Construction<br>Decommissioning | ✓ | Underwater sound and vibration will be generated by a range of project construction activities including geophysical pre-installation surveys, the potential for impact piling or drilling (these methods cannot be ruled out at this stage) for the installation of piles in the seabed and cable lay activities such as dredging, ploughing and jetting. Man-made sound sources, particularly if of high intensity or long duration have the potential to result in permanent and temporary injury and auditory effects and can result in masking and behavioural disturbance in fish (including eggs and larvae). This includes the potential for underwater sound to act as a barrier |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | to the movement of diadromous fish during key migratory periods. Underwater sound impacts from UXO detonation are excluded from the assessment as the determination of the presence of UXO will not be undertaken until a later stage of the Project. |
| Increase in thermal emissions from cable operation. | Operation | ✓ | Electricity cables are known to produce heat during operation and where they are buried within sediment, research indicates that there may be some increase in substratum temperature which could affect marine receptors within the sediment. It has also been suggested that such increases in temperature may have an impact on temperature responsive bacteria. All potential thermal effects are scoped into the assessment for detailed consideration. |
| Effects of EMF emissions. | Operation | ✓ | EMF emissions from subsea cables have the potential to affect the foraging and migratory success and behaviour of electro-receptive (such as elasmobranchs), migratory fish (such as salmon), and shellfish. Therefore, the worst-case scenario of cables in separate trenches will be appraised. Despite this, it is likely that the HVDC cable may be installed in a bundled bi-pole configuration and most EMF emissions beyond background geomagnetic levels would be cancelled out by the close proximity of the cables. Therefore, no significant impact pathways are expected. |
| Aggregation of fish and associated effects such as barrier effects, collision and entanglement from the presence of floating offshore structures and associated tethering systems. | Operation | ✓ | Floating platforms and infrastructure on the seabed may act as fish aggregating devices, changing species composition and abundance at localised scales and foraging pressure for example, from seals. The physical presence of floating offshore wind infrastructure also has the potential, depending on design, to cause barrier effects, entanglement or collisions either directly or indirectly. |
| Underwater sound and vibration. | Operation | ✓ | Underwater sound resulting from the operation of existing, fixed-bottom offshore floating wind are typically low in frequency and level, within regulatory thresholds, and considered to have a low risk to marine receptors. However, floating turbines may have cables that 'snap' as cable tension is released in the mooring system though this depends on the mooring system design. This tensioning has the potential to generate underwater sound that could affect fish and so will be scoped into the assessment. Back-and-forth cable tension release in the turbine |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | mooring system will also generate particle motion, which is known to be a key acoustic stimulus in fish, including larvae and juveniles. This impact pathway is also scoped in. |
| Effects to fish and shellfish from maintenance activities. | Operation | ✓ | Maintenance potential effects of lower magnitude or the same as installation. |
| **Marine Mammals** | | | |
| Effects of underwater sound. | Construction Decommissioning | ✓ | Marine mammals are highly sensitive to underwater sound and man-made sound can mask communication signals, cause auditory injury (temporary and permanent threshold shifts), and induce behavioural changes. |
| Collision with Project vessels. | Construction Decommissioning | ✓ | Marine mammals may be susceptible to collision with operations vessels, which can result in lethal and sub-lethal injury. However, many factors contribute to the likelihood and severity of vessel collisions with marine mammals (e.g. vessel speed and size, species distribution and behaviour) and a detailed risk assessment will be undertaken in the ES for the species present within the Study Area. |
| Alteration of water quality due to unplanned, releases, accidental leaks and spills from vessels and plant. | Construction Decommissioning | ✓ | Accidental / unplanned release of vessel fuels and pollutants could have a significant impact on marine mammals by altering local water quality. Although the risk of occurrence is low, an Environmental Management Plan will be developed for required operations and procedures to minimise the likelihood of occurrence and subsequent impact should it occur. Due to the potentially significant impacts of altered water quality, this impact pathway is scoped into the ES. |
| Temporary increase in suspended sediment concentrations and sediment deposition leading to contaminant mobilisation. | Construction Decommissioning | X | Suspended sediment is expected to be minimal and confined to the lower reaches of the water column, due to the depth at which works will occur. Furthermore, marine mammals are frequent inhabitants of turbid environments with low visibility, and studies have indicated that they do not typically experience severe impact from increased suspended sediment concentrations. |
| Potential for indirect effects through impacts to prey species. | Construction Decommissioning | ✓ | Due to the potential impacts to benthic communities and fish and shellfish species, there remains the possibility of indirect impact to marine mammals through disturbance to prey |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | species. This may include impacts that have been scoped out as direct impacts to marine mammals. This pathway has been scoped in to the ES. |
| Airborne sound and visual disturbance. | Construction<br>Decommissioning | ✓ | Airborne sound from vessels has the potential to affect seals located at coastal breeding sites. Considering the proximity of sites known to host breeding grey seal populations, this impact pathway has been scoped in for assessment. |
| Barrier effects from installation of mooring lines and cables between platform and anchor. | Operation<br>Decommissioning | ✓ | This impact pathway has been scoped in as a precautionary measure to properly assess in the EIA as the final configuration is still to be designed. However, a significant impact is not expected. |
| Entanglement with mooring lines and cables. | Operation<br>Decommissioning | ✓ | The floating configuration of the array requires long mooring lines to connect turbines with their anchors, thus posing an entanglement risk for marine mammals. These lines may also ensnare derelict fishing gear, which may further increase entanglement risk. A recent assessment of entanglement risk with marine renewable energy resources has found that moorings pose a moderate risk to large baleen whales, which expands to a wider range of species if derelict fishing gear becomes attached. Preliminary data indicates that the risk of entanglement for marine mammals with mooring lines is small, although further assessment is required. This pathway has been scoped in for further consideration in the ES. |
| Effects of EMF emissions. | Operation<br>Decommissioning | ✓ | There is potential for EMF from subsea cables to interfere with marine mammal behaviour, as they rely on the Earth's magnetic field for navigation; however, the impacts of EMF are still poorly understood so they have been scoped in for further assessment in the EIA. |
| Maintenance activities. | Operation<br>Decommissioning | ✓ | Maintenance - potential effects same as construction. |
| **Ornithology** | | | |
| Direct disturbance and displacement of birds associated with sound, visual impacts and presence from vessel and construction | Construction<br>Decommissioning | ✓ | Various activities associated with the route preparation, array and cable installation phases of the proposed Project may result in disturbance and displacement of marine ornithological receptors, including, construction and decommissioning activities such as vessel movements |

| Topic or Receptor | Project Phase(s) | Scoped In or Out<br>( ✓ / X ) | Justification |
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| / decommissioning activity in offshore environments. | | | and increased noise may result in displacement and / or avoidance of birds foraging or loafing in the area.<br>The ongoing Llŷr Project offshore bird surveys being carried out will establish the abundance and spatial and temporal distribution of seabirds in the Study Area. |
| Direct loss and disturbance of seabed habitat used by foraging seabirds from construction / decommissioning activities. | Construction<br>Decommissioning | ✓ | There is a potential for direct loss and disturbance of seabird foraging habitat through the placement and removal of offshore project infrastructure. This includes the potential loss of prey items (such as herring and sandeel) for which certain subtidal habitat are important. The loss of benthic habitat will be limited to the locations of the cable installation, anchoring points and at landfall locations. This includes the placement of hard substrates on the seabed for cable protection.<br>The ongoing Llŷr Project offshore bird surveys being carried out will establish the abundance and spatial and temporal distribution of seabirds in the Study Area. |
| Direct disturbance and displacement to foraging diving birds from underwater noise (including piling activities and UXO detonation). | Construction<br>Decommissioning | ✓ | Diving seabirds may be temporarily displaced due to underwater noise (e.g. UXO detonations) which could result in behavioural changes such as changes in swimming direction, diving duration and/or avoidance in the area and interfere with their ability to forage successfully.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds and will identify what species are present and the spatial / temporal distribution of these species within the Study Area. |
| Barrier effect of offshore arrays to seabird movements to and from breeding / foraging grounds or on migration. | Operation | ✓ | The presence of the offshore arrays may result in a barrier effect to bird movements. cause birds in the vicinity to be displaced.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for seabirds and will identify what species are present and the spatial / temporal distribution of flight activity within the Study Area. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| Injury or mortality due to collision with turbines. | Operation | ✓ | Birds in flight are at direct risk of injury or mortality due to collision with the offshore wind turbines if they pass through the turbine arrays.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds and will identify what species are present and the spatial / temporal distribution of flight activity within the Study Area. |
| Displacement or disturbance due to vibration from offshore arrays during operation. | Operation | X | While the operation of the offshore arrays may result in vibration, this is likely to be relatively minor and localised and is therefore not likely to significantly disturb or displace seabirds in the area and is scoped out from further assessment. |
| Displacement and avoidance of birds from foraging or loafing areas due to effective loss of habitat and presence of offshore arrays and associated activities (e.g. maintenance vessels). | Operation | ✓ | The presence of the offshore arrays may deter birds from using the area to forage and/or commute.<br>The ongoing Llŷr Project offshore bird surveys being carried out will determine the importance of the Study Area for foraging seabirds and will identify what species are present and the spatial / temporal distribution of these species within the Study Area |
| Attraction of nocturnal seabirds (e.g. petrels and shearwater) to project infrastructure lighting. | Operation | ✓ | Nocturnal seabirds may be attracted to the offshore project infrastructure lighting causing them to become disorientated and/or increase their risk of collision with the offshore arrays.<br>The offshore bird surveys will provide information to inform which species are present in the area. |
| Direct creation of roosting habitat for birds due to presence of floating platforms and associated infrastructure. | Operation | ✓ | The introduction of floating platforms and associated infrastructure presents the opportunity for new roosting habitat which may be utilised by foraging birds.<br>The offshore bird surveys will provide information to inform which species are present in the area. |
| Increased entanglement risk to diving seabirds from ghost fishing gear catching on project infrastructure. | Operation | ✓ | The presence of the offshore arrays may cause ghost fishing gear (*i.e* any discarded, lost, or abandoned, fishing gear in the marine environment) to get caught on the Project |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | infrastructure. This fishing gear then poses a risk that seabirds could get entangled in the fishing gear causing injury and / or mortality. |
| **Marine Archaeology** | | | |
| Direct impacts on buried marine archaeological / (Palaeo) environmental remains within the Array Area and Offshore Cable Scoping Boundary causing destruction or damage of the assets.<br>Indirect impact associated with changes to marine and coastal processes. | Construction<br>Operation<br>Decommissioning | ✓ | Direct, physical impacts to heritage assets would result in the total loss of their heritage. This would constitute a medium or high impact which, without mitigation, would likely result in a significant effect. Exposure of buried remains following changes to marine or coastal processes could result in increased degradation. Conversely, burial of remains caused by changes to marine or coastal processes could be considered positive. |
| Direct impacts on maritime and aviation archaeology within the Array Area and Offshore Cable Scoping Boundary causing destruction or damage of the assets.<br>Indirect impact associated with changes to marine and coastal processes. | Construction<br>Operation<br>Decommissioning | ✓ | High potential for an impact to be of permanent negative effect, and without mitigation would be of major significance. Exposure of buried remains following changes to marine or coastal processes could result in increased degradation. Conversely, burial of remains caused by changes to marine or coastal processes could be considered positive. |
| Changes to the historic seascape and character of the area. | Construction | ✓ | The acquisition of new information of the offshore historic environment and cultural heritage resource of the Project through geophysical, geotechnical, fieldwork surveys, and excavation exercises could significantly contribute to the understanding of archaeology in the region. |
| **Shipping and Navigation** | | | |
| Visual intrusion and noise pollution caused by Project activities affecting commercial and recreational vessels. | Construction<br>Decommissioning | ✓ | The construction of the Project will result in visual and noise pollution. This has the potential to impact commercial and recreational vessels. |
| Impacts on vessel navigation routes. | Construction<br>Decommissioning | ✓ | Although the offshore array does not sit in any principal navigation routes, the export cable route passes through a principal navigational channel in which vessels transit in and out of the Bristol Channel and Milford Haven. The construction of the Project will temporarily cause the |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | displacement of vessel using this channel, which could result in extended transiting times, particularly affecting fishing and other commercial vessels. Furthermore, the displacement of vessels could result in interaction between larger vessels and smaller vessels using the same route, which has the potential to result in safety concerns. |
| The impact of the Project on navigational and communication equipment in small vessels. | Construction Decommissioning | ✓ | Project vessels during construction could interfere with equipment in smaller vessels, resulting in navigation and communication issues. Construction vessels and plant may also restrict the view of other marine users and marine emergency responses, resulting in poor communication. |
| Adverse weather conditions resulting in drifting recreational vessels. | Construction Decommissioning | ✓ | Storm events and other adverse weather resulting in poor sea and navigational conditions could result in the drifting of small recreational vessels into Project construction vessels resulting in damage to vessels and equipment. |
| Interference of Project vessels with commercial and recreational vessels. | Construction Decommissioning | ✓ | The increase of vessels due to the Project could interfere with other vessels in the area, particularly those transiting in and out of Milford Haven and the Bristol Channel during the construction phase. |
| Displacement of anchorages. | Construction Decommissioning | ✓ | Anchorages could be displaced during construction of the Project, for example during the export cable route clearance. This has potential to cause implications to the nearby shipping industries which may rely on nearby anchorages within Milford Haven for example. Many large commercial vessels use anchors whilst waiting to enter waterways, suggesting this could interfere with the transit of vessels in and out of Milford Haven. |
| Impacts to navigational safety. | Construction Decommissioning | ✓ | During the construction of the Project, changes in water depth may occur, for example during clearance of the areas within the Array Area and Offshore Cable Scoping Boundary and potential sweeping of sandwaves. Changes in water depth have the potential to cause navigational issues, particularly for larger vessels. This is most likely to cause effect along the export cable route into Milford Haven and could cause safety issues such as grounding or vessel damage. Changes to navigation routes may also encourage smaller vessels to enter shipping routes, resulting in a reduction of space for manoeuvring. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | This could also cause a considerable interruption to emergency response service vessels such as the Royal National Lifeboat Institution which has a base in Angle Bay, Milford Haven. |
| Collision risk with other marine users, passing vessels and Project devices and infrastructure. | Construction<br>Decommissioning | ✓ | During construction, there will be an increased presence of Project vessels in the vicinity of the Project. This has potential to cause increased collisions between Project vessels and other marine users such as commercial and recreational craft. Furthermore, the Project devices and infrastructure could also present a collision risk during construction, resulting in damage to both the Project and other marine vessels. Construction activities may also encourage marine users to deviate from normal routes, leading to the presence of small recreational vessels in main shipping lanes and increased collisions. |
| Interaction with subsea cables. | Construction<br>Decommissioning | ✓ | There is the potential for interaction between the subsea cables and fishing gear, which may become caught on cable infrastructure. The deployment of anchors by other marine users may also interact with the subsea cables. Although mitigation measures such as cable burial and rock placement will be implemented to avoid these interactions, there is potential for subsea cables to be exposed during Project construction. |
| The impact of the Project on navigational and communication equipment in small vessels. | Operation | ✓ | The Project infrastructure and any maintenance required during the operation of the Project has the potential to interfere with equipment in smaller vessels. Studies have found that windfarms can disrupt the detection of smaller vessels on navigation and communication systems if they are very close to the structure. |
| Adverse weather conditions resulting in drifting recreational vessels. | Operation | ✓ | Storm events and other adverse weather resulting in poor sea and navigational conditions could result in the drifting of small recreational vessels, potentially making contact with stationary Project infrastructure during Project operation which could result in damage to both parties. |
| Interference of Project vessels with commercial and recreational vessels. | Operation | ✓ | Work and maintenance vessels could interfere with commercial and recreational craft during the operation and maintenance of the Project, particularly during any repairs to the export cable route which lies in a busy navigation channel, and in the entrance to Milford Haven. |
| Displacement of anchorages. | Operation | ✓ | Anchorages may be displaced during any potential repairs to the export cable or landfall site during the operation of the Project. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| Impacts to navigational safety. | Operation | ✓ | Additional rock placement may be required for Project repairs during the operation and maintenance of the Project, which would result in a depth change. This has the potential to cause long-term navigational issues for the duration of the Project and could cause safety issues such as grounding or vessel damage. This could also encourage deviation from normal routes for some vessels, resulting in the clogging of shipping lanes. Furthermore, changes in water depth may implicate emergency service responses, such as the Royal National Lifeboat Institution based in Angle Bay. |
| Collision risk with other marine users, passing vessels and Project devices and infrastructure. | Operation | ✓ | Given the high density of vessels using navigation channels in the vicinity of the Project, there is an increased likelihood of collision with maintenance and service vessels during the operation of the Project. This is thought to be particularly likely in the entrance to Milford Haven due to use by both commercial and recreational craft, and in some instances inexperienced marine users. Furthermore, the Project infrastructure also presents a collision risk during its operational lifetime, which could result in damage to both the Project and other marine vessels. |
| Interaction with subsea cables. | Operation | ✓ | During the operation of the Project, subsea cables may be exposed during maintenance / repairs or bad weather conditions. This presents a risk of entanglement of fishing gear and anchors on the cable. |
| **Commercial Fisheries** | | | |
| Loss or restricted access to commercial fishing grounds. | Construction<br>Decommissioning | ✓ | Works associated with the construction of the proposed Project will require a series of marine vessels transiting and operating within the North-east Celtic Sea, Bristol Channel, and Milford Haven. These have the potential to result in the temporary loss of, or restricted access to, commercial fishing grounds. Further, static fishing gear such as pots and traps may cause obstruction to construction activities. Temporary removal, lifting, or replacement may be required at limited and specific locations. Any Project interaction with known *Nephrops* grounds, scallop dredging areas or lobster/crab potting grounds will be specifically considered. |
| Loss or restricted access to commercial fishing grounds. | Operation | ✓ | The installation of rock armouring / concrete mattressing along the cable route may present an obstruction on the seabed which could result in the loss of commercial fishing grounds |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
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| | | | during the operational phase of the proposed Project. Obstructions on the seafloor may prevent or limit certain types of fishing gear due to the potential for snagging of the equipment. This will predominantly impact mobile demersal fishing gears, such as trawls and drift nets. In addition, static fishing gear such as pots and traps may cause obstruction to maintenance activities. Temporary removal, lifting, or replacement may be required at limited and specific locations. |
| Displacement of commercial fishing activities. | Construction Operation Decommissioning | ✓ | Any loss or restricted access to commercial fishing grounds could result in increased competition if these vessels are displaced to alternative grounds and fisheries resources. |
| Obstruction of navigation / steaming routes to commercial fishing grounds. | Construction Operation Decommissioning | ✓ | The presence of marine vessels and associated exclusions or safety zones could result in the temporary increase in steaming distances and times for commercial fishing vessels to avoid these. This could lead to increased operational costs of the fishing vessels. |
| Indirect effects on commercial fisheries. | Construction Operation Decommissioning | ✓ | There is potential for any works associated with the proposed Project to indirectly impact commercial fisheries as a result of impacts on the behaviour and distribution of fish. |
| Potential for small scale employment of local boat(s). | Construction Operation Decommissioning | X | Vessels hired to provide guard vessel services will have to meet certain standards. The final decision will be made by the installation contractor, but is not considered to have a significant impact on commercial fisheries. |
| **Other Sea Users** | | | |
| Disruption to existing Ministry of Defence and Royal Navy activity in and around the Castlemartin range and surrounding sea area. | Construction Operation Decommissioning | ✓ | The exact scope for construction activity and, subsequently, fully operational wind turbines to interfere with Ministry of Defence operations (including radars, communications and surveillance systems) is currently unknown and will require further assessment within the EIA. |
| Interaction with UXO has the potential to cause risk to life and damage to ecological receptors. | Construction Operation Decommissioning | ✓ | Due to the proximity of military activity there is potential for encountering UXO and as such, assessment will be required within the EIA. |

| Topic or Receptor | Project Phase(s) | Scoped In or Out (✓ / X) | Justification |
|---|---|---|---|
| Risk of construction works / vessels creating direct impacts (disturbance of spoil material) on known marine disposal sites. | Construction<br>Operation<br>Decommissioning | X | As no project infrastructure will be located in this disposal site, no direct impacts (disturbance of spoil material) are predicted. |
| Disruption to routine port operations via project related activities. | Construction<br>Operation<br>Decommissioning | ✓ | The exact scope of interference on existing port operations (including vessel movements; maintenance dredging) is not clear and will require further assessment within the EIA. |
| Damage to existing cables. | Construction<br>Operation<br>Decommissioning | ✓ | Depending on export cable routing, there is potential for interaction with the Greenlink interconnector cable. |
| Potential impact on licensed marine aggregate activities. | Construction<br>Operation<br>Decommissioning | X | No licensed marine aggregate activities occur within the Study Area so there is no scope for impacts. |
| Potential impact on licensed oil and gas exploration activities | Construction<br>Operation<br>Decommissioning | X | No licensed oil and gas exploration activities occur within the Study Area so there is no scope for impacts. |
| Potential adverse impacts on planned marine renewable energy projects in the Study Area. | Construction<br>Operation<br>Decommissioning | ✓ | The exact scope of interference on other planned marine renewables energy projects is not clear and will require further assessment within the EIA. |

## APPENDICES

*Appendix 4-1. Environmental Risk Register Template*

| ID | Risk Event (High level) | Risk Description | Reasonable worst case consequence if event did occur | Worst Case Severity of Harm | Duration | Consequence | Embedded mitigation | Likelihood | Tolerability | Additional Mitigation | Tolerability and Significance | Cross references |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | | | | | | |
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| **Operation** | | | | | | | | | | | | |
| Op-1 | | | | | | | | | | | | |
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