Fishguard Replacement Linkspan

Environmental Statement
Volume I Main text

ES

April 2026

ENVIRONMENTAL STATEMENT VOLUME I MAIN TEXT

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ENVIRONMENTAL STATEMENT ABBREVIATIONS/ACRONYNS

°C	Degrees Celsius
AADT	Average Annual Daily Traffic
ACM	Asbestos Containing Material
ADDs	Acoustic Deterrent Devices
AEP	Annual exceedance probability
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Standard
ASSI	Area of special scientific interest
ALC	Agricultural Land Classification
Auditory Injury (AUD INJ)	A total or partial permanent loss of hearing caused by some kind of acoustic trauma. AUD INJ results in irreversible damage to the sensory hair cells of the ear and thus, a permanent reduction of hearing acuity.
AURN	Automatic Urban and Rural Network
Bgl	Below Ground level
BGS	British Geological Survey
CAFÉ	Cleaner air for Europe
cAL	Chemical Action Level
CCC	Climate Change Committee
CCRA	Climate Change Risk Assessment
CD	Chart Datum
CD&E	Construction Demolition & Excavation
Cefas	Centre for Environment, Fisheries and Aquaculture Scence
CEMP	Construction environmental management plan
CFSR	Climate Forecast System Reanalysis
CH_4	Methane
CIEEM)	Chartered Institute for Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists for the preparation of desk-based assessments
CIHT	Chartered Institute of Highways & Transportation
CMS	Construction Method Statement

CO_2	Carbon dioxide
CoCP	Code of Construction Practice
COP26	The 2021 United Nations Climate Change Conference
CRAPW	Central Registry of Aerial Photographs for Wales
DA	Devolved Administrations
Decibel (dB)	A relative scale most commonly used for reporting levels of sound. The actual sound measurement is compared to a fixed reference level and the "decibel" value is defined to be $10 \cdot \log_{10}$(“actual”/”reference”), where (“actual”/”reference”) is a power ratio. The standard reference for underwater sound pressure is 1 micro-Pascal (µPa), while 20 micro-Pascals is the standard for airborne sound. The dB symbol is often followed by a second symbol identifying the specific reference value (i.e. re 1 µPa).
Decidecade	Refers to a set step in frequency, similar to “one-third-octave”, defined as a ratio of $10^{0.1} \approx 1.259$ (one third octave is $21/3 \approx 1.260$). Used interchangeably with “3rd octave”.
DEFRA	Department for Environment Food and Rural Affairs
DfI	Department for Infrastructure
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EcIA	Ecological Impact Assessment
EC	European Commission
EIA	Environmental Impact Assessment
EQSD	Environmental Quality Standards Directive
EMODnet)	European Marine Observation and Data Network
EMP	Environmental Management Plan
EPUK	Environmental Protection United Kingdom
ES	Environmental Statement
ETS	Emissions Trading Scheme
EU	European Union
EUMM	European Union Monitoring Mechanism
FCA	Flood Consequence Assessment
FD	Floods Directive
FRMP	Flood Risk Management Plan
GGBS	Ground granulated blast-furnace slag
GHGs	greenhouse gases
GHGI	Greenhouse Gas Inventory

GES	Good Environmental Status
GN	General Policies
Grazing angle	A glancing angle of incidence (the angle between a ray incident on a surface and the line perpendicular to the surface).
HDV	Heavy Duty Vehicle
HFCs	Hydrofluorocarbons
HIA	Health Impact Assessment
HSE	Health and Safety Executive
HMWB	Heavily Modified Water Bodies
HER	Historic Environment Record
IAIA	International Association for Impact Assessment
IAMMWG	Interagency Marine Mammal Working Group
IAQM	Institute of Air Quality Management
ICE	The Inventory of Carbon and Energy
ICES	the International Council for the Exploration of the Seas
ICT	Information and Communication Technologies
IEFs	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
IMO	International Maritime Organisation
INNS	Invasive Non-Native Species
IPCC	Intergovernmental Panel on Climate Change
IPH	Institute for Public Health
IUCN	Conservation of Nature
JNCC	Joint Nature Conservation Committee
kgCO_2e/kg	Kilograms of carbon dioxide equivalent per kilogram
Km	Kilometre
Kt	Knots
ktCO_2e	Kilotonnes of carbon dioxide equivalent
Kurtosis	A statistical measure of “peakedness” of a distribution (of e.g. pressure values in a sound pulse). Defined in ISO 5479:1997
LAQM	Local Air Quality Management
LCRM	Land Contamination Risk Management’
LDP	Local Development Plan
LDV	Light Duty Vehicle
LNG	Liquefied natural gas
LULUCF	Land Use, Land-Use Change and Forestry

M	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MarESA	Marine Evidence Based Sensitivity Assessment
MGO	Marine gas oil
MHWS	mean high water spring tide
MCZ	Marine Conservation Zones
Mm	Millimetre
MMO	Marine Management Organisation
MMMP	Marine Mammal Mitigation Plan
Mph	Miles per hour
MPCP	Marine Pollution Contingency Plan
MPAs	Marine Protected Areas
MRF	Material Recycling Facility
MSFD	Marine Strategy Framework Directive
MSY	maximum sustainable yield
$MtCO_2e$	Million Tonnes of Carbon Dioxide Equivalent
MUs	Marine mammal Management Units
N_2O	Nitrous Oxide
NAEI	National Atmospheric Emissions Inventory
NBN	National Biodiversity Network
NCEI	National Centre for Environmental Information
NETCEN	National Environmental Technology Centre
NF_3	Nitrogen Trifluoride
NMP	National Marine Plan
Noise	Sound that is irrelevant, unwanted, or harmful to the organism(s) in question. Noise is often detrimental, but not necessarily so.
NRW	Natural Resource Wales
NSP	Navigation Safety Plan
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NO_x	Oxides of Nitrogen
NOX	Nitrogen Oxides
OD	Ordnance Datum
OS	Ordnance Survey
OSPAR	Oslo Paris Convention
PAH	Polycyclic Aromatic Hydrocarbons
PCU	Passenger Carrier Equivalent Units

PDE	Project Design Envelope
PFCs	Perfluorocarbons
PfG	Programme for Government
PFRA	Preliminary Flood Risk Assessment
PM_{10}	Particulate Matter
$PM_{2.5}$	Particulate Matter
POP	Preferred Options Paper
PTS	Permanent Threshold Shift
Peak Level, Peak Pressure Level (L_P)	The maximal sound pressure level of an event, formally: “ten times the base-ten logarithm of the maximal squared pressure divided by the reference pressure squared” or “twenty times the base-ten logarithm of the peak sound pressure divided by the reference pressure, where the peak sound pressure is the maximal deviation from ambient pressure”. Defined in ISO 18405:2017, 3.2.2.1
POMs	Programme of Measures
PRA	Preliminary Risk Assessment
ProW	Public Rights of Way
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RCPs	Representative Concentration Pathways
RNLI	Royal National Lifeboat Institution
RIGS	Regionally Important Geological Sites
RBMP	River Basin Management Plan
SACs	Special Areas of Conservation
SCIs	Sites of Community Importance
SCOS	Special Committee on Seals
SEPA	Scottish Environment Protection Agency
Sound Exposure Level (SEL)	The cumulative sound energy in an event, formally: “ten times the base-ten logarithm of the integral of the squared pressures divided by the reference pressure squared”. Equal to the often seen “L_E” or “dB SEL” quantity. Defined in: ISO 18405:2017, 3.2.1.5
SF_6	Sulphur Hexafluoride
Source Level (SL)	Taken here to mean the level (SEL/SPL/L_P) at 1 meter range. If not otherwise stated, it is assumed the source is omnidirectional (equal level in all directions). For sources larger than 1m in radius, the Source Level is back calculated to 1m.
SLNCI	Sites of Local Nature Conservation Importance
SLVIA	Seascape, Landscape & Visual Impact Assessment

SO_2	Sulphur Dioxide
SPA	Special Protected Areas
SPM	Suspended Particulate Matter
SPLs	Significant Pollutant Linkages
SSCs	Suspended Sediment Concentrations
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TAN	Technical Advice Note
TfL	Transport for London
TG	Technical Guidance
Temporary Threshold Shift (TTS)	Temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.
UK	United Kingdom
UKCP	UK Climate Projections
UNFCCC	United Nations Framework Convention on Climate Change
UKNAQS	UK National Air Quality Strategy
VMP	Vessel Management Plan
VOCs	volatile organic compounds
WAQF	Welsh Air Quality Forum
WFD	Water Frameworks Directive
WFG	Well-being of Future Generations
WHO	World Health Organisation

WIMD	Welsh Index of Multiple
WOE	Weight of Evidence
WTT	Well-to-tank
WWBIC	West Wales Biodiversity Information Centre
WWRBD	Western Wales River Basin District
µg	Microns

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 1 Introduction

1 Introduction

1.1 Introduction

This Environmental Statement (ES) has been prepared by RPS on behalf of Stena Line Ports Ltd 'Stena Line' for a replacement linkspan at Fishguard Harbour (hereafter referred to as 'the Proposed Development').

1.2 Context

The primary purpose of this ES is to provide assessment of the likely direct and indirect significant effects of the project in support of a Marine License application, to be submitted to Natural Resource Wales (NRW).

1.3 Marine Licence

Under the Marine and Coastal Access Act (MCAA) 2009, it is a licensable marine activity to undertake a range of activities as defined by Section 66 of the Act, including:

- Deposition of any substance or object, in the sea or on or under the seabed, from:
  - − Any vehicle, vessel, aircraft or marine structure
  - − Any container floating in the sea
  - − Any structure on land constructed or adapted wholly or mainly for the purpose of depositing solids in the sea
- Construction, alteration or improvement works either in or over the sea or on or under the sea bed
- Use of a vehicle, vessel, aircraft, marine structure or floating container to remove any substance or object from the sea bed
- Carrying out any form of dredging, whether or not involving the removal of any material from the sea or sea bed

The MCAA defines 'the sea' as:

Any area submerged at mean high water spring tide. This includes waters in any area that is closed, whether permanently or intermittently, by a lock or other artificial means against the regular action of the tide, but:

- − Into which seawater is caused or permitted to flow, whether continuously or from time to time, and:

- From which seawater is caused or permitted to flow, whether continuously or from time to time

- The waters of every estuary, river or channel, as far as the tide flows at mean high water spring tide (MHWS).

In consideration of the above requirements outlined in the MCAA, the Proposed Development is considered to constitute a licensable activity and as such, requires a marine license prior to commencement of works.

1.4 Environmental Impact Assessment

EIA is a key instrument of European Union environmental policy and a procedure required under the terms of European Union Directive 2014/52/EU on assessment of the effects of certain public and private projects on the environment. Article 2 of the Directive requires, inter alia, that "Member States shall adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects." Article 8 requires that "The results of consultations and information gathered pursuant to [the EIA process] must be taken into consideration in the development consent procedure".

The Marine Works (EIA) Regulations 2007 (as amended) incorporate the European Environmental Impact Assessment (EIA) Directive into UK law. The Directive aims to ensure that the authority giving the consent for projects is aware of any likely significant environmental effects before making its decision.

1.5 ES Structure

The ES is comprised as follows:

- Non-Technical Summary
- Volume I – Main Statement
- Volume II – Appendices
- Volume III –Figures
- Volume IV – HRA

Where figures referenced in the chapters of this ES ae not located within the relevant chapter, they are provided in ES Volume II.

The ES comprises the following specific chapters and authors:

Chapter Number	Chapter Title	Consultant	Qualifications
1	Introduction	Michelle Price, TetraTech	BLE (Hons) MRTPI
2	Project Description	Gavin Nicholl, TetraTech	BLE (Hons) MRTPI
3	Project Need & Alternatives	Michelle Price, TetraTech	BLE (Hons) MRTPI
4	EIA Process and Methodology	Michelle Price, TetraTech	BLE (Hons) MRTPI
5	Scoping and Consultation	Michelle Price, TetraTech	BLE (Hons) MRTPI
6	Policy & Legislation	Michelle Price, TetraTech	BLE (Hons) MRTPI
7	Human Health	Katie Hirono, TetraTech	MA PGDip CEnv MIEMA PFPH
8	Marine Biodiversity	Ellie Cooper, TetraTech	BSc Hons, MSc
9	Terrestrial Ecology & Ornithology	Paul Turner, TetraTech	BSc, MSc
10	Coastal Processes	Kristopher Calder, TetraTech	BSc (HONS) MSc C.Sci MCIWEM C.WEM AMICE
11	Water Resources & WFD	Mark Magee, TetraTech	BA, MSc, CSci, CEnv, CWEM, MCIWEM
12	Flood Risk	Diane MacGinnis, TetraTech	BEng, MSc
13	Noise & Vibration	Kerith McDonnell, TetraTech	BSc, MSc, MIOA
14	Underwater Acoustics	Rasmus Pederson, TetraTech	BSc. MSc, PhD
15	Air Quality	Stephen McAfee, TetraTech	BSc, MSc, AIEMA, MIAQM, IES
16	Archaeology, Architectural & Cultural Heritage	Nick Cooke, TetraTech	BA (Hons), PhD, MCIfA, FSA
17	Soils, Geology & Geohydrology	Joseph McGrath, TetraTech	MCIWEM C.WEM C.Sci
18	Land Use & Material Assets	Michelle Price, TetraTech	BLE (Hons) MRTPI

19	Transport	Conor O'Hara, TetraTech	MSc, BSc, CMILT, MCIHT
20	Seascape, Landscape & Visual	Stuart Anderson, TetraTech	BSc, Dip LandMan, Dip For, CMLI
21	Waste	Peter Braithwaite, TetraTech	BSc, MSc
22	Climate	Stephen McAfee, TetraTech	BSc, MSc, AIEMA, MIAQM, IES
23	Risk of Major Accidents & Disasters	Michelle Price, TetraTech	BLE (Hons) MRTPI
24	Shipping & Navigation	Client (Stena Line)	
25	Interactions	Sarah Little, TetraTech	BSc (Hons), MA

Table 1 List of Chapters

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 2 Description

2 Project Description

2.1 Site Location

The application site is located within Goodwick/Fishguard, Pembrokeshire (central grid reference 195171.227: 238812.970).

The site is a parcel of land spanning an area of approximately 0.9 hectares of the harbour, to include the existing linkspan, hinterland and within the bay foreshore.

The port was created in the 1910s by reclaiming land at the base of the headland. The site is indicated in Figure 1-1 and Figure 1-2 shown below.

Figure 2-1 Site Location

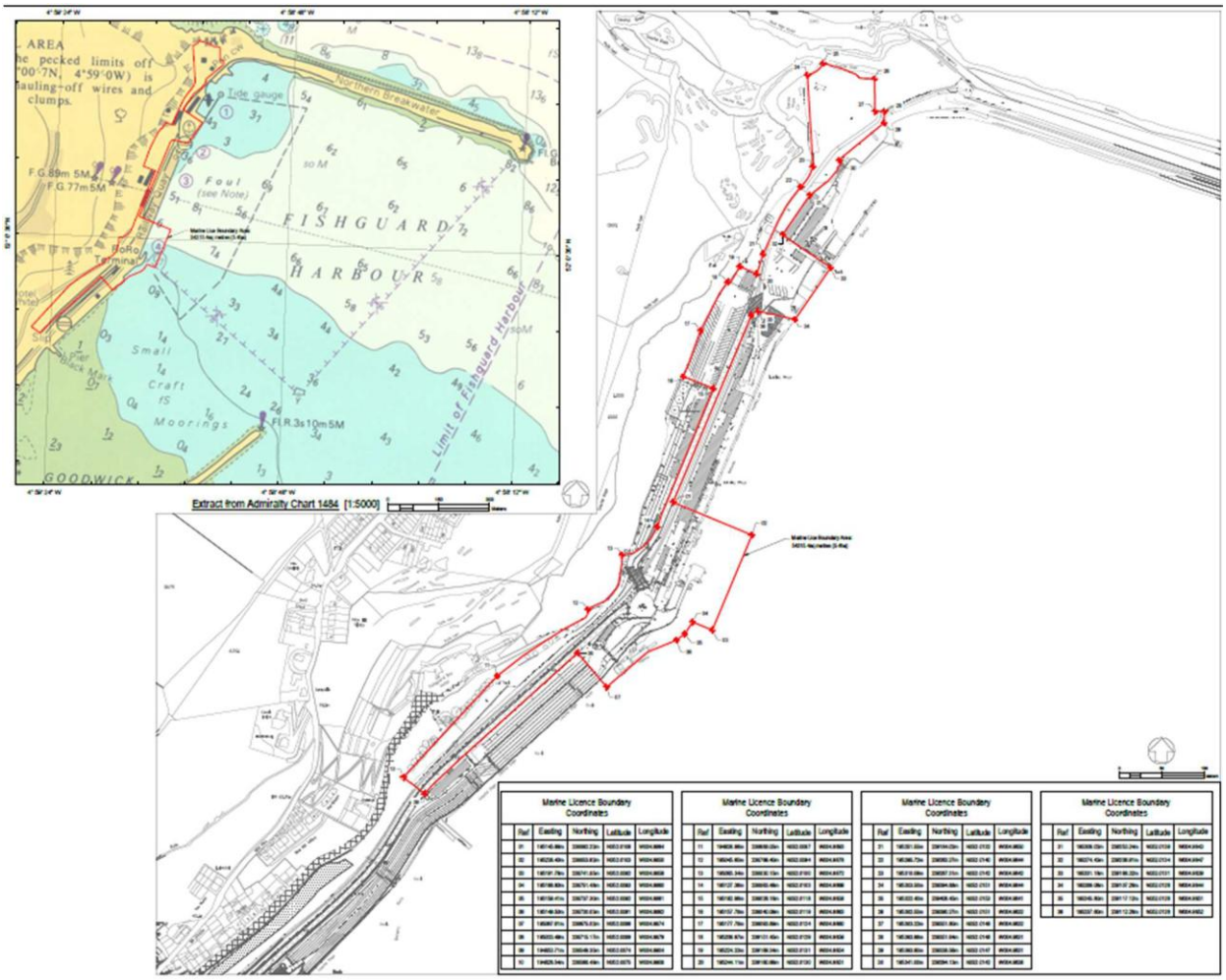

Figure 2-2 Site Boundary

The site lies within the northern fringes of Goodwick which is a coastal town immediately west of its twin town of Fishguard, within Fishguard Bay. It is bound by steep cliff faces and the Fishguard train Station to the western extents; a breakwater to the north and RNLI Lifeboat Station. Residential properties of Harbour Village lie to the west elevated above Fishguard Bay.

The site is accessed from the A40/Station Hill to the south. The current Stena Line operation includes a twice daily ferry service to Rosslare, covering public ferry passengers and accompanied and unaccompanied freight. The berth is also infrequently used by cruise vessels and historic steamboats.

2.2 Overview

Stena Line Ports Ltd (SLPL) operate the ferry terminal in Fishguard. Vehicles embark/disembark the ferries via a temporary linkspan structure which is nearing the end of its useful life. See Figure 1-3 below.

Figure 2-3 Existing Jack UP Brage, Linspan Bridge, Towers and Concrete Buffer Dolphin

To safeguard the future of the port and provide a safe, long-term solution, SLPL wish to replace the existing linkspan with a new arrangement. The new arrangement consists of a pontoon restrained by steel tubular piles, and a replacement bridge structure spanning from the existing concrete deck to the new pontoon.

Civil engineering works are required to accommodate the new arrangement. These works include removal of the existing steel structures and jack up barge, dredging, piling, scour protection and repairs to the open piled concrete structure. New connections to the existing concrete bankseat will be required for the new bridge. Remedial works may be required to the bankseat to allow installation of new connections. Repair works to the suspended concrete deck approach will also be required. A new bankseat structure is included in the licence in the event that the existing structure is not deemed acceptable for the new bridge and traffic loads.

Partial demolition of the buffer dolphin towers is also required to allow installation of the new bridge.

In the event that the existing deck structure cannot support the proposed bridge, a piled bankseat structure is proposed. The structure would be constructed from precast reinforced concrete or a steel frame, supported by 6 nr steel tubular piles.

Plough dredging will be carried out beneath the existing jack up barge to redistribute soft material to allow more straightfoward installation of rock armour scour protection.

It is proposed that all dredging will be undertaken by plough dredging, moving soft material from under the pontoon to the scour pocket in the berth immediately north of the linkspan structure.

A shutdown of the ferry operations will be required to construct the civil engineering infrastructure and install the new pontoon. It is expected that this shutdown will last approximately 2 months.

2.3 Components

The project involves several key activities aimed at enhancing the infrastructure and operational capabilities of the harbour. These include the following:

- Removal of Structures
  - Existing Linkspan bridge, equipment and kiosk including lattice support structure between the buffer dolphins
  - Jack up barge
- Demolition
  - Partial demolition of the inside face of the buffer dolphin towers
- Dredging
  - Plough dredging of very loose silts and sands to be undertaken in the general footprint of the pontoon to enable installation of scour protection.
  - Material to be redistributed to scour hole in berth north of pontoon location.
- Pontoon Restraint/Guide piles
  - 2nr Tubular Steel Guide Piles (circa 2m diameter) to be drilled through bed into bedrock and grouted into place.
  - Temporary Works – 8 nr temporary piles (1.22m diameter) to support structural steel frame on the front of the quay wall for the drilling rig to access the pile locations.
- Scour protection
  - Clean rock armour stone to be placed onto dredged bed in the general area beneath the new pontoon.
- Bankseat and Existing Deck
  - The bankseat structure shall be constructed from precast concrete or fabricated steel and supported on 6 nr 914mm diameter steel tubular piles.
  - Temporary Works – 8 nr temporary piles (0.610m diameter) to support a temporary structural steel frame to allow install of the permanent bankseat piles.
  - The asphalt deck surface in the area of the existing bankseat is to be broken out and replaced with concrete surfacing with new levels to accommodate the new linkspan bridge
- Concrete Repairs

- Concrete repairs to be undertaken to the underside of the open piled reinforced concrete structure. i.e. the soffit of the slabs, beams and columns.
- Defective areas of concrete to be broken out to expose sound steel. Defective steel to be cut out and new steel spliced in. repair areas to be shuttered to allow cementitious repair grout to be poured to replace defective concrete.

- Pontoon
- Pontoon towed to site by a tugboat.
- Pontoon to be floated into position and attached to guide piles.
- Installation of linkspan bridge
- Bridge to be delivered to site on a floating pontoon towed by a tug.
- Bridge will be lifted into place by a floating crane.

The schematic diagram shown in Figure 1-4 below identifies the main components of the proposed development.

It is anticipated that the restraining piles will be installed in advance of the jack up barge and linkspan removal.

The jack up and existing linkspan components will be removed, dredging carried out and scour protection installed in advance of the pontoon installation. The new linkspan bridge will be installed following the pontoon installation.

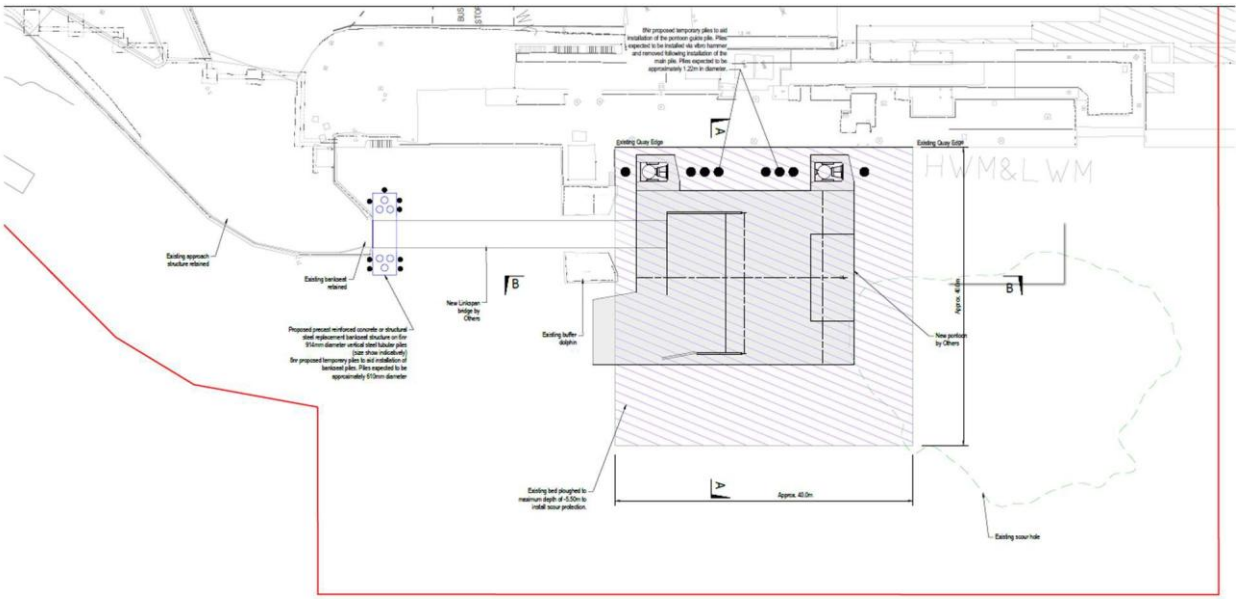

Figure 2-4 Layout showing Proposed works

2.3.1 Removal of Structures

It will be necessary to dismantle a number of structures to enable the construction of the civil engineering works and the installation of the new pontoon and bridge. These are presented in Figure 2-5, below.

Summary of structures to be removed:

- Jack up barge
- 1 No. kiosk adjacent to the existing linkspan structure
- Existing linkspan bridge and steel linkspan towers
- The total volume of material to be removed is approximately 250m3

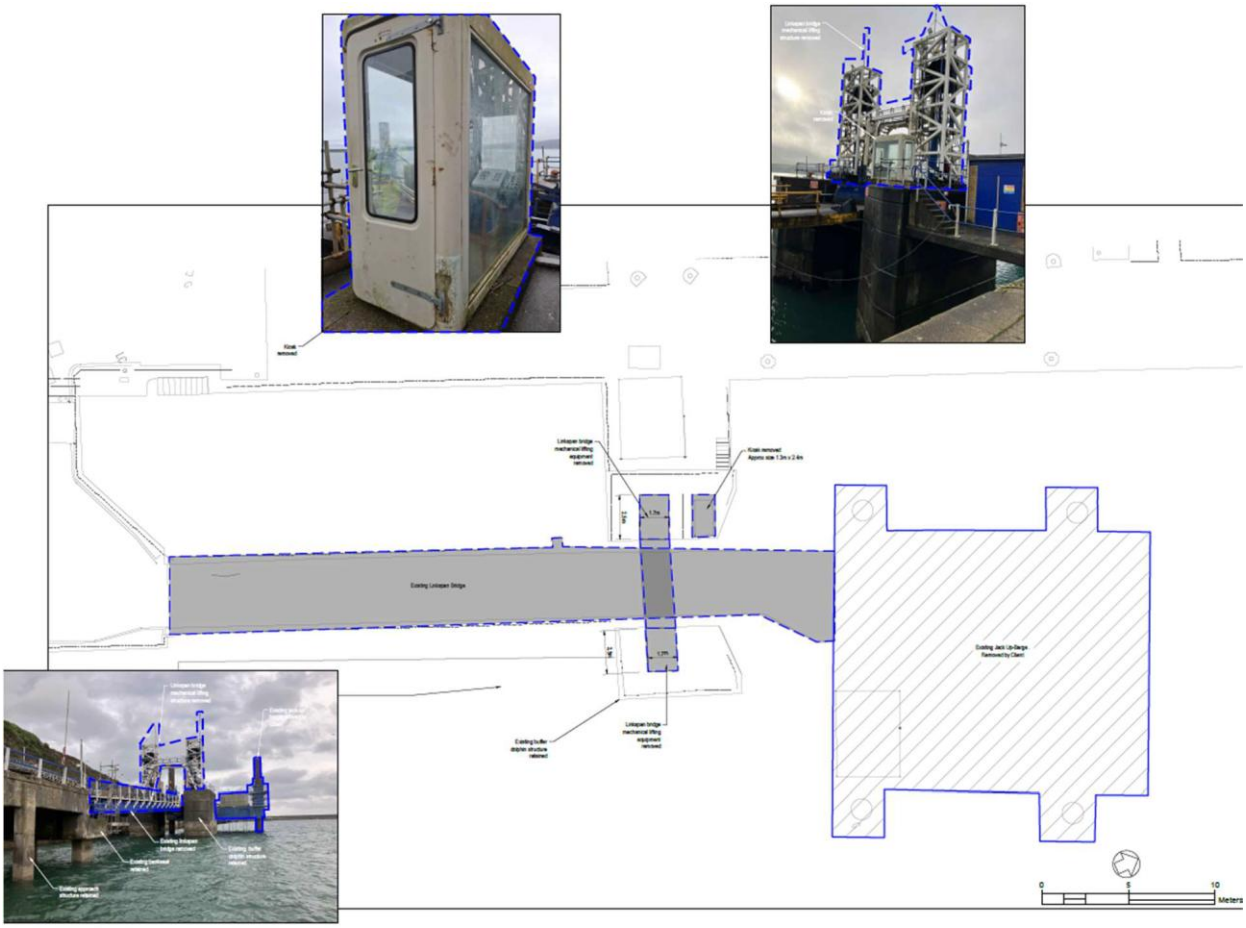

Figure 2-5 Extents of Dismantling and removal from site

The existing linkspan bridge, equipment and kiosk including lattice support structure between the buffer dolphins to be lifted off by a floating crane and/or landside plant and placed onto a pontoon

towed by a tugboat or to the land for disposal off site. All arisings shall be disposed of to an appropriate offsite disposal facility.

The existing jack-up barge legs will be lifted from the seabed and the barge lowered and towed away by tugboat.

Figure 2-6 Linkspan Tower and Bridge

2.3.2 Demolition

Partial demolition of the buffer dolphin towers is required to allow adequate clearance for the new bridge. 500mm of the inside face of the towers will be removed over a vertical length of 7.5m. Total reinforced concrete to be removed is 60m3 including an allowance for tolerance, equivalent to a weight of 144t.

Demolition shall be carried out using a wire saw, and sections of concrete removed by either a landside or marine crane.

Asphalt surfacing on the existing deck over an area of 50m2 is to be planed off and reinstated with concrete surfacing. Surfacing to be removed is assumed to be up to 100mm. Total volume of 5m3.

These works will be carried out following the removal of the existing bridge and existing linkspan equipment.

All demolition arisings shall be disposed of to an appropriate offsite disposal facility.

2.3.3 Dredging

There has been no dredging undertaken in the harbour for at least the last ten years.

Plough dredging is proposed in the area of scour protection to remove a layer of soft material before the scour protection is installed.

The dredged material will be placed in an area within the berth that has experienced scour. It is anticipated that approximately 2500m3 of material will be redistributed in the berth.

The dredge material is expected to be loose silts and sands.

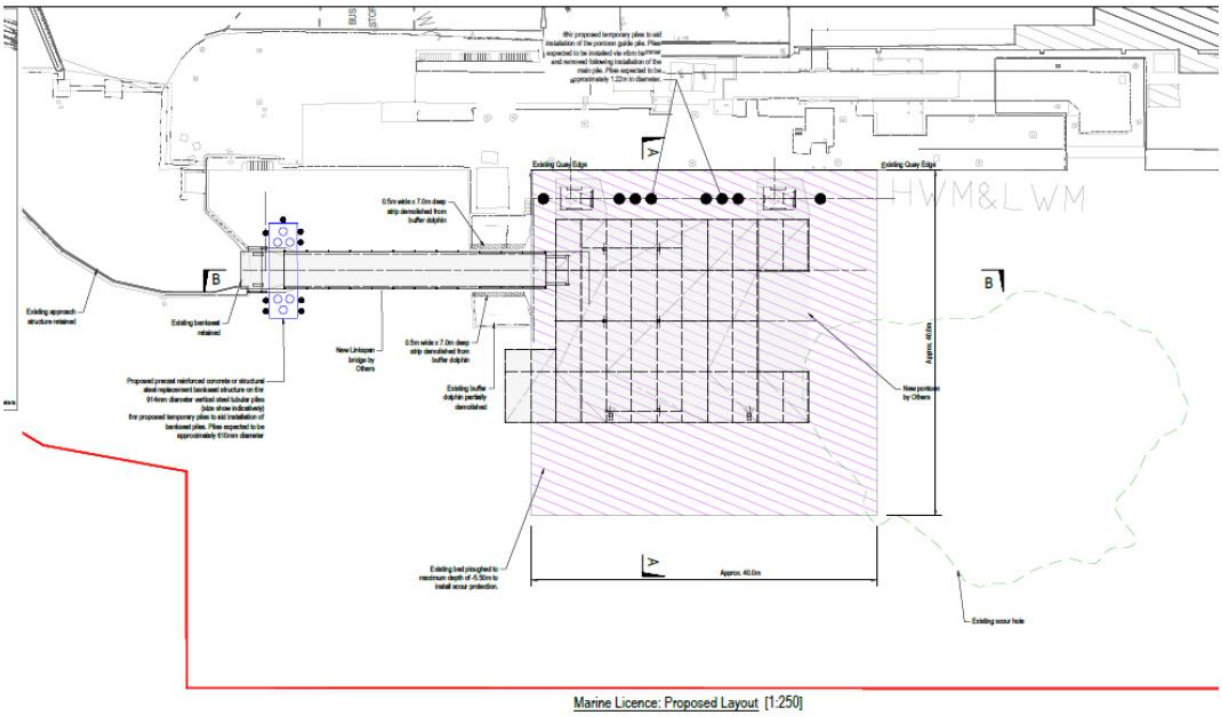

Figure 2-7 Approximate Dredge Area Shown in Purple

2.3.4 Guide Piles and Pontoon

Two guide piles are to be installed to restrain the pontoon. These are anticipated to be steel tubular piles, approximately 2.032m in diameter, filled with reinforced concrete. These guide piles will be socketed into bedrock beneath the bed material using a combination of vibro and rotary boring techniques. The installation of the guide pile will require eight temporary steel piles to be installed adjacent to it to support the piling rig. These temporary support piles will each be approximately 1.22m in diameter and will be installed via vibro and/or impact driving techniques.

The piles will be lifted into place using a crawler crane operating from the quay edge. A temporary steel piling platform will be installed supported on temporary piles to increase the working area of the crawler crane.

The eight temporary support piles will be removed once the guide pile has been installed. The pontoon will be floated into place and secured to the guide piles.

2.3.5 Scour Protection

Plough dredging will be carried out over the footprint of the scour protection where required. A layer of soft material up to 1.5m in depth shall be removed and displaced to a deeper 'scour

pocket' close by within the berth. It is anticipated that the plough dredger will track over the area a number of times to achieve the appropriate depth.

Scour protection will be provided to the northern edge of the existing buffer dolphin on the seabed under the proposed pontoon footprint and extending to the toe of the quay wall. This scour protection will consist of rock armour approximately 1000mm thick.

Scour protection in the form of rock armour will be placed on the seabed via a long reach excavator mounted on a barge.

2.3.6 Remedial works to Bankseat, Existing Deck and New Bankseat

Remedial works such as the removal of existing bolts or addition of chemical anchors to the existing bankseat may be required to allow installation of the bridge. This will be carried out once the existing bridge has been removed.

Following the removal of the asphalt surfacing on the existing deck, the surface will be reformed with concrete to the correct level for the proposed ramp. The existing railings may need to be extended to suit the new deck levels. New concrete surfacing will be up to a maximum of 400mm thick.

If required, a new bankseat structure will be constructed at the northern edge of the existing deck structure to support the bridge. This structure is expected to be constructed from precast concrete or a steel frame supported by steel tubular piles filled with concrete. The piles will be vertical piles installed using vibro, impact driving and rotary boring techniques. These piles are proposed to be steel tubes approximately 0.914m in diameter. The concrete section of the bankseat will be installed from insitu concrete. 8nr temporary piles will be installed to support the piling frame for the permanent piles. These 8nr piles are expected to have a diameter of 610mm.

2.3.7 Installation of Bridge

The proposed pontoon and bridge will be transported to the site via floating plant. The pontoon will be floated into place and secured to the guide piles. The bridge will be lifted into position using floating plant.

The proposed pontoon and bridge will be transported to the site via floating plant. The pontoon will be floated into place and secured to the guide piles. The bridge will be lifted into position using floating plant and secured to the existing bankseat at the edge of the suspended concrete deck structure. Electrical connections to the pontoon to be made, and testing and commissioning of the pontoon completed.

Upon installation of the pontoon and bridge the ferry sailings may recommence.

2.4 Temporary Site Compound

An area will be required for the establishment of the Contractor's site compound. The site compound will be used for the Contractor's site office accommodation, welfare facilities and temporary storage of construction materials. Two potential areas have been identified in Figure 1-8. Area 1 is sited along the eastern edge of the Terminal area. The area is currently in use as a carpark for staff and passengers. It is envisaged that this area could be used throughout works for site cabins and parking.

Area 2 comprises a large area of gravel to the north end of the Port which is currently in use for overflow parking for trailers and machinery.

It is not expected that the use of either or both of these areas would adversely affect the operation of the terminal.

Figure 2-8 Potential Site Compound Locations

2.5 Site Access

With the exception of ferry operations, other port activities will continue to operate throughout the works.

Vehicular access to the site will be via Station Hill roundabout which can be accessed at Quay Road from Goodwick in the West or via the Parrog/A40 from Fishguard town in the East. Construction related traffic will use the Stena Ferry Terminal entrance via Station Hill which is accessed from the main centre of Fishguard.

Construction traffic is most likely to arrive from Fishguard town direction, as it is the main commuter road from inland cities and towns within Wales.

Suitable traffic management and other systems will be put in place as required to minimise disruption to existing activities within the Stena Line terminal during the construction period.

The town itself should not be significantly affected by construction traffic.

2.6 Construction Period

It is anticipated that port operations will continue during the initial pile installation works, however the port will close with ferry operations suspended during the shutdown period.

The Port currently operates 24 hours per day, 7 days a week.

Due to the 2-month shutdown to the ferry service, it is expected that work during the construction stage will be 24hrs/day 7 days per week.

2.7 Construction Sequence

The piling works will be done while the ferry is still operational, ie pre-shutdown.

Piling works including all temporary works.

- Temporary works installation – 6 weeks
- Guide Pile Installation – 4 weeks
- Temporary works removal – 2 weeks Total of 12 weeks.

Electrical connections extended to the pontoon location.

During the shutdown the following works will take place

- Removal of the jack up barge
- Removal of existing linkspan steelwork and bridge
  - Partial demolition of buffer dolphin towers

  - Removal of asphalt surfacing from an area of the existing deck
  - Placement of new concrete deck surfacing in area of removed asphalt surfacing
- Plough dredging
- Scour protection installation
- Pontoon installation
- including any remedial works to the existing bankseat
- Concrete repairs to the suspended deck
- Bridge Installation

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Chapter 3 Project Need and Alternatives

3 Project Need and Alternatives

As stated in Chapter 2, Project Description, the Proposed Development is located within Fishguard Port, a privately run Port, owned by Stena Line who is the sole ferry operator at Fishguard Harbour providing two daily Ro Ro ferry crossings in Rosslare, Ireland all year round on the Stena Nordica.

Access to the ferry is currently via a single land linkspan (access ramp to ship from a fixed land structure), installed in the early 1970's supplemented by a temporary jack up structure. This existing linkspan pontoon and jack up barge does not provide a long-term solution for the ferry at the berth as it is approaching its practical end of life. Stena Line wish to remedy this by providing a replacement linkspan pontoon and associated civil and marine infrastructure to allow the continuation of ferry service from the Fishguard Port.

Stena Line's overarching driver for this project is to have a new linkspan bridge and pontoon in place and operational by Spring 2027. Failure to achieve this would result in the closure of their Fishguard- Rosslare route.

The original proposals provided for a two lane linkspan bridge to allow vehicles to board/disembark the vessel side by side. This two lane linkspan would not fit in the location of the existing single lane linkspan and therefore necessitated the reclamation of new hinterland area as detailed in the initial submissions.

Geotechnical site investigations found the seabed in the area of reclamation to be poor. This created a significant risk that the project could not be completed by Spring 2027. Stena Line were not comfortable with this risk.

To mitigate this risk, Stena line revisited their original requirements and satisfied themselves that a single lane linkspan bridge was sufficient. This change to their requirements meant that the linkspan could be located where the current linkspan is and therefore avoided the need to reclaim hinterland. This is the basis of this new submission.

The Proposed Development will provide ongoing conventional ferry service to and from Fishguard in Wales and Rosslare in Ireland, the need for the Proposed Development is established in terms of continuing to operate the ferry route from the Port.

3.1 Assessment of Alternatives

3.1.1 Legislation and Guidance

Schedule 3, Paragraph 2, of the Marine Works (Environmental Impact Assessment) Regulations 2007 requires that an Environmental Statement (ES) includes:

“a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the applicant, which are relevant to the proposed project, the regulated activity and their specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects”

Schedule 3 paragraph 3 of the EIA Regulations also requires:

“A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of availability of environmental information and scientific knowledge.”

This "do nothing scenario" is an assessment of the likely environmental effects that will ensue in the event that the Proposed Development is not taken forward.

The presentation and consideration of the various reasonable alternatives considered by the Applicant is an important requirement of the EIA process.

3.1.2 Consideration of Alternatives

Relocating the existing service to an alternative port or developing an entirely new port was ruled out at the outset of the design process, on the basis of a number of critical factors, including impact on the existing port and surrounding area, availability of site, associated infrastructure requirements, cost and operational limitations. As such, consideration was only given to design options which would permit the continuation of the ferry service, within Fishguard Port.

An assessment of the existing linkspan pontoon was carried out in October 2024 to determine if the existing structure could be refurbished. This was ruled out for several reasons:

- The existing linkspan pontoon and structure is approximately 50 years old which is approaching its potential design life.
- The structure is classified under maritime rules and requires ongoing certification which requires increasing amounts of work and poses a risk to continuing operations (in terms of failure to obtain certification).
- The Jack-up structure has been employed to improve the access to the ship due to the narrow width of the original linkspan.
- The existing linkspan is of a single lane configuration which is not the optimum arrangement for efficient and safe ferry operations.

It was considered that replacement of the existing linkspan pontoon was a better solution in terms of long-term sustainability of the ferry operations.

It was concluded that following assessments including site investigations, that the preferred location for the Proposed linkspan pontoon is at the location of the existing linkspan which produced the least impact on the surrounding environment and infrastructure.

For sufficient water depth to accommodate the Proposed pontoon linkspan at all stages of the tide, the design has evolved to include the necessary plough dredging of approximately 2,500m3.

3.1.3 Conclusion

This chapter ES outlined the ‘reasonable alternatives’ considered in the design of the Proposed Development and identifies the reasons for the final selection. It demonstrates that the ES complies with the requirements of the EIA Regulations in providing a description of the reasonable alternatives studied by the applicant which are relevant to the Proposed Development and its specific characteristics and giving an indication of the main reasons for the options chosen, taking into account the significant effects of the development on the environment.

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Chapter 4 EIA Process and Methodology

4 EIA Process and Methodology

4.1 Introduction

This section describes the methodology that will be used in the Environmental Statement (ES) prepared in support of the application for Marine Consent for the Proposed Development. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects (as defined in the EIA Regulations and presents the proposed methodology for the identification and evaluation of potential cumulative and inter-related impacts, which includes due consideration of potential transboundary effects. A systematic and auditable evidence-based approach will be followed to evaluate and interpret the potential effects on physical, biological and human receptors.

4.2 Basis of Assessment

4.2.1 EIA Legislative Basis and Guidance Documents

In compliance with the EIA Regulations in Wales and the EU Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU) as applied by The Environment, Food and Rural Affairs (Environmental Impact Assessment)(Amendment)(EU Exit) Regulations 2019 in the marine environment, when applying for a marine licence, and Harbour Revision Order an ES is required to be prepared and submitted in support of these applications if they are likely to have a significant effect on the environment due to factors such as their size, nature or location.

An EIA is required to fulfil the requirements of the following regulations:

- In respect of a marine licence application: The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended)
- In respect of a Harbour Revision Order: The Harbour Act 1964

Environmental Impact Assessment of applications for consents likely to have a significant effect on the environment by virtue of factors such as their size, nature or location under Article 2 are required under the Marine Works (Environmental Impact Assessment) Regulations 2007, as amended.

In addition, the following Regulations will also be considered in the production of the Project ES:

- The Conservation (Natural Habitats, etc) Regulations 1994;
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to marine licences);

- The Wildlife and Countryside Act 1981 (Variation of Schedule 9) (Wales) Order 2015

In addition to the legislative requirements, guidance and best practice documents will be developed to assist with the production of a 'fit for purpose' ES. These include:

- Guidance on Marine Licencing under Part 4 of the Marine and Coastal Access Act 2009;
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- IEMA Environmental Impact Assessment Guide to Shaping Quality Development (IEMA, 2015);

4.3 Environmental Impact Assessment Process

The EIA process can be broadly summarised as consisting of:

- Scoping: The Applicant produces a Scoping Report and requests a formal Scoping Opinion from the competent authority, NRW)
- Consultation: The competent authority is required to consult statutory consultees;
- EIA Report Preparation: The ES will be prepared, considering the responses to the consultation process and outcomes of the assessment of likely significant environmental effects of the Proposed Development during the construction, operation and maintenance, and decommissioning stages of the project lifecycle;
- EIA Report Consultation: The ES (and the application to which it relates) must be publicised, and the consultation bodies and the public must be given an opportunity to give their views about the Proposed Development and the ES;
- Determination: The competent authority must examine all the environmental information, including the ES and any comments and representations received, and must reach their reasoned conclusion on the significant effects of the development on the environment. The environmental information, and the conclusions reached, must be taken into account by the competent authority in deciding whether or not to give consent for the development. The competent authority must also consider whether any monitoring measures are appropriate; and
- Decision notice: The competent authority must inform the public and the consultation bodies of the decision and must publish a 'decision notice' which incorporates the authority's reasoned conclusion on the significant effects of the development on the environment.

4.3.1 Proportionate EIA

The importance of delivering EIAs which are proportionate and accessible to a wide range of stakeholders has been acknowledged by EIA practitioners, with a recent drive for improved quality of ES from a number of organisations (e.g. IEMA, 2017).

4.3.2 Key Principles of EIA

4.3.2.1 Overview

Within the ES, the assessment of each topic will be included in a separate chapter. A list of the topic chapters that will be included in the ES is outlined in Chapter 1, Table 1. Within each of the topic chapters, the following matters will be considered:

- Identification of the study area for the topic specific assessment;
- Description of relevant legislation and guidance;
- Description of any relevant consultees responses from consultation;
- Description of the methodology to inform the baseline including any surveys or site specific studies
- The assessment methodology impact criteria
- Description of the baseline environment;
- The impact assessment and construction and operational effects;
- Identification of mitigation measures likely to be implemented to reduce or avoid significant adverse environmental effects
- Assessment of any residual effects
- Description of cumulative effects in-combination and effects interactions;
- Description of any limitations of the assessment;
- Summary of the effects and conclusions;
- Reporting; preparation of ES and Non-Technical Summary

4.3.3 Assessment of the Environmental Effects

The assessment of whether the proposed development is likely to have a significant impact on the environment has been undertaken through a variety of methods:

- Professional judgment and experience based on published guidance criteria;
- Assessment of both temporary and permanent effects (direct, indirect, secondary and residual);
- Assessment of interaction and cumulative effects;
- Assessment of duration and reversibility of these effects;
- Assessment against local, regional and national planning policy;
- Consultation with statutory and non-statutory consultees.

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. The criteria for defining impact magnitude are outlined in Figure 4-1 Definition of terms relating to the magnitude of an impact.

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

	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).

Figure 4-1 Definition of terms relating to the magnitude of an impact

The criteria for defining receptor sensitivity are outlined in Figure 4-2 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

Figure 4-2 Definition of terms relating to the sensitivity of the receptor

The significance of the effect is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented. Where a range of significance of effect is presented, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Sensitivity of Receptor / Receiving Environment to Change / Effect					
Magnitude of Change		**High**	**Medium**	**Low**	**Negligible**
	High	**Major**	**Major**	**Moderate**	Negligible
	Medium	**Major**	**Moderate**	Minor	Negligible
	Low	**Moderate**	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 4-3 Matrix used for the assessment of the significance of the effect

In instances where assessment do not adhere to the significance criteria stated above, this is due to specific tailored approaches to assessment of significance that are required by professional institutions of which the assessors are members and/or approaches that have been refined and agreed through previous experience.

In all instances, assessments contained in the ES follow a structed layout and contain an assessment of significance that is clearly set out and rationalised in each topic chapter.

Each topic chapter provides an explanation of any assumptions and limitations that have been recognised in the preparation of the ES and identifies the predicted effects on identified receptors with regard to that specific environmental consideration.

4.3.4 Mitigation Measures

The EIA can influence the design of a project in many ways, including:

- amending the layout and extent of a development site to avoid key sensitive receptors;
- amending the design of a specific aspect of the development to manage impacts;
- specifying construction techniques to avoid effects on particular receptors; and
- changing materials to reduce volume and/or transport impacts (IEMA, 2016).

There are three distinct forms of mitigation which include:

- **primary mitigation** (inherent): “Modification to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken” (IEMA, 2016);

- **secondary mitigation** (foreseeable): “Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the ES” (IEMA, 2016); and
- **tertiary mitigation** (inexorable): “Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirement, or actions that are considered to be standard practices used to manage commonly occurring environmental effects” (IEMA, 2016).

Primary Mitigation (Embedded Mitigation Measures)

Primary mitigation has been referred to as “Embedded Mitigation Measures” within this report. The iterative approach to the impact assessment process has been utilised to inform the design of the Proposed Development (through the identification of likely significant environmental effects and development of embedded mitigation measures to address these). The incorporation of such measures within the design demonstrates commitment to implementing the identified measures. These measures will be referred to throughout the ES as ‘embedded mitigation measures.

By employing this approach, the significance of effect to be presented in the ES is considered representative of the maximum residual effect that the Proposed Development will have, should the application for consent be approved and the Proposed Development be constructed.

Both primary and tertiary measures can be ‘embedded’ into the project design. EIA can therefore be undertaken on the basis that these measures will definitely be delivered and therefore any effects which might arise without these mitigation measures do not need to be identified as potential effects as there is no potential for them to arise (IEMA, 2016).

4.3.5 Cumulative Effects

A Cumulative Effect Assessment (CEA) is a legal requirement under the EIA Regulations. A CEA provides consideration of the impacts arising from the Proposed Development alone and cumulatively with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource.

A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the Project may interact to have the potential to result in a cumulative impact. All phases (construction, operation and maintenance, and decommissioning) of the Proposed Development may have the potential to lead to cumulative impact.

The CEA will consider all other relevant plans, projects and activities that are publicly available six months prior to the Proposed Development application.

The EIA Directive 2014/52/EU specifies at Annex III that "the likely significant effects of projects on the environment must be considered […] taking into account [*inter alia*] the cumulation of the impact with the impact of other existing and/or approved projects"; and at Annex IV that "a description of the likely significant effects of the project on the environment resulting from, inter alia […] the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources" is required.

This obligation is mirrored in Schedule 4 of The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

Cumulative effects are assessed in each chapter in respect of impacts resulting from the accumulation of impacts generated by the proposed redevelopment on the same receptors and the impacts potentially arising from adjacent or nearby developments together with those predicted for the proposed redevelopment. A list of projects considered for their potential to generate significant cumulative effects is contained at Appendix 4.A and Figure 4.1.

The first step in determining cumulative effects comprised the identification of a list of other projects which may have the potential to overlap with the proposed redevelopment based on available information.

A 100km radius was adopted to give adequate coverage for marine mammals as a realistic, although arbitrary distance over which marine mammals could be cumulatively affected by projects due to the mobile nature of marine mammals when weighed against the size of the marine units for cetaceans and NRW advice to use the OSPAR Region III when considering connectivity of grey seals.

The scope of the other projects that have been considered as part of this cumulative assessment have been identified through a desk study involving general internet searches and in particular, scrutiny of consenting authority websites. The projects were either registered on Natural Resource Wales, An Bord Pleanála, Maritime Area Regulatory Authority (MARA), Pembrokeshire Coast National Park and North Devon Council websites.

Other projects for which a development consent application has been submitted or consent granted were included. Potential future projects which have not submitted an application for consent were not included.

Those other projects whose impacts could foreseeably overlap with the construction or operation of the proposed redevelopment or where construction impacts may be consecutive but cumulative, were considered.

When undertaking the CEA of the Proposed Development, a tiered approach was adopted. This provides a framework for placing relative weight upon the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- **Tier 1 assessment** – Proposed Development;
- **Tier 2 assessment** – All plans/projects assessed under Tier 1, plus projects which are operational, under construction, those with consent and submitted but not yet determined;
- **Tier 3 assessment** – All plans/projects assessed under Tier 2, plus those projects with a Scoping Report; and
- **Tier 4 assessment** – All plans/projects assessed under Tier 3, plus projects where a TCE Agreement for Lease (AfL) or regional equivalent has been granted.

All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the above Tiers and assessed in the CEA.

4.3.6 Transboundary effects

Transboundary effects arise when impacts from the Proposed Development within one devolved UK region affects the environment of another devolved UK region, self-governing Crown Dependency or EC or EEA member state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Article 7 of the amended EIA Directive provides the basis for consultation between sovereign States in relation to the likely significant environmental effects of proposed development in one State on the environment in another State. The principal obligation is in respect of information and consultation and is imposed by Article 7(4) of the amended Directive:

"The Member States concerned shall enter into consultations regarding, inter alia, the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects and shall agree on a reasonable timeframe for the duration of the consultation period. Such consultations may be conducted through an appropriate joint body."

Under Regulations 27 and 28 of the EIA Regulations, for any project that is likely to cause significant transboundary effects, the Department must send information about the development to the relevant government department of the affected State and invite them to participate in the consultation procedures. The possibility of transboundary effects with Republic of Ireland and other neighbouring devolved UK regions will also be considered.

4.3.7 Inter-related effects/Interactions

The EIA Regulations require consideration of inter-related effects. Inter-related effects refer to the inter-relationships between EIA topics that may lead to environmental effects. There are two categories of inter-related effects:

- project lifetime effects: effects that occur throughout more than one phase of the project (construction, operational and maintenance, or decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and
- receptor-led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the effect upon subsea noise on marine mammals may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Within the EIA, assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term 'receptor group' is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors.

Where the significance of an effect within the topic-specific assessment has been identified as 'no effect across all stages of the project', the assumption has been made that these effects can not contribute to any inter-related effects. These effects will therefore not be included in the inter-related effects assessment as there will be no effect from the Proposed Development over the lifetime of the project.

The inter-related assessment will consider only effects from the Proposed Development and not those from other projects, which will be considered in the Cumulative Effect Assessment (CEA).

4.3.8 Assumptions and Limitations

The key assumptions and limitations that have been identified in undertaking the ES are set out below:

- Baseline conditions established from a variety of sources, including historical data, are correct and accurate, but due to the dynamic nature of certain aspects of the environment, conditions will change during the construction and operation of the Proposed Development;
- It is assumed that information received from third parties is accurate, complete and up to date;
- The assessments contained within each of the technical chapters are based on an assumption that embedded mitigation measures set out in the drawings and detailed in ES Volume I Chapter 2: Project Description are implemented;
- The mitigation and monitoring measures outlined within each of the technical chapters are implemented and secured by the LPA through conditions and/or obligations (as appropriate);
- Demolition and construction works across the site would take place substantially in accordance with the programme of works described in ES Volume I Chapter 2: Project Description;
- Where detailed information has not been available, reasonable assumptions have been made, and have been clearly set out, based on experience of developments of similar type and scale to enable assessment of likely significant effects; and
- Consented or proposed cumulative schemes will be implemented substantially in accordance with information that is publicly available and subject to the same regulatory regimes and good practice management controls as this Proposed Development.

Assumptions and limitations specific to certain topics are identified in the appropriate technical chapters.

4.4 Professional Team and Quality Management

4.4.1 The Applicant

Stena Line is a Swedish shipping company and one of the world's largest ferry operators. It services Denmark, France, Germany, the United Kingdom, Ireland, Latvia, the Netherlands,

Poland, Finland and Sweden. Stena Line was founded in 1962 in Gothenburg, Sweden, the company headquarters.

4.4.2 The Project EIA Team

The EIA regulations require that the ES must be prepared by competent experts in order to ensure completeness and quality of the EIA Report. All experts employed to prepare the individual assessment have the appropriate qualifications and level of experience with their given field to undertake the relevant surveys and assessments.

RPS has been instructed by the developer to lead the Marine Licencing, design and EIA for the Proposed Development. This includes a review of the key environmental issues associated with the construction, operation and maintenance, and decommissioning of the Proposed Development as part of the EIA.

This ES has been completed using the quality controls and procedures with the RPS Tetratech Quality Management System to British Standard ISO 9001 and has ensured that all surveyors, assessors, co-ordinators and reviewers associated with the preparation of hits ES have the appropriate qualifications and experience. The ES has been subject to rigorous internal RPS Tetratech peer review to ensure compliance with EIA Regulations.

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Chapter 5 Scoping and Consultation

5 Scoping and Consultation

5.1 Screening, Scoping and Consultation

5.1.1 Pre application Discussions with NRW

Formal consultation with NRW, the client and RPS was undertaken on the 5th November 2024 to discuss the site investigation works and marine licence for construction and dredging and disposal of the initial project which comprised a revetment and significant dredging. Clarifications were sought from NRW regarding the sample locations, sample plan and analysis and timescales for the associated band 1 licence. NRW clarified the submission of two application forms for the construction and dredging/disposal at sea however to be recorded as same case number (one licence). NRW also advised that the INNS Biosecurity Risk Assessment and Management Plan and the National Marine Plan signposting should be submitted with the Band 3 licence.

5.1.2 Band 1 Marine Licence Responses

A list of the consultees who responded to the pre submission of the associated Band 1 Marine Licence Consultees and Response to Marine Licence for Band 1 - Site Investigations are set out in 5.1.1.8.

5.1.3 Scoping Response

In preparation of the initial Marine Licence application, a formal screening and scoping opinion was sought on the need for an EIA in respect of the Proposed Development in accordance with Part 2, Regulation 11 and 13 of the Marine Works (EIA) Regulations 2007 (as amended). The screening and scoping request was submitted to NRW in November 2024 (NRW reference SC2402) and NRW issued a formal response on the 31st of January 2025 (Appendix 5.A). A list of the consultees who responded to the scoping request are set out in 5.1.1.7 List of Consultees; and issues raised and project team responses are set out in 5.1.1.6 Consultee Responses and Consideration.

Under direction of the applicant, Stena Line, RPS have coordinated and prepared an ES in line with The Marine Works (EIA) Regulations 2007 (as amended) in respect of the Proposed Development. In defining the scope of the ES and undertaking the EIA process, consideration has been given to the matters identified within the NRW response.

NRW have confirmed that this Proposed Development would also require Environmental Impact Assessment.

5.1.4 Engagement with NRW Advisory Team

Further meetings were undertaken between NRW and the project team following the scoping opinion received in January 2025 to clarify assessments of dredging and disposal, elements which are largely removed from this submission.

Following submission of the Marine Licence application in May 2025, formal request for further information/technical clarifications was received on 15th August 2025 from NRW to which RPS Tetratech responded to on 22nd September 2025. A copy of the request and response is contained within Appendix 5.C. Discussions were ongoing as to the necessity for further sampling in dredging areas containing elevated zinc and PAH concentrations. These dredging areas have now been removed from this Proposed Development, and no possible areas of contamination are to be disturbed.

Between September 2025 and February 2026 discussions have been bi-monthly between RPS Tetratech and NRW to address design options and the consenting processes. NRW have advised to withdraw the previous application under ML2533 and resubmit an application for the Proposed Development, the subject to this ES.

5.1.4.1 Consultee Responses and Consideration

Consultee and type of response Date	Issues Raised	Response to issue raised and/or where considered in EIA
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Competent expert statement	A list of the competent authors is listed within Table 1, Chapter 1 and statement of competency within section 4.4, Chapter 4
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Non-technical summary	A Non-Technical Summary accompanies this EIA
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Chart/Map of activity	A Chart/Map of activities are included within Volume III of this EIA
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Description of likely significant effects	A description of the likely significant effects are included within Chapters 7 – 24 of this EIA

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General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Description of methodology for assessment	Chapter 4 outlines the overarching EIA Process and Methodology
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Description of measures used to avoid significant adverse effects and mitigation	A description of significant adverse effects and mitigation are included within Chapters 7 – 24 of this EIA
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Description of significant adverse effects from risks of major accidents and disasters	Chapter 23 outlines the risks of major accidents and disasters
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Inclusion within EIA: - Transboundary impacts	Transboundary impacts (were appropriate) are included within Chapters 7 – 24 of this EIA
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Engagement with relevant stakeholders	Chapter 5 (this chapter) outlines the consultation with relevant stakeholders

General/Overarching 31 January 2025 NRW PS Scoping Opinion	Sediment sampling and analysis and biosecurity risk assessment	Sediment sampling results and analysis are provided at Appendix 17.C INNSMP/Biosecurity Risk Assessment is provided at Appendix 8.B
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Consideration and compliance with the Shoreline Management Plan; UK Marine Policy Statement; and Welsh National Marine Plan	These are considered within Chapter 6 Policy & Legislation and Appendix 6.A WNP Signposting document
General/Overarching 31 January 2025 NRW PS Scoping Opinion	Landowners consent (Crown Estate)	Correspondence with Crown Estate is provided at Appendix 5.2
Project Description 31 January 2025 NRW PS Scoping Opinion	Further information on dredging programme (volumes, footprint and particle size distribution)	Chapter 2 Project Description sets out the dredging volume and footprint. Sediment sampling results and analysis are provided at Appendix 17.C
Project Description 31 January 2025 NRW PS Scoping Opinion	Samples analysed in accredited UK lab and sediment characterised by particle size distribution, type and contaminants	Sediment sampling results and analysis are provided at Appendix 17.C Macrofauna sampling results and analysis are provided at Appendix 8.A
Project Description 31 January 2025	Further information on dredging methodology, location and duration	Chapter 2 Project Description sets out the dredging methodology, location and duration

NRW PS Scoping Opinion		
Project Description 31 January 2025 NRW PS Scoping Opinion	Further information on use and disposal of dredge	Chapter 2 Project Description sets out the disposal of the dredge materials
Project Description 31 January 2025 NRW PS Scoping Opinion	Details of existing dredge maintenance regime and prediction of maintenance following proposal	Localised plough dredging occurs in the harbour periodically. Any maintenance dredging will be dealt with separately under a future licence.
Project Description 31 January 2025 NRW PS Scoping Opinion	Disposal site suitability of dredge	Appendix 17.C sets out the Particle Size Analysis and Results. Whilst this indicates that there is some contamination in VC3 and VC9, the location of depth of the samples found above action level 2 is not in an area scheduled for dredging to the contaminated depth. The disposal site is relatively local to Fishguard port, accepting the full range of particle sizes and providing capacity for dredging volume.
Project Description 31 January 2025 NRW PS Scoping Opinion	Further information on land reclamation and rock revetment methodology (volumes required, area of seabed lost, area reclaimed) Clarity on how the sediment will be retained prior to construction of rock armour revetment	Chapter 2 Project Description sets out the land reclamation and rock revetment volume and area. Following design evolution there is no longer requirement for sediment retention.
Project Description 31 January 2025	Further information on rock armour revetment toe methodology (type of materials for buried toe and rock revetment)	Following design evolution there is no longer requirement for a buried rock armour revetment toe. Scour protection details are outlined in section 2.3.6 of the Project Description.

NRW PS Scoping Opinion		
Policy & Legislation 31 January 2025 NRW PS Scoping Opinion	Include policy and legislation section and consideration of plan policies	These are considered within Chapter 6 Policy & Legislation and Appendix 6.A WNP Signposting document
Benthic Subtidal and Intertidal Ecology 16 January 2025 NRW(A)	NRW(A) advises that the potential release of contaminants during dredging and construction works needs to be included for assessment of impact to Water Frameworks Directive (WFD), Water Quality and benthic ecology.	The impact of the release of sediment bound contaminants has been assessed for benthic ecology in section 8.9.1.2.4.
Benthic Subtidal and Intertidal Ecology 16 January 2025 NRW(A)	NRW have records of blue mussel Mytilus edulis beds within the Planning Boundary. As these are a 'Habitat of Principal Importance to Wales' under Section 7 of the Environment (Wales) Act (2016), we advise that they are given consideration in the full EIA and Environment Statement.	Blue mussel beds were identified within Fishguard Harbour during a 2014 NRW survey (NRW, 2025b). However, during a meeting with NRW on 5th March 2025, a benthic specialist at NRW confirmed that these blue mussel records were juveniles and were highly unlikely that the mussel bed habitat is present (NRW, pers. comm.). Therefore, blue mussel beds were not considered further in the assessment.
Benthic Subtidal and Intertidal Ecology 31 January 2025 NRW Permitting Service (NRW PS) Scoping Opinion	NRW PS draw to your attention, as identified by NRW(A) that there are records of blue mussel beds within the Planning Boundary. These beds are listed as 'Habitat of Principal Importance to Wales' under Section 7 of the Environment (Wales) Act (2016) and must be appropriately considered in the ES.	Blue mussel beds were identified within Fishguard Harbour during a 2014 NRW survey (NRW, 2025b). However, during a meeting with NRW on 5th March 2025, a benthic specialist at NRW confirmed that these blue mussel records were juveniles and were highly unlikely that the mussel bed habitat is present (NRW, pers. comm.). Therefore, blue mussel beds were not considered further in the assessment.

Benthic Subtidal and Intertidal Ecology 16 January 2025 NRW(A) Comments	NRW(A) note that no subtidal surveys have been proposed by the Applicant in the EIA Scoping Report. As the habitats maps shown in Figures 4.2 and 6.7 [of the EIA Scoping Report] differ slightly, NRW(A) advise that an updated survey programme is conducted to gain an accurate understanding of the benthic habitats present both within and outside the Planning Boundary in order to fully understand the potential impacts of the Proposed Development and identify suitable mitigation measures. We advise that the Phase 1 intertidal survey discussed in the EIA Scoping Report is also conducted to inform and update the baseline.	Figure 4.2 of the EIA Scoping Report is presented as Figure 8.2 of Chapter 8 Marine Ecology and shows the EUSeaMap seabed habitat classifications from the European Marine Observation Database (EMODnet, 2025). Figure 6.7 of the EIA Scoping Report showed marine sediments within the Coastal Processes Study Area, however these were derived from the British Geological Survey (BGS) Seabed Sediments 250k dataset (BGS, 2025), therefore differ slightly. Within both these figures, seabed sediment data were only available for a portion of the Planning Boundary. In Figure 8.2 of Chapter 8 Marine Ecology, the seabed sediments within the Planning Boundary were 'infralittoral sandy mud' and 'circalittoral sandy mud' and the equivalent area was labelled as 'muddy sand' in Figure 6.7 of the EIA Scoping Report. As both the EUSeaMap and BGS Seabed Sediments 250k datasets are very high level and not designed to be used for local-scale classification, the discrepancy in labelling between 'infralittoral sandy mud/circalittoral sandy mud' (EMODnet, 2025) and 'muddy sand' (BGS, 2025) is not expected to cause a material difference in the baseline nor assessments provided for Benthic Ecology and Coastal Processes. These figures were included in the EIA Scoping Report to provide wider-scale information on the seabed substrates and illustrate that a portion of the Planning Boundary consists of sandy mud or muddy sand. In addition, a site-specific subtidal survey (including PSA) was undertaken in 2017 at the Stena Line Ferry Terminal (thus within the Planning Boundary). The results of this survey (slightly gravelly sand to slightly gravelly muddy sand) were at a finer scale than that of EUSeaMap and BGS Seabed Sediments 250k datasets, and therefore provide additional, recent context to the seabed within Fishguard Harbour. In addition, PSA data collected by NRW in 2022 (*pers. comm*.)[1] were available for two sampling stations within Fishguard Harbour. These two samples consisted of mud and sand sediments, respectively, further corroborating the muddy and sandy sediments detailed in

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		the wider scale data (BGS, 2025, EMODnet, 2025) and the finer scale site-specific data from the 2017 Stena Line ferry terminal survey (ABPmer, 2018). A benthic subtidal validation survey was undertaken in March 2025 and an intertidal survey was undertaken in April 2025. The results of these will not be available at the time of submission of this EIA, however the results will be submitted once available and provide further justification to support the conclusions of the assessment on benthic ecology presented in this chapter.
Benthic Subtidal and Intertidal Ecology 16 January 2025 NRW(A) Comments	The Drop Down Video (DDV) survey undertaken in 2015 classified much of the study area as 'Arenicola marina in infralittoral fine sand or muddy sand' (SS.SSA.IMuSa.AreISa) but as no suitable groundtruthing was undertaken in the form of sediment samples and subsequent Particle Size Analysis (PSA), and given the age of the data, NRW(A) advise that the confidence levels in these data cannot be high. As such, we recommend that new subtidal sediment data is collected both within the footprint of the Proposed Development and outside of the current benthic study area for context and to take into account potential impacts from increased Suspended Sediment Concentrations (SSCs) over a wider area than that represented by the present study area, as per those discussed in the Physical Processes chapter [of the EIA Scoping Report]. NRW(A) advise that sediment samples are analysed for PSA, Macrofauna and contaminants by an accredited UK laboratory in line with the guidelines of the North East Atlantic Marine Biological Analytical Quality Control (NMBAQC) scheme.	Increases in SSCs, sediment plumes, and associated deposition has been modelled in Chapter 10: Coastal Processes, with the results used to inform the assessment on benthic and fish and shellfish receptors in this chapter (see section 8.9). As detailed in the row above, the sediments within Fishguard Harbour are largely comprised of muddy sand and/or sandy mud (based on site specific data from the 2017 survey at the Stena Line terminal and from NRW data within the Planning Boundary). The Coastal Processes modelling accounts for slight variations in these sediment types and will therefore still be representative of the Maximum Design Scenario (MDS) for the impact of increased SSCs and associated deposition for marine biodiversity receptors. .
Benthic Subtidal and Intertidal Ecology 31 January 2025 NRW PS Scoping Opinion	NRW(A) note that no subtidal surveys are proposed. NRW(A) have a low confidence in the existing subtidal data identified within the Scoping Report. NRW(A) indicate that the DDV survey undertaken in 2015, which classified much of the study area as '*Arenicola marina* in infralittoral fine sand or muddy sand' (SS.SSA.IMuSa.AreISa), has relatively low confidence due to the age of the data and the lack of	A benthic validation survey is currently being undertaken and an intertidal survey was undertaken in April 2025. The results of these will not be available at the time of submission of this EIA, however the results will be submitted once available and provide further justification to support the conclusions of the assessment on benthic ecology presented in this chapter

	associated direct ground-truthing. NRW(A) also note that there are discrepancies between the habitats maps shown in Figures 4.2 (EUSeaMap) and 6.7 (BGS) of the EIA Scoping Report. NRW A request that a survey programme is conducted to gain an accurate understanding of the benthic habitats present within the Proposed Development and its zone of influence. NRW PS consider that the baseline subtidal environment must be suitably assessed and see this to be necessary to fully understand the potential impacts on benthic habitats and identify possible mitigation measures. NRW PS would strongly recommend you engage with NRW(A) to ensure that baseline data relied upon or collected is suitable. NRW PS recommend engagement with NRW(A) to understand the extent and sampling effort required to adequately assess the Proposed Development's direct and indirect impacts. NRW(A) advise that sediment samples are analysed for PSA, macrofauna and contaminants. NRW PS remind you that this has to be undertaken by an accredited UK laboratory in line with the guidelines of the NMBAQC scheme.	
Benthic Subtidal and Intertidal Ecology 16 January 2025 NRW(A) Comments	There is no mention within the EIA Scoping Report of the Welsh National Marine Plan which "sets out the Welsh Government's vision and objectives for the Welsh marine plan area and policies to support their achievement, helping marine users and those undertaking land-based activities (with the potential to affect the plan area) to support the sustainable development of our seas. The Welsh National Marine Plan supports sustainable development by guiding and supporting effective, proportionate and consistent decision making". NRW(A) recommends that the Applicant take the policies set out in the Welsh National Marine Plan into consideration with particular focus on those relating to 2.4 ENV – Living within environmental limits and the sector supporting policies in Section 3.1 such as 3.1.3 Dredging and Disposal and 3.1.7 Ports and Shipping.	The Welsh National Marine Plan has been considered in section 8.4, with particular attention paid to the policies highlighted by NRW(A) (see Table 8 2).

Benthic Subtidal and Intertidal Ecology 16 January 2025NRW(A) Comments	NRW(A) agrees with the impacts scoped in for Benthic subtidal and intertidal ecology receptors and recommends that the impact pathway "Accidental pollution to the surrounding environment" should also be scoped into the EIA for further assessment. The reasons given for being scoped out are reliant on mitigation which suggest that an adverse impact is possible, and, in addition, rock armour revetments are known to trap litter which represents a form of accidental pollution. Therefore, this impact pathway should be scoped into both the construction and operation phases at this stage of the process.	This impact is still scoped out of assessment based on the following justification (also provided in Table 8.16, Chapter 8 Marine Ecology). The risk of accidental pollution will be mitigated by the implementation of measures set out in standard post-consent plans, such as an Environmental Management Plan (EMP), which will include a Marine Pollution Contingency Plan (MPCP). These plans will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from the Oslo Paris Convention (OSPAR), International Maritime Organisation (IMO), and the International Convention for the Prevention of Pollution from Ships (MARPOL)). Thus, it is unlikely that accidental pollution will occur and in the unlikely event that it did, it will be minimised through measures outlined in the MPCP. The approach to scope out this impact using the justification provided here is standard practice across EIAs from a range of sectors and aligns with the proportionate EIA approach.
Benthic Subtidal and Intertidal Ecology 31 January 2025 NRW PS Scoping Opinion	NRW PS disagree that accidental pollution should be scoped out of the EIA. NRW PS consider that the details of the proposed post-consent plans are unknown at this stage. Therefore, as mitigation measures are not yet known, accidental pollution should be scoped into the assessment.	As above

Fish and Shellfish Ecology 16 January 2025 NRW(A) Comments	NRW(A) agree with the sites and potential impacts scoping assessment for fish and shellfish ecology. We welcome the inclusion of nearby designated sites (Cardigan Bay Special Area of Conservation (SAC), Afon Teifi SAC, Cleddau Rivers SAC, Pembrokeshire Marine SAC and Carmarthen Bay and Estuaries SAC) in view of the migratory species features. The applicant should make consideration of relevant section 7 species as listed within the Environment (Wales) Act 2016 alongside the SAC species features.	These designated sites have been considered in this assessment (see section 8.8.2.5 of Chapter 8 Marine Ecology). In addition, species listed within the Environment (Wales) Act 2016 have been included as Important Ecological Features (IEFs) in this assessment (see section 8.8.2.6 of Chapter 8 Marine Ecology).
Fish and Shellfish Ecology 31 January 2025 NRW PS Scoping Opinion	NRW PS agrees with the sites included and potential impacts scoped into the assessment for fish and shellfish ecology. NRW(A) welcomes the inclusion of nearby designated sites (Cardigan Bay SAC, Afon Teifi SAC, Cleddau Rivers SAC, Pembrokeshire Marine SAC and Carmarthen Bay and Estuaries SAC) in view of the migratory species features. NRW PS agrees with NRW(A) that the relevant section 7 species listed within the Environment (Wales) Act 2016 should also be scoped into the assessment.	As above
Fish and Shellfish Ecology 16 January 2025NRW(A) Comments	NRW(A) agree with the underwater noise scoping assessment. The preliminary mitigation measures proposed for noise are standard measures and likely to be sufficient given the amount of piling proposed, however, the Applicant will need to consider the appropriateness of measures designed to reduce noise impact for mammals on fish species. However, section 10.4 in the EIA scoping report mentions that the assessment will also account for fleeing animals. It is not clear if this statement only relates to marine mammals or applies to fish as well. NRW(A) advise that assessments for fish focus on fish as a stationary receptor, as this will cover the worst-case scenario and there is limited consistent information on fish utilising directional avoidant fleeing behaviour in response to noise impacts	This response is noted. Stationary fish have been presented as a worst-case scenario, based on the underwater noise modelling. Appropriate mitigation measures for fish and shellfish receptors have been included.

Fish and Shellfish Ecology 31 January 2025 NRW PS Scoping Opinion	NRW PS agrees that underwater noise from piling during construction is scoped into the EIA and agrees with the preliminary mitigation measures proposed. NRW(A) advises that these standard mitigation measures are likely to be sufficient; however, stresses that measures designed to reduce noise impact for mammals are not always appropriate on fish species. NRW PS would encourage you to engage with NRW(A) as you carry out your assessment and consider appropriate mitigation measures.	This response is noted. Stationary fish have been presented as a worst-case scenario, based on the underwater noise modelling (see section 8.9.2.2.3 of Chapter 9 marine Ecology). Appropriate mitigation measures for fish and shellfish receptors have been discussed in section 8.10 of Chapter 8 Marine Ecology and within the assessment itself in section 8.9.2.2.3 of Chapter 8 Marine Ecology.
Marine Mammals 16 January 2025 NRW(A) Comments	NRW(A) note that North Anglesey Marine SAC has been omitted from scoping. The activity is located within the Celtic and Irish Seas Management Unit (MU) for harbour porpoise *Phocoena phocoena*, so animals from the SAC population could feasibly be found within the survey area and could potentially therefore be impacted. Due to the mobile nature of all Annex II marine mammal features of SACs, it is accepted that they do not stay within site boundaries. We generally consider that the appropriate scale at which to consider offsite impacts for marine mammals is the relevant species-specific MU. We consider SACs within an MU to be 'functionally linked' to the surrounding sea because evidence demonstrates a degree of connectivity between SACs and the wider area, and because SACs represent special areas of sea within the MU. We recommend that North Anglesey Marine SAC is scoped in for harbour porpoise.	The North Anglesey Marine SAC has been included in the baseline assessment presented in section 8.8.3.3 of Chapter 8 Marine Ecology.
Marine Mammals 16 January 2025 NRW(A) Comments	For most impact pathways, particularly those associated with potential removals or injury, NRW(A) consider MUs as the most appropriate spatial scale for assessment of the Test of Likely Significant Effect (screening).	This advice has been incorporated into the assessment for marine mammals (see section 8.9.3 of Chapter 8 Marine Ecology).
Marine Mammals 16 January 2025 NRW(A) Comments	NRW(A) would like to highlight the preferred use of OSPAR Region III as a spatial area for the assessment of grey seal *Halichoerus grypus*, rather than seal MUs. However, as all	This comment is noted, and information on the OSPAR Region III grey seal population has been included in the baseline for additional context (see section 8.8.3.2.4 of Chapter 8 marine Ecology).

	three Welsh sites for grey seal have been scoped in here, no changes are required.	
Marine Mammals 16 January 2025NRW(A) Comments	NRW(A) have anecdotal evidence of common dolphin *Delphinus delphis* usage within the study area on a regular basis and therefore we recommend that the common dolphin, as a protected species under Annex IV of the Habitats Directive as enacted through the England and Wales Conservation of Habitats and Species Regulations, Schedule 5 & 6 of the Wildlife and Countryside Act 1981(as amended) and Sections 6 & 7 of the Environment (Wales) Act 2016, should be also considered for assessment.	Common dolphin has been scoped into the assessment (see section 8.8.3.2.3 of Chapter 8 Marine Ecology).
Marine Mammals 16 January 2025NRW(A) Comments	The justification for scoping out "accidental pollution to the surrounding environment" impact pathway relies on the need for mitigation measures, which suggests that this has the potential to create an adverse effect. Therefore, NRW(A) recommends the impact pathway "Accidental pollution to the surrounding environment" should be scoped into EIA for further assessment.	This impact is still scoped out of assessment based on the following justification (also provided in Table 8-29 of Chapter 8 Marine Ecology). The risk of accidental pollution will be mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP which will include a MPCP. These plans will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from OSPAR, the IMO, and MARPOL)). Thus, it is unlikely that accidental pollution will occur and in the unlikely event that it did, it will be minimised through measures outlined in the MPCP. The approach to scope out this impact using the justification provided here is standard practice across EIAs from a range of sectors and aligns with the proportionate EIA approach.
Marine Mammals 16 January 2025NRW(A) Comments	NRW(A) welcomes the use of the data sources and literature listed within the EIA Scoping Report but would like to highlight the following relevant guidance on underwater noise to be considered when undertaking the EIA:	These guidance documents have been considered as part of the assessment on marine mammal receptors.

	NRW's Position on Assessing Behavioural Disturbance of Harbour Porpoise from underwater noise (NRW, 2023a); and NRW's Position on Assessing the effects of hearing injury from underwater noise for environmental assessments (NRW, 2023b).	
Marine Mammals 31 January 2025 NRW PS Scoping Opinion	NRW PS will expect that the assessment is carried out in line with NRW's position statements (NRW, 2023a, NRW, 2023b)	These guidance documents have been considered as part of the assessment on marine mammal receptors.
Biodiversity – Birds 31 January 2025 NRW PS Scoping Opinion	Suggestion of creating habitat for Black guillemots	Measures for Black Guillemots are provided within Chapter 9, section 9.11.3
Coastal Processes 31 January 2025 NRW PS Scoping Opinion	Requests copy of historical numerical modelling to inform baseline	Chapter 10 Coastal Processes sets out the baseline data
Coastal Processes 31 January 2025 NRW PS Scoping Opinion	Modelling as separate technical appendix to coastal processes chapter	Appendix 10.A sets out the Coastal Process Modelling
Coastal Processes 31 January 2025 NRW PS Scoping Opinion	Modelling of SSC plumes, duration, dispersion and settlement	Appendix 10.A sets out the Coastal Process Modelling

Coastal Processes 31 January 2025 NRW PS Scoping Opinion	Scour protection possible formation of secondary scour pits around toe of rock armour requiring assessment	Following design evolution there is no longer requirement for a buried rock armour revetment toe.
Coastal Processes 31 January 2025 NRW PS Scoping Opinion	Consideration of increased erosion at the end of the revetment and seabed lowering in front	Following design evolution there is no longer requirement for a buried rock armour revetment toe
Water Resources 31 January 2025 NRW PS Scoping Opinion	WFD compliance assessment is required	Appendix 11.A sets out the Water Framework Directive Assessment.
Noise & Vibration 31 January 2025 NRW PS Scoping Opinion	Consideration of how materials are transported to site	Chapter 13 Noise and Vibration and Chapter 19 Transport considers transportation of materials
Underwater Acoustics 31 January 2025 NRW PS Scoping Opinion	Assessment for fish as stationary receptors	Chapter 14 Underwater Acoustics, Section 14.7 assesses the impact on fish as stationary receptors

Air Quality & Climate 31 January 2025 NRW PS Scoping Opinion	Compliance with Public Health Wales	Chapters 15 & 22 Air Quality and Climate sets out how the Proposed Development complies with relevant public health legislation.
Historic Environment 31 January 2025 NRW PS Scoping Opinion	Engage with RCAHMW, HENEB and CADW	Chapter 16 Cultural Heritage section 16.5 sets out engagement with RCAHMW, HENEB and CADW.
Historic Environment 31 January 2025 NRW PS Scoping Opinion	Assessment of the intertidal historic environment	Appendix 16.A Cultural Heritage Desk Based Assessment sets out the intertidal features within the study area.
Historic Environment 31 January 2025 NRW PS Scoping Opinion	The historic Environment (Wales) Act 2023 enacted 4th November and removal ref earlier versions	Chapter 16 Cultural Heritage Section 16.4 sets the policy context in The Historic Environment (Wales) Act 2023
Historic Environment 31 January 2025	CADW recommends search area of 3km for designated assets and 1km non designated assets	A 2km radius for designated heritage assets and 1km radius for non-designated heritage assets has been applied to the assessment within Appendix 16.A as agreed with Mr Neil Maylan of CADW and RPS via email 12/11/2024.

NRW PS Scoping Opinion		
Transport 31 January 2025 NRW PS Scoping Opinion	Clarity on how materials will be transported to site	Chapter 13 Noise and Vibration and Chapter 19 Transport considers transportation of materials
Waste 31 January 2025 NRW PS Scoping Opinion	Adequate disposal of dredging materials required.	Chapter 2 Project Description outlines that the dredged materials will be taken for disposal at sea at licenced disposal site Milford Haven LU69
Waste 31 January 2025 NRW PS Scoping Opinion	Identify suitable site at sea and status of.	Chapter 2 Project Description outlines that the dredged materials will be taken for disposal at sea at licenced disposal site Milford Haven LU69
Shipping and Navigation 31 January 2025 NRW PS Scoping Opinion	Requirement to be scoped in	Chapter 24 outlines Shipping & Navigation
Shipping and Navigation 31 January 2025	Navigation Safety Plan and Vessel Management Plan	Stena Lines existing Navigational Safety and Vessel Management of Fishguard Harbour will apply.

NRW PS Scoping Opinion		
Shipping and Navigation 31 January 2025 NRW PS Scoping Opinion	Consider impact on recreational sea users	Chapter 24 Shipping & Navigation section 1.8 considers the baseline environment

5.1.4.2 List of Consultees

Consultee	Date of Response
CADW (Historic Environment Service)	15/01/2025
Maritime & Coastguard Agency	15/01/2025
Defence Infrastructure Organisation	10/12/2024
NATS Safeguarding	10/12/2024
NRW - Marine Area Advice and Management Team	17/01/2025
Royal Commission on the Ancient and Historical Monuments of Wales	08/01/2025

Royal Yachting Association	15/01/2025
The Crown Estate	08/01/2025
Trinity House Navigation	15/01/2025
HENEB – The Trust for Welsh Archeaology	17/01/2025
Marine and Fisheries	15/01/2025
Local Biodiversity Officer (Pembrokeshire)	No response
Local Planning Authority (Pembrokeshire Coast National Park Authority)	No response
Local Harbour Authority	No response
Local Port Authority (Fishguard)	No response
Local Port Authority (Stenaline)	No response
Welsh Fishermen's Association (WFA)	No response

National Federation of Fishermen's Organisations (NFFO)	No response
Royal Society for the Protection of Birds (RSPB)	No response
Chamber of Shipping	No response

5.1.4.3 Consultees and Response to Marine Licence for Band 1 - Site Investigations

Consultee	Date of Response
HENEB – The Trust for Welsh Archaeology	No objections - 19/11/2024
Maritime & Coastguard Agency	No objections - 25/11/2024
Trinity House Navigation	No objections - 29/11/2024
Royal Commission on the Ancient and Historical Monuments of Wales	No objections – 19/11/2024

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 6 Policy & Legislation

6 Policy and Legislation

6.1 EU Legislation and Policy

6.1.1 EIA Regulations

EIA is a key instrument of European Union environmental policy and a procedure required under the terms of European Union Directive 2014/52/EU on assessment of the effects of certain public and private projects on the environment Article 2 of the Directive requires, inter alia, that "Member States shall adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects." Article 8 requires that "The results of consultations and information gathered pursuant to [the EIA process] must be taken into consideration in the development consent procedure".

The Marine Works (EIA) Regulations 2007 (as amended) incorporate the European Environmental Impact Assessment (EIA) Directive into UK law. The Directive aims to ensure that the authority giving the consent for projects is aware of any likely significant environmental effects before making its decision.

6.1.2 The Habitats and Birds Directives and Associated Regulations

Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992, providing a means for the EU to meet its obligations under the Bern Convention. The Wildlife and Countryside Act 1981 (as amended) was passed as UK legislation to comply with the European Directive on Conservation. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection is granted through the designation of European Sites and European Protected Species (EPS). The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds within Europe. The Directive affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs).

The Directives that have been transposed into Welsh law by various regulations, those of relevance to the project include:

- The Conservation (Natural Habitats, etc) Regulations 1994; and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017

These are thereafter referred to the Habitats Regulations. These regulations transpose *inter alia* Articles 6(3) and 6(4) of Council Directive 92/43/EEC and remain following the UK's departure from

the EU, taking into account the effect of the Conservation of Habitats and Species (Amendment (EU Exit)) Regulations 2019.

6.2 Marine and Planning Policy

Key legislation and policy in relation to the Proposed Development in Welsh waters is set out below and within Appendix 6.A Fishguard Replacement Linkspan Pontoon WNMP Signposting Document.

6.2.1 UK Marine Policy Statement

The UK Marine Policy Statement (MPS) published in 2011 is the framework for preparing Marine Plans and taking decisions affecting the marine environment prepared under the Marine and Coastal Access Act 2009. The range of licensable marine activities defined by section 66 of this Act have been set out in Chapter 1: Introduction. Guidance from 1st January 2021 sets out interpretation of reference to EC/EU regulations following UK withdrawal from the EU.

The UK vision for the marine environment is for a 'clean, healthy, safe and productive and biologically diverse oceans and sea'. The high-level marine objectives are; achieving a sustainable marine economy; ensuring a strong, health and just society; living within environmental limits; promoting good governance and using sound science responsibly.

This statement also sets out Marine Protected Areas, Sites of Special Scientific interest, Special Areas of Conservation and Special Protection Areas and sites of International Importance (Ramsar).

The importance of Ports is outlined as critical to the effective movement of cargo and people, recognising that 95% of international trade by volume passes through ports and domestic freight transport. It also acknowledges that the operation of ports requires dredging and disposal and the potential impacts on environmental as related to noise, air emissions and spread of non-indigenous species. Positive impacts from ports development include job creation and benefits to local fishermen.

Marine dredging is acknowledged as an enabling activity essential to the functioning of ports and compliance with the requirements of the Water Framework Directive (WFD) and other EU Directives.

Socio-economic benefits of tourism and recreation of the coast and sea are also acknowledged.

6.2.2 Welsh National Marine Plan 2019

The Welsh National Marine Plan was published in 2019 with the vision that Welsh seas are clean, healthy, safe, productive and biologically diverse. This plan sits within the UK framework with the

high-level marine objectives replicated however with distinct Welsh focus. For the development of Band 3 activities (the Proposed Development) the Plan states that there should be a clear statement of which policies are relevant, the extent to which the proposal complies with the policies and how the proposal contributes to the plan vision and objectives. The Plan sets out areas of potential sector resource around the coastline identifying Fishguard as an aquaculture: water column area.

Policy GEN 01 supports sustainable development to contribute to Wales' wellbeing goals. The Proposed Development will ensure the continuation of the Fishguard to Rosslare ferry route supporting a prosperous and resilient Wales in terms of the wellbeing goals.

Policy GEN 02 states that authorities should take a proportionate, risk-based approach to application of relevant marine planning policies in decision making and as such the Proposed Development demonstrates compliance with the marine policies plan and is accompanied by a proportionate EIA.

Policy ECON 01: sustainable economic growth encourages proposals that provide employment opportunities for coastal communities; and protecting and creating employment. The Proposed Development will contribute to the resilience of the economy via enhanced replacement linkspan, the continuation of the ferry route and protection of the employment that it brings for Fishguard.

Policy ECON 02: Coexistence seeks proposals to demonstrate coexistence with other compatible sectors and potential opportunities at the land-sea interface. The Proposed Development is compatible with the Harbour as a linkspan serving a ferry and adjacent transport network.

Policy SOC 01: Access to the marine environment ensures people get to take part in activities and services provided by the marine environment and therefore supporting recreation and wellbeing. The Proposed Development ensures that people are able to avail of the ferry service. There is no impact on any recreation as the harbour is owned and manged by Stena Line.

Policy SOC 02: Wellbeing of coastal communities recognises that development has the potential to effect socio-economic factors including cultural identify and wellbeing. The Proposed Development has the potential to positively affect the socio-economic future of Fishguard and Goodwick.

Policy SOC 03: Marine pollution incidents seek that developments minimise the risk of causing or contributing to marine incidents. An EIA (this report) accompanies the Proposed Development which has assessed the impacts and outlined mitigation measures were necessary.

Policy SOC 04: Welsh language and culture seeks to encourage use of Welsh language and culture including heritage, historic environment, designated landscapes, seascape and character including underwater heritage. The Proposed Development will facilitate and promote the use of Welsh language in the Harbour were possible.

Policy SOC 05: Historic Assets seeks that proposals demonstrate how potential impacts on historic assets and their settings have been taken into consideration. The EIA which accompanies the Proposed Development submission includes an assessment of impacts on archaeology and cultural heritage assets and their setting and demonstrates no impact.

Policy SOC 06 and Policy SOC 07 seeks that proposed demonstrate consideration on landscapes and seascapes. The EIA which accompanies the Proposed Development submission includes an assessment of the seascape, landscapes and visual impacts upon the surrounding area including the Pembrokeshire Coast National Park and Marine Character Areas. Photomontage have been prepared which demonstrates no unacceptable adverse visual impact.

Policy SOC08 and 09 seek that proposals demonstrate resilience to coastal change and flooding. The EIA which accompanies the Proposed Development submission includes an assessment of the impacts on coastal processes, flood risk and climate change and includes measures to address any risk and increase resilience. The location of the Proposed Development is essential for operational reasons, and it cannot be located elsewhere. Rock revetment is proposed within the Proposed Development.

Policy SOC 10 and SOC 11 relate to minimising climate change and resilience to climate change and how proposals demonstrate consideration of in assessments. The EIA which accompanies the Proposed Development submission includes an assessment of the impacts of climate change in terms of greenhouse gases and climate vulnerability and includes essential and embedded mitigation and no residual impacts from climate.

Policy ENV 01: Resilient marine ecosystems policy seeks that proposals demonstrate how potential impacts on marine ecosystems have been taken into consideration and mitigated and Policy ENV 02 seeks to avoid adverse impacts on marine protected areas and designated sites. The EIA which accompanies the Proposed Development submission includes an assessment of the impacts on marine ecology and protected marine areas and includes mitigation and embedded mitigation measures.

Policy ENV 03 seeks to avoid or minimise introduction and spreading of invasive non-native species and include biosecurity measures and as such an invasive non-native management plan/biosecurity risk assessment has been undertaken to accompany the submission and includes mitigation measures.

Policy ENV 04 seeks to avoid deliberate introduction and minimise risk of litter and as such the submission includes an outline Construction and Environmental Management Plan. Policy ENV 05 seeks that proposals demonstrate consideration of and avoid/minimise or mitigate impacts of man-made noise and as such the EIA includes an assessment of noise and mitigation measures.

Policy ENV 06 seeks that proposals demonstrate consideration of and avoid/minimise and mitigate impacts on air and water quality. The EIA which accompanies the Proposed Development includes an assessment of the effects on air quality, water quality and an assessment under the water framework directive.

Policy ENV 07 seeks that proposals affecting fish species and habitats are avoided/minimised and mitigated and as such the EIA which accompanies the Proposed Development includes an assessment of underwater noise including on fish species and other species and includes essential and embedded mitigation for the construction phase.

Policy GOV 01 states that proposals should demonstrate that they have assessed potential cumulative effects and should avoid, minimise and/or mitigate effects. The EIA which accompanies this Proposed Development includes a Cumulative assessment within each chapter topic and any mitigation if relevant.

GOV 02 cross border and plan compatibility seeks regards to applicable policy in the marine plan; applicable policy in terrestrial development plans or related documents; the Natural Resources Policy; relevant well-being plans and assessment and any relevant NRW Area Statements. This chapter sets out the relevant legislation and policies to the Proposed Development and demonstrates compatibility.

Policy SCI 01 Risk based decision making seeks sound evidence, risk based, proportionate approach to decisions. The EIA which accompanies this Proposed Development is proportionate to the project and has followed a systematic and evidence-based approach to evaluate the potential effects on receptors.

Policy D&D 01 Dredging and Disposal supports proposals that maintain navigable channels and long-term access to open at sea disposal sites subject to complying with the general and safeguarding policies. The Proposed Development includes essential dredging within the Fishguard Harbour to maintain navigational channels which is vital to the Port development and construction of the replacement linkspan. The Proposed Development will use a licensed disposal site to deposit sediment which has been analysed as acceptable.

Policy SAF 01a applies to proposals with potential to impact upon existing or planned dredging and disposal activities in areas where a consent for dredging or at sea disposal has been granted. There are no other planning dredging campaigns within Fishguard Harbour and Stena is the sole operator. The EIA which accompanies this Proposed Development includes an assessment of the affects on coastal processes within the Fishguard Harbour and calibration of the model of the disposal site area. The Proposed dredging materials have been analysed and demonstrate compatibility with the licensed disposal site.

Policy P&S 01 supports proposals for harbours where they contribute to the Marine Plan and comply with general policies and P&S 02 supports maintenance and repair of port and harbour facilities. The Proposed Development includes the replacement of an existing linkspan pontoon to safeguard the continuation of the Stena Line Fishguard to Rosslare ferry route. Policy P&S 01b seeks that relevant public authorities collaborate to support sustainable development of ports and shipping sectors and as such the EIA processes has included pre application consultations with Natural Resource Wales (NRW) and Planning and Environment Decisions Wales (PEDW).

Policies T&R 01a and T&R 01b supports proposals that demonstrate positive contribution on tourism and recreation. The Proposed Development ensures the long term future of the Fishguard to Rosslare ferry route linking Wales and Ireland.

6.2.3 Future Wales: The National Plan 2040

Future Wales is the National Development Framework for Wales published in February 2021.

The Spatial Strategy supports sustainable growth in all parts of Wales.

Policy 10 International Connectivity identifies Fishguard Port as a Strategic gateway to facilitate international connectivity and critical to the effective movement of people and cargo. The Plan states that the Welsh Government will support appropriate development which can enhance international connectivity and be accommodated within statutory climate change targets and carbon budgets. The Welsh Government supports international efforts to reduce emissions from shipping.

The Plan acknowledges Fishguard Port as an important gateway for freight and passengers providing a key roll-on roll-off ferry link which has a strategically importance role in connecting mainland Europe, the UK and Wales with Ireland.

Policy 32 Haven Waterway and Energy recognises Fishguard as playing an important role in supporting the maritime sector and the national economy. The port is important national infrastructure, and the future role is supported locally, regionally and nationally.

Policy 9 Resilient ecological networks and green infrastructure seeks the protection of woodland, coastal heath and grassland habitats. Although the landside parts of the Proposed project are located on developed operational port lands, there are woodland habitats adjoining the site which have been considered within Chapter 9: Terrestrial Ecology and Ornithology and Appendix 9.A Preliminary Ecological Appraisal and Chapter 8 Marine Ecology and associated subtidal survey Appendix 8.A.

6.2.4 Planning Policy Wales

Planning Policy Wales (PPW) Edition 12 published February 2024 sets out the land use planning policies of the Welsh Government. The primary objective is to ensure the delivery of sustainable development and the improvement of social, economic, environmental and cultural wellbeing of Wales.

PPW puts placemaking at the forefront, supporting adequate and efficient infrastructure for economic, social and environmental sustainability. Paragraph 5.3.14 supports investment in ports and harbours to boost economy in a way that minimises any adverse impacts on the environment. Sustainable movement of freight via water is supported.

PPW also sets out the importance of Shoreline Management Plans in the context of coastal change.

Water Quality and Surface Water Flooding is highlighted in terms of avoiding flooding and diffusing pollution by ensuring sustainable drainage systems. The climate emergency is acknowledged as likely to increase the risk of flooding as a result of sea level rises, increased storminess and more intense rainfall and seeks that a precautionary approach of positive avoidance of development in areas of flooding from the sea. PPW states that in areas of flood, development should be limited to essential transport and utilities infrastructure.

PPW states that commercial and/or transport infrastructure are potentially polluting development and seeks to minimise through design and mitigation measures. This includes managing potential environmental risks through the construction phases.

PPW Section 6 seeks the protection of notable species and as such a baseline habitat survey has been undertaken and an assessment outlined in Chapter 8: Terrestrial Ecology.

6.2.5 Wales Transport Strategy 2021

The Wales Transport Strategy 2021 sets out the vision of an accessible, sustainable and efficient transport system. Priority 2 is to "*Allow people and goods to move easily from door to door by accessible, sustainable and efficient transport services and infrastructure*".

In terms of Ports the strategy's vision is that it will 'adopt a more strategic approach to Welsh Ports and nearby development sites, recognising their role as a catalyst for co-location of manufacturing, energy, leisure, distribution and tourism. The key priorities are; to invest more sustainable ports infrastructure; identify opportunities for future economic development; acknowledge ports transport as a key facet of the wider policy on freight and logistics; seek to reduce barriers to investment; and support the contribution of ports to the visitor economy.

The strategy supports ports and harbours contribution to well-being through travel opportunities; energy efficiency and low carbon networks; renewable energy projects; increase in trade and inward investment opportunities; focal point for investment, delivering local jobs and services and benefits; and the rich maritime history.

6.2.6 The Wellbeing of Future Generations (Wales) Act 2015

The Wellbeing of Future Generations (Wales) Act is about improving the social, economic, environmental and cultural well-being of Wales. It sets out 7 wellbeing goals; a prosperous Wales; a resilient Wales; a healthier Wales; a more equal Wales; a Wales of cohesive communities; a Wales of vibrant culture and thriving Welsh language; and a globally responsible Wales.

6.2.7 The Environment (Wales) Act 2016

The purpose of this Act is to promote sustainable management of natural resources to which animals, plants and organisms; air, water and soil; minerals; geological features and processes; physiographical features; and climate features ad processes. The sustainable management of natural resources means meeting the needs of present generations without compromising the ability of future generations to meet their needs and contributing to the wellbeing goals of the Future Generations (Wales) Act 2015.

6.2.8 Ports National Policy Statement

Draft National Policy of Ports published in June 2025 updates and enhances the Ports National Policy Statement designated in 2012. This reaffirms the long-term need for expanded port capacity and revised forecasts for port freight traffic. Overall, the draft document intends to boost expansion of maritime ports to propel economic growth and support jobs and secure long-term future of the maritime industry. The Proposed Development supports and in compliance with this draft policy.

6.2.9 West of Wales Shoreline Management Plan

The West of Wales Shoreline Management Plan 2 was published in June 2012 to provide a large-scale assessment of the risks associated with coastal evolution and presents a policy framework to address risks to people and the developed, historic and natural environment in a sustainable manner.

Policy PDZ4 (Policy Unit 4.2) sets out the policy development zone from Strumble Head to New Quay Head. Relevant objectives seek to maintain Fishguard as a viable commercial centre and support opportunities for regeneration and states that there is potential for advance the line to

improve sustainability of the head of the harbour through possible joint funding. The Proposed Development is supported by this policy.

6.2.10 Climate Change Act 2008

This Act sets the target for the year 2050 for the reduction of targeted greenhouse gas emissions, including making provision about adaptation to climate change and provision for carbon emissions reduction targets. The effects of the Proposed Development on climate change have been assessed in this ES (this report).

6.2.11 Development Plan Context

6.2.11.1 Pembrokeshire County Local Development Plan 2013

The Pembrokeshire County Council Local Development Plan was adopted on 28th February 2013. A review of the Local Development Plan (LDP2) commenced in May 2017 and is currently undergoing examination and not adopted, and therefore the extant plan is LDP 2013. This review however is supportive of port and energy related development at Fishguard Port where they respect and protect the landscape, natural and built environment. In sequence with the extent LDP, the LDP2 review acknowledges that improvements to facilities and infrastructure will benefit the local and national economy and will confer benefits on others, namely Republic of Ireland.

The LDP provides the policy context for guiding development to appropriate locations, conserving the natural, built and historic environment and providing a basis for rational and consistent decision-making on planning applications.

The LDP vision ‘to ensure that Pembrokeshire is prosperous and that it remains vibrant .. by creating .. maritime access to the Ilford Haven waterway and Fishguard Harbour’.

The Strategic Policies relate to a range of and-uses and topics which contribute to delivering sustainable development and achieving positive change in development in Pembrokeshire. Strategic Policy 2 Port and Energy Related Development supports development at the Port of Fishguard and acknowledges that improvements to facilities and infrastructure will benefit the local and national economy. Development at the Port of Fishguard will be permitted for port related facilities and infrastructure, including energy related development.

Improvements to Fishguard Harbour facilities and infrastructure will benefit the local and national economy and confer benefits on other countries, particularly the Republic of Ireland.

Development proposals below the mean water mark are outside the scope of the planning system.

6.2.11.2 Supplementary Planning Guidance

Supplementary Planning Guidance (SPG) Biodiversity was adopted in May 2021 to provide guidance on how biodiversity should be considered at each stage of the process, to assist consideration of ecology at early stage; provide relevant and proportionate surveys to inform the assessment and follow a mitigation hierarchy to ensure no loss of biodiversity. The screening assessment of the Likely Significant Effects (LSE) and Report to Inform the Appropriate Assessment (RIAA) contained within Volume IV, have been undertaken and precautionary mitigation proposed where necessary.

6.2.11.3 Pembrokeshire Coast National Park Partnership Plan 2025 – 2029

The Pembrokeshire Coast National Park Partnership Plan 2025 – 2029 was adopted in 2025. The Proposed Development does not lie within the Parks jurisdiction however the Park is in close proximity. There are 4 themes for partnership action including, conservation; cultural heritage and connection; climate action and natural resources; and communities.

Conservation policies L1 seeks to conserve and enhance National Park landscapes and seascapes. Cultural Heritage Policy H1 seeks to conserve and enhance landscapes of historic interest, conservation areas, historic parks and gardens, scheduled monuments, buildings of interest, non-designated heritage assets and their settings. The Proposed Development is accompanied by an assessment on seascape, landscape and visual which demonstrates no impacts.

Conservation Policy E1 seeks to conserve and enhance biodiversity quality, extent and connectivity at scale and E2 seeks to conserve and enhance marine biodiversity. The Proposed Development is accompanied by an assessment of terrestrial and marine ecology which demonstrates no impacts.

Climate Policy N4 seeks to conserve and enhance water quality. The EIA which accompanies this Proposed Development concludes that there are no impacts on water quality.

Community Policy SE1 seeks to foster socio-economic well-being of National Park communities. The Proposed Development is necessary for the continued function of the Fishguard Stena ferry route which brings economic benefits into the area and park communities.

6.3 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

The key focus of the water quality assessment is to ensure that the proposed development is undertaken in a manner which is consistent with the objectives of the Water Framework Directive (2000/60/EC) (WFD).

The WFD (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) was adopted by the European Commission in December 2000. The WFD is transposed into law in England and Wales by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (hereafter referred to as 'the 2017 WFD Regulations'). The WFD is retained EU legislation and is still applicable in England and Wales as set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 and the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019. The 2017 WFD regulations require Secretary of State (SoS), Welsh Ministers, the Environment Agency and NRW to exercise their 'relevant functions' so as to secure compliance with the WFD (Regulation 3). Under the regulations the SoS, the Welsh Ministers, NRW, and each public body have a specific duty to have regard to the relevant River Basin Management Plan (RBMP), and any supplementary plans made under it, in exercising their functions. 'Having regard to' river basin management plans include taking account of and considering the environmental objectives and summary of measures contained within the plan when exercising any functions and the effects of those functions on the objectives and measures within the plan (Planning Inspectorate, 2018).

A key requirement of the WFD is that surface water bodies attain at least good, and that there should be no deterioration in existing status.

For groundwater, the objective is to achieve good groundwater status, requiring both quantitative status and chemical status to be at least good. Therefore, a WFD assessment must be conducted to ensure that the proposed development does not compromise the fundamental requirement of the WFD. The aim of conducting a WFD Assessment is to determine if specific components or activities related to the proposed development will compromise the attainment of a WFD objective or result in the deterioration in the overall status of any water body. This will determine whether it is possible to proceed with the scheme or whether amendments or mitigation measures are necessary.

The WFD requires the preparation of a Programme of Measures (POMs) outlining the steps that will be taken to meet WFD objectives as applicable to each water body. This Programme is contained within an overarching River Basin Management Plan (RBMP). One RBMP is prepared

for each RBD and also contains information on water body status, objectives, and timescales. The RBMPs were published in 2009 in Wales for the first river basin management cycle from 2009 – 2015. The third cycle of river basin management plans (2021 – 2027) are now finalised and available on the Natural Resources Wales website.

In the context of the RBMPs, this development concerns the Cleddau and Pembrokeshire Coastal Rivers Management Catchment within the Western Wales RBD. Natural Resources Wales is responsible for producing the RBMP, there are, however a number of public authorities and organisations that are required to undertake their functions with due regard for the RBMP and the requirements of the WFD. These include regulators, deliverers, experts, and organisations representing the public in particular the voluntary sectors though Non-Governmental Organisations.

The Proposed Development proposals have been scoped to determine potentially significant effects in terms of current status and the WFD objectives for the Cardigan Bay South Coastal water body to determine what elements of the project have the potential to have a significant effect on the water environment and the environmental objectives of the water bodies affected. If the assessment concludes, after taking account of the mitigation proposed, that the proposal may either reduce the quality of any of the contributing elements of the status of the water bodies or prevent the quality elements from achieving the standards required in the RBMP, then this represents a failure to achieve the WFD objectives and the proposal should not go ahead unless justification for the new modification is demonstrated under Article 4.7 of the Directive. The four objectives of the WFD compliance assessment are:

1. Objective 1: To prevent deterioration of any contributing quality element to the status of the water body
2. Objective 2: To prevent the introduction of impediment to the attainment of Good WFD status for the water body
3. Objective 3: To ensure the attainment of the WFD objectives for the water body are not compromised
4. Objective 4: To ensure the achievement of WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.

A WFD Assessment accompanies this ES, Appendix 11.A.

6.4 Additional Statutory Consents

In addition to the requirement for a marine licence, the Proposed Development has been considered in the context of other statutory consents which may be required prior to construction.

6.5 Planning Permission

Whilst the Proposed Development consists of works to the marine environment, consideration has been given to the proposal in the content of requirement for planning permission in line with the Planning (Wales) Act 2005.

The Town and Country Planning (General Permitted Development) (Amendment) (Wales) Order 2019 Class B, Part 17, Schedule 2 sets out the permitted development rights on operational land by statutory undertakers or their lessees in respect of a dock, pier or harbour for the purposes of shipping or in connection with embarking, disembarking, loading, disembarking or transport of passengers, livestock or goods at a dock, pier or harbour. As such no formal planning permission is required.

6.6 Harbour Revision Order

An application for a Harbour Revision Order shall be required to be obtained from PEDW. It is anticipated that this ES shall serve to comply with the requirements of a revision order application.

Under paragraph 3(1) of Part 1 of Schedule 3 to the Harbours Act 1964 a person may not make an application for a harbour revision order which directly or indirectly authorises a project unless the applicant has given notice of the intention to make that application to the Welsh Ministers and that they have responded under paragraph 5 or 6 of Part 1 of Schedule 3. This relates to a project which falls under the EIA Directive. NRW have determined that this Proposed Development is development which requires an EIA. Accordingly, the EIA undertaken for the Proposed Development is reported in a single Environmental Statement for the purposes of the determination of both the application to Welsh Ministers for the proposed HRO and the application to NRW for Marine Licence.

Stena requested that the Welsh Ministers issue a deferral direction pursuant to paragraph 20D of Part 1 of Schedule 3, the effect being to defer responsibility for undertaking the EIA in respect of the application for the proposed HRO to NRW. The Proposed HRO will therefore be determined following determination of the EIA by NRW.

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 7: Population and Human Health

7 Population and Human Health

7.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") on population and human health and the vulnerability of the Proposed Development to bio-physical, social, behavioural, economic and institutional determinants of health and population. This chapter considers the potential impacts to population health from the Proposed Development during the construction and operational phases of the Proposed Development.

The Town and Country Planning (EIA) (Wales) Regulations 2017 included human health as a factor for assessment in EIA in terms of the impact of the project on human health. Regulation 4 (2)(a) requires the EIA to "*identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on … human health* …".

The main objectives of this assessment are to:

- Undertake a desktop study of the existing health trends to assess current environmental baseline conditions locally and nationally.
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on human health and population; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description
- Chapter 4: EIA Process and Methodology
- Chapter 11: Water Resources & WFD
- Chapter 13: Noise & Vibration
- Chapter 15: Air Quality
- Chapter 19: Transportation chapters

Other aspects relevant to human health are addressed in the specific chapters of the ES, namely:

- Chapter 23: Risk of Major Accidents & Disasters

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

As set out in the Institute of Environmental Management and Assessment (IEMA) 2022 guidance (Pyper et al., 2022a) the EIA Human Health assessment "*should explain the project's public health implications, including relevant health outcomes and effects on health inequalities*". In so doing, the Human Health assessment uses the residual effect conclusions of other relevant EIA topic assessments as an input. The IEMA 2022 guidance (Pyper et al., 2022b) confirms that "*a population health approach should be taken when determining significance*". In such assessment the terms health and wellbeing are used interchangeably, and parity is given to considering both physical and mental health outcomes.

The assessment has used the World Health Organization (WHO) definition of health, which states that health is a "*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (World Health Organization, 1948).

The assessment has also used the WHO definition for mental health, which is a “a state of mental well-being that enables people to cope with the stresses of life, to realize their abilities, to learn well and work well, and to contribute to their communities” (World Health Organization, 2022).

7.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on human health and population. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 7.7.1.1);
- Identifies any limitations encountered in compiling the environmental information (section 7.13);
- Presents an assessment of the potential likely significant effects on human health arising from the Proposed Development (section 7.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 7.12.
- Highlights any necessary monitoring (section 7.10.3) and/or measures (see section 7.10.1 and section 7.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 7.9).

7.3 Study Area

The human health and population study area has been defined on the basis of relevant human populations that may be affected directly or indirectly by the Proposed Development.

Consistent with IEMA 2022 guidance (Pyper et al., 2022a), the human health chapter uses study areas to determine the sensitivity of the populations in the areas, not set a limit on the extent of all health effects. This reflects that health study areas do not necessarily define the boundaries of all potential health effects, particularly mental health effects. The health study areas represent the locations that would drive any likely significant population health effect, i.e., where the great majority of the impact is anticipated to occur. Any effects beyond the study areas would not change the conclusions reached in relation to the likely significant population health effects of the Proposed Development.

The following study areas are used in the health assessment to indicate the relevant population and the expected maximum extent of any likely significant effects:

- Site-specific health study area: Goodwick and Fishguard Northeast Wards
- Local health study area: Pembrokeshire local authority district (LAD)
- National health study area: Wales

The site-specific wards have been selected to reflect the relevant geographic locations, but also the more deprived areas to ensure potential inequalities are reflected.

The health assessment also has regard to the zones of influence defined by other topic chapters. Those zones of influence are relevant and inform the health assessment’s consideration of effect magnitude.

Fishguard Harbour is located on the northern coast of Pembrokeshire, south-west Wales. The harbour lies north of the towns of Goodwick and Fishguard which are under a joint Town Council. The administrative Council boundary is made up of three electoral wards of Goodwick, Fishguard Northwest and Fishguard Northeast.

Fishguard and Goodwick were established during the late 10th Century, a period in which the coasts of Wales were subject to Viking raids, establishing trading posts and settlements.

The settlement of Fishguard was called "Fiscard" until the turn of the 19th century when the name was "Anglicised", Fishguard was a marcher borough and in 1603 was described as one of five Pembrokeshire boroughs overseen by a portreeve. Lower Fishguard developed as a herring fishery and port, trading with Ireland, Bristol and Liverpool. Goodwick was a small fishing village in the parish of Llanwnda, but in 1887 work commenced on a railway connection and harbour, and the village grew rapidly to service this. The main industry is now tourism although in the town's industrial past brick making was once an important industry. Some fishing still takes place on a small scale but most activity is centered on Milford Haven. The local beach, Goodwick Sands, is where the defeated French invasion force assembled prior to their unconditional surrender on 24 February 1797.
The harbour was constructed by blasting 1.6 million tonnes of rock from the hillside to make a 900m long breakwater. The quarried-out area became the quay. The harbour was finally opened on 30 August 1906. Planned to be the end of the Great Western Railway's line and its major sea port, replacing Neyland, problems with the harbour prevented larger ocean liners from docking. Accordingly, the harbour has a smaller inner breakwater protecting the remaining open side.
During construction of the harbour a small estate was built directly above the harbour to house its workers known as "Harbour Village". The port now accommodates a ferry service to Rosslare operated by Stena Line.

7.4 Policy Context

7.4.1 National legislation and policy

7.4.1.1 Planning Policy Wales

The assessment of potential impacts upon human health and population has been made with consideration to the specific policies set out in the Planning Policy Wales (Welsh Government, 2024). Key provisions that have been considered within the assessment are set out in Table 7-1 below.

Table 7-1: Summary of the Planning Policy Wales policies and provisions relevant to the health assessment

Policy	Evidence
Promoting Healthier Places	Paragraph 3.19 *"The built and natural environment is a key determinant of health and well-being. The planning system has an important role in shaping the social, economic, environmental and cultural factors which determine health and which promote or impact on well-being in line with the Healthier Wales goal. The way places work and operate can have an impact on the choices people make in their everyday lives, including their travel and recreational choices and how easy it may be to socialise with others".*
	Paragraph 3.20 "*Disadvantaged and deprived communities tend to be disproportionately affected by health problems. There are links between the built and natural environment and health throughout a person's lifetime and an understanding of the wider determinants of health should be a key component of development plan preparation. The planning system should identify proactive and preventative measures to reduce health inequalities*"
	Paragraph 3.21 *"...Health impacts should be minimised in all instances, and particularly where new development could have an adverse impact on health, amenity and well-being…"*

	Paragraph 3.24 *"Where significant effects on human health are likely to arise as a result of development plans or individual development proposals, environmental impacts should be considered in full knowledge of the likely consequences for health. Information to assess potential impacts on health can be required through various mechanisms, such as sustainability appraisal of development plans and environmental impact assessments, and where relevant, health impacts should be incorporated into such assessments. In general, the most effective and collaborative ways of working will require shared and integrated approaches to evidence gathering and assessments. Health Impact Assessment makes a valuable contribution towards plan making […] Evidence on health impacts can help the planning system develop stronger and more coherent approaches towards maximising health and well-being"*
Planning Policy Wales and Placemaking: Assessing the Sustainable Benefits of Development	Paragraphs 2.26 and 2.27 Planning authorities should ensure that social, economic, environmental and cultural benefits are considered in the decision-making process. Key factors in the assessment process include: • "*are the environmental impacts of development on health and amenity limited to acceptable levels and the resilience of ecosystems improved*"
Productive and Enterprising Places	"*Development should prevent problems from occurring or getting worse such as the generation of carbon emissions, poor air quality and waste and the depletion of our natural resources which will need to be managed for many years to come*." (Page 76).
6.7 Air Quality and Soundscape	Paragraph 6.71 "*Clean air and an appropriate soundscape, contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible*" Paragraph 6.79 *"When proposing new strategies for development and when allocating sites in development plans it will be important to avoid instances where incremental development of infrastructure […] creates or exacerbate health and amenity inequalities by introducing more sensitive receptors into an area or by making existing occupiers more vulnerable to poor air quality or noise"*.

7.4.1.2 Future Wales, the National Plan 2040

The assessment of potential impacts upon human health has been made with consideration to the specific policies set out in Future Wales (Welsh Government, 2021). Future Wales sets out specific policies that ensure resilient location and design choices by promoting sustainable growth strategy as well as ensuring the consideration of natural resources and health and well-being form part of site and design choices.

Policy 10 on international connectivity, specifically identifies Fishguard Port as a strategic gateway, stating "*Future Wales and the Wales Transport Strategy should be used together and an integrated approach taken to their implementation at the regional and local levels. This is critical to ensure new development is built in sustainable locations and supported by the active travel and public*

transport infrastructure and services required to enable people to live active and healthy lives. Taking an integrated approach is also key to ensuring new development provides the critical mass of people needed to help fund and sustain infrastructure and services, as well as ensuring average levels of airborne pollution continue to be reduced" (page 80).

7.4.1.3 Wales Transport Strategy, 2021

The strategy sets out a vision for how the transport system can help deliver priorities for Wales, helping on a pathway to creating a more prosperous, green and equal society. Priority 2 is to "*Allow people and goods to move easily from door to door by accessible, sustainable and efficient transport services and infrastructure*". The Strategy includes a specific 'health' ambition. This encompasses improving air quality and reducing noise associated with transport, as well as contributing to higher activity levels through more people walking and cycling.

The strategy states: "*We will make healthy transport options more attractive, affordable, prominent and accessible by investing more in cycling and walking, integrated transport, accessible transport hubs and public transport. We will use Health Impact Assessments, social welfare cost models and other planning tools to ensure health is taken into account in transport planning in line with our commitments in A Healthy Weight, A Healthy Wales*" (page 25).

In terms of Ports the strategy's vision is that it will '*adopt a more strategic approach to Welsh Ports and nearby development sites, recognising their role as a catalyst for co-location of manufacturing, energy, leisure, distribution and tourism'*. The key priorities are; to invest more sustainable ports infrastructure; identify opportunities for future economic development; acknowledge ports transport as a key facet of the wider policy on freight and logistics; seek to reduce barriers to investment; and support the contribution of ports to the visitor economy.

The strategy supports ports and harbours contribution to well-being through travel opportunities; energy efficiency and low carbon networks; renewable energy projects; increase in trade and inward investment opportunities; focal point for investment, delivering local jobs and services and benefits; and the rich maritime history.

7.4.1.4 Well-being of Future Generations (Wales) Act

The Act (Welsh Government, 2025) gives a legally-binding common purpose – the seven well-being goals – for national government, local government, local health boards and other specified public bodies. One of the goals is 'A healthier Wales', describing this as "*A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood*".

The Act requires public bodies in Wales to think about the long-term impact of their decisions, to work better with people, communities and each other, and to prevent persistent problems such as poverty, health inequalities and climate change.

The Act defines Sustainable Development in Wales as: "*The process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals*."

7.4.1.5 Pembrokeshire County Council Local Development Plan 1

The adopted Pembrokeshire Local Development Plan, hereafter the "Local Plan" has also informed this health assessment. Table 7-2 below summarises the policies and provisions relevant to this assessment.

Table 7-2: Pembrokeshire County Council Local Development Plan policies and provisions

Policy	Evidence

GN.1 General Development Policy	*"Development will be permitted where the following criteria are met: […]* *2. 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*"; *7. It would not cause or result in unacceptable harm to health and safety*" *8. It would not have a significant adverse impact on water quality"*
	Paragraph 6.8 "*Where there are concerns that a proposal would cause harm to health and safety through contamination, adverse impact on air quality, land instability, flooding or erosion, professional advice will be sought from the relevant authority*".
GN.34 Protection and Creation of Outdoor Recreation Areas	Paragraph 6.139 "*Recreational activities are an important means of improving the quality of life of Pembrokeshire's residents and visitors. Places and facilities such as playgrounds, playing fields, parks and cycle paths are used by people of all ages across the whole of Pembrokeshire and they encourage healthier lifestyles*"
The LDP vision	'to ensure that Pembrokeshire is prosperous and that it remains vibrant .. by creating .. maritime access to the Milford Haven waterway and Fishguard Harbour'.
Strategic Policy 2	Port and Energy Related Development supports development at the Port of Fishguard and acknowledges that improvements to facilities and infrastructure will benefit the local and national economy. Fishguard Harbour improvements to facilities and infrastructure will benefit the local and national economy and confer benefits on other countries, particularly the Republic of Ireland.

The following policies from the Draft Pembrokeshire Local Development Plan 2 have also been considered in this HIA.

Strategic Policy 1 (SP1) of the LDP2 states that *"All proposals must ensure that development supports the delivery of economic, social, environmental and cultural well-being and sustainable development. Development proposals should demonstrate the following […] 3. Promotion of health and wellbeing, […] 5. Accessibility to services*". The Proposed Development promotes health and wellbeing through improved transport connectivity within the study area and ensuring accessibility to services.

Policy SP 8 (Regional Growth Areas and Urban Settlements) states that "*Within Regional Growth Areas and other urban settlements, development will support sustainable communities, complementary relationships between growth towns, place-making and well-being by ensuring: 1. Accessibility by a range of sustainable modes of transport*". The Proposed Development improves sustainable transport connectivity between Wales, Ireland and the wider EU.

7.5 Consultation

Table 7-3 summarises the issues raised relevant to human health, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Proposed Development and the consultees that were contacted.

Table 7-3: Summary of key consultation issues raised during consultation activities undertaken for the Proposed Development relevant to human health.

Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
Public Health Wales	"*Compliance with best practice techniques [...] if good management & maintenance of the works in compliance with current sector guidance is followed, there should not be any adverse impacts to human health, during or after construction*"	As stated in Chapter 2: Project Description, the Proposed Development will follow good management and maintenance practices. This chapter provides a detailed assessment of the potential impacts of the Proposed Development on human health in section 7.9. There are no significant effects on human health identified during construction or operation phases.
Public Health Wales 25 July 2025	"*Having reviewed the application our public health risk assessment concludes that there are minor adverse effects on public health from this development, including potential for dust and emissions from machinery and traffic impacting local air quality, temporary increases in noise, especially during piling and demolition, risk of sediment-bound contaminants being released into the environment and access disruption around the site. These impacts can be minimised by adhering to best available techniques (BAT) for construction methods, including pollution prevention measures, adherence to Marine Pollution Contingency Plans, sediment testing and disposal at a licensed site, dust suppression, use of low-emission machinery and consideration of the location of the nearest sensitive receptors (none within 100m of the site).* *Our position is that any activity that can demonstrate full compliance with best practice techniques (BAT), in line with the Regulator's requirements, presents a low risk to human health and so does not require a detailed public health risk assessment. We would expect the Regulator to ensure the activity and construction works are well managed, maintained and remains in compliance with current sector guidance and do not give rise to any adverse impacts to human health, during or after construction.*	This response is noted and welcomed. The Human Health ES chapter has scoped in relevant wider health determinants based on the findings of other EIA technical disciplines that inform the health assessment and the scale and nature of the Proposed Development. The human health chapter also serves to demonstrate that there will be no significant impacts to public health as a result of construction and operation of the Proposed Development, which minimises perceived risk from members of affected communities.

Should any additional information be obtained by the Regulator that might significantly alter the contents of the application we would be happy to review this position"

7.6 Methodology to inform the baseline

7.6.1 Desktop study

Information on human health and population within the study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 7-4. These sources provide the most up to date data for this assessment.

Table 7-4 Summary of key desktop reports.

Title	Source	Year
Public Health Outcomes Framework, Wales	The Public Health Wales Observatory	2011 - 2020
Detailed official data on Wales	StatsWales	2021-2023
Official census and labour market statistics	Office for National Statistics	2021
Economic Activity Population and household Estimates	Office for National Statistics (ONS)	2022
Pembrokeshire County Local Development Plan	Pembrokeshire Council	2013

7.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for human health and population. The baseline data presented in this section is derived from publicly available public health and population data from the sources outlined above.

7.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology, and the following human health specific guidance:

- IEMA 2022 guidance on health in EIA series: effective scoping (Pyper et al., 2022a) and determining significance (Pyper et al., 2022b).
- Wales Health Impact Assessment Support Unit (WHIASU). Health Impact Assessment: A practical guide (WHIASU, 2017)
- Institute of Public Health (IPH), Guidance, Standalone Health Impact Assessment and health in environmental assessment, 2021 (Pyper et al., 2021)

- International Association for Impact Assessment (IAIA) and European Public Health Association. A reference paper on addressing Human Health in EIA (Cave et al., 2020) and academic discussion of the same (Cave et al., 2021, p. 20).
- World Health Organisation (WHO) guidelines on air quality and noise (Berglund et al., 1999; Government of Ireland, 2018; WHO, 2021, 2009).

7.7.1 Impact assessment criteria

The criteria for determining the significance of effects involves a two-stage process of defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

Judgements are based on most relevant criteria in Table 7-5, Table 7-6 and Table 7-7. It is likely in any given analysis that some criteria will span score categories. These are as set out by guidance (Pyper et al., 2022b).

The criteria for defining magnitude in this chapter are outlined in Table 7 5 below.

Table 7-5 Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
High	High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; majority of population affected; permanent change; substantial service quality implications.
Medium	Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications.
Low	Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications.
Negligible	Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication.

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 7-6 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High levels of deprivation (including pockets of deprivation); reliance on resources shared (between the population and the project); existing wide inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or concern; people who are prevented from

	undertaking daily activities; dependants; people with very poor health status; and/or people with a very low capacity to adapt.
Medium	Moderate levels of deprivation; few alternatives to shared resources; existing widening inequalities between the most and least healthy; a community whose outlook is predominantly uncertainty with some concern; people who are highly limited from undertaking daily activities; people providing or requiring a lot of care; people with poor health status; and/or people with a limited capacity to adapt.
Low	Low levels of deprivation; many alternatives to shared resources; existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern; people who are slightly limited from undertaking daily activities; people providing or requiring some care; people with fair health status; and/or people with a high capacity to adapt.
Very low	Very low levels of deprivation; no shared resources; existing narrow inequalities between the most and least healthy; a community whose outlook is predominantly support with some concern; people who are not limited from undertaking daily activities; people who are independent (not a carer or dependant); people with good health status; and/or people with a very high capacity to adapt.

The significance of the effect upon human health is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 7-7. Where a range of significance of effect is presented in Table 7-7, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 7-7 Matrix used for the assessment of the significance of the effect.

Magnitude of impact					
Sensitivity of Receptor		**Negligible**	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate. The significance conclusions reached for population health are driven by the vulnerable population group sensitivity score, reflecting a consideration of potential health inequalities.

Effects of moderate and above are considered significant in terms of the EIA Regulations.

The IEMA 2022 guidance requires that the conclusions, reached using sensitivity and magnitude, are then explained for the public health audience with a suitable concise narrative. The narrative summarises key considerations and supporting evidence. The guidance sets out the criteria for doing so, see

Table 7-8: Explanation of Population Health Significance

Category/Score	Indicative criteria
Major (significant)	The narrative explains that this is significant for public health because: • Changes, due to the project, have a substantial effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show consensus on the importance of the effect • Change, due to the project, could result in a regulatory threshold or statutory standard being crossed (if applicable) • There is likely to be a substantial change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a causal relationship between changes that would result from the project and changes to health outcomes • In addition, health priorities for the relevant study area are of specific relevance to the determinant of health or population group affected by the project.
Moderate (significant)	The narrative explains that this is significant for public health because: • Changes, due to the project, have an influential effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show mixed views • Change, due to the project, could result in a regulatory threshold or statutory standard being approached (if applicable) • There is likely to be a small change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a clear relationship between changes that would result from the project and changes to health outcomes • In addition, health priorities for the relevant study area are of general relevance to the determinant of health or population group affected by the project.
Minor (not significant)	The narrative explains that this is not significant for public health because: • Changes, due to the project, have a marginal effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that no relevant consultation themes emerge among stakeholders

	• Change, due to the project, would be well within a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable) • There is likely to be a slight change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a suggestive relationship between changes that would result from the project and changes to health outcomes In addition, health priorities for the relevant study area are of low relevance to the determinant of health or population group affected by the project.
Negligible (not significant)	The narrative explains that this is not significant for public health because: • Changes, due to the project, are not related to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the project having no responses on this issue among stakeholders • Change, due to the project, would not affect a regulatory threshold, statutory standard or guideline (if applicable) • There is likely to be a very limited change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is an unsupported relationship between changes that would result from the project and changes to health outcomes • In addition, health priorities for the relevant study area are not relevant to the determinant of health or population group affected by the project.

The temporal scope of this chapter used the following summary terms:

- ‘Very short term’ relates to effects measured in hours, days or weeks
- ‘Short term’ relates to effects measured in months, (up to 24 months duration)
- ‘Medium term’ relates to effects measured in years
- ‘Long term’ relates to effects measured in decades.

The chapter uses the WHO definition of health, which states that health is a ‘state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity’ (World Health Organization, 1948).

The chapter also uses the WHO definition for mental health, which is a ‘state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community’ (WHO, 2022).

Health and wellbeing are influenced by a range of factors, termed the wider determinants of health. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.

Impacts of the Proposed Development that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility and exposure.

A change in a determinant of health affects does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Development. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

Typically, the change in a risk factor may need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

7.7.1.1 Population Health Approach and Vulnerable Groups

In line with IEMA guidance a population health approach has been taken, informed by discussion of receptors within the other technical reports.

The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the assessment. People falling into more than one group may be especially sensitive:

- Young age: Children and young people (including pregnant women and unborn children)
- Old age: older people (particularly frail elderly)
- Low income: People on low income, who are economically inactive or unemployed
- Poor health: People with existing poor health; those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities
- Social disadvantage: People who suffer discrimination or other social disadvantage, including relevant protected characteristics under the Equality Act 2010 or groups who may experience low social status or social isolation for other reasons.
- Access and geographical factors: People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and/or health indicators.

The following characterisations of how the general population may differ from vulnerable group populations were considered when scoring sensitivity:

- The general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care; experiencing low deprivation; comprising people with good health status; rating their day-to-day activities as not limited; having a high capacity to adapt to change (high resilience); less likely to rely on resources shared with the Proposed Development.
- The vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant; experiencing high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas); reporting bad or very bad health status; rating their day-to-day activities as limited; having a low capacity to adapt to change (limited resilience); more likely to rely on resources shared with the Proposed Development.

Heightened vulnerability is rarely due to a single cause and people may experience multiple forms of vulnerability due to intersecting social processes that result in inequalities (e.g., socioeconomic status and income).

As all development has the potential for adverse effects to some particularly vulnerable individuals, the role of the human health chapter significance conclusions are not to set a threshold of ‘no

harm' from development, but to show where, at a population level, the harm should weigh strongly in the balance alongside the development's benefits for health and other outcomes.

In some situations, an effect may only be relevant to a few individuals, indicating that a population health effect would not occur. As stated by guidance: "*Where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change*" (Pyper et al., 2022b).

7.8 Baseline Environment

7.8.1 General Health

Indicator Name	Site specific wards		Local	National
	Fishguard: Northeast Ward	Goodwick Ward	Pembrokeshire	Wales
Life Expectancy				
Healthy Life expectancy at birth for males (year)	n/a	n/a	61.8	61.1
Healthy Life expectancy at birth for females (year)	n/a	n/a	65.8	60.3
Life expectancy at birth for males (year)	n/a	n/a	79.4	78.0
Life expectancy at birth for females (year)	n/a	n/a	83.5	81.8
General Health				
Very good or good health %	76.7	78.7	80.4	78.6
Fair health %	16.3	14.2	13.6	14.5
Very bad or bad health %	7.0	7.1	6.0	7.0
Mental Health				
Mental well-being among adults (average Warwick-Edinburgh Mental Well-being Scale score)	n/a	n/a	48.5	48.1
Mortality				
Premature deaths from key non communicable diseases[1]	n/a	n/a	280	311
Healthy lifestyles				
Adults meeting physical activity guidelines %	n/a	n/a	55.5	55.4
Deprivation				
Overall deprivation (WIMD)	50% least deprived	50% most deprived	n/a	n/a

[1] Including diseases of the circulatory system, malignant neoplasms, diabetes mellitus, diseases of the respiratory system excluding infectious

Transport				
Deaths from road traffic injuries	n/a	n/a	3.9	3.0
Travel to work: Bicycle %	0.6	0.9	0.6	1.1
Travel to work: On foot %	12.7	5.6	7.6	7.1
Air Quality				
Quality of the air we breathe, average NO_2 concentration ($\mu g/m^3$)	n/a	n/a	4.2	6.9

Healthy life expectancy at birth, i.e. the average number of years a person can be expected to live in good health, is similar in Pembrokeshire for males (61.8 years) and higher for females (65.8 years) compared to the national averages (61.1 years for males and 60.3 years for females).

Considering **general health** in the site-specific study area, the majority of the population reported to be in very good or good health, consistent with the national averages. 76.7% of people in Fishguard northeast Ward reported to be in good to very good health, which is slightly lower than the national average of 78.6%. In Goodwick Ward 78.7% reported to be in good to very good health, which is similar to the national average. 16.3% of the population in Fishguard northeast and 14.2% in Goodwick reported to be in fair health which is higher than and similar to the national averages, respectively. 7% of the population in Fishguard northeast Ward and 7.1% in Goodwick Ward reported to be in bad or very bad health which are both similar to the national average of 7.0%.

Similarly, in the local study area, the majority of the population reported to be in very good or good health with less than 10% reporting to be in bad to very bad health. 80.4% of people in Pembrokeshire reported to be in good to very good health, which is higher than the national average of 78.6%. Pembrokeshire has a proportion of 13.6% of people who reported to be in fair health which is slightly lower than the national average of 14.5%. Only 6% of the population reported to be in bad to very bad health in the district which is slightly lower than the national average of 7%.

Mental health in Pembrokeshire (using the Mental Well-being Scale score) is similar to the national average. The levels of **physical activity** in the local authority area are similar to those nationally. The percentage of adults meeting physical activity guidelines in Pembrokeshire (55.5%) is similar to the national average (55.4%).

Considering transport related health outcomes, the proportion of people seriously injured from road traffic injuries in Pembrokeshire is slightly higher than the national average. The proportion of people who cycle to work in Fishguard: Northeast Ward (0.6%) and Goodwick Ward (0.9%) are both lower than the national average (1.1%). On the other hand, the proportion of those who walk to work in Fishguard: Northeast Ward (12.7%) is higher than the national average whereas that in Goodwick Ward (5.6%) is lower than the national average.

Considering air quality in the local area, the average concentration of NO_2 in Pembrokeshire is 4.2 $\mu g/m^3$ which is lower (better) than the national average of 6.9 $\mu g/m^3$.

Using **deprivation** as a health resilience indicator, Deprivation Mapping shows pockets of deprivation with the study area. Goodwick falls within the 50% most deprived nationally. On the other hand, Fishguard Northeast falls within the 50% least derived nationally.

7.8.2 Population

2021 Census

The population of Wales in 2021 was 3.10 million, the largest population ever recorded through a census in Wales. The population of Wales has grown by 44, 000 (1.4%) since the last census in 2011, when it was 3.06 million. The rate of population growth in Wales between 2011 and 2021 (1.4%) was lower than the rate between 2001 and 2011, when the population grew by 5.5%. The

rate of population growth in Wales was considerably lower than in England, where the population grew by 6.6% (almost 3.5 million).

In 2021 Pembrokeshire had a population of 123,354, over this is approximately 4% of Wales's total population. Of the total Pembrokeshire population 60,069 were male and 63,285 were female.

There were more deaths than births in Wales between 2011 and 2021. The population growth since 2011 is due to positive net migration into Wales (approximately 55,000 usual residents). There were more people than ever before in older age groups in Wales. The proportion of the population who were aged 65 years or older was 21.3% (up from 18.4% in 2011).

In regard to economic activity for the local authority of Pembrokeshire there were 55,000 in employment at the time of the 2021 census compared to 1.45 million across Wales. In 2021 the employment rate for Pembrokeshire was 73.6% per cent. This was the 17th highest amongst the 22 Welsh local authorities.

7.8.3 Population characteristics

Relevant protected characteristics are listed in Table 7-9 to consider the potential for any disproportionate effects that may arise due to the distribution of such characteristics within the population. Protected characteristics not shown in Table 7-9 have been reviewed and are not considered to have relevant links to health outcomes that may be influenced by this Proposed Development.

Table 7-9: Protected characteristics

Indicator Name	Site specific wards		Local	National
	Fishguard: Northeast Ward	Goodwick Ward	Pembrokeshire	Wales
Sex				
Male %	52.0	51.1	51.3	51.1
Female %	48.0	48.9	48.7	48.9
Age				
% age 0 to 15	15.4	16.9	16.9	17.7
% age 16 to 64	49.7	58.7	56.9	61.0
% aged 65 and over	34.9	24.3	26.2	21.4
Disability				
Disabled under the Equality Act	23.5	21.7	20.3	21.6
Not disabled under the Equality Act	76.5	78.3	79.7	78.4
Language barriers				
Population who cannot speak English well or at all (%)		0.2	0.5	0.3
Ethnicity				
Asian, Asian British or Asian Welsh %	0.7	0.7	0.9	2.9
Black, Black British, Black Welsh, Caribbean or African %	0.3	0.2	0.2	0.9

Mixed or Multiple Ethnic groups %	0.4	0.7	0.9	1.6
White %	97.9	98.2	97.6	93.8
Other ethnic group %	0.7	0.1	0.3	0.9

In terms of **population age profile**, compared to the national average, there are more older people and fewer young people and people of working age in the site specific study area compared to the national average. Fishguard northeast has a proportion of 15.4% and Goodwick a proportion of 16.9%, of children and young people aged 0-15 years which are both lower than the national average of 17.7%. For the working age population, Fishguard northeast has a proportion of 49.7%, and Goodwick a proportion of 58.7% which are both lower than the national average of 61.0%. An opposite trend is observed in the elderly population; Fishguard northeast has a proportion of 34.9% of people who are aged 65 and over which is notably higher than the national average of 21.4%. Similarly, Goodwick ward has a proportion of 24.3% of the elderly population which is slightly higher than the national average.

Considering **disability and limiting conditions**, 23.5% of people in Fishguard northeast have a disability under the Equality Act which is slightly higher than the national average of 21.6% and 21.7% of people in Goodwick have a disability under the Equality Act which is similar to the national average. The majority of the population across the study area have no disability or limiting condition. Fishguard northeast has a proportion of 76.5% with no disability or limiting condition which is slightly lower than the national average of 78.4% and Goodwick has a proportion of 78.3% which is similar to the national average.

Considering **language proficiency**, relevant to communicating findings and mitigations, 0.2% of the population in Fishguard northeast and 0.5% in Goodwick cannot speak English well or at all, which is lower (better) than the national average of 0.7%.

In terms of **ethnicity**, the majority of the site-specific study area population identify as white, consistent with the national averages (Fishguard northeast has a proportion of 97.9% and Goodwick a proportion of 98.2%, which are higher than the national average of 93.8%). The proportion of people who identify as Asian in Fishguard northeast and Goodwick is 0.7% which is lower than the national average of 2.9%. Fishguard northeast has 0.3% and Goodwick 0.2% of people who identify as black which are both lower than the national average of 0.9%.

7.9 Impact Assessment

7.9.1 Do Nothing Scenario

The Do-Nothing Scenario will result in no impact upon the existing baseline population health profile as the Ferry Port will continue to operate as it currently does.

7.9.2 Assessment of Construction Effects

7.9.2.1 Transport modes, access and connections

This section discusses changes to transport modes, access and connections during the construction of the Proposed Development, and related effects on population health. Construction of the Proposed Development has the potential to disrupt local vehicle traffic (private and public transport) and access as well as active travel (pedestrians and cyclists).

This section has been informed by Chapter 2: Project Description, Chapter 19: Transportation and Chapter 24: Shipping and Navigation of the ES, which set out relevant assessment findings and mitigation measures that have been taken into account.

The scientific literature identifies the following general points relevant to potential exposures and health outcomes. For accessibility, health effects are associated with emergency response times or non-emergency treatment outcomes. Transportation barriers are important to healthcare access, particularly for those with lower incomes. Transportation barriers may lead to rescheduled or missed appointments, delayed care, and missed or delayed medication use. These consequences may lead to poorer management of chronic illness and poorer health outcomes (Syed et al., 2013).

A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is disruption and disturbance to roads, ferry services, and active travel routes.
- The pathways are:
  - a change in access to goods and services that support health directly and indirectly; and
  - behavioural change in physical activity, transport delay, and road accidents and safety.
- Receptors are residents and long-term occupiers of nearby communities.

The population groups relevant to this assessment are:

- The site-specific population of Fishguard northeast and Goodwick wards.
- The local population of Pembrokeshire.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people are potentially more vulnerable road users)
  - Old age vulnerability (older people are potentially more vulnerable road users)
  - Poor health vulnerability (people with existing poor physical and mental health in relation to health trip journey times)
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on the affected routes, including for healthcare and other amenities).

Sensitivity of the population

The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 7.7.1.1 of this report. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to changes in access, including changes in healthcare access.

The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, including children, elderly and those receiving care due to poor health. This sub-population may have fewer resources and less capacity to adapt to changes, making them more reliant on affected routes with greater likelihood that any disruption or disturbance could lead to a greater effect. Vulnerability is linked to mode of travel, including pedestrians and cyclists being more sensitive to road safety changes. It also relates to age, especially young people and older people being more vulnerable to accident severity, as well as to those who are reliant on services accessed on affected routes (e.g. traveling to schools and work). Vulnerability may be increased in areas of moderate deprivation. Deprived populations may already face more access barriers compared to the general population and therefore be more sensitive to access changes. Vulnerability also includes those accessing health services (emergency or non-emergency) at times and locations affected by congestion. People in poor or

very poor health may be more frequent users of healthcare service and therefore be more sensitive to access changes.

Magnitude of change

As stated in Chapter 2: Project Description, the construction programme is anticipated to be over a 12 month period. While port operations will continue for the majority of this time, there will be a 2 month shutdown, during the low season, where ferry operations will be suspended.

Access to the site is via the Station Hill roundabout, accessed at Quay Road from Goodwick in the west or via the A40/ Parrog from Fishguard town in the east. Construction traffic is anticipated to mostly be from Fishguard town and therefore has the potential to cause disruptions along Station Hill. Suitable traffic management and other systems will be put in place as required to minimise disruption to existing activities within the Stena Line port during the construction period. These are detailed in Appendix 2A: Outline Construction Environmental Management Plan (OCEMP).

Chapter 19: Transportation of the ES states that impacts to any of the 3 approach routes would not exceed thresholds, indicating a not significant impact.

In relation to health-related travel times and accessibility, the scale of change in delays is expected to be low. The frequency with which health related journeys may be affected is likely to be occasional for most people though for a few people, severity could relate to a small change in morbidity (rate of disease or health condition within a population) risk. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient). The priority given to ambulances travelling under blue lights would be expected to reduce any changes in journey times. Mitigation in terms of early and ongoing information sharing with emergency and healthcare services is secured within the OCEMP. The temporary nature of the work and ability for people to adapt to known planned diversions or delays means there is unlikely to be a significant change to population health outcomes associated with access to social infrastructure such as shops, employment and educational facilities.

In relation to temporary loss of access and connections as a result of the shutdown of ferry services, the existing Stena line ferry service will be temporarily shutdown for 3 months of the construction phase and there are no plans for alternative ferry crossings. As reported in Chapter 24: Shipping and Navigation the planned shutdown is during the low season and it is considered that customers will utilise alternative ferry crossings or means of transport or delay travel. The effect will, therefore, be of tolerable adverse significance, which is not significant in EIA terms. For population health, the impact would be of a short-term duration, and the scale of change would be small. There is the potential for minor adverse changes in quality of life for a very few people specifically the Stena Line customers on the Fishguard – Rosslare route. Outcome reversal may be rapid once services are reinstated.

In relation to active/sustainable travel the scale of change in use of active or public transport is small to negligible. Due to the temporary nature of construction works and ability of people to adapt to known planned roadworks, the delays are not expected to significantly change population health relating to sustainable/ active travel. The scale of change is therefore considered small and short-term in duration. There is the potential for minor adverse changes in morbidity for a small minority of the population. Most adverse effects on health behaviours and outcomes would be expected to reverse on completion of the construction works. Outcome reversal may be rapid once services are reinstated, with slight service quality implications.

In relation to road safety, a small to negligible scale of change in road traffic would have a corresponding very small increase in accident risk (simply as a function of traffic volumes). Such events would be once-off over the short-term for the construction phase. Severity relates to a very minor change in risk of injury or mortality (with outcome reversal gradual or permanent). Very few people would be affected, with no or slight implications for healthcare services.

It is predicted that the impact will affect the receptor directly and indirectly. Based on the above, the magnitude is therefore considered to be **low**.

Significance of effect

Construction traffic and access impacts of the Proposed Development are considered to result in a **minor adverse (not significant)** effect on population health. The professional judgment is that there would be, at most, a slight adverse change in the health baseline of the study area. This conclusion reflects that access to health supporting services, active/sustainable travel and road safety are public health priorities and there is causal association that is supported by the scientific literature. However, the level of change due to the Proposed Development is temporary, small and is appropriately mitigated by standard good practice measures that minimise disruption and disturbance. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, no widening of health inequalities would be expected, and no influence is expected on the ability to deliver local or national health policy.

7.9.2.2 Air quality

This section discusses changes to environmental conditions, in particular, air quality during the construction of the Proposed Development, and related effects on population health. Construction of the Proposed Development has the potential to result in dust nuisance from construction activities, particularly as a result of the proposed demolition of the existing disused RNLI slipway, existing buffer dolphin tower structures, operations room, and concrete deck structure, and construction of the project infrastructure and movement of vehicles on site.

This section has been informed by Chapter 15: Air Quality, which sets out relevant assessment findings and mitigation measures that have been taken into account.

The scientific literature indicates that there is an association between air quality emissions and health and wellbeing effects. Environmental air pollution is associated with increased risk of respiratory and cardiovascular diseases. Air pollution exerts detrimental effects on the heart by developing pulmonary inflammation, systemic inflammation, oxidative stress, endothelial dysfunction and prothrombotic changes (Meo and Suraya, 2015). The adverse effects on health of particulate matter (PM) and nitrogen dioxide (NO_2) indicates that the effects occur at air pollution concentrations lower than those in guidelines (WHO, 2021). Long term exposure to particulate matter is associated with incidence of coronary events, and this association persists at levels of exposure below the current limit values (Cesaroni et al., 2014). The magnitude of the long-term effects of NO_2 on mortality is at least as important as that of $PM_{2.5}$ (Cesaroni et al., 2014).

A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is dust and air pollutants (particularly NO_2, $PM_{2.5}$ and PM_{10}) from construction activities and plant/vehicle emissions.
- The pathway is diffusion through the air.
- Receptors are residents and long-term occupiers of nearby properties (e.g. Harbour Village and Quay Road) and community buildings, as well as Goodwick beach and surrounding amenity users.

Furthermore, the theoretical effect is considered applicable in the context of this project.

The population groups relevant to this assessment are:

- The site-specific population of Fishguard northeast and Goodwick wards.
- The sub-population vulnerable due to:
  - Young age vulnerability (particularly children with developing lungs).
  - Old age vulnerability (older people, who are more sensitive to changes in air quality)

- Poor health vulnerability (people with existing poor respiratory or cardiovascular health).
- Access and geographical vulnerability (people for whom close proximity to Proposed Development increases sensitivity).

As noted in **Chapter 19: Transportation,** the worst case predicted increases in construction related traffic are still below all relevant thresholds and therefore the construction traffic impact is insignificant. Regard has been given to the potential for effects to the local population of Pembrokeshire. Whilst transport related air quality effects would extend to this area; the potential to affect public health at a wider local level from such impacts is considered unlikely due to the scale of predicted construction traffic emissions. The health assessment focus is therefore on effects at the site-specific level and construction dust impacts.

Construction activities that produce dust relate to the coarser fractions of PM_{10} and potential nuisance from dust deposition on property. The great majority of anthropogenic $PM_{2.5}$ and NO_2 health effects relate to combustion related processes, particularly use of fossil fuels (natural gas) in electricity generation, changes in transport patterns, and solid fuel burning from space heating.

Whilst the focus of discussion in this health chapter differentiates between coarse PM during construction and fine PM, the health outcomes of PM_{10} and $PM_{2.5}$ are not distinguished in this assessment. This reflects that both are typically present (though the relative proportions change) and that the evidence base does not consistently distinguish their effects particularly given that $PM_{2.5}$ is a subset of PM_{10}. However, generally, elevated concentrations of $PM_{2.5}$ are considered of greater concern due to their greater potential to interact within the body.

For construction dust, the main health outcomes are likely to relate to exacerbation of existing conditions, such as asthma or COPD (i.e. airway inflammation by coarse PM) and to reductions in wellbeing associated with annoyance or reduced amenity. Whilst other outcomes (e.g. cardiovascular events) may be relevant in the event of brief high concentrations, such elevated exposures are expected to be avoided via the embedded standard good practice mitigation discussed in Chapter 15: Air Quality. The potential for dust and PM to include mobilised soil and building material contaminants is noted and taken into account. The use of standard good practice measures to avoid new contamination and appropriately manage any historic contamination encountered including asbestos (see Chapter 17: Soils, Geology & Geohydrology) would mitigate against a public health risk due to airborne mobilisation of soil contaminants.

Whilst the literature supports there being thresholds set for health protection purposes, it also acknowledges that for $PM_{2.5}$ and NO_2 there are non-threshold health effects (i.e. when there is no known exposure threshold level below which adverse health effects may not occur) (WHO, 2013). The health assessment has identified population groups that may be particularly sensitive to air quality effects. For example, young children are particularly susceptible to air pollution because of their developing lungs, high breathing rates per bodyweight, and amount of time spent exercising outdoors. Other vulnerable groups include people with poor health or long-term health conditions (e.g. people with type 2 diabetes), the elderly, and pregnant people.

Sensitivity of the population

The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 7.7.1.1 of this report. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to change. Additionally, most people live, work or study at a distance from the Proposed Development where construction dust and air pollutants are unlikely to be a source of concern.

The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. For example, existing respiratory conditions including asthma and chronic

obstructive pulmonary disease (COPD) and type 2 diabetes would increase sensitivity. People likely to be most affected by the Proposed Development are those either living or working close to the construction compounds (see receptors listed in Chapter 15: Air Quality). It is noted that whilst Harbour Village is considered sensitive due to proximity, being approximately 200m north of the Fishguard's port area, the topography is a steep gradient. Harbour Village is therefore situated above and set back from the port, which is likely to limit the potential for dust and other exposures.

Magnitude of change

As stated in Chapter 15: Air Quality, the overall dust impact on human health receptors as a result of construction and demolition work is deemed to be medium. A comprehensive set of mitigation measures and dust monitoring will be implemented during the construction phase, to further minimise construction dust impacts. These are detailed in Chapter 15: Air Quality (Section 15.10.1). Following mitigation, the air quality assessment predicts the risk of dust impacts to be at a level that is negligible (not significant). The impact would be short-term, and localised.

For population health, the magnitude of change due to the Proposed Development is **low**. Occasionally, weather conditions may coincide with construction activities to generate higher levels of dust. This can cause temporary annoyance, and for people with existing poor health, higher levels of coarse dust in the air can exacerbate some conditions (e.g. asthma). Coarse PM is larger and heavier and so it is deposited more quickly. This means that the concentration of coarse PM in the air reduces rapidly as it gets further from the source. The potential for nuisance-type dust effects is therefore expected to be occasional and limited in extent (though there would be periods of more intensive activity where particular demolition and construction activities require). Deposition rates are slower for finer PM and affect a wider area and thus, potentially, a greater number of people. However, exposure is expected to be very low due to the finer PM being typically a relatively small component of dust and the effects of dispersion would reduce concentrations over distance. At these levels it is unlikely that there would be discernible changes in the risk of developing a new health condition or of exacerbating an existing condition. Such changes would be short-term, with a very minor influence on quality of life and/or morbidity risk for respiratory and cardiovascular conditions for a very few people. Most effects would rapidly reverse, with no discernible influence for healthcare services.

Significance of effect

Construction air quality effects are considered **minor adverse (not significant)**. The minor adverse (rather than negligible) score represents a conservative assessment finding given scientific uncertainty (and emerging evidence) about non-threshold health effects of NO_2, and $PM_{2.5}$. The score takes into account WHO advisory guidelines. The level of change in the health baseline due to the Proposed Development is likely to be very limited, with at most a marginal effect on the delivery of health policy and inequalities. This is a public health acknowledgement of the very small incremental contribution to air pollution that the Proposed Development would make, but also recognition that at the Proposed Development level this should not be considered a significant effect on population health or health inequalities.

7.9.2.3 Noise and vibration

This section discusses changes to environmental conditions, in particular, noise during the construction of the Proposed Development, and related effects on population health. Construction of the Proposed Development has the potential to result in noise nuisance from construction activities, particularly night-time noise that may be detrimental to population health where sleep is disturbed to a high degree. Changes in the distribution of day-time noise are also considered.

This section has been informed by Chapter 13: Noise and Vibration, which sets out relevant assessment findings and mitigation measures that have been taken into account.

In general, the scientific literature suggests the potential for annoyance with an indication of further stress due to exposure to environmental noise (Guski et al., 2017). Annoyance describes negative reactions such as disturbance, irritation, dissatisfaction, and nuisance (Guski, 1999) . Environmental noise can initiate physiological stress responses in an individual that leads to a cascade of effects including a rise in heart rate and in levels of stress hormones (Guski et al., 2017) . These responses influence risk factors for cardiometabolic health issues including blood pressure, blood sugar and blood fats and long-term exposure may affect mental health and lead to diseases such as diabetes, heart attack, and stroke (Münzel et al., 2018b, 2018a, 2017). Night-time noise may disrupt the total sleep time and the required physiological and mental restoration in an individual even at low levels (Guski et al., 2017) .

Whilst the literature supports there being thresholds at which effects (such as annoyance and sleep disturbance) are likely, it also acknowledges the subjective nature of responses to noise. In this regard noise effects can be considered to have non-threshold effects, with characteristics other than sound levels also determining the influence on health outcomes (WHO, 2018). The assessment had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, the elderly, the chronically ill, people with a hearing impairment, shift-workers, people with mental illness (e.g., schizophrenia) and people who are hypersensitive to noise (e.g. associated with autism).

A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is noise and vibration generated by construction activities.
- The pathway is pressure waves through the air and vibration through the ground.
- Receptors are residents and long-term occupiers of nearby properties (e.g. Harbour Village and Quay Road) and community buildings, as well as Goodwick beach and surrounding amenity users.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Development.

The population groups relevant to this assessment are:

- The site-specific population of Fishguard northeast and Goodwick wards.
- The sub-population vulnerable due to:
    - Young age vulnerability (children and young people, whose auditory systems are still developing and may have less control over their acoustic environments. This also includes for educational disturbance).
    - Old age vulnerability (older people including for elderly nursing homes, who are more susceptible to effects of noise due to cognitive and sensory impairments and may have reduced coping mechanisms and decreased ability to adapt to environmental stressors).
    - Poor health vulnerability (people with existing poor physical or mental health who may have high sensitivity to noise).
    - Low-income vulnerability (people living in deprivation, including those on low incomes may have fewer resources to adapt, e.g. seek respite or install insulation; furthermore, those who are economically inactive may spend more time in affected dwellings).
    - Access and geographical vulnerability (people for whom close proximity to the proposed development increases sensitivity).

Sensitivity of the population

The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 7.7.1.1 of this report. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to change. Additionally, most people live, work or study at a distance from the Proposed Development where construction noise and vibration is unlikely to be a source of concern.

The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, including children, elderly and those receiving care due to poor health. This sub-population may experience existing widening inequalities due to living in areas with increasing noise and moderate deprivation, with limited capacity to adapt to changes. Vulnerability particularly relates to those living close to the construction activities, including those spending more time in affected dwellings, e.g. due to low economic activity, shift work or poor health. People who are concerned or have high degrees of uncertainty about construction noise and its effect on their wellbeing may be more sensitive to changes in noise.

The following noise sensitive receptors are noted: users of the Goodwick beach, nearby residential areas in Fishguard and Goodwick, users of the Ocean Lab Aquarium, Goodwick Sands Plan Area, Goodwick Scout Group and Phoenix Community Centre and Park. These locations may be sensitive to noise from the construction activities of the Proposed Development.

Magnitude of change

As stated in Chapter 2: Project Description, the duration of construction works is estimated to be 12 months. Daytime construction hours will be Monday to Sunday, 07:00 to 19:00 hrs. No significant construction noise activities shall be permitted outside of these hours except as necessary for operation or safety reasons. Dredging works will be undertaken in two phases, and these activities may be undertaken overnight.

Chapter 13: Noise and Vibration notes construction of the Proposed Development will involve three primary activities: demolition of the existing tower structures and operation rooms, dredging, construction of supporting structures and installation of the pontoon. Construction noise is predicted to be within limits set to be protective of health and the environment in most cases. Chapter 13 finds that the noise and vibration impact due to construction of the Proposed Development would be negligible and not significant. A number of mitigation measures are proposed in Chapter 13 to further reduce any impact.

From the public health perspective, the magnitude of change due to the proposed works is **low**. For population health the small scale of change in noise levels is likely to predominantly relate to a minor change in quality of life for a small minority of the community, and a very minor change in cardiovascular and mental wellbeing morbidity for the very few people closest to construction activities. The changes would be of short-term duration and relate to frequent construction related noise exposures. Annoyance related health outcomes would be expected to reverse rapidly on completion of the works. There are unlikely to be healthcare service implications as a result of construction noise and vibration. Construction noise is not expected to result in disruption of education. As discussed in Chapter 13: Noise and Vibration, a comprehensive set of mitigation measures would be implemented during the construction phase to appropriately manage construction noise and vibration impacts.

Significance of effect

Construction noise impacts of the Proposed Development are considered to result in a **minor adverse (not significant)** effect on population health. This assessment conclusion reflects that

although the scientific literature indicates a clear association between elevated and sustained noise disturbance and reduced health outcome, the changes would result in a very limited effect in the health baseline of the site-specific populations. The temporary and localised construction noise effects are not expected to affect health inequalities.

7.9.2.4 Water Quality

This section considers onshore and nearshore water quality implications for population health of potential pollution releases during construction.

During construction, there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels.

Bathing water quality at the nearshore may be temporarily affected by activities of the pontoon installation and construction of related supporting structures. The key health outcomes relevant to this determinant of health arise from toxicological exposure by skin contact, accidental swallowing of water or inhalation and can cause a wide range of acute or chronic illnesses.

Changes to water quality onshore and nearshore may be due to either new accidental pollutant spills or mobilisation of historic pollutants. In both cases standard good practice pollution control measures form part of construction management plans. Increased suspended sediment concentrations (SSC) that do not pose toxicological risk may discourage bathing but are not expected to pose direct risks to population health.

The scientific literature identifies the following general points relevant to potential exposures and health outcomes. The benefits that marine and coastal environments offer to society are well recognised and documented (Papadopoulou et al., 2018). The physical and psychological benefits derived by visiting or being close to coastal environments have been recognised in improvements in people's mood and cognitive attention, self-reported health, reduced stress and restored emotional and cognitive resources, quality of life, affect, as well as, improvements in physical health manifested in reduced blood pressure (Papadopoulou et al., 2018). Recreational exposure to natural toxins by skin contact, accidental swallowing of water or inhalation can cause a wide range of acute or chronic illnesses (Koreivienė et al., 2014).

This section has been informed by Chapter 11: Water Quality, which sets out relevant assessment findings and mitigation measures that have been taken into account.

The potential effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is mobilisation of contaminants or sediment or new leaks or spills of pollutants.
- The pathway is transmission through nearshore and onshore waters. Exposure includes ingestion and dermal contact.
- Receptors are residents and visitors.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Development.

The population groups relevant to this assessment are:

- The site specific population of Fishguard and Goodwick wards;
- The local population of Pembrokeshire; and
- The sub-population vulnerable due to:

- young age (including children and young people whose bodies are still developing and may be more susceptible to toxins, and may spend more time outdoors which can expose them to contaminated water),
- old age (including the elderly who may have underlying conditions which can exacerbate the effects of water pollution),
- access and geographical factors (for example, people for whom alternative opportunities may be limited).

Sensitivity of Receptor

The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 7.7.1.1. This reflects many people would make limited use of coastal waters for bathing or related recreation. The potential for any effect to public water supplies is considered very limited, with the great majority of people having water supplies that would be unaffected. The general population includes those who are in good health and less likely to be adversely affected by contaminants.

The sensitivity of the vulnerable group population is **high**. Vulnerability in this case relates to people more sensitive due to life stage or health status. For example, children and young people may spend more time in coastal waters and due to developmental stage or relative body size have increased risk from a given toxin exposure. Increased sensitivity to exposure may also apply to older people and those with existing poor health (e.g. long-term illness) whose existing underlying conditions (and potentially lower immunity) may exacerbate the effects of water pollution.

Magnitude of Impact

Chapter 11: Water Quality concludes that, due to low level of contamination in the sediments that are to be dredged and modelling showing that the sediment plumes will remain very localised, there is no potential for significant effects on nearby designated bathing waters (water at beaches at Abermawr and Newport North).

The implementation of best practice pollution control measures as recommended by Natural Resources Wales (NRW), the Northern Ireland Environment Agency (NIEA), and the Scottish Environment Protection Agency (SEPA) will prevent significant effects on water quality or the environmental objectives of the Cardigan Bay South Coastal Water body within which the works are proposed.

In terms of population health, magnitude of change is considered to be **low**. This reflects that nearshore works would result in some dispersion in relation to bathing waters and the use of standard good practice mitigations would avoid and contain any spills or appropriately respond to historic contamination encountered. It is considered unlikely that suspended sediment concentrations would be directly harmful or could have secondary effects, e.g. via toxic algal blooms. The level of exposure to any contaminants would likely be very low, short-term and associated with one-off events. The severity of health outcomes would likely relate to a minor change in morbidity related risk factors associated with toxin exposures for a very few people. At most there may be slight healthcare service implications.

Significance of Effect

The effect is characterised as being adverse in direction, temporary and direct. The significance of the population health effect for this determinant of health is **negligible adverse (not significant)**. This conclusion reflects that although there are credible pathways in the scientific literature by which bathing waters may be affected, these are addressed by mitigation and there is therefore potential for only a very limited effect on the population health baseline. Water quality is expected

to be well within standards for bathing water and the changes would not affect a regulatory threshold, statutory standard or guideline. Changes due to the Proposed Development are not expected to affect delivery of health policy or influence inequalities

7.9.3 Assessment of Operational Effects

7.9.3.1 Transport modes, access and connections

This section discusses changes to transport modes, access and connections during the operation of the Proposed Development, and related effects on population health. The Proposed Development will improve safety of the Fishguard berth, providing long-term safe berthing for the Stena line ferry service linking Fishguard to Rosslare, Ireland. Improved access and connections also have the potential to result in indirect economic benefits to the local communities.

This section has been informed by Chapter 2: Project Description and Chapter 19: Transportation of the ES, which sets out relevant assessment findings and mitigation measures that have been taken into account.

The scientific literature identifies relevant associations between transport, including active transport, and human health. These are set out in section 7.9.2.1.

A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is the proposed replacement of the linkspan structure and associated infrastructure.
- The pathway is changes to the safety of ferry users and improved access to and from Fishguard and Goodwick.
- Receptors are residents, visitors and long-term occupiers of nearby communities.

The population groups relevant to this assessment are:

- The site-specific population of Fishguard northeast and Goodwick wards.
- The local population of Pembrokeshire.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people are potentially more vulnerable transport users)
  - Old age vulnerability (older people are potentially more vulnerable transport users)
  - Poor health vulnerability (including people with mobility limitations)
  - Social disadvantage (particularly those who are reliant on the ferry service for work or other economic reasons)
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on the affected routes).

Sensitivity of the population

The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in section 7.7.1.1 of this report. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to changes in access..

The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, including children, elderly and those receiving care

due to poor health. This sub-population may have fewer resources and are more reliant on affected routes. This population may be more sensitive to safety hazards. Vulnerability may be increased in areas of moderate deprivation. Deprived populations may already face more access barriers compared to the general population and therefore be more sensitive to access changes. Vulnerability also includes people with a disability such as mobility issues, who will benefit from the proposed improvements to passenger access and footways.

Magnitude of change

Chapter 19: Transportation of the ES reports that the number of vessels, vessel size, and number of generated vehicle movements are not expected to increase above existing levels. Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed and no requirement for an assessment of operational effects.

For population health, the magnitude of change due to the Proposed Development is **low**. The Proposed Development would improve the safety of the Fishguard berth, providing long-term safe berthing for the Stena line ferry service linking Fishguard to Rosslare, Ireland. Improved access and connections also have the potential to result in indirect economic benefits to the local communities. The benefits will therefore represent a small scale of change relating to a minor change in quality of life for the large minority of the population. The changes will be long-term in duration and relate to continuous effects with regard to improved opportunities for residents and visitors of nearby communities.

Significance of Effect

The significance of the population health effect for this determinant of health is **minor beneficial (not significant)**. The professional judgment is that improved access to and from Fishguard harbour will result in indirect socio-economic benefits to local communities; and provide safe and effective transport for users of the ferry services, particularly those travelling for work and those with access needs.

7.10 Mitigation

7.10.1 Construction Phase Mitigation Measures

To reduce likelihood of health and safety risks to the public during the construction phase, fencing, signage, adherence to road safety guidelines, and other best practice measures, as detailed in the OCEMP will be adhered to. Communications will be maintained with local residents, local emergency services and businesses throughout the construction phase to notify them of any road closures, construction noise and other disruptions in advance. Consultation has been held to communicate details of the Proposed Development to the local population and take note of their concerns. Additional details on construction phasing and progress will be available and regularly updated on the local authority website.

7.10.2 Operational Phase Mitigation Measures

No further mitigation is proposed in the health assessment for the operational phase.

7.10.3 Future Monitoring

Details of construction phase monitoring for the Proposed Development can be found in the OCEMP. No further monitoring is proposed for the human health assessment.

7.11 Assessment of Residual Effects

The residual effects of the Proposed Development during construction and operation remain the same as those presented in section 7.9.

7.12 Cumulative Effects

There are no cumulative projects identified which could result in a cumulative effect on human health and population in the study area.

7.12.1 Effects interactions

A summary of project lifetime effects i.e. an assessment of the potential for effects across more than one phase of the Proposed Development (construction and operations), to interact and result in a more significant effect on a receptor than if just assessed in isolation is provided in Table 7-10 below.

Table 7-10: Summary of likely significant in-combination effects on health for individual effects occurring across the construction and operational and maintenance phases of the Proposed Development.

Description of impact	Phase		Likely significant inter-related effects	Significance
	C	O		
Combined Transport access effects across project phases.	✓	✓	Effects relating to ongoing disruption to access across construction, operations and maintenance are already taken into account by the health assessment, including where effects are characterised as ‘long-term’.	No change.

7.13 Limitations of the Assessment

This chapter relies, in part, on data provided by third parties (e.g., OS Mapping, Local Authorities, NOMIS) which will be the most up-to-date available at the time of writing. No significant limitations in these datasets have been identified that would affect the robustness of the assessment.

The assessment of effects on human health relies on the use of reasonable assumptions, professional judgement, and above guidance to determine the significance of effects.

The methods take into account that a change in a determinant of health does not equate directly to a change in population health outcomes. Rather, the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Development. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

The health and wellbeing assessment partially draws from and builds upon, the technical outputs from inter-related technical disciplines, as a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter (e.g. for modelling work undertaken). It is, however, considered that the information available will provide a suitable basis for assessment.

Baseline data includes indicators where the available public data is pre-COVID-19 pandemic, e.g. in relation to indices of deprivation, or that have yet to show the full impacts of the pandemic for public health. The baseline is however considered sufficient and robust in evidencing that there are vulnerable population groups with high sensitivity.

All decision-making is within the context of imperfect information and the following steps will be taken to allow confidence in the EIA health assessment conclusions:

- Methods are used that triangulate evidence sources and professional perspectives.
- The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence.
- Quantitative inputs for other assessments have been used where available, which included model validation, as described in other chapters.
- The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings.
- The health assessment has been transparent in its analysis and follows good practice.

Regarding the application of the precautionary principle in public health, this is discussed by the WHO (World Health Organization, 2004). The WHO notes how the precautionary principle is a two-stage test, requiring both uncertainty and serious threats to health, i.e. large effect sizes indicated by available evidence. The WHO describes health impact assessments (such as this health assessment) as a "*compass to guide public health decisions under uncertainty*" and that "*a centrepiece of precautionary assessment is environment and health assessment, which weighs the science of hazards and exposure. In this step, evidence of risk and uncertainty is examined to determine the possibility (and plausibility) of a significant health threat and the need for precautionary action."* (World Health Organization, 2004). Such an approach has been taken in this health assessment, for example by considering levels of exposure, extent of the population exposed and the scale of change in relevant risk factors for health outcomes.

7.14 Summary of Effects and Conclusion

A summary of the assessment of significance for the impacts as identified is presented below in Table 7-11.

Table 7-11: Summary of effects

Description of impact	Phase C O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Transport modes, access and connections	✓ ✓	None	C: Low O: Low	C: High O: High	C: Minor adverse O: Minor beneficial	None	C: Minor adverse O: Minor beneficial	None
Air quality	✓ ×	None	C: Low	C: High	C: Minor adverse	None	C: Minor adverse	None
Noise and vibration	✓ ×	None	C: Low	C: High	C: Minor adverse	None	C: Minor adverse	None
Water quality	✓ ×	None	C: Low	C: High	C: Minor adverse	None	C: Minor adverse	None

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7.16 List of Abbreviations / Acronyms

EIA	Environmental Impact Assessment
ES	Environmental Statement
HIA	Health Impact Assessment
IAIA	International Association for Impact Assessment
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IPH	Institute of Public Health
NIEA	Northern Ireland Environment Agency
NRW	Natural Resources Wales
PRoW	Public Rights of Way
SEPA	Scottish Environment Protection Agency
UK	United Kingdom
WIMD	Welsh Index of Multiple Deprivation
WHO	World Health Organization

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 8 Marine Biodiversity

8 Marine Biodiversity

8.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") on marine biodiversity. This chapter considers the potential impacts to marine biodiversity from the Project during the construction and operational phases of the Proposed Development.

This marine biodiversity assessment covers the following receptors:

- Benthic subtidal and intertidal ecology;
- Fish and shellfish ecology; and
- Marine mammals.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing marine biodiversity baseline;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on marine biodiversity; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES:

- Chapter 2: Project Description
- Chapter 10: Coastal Processes; and
- Chapter 14: Underwater Noise.

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

8.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on marine biodiversity. In particular, this ES chapter:

- Presents the existing marine biodiversity baseline established from desk studies, relevant datasets and consultation (section 8.8);
- Identifies any limitations encountered in compiling the environmental information (section 8.13);
- Presents an assessment of the potential likely significant effects on marine biodiversity arising from the Proposed Development (section 8.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 8.12; and
- Highlights any necessary monitoring and/or measures (section 8.10) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 8.9).

8.3 Study Area

For all three receptor groups, the Marine Biodiversity Study Area has been defined as Fishguard Harbour (Figure 8-1). This is due to the high levels of anthropogenic activity and man-made

structures already present within the vicinity of the Site Boundary, which represent an altered baseline environment, in comparison to the surrounding areas of the Pembrokeshire coast and offshore Welsh waters. Therefore, it is assumed that the marine biodiversity assemblage within Fishguard Harbour is established and adapted to the anthropogenic activities associated with it, and it would not be comparable to areas along the nearby coast. Further, due to the nature and limited extent of the activities associated with the Proposed Development, a small study area is deemed to be appropriate, even for mobile receptors, such as fish and marine mammals. This study area encompasses the Site Boundary, wherein all construction and operation activities will take place (Figure 8-1).

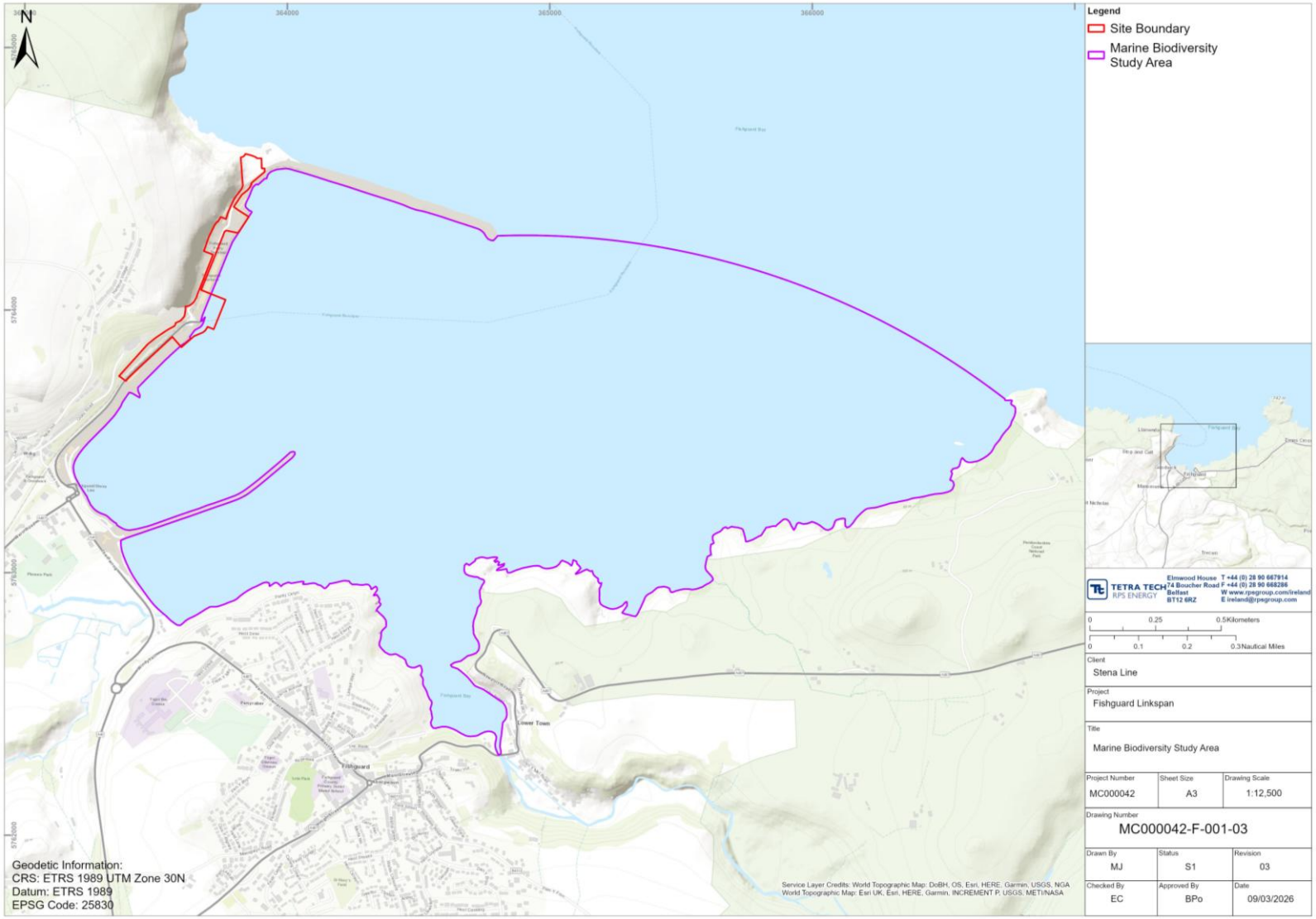

Figure 8-1: Marine Biodiversity Study Area.

8.4 Policy Context

This section presents policy and legislation relevant to the three marine biodiversity receptor groups (benthic subtidal and intertidal ecology, fish and shellfish ecology, and marine mammals).

8.4.1 National legislation and policy

8.4.1.1 UK Marine Policy Statement

The UK Marine Policy Statement provides the framework for preparing Marine Plans and has been adopted for the purposes of section 44 of the Marine and Coastal Access Act 2009 (UK Government, 2011). Detailed considerations as part of the UK Marine Policy Statement relevant to marine biodiversity are presented in Table 8-1.

Table 8-1: UK Marine Policy Statement Considerations Relevant to Marine Biodiversity (UK Government, 2011).

Detailed Considerations	Where Considered in this Chapter
Marine plan authorities should be mindful that, consistent with the high-level marine objectives, the UK aims to ensure:	This Marine Biodiversity Chapter sets out an assessment and appropriate justifications to demonstrate that the Proposed Development will not contribute to biodiversity loss or diminish the functioning of the ecosystems within Fishguard Harbour.
• A halting and, if possible, a reversal of biodiversity loss with species and habitats operating as a part of healthy, functioning ecosystems; and	
• The general acceptance of biodiversity's essential role in enhancing the quality of life, with its conservation becoming a natural consideration in all relevant public, private and non-governmental decisions and policies.	

8.4.1.2 Welsh National Marine Plan

The Proposed Development sits within Welsh waters and therefore the Welsh National Marine Plan (Welsh Government, 2019) has been considered. Key provisions are set out in Table 8-2, along with details as to where these have been addressed within the assessment.

Table 8-2: Welsh National Marine Plan Policies of Relevance to Marine Biodiversity (Welsh Government, 2019).

Key Provision/Objective	Where Considered in this Chapter
The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. Commitments to supporting an ecologically coherent network of Marine Protected Areas (MPAs).	The assessment of each potential impact on the marine biodiversity receptors takes into account the abundance and distribution of species and habitats, which are considered throughout the assessment and the cumulative assessment (sections 8.9 and 8.12). Identification of relevant designated sites is considered in section 8.8. Adverse effect on integrity of relevant designated sites has been considered within

Key Provision/Objective	Where Considered in this Chapter
	Volume 4: Habitats Regulations Assessment (HRA).
Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.	The potential impact of Invasive Non Native Species (INNS) due to the Proposed Development is considered in sections 8.9 and 8.12, where relevant.
All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.	The assessment of each potential impact on the marine biodiversity receptors takes into account the abundance and distribution of species and habitats and is considered in sections 8.9 and 8.12.
Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.	Seabed integrity is considered within the impact 'Temporary habitat loss and/or disturbance' and 'Long term habitat loss and/or disturbance' (sections 8.9 and 8.12). These impacts consider pressures such as surface abrasion, changes in substrate or seabed type and the sensitivity of the impacted habitats and species in relation to this pressure.
Contaminants are at a level not giving rise to pollution effects.	The impact of 'Changes in water quality (including release of sediment bound contaminants)' is considered in sections 8.9 and 8.12, where relevant.
Proposals should demonstrate how potential impacts on marine ecosystems have been taken into consideration and should, in order of preference: • avoid adverse impacts; and/or • minimise impacts where they cannot be avoided; and/or • mitigate impacts where they cannot be minimised. If significant adverse impacts cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding. Proposals that contribute to the protection, restoration and/or enhancement of marine ecosystems are encouraged.	Potential impacts on marine biodiversity receptors from the Proposed Development have been identified and further assessed in sections 8.9 and 8.12. Mitigation measures have been outlined in section 8.10.
Proposals should demonstrate how they: • avoid adverse impacts on individual MPAs and the coherence of the network as a whole; • have regard to the measures to manage MPAs; and • avoid adverse impacts on designated sites that are not part of the MPA network.	All relevant nearby MPAs and designated sites were identified through desktop review (section 8.8). Adverse effect on integrity of relevant designated sites has been considered within Volume 4: HRA.
Living within Environmental Limits: Support the achievement and maintenance of Good	This chapter provides an assessment of the Proposed Development alone and cumulatively

Key Provision/Objective	Where Considered in this Chapter
Environmental Status (GES) and Good Ecological Status (GeS).	with other plans and projects to ensure that it does not hinder the achievement and maintenance of GES or GeS.
Living within Environmental Limits: Protect, conserve, restore and enhance marine biodiversity to halt and reverse its decline including supporting the development and functioning of a well-managed and ecologically coherent network of MPAs and resilient populations of representative, rare and vulnerable species.	Identification of relevant designated sites is considered in section 8.8. Adverse effect on integrity of relevant designated sites has been considered within Volume 4: HRA.
Living within Environmental Limits: Maintain and enhance the resilience of marine ecosystems and the benefits they provide in order to meet the needs of present and future generations	This chapter provides an assessment of the Proposed Development alone and cumulatively with other plans and projects to ensure that it does not hinder the resilience of marine ecosystems and the benefits they provide.
Dredging and Disposal: To maintain safe and effective navigational access for shipping, fishing and leisure craft and support future growth and increases in port facilities and vessel size whilst promoting the optimal sustainable use of dredged material and ensuring adequate disposal facilities are available.	Impacts associated with dredging have been considered throughout the assessment in sections 8.9 and 8.12, where relevant.
Ports and Shipping: To safeguard established shipping routes and support sustainable development in the shipping and ports sector.	As the Project aims to improve the Stena Ferry Terminal, it, by nature, aims to safeguard established vessel routes and support the ports sector.

8.5 Consultation

Table 8-3 summarises the issues raised relevant to marine biodiversity, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Proposed Development between November 2024 and January 2025 and the consultees that were contacted.

Table 8-3: Summary of Key Consultation Issues Raised during Consultation Activities undertaken for the Proposed Development relevant to Marine Biodiversity.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
Overarching			
31 January 2025	Natural Resources Wales Advisory (NRW(A)) Comments	NRW(A) generally agree with the topics that the report has scoped into the Environmental Impact Assessment (EIA). NRW have provided specific comment below. Where no comment has been provided the assessment should be carried out as detailed within the Scoping Report.	This response was noted, and all relevant consultation from NRW has therefore been addressed and incorporated into the assessment.
Benthic Subtidal and Intertidal Ecology			
16 January 2025	NRW(A) Comments	NRW(A) advises that the potential release of contaminants during dredging and construction works needs to be included for assessment of impact to Water Frameworks Directive (WFD), Water Quality and benthic ecology.	The impact of the release of sediment bound contaminants has been assessed for benthic ecology in section 8.9.1.2.4.
16 January 2025	NRW(A) Comments	NRW have records of blue mussel Mytilus edulis beds within the Site Boundary. As these are a 'Habitat of Principal Importance to Wales' under Section 7 of the Environment (Wales) Act (2016), we advise that they are given consideration in the full EIA and Environment Statement.	Blue mussel beds were identified within Fishguard Harbour during a 2014 NRW survey (NRW, 2025b). However, during a meeting with NRW on 5th March 2025, a benthic specialist at NRW confirmed that these blue mussel records were juveniles and were highly unlikely that the mussel bed habitat is present (NRW, pers. comm.). Therefore, blue mussel beds were not considered further in the assessment.
31 January 2025	NRW Permitting Service (NRW PS) Scoping Opinion	NRW PS draw to your attention, as identified by NRW(A) that there are records of blue mussel beds within the Site Boundary. These beds are listed as 'Habitat of Principal Importance to Wales' under Section 7 of the Environment (Wales) Act (2016) and must be appropriately considered in the ES.	
16 January 2025	NRW(A) Comments	NRW(A) note that no subtidal surveys have been proposed by the Applicant in the EIA Scoping	Figure 4.2 of the EIA Scoping Report is presented as Figure 8-2 of this Chapter and shows the

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		Report. As the habitats maps shown in Figures 4.2 and 6.7 [of the EIA Scoping Report] differ slightly, NRW(A) advise that an updated survey programme is conducted to gain an accurate understanding of the benthic habitats present both within and outside the Site Boundary in order to fully understand the potential impacts of the Proposed Development and identify suitable mitigation measures. We advise that the Phase 1 intertidal survey discussed in the EIA Scoping Report is also conducted to inform and update the baseline.	EUSeaMap seabed habitat classifications from the European Marine Observation Database (EMODnet, 2025). Figure 6.7 of the EIA Scoping Report showed marine sediments within the Coastal Processes Study Area, however these were derived from the British Geological Survey (BGS) Seabed Sediments 250k dataset (BGS, 2025), therefore differ slightly. Within both these figures, seabed sediment data were only available for a portion of the Site Boundary. In Figure 8-2, the seabed sediments within the Site Boundary were 'infralittoral sandy mud' and 'circalittoral sandy mud' and the equivalent area was labelled as 'muddy sand' in Figure 6.7 of the EIA Scoping Report. As both the EUSeaMap and BGS Seabed Sediments 250k datasets are very high level and not designed to be used for local-scale classification, the discrepancy in labelling between 'infralittoral sandy mud/circalittoral sandy mud' (EMODnet, 2025) and 'muddy sand' (BGS, 2025) is not expected to cause a material difference in the baseline nor assessments provided for Benthic Ecology and Coastal Processes. These figures were included in the EIA Scoping Report to provide wider-scale information on the seabed substrates and illustrate that a portion of the Site Boundary consists of sandy mud or muddy sand. In addition, a site-specific subtidal survey (including PSA) was undertaken in 2017 at the Stena Ferry Terminal (thus within the Site Boundary). The results of this survey (slightly gravelly sand to slightly gravelly muddy sand) were at a finer scale than that of EUSeaMap and BGS Seabed Sediments 250k datasets, and therefore provide

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
			additional, recent context to the seabed within Fishguard Harbour. In addition, PSA data collected by NRW in 2022 (pers. comm.)[1] were available for two sampling stations within Fishguard Harbour. These two samples consisted of mud and sand sediments, respectively, further corroborating the muddy and sandy sediments detailed in the wider scale data (BGS, 2025, EMODnet, 2025) and the finer scale site-specific data from the 2017 Stena Ferry Terminal survey (ABPmer, 2018). A subtidal benthic validation survey was undertaken in March 2025 and an intertidal survey was undertaken in April 2025. The results of these were consistent with the baseline environment characterised through desktop review, and the results of the subtidal benthic validation survey are reported in full in Appendix 8.A. The results of the intertidal survey will be submitted when available.
16 January 2025	NRW(A) Comments	The Drop Down Video (DDV) survey undertaken in 2015 classified much of the study area as 'Arenicola marina in infralittoral fine sand or muddy sand' (SS.SSA.IMuSa.AreISa) but as no suitable groundtruthing was undertaken in the form of sediment samples and subsequent Particle Size Analysis (PSA), and given the age of the data, NRW(A) advise that the confidence levels in these data cannot be high. As such, we recommend that new subtidal sediment data is collected both within the footprint of the Proposed Development and	Increases in SSCs, sediment plumes, and associated deposition has been modelled in Chapter 10: Coastal Processes, with the results used to inform the assessment on benthic and fish and shellfish receptors in this chapter (see section 8.9). As detailed in the row above, the sediments within Fishguard Harbour are largely comprised of muddy sand and/or sandy mud (based on site specific data from the 2017 survey at the Stena Terminal and from NRW data within the Site Boundary). The Coastal Processes modelling

[1] Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		outside of the current benthic study area for context and to take into account potential impacts from increased Suspended Sediment Concentrations (SSCs) over a wider area than that represented by the present study area, as per those discussed in the Physical Processes chapter [of the EIA Scoping Report]. NRW(A) advise that sediment samples are analysed for PSA, Macrofauna and contaminants by an accredited UK laboratory in line with the guidelines of the North East Atlantic Marine Biological Analytical Quality Control (NMBAQC) scheme.	accounts for slight variations in these sediment types and will therefore still be representative of the Maximum Design Scenario (MDS) for the impact of increased SSCs and associated deposition for marine biodiversity receptors. A subtidal benthic validation survey was undertaken in March 2025 and an intertidal survey was undertaken in April 2025. The results of these were consistent with the baseline environment characterised through desktop review, and the results of the subtidal benthic validation survey are reported in full in Appendix 8.A The results of the intertidal survey will be submitted when available.
31 January 2025	NRW PS Scoping Opinion	NRW(A) note that no subtidal surveys are proposed. NRW(A) have a low confidence in the existing subtidal data identified within the Scoping Report. NRW(A) indicate that the DDV survey undertaken in 2015, which classified much of the study area as 'Arenicola marina in infralittoral fine sand or muddy sand' (SS.SSA.IMuSa.AreISa), has relatively low confidence due to the age of the data and the lack of associated direct ground-truthing. NRW(A) also note that there are discrepancies between the habitats maps shown in Figures 4.2 (EUSeaMap) and 6.7 (BGS) of the EIA Scoping Report. NRW A request that a survey programme is conducted to gain an accurate understanding of the benthic habitats present within the Proposed Development and its zone of influence. NRW PS consider that the baseline subtidal environment must be suitably assessed and see this to be necessary to fully understand the potential impacts on benthic habitats and identify	

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		possible mitigation measures. NRW PS would strongly recommend you engage with NRW(A) to ensure that baseline data relied upon or collected is suitable. NRW PS recommend engagement with NRW(A) to understand the extent and sampling effort required to adequately assess the Proposed Development's direct and indirect impacts. NRW(A) advise that sediment samples are analysed for PSA, macrofauna and contaminants. NRW PS remind you that this has to be undertaken by an accredited UK laboratory in line with the guidelines of the NMBAQC scheme.	
16 January 2025	NRW(A) Comments	There is no mention within the EIA Scoping Report of the Welsh National Marine Plan which "*sets out the Welsh Government's vision and objectives for the Welsh marine plan area and policies to support their achievement, helping marine users and those undertaking land-based activities (with the potential to affect the plan area) to support the sustainable development of our seas. The Welsh National Marine Plan supports sustainable development by guiding and supporting effective, proportionate and consistent decision making*". NRW(A) recommends that the Applicant take the policies set out in the Welsh National Marine Plan into consideration with particular focus on those relating to 2.4 ENV – Living within environmental limits and the sector supporting policies in Section 3.1 such as 3.1.3 Dredging and Disposal and 3.1.7 Ports and Shipping.	The Welsh National Marine Plan has been considered in section 8.4, with particular attention paid to the policies highlighted by NRW(A) (see Table 8-2).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
16 January 2025	NRW(A) Comments	NRW(A) agrees with the impacts scoped in for Benthic subtidal and intertidal ecology receptors and recommends that the impact pathway "Accidental pollution to the surrounding environment" should also be scoped into the EIA for further assessment. The reasons given for being scoped out are reliant on mitigation which suggest that an adverse impact is possible, and, in addition, rock armour revetments are known to trap litter which represents a form of accidental pollution. Therefore, this impact pathway should be scoped into both the construction and operation phases at this stage of the process.	This impact is still scoped out of assessment based on the following justification (also provided in Table 8-16). The risk of accidental pollution will be mitigated by the implementation of measures set out in standard post-consent plans, such as an Environmental Management Plan (EMP), which will include a Marine Pollution Contingency Plan (MPCP). These plans will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from the Oslo Paris Convention (OSPAR), International Maritime Organisation (IMO), and the International Convention for the Prevention of Pollution from Ships (MARPOL)). Thus, it is unlikely that accidental pollution will occur and in the unlikely event that it did, it will be minimised through measures outlined in the MPCP. The approach to scope out this impact using the justification provided here is standard practice across EIAs from a range of sectors and aligns with the proportionate EIA approach.
31 January 2025	NRW PS Scoping Opinion	NRW PS disagree that accidental pollution should be scoped out of the EIA. NRW PS consider that the details of the proposed post-consent plans are unknown at this stage. Therefore, as mitigation measures are not yet known, accidental pollution should be scoped into the assessment.	
Fish and Shellfish Ecology			
16 January 2025	NRW(A) Comments	NRW(A) agree with the sites and potential impacts scoping assessment for fish and shellfish ecology. We welcome the inclusion of nearby designated sites (Cardigan Bay SAC, Afon Teifi SAC, Cleddau Rivers SAC, Pembrokeshire Marine SAC and Carmarthen Bay and Estuaries SAC) in view of the migratory species features. The applicant should make consideration of relevant section 7 species	These designated sites have been considered in this assessment (see section 8.8.2.5). In addition, species listed within the Environment (Wales) Act 2016 have been included as Important Ecological Features (IEFs) in this assessment (see section 8.8.2.6).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		as listed within the Environment (Wales) Act 2016 alongside the SAC species features.	
31 January 2025	NRW PS Scoping Opinion	NRW PS agrees with the sites included and potential impacts scoped into the assessment for fish and shellfish ecology. NRW(A) welcomes the inclusion of nearby designated sites (Cardigan Bay SAC, Afon Teifi SAC, Cleddau Rivers SAC, Pembrokeshire Marine SAC and Carmarthen Bay and Estuaries SAC) in view of the migratory species features. NRW PS agrees with NRW(A) that the relevant section 7 species listed within the Environment (Wales) Act 2016 should also be scoped into the assessment.	
16 January 2025	NRW(A) Comments	NRW(A) agree with the underwater noise scoping assessment. The preliminary mitigation measures proposed for noise are standard measures and likely to be sufficient given the amount of piling proposed, however, the Applicant will need to consider the appropriateness of measures designed to reduce noise impact for mammals on fish species. However, section 10.4 in the EIA scoping report mentions that the assessment will also account for fleeing animals. It is not clear if this statement only relates to marine mammals or applies to fish as well. NRW(A) advise that assessments for fish focus on fish as a stationary receptor, as this will cover the worst-case scenario and there is limited consistent information on fish utilising directional avoidant fleeing behaviour in response to noise impacts	This response is noted. Stationary fish have been presented as a worst-case scenario, based on the underwater noise modelling (see section 8.9.2.2.3). Appropriate mitigation measures for fish and shellfish receptors have been discussed in section 8.10 and within the assessment itself in section 8.9.2.2.3.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
31 January 2025	NRW PS Scoping Opinion	NRW PS agrees that underwater noise from piling during construction is scoped into the EIA and agrees with the preliminary mitigation measures proposed. NRW(A) advises that these standard mitigation measures are likely to be sufficient; however, stresses that measures designed to reduce noise impact for mammals are not always appropriate on fish species. NRW PS would encourage you to engage with NRW(A) as you carry out your assessment and consider appropriate mitigation measures.	
Marine Mammals			
16 January 2025	NRW(A) Comments	NRW(A) note that North Anglesey Marine SAC has been omitted from scoping. The activity is located within the Celtic and Irish Seas Management Unit (MU) for harbour porpoise *Phocoena phocoena*, so animals from the SAC population could feasibly be found within the survey area and could potentially therefore be impacted. Due to the mobile nature of all Annex II marine mammal features of SACs, it is accepted that they do not stay within site boundaries. We generally consider that the appropriate scale at which to consider offsite impacts for marine mammals is the relevant species-specific MU. We consider SACs within an MU to be 'functionally linked' to the surrounding sea because evidence demonstrates a degree of connectivity between SACs and the wider area, and because SACs represent special areas of sea within the MU. We recommend that North Anglesey Marine SAC is scoped in for harbour porpoise.	The North Anglesey Marine SAC has been included in the baseline assessment presented in section 8.8.3.3.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
16 January 2025	NRW(A) Comments	For most impact pathways, particularly those associated with potential removals or injury, NRW(A) consider MUs as the most appropriate spatial scale for assessment of the Test of Likely Significant Effect (screening).	This advice has been incorporated into the assessment for marine mammals (see section 8.9.3).
16 January 2025	NRW(A) Comments	NRW(A) would like to highlight the preferred use of OSPAR Region III as a spatial area for the assessment of grey seal *Halichoerus grypus*, rather than seal MUs. However, as all three Welsh sites for grey seal have been scoped in here, no changes are required.	This comment is noted, and information on the OSPAR Region III grey seal population has been included in the baseline for additional context (see section 8.8.3.2.4).
16 January 2025	NRW(A) Comments	NRW(A) have anecdotal evidence of common dolphin *Delphinus delphis* usage within the study area on a regular basis and therefore we recommend that the common dolphin, as a protected species under Annex IV of the Habitats Directive as enacted through the England and Wales Conservation of Habitats and Species Regulations, Schedule 5 & 6 of the Wildlife and Countryside Act 1981(as amended) and Sections 6 & 7 of the Environment (Wales) Act 2016, should be also considered for assessment.	Common dolphin has been scoped into the assessment (see section 8.8.3.2.3).
16 January 2025	NRW(A) Comments	The justification for scoping out “accidental pollution to the surrounding environment” impact pathway relies on the need for mitigation measures, which suggests that this has the potential to create an adverse effect. Therefore, NRW(A) recommends the impact pathway “Accidental pollution to the surrounding environment” should be scoped into EIA for further assessment.	This impact is still scoped out of assessment based on the following justification (also provided in Table 8-27). The risk of accidental pollution will be mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP which will include a MPCP. These plans will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
			for preventing pollution at sea (such as those from OSPAR, the IMO, and MARPOL). Thus, it is unlikely that accidental pollution will occur and in the unlikely event that it did, it will be minimised through measures outlined in the MPCP. The approach to scope out this impact using the justification provided here is standard practice across EIAs from a range of sectors and aligns with the proportionate EIA approach.
16 January 2025	NRW(A) Comments	NRW(A) welcomes the use of the data sources and literature listed within the EIA Scoping Report but would like to highlight the following relevant guidance on underwater noise to be considered when undertaking the EIA: NRW's Position on Assessing Behavioural Disturbance of Harbour Porpoise from underwater noise (NRW, 2023a); and NRW's Position on Assessing the effects of hearing injury from underwater noise for environmental assessments (NRW, 2023b).	These guidance documents have been considered as part of the assessment on marine mammal receptors.
31 January 2025	NRW PS Scoping Opinion	NRW PS will expect that the assessment is carried out in line with NRW's position statements (NRW, 2023a, NRW, 2023b)	

8.6 Methodology to inform the baseline

8.6.1 Desktop study

Baseline information within the Marine Biodiversity Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 8-4. These sources provide the most up to date data for this assessment. Where relevant, these data sources include those recommended by NRW for marine developments (NRW, 2025a).

Table 8-4 Summary of key desktop reports.

Title	Source
Data Map Wales: Blue Mussel Beds Points and Polygons	NRW (2025b) and NRW (2025c)
Data Map Wales: Intertidal Phase 1 Habitat Survey Results Portal	NRW (2025d)
Biogenic Substrate in Europe	EMODnet (2025)
Fishguard Ferry Port Marine Ecology Surveys: site-specific subtidal and intertidal surveys for replacement linkspan works undertaken in June 2017	ABPmer (2018)
Fishguard DDV survey: DDV survey of predominantly subtidal habitats in Goodwick Bay and the wider Fishguard area undertaken in October 2015	Aquatic Environments (2015) cited in RPS (2018)
Fishguard Harbour Littoral Biotope Mapping Survey: Phase 1 intertidal habitat survey undertaken at Goodwick Beach in 2011	Aquatic Environments (2011) cited in RPS (2018)
NRW Marine Fish Survey Database	NRW (2024)
United Kingdom (UK) Sea Fisheries Annual Statistics Report 2022: Fisheries Landing Data from 2018 to 2023	Marine Management Organisation (MMO (2023), (MMO, 2024)
Spawning and Nursery Grounds of Forage Fish in Welsh and Surrounding Waters	Campanella and van der Kooij (2021)
UK Basking Shark Sightings from 1987 to 2016	Marine Conservation Society (2020)
NRW Diadromous Fish Electro-fishing Monitoring Data from the River Gwaun	Data from 2005, 2007, and 2011 were cited in RPS (2018)
Fishguard Ferry Port Marine Ecology Surveys: site-specific baseline surveys for replacement linkspan works undertaken in June 2017	ABPmer (2018)
Fishguard DDV Survey: DDV survey of predominantly subtidal habitats in Goodwick Bay and the wider Fishguard area undertaken in October 2015	Aquatic Environments (2015) cited in RPS (2018)
Spawning and Nursery Grounds of Selected Fish Species in UK Waters	Ellis *et al*. (2012)
Fisheries Sensitivity Maps in British Waters	Coull *et al*. (1998)
Modelled Distribution and Abundance of Cetaceans and Seabirds in Wales and Surrounding Waters	Evans and Waggitt (2023)
Small Cetaceans in European Atlantic waters and the North Sea (SCANS) surveys	Gilles *et al*. (2023), Hammond *et al*. (2021)

Title	Source
Special Committee on Seals (SCOS) Reports	SCOS (2023)
Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management	Carter *et al*. (2022)
Bottlenose Dolphin Tursiops truncatus Monitoring in Cardigan Bay 2014 – 2016	Lohrengel *et al*. (2018)
Atlas of the Marine Mammals of Wales	Baines and Evans (2012)

8.6.2 Site-specific surveys

A subtidal benthic validation survey was undertaken in March 2025 and an intertidal survey was undertaken in April 2025. The results of these surveys were consistent with the baseline environment characterised through desktop review provided here; the benthic validation survey results are reported in full in Appendix 8.A and the intertidal survey report is presented in Appendix 8.C.

These desktop data sources include the results of site-specific surveys undertaken within Fishguard Harbour for similar works at both the Stena Ferry Terminal, and within the wider harbour itself (see Table 8-4).

8.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following specific guidance relevant to marine biodiversity as follows:

- ‘Marine Evidence Based Sensitivity Assessment – A Guide’ (Tyler-Walters *et al*., 2023);
- ‘NRW’s Position on Assessing Behavioural Disturbance of Harbour Porpoise from underwater noise’ (NRW, 2023a);
- ‘NRW’s Position on Assessing the effects of hearing injury from underwater noise for environmental assessments’ (NRW, 2023b);
- ‘Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland’ (Chartered Institute for Ecology and Environmental Management (CIEEM), 2022);
- ‘Consultation report: harbour porpoise SACs noise guidance’ (Joint Nature Conservation Committee (JNCC), 2020a);
- ‘Guidance on noise management in harbour porpoise SACs ’ (JNCC, 2020b);
- ‘Marine mammal sound exposure criteria’ (Southall *et al*., 2019);
- ‘Sound Exposure Guidelines for Fishes and Sea Turtles’ (Popper *et al*., 2014); and
- ‘Guidelines for minimising the risk of injury to marine mammals from piling’ (JNCC, 2010).

8.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in Table 8-5.

Table 8-5: Definition of terms relating to the magnitude of an impact.

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

The criteria for defining receptor sensitivity in this chapter are outlined in Table 8-6 below. Sensitivity is a combination of vulnerability, recoverability, and value of the marine biodiversity IEFs. For benthic subtidal and intertidal ecology, the Marine Life Information Network (MarLIN) sensitivity assessments and/or Marine Evidence Based Sensitivity Assessments (MarESAs) have been consulted where available to help inform the sensitivity of the receptor (Tyler-Walters *et al.*, 2023). For all other receptors (and for benthic ecological receptors which do not have a MarLIN sensitivity assessment or a MarESA), the best available scientific literature has been consulted to inform the sensitivity of the receptor.

Table 8-6: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon marine biodiversity is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 8-7. Where a range of significance of effect is presented in Table

8-7, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 8-7: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

8.7.2 Underwater Noise Assessment Methodology

There are a number of activities associated with the Proposed Development that are likely to generate underwater noise (see Table 8-8). Underwater noise has the potential to affect marine life in different ways depending on its noise level and characteristics. Richardson *et al*. (1995) defined four zones of noise influence which vary with distance from the source and level, to which an additional zone has been added 'zone of temporary hearing loss'. These are:

- The zone of audibility: This is defined as the area within which the animal can detect the sound. Audibility itself does not implicitly mean that the sound will affect the animal.
- The zone of masking: This is defined as the area within which sound can interfere with the detection of other sounds such as communication or echolocation clicks. This zone is very hard to estimate due to a paucity of data relating to how animals detect sound in relation to masking levels (for example, humans can hear tones well below the numeric value of the overall sound level). Continuous sounds will generally have a greater masking potential than intermittent sound due to the latter providing some relative quiet between sounds. Masking only occurs if there is near-overlap in sound and signal, such that a loud sound at e.g., 1,000 Hz will not be able to mask a signal at 10,000 Hz.
- The zone of responsiveness: This is defined as the area within which the animal responds either behaviourally or physiologically. The zone of responsiveness is usually smaller than the zone of audibility because, as stated previously, audibility does not necessarily evoke a reaction. This zone has been quantified in the noise modelling assessment using behavioural thresholds (see Chapter 14: Underwater Noise).
- The zone of temporary hearing loss: The area where the sound level is sufficient to cause the auditory system to lose sensitivity temporarily, causing loss of "acoustic habitat": the volume of water that can be sensed acoustically by the animal. This hearing loss is typically classified as Temporary Threshold Shift (TTS).
- The zone of injury/permanent hearing loss: This is the area where the sound level is sufficient to cause permanent hearing loss in an animal. This hearing loss is classified as Auditory Injury

(AUD INJ). At even closer ranges, and for very high intensity sound sources (e.g., underwater explosions), physical trauma or acute mortal injuries are possible.

Within the noise modelling assessment, the zones of auditory injury are of primary interest, along with estimates of behavioural impact ranges. To determine the potential spatial range of injury and behavioural change for fish and shellfish and marine mammal receptors, a review was undertaken of available evidence, including international guidance and scientific literature (see Chapter 14: Underwater Noise).

Underwater noise is generally split into two distinct types:

- Impulsive sounds which are typically transient, momentary (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay. This category includes sources such as seismic surveys, impact piling and underwater explosions.
- Non-impulsive (and continuous) sounds which can be broadband, narrowband or tonal, momentary, brief or prolonged, continuous or intermittent and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do. This category includes sound sources such as continuous vibro-piling, running machinery, vessels, and some sonar equipment (see Chapter 14: Underwater Noise for further information).

As detailed in Chapter 2: Project Description, a bankseat structure will be constructed at the northern edge of the existing deck structure to support the bridge if required. This structure is expected to be constructed from precast reinforced concrete or a steel frame supported by six steel tubular piles. The piles will be vertical piles installed using vibro, impact driving and rotary boring techniques. These piles are proposed to be steel tubes approximately 0.914 m in diameter. The concrete section of the bankseat will be installed from *in-situ* concrete. Eight temporary piles will be installed to support the piling frame for the permanent piles. These eight piles are expected to have a diameter of 0.610 m. Two guide piles are to be installed to restrain the pontoon. These are anticipated to be steel tubular piles, approximately 2.032 m in diameter, filled with reinforced concrete. These guide piles will be socketed into bedrock beneath the bed material using a combination of vibro and rotary boring techniques. The installation of the guide pile will require eight temporary steel piles to be installed adjacent to it to support the piling rig. These temporary support piles will each be approximately 1.22 m in diameter and will be installed via vibro and/or impact driving techniques. The piles will be lifted into place using a crawler crane operating from the quay edge. A temporary steel piling platform will be installed supported on temporary piles to increase the working area of the crawler crane. The eight temporary support piles will be removed once the guide pile has been installed. The pontoon will be floated into place and secured to the guide piles.

The source levels used in the underwater noise modelling (see Chapter 14: Underwater Noise) are based on the following metrics: Sound Pressure Level (SPL) equal to SPLRMS and used to describe non-impulsive sounds, maximal instantaneous SPL (L_p), and/or Sound Exposure Level (SEL).

The noise source levels used within underwater noise modelling for the different noise producing activities (as detailed in the above paragraph and also in Chapter 2: Project Description) are summarised in Table 8-8.

Table 8-8: Summary of Noise Source Levels Associated with the Proposed Development.

Equipment	Source level	Comments/details	Impulsive/non-impulsive
Dredging	174 dB SPL	Based on a 90 m generic Trailing Suction Hopper Dredger (TSHD) vessel.	Non-impulsive

Equipment	Source level	Comments/details	Impulsive/non-impulsive
		Also covers backhoe and plough dredging.	
Demolition, Rock Breaking, Pecking during dredging	194 dB SPL	Based on SPT testing, down-the-hole hammering and hydraulic rock breakers. This also covers the use of wire saws and drilling in relation to the demolition.	Non-impulsive
Vibro piling, main pontoon piles	194 dB SPL	Assuming diameter of 2 m. Also covers vibro extraction of piles.	Non-impulsive
Coring, main pontoon piles	163 dB SPL	Assuming diameter of 2 m.	Non-impulsive
Impact piling, support piles	209 dB SEL (245 dB L_P)	Assuming a blow rate of 0.6 Hz, diameter of 1.22 m, 110 kJ hammer. Max daily duration of 2x30 min.	Impulsive to 900 m range then non-impulsive*
Vibro piling, support piles	194 dB SPL	Assuming diameter of 1.22 m.	Non-impulsive
Impact piling, Bankseat piles (piles installed in made ground)	194 dB SPL in water *Based on 209 dB SEL (245 dB L_P)*	Assuming diameter of 1.22 m. not assessed separately, see "Demolition, Rock breaking etc."	Non-impulsive (due to land-water interface effects)
Coring, Bankseat piles	159 dB SPL	Assuming diameter of 1.22 m.	Non-Impulsive

The reduction of noise between the source and the receiver was modelled using the Weston model (Appendix 13.C), suitable for water depths of c. 200 m. Parameters included in the noise propagation model were 'sediment properties' 'water temperature' 'salinity' and 'soundspeed profile'.

Results presented in the fish and shellfish ecology and marine mammal sections 8.9.2 and 8.9.3 are detailed as the geographical "risk range" to the auditory thresholds. The results for all receptors are given for the instantaneous risk, using the dual criteria of for TTS and AUD INJ, of a 1 second sound exposure, and Lp. The accumulated sound exposure was assessed using a fleeing receptor model for marine mammals, and a static model for fishes. The accumulated sound exposure (SEL) was assessed for two scenarios: with and without a soft start. The transition from impulsive to non-impulsive noise was determined by modelling the predicted waveform from pile driving with a ray tracing model (see examples in Appendix 14.1, Impulsiveness) to establish when kurtosis drops below 40. Kurtosis is a statistical measure of the 'peakedness' of the waveform.

8.8 Baseline Environment

8.8.1 Benthic Subtidal and Intertidal Ecology

Site-specific benthic subtidal and intertidal surveys were undertaken, with the results of the subtidal survey presented in full in Appendix 8.A and the results of the intertidal survey presented in Appendix 8.C. The key desktop data sources used to characterise the baseline are as presented in Table 8-4.

The seabed within Fishguard Harbour largely consists of muds and sands within the centre, with patches of boulders, cobbles, and bedrock around the periphery (RPS, 2018). The benthic environment within Fishguard Harbour is described in the following sections for the subtidal (section 8.8.1.1) and intertidal zones (section 8.8.1.2).

The EUSeaMap data (EMODnet, 2025) presents broad-scale sediment classifications in European waters. Although these EUSeaMap data do not fully extend into the Marine Biodiversity Study Area, they illustrate that the following seabed sediment classifications are present in some areas:

- Circalittoral sandy mud;
- Infralittoral sandy mud;
- Moderate energy circalittoral seabed;
- Moderate energy infralittoral seabed; and
- Infralittoral rock and other hard substrata (Figure 8-2; EMODnet (2025)).

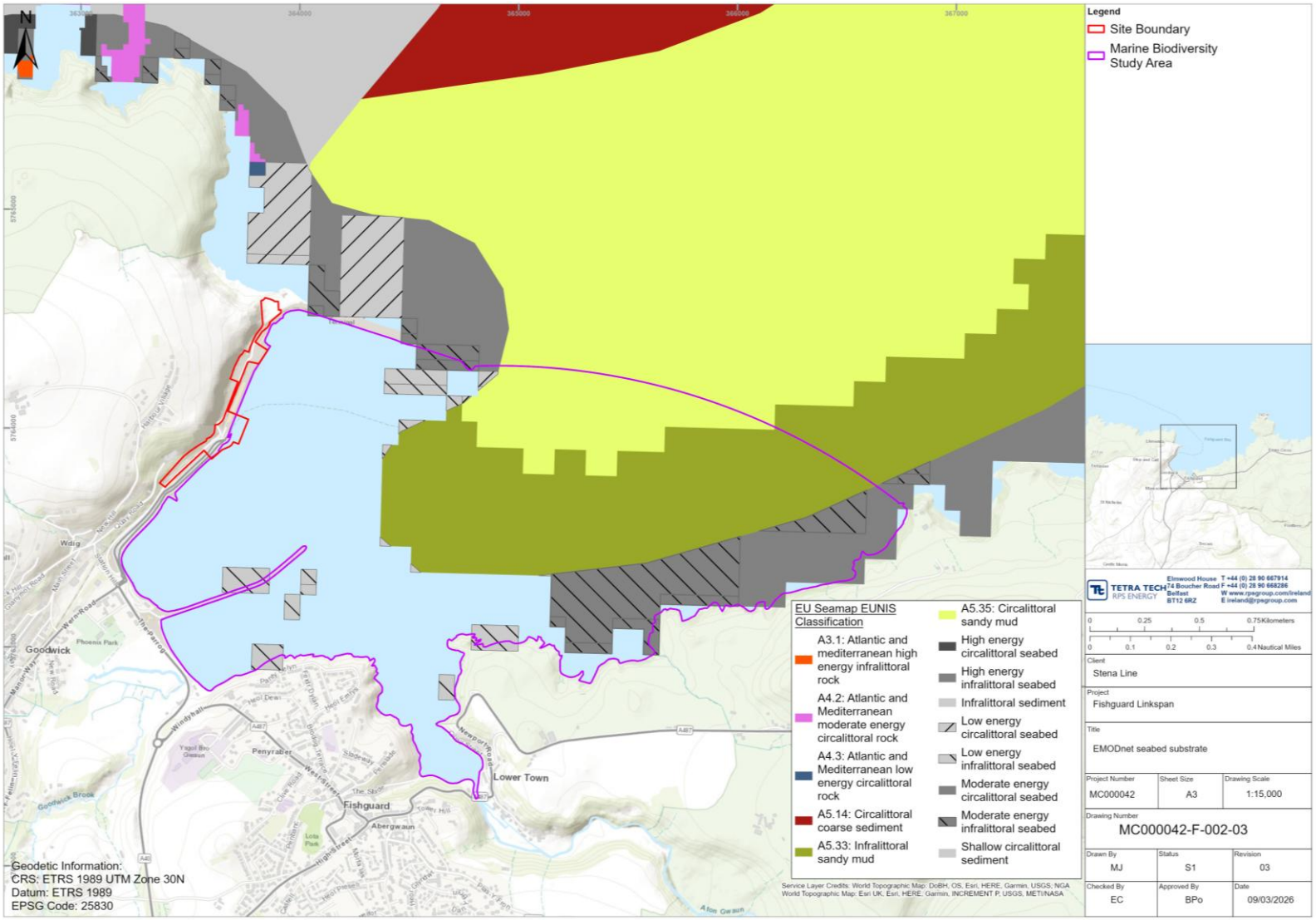

Figure 8-2: EUSeaMap Habitat Classifications in the vicinity of the Marine Biodiversity Study Area (EMODnet, 2025).

8.8.1.1 Benthic Subtidal Ecology

Using the NRW Data Map Wales Portal, blue mussel beds were identified within Fishguard Harbour during a 2014 NRW survey (NRW, 2025b) (Figure 8-3). However, as detailed in Table 8-3, these were confirmed by NRW to be juvenile blue mussel records, and therefore unlikely to be blue mussel beds. Therefore, these points do not correspond to the UK Biodiversity Action Plan (BAP) Priority Habitat 'Blue Mussel Beds on Sediment' or to 'Blue mussel beds' as a Habitat of Principal Importance under the Environment (Wales) Act 2016. In addition, during a Countryside Council for Wales (CCW; now NRW) survey in 2001, intertidal blue mussel beds were recorded along Goodwick Beach, Harbour Beach and near Lampit Beach, although these are beyond the Site Boundary, on the southern side of Fishguard Bay (NRW, 2025c) (Figure 8-4).

As detailed in section 8.6.2, a subtidal (and infralittoral) survey was undertaken in the vicinity of the Site Boundary in 2017 for a replacement linkspan at the Stena Ferry Terminal (ABPmer, 2018). This involved DDV and grab sampling. At each sample location, two grab samples were collected. One grab sample was collected for infaunal invertebrate analysis. The other grab sample was collected for PSA and contaminants analysis. Although the surveyed area was smaller than and located entirely within the Site Boundary, the results are still relevant to characterise part of the baseline subtidal environment in Fishguard Harbour.

The sublittoral fringe below the quayside and rock armouring of the Stena Ferry Terminal consisted of large boulders and other hard substrata with fronds of sugar kelp *Saccharina latissima* and oarweed *Laminaria digitata*. This was assigned the biotope '*Saccharina latissima* and *Laminaria digitata* on sheltered sublittoral fringe rock' (IR.LIR.K.Slat.Ldig; JNCC 2022 Classification) (ABPmer, 2018). Other flora recorded included dead man's rope Chorda filum and sea lettuce *Ulva lactuca*. In terms of fauna, the light bulb sea squirt *Clavelina lepadiformis* was present on boulders. There were some patches of sugar kelp recorded on sand, which was assigned the biotope '*Saccharina latissima* and filamentous red algae on infralittoral sand' (SS.SMp.KSwSS.SlatR.Sa) (ABPmer, 2018).

In the subtidal zone, there were six grab sampling stations investigated, which ranged from 'slightly gravelly sand' to 'slightly gravelly muddy sand'. This was defined from the PSA on the grab samples collected. The total biomass ranged from 16 to 185 g per m^2, with the white furrow shell *Abra alba* contributing most to the total biomass (ABPmer, 2018). Key characterising species recorded in the grab samples included:

- Polychaetes (*Aphelochaeta marioni*, *Chaetozone gibber*, *Mediomastus fragilis*, and *Euclymene oerstedii*);
- Bivalves (*A. alba*, basket shell *Varicorbula gibba*, two-toothed Montagu shell *Kurtiella bidentata*, *Nucula hanleyi*, and *Thyasira flexuosa*); and
- Brittlestars (*Amphiura filiformis* and Ophiuroidea) (ABPmer, 2018).

There were also a range of crustaceans recorded in low abundances, including brown shrimp *Crangon crangon* and amphipods, such as *Harpinia antennaria*.

The subtidal seabed sediment habitat was assigned the biotope 'Circalittoral muddy sand' (SS.SSa.CMuSa), which is illustrated in Figure 8-5[2], alongside the patches of '*Saccharina latissima* and filamentous red algae on infralittoral sand' (SS.SMp.KSwSS.SlatR.Sa) (note that the scientific name for sugar kelp has since been updated to *Saccharina latissima* as opposed to *Laminaria saccharina,* as presented in Figure 8-5).

[2] The Development Footprint shown on Figure 8-5 shows the boundary when the 2017 site-specific subtidal and intertidal surveys (ABPmer, 2018) were undertaken. However, the data is still relevant to the updated Site Boundary.

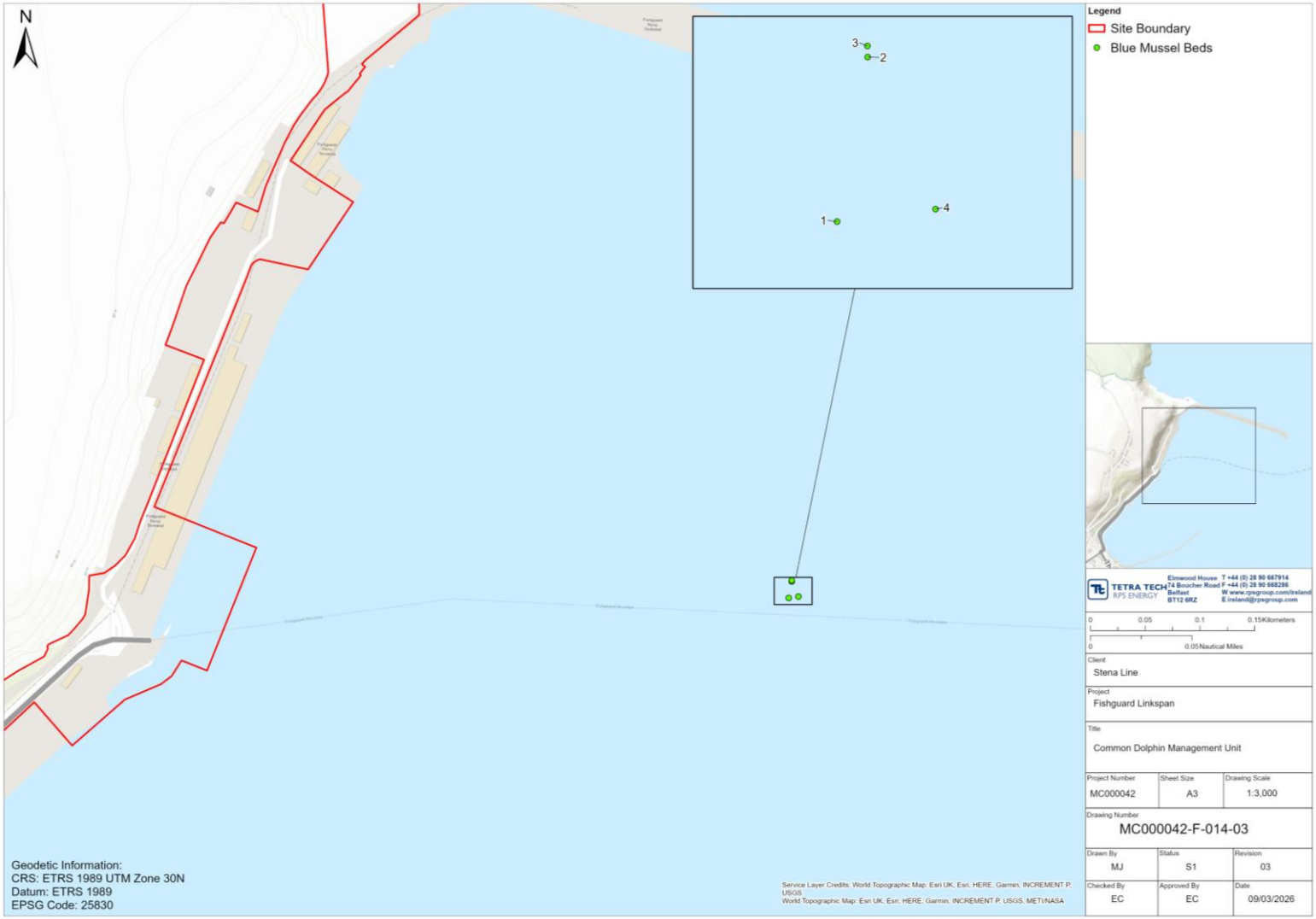

Figure 8-3: Location of Blue Mussel Beds (Later Confirmed to be juvenile Blue Mussels not Beds) Recorded within the Site Boundary (NRW, 2025b).

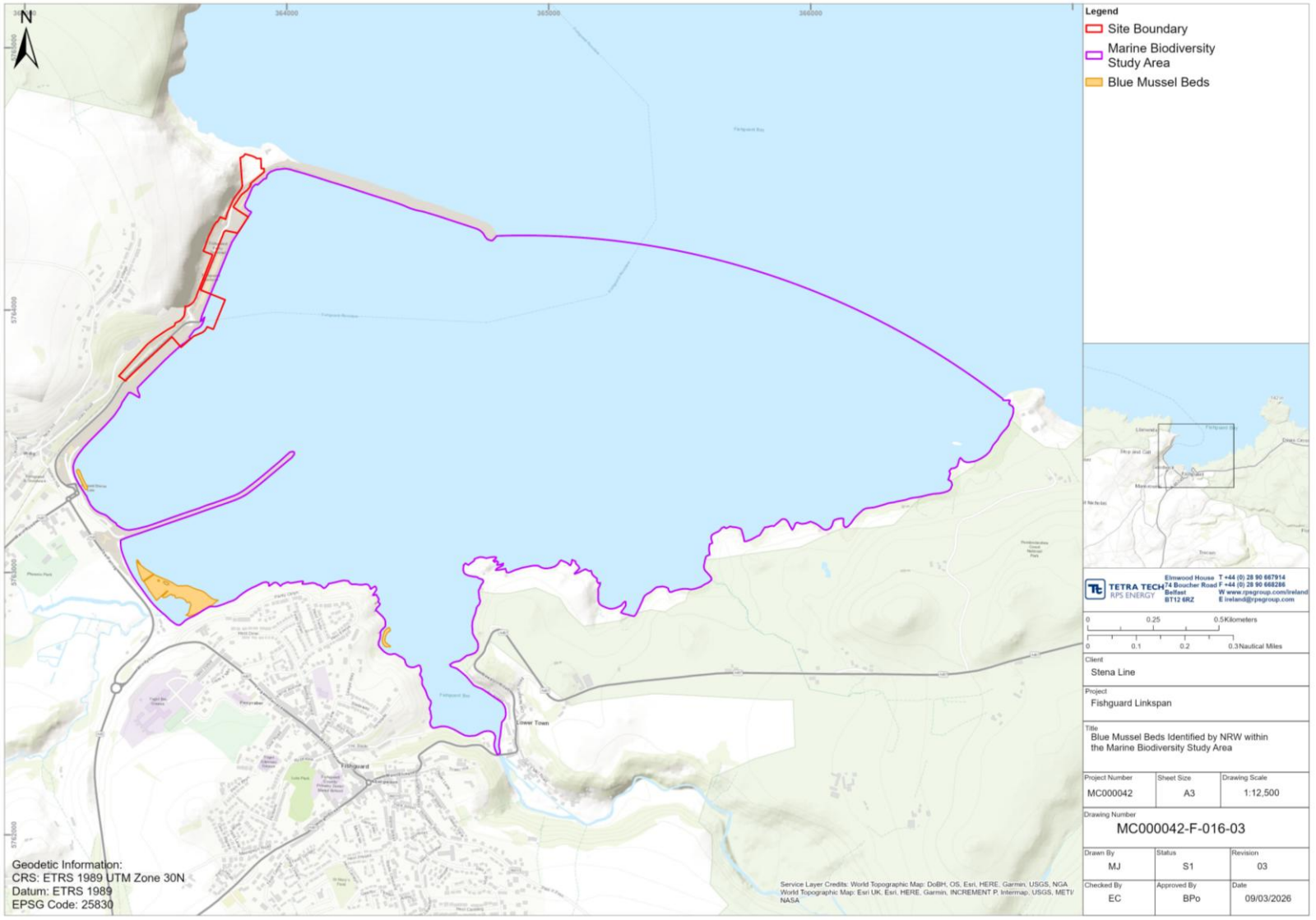

Figure 8-4: Location of Intertidal Blue Mussel Beds within the Marine Biodiversity Study Area (NRW, 2025c).

Figure 8-5: Grab Sample Locations and the Results of Site-specific Surveys conducted in 2017 for similar works at the Stena Ferry Terminal (ABPmer, 2018).

In 2015, DDV surveys were undertaken in Fishguard Harbour for another project. Most of the area surveyed was assigned the biotope '*Arenicola marina* in infralittoral fine sand or muddy sand' (SS.SSA.IMuSa.AreISa) (Aquatic Environments (2015) cited in RPS (2018)) (Figure 8-6). Patches of gutweed were also present on the seabed, which was assigned the biotope 'Filamentous green seaweeds on low salinity infralittoral mixed sediment or rock' (SS.SMp.KSwSS.FilG) (Aquatic Environments (2015) cited in RPS (2018)) (Figure 8-6). There were two other biotopes recorded at one site each:

- 'Dense foliose red seaweeds on moderately exposed, silted, stable infralittoral rock' (IR.MIR.KR.XFoR); and
- '*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (LR.MLR.BF.Fser.R) (Aquatic Environments (2015) cited in RPS (2018)) (Figure 8-6).

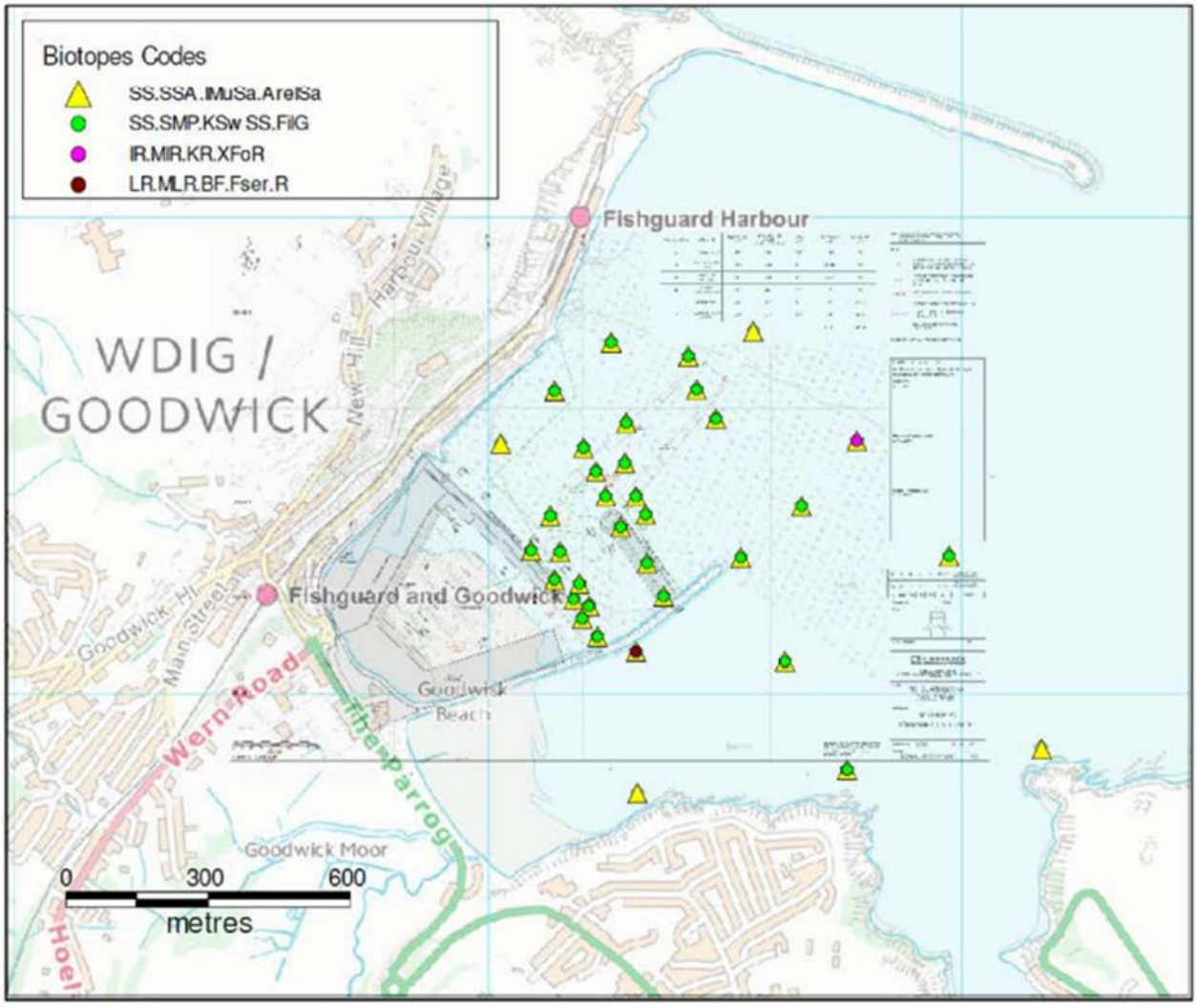

Figure 8-6: Subtidal Biotopes Recorded in a DDV Survey of Fishguard Harbour (Aquatic Environments (2015) cited in RPS (2018)).

In addition, grab sample data provided by NRW (pers. comm.)[3] included grab sampling from two sites within the study area in 2022 (one of which was within the Site Boundary). The PSA results of

[3] Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

the grab samples within the Site Boundary classified the substrate as mud, while the PSA results of the samples within the wider Fishguard Harbour classified the substrate as sand.

The most commonly recorded species in the 2022 grab samples within the Site Boundary were as follows (NRW, pers. comm.):

- Oligochaete *Tubificoides.amplivasatus*;
- Polychaetes (*C. gibber; Kirkegaardia* sp., *Ophryotrocha* sp., *Tharyx killariensis*, *E. oerstedii, Galathowenia oculata A. marioni, M. fragilis, Capitella* spp., *Parexogone hebes, Praxillella affinis, Levinsenia gracilis, Magelona minuta*);
- Juvenile blue mussel;
- Crustaceans of the Class Ostracoda; and
- Bivalves (*A. alba*, and *T. flexuosa*).

The average abundance across replicate samples at this station was 2,009.6 individuals and the average diversity was 57.6 taxa (NRW, pers. comm.).

For the other sampling station within the study area, but outside of the Site Boundary, the most commonly recorded species in the 2022 grab samples were as follows:

- Crustaceans of the Class Ostracoda;
- Polychaetes (*Kirkegaardia* sp., *E. oerstedii, P. affinis, C. gibber, P. hebes, Pholoe baltica, G. oculata, Ampharete lindstroemi, Melinna palmata*);
- Bivalves (*Nucula nitidosa, A. alba, T. flexuosa, K. bidentata*);
- Oligochaete *Tubificoides amplivasatus*; and
- Amphipod crustaceans (*Harpinia crenulata* and *Harpinia antennaria*).

The average abundance across replicate samples at this station was 1,682.8 individuals and the average diversity was 62.8 taxa (NRW, pers. comm.).

During the benthic validation survey for the Proposed Development, where grab samples were collected from stations within the Site Boundary, the faunal communities were generally dominated by molluscs and annelids. The most commonly recorded species were *A. alba* and *K. bidentata*, while other species recorded in high abundances included *N. nitidosa*, *M, palmata* and *P. baltica*. These results align with previous studies of the area. See Appendix 8.A for further details.

8.8.1.2 Benthic Intertidal Ecology

As detailed in section 8.6.2, an intertidal survey was undertaken in the vicinity of the Site Boundary in 2017 for a replacement linkspan at the Stena Ferry Terminal (ABPmer, 2018). The survey approach was based on the standardised Phase 1 mapping methodology as detailed in the Marine Monitoring Handbook, Procedural Guidance No 3-1 (Wyn and Brazier, 2001) and the Handbook for Marine Intertidal Phase 1 Survey and Mapping (Wyn *et al*., 2006). The surveyed area extended from approximately 70 m south of the old Royal National Lifeboat Institution (RNLI) slipway to just north of the existing linkspan infrastructure. This survey, therefore, covered part of the intertidal area within the Site Boundary and the results are therefore relevant to characterise part of the baseline intertidal environment in Fishguard Harbour. As per standard procedure, the results of the intertidal zone were presented for the lower, mid, and upper shore zones.

The lower shore was characterised by the following flora: fronds of oarweed, red seaweeds (such as Irish moss *Chondrus crispus*), and sea lettuce. The substrate was comprised of large boulders and cobbles (ABPmer, 2018). Underneath the boulders, the following fauna were recorded: broad-clawed porcelain crab *Porcellana platycheles*, barnacles *Semibalanus* spp., star ascidian *Botryllus schlosseri*, sea squirts *Aplidium nordmanni*, and polychaete worms *Spirobranchus* spp. Sponge species, such as *Hymeniacidon perlevis*, were also recorded attached to boulders and

anthropogenic concrete pillars in the lower shore (ABPmer, 2018). The lower shore was assigned the biotope '*Laminaria digitata* and under boulder fauna on sublittoral fringe borders' (IR.MIR.KR.Ldig.Bo). There were also patches of serrated wrack *Fucus serratus* on the lower shore, which were assigned the biotope '*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (LR.MLR.BF.Fser.R) (ABPmer, 2018). The under boulder species assemblage was characteristic of the UK BAP Priority Habitat 'Intertidal under boulder communities' (BRIG, 2016) and is also listed as a Habitat of Principal Importance in Wales (Welsh Government, 2016). Approximately 0.009 hectares (90 m^2) of this habitat was recorded during the survey. The area of the Site Boundary is 54,325 m^2, therefore this footprint of 'Intertidal under boulder communities' is small in relation, up to 0.17% of the total Site Boundary Area. However, it should be noted that is a precautionary estimate as much of the Site Boundary is onshore.

The lower to mid shore was characterised by a zone of knotted wrack *Ascophyllum nodosum* covering boulders and anthropogenic structures. This was assigned the biotope '*Ascophyllum nodosum* on very sheltered mid eulittoral rock' (LR.LLR.F.Asc) (ABPmer, 2018). Moving up the mid shore, spiralled wrack *Fucus spiralis* was present, and the habitat transitioned into the biotope '*Fucus spiralis* on sheltered upper eulittoral rock' (LR.LLR.F.Fspi). Fauna recorded in the mid shore included barnacles, the limpet *Patella vulgata*, the top shell *Steromphala umbilicalis*, and periwinkles *Littorina littorea* and *Littorina obtusata* (ABPmer, 2018).

The channelled wrack *Pelvetia canaliculata* began to occur at the upper shore zone, alongside barnacles. This was assigned the biotope '*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock' (LR.MLR.BF.PelB). Above this, green algae and lichens were present, assigned the biotope 'Lichens or small green algae on supralittoral and littoral fringe rock' (LR.FLR.Lic) (ABPmer, 2018).

The distribution of the intertidal biotopes identified in the 2017 survey are presented in Figure 8-5. Some additional biotopes were identified in the 2025 intertidal survey (Appendix 8.C), however, the habitats align with those identified in 2017:

- '*Porphyra purpurea* and *Ulva* spp. on sand-scoured mid or lower eulittoral rock' (LR.FLR.Eph.UlvPor) was identified on the lower shore;
- 'Ephemeral green or red seaweed communities (freshwater or sand-influenced)' (LR.FLR.Eph), '*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock' (LR.MLR.BF.FvesB) and '*Fucus serratus* on moderately exposed lower eulittoral rock' (LR.MLR.BF.Fser) were identified in the mid shore; and
- '*Verrucaria maura* on littoral fringe rock' (LR.FLR.Lic.Ver) was identified in the upper shore.

Although somewhat dated, there was a Phase 1 intertidal survey undertaken at Goodwick Beach in 2011 for a marina development project (Aquatic Environments (2011) cited in RPS (2018)). Although outside the Site Boundary, the results are briefly discussed here for additional context into the intertidal zone within Fishguard Harbour. This 2011 survey recorded 16 distinct biotopes across the rocky areas and two biotopes in the sandy bay area (Aquatic Environments (2011) cited in RPS (2018)). There were a range of typical rocky shore species recorded, such as fucoid algae, limpets, mussels, and barnacles, and a range of under boulder communities. Within the sandy bay area, characteristic species such as polychaetes (*A. marina, Scoloplos armiger*, and *Pygospio elegans*), bivalves (such as *Macoma balthica*), sand burrowing brittlestar *Acrocnida brachiata*, brown shrimp, and sand slug *Philine aperta* (Aquatic Environments (2011) cited in RPS (2018)).

Results of Phase 1 Intertidal Surveys are collated by NRW and presented on the Data Map Wales portal (NRW, 2025d). Within the Site Boundary, data were available from surveys undertaken in 2001 and 2003. The following intertidal biotopes (JNCC 2022 Classification) were recorded within the Site Boundary:

- '*Ascophyllum nodosum* on full salinity mid eulittoral rock' (LR.LLR.F.Asc.FS);
- '*Pelvetia canaliculata* on sheltered littoral fringe rock' (LR.LLR.F.Pel);

- '*Fucus spiralis* on sheltered upper eulittoral rock';
- 'Yellow and grey lichens on supralittoral rock' (LR.FLR.Lic.YG);
- '*Verrucaria maura* on littoral fringe rock' (LR.FLR.Lic.Ver); and
- '*Laminaria digitata* on moderately exposed sublittoral fringe bedrock' (IR.MIR.KR.Ldig.Ldig) (NRW, 2025d).

8.8.1.3 Designated Sites

There are no designated sites with relevant benthic features within Fishguard Harbour or within several kilometres. This includes SACs, Marine Conservation Zones (MCZs), or Sites of Special Scientific Interest (SSSIs). The closest designated site with benthic qualifying features is the Cardigan Bay/Bae Ceredigion SAC, which sits 15.8 km from the Site Boundary. This site is designated for the following Annex I habitat features:

- Reefs;
- Sandbanks which are slightly covered by seawater all the time; and
- Submerged or partially submerged sea caves.

However, given the distance of this SAC from the Site Boundary, and that these benthic features are not mobile, this site is not proposed to be considered further for benthic subtidal and intertidal ecology. This is because there is considered to be no pathway for direct or indirect impacts associated with the Proposed Development.

8.8.1.4 Important Ecological Features

As per the CIEEM (2022) guidance, IEFs have been identified. The benthic subtidal and intertidal IEFs have been assigned a value of importance based on the level of protection legislation and ecological significance that they possess. The benthic subtidal and intertidal ecology IEFs are presented in Table 8-9, alongside justification for their assigned value.

Table 8-9: Benthic Subtidal and Intertidal IEFs Identified.

IEF	Value	Justification
Under boulder assemblage	National	• The under boulder species assemblage recorded during the 2017 survey in Fishguard Harbour (ABPmer, 2018) was characteristic of the UK BAP Priority Habitat 'Intertidal under boulder communities', which is also listed as a Habitat of Principal Importance under the Environment (Wales) Act 2016.
Fishguard Harbour benthic subtidal community	Local	• The subtidal benthic community recorded within the Site Boundary is likely to be representative of a highly anthropogenically influenced harbour ecosystem. Based on the desktop data, it largely corresponded to the biotope 'Circalittoral muddy sand' (SS.SSa.CMuSa), which is not characteristic of any UK BAP Priority Habitats or a Habitat of Principal Importance under the Environment (Wales) Act 2016. • The benthic validation survey (Appendix XX) classified the inshore area within the Site Boundary close to the linkspan location as the '*Kurtiella bidentata* and *Abra* spp. in infralittoral sandy mud' (SS.SMu.ISaMu.KurAbr) biotope. This biotope aligns with the desktop data and is also not characteristic of any UK BAP Priority Habitats or a Habitat of

IEF	Value	Justification
		Principal Importance under the Environment (Wales) Act 2016. • Common species included a range of polychaetes (*A. marina, A. marioni, C. gibber, M. fragilis, M. palmata, P. baltica* and *E. oerstedii*), bivalves (*A. alba, V. gibba, K. bidentata, N. hanleyi, N. nitidosa* and *T. flexuosa*), and brittlestars *A. filiformis*.
Fishguard Harbour benthic intertidal community	Local	• Aside from the under boulder assemblage, the intertidal benthic community recorded within the Site Boundary was not characteristic of any UK BAP Priority Habitats or any Habitats of Principal Importance under the Environment (Wales) Act 2016. • The intertidal community featured a range of typical algal and faunal species, with no species of conservation interest recorded. The substrates consisted of bedrock and boulders in the intertidal zone within the Site Boundary.

8.8.2 Fish and Shellfish Ecology

Given the nature and scale of the Proposed Development, no site-specific fish and shellfish surveys were undertaken. The key data sources used to characterise the baseline are therefore as presented in Table 8-4.

The fish and shellfish assemblage at Fishguard Harbour is likely to representative of the Irish Sea, featuring a range of marine fish (e.g. teleost fish (bony fish) and elasmobranchs (sharks, skates, and rays)), diadromous fish (i.e. those which migrate between freshwater and seawater), and shellfish (i.e. commercial crustaceans and molluscs). Although other crustacean and mollusc species are technically shellfish, these are a non-commercial species. Non-commercial shellfish species have therefore been considered under benthic subtidal and intertidal ecology (section 8.8.1).

8.8.2.1 Marine Fish

The teleost fish species within Fishguard Harbour and the Irish Sea include both demersal and pelagic species. Typical Irish Sea demersal teleost fish species recorded near and/or within Fishguard Harbour include:

- Gadoids (e.g. cod *Gadus morhua*, European hake *Merluccius merluccius*, pollock *Pollachius pollachius*, poor cod *Trisopterus minutus*, and whiting *Merlangius merlangus*);
- Flatfish (e.g. flounder *Platichthys flesus*, lemon sole *Microstomus kitt*, plaice *Pleuronectes platessa*, and sole *Solea solea*);
- Sandeel (e.g. lesser sandeel *Ammodytes tobianus* and Raitt's sandeel *Ammodytes marinus*);
- Sea bass *Dicentrarchus labrax*; and
- Other demersal species, such as anglerfish *Lophius piscatorius*, gobies (family: Gobiidae), and gurnards (family: Triglidae) (Campanella and van der Kooij, 2021, Coull *et al*., 1998, Ellis *et al*., 2012, MMO, 2023, MMO, 2024, NRW, 2024).

There were no site-specific fish and shellfish ecology studies conducted for the Proposed Development or for previous linkspan replacement works at the Stena Ferry Terminal, however, data from seine netting and beam trawls conducted within Fishguard Harbour are provided by NRW (2024). A range of demersal and pelagic teleost fish species were recorded during these trawls, such as flounder, lesser pipefish *Syngnathus rostellatus*, lesser sandeel, plaice, pollock,

sand goby *Pomatoschistus minutus*, sand smelt *Atherina presbyter*, sea bass, sprat, thinlip mullet *Chelon ramada*, and transparent goby *Aphia minuta* (NRW, 2024).

Pelagic teleost species (i.e. those which live within the mid-section of the water column in the open ocean) recorded in the Irish Sea near Fishguard Harbour include European anchovy *Engraulis encrasicolus*, horse mackerel *Trachurus trachurus*, mackerel *Scomber scrombus*, and sprat *Sprattus sprattus* (Campanella and van der Kooij, 2021, Coull *et al*., 1998, Ellis *et al*., 2012, MMO, 2023, MMO, 2024, NRW, 2024). While herring *Clupea harengus* are a key pelagic fish species for marine food webs, recent modelling indicates low juvenile and adult abundance around Fishguard Harbour and its surrounding waters, with hotspots of activity concentrated further north in the Irish Sea (around the Isle of Man and Northern Ireland) and further south towards the Celtic Sea (Campanella and van der Kooij, 2021). Further, there were no herring landed in the International Council for the Exploration of the Seas (ICES) rectangles that overlap with Fishguard Harbour and its surrounding waters between 2018 to 2023 (most recently available data) (MMO, 2023, MMO, 2024). Based on the literature, and the fact that herring spawn in clean gravelly seabeds, the Marine Biodiversity Study Area is not likely to represent a key habitat for herring.

Elasmobranchs that may be present within the vicinity of Fishguard Harbour include blonde ray *Raja brachyura*, cuckoo ray *Leucoraja naevus*, small-spotted catshark *Scyliorhinus canicula*, spotted ray *R. montagui*, thornback ray *R. clavata*, and tope shark *Galeorhinus galeus* (Coull *et al*., 1998, Ellis *et al*., 2012, MMO, 2023), among others. The basking shark *Cetorhinus maximus* may also be present within the offshore waters around Fishguard Harbour, with a low number (i.e. tens) of individuals recorded along the Pembrokeshire coast in the UK basking shark database from 1987 to 2016 (Marine Conservation Society, 2020).

8.8.2.2 Diadromous Fish

Diadromous fish have complex life histories and migrate between freshwater and seawater to complete their life cycles. The River Gwaun is a tributary which enters into Fishguard Harbour. Diadromous fish species recorded in this river include Atlantic salmon *Salmo salar*, sea trout *Salmo trutta*, and European eel *Anguilla anguilla* (RPS, 2018). In addition, rivers designated as SACs along the coast of Pembrokeshire and Cardigan Bay, such as the River Teifi and River Cleddau, support the brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*, however these do not flow into the Marine Biodiversity Study Area. There are few records of either the allis shad *Alosa alosa* or twaite shad *Alosa fallax* species in Pembrokeshire, with the current status of these species in the area uncertain (RPS, 2018). The freshwater pearl mussel *Margaritifera margaritifera* shares a complex parasitic life history with salmonids, such as Atlantic salmon and sea trout (Taeubert and Geist, 2017). Therefore, although this species is freshwater-resident, populations may be impacted if Atlantic salmon or sea trout populations were to be affected by the Proposed Development.

The River Gwaun is not one of the 23 principal Atlantic salmon rivers or 33 principal sea trout rivers in Wales, and therefore does not have the same level of documentation as principal rivers. There have been no reported rod catches of Atlantic salmon or sea trout within the River Gwaun since 2008 (NRW, pers. comm.). Electrofishing data on juvenile salmonids from the River Gwaun catchment have been provided by NRW[4], ranging from 2011 to 2018. From these data, the following species have been recorded within the River Gwaun in low numbers: Atlantic salmon, sea trout, European eel, lamprey species (Petromyzontidae), stone loach *Barbatula barbatula*, bullhead *Cottus gobio*, and minnow *Phoxinus Phoxinus*. However, stone loach, bullhead, and minnow are freshwater resident species, and are therefore not considered further as part of this assessment.

[4] Contains NRW information © NRW and Database Right. All rights reserved.

8.8.2.3 Shellfish

There were no site-specific fish and shellfish ecology studies conducted for the Proposed Development or for previous linkspan replacement works at the Stena Ferry Terminal, however the common cockle *Cerastoderma edule* was recorded during grab sampling for benthic ecology in 2017 (ABPmer, 2018). Large spider crabs *Maja brachydactyla* were also recorded in the infralittoral zone (ABPmer, 2018). Similarly, the DDV survey conducted in Fishguard Harbour in 2015 recorded various shellfish, such as the harbour crab *Polybius depurator*, common shore crab *Carcinus maenas*, European lobster *Homarus gammarus*, and spider crabs (Aquatic Environments (2015) cited in RPS (2018)).

Information on shellfish distribution in UK waters is largely derived from commercial fishing and landings data. These data can be used to determine the likely shellfish species within Fishguard Harbour. Landings are reported annually by the Government and have been used to help characterise the shellfish baseline. Fishguard Harbour sits wholly within ICES rectangle 33E5, with ICES rectangle 33E4 to the west. At the time of writing, the most recent landings data are available up until 2023. Between 2018 to 2023, there were 9,335 tonnes of shellfish caught from ICES rectangles 33E4 and 33E5, of which 4,595 tonnes were landed at Fishguard Harbour itself (MMO, 2023, MMO, 2024). The total of 8,639 tonnes of shellfish from these ICES rectangles were largely comprised of common whelk *Buccinum undatum* (5,095 tonnes), king scallop *Pecten maximus* (2,483 tonnes), edible crab Cancer pagurus (403 tonnes), spider crab Maja squinado (382 tonnes), and European lobster (191 tonnes) (MMO, 2023, MMO, 2024). Shellfish species landed in lower quantities (<100 tonnes over 2018 to 2022) included common prawn *Palaemon serratus*, velvet swimming crab *Necora puber*, queen scallop *Aequipecten opercularis*, and Norway lobster *Nephrops norvegicus* (MMO, 2023).

8.8.2.4 Spawning and Nursery Grounds

Legacy datasets by Coull *et al*. (1998) and Ellis *et al*. (2012) have been used to determine the locations of spawning and nursery grounds in relation to Fishguard Harbour. While somewhat dated, more recent work by Campanella and van der Kooij (2021) corroborates the spawning and nursery grounds presented by Coull *et al*. (1998) and Ellis *et al*. (2012), emphasising their current relevance. Species with spawning and/or nursery grounds within the Marine Biodiversity Study Area and overlapping with the Site Boundary are presented in Table 8-10 and in Figure 8-7 to Figure 8-9.

Table 8-10: Species with Spawning and Nursery Grounds overlapping with the Marine Biodiversity Study Area (Coull *et al*., 1998, Ellis *et al*., 2012) (N/A = Not Applicable).

Species	Spawning Grounds	Spawning Intensity	Nursery Grounds	Nursery Intensity
Teleost Fish				
Anglerfish	×	N/A	✓	Low
Cod	✓	Low	×	N/A
Plaice	✓	Low	✓	Low
Sandeel	✓	Low	×	N/A
Sole	✓	High	×	N/A
Whiting	✓	Low	✓	Low
Elasmobranchs				
Thornback ray	×	N/A	✓	Low
Tope shark	×	N/A	✓[1]	Low

Species	Spawning Grounds	Spawning Intensity	Nursery Grounds	Nursery Intensity
Spotted ray	×	N/A	✓	Low

[1] Low intensity nursery grounds for tope shark identified within the Marine Biodiversity Study Area, but not overlapping with the Site Boundary. All other grounds for the other species overlap with the Site Boundary.

The spawning periods of species with spawning grounds overlapping with the Planning BoundarySite Boundary are presented in Table 8-11.

Table 8-11: Spawning Periods of Species with Spawning Grounds within the Marine Biodiversity Study Area (Coull *et al*., 1998, Ellis *et al*., 2012).

	Calendar Month											
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cod		P	P									
Plaice	P	P										
Sandeel												
Sole				P								
Whiting												
Key:	Spawning period					Peak spawning period						P

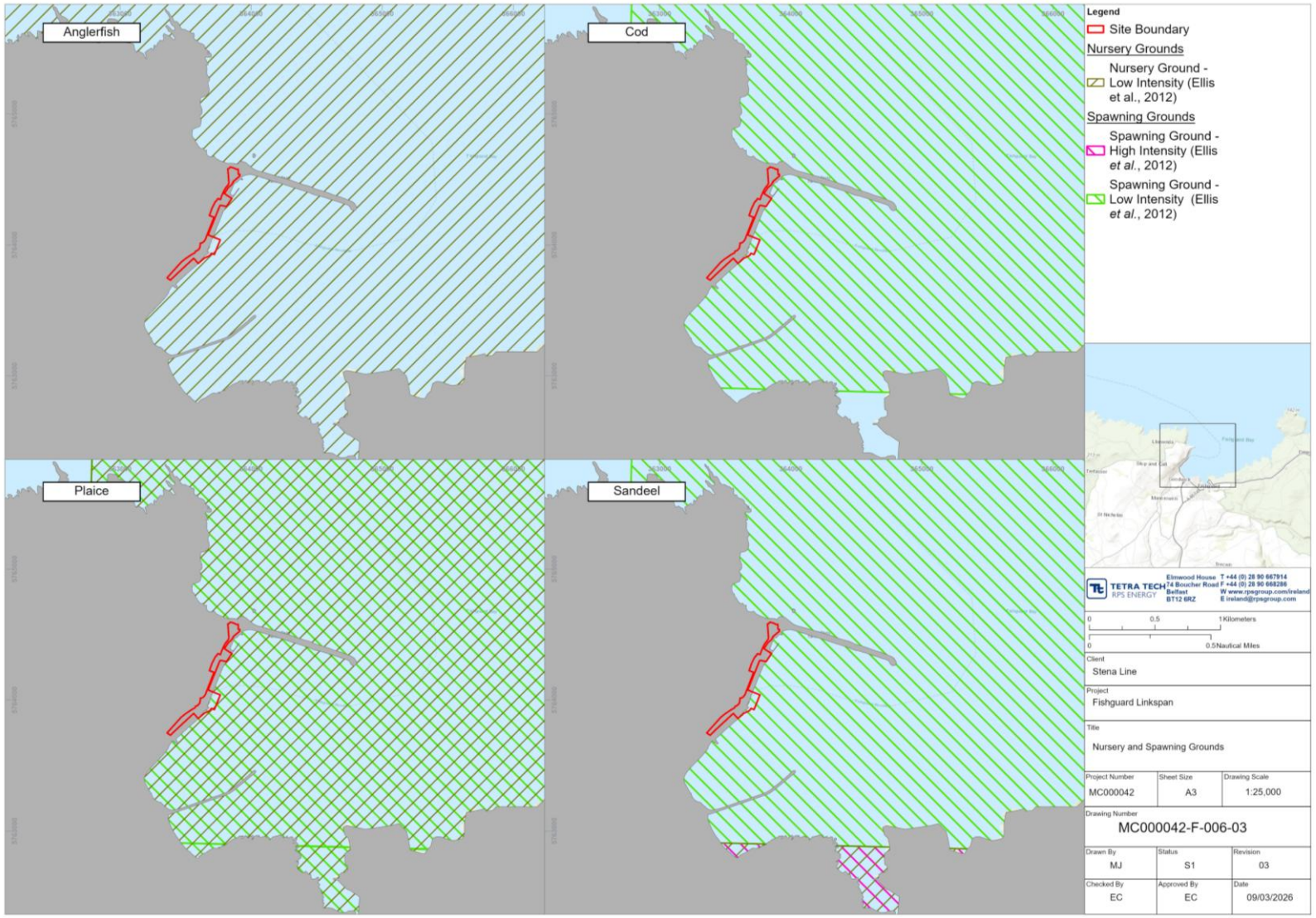

Figure 8-7: Spawning and Nursery Grounds of Anglerfish, Cod, Plaice, and Sandeel (Ellis *et al.*, 2012).

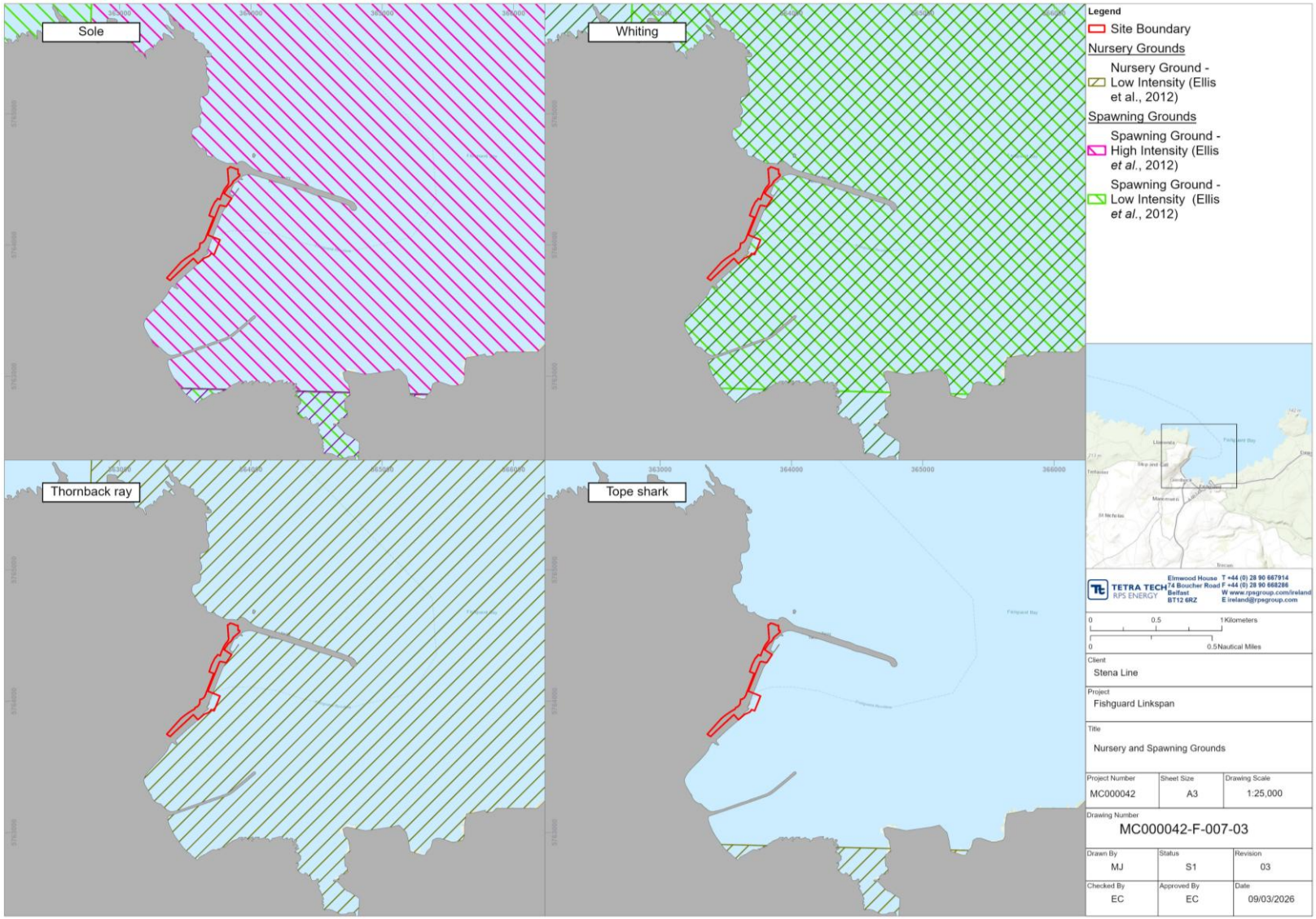

Figure 8-8: Spawning and Nursery Grounds of Sole, Whiting, Thornback Ray, and Tope Shark (Ellis *et al*., 2012).

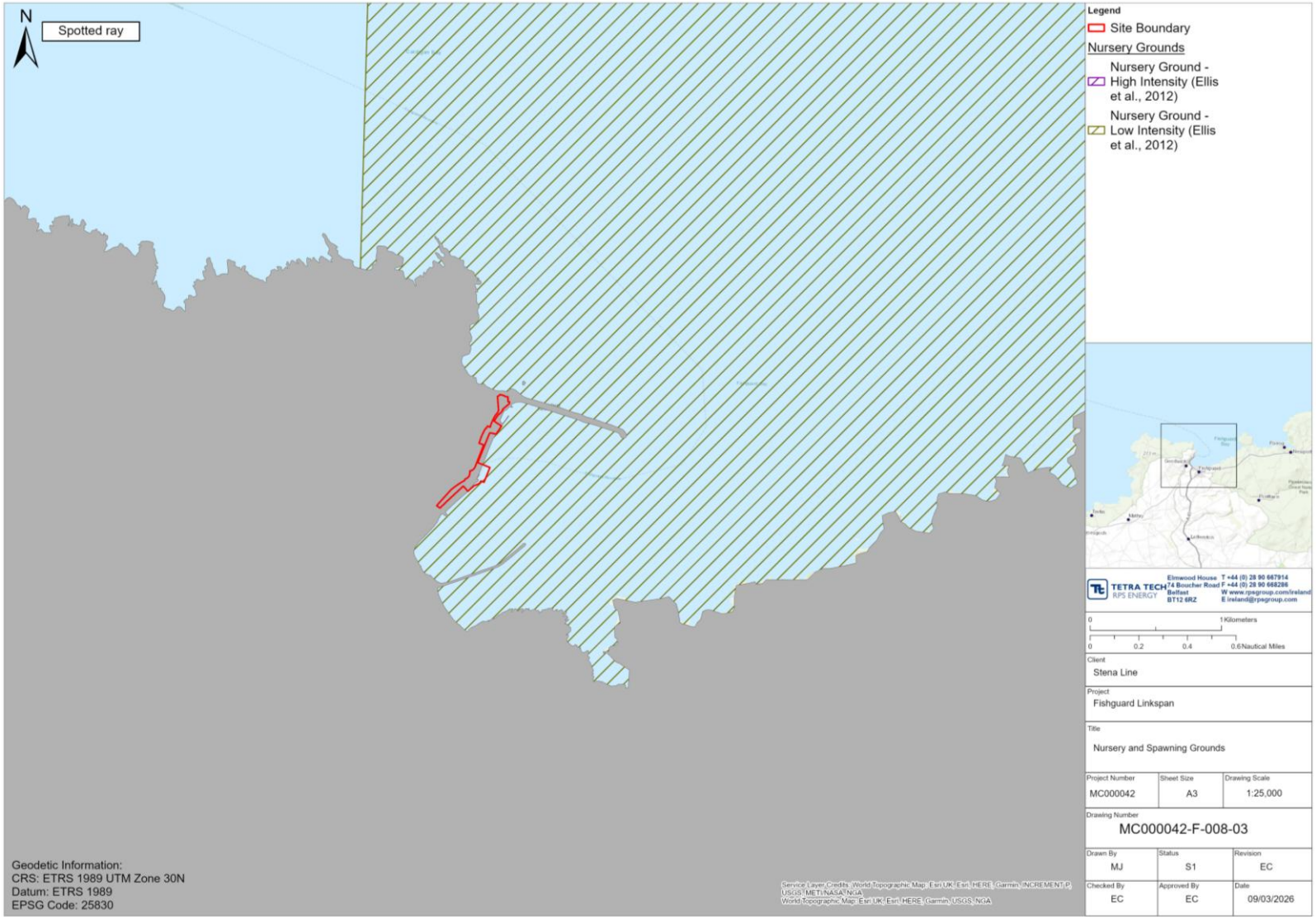

Figure 8-9: Nursery Grounds of Spotted Ray (Ellis *et al.*, 2012).

Campanella and van der Kooij (2021) built upon the spawning and nursery grounds presented in Coull *et al*. (1998) and Ellis *et al*. (2012) for forage fish species in Welsh waters. The term 'forage fish' refers to small to medium fish species which are a key prey resource for a range of higher predators, such as larger fish, marine mammals, and seabirds. This study focussed on eleven forage fish species: herring, sprat, European sardine Sardina pilchardus, European anchovy, sandeel, horse mackerel, mackerel and garfish Belone belone, as well as the gadoid species: cod, poor cod, and whiting. Heatmaps of juvenile and adult abundance were produced, which were extrapolated to represent areas important for nurseries and spawning, respectively (Campanella and van der Kooij, 2021). From this, medium to high numbers of adults and/or juveniles of the following species may be present in the vicinity of Fishguard Harbour: cod, European anchovy, garfish, horse mackerel, mackerel, poor cod, sandeel species, sprat, and whiting (Campanella and van der Kooij, 2021). However, given the high anthropogenic activity and alterations to the seabed, it is unlikely that Fishguard Harbour itself represents key spawning or nursery habitat for any species, or if it does, these species are adapted to these conditions.

8.8.2.5 Designated Sites

The Site Boundary does not overlap with any designated sites for fish and shellfish species, however there are some designated sites with fish and shellfish features in the vicinity of Fishguard Harbour, which are presented in Table 8-12 and in Figure 8-10. Given that the qualifying fish features of these SACs are mobile species, they could potentially occur within Fishguard Harbour and/or within the Zone of Impact (ZoI) from noise producing activities associated with the Proposed Development. However, given the estuarine nature of the brook lamprey and river lamprey, these two species are considered less likely to interact with the Site Boundary as their designated rivers do not flow into Fishguard Harbour (Figure 8-10).

Table 8-12: Designated Sites with Fish and Shellfish Qualifying Features in the Surrounding Region.

Site Name	Minimum Distance from Site Boundary (km)	Relevant Qualifying Feature
Cardigan Bay/Bae Ceredigion SAC	15.8	Sea lamprey River lamprey
Pembrokeshire Marine/Sir Benfro Forol SAC	22.1	Sea lamprey River lamprey Allis shad
River Teifi/Afon Teifi SAC	23.8	Brook lamprey River lamprey Atlantic salmon Sea lamprey
Cleddau Rivers/Afonydd Cleddau SAC	92.9	Brook lamprey River lamprey Sea lamprey
Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd SAC	117.9	River lamprey Sea lamprey Allis shad Twaite shad

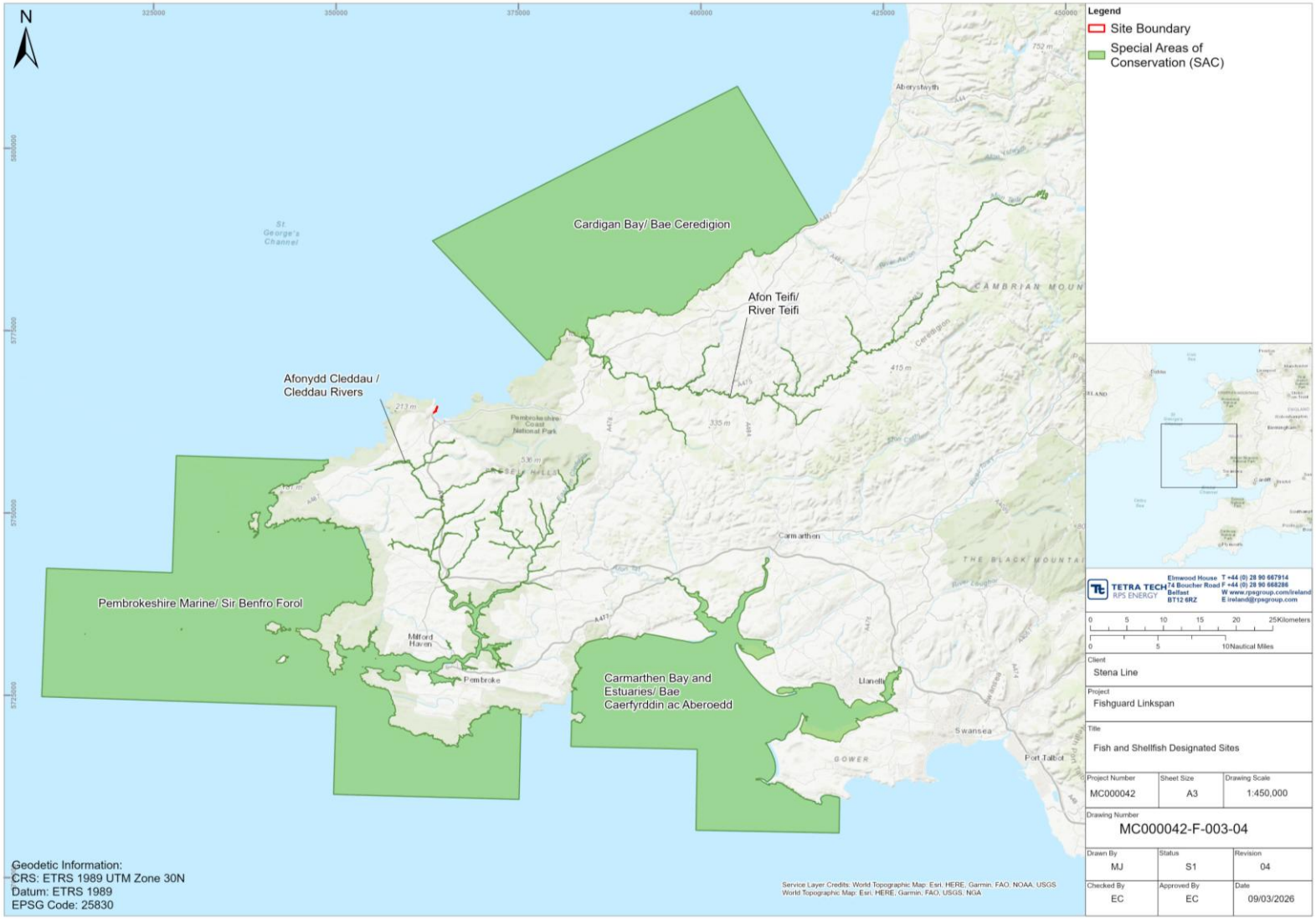

Figure 8-10: Designated Sites with Fish and Shellfish Qualifying Features in the Surrounding Region.

8.8.2.6 IEFs

As per the CIEEM (2022) guidance, IEFs have been identified for fish and shellfish ecology, and have been assigned a value of importance based on the level of protection legislation and ecological significance that they possess. The fish and shellfish ecology IEFs are presented in Table 8-13, alongside justification for their assigned value.

Table 8-13: Fish and Shellfish Ecology IEFs Identified.

IEF	Value	Justification
Teleost Fish		
Anglerfish	National	• Low intensity nursery grounds overlapping with the Site Boundary; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Cod	National	• OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas; • Low intensity spawning grounds overlapping with the Site Boundary; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Plaice	National	• Low intensity spawning and nursery grounds overlapping with the Site Boundary; and • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Sandeel	National	• Low intensity spawning grounds overlapping with the Site Boundary; • Priority Species under the Environment (Wales) Act 2016; • UK BAP Priority Species; and • Key forage fish species.
Sole	National	• High intensity spawning grounds overlapping with the Site Boundary; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Whiting	National	• Low intensity spawning and nursery grounds overlapping with the Site Boundary; and • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Elasmobranchs		
Thornback ray	National	• OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas;

IEF	Value	Justification
		• Priority Species under the Environment (Wales) Act 2016; and • Low intensity nursery grounds overlapping with the Site Boundary.
Tope shark	International	• Protected under the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979); • IUCN Status of 'Critically Endangered'; • Priority Species under the Environment (Wales) Act 2016; • UK BAP Priority Species; and • Low intensity nursery grounds within the Marine Biodiversity Study Area but not overlapping with the Site Boundary.
Spotted ray	National	• OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas; and • Low intensity nursery grounds overlapping with the Site Boundary.
Diadromous Species		
Atlantic salmon	International	• Listed under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979); • Annex II species that is a designated feature of the River Teifi/Afon Teifi SAC, which is 22.8 km from the Site Boundary; • OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas; • Protected under the Salmon Act 1986 and Salmon and Freshwater Fisheries Act 1975; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
European eel	International	• Protected under the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979); • Listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); • IUCN Status of 'Critically Endangered'; • Protected under The Eel (England and Wales) Regulations 2009; • OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Lampreys	International	• Sea lamprey are on the OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas;

IEF	Value	Justification
		• Annex II species that are designated features of a several SACs in Pembrokeshire, the closest being 15.8 km from the Site Boundary; • Listed under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979); • Protected under the Salmon Act 1986 and Salmon and Freshwater Fisheries Act 1975; and • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Sea trout	National	• Protected under the Salmon Act 1986 and Salmon and Freshwater Fisheries Act 1975; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Shads	International	• Annex II species that are designated features of a several SACs in Pembrokeshire, the closest being 22.1 km from the Site Boundary; • Protected under the Salmon Act 1986 and Salmon and Freshwater Fisheries Act 1975; • Listed under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979); • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Freshwater pearl mussel	International	• Annex II species but not a designated feature of any SACs in Pembrokeshire; • Listed under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979); • Protected under the Wildlife and Countryside Act 1981; • IUCN Status of 'Critically Endangered'; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Shellfish		
Mixed shellfish assemblage (common cockle, crab species, European lobster, and scallops)	Local	• Not protected under any conservation legislation and are common in UK and Welsh waters.

8.8.3 Marine Mammals

Given the nature and scale of the Proposed Development, no site-specific marine mammal baseline surveys were undertaken. The key data sources used to characterise the marine mammal baseline are therefore as presented in Table 8-4.

Across the literature (Baines and Evans, 2012, Carter *et al*., 2022, Evans and Waggitt, 2023, Gilles *et al*., 2023, Hammond *et al*., 2021, Hammond *et al*., 2013), there are a range of marine mammal species that have been recorded in Welsh waters:

- Harbour porpoise;
- Bottlenose dolphin;
- Common dolphin;
- Risso's dolphin *Grampus griseus*;
- Striped dolphin *Stenella coeruleoalba*;
- White-beaked dolphin *Lagenorhynchus albirostris*;
- White-sided dolphin *Lagenorhynchus acutus*;
- Fin whale *Balaenoptera physalus*;
- Humpback whale *Megaptera novaeangliae*;
- Killer whale *Orcinus orca*;
- Long-finned pilot whale *Globicephala melas*;
- Minke whale *Balaenoptera acutorostrata*;
- Grey seal; and
- Harbour seal *Phoca vitulina*.

While a wide range of marine mammals have been recorded in Welsh waters, including those around Pembrokeshire and Fishguard Harbour, some of these species occur in very low numbers and are regarded as 'occasional visitors' to the area. Therefore, as per the approach taken in the recent EIA for the linkspan replacement at the Fishguard Stena Ferry Terminal (RPS, 2018), only the commonly occurring marine mammal species are considered further in this assessment. These are harbour porpoise, bottlenose dolphin, and grey seal. As per consultation received from NRW and NRW(A) as part of the Scoping Opinion, common dolphin has also been included in the assessment (section 8.5). This proposed approach is supported by the highly localised nature and extent of the impacts associated with the Proposed Development, and the proportionate EIA philosophy.

8.8.3.1 Management Units

Marine mammal MUs have been defined by the Interagency Marine Mammal Working Group (IAMMWG) for cetaceans and by SCOS for seals (IAMMWG, 2022, IAMMWG, 2023, SCOS, 2023). The Site Boundary sits within the following MUs:

- Celtic and Irish Seas MU for harbour porpoise (Figure 8-11);
- Irish Sea MU for bottlenose dolphin, and close to the Offshore Channel, Celtic Sea and South West England MU (Figure 8-12);
- Celtic and Greater North Seas MU for common dolphin (Figure 8-13); and
- Wales MU for grey seal (Figure 8-14).

As per consultation received from NRW, the OSPAR Region III area has also been considered for grey seal, alongside the Wales MU (Figure 8-14).

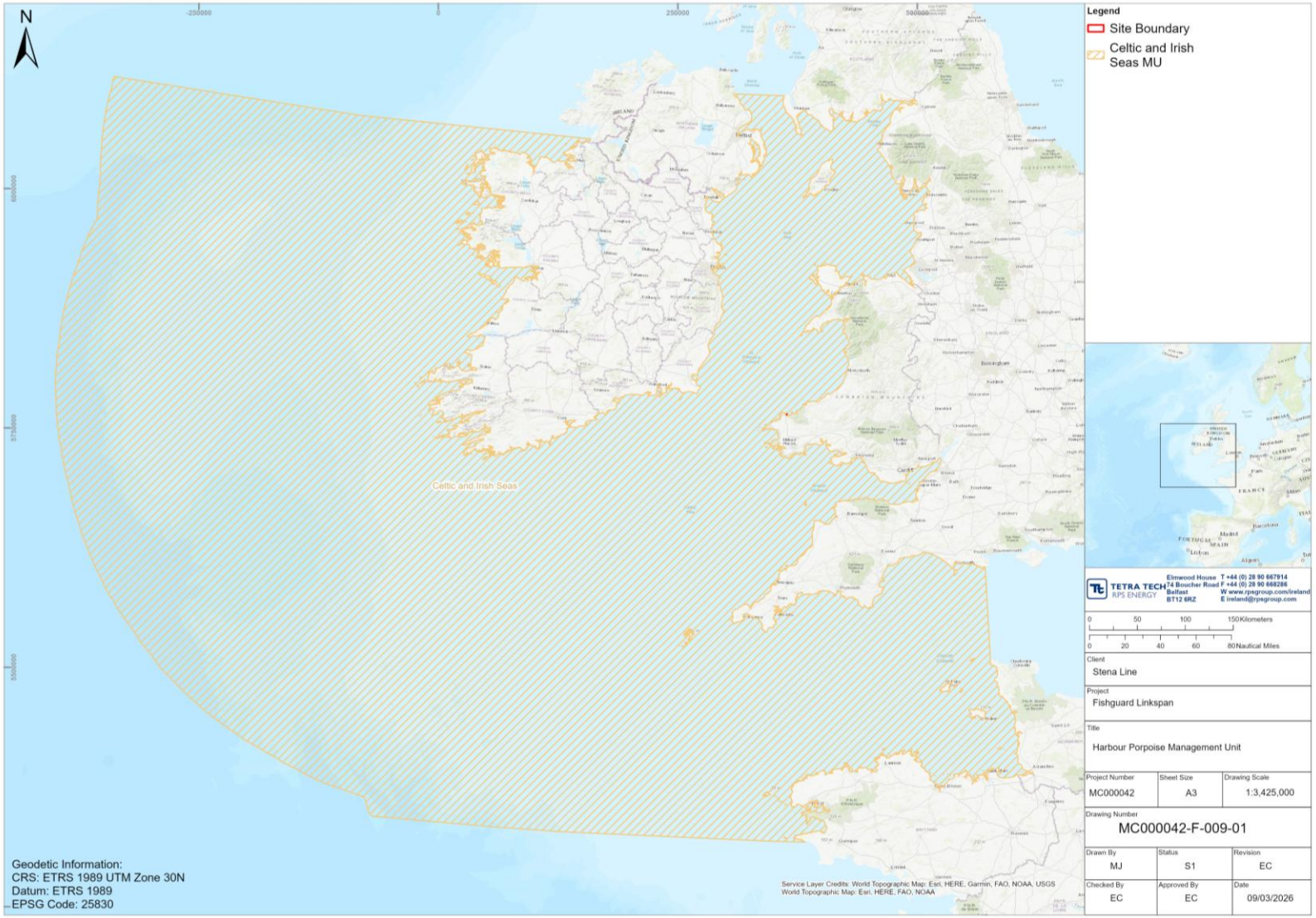

Figure 8-11: Celtic and Irish Seas MU for Harbour Porpoise in relation to the Site Boundary.

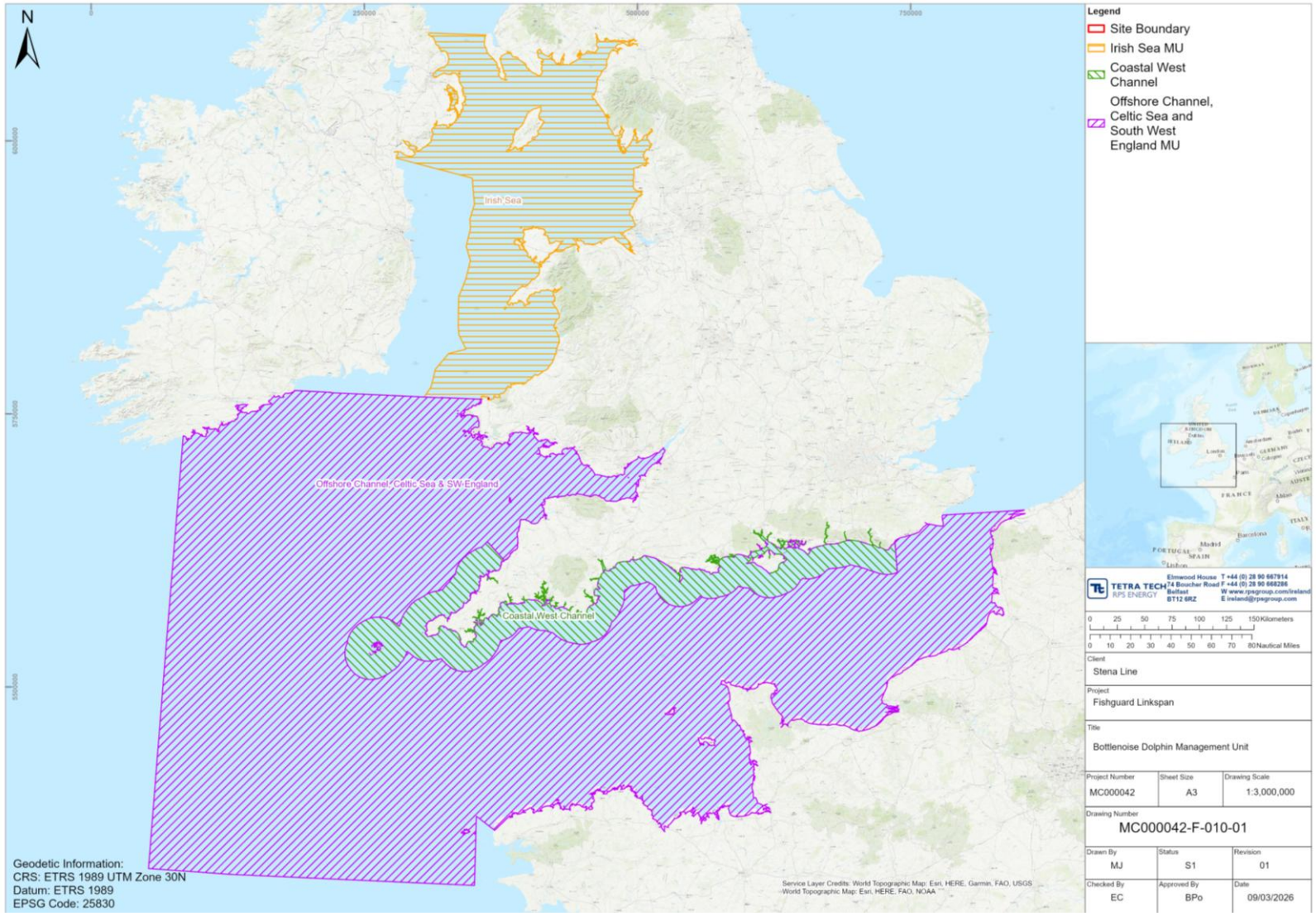

Figure 8-12: Bottlenose Dolphin MUs in relation to the Site Boundary (the Coastal West Channel MU is noted for context but the population is not considered in this ES).

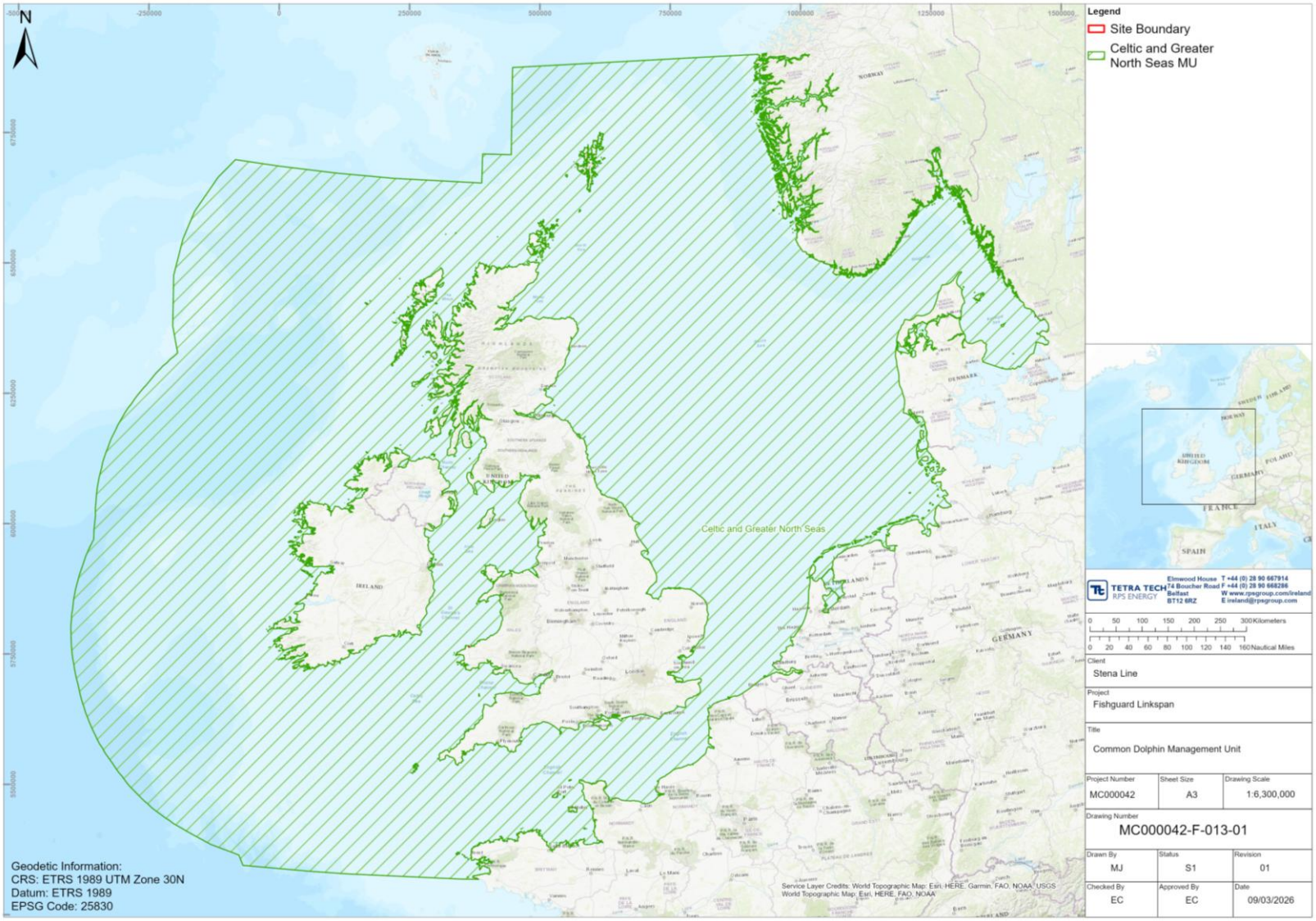

Figure 8-13: Celtic and Greater North Seas MU for Common Dolphin in relation to the Site Boundary.

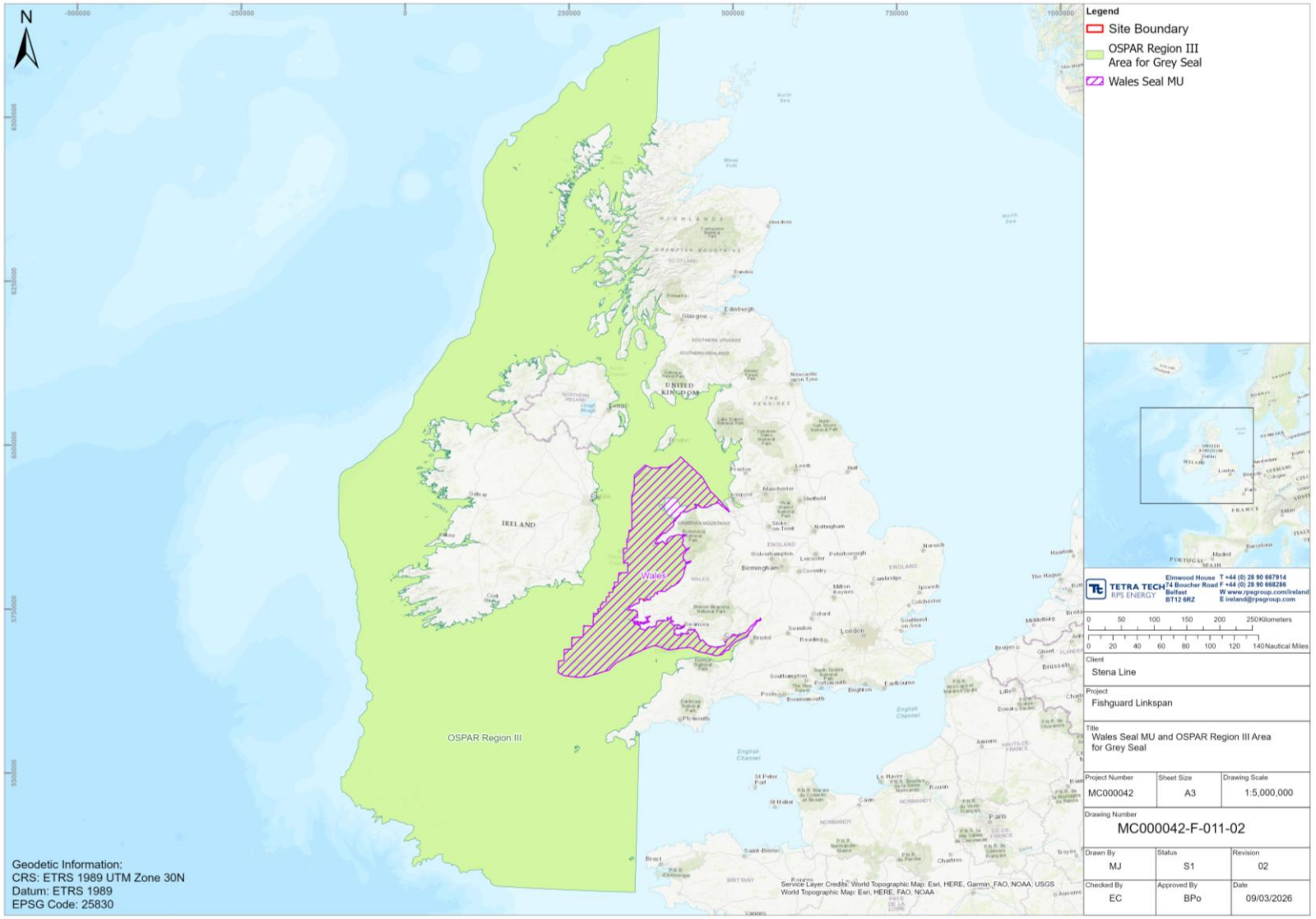

Figure 8-14: Wales Seal MU and OSPAR Region III in relation to the Site Boundary.

8.8.3.2 Species Accounts

8.8.3.2.1 Harbour porpoise

Harbour porpoise are the most abundant cetacean species in the UK, with persistent presence in Welsh waters, including in the vicinity of Fishguard Harbour (Baines and Evans, 2012, Evans *et al*., 2015, Evans and Waggitt, 2023, Gilles *et al*., 2023, Heinänen and Skov, 2015). They are also one of the smallest marine mammals in the UK, and therefore have a high body surface area to volume ratio (Kastelein *et al*., 2019). Due to this, harbour porpoise has a high metabolic rate and must feed often to maintain a stable body temperature (Kastelein *et al*., 1997, Rojano-Doñate *et al*., 2018). This high metabolic rate means that this species is particularly sensitive to any disruption of foraging and is susceptible to starvation (Wisniewska *et al*., 2016).

The harbour porpoise is protected under a range of international and national designations, such as under Annex II of the Habitats Directive[5]. This species is therefore a qualifying feature of various SACs around the UK, including the West Wales Marine/Gorllewin Cymru Forol SAC, which overlaps with Fishguard Harbour (see section 8.8.3.3 for further information). Therefore, the Pembrokeshire coast represents an internationally important area for harbour porpoise, with persistent high densities modelled in both summer and winter (Heinänen and Skov, 2015), and this area is regarded as a population hotspot (Evans *et al*., 2015). Recent modelling from Evans and Waggitt (2023) illustrates the high densities of harbour porpoise in Welsh waters, particularly around Pembrokeshire (Figure 8-15). Within Fishguard Harbour, the maximum density of harbour porpoise modelled by Evans and Waggitt (2023) was 0.313 animals per km^2.

Fishguard Harbour is situated within SCANS survey blocks CS-D in the 2022 survey and block E in the 2016 survey (these are largely the same area, just with different names) (Gilles *et al*., 2023, Hammond *et al*., 2021). In the 2022 survey, there were an estimated 9,773 harbour porpoise within this block (95% Confidence Interval (CI): 4,764 – 18,125 animals), with an estimated density of 0.316 animals per km^2 (Gilles *et al*., 2023). In the 2016 survey, there were an estimated 8,302 harbour porpoise within this block (95% CI: 4,643 – 14,354), with an estimated density of 0.239 animals per km^2 (Hammond *et al*., 2021).

As presented in Figure 8-11, Fishguard Harbour is located within the Celtic and Irish Seas MU for harbour porpoise. The most recent abundance estimate for this MU is 62,517 animals (95% CI: 48,324 – 80,877 animals) (IAMMWG (2023), based on data from Hammond *et al*. (2021) and Rogan *et al*. (2018)).

[5] Council Directive 94/43/EEC

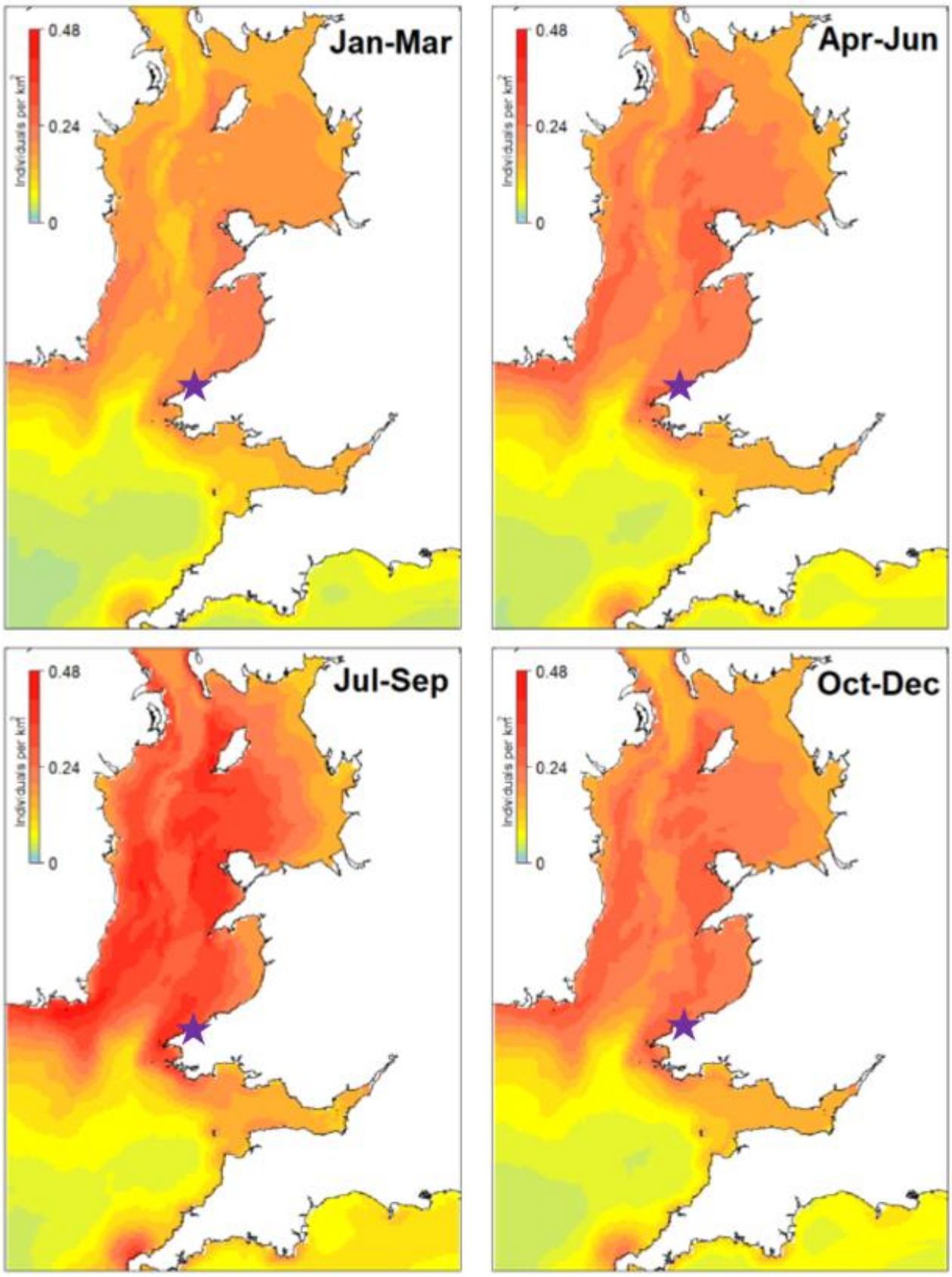

Figure 8-15: Modelled Densities of Harbour Porpoise per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star).

8.8.3.2.2 Bottlenose dolphin

Bottlenose dolphins are large odontocetes (i.e. toothed whales) which are distributed worldwide in temperate and tropical waters. They have a high flexibility in foraging behaviour and habitat use (Fernandez-Betelu *et al*., 2019, Genov *et al*., 2019) and typically prey upon fish. As above for harbour porpoise, the bottlenose dolphin is protected under a range of international and national designations, such as under Annex II of the Habitats Directive. This species is therefore a qualifying feature of various SACs around the UK, with the Cardigan Bay/Bae Ceredigion SAC the closest to the Planning BoundarySite Boundary (see section 8.8.3.3 for further information). Cardigan Bay is one of only two semi-residential bottlenose dolphin populations in the UK, with the other being in the Moray Firth, in northern Scotland (Evans *et al*., 2015, Feingold and Evans, 2014). This SAC, which is located 15.8 km from the Site Boundary, is therefore an important area for bottlenose dolphin, providing justification for the proposed inclusion of this species in the ES. The wider Cardigan Bay area has been surveyed annually since 2005, with estimates in recent years some of the lowest recorded (Evans and Waggitt, 2023). Robust models indicate that there may have been some permanent emigration from Cardigan Bay (Lohrengel *et al*., 2018). Modelling from Evans and Waggitt (2023) illustrates the hotspot of bottlenose dolphin density within Cardigan Bay, showing the persistent high densities in the vicinity of Fishguard Harbour (Figure 8-16). Within Fishguard Harbour, the maximum density of bottlenose dolphin modelled by Evans and Waggitt (2023) was 0.099 animals per km^2.

Fishguard Harbour is situated within SCANS survey blocks CS-D in the 2022 survey and block E in the 2016 survey (these blocks are largely the same area, however, were updated between the two years) (Gilles *et al*., 2023, Hammond *et al*., 2021). In the 2022 survey, there were an estimated 8,199 bottlenose dolphin within this block (95% CI: 3,595 – 15,158 animals), with an estimated density of 0.235 animals per km^2 (Gilles *et al*., 2023). In the 2016 survey, there were an estimated 288 bottlenose dolphin within this block (95% CI: 0 - 664), with an estimated density of 0.0082 animals per km^2 (Hammond *et al*., 2021). The difference in estimated abundance and density of bottlenose dolphin between these two SCANS surveys should be highlighted. Further clarification was sought from the authors of SCANS, who highlighted that the particular survey block contains both coastal and offshore ecotypes of bottlenose dolphin (the coastal ecotype here is referring to the semi-resident population within Cardigan Bay) (A. Gilles, pers. comm.).

As presented in Figure 8-12, Fishguard Harbour is located within the Irish Sea MU for bottlenose dolphin, and close to the Offshore Channel, Celtic Sea and South West England MU. The most recent abundance estimate for the Irish Sea MU is 293 animals (95% CI: 108 – 793 animals) (IAMMWG (2023), based on data from Hammond *et al*. (2021) and Rogan *et al*. (2018)). The most recent abundance estimate for the Offshore Channel, Celtic Sea and South West England MU is 10,653 animals (95% CI: 6,533 – 17,372 animals) (IAMMWG (2023), based on data from Hammond *et al*. (2021) and Rogan *et al*. (2018)).

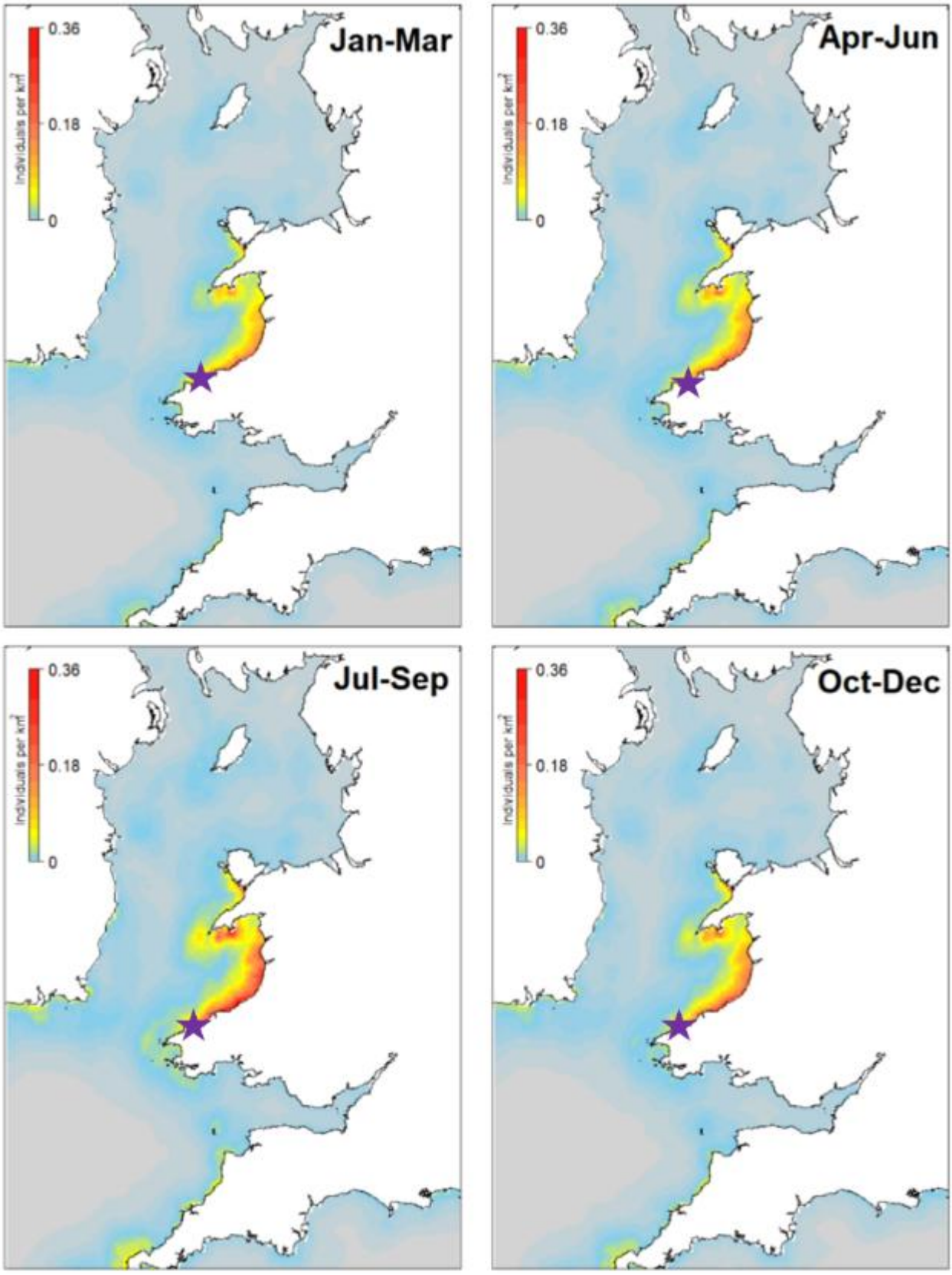

Figure 8-16: Modelled Densities of Bottlenose Dolphin per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star).

8.8.3.2.3 Common dolphin

Common dolphins are found worldwide in temperate and tropical waters, and are widely distributed throughout Europe. In the context of the Proposed Development, common dolphin are recorded in the central and southern Irish Sea and around the southern coasts of Pembrokeshire. Modelling from Evans and Waggitt (2023) illustrates higher densities of common dolphin in these areas in the summer months compared to the rest of the year (Figure 8-17). Within Fishguard Harbour, the maximum density of common dolphin modelled by Evans and Waggitt (2023) was 0.008 animals per km^2.

Common dolphin can occur in large groups, ranging from small schools to large concentrations of up to 5,000 individuals. They are opportunistic feeders, with small pelagic schooling fish and squid likely to be the main prey items in the Irish Sea (Hammond *et al*., 2005). The common dolphin is listed under Annex IV of the Habitats Directive[6]. This species is therefore not listed as a qualifying feature of any SACs around the UK, however is protected under other legislation (detailed in Table 8-15).

Fishguard Harbour is situated within SCANS survey blocks CS-D in the 2022 survey and block E in the 2016 survey (these are largely the same area, just with different names) (Gilles *et al*., 2023, Hammond *et al*., 2021). In the 2022 survey, there were an estimated 949 common dolphin within this block (95% CI: 32 – 2,990 animals), with an estimated density of 0.0272 animals per km^2 (Gilles *et al*., 2023). In the 2016 survey, there were no common dolphin observed in block E, so no population estimate was provided, however there was an estimated 18,187 common dolphin in the nearby block D (the southern side of the Pembrokeshire coast and down towards the southeastern tip of England). The estimated density of this block was 0.3743 animals per km^2 (Hammond *et al*., 2021).

As presented in Figure 8-13, Fishguard Harbour is located within the Celtic and Greater North Seas MU for common dolphin. The most recent abundance estimate for this MU is 102,656 animals (95% CI: 58,932 – 178,822 animals) ((IAMMWG, 2022) based on data from Hammond *et al*. (2021) and Rogan *et al*. (2018)).

[6] Council Directive 94/43/EEC

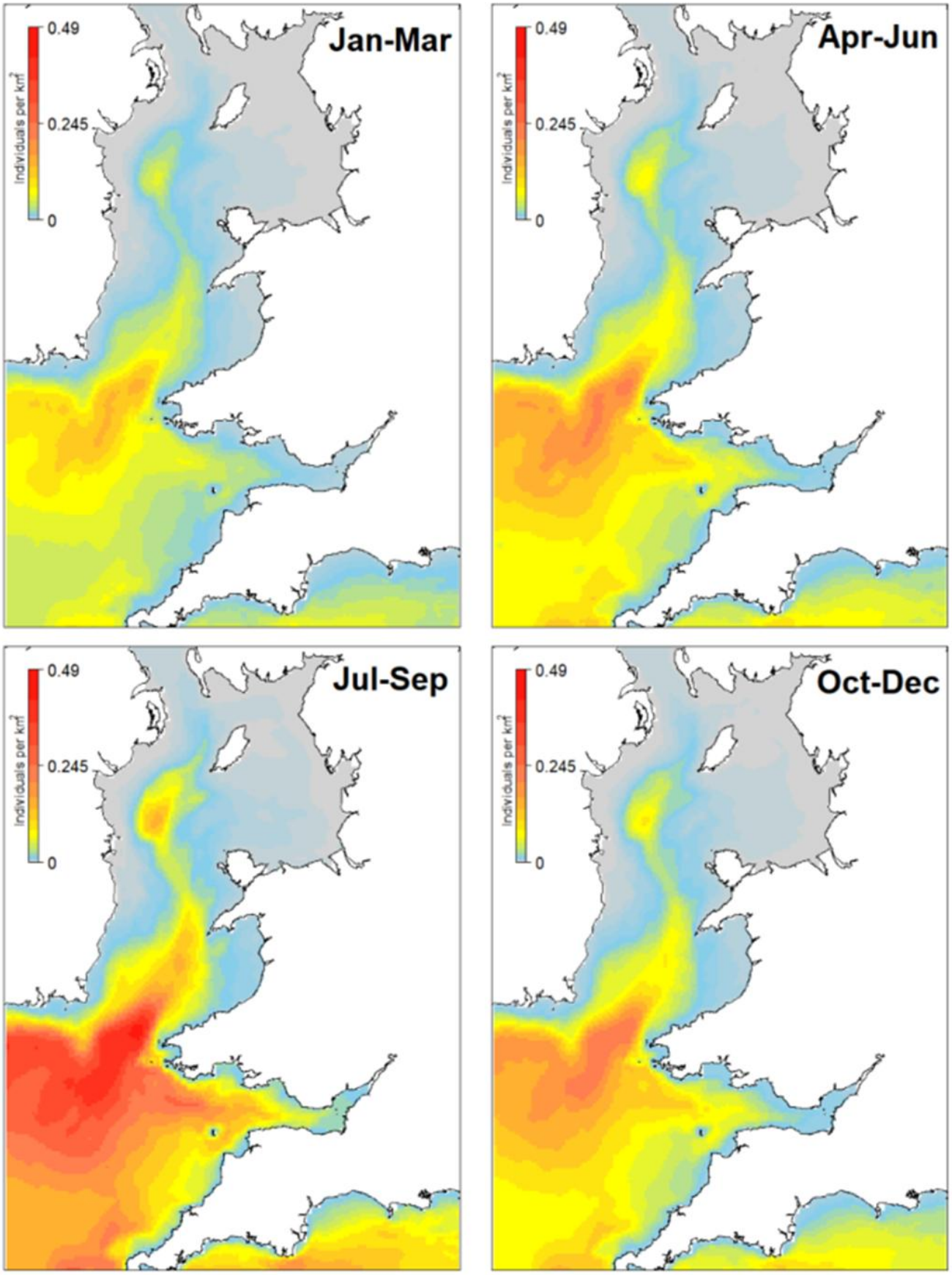

Figure 8-17: Modelled Densities of Common Dolphin per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star).

8.8.3.2.4 Grey Seal

Grey seals are one of the two pinniped species that live and breed within the UK, with the other being harbour seal (which is not considered further in this assessment). Grey seal are distributed across the North Atlantic Ocean, North Sea, Barents Sea, and Baltic Sea, with their main concentrations in North-West Europe and the east coasts of Canada and the United States of America (SCOS, 2023). They are larger than harbour seal, with males reaching over 300 kg (SCOS, 2023). They forage in open waters and regularly return to land to haul out, rest, moult, and breed (SCOS, 2023). They can travel over 100 km from haul out sites to forage, with trips lasting for up to 30 days at a time (Jones *et al*., 2015). Their prey species include gadoids, flatfish, and sandeel and vary spatially and seasonally. As above for harbour porpoise and bottlenose dolphin, the grey seal is protected under a range of international and national designations, such as under Annex II of the Habitats Directive. This species is therefore a qualifying feature of various SACs around the UK, with the Cardigan Bay SAC the closest to the Site Boundary (15.8 km) (see section 8.8.3.3 for further information).

As presented in Figure 8-14, Fishguard Harbour is located within the Wales Seal MU for grey seal. The annual SCOS reports present counts of grey seals at haul-out sites around the UK which are undertaken in August (with frequency varying across MUs). August haul-out counts of grey seal within the Wales MU have increased from an estimated 750 animals in the 2000 – 2006 survey period to an estimated 900 animals in 2021, the most recently available survey period (SCOS, 2023). These estimates were compiled by counts undertaken by organisations other than SCOS (see full list compiled in SCOS (2023)) and it should be noted that the apparent increase may partly be due to increased reporting. Within Wales, the most recent pup production estimate was 2,250 pups in 2019, from which a 2022 population estimate of 5,400 animals was derived (SCOS, 2023). As illustrated in Figure 8-18, the grey seal colonies around Pembrokeshire are not regularly monitored and have lower pup production than other areas of the UK, such as Orkney, the Hebrides, and the east coast of Scotland and England.

Fishguard Harbour is also located within OSPAR Region III (Figure 8-14), which has an estimated abundance of 60,780 grey seals (Taylor *et al*., 2022).

Carter *et al*. (2022) present at-sea distribution for grey seal around the UK from high resolution tracking data. The grey seal at-sea density is presented in Figure 8-19, with up to one animal per 25 km^2 within Fishguard Harbour.

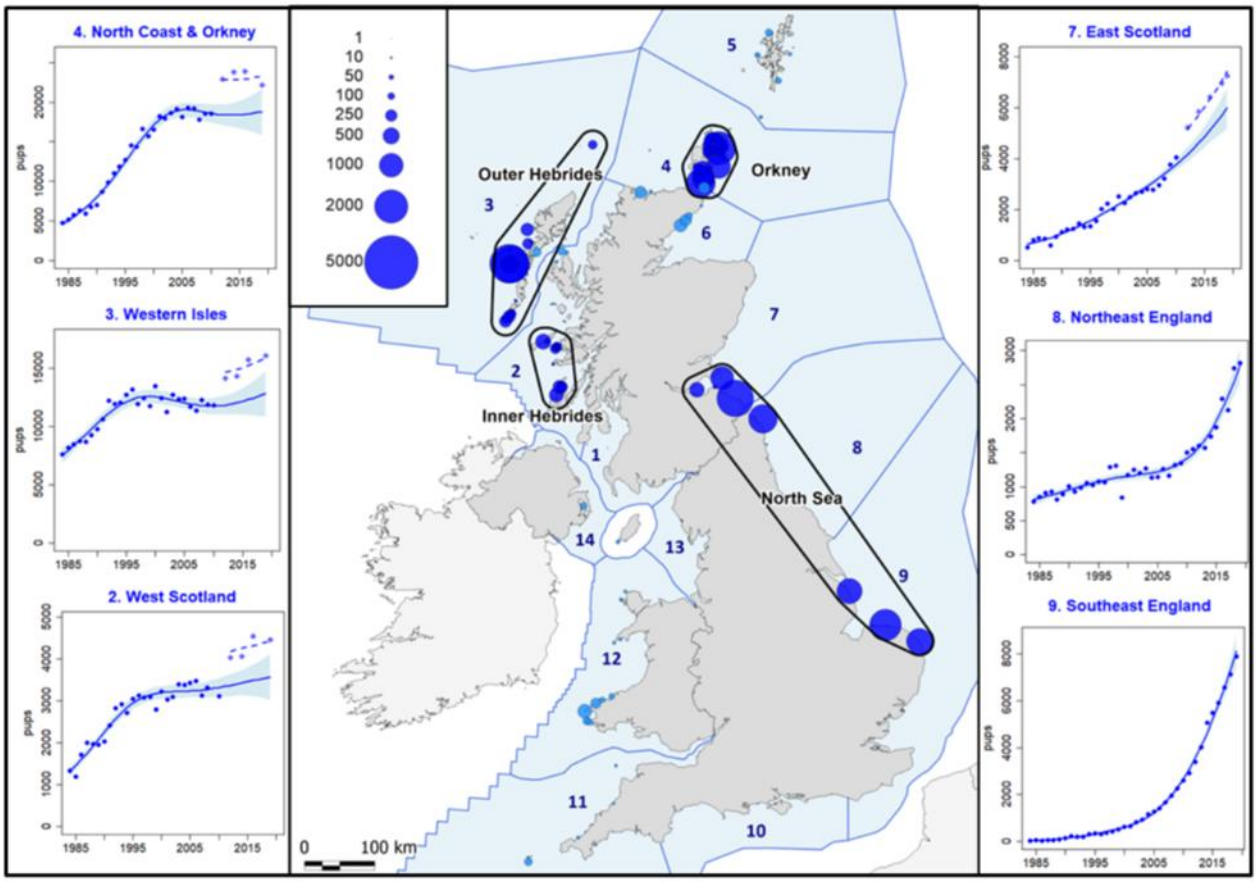

Figure 8-18: Distributions and Estimated Pup Production of the main Grey Seal Breeding Colonies in the UK (Light Blue Circles Indicate Sporadically Monitored Areas, while Dark Blue Indicate Regularly Monitored, Approximate Location of Fishguard Harbour Marked with a Red Arrow) (SCOS, 2023).

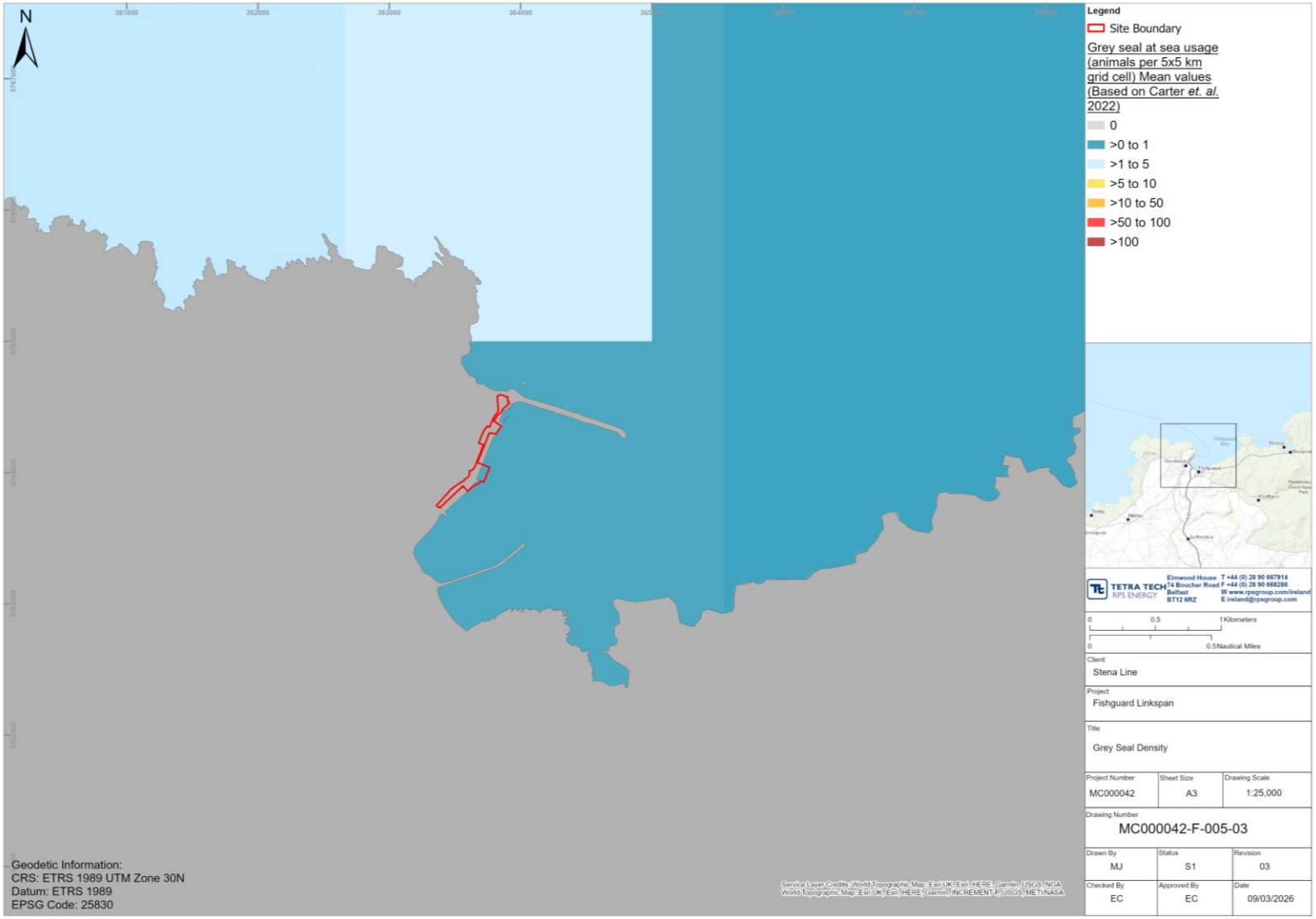

Figure 8-19: Grey Seal Density at Sea in the Vicinity of the Site Boundary (Carter *et al.*, 2022).

8.8.3.3 Designated sites

The Site Boundary is situated within the West Wales Marine/Gorllewin Cymru Forol SAC for harbour porpoise. There are several other designated sites with marine mammal features in the vicinity of Fishguard Harbour, which are presented in Table 8-14 and in Figure 8-20. Given that the qualifying marine mammal features of these SACs are mobile species, they could potentially occur within Fishguard Harbour and/or within the ZoI from noise producing activities associated with the Proposed Development.

Table 8-14: Designated Sites with Marine Mammal Qualifying Features in the Surrounding Region.

Site Name	Minimum Distance from Site Boundary (km)	Relevant Qualifying Feature
West Wales Marine/Gorllewin Cymru Forol SAC	Overlaps	Harbour porpoise
Cardigan Bay/Bae Ceredigion SAC	15.8	Bottlenose dolphin Grey seal
Pembrokeshire Marine/Sir Benfro Forol SAC	22.1	Grey seal
Lleyn Peninsula and the Sarnau/Pen Llyn a`r Sarnau SAC	67.6	Bottlenose dolphin Grey seal
Bristol Channel Approaches/Dynesfeydd Môr Hafren SAC	83.4	Harbour porpoise
North Anglesey Marine/Gogledd Môn Forol SAC	136.1	Harbour porpoise

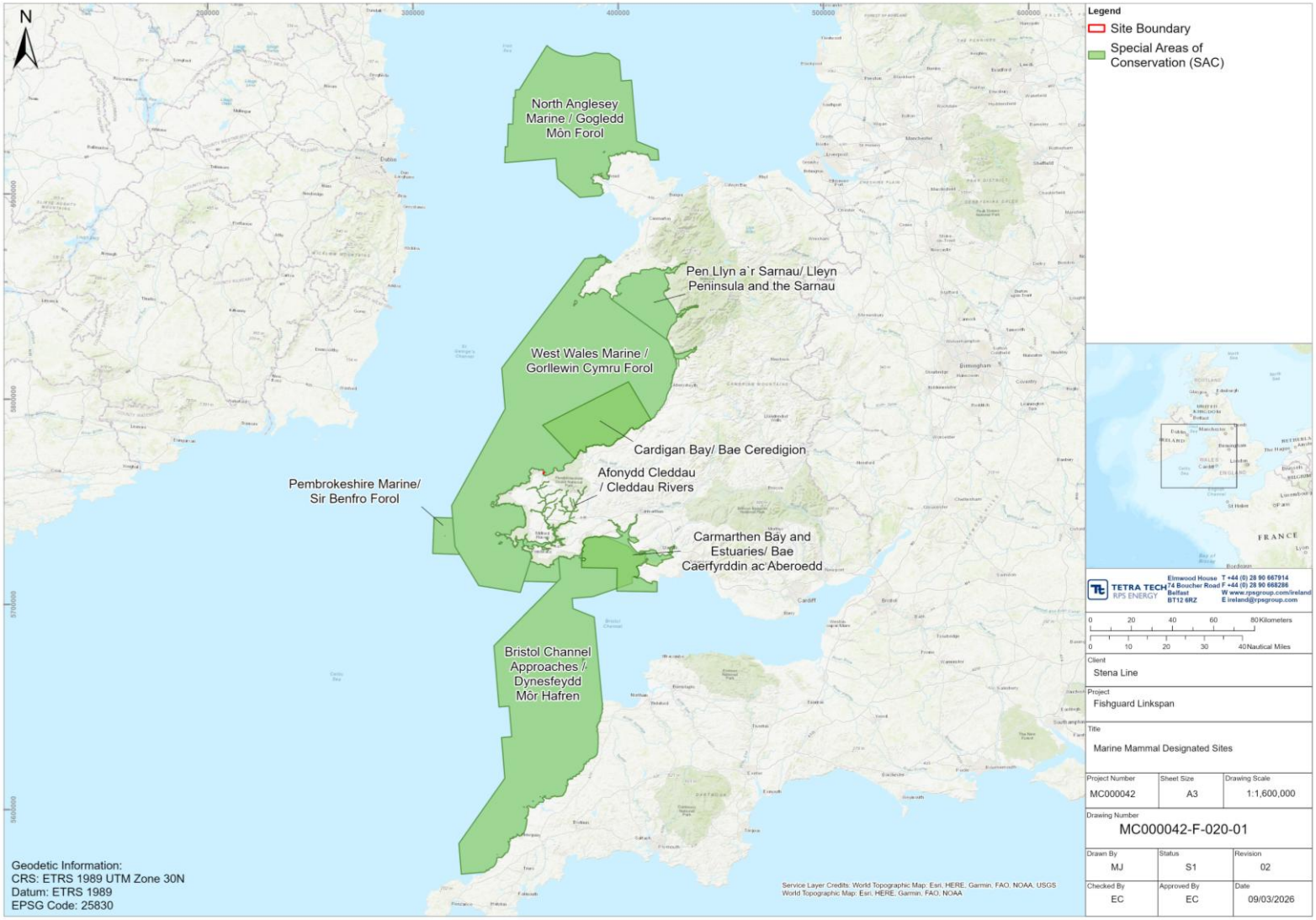

Figure 8-20: Designated Sites with Marine Mammal Qualifying Features in the Surrounding Region.

8.8.3.4 IEFs

As outlined by the marine mammal baseline presented, four species have been carried forward to assessment as IEFs: harbour porpoise, bottlenose dolphin, common dolphin, and grey seal. These three species have all been assigned a value of 'international', given the international legislation that protects marine mammals in UK and European waters (Table 8-15).

Table 8-15: Marine Mammal IEFs Identified.

IEF	Value	Justification
Harbour porpoise	International	• Annex II species that is a designated feature of the West Wales Marine/Gorllewin Cymru Forol SAC, which overlaps with the Site Boundary; • European Protected Species (EPS); • OSPAR List of Threatened and/or Declining Species within OSPAR Region III: Celtic Seas; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Bottlenose dolphin	International	• Annex II species that is a designated feature of the Cardigan Bay/Bae Ceredigion SAC, which is 15.8 km from the Site Boundary; • EPS; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Common dolphin	International	• Annex IV species under the Habitats Directive; • EPS; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Grey seal	International	• Annex II species that is a designated feature of the Cardigan Bay/Bae Ceredigion SAC, which is 15.8 km from the Site Boundary.

8.9 Impact Assessment

8.9.1 Benthic Subtidal and Intertidal Ecology

8.9.1.1 Do Nothing Scenario

As per EIA protocol, the likely evolution of the existing benthic subtidal and intertidal ecology baseline in the absence of the Proposed Development (i.e. the 'Do Nothing Scenario') has been assessed. Given that the Proposed Development is located within an active harbour, it is likely that high levels of anthropogenic activity will continue under a Do Nothing Scenario, and that the benthic subtidal and intertidal communities already established within Fishguard Harbour will persist.

8.9.1.2 Assessment of Construction Effects

There were five impacts scoped in for the construction phase of the Proposed Development for benthic subtidal and intertidal ecology:

- Temporary habitat loss and/or disturbance;
- Long term habitat loss and/or disturbance;
- Increased Suspended SSCs and associated deposition;
- Changes in water quality (including release of sediment bound contaminants); and
- Increased risk of introduction and spread of INNS.

The impacts scoped out of further assessment for the construction phase are detailed in Table 8-16.

Table 8-16: Impacts Scoped Out of the Assessment for Benthic Subtidal and Intertidal Ecology in the Construction Phase.

Impact	Justification for Scoping Out
Accidental pollution to the surrounding environment	There is a risk of accidental pollution from vessels and equipment. However, this risk is mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP, which will include a MPCP. These plans will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from OSPAR), the IMO, and MARPOL. Thus, it is unlikely that accidental pollution will occur. In the unlikely event that it did, the magnitude will be minimised through measures outlined in plans such as the MPCP. Therefore, this impact has been scoped out of the assessment for benthic subtidal and intertidal ecology.

8.9.1.2.1 Temporary Habitat Loss and/or Disturbance

8.9.1.2.1.1 Magnitude of Impact

Temporary habitat loss and disturbance may occur due to dredging within the construction phase. As per Chapter 2: Project Description, up to 2,520 m^2 of temporary habitat loss and disturbance may occur due to the dredging of up to 2,500 m^3 of sediment. Dredging involves physical removal of seabed sediments (over an area of 1,600 m^2), causing a short term modification to the existing

habitat. It is anticipated that dredging will occur over a two month period. Dredging will be carried out beneath the existing jack up barge (JUB) to remove soft material to create sufficient water depth for the installation of rock armour scour protection. All dredging will be undertaken using plough dredging, whereby soft seabed material beneath the pontoon footprint will be moved into the existing scour pocket within the berth, located immediately north of the linkspan structure (1,050 m^2). This process will allow the estimated 2,500 m^3 of sediment to naturally infill and level the scour pocket area.

Therefore, the MDS for this impact is up to 2,520 m^2 of temporary habitat loss and disturbance due to dredging of up to 2,500 m^3 of sediment. This is low in the context of the Site Boundary (54,325 m^2) and the Marine Biodiversity Study Area (3,970,000 m^2). The footprint of temporary habitat loss and disturbance due to dredging therefore represents up to 4.64% of the Site Boundary[7] and up to 0.06% of the Marine Biodiversity Study Area. The footprint of the proposed dredge, therefore, covers a very small area. Further, Fishguard Harbour is a dynamic environment, subject to relatively high levels of disturbance from vessels and maintenance dredging.

The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.2.1.2 Sensitivity of the Receptor

The speed of recovery of the temporarily disturbed areas is dependent on the scale and timing of the disturbance, the life histories of species, and the stability and diversity of the benthic communities present. For example, despite robust body forms, bivalves can be vulnerable to abrasion and physical disturbance associated with dredging (Budd, 2007). For example, *A. alba* and *V. gibba* are considered to have a low to medium sensitivity to substratum loss, abrasion, and physical disturbance (Budd, 2007, Marine Ecological Surveys Limited, 2008, Sabatini and Ballerstedt, 2008). The MarLIN sensitivity assessment recommends a low to medium sensitivity to substratum loss, abrasion and physical disturbance due to their high vulnerability but also their high recoverability potential (Budd, 2007, Sabatini and Ballerstedt, 2008). These species have high fecundity and growth rates, produce large volumes of eggs, and display effective planktonic dispersal, allowing potentially diminished populations to be replenished (Budd, 2007, Sabatini and Ballerstedt, 2008). Similarly, the bivalve *K. bidentata* is also known to have high larval dispersal potential and high recovery rates following disturbance, therefore can be concluded to have a low to medium sensitivity to this impact (De-Bastos *et al*., 2023, Marine Ecological Surveys Limited, 2008)

Many of the infaunal species recorded in the Marine Biodiversity Study Area are considered tolerant to physical disturbance of the seabed. For example, with respect to polychaete worms, *A. marioni* produces high number of offspring (laying up to 500 eggs on sediment) with sexual maturity reached after one year and *C. gibber* is an opportunistic species reaching sexual maturity in less than one year, with a short life-span and rapid growth rate (Marine Ecological Surveys Limited, 2008). These are all attributes which promote high recoverability to temporary habitat loss and disturbance from dredging (Marine Ecological Surveys Limited, 2008, Rayment, 2007). These species are therefore considered to have a low to medium sensitivity to this impact (Marine Ecological Surveys Limited, 2008, Rayment, 2007). The polychaete *A. marina* lives in the sediment between 20 to 40 cm, and therefore has a low sensitivity to surface abrasion, but could be damaged by dredging which penetrates deeper into the sediment (Tyler-Walters, 2008). This species has a high recovery potential, with population recovery and recolonisation of areas affected by substratum loss occurring within months (Tyler-Walters, 2008).

[7] Noting this is a precautionary estimate as much of the Site Boundary is onshore and the overlap with the intertidal and subtidal areas is minimal.

However, other species such as the brittlestar *A. filiformi*s are long-lived and slow growing, with a lifespan of 10 to 20 years and sexual maturity only reached after three to five years (Hill and Wilson, 2008, Marine Ecological Surveys Limited, 2008). Therefore, while this species is capable of high initial colonisation, producing approximately 50,000 gametes, recovery of the biomass lost during dredging could take up to 10 years after initial recolonisation of the seabed. The brittlestar *A. filiformis* has a medium sensitivity to this impact on the MarLIN sensitivity assessment (Hill and Wilson, 2008).

In general, studies on the effects of temporary physical disturbance have shown that recolonisation of disturbed sediments can be quite rapid. Sites are initially colonised by short lived, fast growing, opportunistic species, that are tolerant of high levels of disturbance; particularly infaunal species, such as polychaetes. Over time, these species are succeeded by longer lived, slower growing species with a lower tolerance for disturbance (Newell *et al*., 1998, Tillin *et al*., 2011). A recovery time of six to nine months is characteristic of many estuarine muds where frequent disturbance of the deposits precludes the establishment of long-lived communities, and a community of sands and gravels may take two to three years to establish, depending on the proportion of sand and level of environmental disturbance by waves and currents (Bolam and Rees, 2003, Newell *et al*., 1998). Furthermore, a regularly disturbed sedimentary habitat (such as that found within Fishguard Harbour) is likely to recover more quickly (i.e. return to its disturbed or 'environmentally-stressed' baseline condition) than a stable habitat with a pre-existing undisturbed, mature, and diverse assemblage.

In addition, most of the benthic habitats and species recorded are generally considered commonly occurring and are not listed as nationally rare or protected under conservation designations (see Table 8-9). However, small areas of intertidal habitat characteristic of the UK BAP Priority Habitat 'Intertidal Under boulder Communities' which is also listed as a Habitat of Principal Importance in Wales were recorded in the Site Boundary (approximately 90 m^2). However, the footprint of this habitat was small in relation to the Site Boundary (490,000 m^2), at up to 0.02% of the total Boundary area. Dredging is not considered likely to cause temporary habitat loss and at most, minimal disturbance, to this habitat (BRIG, 2016). Further, a study of recolonisation upon anthropogenically introduced intertidal boulders observed no clear succession, although diversities and abundances of some species in the new boulder habitat matched those of natural boulders within a few months (Chapman, 2012). Therefore, it is likely that this habitat, if disturbed at all by this impact, will demonstrate some natural recovery in species assemblage and diversity.

The benthic subtidal community IEF is deemed to be of medium vulnerability, medium to high recoverability and local value. The sensitivity of the receptor is therefore, considered to be medium.

The benthic intertidal IEFs are deemed to be of low vulnerability, high recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be low.

8.9.1.2.1.3 Significance of Effect

For the benthic IEFs, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low to medium for the different IEFs. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.1.2.2 Long Term Habitat Loss and/or Disturbance

8.9.1.2.2.1 Magnitude of Impact

Long term habitat loss and disturbance may occur in the construction phase (and persist into the operational phase) due to scour protection beneath the proposed pontoon. This will consist of clean rock armour forming a layer approximately 1,000 mm thick, placed over the prepared dredged bed and extending from the northern edge of the existing buffer dolphin to the toe of the quay wall (see Chapter 2: Project Description). This area will be formed with scour protection in the form of rock armour and will be placed on the seabed via a long reach excavator mounted on a

barge. The footprint of any permanent structures (i.e. scour protection) is approximately 1,600 m^2, which represents the MDS for this impact. This is low in the context of the Site Boundary (54,325 m^2) and the Marine Biodiversity Study Area (3,970,000 m^2). The footprint of long term habitat loss and disturbance therefore represents only up to 2.95% of the Site Boundary[7] and up to 0.04% of the Marine Biodiversity Study Area.

The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.2.2.2 Sensitivity of the Receptor

Both subtidal and intertidal benthic habitats are sensitive to physical habitat loss at locations where new structures are introduced (i.e. within the footprint of these structures). This impact will result in substratum loss and physical change from the existing substrata to a hard substrate. For some species, such as the bivalves *A. alba* and *V. gibba*, polychaetes *A. marioni* and *A. marina*, and brittlestar *A. filiformis*, a medium sensitivity to substratum loss has been concluded in their MarLIN sensitivity assessments (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). The reasoning behind these medium sensitivities is as presented in section 8.9.1.2.1.2 for 'Temporary Habitat Loss and/or Disturbance'. The MarLIN sensitivity assessments available for these species do not contain a relevant pressure for the physical change from soft seabed to hard substrate, however, given that hard substrates do not represent suitable habitat, it can be assumed that these species will have a high sensitivity to this pressure. These species will not be able to recolonise the artificial hard substrates installed during the construction of the Proposed Development.

In contrast, the benthic intertidal IEFs consisted of habitats and communities upon bedrock and boulder substrates. Any infrastructure installed in these areas will not represent as significant a change in substrate type, and recolonisation of characteristic species is considered to be likely.

Overall, the benthic subtidal community IEF is deemed to be of high vulnerability, low recoverability and local value. The sensitivity of the receptor is therefore, considered to be high.

The benthic intertidal IEFs are deemed to be of low vulnerability, high recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be low.

8.9.1.2.2.3 Significance of Effect

Overall, for the benthic subtidal community IEF, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. As per Table 8-7 this yields a minor to moderate significance. Based on the very low footprint of long term habitat loss in the context of the Site Boundary (up to 1.12%) and that the characterising species and habitats within the subtidal zone are widespread, common and not protected under any conservation legislation, the effect has been assigned a minor adverse significance, which is not significant in EIA terms.

For the benthic intertidal IEFs, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms

8.9.1.2.3 Increased SSCs and Associated Deposition

8.9.1.2.3.1 Magnitude of Impact

As per Chapter 2: Project Description, up to 2,500 m^3 of sediment may be dredged during the construction phase (see Chapter 10: Coastal Processes for description of seabed characteristics and dredge simulation input parameters) within the Site Boundary. It is anticipated that dredging will occur over a two month period. Dredging will be carried out beneath the existing JUB to remove soft material to create sufficient water depth for the installation of rock armour scour

protection. It is proposed that all dredging will be undertaken by plough dredging, moving soft material from under the pontoon to the scour pocket in the berth immediately north of the linkspan structure. The dredged material will be placed in an area within the berth that has experienced scour. A 10% overspill has been assumed for the dredging method (plough).

To characterise the sediment plumes generated as a result of the dredging activities, a coupled hydrodynamic and mud transport model was run for the dredging operation over a range of spring tides. Modelling of the dredging operations indicates that sediment dispersion, SSCs, and deposition are highly localised around the dredge area. The largest plume occurs during spring-tide conditions, when sediment may disperse up to approximately 300 m to the south and around 180 m to the northeast under flood tide, although concentrations generally remain below 100 mg/L and do not exceed 2.1 g/L. The highest SSCs, reaching approximately 2.8 g/L, occur during neap-tide conditions at low water but are restricted to the immediate dredging source. Average SSCs remain limited, typically below 1.4 g/L during spring tides and 1.75 g/L during neap tides, and return to below background levels of 5 mg/L within roughly 300 m and 200 m of the dredging area for spring and neap tides, respectively. Sediment deposition is greatest within the scour pit, which is designed to receive the dredged material, where up to approximately 0.65 m of deposition may occur during spring tides and 0.7 m during neap tides. In the wider dredge area, deposition may reach up to 0.3 m but is more typically less than 0.2 m, reducing to less than 5 cm at distances greater than about 5 m from the dredge paths. Deposition continues to diminish rapidly with distance, falling to less than 1 mm within approximately 200 m of the works. (see Chapter 10: Coastal Processes for full details). These modelling outputs suggest that elevated SSCs, sediment plumes, and associated deposition will be localised within the vicinity of the dredge footprint of the different dredge areas, and be diminished quickly to below background concentrations of 5 mg/L.

Therefore, this impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.2.3.2 Sensitivity of the Receptor

Increased SSCs during dredging and disposal have the potential to resettle over the seabed. This potential blanketing or smothering of benthic species may cause stress, reduced rates of feeding, growth or reproduction and even fatal effects. Benthic habitats within estuarine and coastal environments have naturally highly fluctuating conditions, including the resuspension and deposition of sediments on a daily basis (through tidal action), lunar cycles (due to the differing influences of spring and neap tides) and on a seasonal basis (due to storm activity and conditions of extreme waves). The benthic habitats within Fishguard Harbour are, therefore, characterised by such perturbations and the biological communities of these environments are considered to be well adapted to survival under fluctuating conditions.

If the amount of sediment deposited is too great to allow species to survive, then recovery occurs via re-colonization and/or migration to the new sediment surface (Bolam *et al*., 2006a, Bolam *et al*., 2006b). In general, the rate of recovery is dependent upon just how stable and diverse the assemblage was in the first place. A regularly disturbed sedimentary habitat is likely to recover more quickly (i.e. return to its disturbed or ‘environmentally-stressed’ baseline condition) than a stable habitat.

The common and characteristic species within the subtidal benthic community, such as the bivalves *A. alba* and *V. gibba*, polychaetes *A. marioni* and *A. marina*, and brittlestar *A. filiformis*, were all assigned as either not sensitive or low sensitivity to smothering and increases in SSCs in their MarLIN sensitivity assessments (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). For bivalves, such as *A. alba* and *V. gibba*, increased SSCs are likely to be most relevant to feeding. These species, among other bivalves, are suspension feeders, and increased SSCs are likely to increase the siltation rate and therefore their food availability (Budd, 2007, Sabatini and Ballerstedt, 2008). As burrowing bivalves, they are

considered to be not sensitive to smothering as they are able to burrow up through deposited sediment, and resume feeding once repositioned (Budd, 2007, Sabatini and Ballerstedt, 2008). Similarly, the characteristic polychaetes *A. marioni* and *A. marina*, among others recorded within the Site Boundary, live infaunally within soft sediments and are considered to be adapted to natural re-suspension of sediments. These species were both assessed as being not sensitive to increased SSCs and smothering on their MarLIN sensitivity assessments (Rayment, 2007, Tyler-Walters, 2008). For *A. marioni*, and other deposit feeding polychaetes, increased SSCs and associated deposition may increase food availability if the suspended sediments contain a significant proportion of organic matter (Rayment, 2007).

Although SSCs could be present within the sublittoral and infralittoral zone, and therefore within the remit of the intertidal zone, it is unlikely that the benthic intertidal IEFs will be vulnerable to these, given the natural fluctuations in sedimentation already occurring due to the tide. For example, Bolam *et al*. (2004) concluded that the relatively rapid recovery of intertidal mudflats was due to the opportunistic nature of the invertebrate assemblages and the dispersive behaviour of the dominant species that were there before the materials was placed over them. Similar recovery could be expected within the ZoI associated with the construction phase.

The benthic intertidal IEFs are deemed to be of low vulnerability, high recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be low.

The benthic subtidal community IEF is deemed to be of low vulnerability, high recoverability and local value. The sensitivity of the receptor is therefore, considered to be low.

8.9.1.2.3.3 Significance of Effect

For all IEFs, magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.1.2.4 Changes in Water Quality (including release of sediment bound contaminants)

8.9.1.2.4.1 Magnitude of Impact

Dredging during the construction phase may impact water quality within the ZoI in the following ways:

- increased SSCs within the water column: which has been assessed in section 8.9.1.2.3;
- organic enrichment and oxygen depletion, as the resuspension of sediments containing organic material can deplete oxygen levels in the water column, while the subsequent settling of these sediments can then deplete sediment oxygen levels; and
- release of sediment bound contaminants.

The likelihood of mobilising sediments and contaminated sediments is dependent upon the level of contamination and the volume of material being removed, the proximity of the activity to the benthic receptor, the extent and duration of dredging, the particle size of the disturbed sediments (contaminants tend to be associated with finer particles), and the hydrodynamic conditions. As per Chapter 2: Project Description, up to 2,500 m^3 of sediment may be dredged during the construction phase. It is anticipated that dredging will occur over a two month period. Dredging will be carried out beneath the existing JUB to remove soft material to create sufficient water depth for the installation of rock armour scour protection. It is proposed that all dredging will be undertaken by plough dredging, moving soft material from under the pontoon to the scour pocket in the berth immediately north of the linkspan structure. The dredged material will be placed in an area within the berth that has experienced scour.

Chemical sediment analysis was undertaken on samples collected during the 2017 site-specific baseline surveys for replacement linkspan works at the Stena Ferry Terminal (ABPmer, 2018) (see

Figure 8-5 for the sample locations), which are within the Site Boundary for the Proposed Development. The results of these analyses indicated that there were negligible to very low levels of contamination in the surface sediments that may be disturbed by dredging (at levels below UK guidelines and internationally recognised standards, such as Cefas Action Levels 1 and 2) (ABPmer, 2018). Although some organic black sludge material was identified, this is common in the area and appears on local beaches at low tide. It is possible that this washes down from an adjacent valley, which has areas of marsh. This organic black sludge material is therefore, not expected to cause significant contamination risk. Results from chemical sediment analysis which was undertaken on samples taken during the benthic validation survey (see Appendix 8.A) also showed low levels of contamination in the surface sediments throughout the Site Boundary, in line with previous results.

Given that the overall level of contamination in the proposed dredge area is low, the period of dredging is temporally limited, and the extent of sediment dispersal considered to be spatially limited (see section 8.9.1.2.3), changes in water quality are likely to be minimal, if at all. The impact is predicted to be of highly local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.2.4.2 Sensitivity of the Receptor

Benthic habitats and species can be sensitive to toxic contamination, when concentrations of contaminants exceed sensitivity thresholds. Release of sediment bound contaminants during construction can occur through the resuspension of sediment during dredging which can lead to the release and mobilisation of sediment-bound contaminants into the water column. These include both toxic contaminants, such as heavy metals, pesticides and hydrocarbons, and non-toxic contaminants, such as organic matter. In particular, there is a risk that any uncontrolled releases of materials or sediments into the water column could make contaminants temporarily available for uptake by benthic species. Over a longer scale, contaminants could also become stored in surface sediments of the seabed for future benthic uptake.

Suspension-feeding organisms may be particularly vulnerable to pollutants in the water column due to their dependence on filtration. High levels of chemical contaminants could cause genetic, reproductive and morphological issues. Contaminants may also have combined effects. Studies have suggested links between contamination with Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), amines and metals and a range of disorders (MacDonald and Ingersoll, 2010). Increased incidence of tumours, DNA damage, and reduced immune response have all been reported in marine invertebrates in areas of high levels of pollution (Catalano *et al*., 2012, Gardner *et al*., 1992, Hannam *et al*., 2010, Nacci and Jackim, 1989).

Sub-lethal effects of chemical contamination on benthic species can reduce individual fitness levels and lethal effects may allow a shift in community composition to one dominated by pollution-tolerant species. Reduced community species richness can be associated with elevated levels of pollutants. Contamination with PAHs, for example, can lead to high levels of mortality in amphipod and shrimp species, and decreased benthic diversity (Long *et al*., 1995). Similar reductions in diversity have been linked to heavy metal contamination (Dauvin, 2008).

However, the common and characteristic species within the subtidal benthic community, such as the bivalves *A. alba* and *V. gibba*, polychaetes *A. marioni* and *A. marina*, and brittlestar *A. filiformis*, were all assigned as having varying very low to medium sensitivities to hydrocarbon, heavy metal, and synthetic compound contamination in their MarLIN sensitivity assessments (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). These species were all considered to have very low or no sensitivity to changes in dissolved oxygen levels, which could be associated with this impact (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). These species may be acclimatised to reduced water quality (including the release of sediment bound contaminants) due to routine maintenance dredging throughout Fishguard Harbour. The benthic subtidal community IEF is

therefore deemed to be of low vulnerability, high recoverability, and local value. The sensitivity of the receptor, is therefore, considered to be low.

Although changes in water quality could occur within the sublittoral and infralittoral zone, and therefore within the remit of the intertidal zone, it is unlikely that the benthic intertidal IEFs will be vulnerable to these, given the natural fluctuations in sedimentation and oxygenation levels already occurring due to the tide. Therefore, the benthic intertidal IEFs are deemed to be of low vulnerability, high recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be low.

8.9.1.2.4.3 Significance of Effect

Overall, for all IEFs, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.1.2.5 Increased Risk of Introduction and Spread of INNS

8.9.1.2.5.1 Magnitude of Impact

The introduction and spread of INNS can occur accidentally, typically via fouling of vessels' hulls, ballast water, and materials brought into the environment during development. Pathways of introduction involving vessel movements (fouling and ballast water) carry the highest potential risk, and areas with high volumes of shipping traffic can be hotspots for INNS (Pearce *et al*., 2012).

Therefore, vessels associated with the construction of the Proposed Development may act as vectors to facilitate the spread of INNS. The MDS for this impact includes the following vessels during the construction phase:

- Pontoon & bridge shipment (potentially a geared cargo vessel that can offload the shipment itself);
- Up to two tug boats;
- Plough dredger/multipurpose vessel; and
- Floating crane or floating barge with associated tug.

These vessels do not represent a significant increase in vessel traffic under the baseline conditions, and they will not be on site for an extended period of time. For example, barges and tug boats required to install the replacement pontoon and bridge will be on site for up to a week (weather dependant). In addition, the construction works will include a two month shutdown of the existing ferry service to the Stena Ferry Terminal, which will in turn reduce the number of vessels present within Fishguard Harbour.

The UK is bound by international agreements such as the Convention on Biological Diversity, the United Nations Convention on the Law of the Sea, the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979), the Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979) and the Habitats and Birds Directives. All of these include provisions requiring measures to prevent the introduction of, or control of, INNS, especially those that threaten native or protected species. Additionally, Section 14(1) of the Wildlife and Countryside Act (1981) makes it illegal to release, or allow to escape into the wild, any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state or is listed in Schedule 9 of the Act.

The fouling of a boat hull and other below-water surfaces can be reduced through the use of protective coatings. These coatings usually contain a toxic chemical (such as copper) or an irritant (such as pepper) that discourages organisms from attaching. Other coatings, such as those that are silicone-based, provide a surface that is more difficult to adhere to firmly, making cleaning of the hull less laborious. Maintenance of hulls through regular cleaning will minimise the number of

fouling INNS present. It is likely that some of the vessels associated with the Proposed Development and others using Fishguard Harbour will already be applying these preventative measures, particularly in light of the international agreements to prevent INNS detailed in the previous paragraph.

In addition, INNS may also be transported via ballast water. In 2004, the IMO adopted the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments', which introduced two performance standards seeking to limit the risk of INNS being imported (including distances for ballast water exchange and standards for ballast water treatment). The Convention came into force in September 2017, and vessels are required to comply with this Convention, helping to reduce the risk of introduction and spread of INNS into Fishguard Harbour. Further detail on the control measures in place as part of the Proposed Development are provided in the INNS Management Plan (Appendix 8.B).

The installation of artificial hard surfaces in the construction phase of the Proposed Development has the potential to facilitate the spread of INNS by providing additional potential habitat. This artificial hard infrastructure could represent a fresh surface for INNS to colonise, with limited competition from established, native species. As detailed in section 8.9.1.2.2, a footprint of up to 1,600 m^2 of permanent structures including scour protection will be installed during the construction phase and persist into the operational phase. However, it should be noted that there is already a widespread presence of artificial hard habitat within Fishguard Harbour, so this only represents a minor alteration to the baseline conditions.

Overall, although there is possibility for introduction and colonisation of INNS due to vessel movements associated with the Proposed Development, this additional vessel activity will be minor in comparison to the baseline vessel movements within Fishguard Harbour already. In addition, the two-month shutdown of the Stena Ferry Terminal during construction works will also help to reduce the number of vessels on site at any one time. The magnitude of change will be small, due to the low footprint of artificial hard habitat installed and the low number of vessels required for the construction works at the Proposed Development.

The impact is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility (if an introduction occurs, which is unlikely). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.2.5.2 Sensitivity of the Receptor

The ecological impacts of invasions of INNS are considered to be the second largest threat to biodiversity worldwide, after habitat loss and destruction, with marine and freshwater systems suffering greatly from INNS as a result of increased global shipping.

However, the pressure of INNS was not concluded to be relevant to the common and characteristic species within the subtidal benthic community, such as the bivalves *A. alba* and *V. gibba*, polychaetes *A. marioni* and *A. marina*, and brittlestar *A. filiformis*, in their MarLIN sensitivity assessments (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). This was because there was no deemed to be no evidence of any INNS that were likely to threaten or compete with these species (Budd, 2007, Hill and Wilson, 2008, Rayment, 2007, Sabatini and Ballerstedt, 2008, Tyler-Walters, 2008). Therefore, the benthic subtidal community IEF is deemed to be of low vulnerability, high recoverability, and local value. The sensitivity of the receptor, is therefore, considered to be low.

In addition, the under boulder habitat recorded within the Site Boundary (see Table 8-9) is likely to be at a higher risk of invasion from INNS. Intertidal under boulder communities were considered to potentially be suitable for colonisation by a wide range of INNS in an NRW review, including the carpet sea squirt, compass sea squirt *Asterocarpa humilis*, Chinese mitten crab *Eriocheir sinensis*, and red rust bryozoan *Watersipora subtorquata* (Tillin *et al*., 2020). Therefore, the benthic intertidal IEFs are deemed to be of high vulnerability, low recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be high.

8.9.1.2.5.3 Significance of Effect

Overall, for the benthic subtidal community IEF, the magnitude of the impact is deemed to be low, and the sensitivity of the receptor is considered to be low. The effect will therefore be of **minor adverse** significance, which is **not significant** in EIA terms.

For the benthic intertidal IEFs, the magnitude of the impact is deemed to be low, and the sensitivity of the receptor is considered to be high. As per Table 8-7, this yields a minor to moderate significance. However, a very low prevalence of the Priority Habitat 'Intertidal under boulder communities' identified (90 m^2; 0.17% of the Site Boundary[7]), suggesting that Fishguard Harbour does not represent a significant area of this habitat. Based on this, the effect has been assigned a assigned a **minor adverse** significance, which is **not significant** in EIA terms.

8.9.1.3 Assessment of Operational Effects

There were two impacts scoped in for the operational phase of the Proposed Development for benthic subtidal and intertidal ecology:

- Long term habitat loss and/or disturbance; and
- Increased risk of introduction and spread of INNS.

The impacts scoped out of further assessment for the operational phase are detailed in Table 8-17.

Table 8-17: Impacts Scoped Out of the Assessment for Benthic Subtidal and Intertidal Ecology in the Operational Phase.

Impact	Justification for Scoping Out
Accidental pollution to the surrounding environment	This impact has been scoped out of the assessment for benthic subtidal and intertidal ecology, using the same justification as provided for the construction phase in Table 8-16.
Temporary Habitat Loss and/or Disturbance	This impact has been scoped out of the assessment for benthic subtidal and intertidal ecology for the operational phase because the project design does not include any operational activities that would disturb the seabed or cause additional temporary habitat loss once construction is complete. All habitat-disturbing activities such as plough dredging, scour protection, and piling occur solely during the construction phase and do not continue into operation as there is no maintenance dredging proposed.
Increased SSCs and Associated Deposition	This impact has been scoped out of the assessment for benthic subtidal and intertidal ecology for the operational phase because the project design does not include any activities capable of disturbing seabed sediments once construction is complete. All sediment-disturbing works occurred solely during the construction phase, and no ongoing operational activities have the potential to generate increases in SSCs or cause additional seabed deposition as there is no maintenance dredging proposed.
Changes in Water Quality (including release of sediment bound contaminants)	This impact has been scoped out of the assessment for benthic subtidal and intertidal ecology for the operational phase because the Proposed Development does not involve any physical works that could disturb sediments, mobilise contaminants, or otherwise alter water quality. All potential sources of water-quality change are restricted to the construction phase and are not carried forward into operation.

8.9.1.3.1 Long Term Habitat Loss and/or Disturbance

8.9.1.3.1.1 Magnitude of Impact

The permanent (scour protection) infrastructure installed within the construction phase and persisting throughout the operational phase of the Proposed Development represents up to 1,600 m^2 of long term habitat loss and disturbance (see section 8.9.1.2.2). This represents only up to 2.95% of the Site Boundary[7] and up to 0.04% of the Marine Biodiversity Study Area.

The impact is predicted to be of local spatial extent, long term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.3.1.2 Sensitivity of the Receptor

Overall, the benthic subtidal community IEF is deemed to be of high vulnerability, low recoverability and local value. The sensitivity of the receptor is therefore, considered to be high.

The benthic intertidal IEFs are deemed to be of low vulnerability, high recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be low.

8.9.1.3.1.3 Significance of Effect

Overall, for the benthic subtidal community IEF, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. As per Table 8-7, this yields a minor to moderate significance. Based on the very low footprint of long term habitat loss in the context of the Marine Biodiversity Study Area (up to 0.04%) and that the characterising species and habitats within the subtidal zone are widespread, common and not protected under any conservation legislation, the effect has been assigned a minor adverse significance, which is not significant in EIA terms.

For the benthic intertidal IEFs, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.1.3.2 Increased Risk of Introduction and Spread of INNS

8.9.1.3.2.1 Magnitude of Impact

As detailed in section 8.9.1.2.5 for the construction phase, the introduction and spread of INNS can occur accidentally, typically via fouling of vessels' hulls, ballast water, and materials brought into the environment. During the operational phase, the magnitude of impact is considered to be as defined in section 8.9.1.2.5 for the construction phase, but of a lower extent, due to the lack of construction vessels.

The impact is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility (if an introduction occurs, which is unlikely). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.1.3.2.2 Sensitivity of the Receptor

The sensitivity of the receptor is as defined for this impact in the construction phase, see section 8.9.1.2.5.

The benthic subtidal community IEF is deemed to be of low vulnerability, high recoverability, and local value. The sensitivity of the receptor, is therefore, considered to be low.

The benthic intertidal IEFs are deemed to be of high vulnerability, low recoverability and local to national value. The sensitivity of the receptor is therefore, considered to be high.

8.9.1.3.2.3 Significance of Effect

Overall, for the benthic subtidal community IEF, the magnitude of the impact is deemed to be low, and the sensitivity of the receptor is considered to be low. The effect will therefore be of **minor adverse significance**, which is **not significant** in EIA terms.

For the benthic intertidal IEFs, the magnitude of the impact is deemed to be low, and the sensitivity of the receptor is considered to be high. As per Table 8-7, this yields a minor to moderate significance. However, a very low prevalence of the Priority Habitat 'Intertidal under boulder communities' identified (90 m^2; 0.17% of the Site Boundary[7]), suggesting that Fishguard Harbour does not represent a significant area of this habitat. Based on this, the effect has been assigned a assigned a **minor adverse** significance, which is **not significant** in EIA terms.

8.9.2 Fish and Shellfish Ecology

8.9.2.1 Do Nothing Scenario

As per EIA protocol, the likely evolution of the existing fish and shellfish ecology baseline in the absence of the Proposed Development (i.e. the 'Do Nothing Scenario') has been assessed. Given that the Proposed Development is located within an active harbour, it is likely that high levels of anthropogenic activity will continue under a Do Nothing Scenario, and that the fish and shellfish communities already established within Fishguard Harbour will persist.

8.9.2.2 Assessment of Construction Effects

There were three impacts scoped in for the construction phase of the Proposed Development for fish and shellfish ecology:

- Increased SSCs and associated deposition;
- Changes in water quality (including release of sediment bound contaminants); and
- Underwater noise from piling (alongside other noise sources, such as dredging and demolition activities).

The impacts scoped out of further assessment for the construction phase are detailed in Table 8-18.

Table 8-18: Impacts Scoped Out of the Assessment for Fish and Shellfish Ecology in the Construction Phase.

Impact	Justification for Scoping Out
Temporary habitat loss and/or disturbance	Temporary habitat loss and/or disturbance may occur during dredging activities. The footprint of this impact, however, would only constitute a very small fraction of the known ranges of local fish and shellfish populations. Given that the works will be undertaken within an existing ferry terminal in Fishguard Harbour, the area does not represent pristine habitat, and any fish and shellfish populations within the harbour are likely to be habituated to this. The Fishguard Harbour is not considered to represent an important habitat for fish and shellfish species, in the context of the wider Pembrokeshire coast. Temporary loss and/or disturbance to important fish and shellfish feeding, nursery and spawning habitats is therefore unlikely. Therefore, this impact has been scoped out of the assessment for fish and shellfish ecology.
Long term habitat loss and/or disturbance	The footprint of infrastructure associated with the Proposed Development will cover a localised area which would only

Impact	Justification for Scoping Out
	constitute a very small fraction of the known ranges of local fish and shellfish populations. Given that the works will be undertaken within an existing ferry terminal within a harbour, the area does not represent pristine habitat, and any fish and shellfish populations within the harbour are likely to be habituated to this. The Fishguard Harbour is not considered to represent an important habitat for fish and shellfish species, in the context of the wider Pembrokeshire coast. Long term habitat loss of important fish and shellfish feeding, nursery and spawning habitats is therefore unlikely. Therefore, this impact has been scoped out of the assessment for fish and shellfish ecology.
Accidental pollution to the surrounding environment	This impact has been scoped out of the assessment for fish and shellfish ecology, using the same justification as provided for benthic subtidal and intertidal ecology in Table 8-16.
Increased risk of introduction and spread of INNS	There is potential for the increased risk of introduction and spread of INNS associated with the Proposed Development. This is due to vessel movement which may act as vectors facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as a pontoon and/or decking) may represent increased available habitat for INNS to colonise. This impact has been scoped in for benthic subtidal and intertidal ecology (see section 8.9.1). However, given the wider ranging nature and habitat use of fish and shellfish species in comparison to benthic species, this impact is not likely to represent significant impact to fish and shellfish ecology. This, in combination with the embedded mitigation of an INNS Management Plan (Appendix 8.B) has been deemed sufficient rational to scope out this impact for fish and shellfish ecology.
Underwater noise from vessels	The presence of vessels associated with the Proposed Development are not likely to represent a significant change from the baseline vessel traffic already present within Fishguard Harbour. Therefore, this impact has been scoped out of the assessment for fish and shellfish ecology.

8.9.2.2.1 Increased SSCs and Associated Deposition

8.9.2.2.1.1 Magnitude of Impact

The magnitude of impact is considered to be low as described in section 8.9.1.2.3 for benthic subtidal and intertidal ecology.

8.9.2.2.1.2 Sensitivity of the Receptor

Increased SSCs and associated deposition could impact the fish and shellfish IEFs. A review on the effects of dredging on fish by Wenger *et al*. (2017) considered the impact of increased SSCs at great length, with a wide range of responses presented in the studies reviewed:

- 14 studies showed no effect of suspended sediment (although only 11 of these recorded an exposure time);
- 12 studies observed behavioural changes;
- 34 studies recorded physical damage and substantial behavioural changes;

- 37 studies measured physiological stress and sublethal responses; and
- 49 studies recorded some level of mortality (Wenger *et al*., 2017).

The fish species reviewed had markedly different tolerances to increased SSCs, with some species able to withstand concentrations up to 28,000 mg/L, while others experience mortality starting at 25 mg/L (Wenger *et al*., 2017). As per Newcombe and Macdonald (1991) and Newcombe and Jensen (1996), linear discriminant analysis indicated that increasing both the concentration and exposure time to suspended sediment increased the severity of fish response (Wenger *et al*., 2017).

In general, fish and shellfish eggs and larvae are the most susceptible life stage to increased SSCs and associated deposition (Engell-Sørensen and Skyt, 2001, Yang *et al*., 2019). Adult fish are typically highly mobile and, therefore able to avoid areas with high sediment loads (Robertson *et al*., 2006). Generally, SSCs on the scale of mg/L can be lethal to eggs and larvae but only lethal to juveniles and adults on the scale of g/L (Engell-Sørensen and Skyt, 2001). Given that the Proposed Development is located within an active harbour with heavy anthropogenic influence, it is not likely to represent a key spawning or nursery area for fish and shellfish species. Therefore, eggs and larvae are not expected to be present in significant quantities within Fishguard Harbour and the ZoI of increased SSCs and associated deposition.

As stated, adult fish are more mobile than eggs and larvae, and therefore may show greater avoidance behaviour within areas affected by increased SSCs. For example, avoidance of turbid water is a common response behaviour to elevated SSCs (Collin and Hart, 2015). In a study by Westerberg *et al*. (1996), avoidance behaviour was observed in adult cod exposed to sediment plumes as low as 2 mg/L. It is therefore proposed that this increased mobility makes adults of these species less susceptible to physiological effects of this impact. Recoverability, in terms of fish returning to the area affected by this impact, is highly dependent on the recovery of the area to pre-disturbance conditions, the availability of alternative suitable habitat, and the ecological plasticity of that species (Wenger *et al*., 2017). Given that the Proposed Development is within a harbour, species directly impacted are likely to have a high plasticity to increased SSCs, which are likely to be higher in the harbour in comparison to areas with lower anthropogenic influence.

Diadromous fish specifically are expected to have some tolerance to high SSCs as their migration routes typically require them to travel through estuarine habitats, which naturally have considerably higher background SSCs than in the marine environment (Bash *et al*., 2001). As the activities associated with the Proposed Development will only produce temporary increases in SSCs, with levels lower than those naturally present in estuarine environments, it is predicted that diadromous fish IEFs will only temporarily be affected at most. Any negative effects on these species are therefore likely to be short term behavioural effects, such as temporary slightly erratic alarmed swimming behaviour (Berli *et al*., 2014, Chiasson, 1993), or avoidance behaviour (Bash *et al*., 2001, Berg, 1979, Berg and Northcote, 1985, Bisson and Bilby, 1982, Robertson *et al*., 2007). Avoidance behaviour could occur at very low levels of suspended sediment (Wenger *et al*., 2017), but may vary between species (Boubée *et al*., 1997). Given that the Giver Gwaun, which flows into Fishguard Harbour, is not a key river for diadromous fish species (see section 8.8.2.2), it is unlikely that this highly localised impact will cause barriers to migration of any of the IEFs.

Many shellfish species have high tolerances to increased SSCs and are reported to be insensitive to increases in turbidity (Wilber and Clarke, 2001). This includes crustacean IEFs, such as and common shore crab, edible crab which have been assessed as having low or no sensitivity to the pressure: ‘increase in suspended sediment’ on their respective MarESAs (Neal and Pizzolla, 2008, Neal and Wilson, 2008). These species also have a very low to no sensitivity to the pressures ‘smothering’ and ‘increase in turbidity’, which can be associated with this impact (Neal and Pizzolla, 2008, Neal and Wilson, 2008). The low to no sensitivity of these IEFs to increased SSCs is largely due to their high mobility levels and therefore their ability to relocate to unaffected areas (Neal and Pizzolla, 2008, Neal and Wilson, 2008). Egg bearing (e.g., ‘berried’) European lobster could potentially be more vulnerable to increased SSCs as the eggs they carry attached to their bodies required regular aeration. However, as lobsters are mobile species, they are able to move

to more suitable conditions if necessary, during periods of increased SSCs in the construction phase, which are not expected to be continuous and will only affect a small area at any one time.

Although far less mobile than the crustacean IEFs, king scallop was also assessed as having low sensitivity to increased suspended sediment and no sensitivity to increased turbidity in its MarESA (Marshall and Wilson, 2008). While scallops could potentially be buried due to during sediment deposition, the sensitivity to smothering was still considered to be low on the MarESA (Marshall and Wilson, 2008). Scallop species may also be able to visually detect the size and speed of moving particles to identify preferrable feeding conditions (Speiser and Johnsen, 2008), and may therefore be able to avoid areas of increased SSCs. Given the highly localised sediment plumes and low deposition levels outwith the immediate dredging footprint (section 8.9.1.2.3) and the potential for avoidance behaviour and re-emergence from light deposition, this impact is unlikely to affect scallops within the ZoI in the short or long term. It is also unlikely the Fishguard Harbour represents an important area for scallop populations, due to the high level of anthropogenic influence and regular disruption to the seabed, via anchoring and maintenance dredging.

Overall, the fish and shellfish IEFs are deemed to be of low vulnerability, high recoverability and local to international value. The sensitivity of the receptor is therefore, considered to be low. Due to the obligate life history of freshwater pearl mussel IEF with Atlantic salmon and sea trout, the sensitivity of the freshwater pearl mussel IEF is also considered to be low.

8.9.2.2.1.3 Significance of Effect

Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.2.2.2 Changes in Water Quality (including release of sediment bound contaminants)

8.9.2.2.2.1 Magnitude of Impact

The magnitude of impact is considered to be low, as described in section 8.9.1.2.4 for benthic subtidal and intertidal ecology.

8.9.2.2.2.2 Sensitivity of the Receptor

The potential release of contaminants during construction activities may result in them becoming available for uptake by any fish shellfish in the water column or at the seabed. There is also an indirect risk to some fish species, as sediment-bound contaminants may be temporarily bioaccumulated in the tissues of their prey, such as polychaete worms and marine bivalves, and made available for uptake by feeding fish. Demersal fish species, such as flatfish, which remain close to the seabed and feed mainly on benthic infauna, could potentially experience the highest exposure to changes in water quality and release of sediment bound contaminants.

Water quality can be affected by increased SSCs and the resuspension of sediments containing organic material, which can deplete oxygen levels within the water column. The subsequent settling of this organic rich sediment can deplete the sediments of oxygen and affect shellfish and also the benthic prey species used by fish. The response of fish and shellfish to low concentrations of dissolved oxygen (hypoxia) is determined by a range of factors, including the duration of exposure, water temperature, and the presence of other pollutants (Wang *et al*., 2023). The duration of any low dissolved oxygen event is a key factor in determining its effect. Most fish would survive an extremely low concentration of dissolved oxygen, such as 2 mg/l, for a short amount of time, however, some studies have suggested that this is conservative, and significant negative responses may actually occur below 4.5 mg/l (Hrycik *et al*., 2017). Furthermore, Fishguard Harbour does not represent a pristine environment, and fish and shellfish present within it are expected to be acclimatised to the potentially poorer quality habitat, in comparison to natural environments with

no anthropogenic activity. Finally, fish and shellfish species are highly mobile, and will be able to move away from potentially affected areas.

The sensitivity of the receptor has been defined due to the limited duration of construction activities which may deplete oxygen levels (a matter of weeks, see section 8.9.1.2.4.1), the high mobility of fish and shellfish, and the likely acclimatisation to high levels of anthropogenic activity and potentially reduced water quality within the Fishguard Harbour. The fish and shellfish IEFs are deemed to be of low vulnerability, high recoverability and local to international value. The sensitivity of the receptor is therefore, considered to be low.

8.9.2.2.2.3 Significance of Effect

Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

8.9.2.2.3 Underwater Noise from Piling and Other Activities

The underwater noise modelling (detailed in Chapter 14: Underwater Noise and summarised in this section) concluded that the noise producing activities at the Proposed Development will be limited both spatially and temporally, with impacts upon fish receptors not predicted to occur over large ranges.

8.9.2.2.3.1 Magnitude of Impact

As detailed in section 8.7.2 and illustrated in Table 8-8, various piling and construction activities will occur as part of the construction phase of the Proposed Development, with most considered to be non-impulsive noise sources. Impact piling (i.e. an impulsive noise source) will only take place in connection with the installation of eight support piles, each of which will require less than half an hour of impact piling each, for a total maximal duration of two hours of impact piling spread over two to ten days.

The impact is predicted affect the receptor directly, but to be of local spatial extent, short term duration, intermittent and high reversibility. magnitude is therefore considered to be low.

8.9.2.2.3.2 Sensitivity of the Receptor

For fish, the most relevant criteria for injury from noise are considered to be those contained in the Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014). These guidelines do not group by species but instead broadly group fish into the following categories based on their anatomy and the available information on hearing of other fish species with comparable anatomies:

- Group 1 fish: species with no swim bladder or other gas chamber (e.g., elasmobranchs, flatfishes and lampreys). These species are less susceptible to barotrauma and are only sensitive to particle motion, not sound pressure. Sharks, which do not have swim bladders, fall into this hearing group;
- Group 2 fish: fishes with swim bladders but the swim bladder does not play a role in hearing (e.g., salmonids, such as Atlantic salmon and sea trout). These species are susceptible to barotrauma, although hearing only involves particle motion, not sound pressure;
- Group 3: Fishes with swim bladders that are close, but not connected, to the ear (e.g., gadoids and eels). These fishes are sensitive to both particle motion and sound pressure and show a more extended frequency range than groups 1 and 2, extending to about 500 Hz;
- Group 4: Fishes that have special structures mechanically linking the swim bladder to the ear (e.g., clupeids such as sprat and shads). These fishes are sensitive primarily to sound pressure, although they also detect particle motion. These species have a wider frequency

range, extending to several kHz and generally show higher sensitivity to sound pressure than fishes in Groups 1, 2 and 3; and

- Eggs and larvae (Popper *et al*., 2014).

Physiological effects related to injury criteria were also described in Popper *et al*. (2014) as follows:

- Mortality and potential mortal injury: either immediate mortality or tissue and/or physiological damage that is sufficiently severe (e.g., a barotrauma) that death occurs sometime later due to decreased fitness. Mortality has a direct effect upon animal populations, especially if it affects individuals close to maturity.
- Recoverable injury ('Auditory Injury in tables and figures): Tissue damage and other physical damage or physiological effects, that are recoverable, but which may place animals at lower levels of fitness, may render them more open to predation, impaired feeding and growth, or lack of breeding success, until recovery takes place. The auditory injury term is used here to describe this, more serious impact, even though it is not strictly permanent for fish. This is to better reflect the fact that this level of impact is perceived as serious and detrimental to the fish.
- TTS: Short term changes (minutes to few hours) in hearing sensitivity may, or may not, reduce fitness and survival. Impairment of hearing may affect the ability of animals to capture prey and avoid predators, and also cause deterioration in communication between individuals, affecting growth, survival, and reproductive success. After termination of a sound that causes TTS, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of sound exposure.

However, Popper *et al*. (2014) does not set out specific TTS limits for L_P or disturbance limits for impulsive noise for fish. Therefore, publications on the effects of seismic noise on fish have been used to determine limits for these (Washington State Department of Transport (WSDOT, 2020)) and (Worcester, 2006):

- WSDOT (2020) suggests an un-weighted sound pressure level of 150 dB SPL (assumed to be duration of 95% of energy) as the criterion for onset of behavioural effects, based on work by Hastings (2002). Sound pressure levels in excess of 150 dB SPL are expected to cause temporary behavioural changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area. WSDOT (2020) notes that levels exceeding this threshold are not expected to cause direct permanent injury but may indirectly affect the individual fish (such as by impairing predator detection). It is important to note that this threshold is for onset of potential effects, and not necessarily a threshold for adverse effects. The threshold has been implemented in the underwater noise modelling as either single impulse SEL or 1 second SEL, whichever was greater.
- A review by Worcester (2006) found large differences in response between experiments. Onset of behavioural response varied from 107 to 246 dB L_P, the 10th percentile level for behavioural response was 160 dB LP (rounded to nearest 5 dB to reflect large variation in data).
- Therefore, the behavioural disturbance threshold for fish for impulsive sound was 160 dB L_P, and 150 dB SPL for non-impulsive sound, based on WSDOT (2020) and Worcester (2006).

The injury and disturbance criteria used in this noise assessment for fish are given in Table 8-19 and Table 8-20 for impulsive noise (L_p) and non-impulsive noise (SEL) respectively. The Lp and SEL criteria presented in these tables are unweighted. It's important to clarify that this lack of weighting for fishes reflects a lack of scientific consensus about the best method for applying frequency dependence to received levels for fish, rather than a statement that fish can hear all frequencies equally. Thus, fish generally cannot hear above 10 kHz, and if they can, the sensitivity is generally very poor (Chapter 14: Underwater Noise for further detail). It should be noted that there are no defined injury and disturbance thresholds for shellfish, with the, albeit limited, literature suggesting that shellfish have a low (if any) sensitivity to underwater noise (Christian *et al*., 2003,

Edmonds *et al*., 2016, Parry and Gason, 2006, Pearson *et al*., 1994). For example, crustaceans tend to be physiologically resilient to noise due to the lack of gas within their bodies (Popper *et al*., 2001).

Table 8-19: Criteria for the Onset of Injury to Fish due to Impulsive Noise (the lowest threshold for any group has been used for all groups, shown in bold).

Fish Hearing Group	Unit	Mortality and potential mortal injury (dB)	Recoverable injury (Auditory Injury) (dB)	TTS (dB)	Behavioural disturbance (dB)
Fish: no swim bladder (particle motion detection) Example: Sharks.	SEL	219[1]	216[1]	186[1]	150[3]
	L_P	213[1]	213[1]	193[2]	160[2]
Fish: where swim bladder is not involved in hearing (particle motion detection). Example: Salmonoids.	SEL	210[1]	203[1]	186[1]	150[3]
	L_P	207[1]	207[1]	193[2]	160[2]
Fish: where swim bladder is involved in hearing (primarily pressure detection). Example: Gadoids (cod-like).	SEL	207[1]	**203[1]**	**186**	**150[3] [SPL]**
	L_P	207[1]	**207[1]**	**193[2]**	**160[2]**
Eggs and larvae	SEL	2101	(*Near*) Moderate* (*Mid*) Low* (*Far*) Low*	-	-
	LP	207[1]		-	-

[1] Popper *et al*. (2014)
[2] Worcester (2006)
[3] WSDOT (2020)
* Indicates (range) and risk of effect, e.g. '(Near) High', meaning a high risk of that effect when near the noise source.

Table 8-20: Criteria for Injury and Disturbance to all Fish Hearing Groups due to Non-Impulsive Noise (Popper *et al*., 2014).

Fish Hearing Group	Unit	Mortality and potential mortal injury	Recoverable injury (Auditory Injury) (dB)	TTS (db)	Behavioural Disturbance (dB)
All hearing groups	SEL	(Near) Low (Mid) Low (Far) Low	222†	204	126 [SPL]*

†Based 48 hours of 170 dB SPL and 12 hours of 158 dB SPL.
*Based on review in Chapter 14: Underwater Noise.

Dredging

The results of the noise modelling indicated that dredging has little to no risk of exceeding TTS or auditory injury thresholds for fish modelled as stationary receptors but estimates for exceedance of the behavioural thresholds extend to 1,100 m (Table 8-21). There is considerable variation in the extent of the noise from the dredging depending on the location of the dredging vessel, with the breakwater and headland to the east (Ynys Dinas/Dinas Island), blocking noise transmission (Figure 8-21 and Figure 8-22).

Table 8-21: Threshold Exceedance Ranges for Dredging for All Fish Hearing Groups.

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	90th percentile range [m]	1,100
	Maximal range [m]	1,100
TTS,1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
TTS, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10
Auditory injury, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10

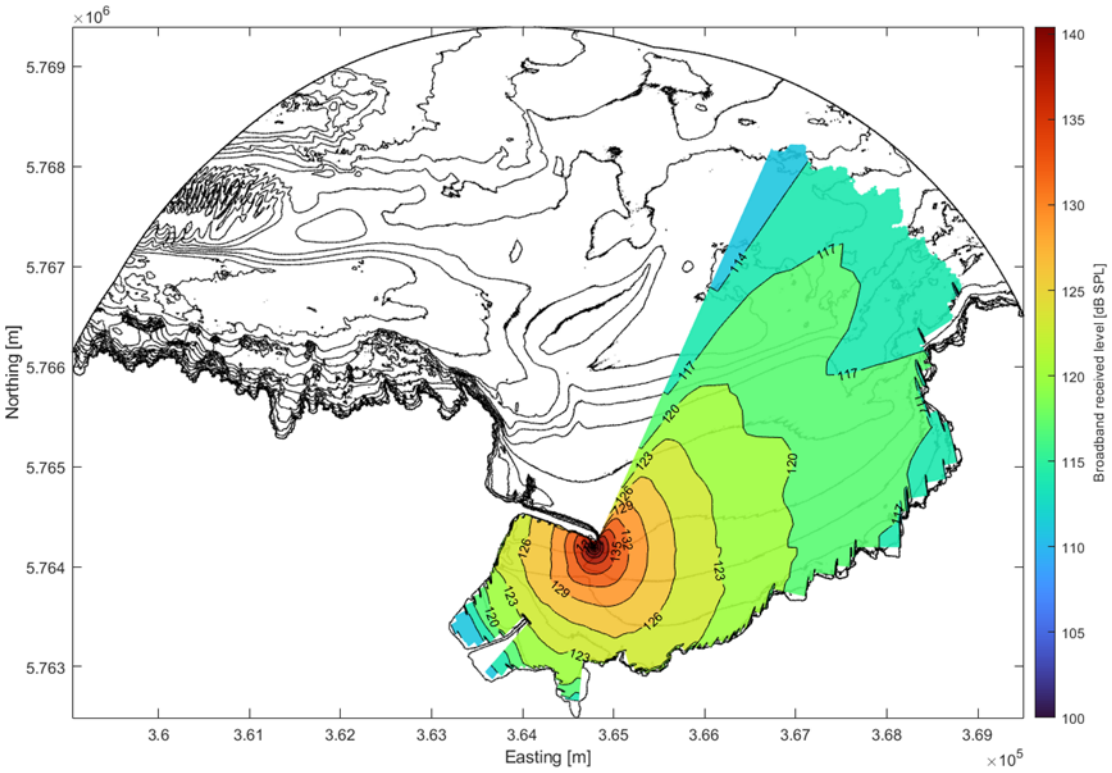

Figure 8-21: Map of Unweighted Levels (SPL) from Dredging near the end of the Breakwater. UTM 30N.

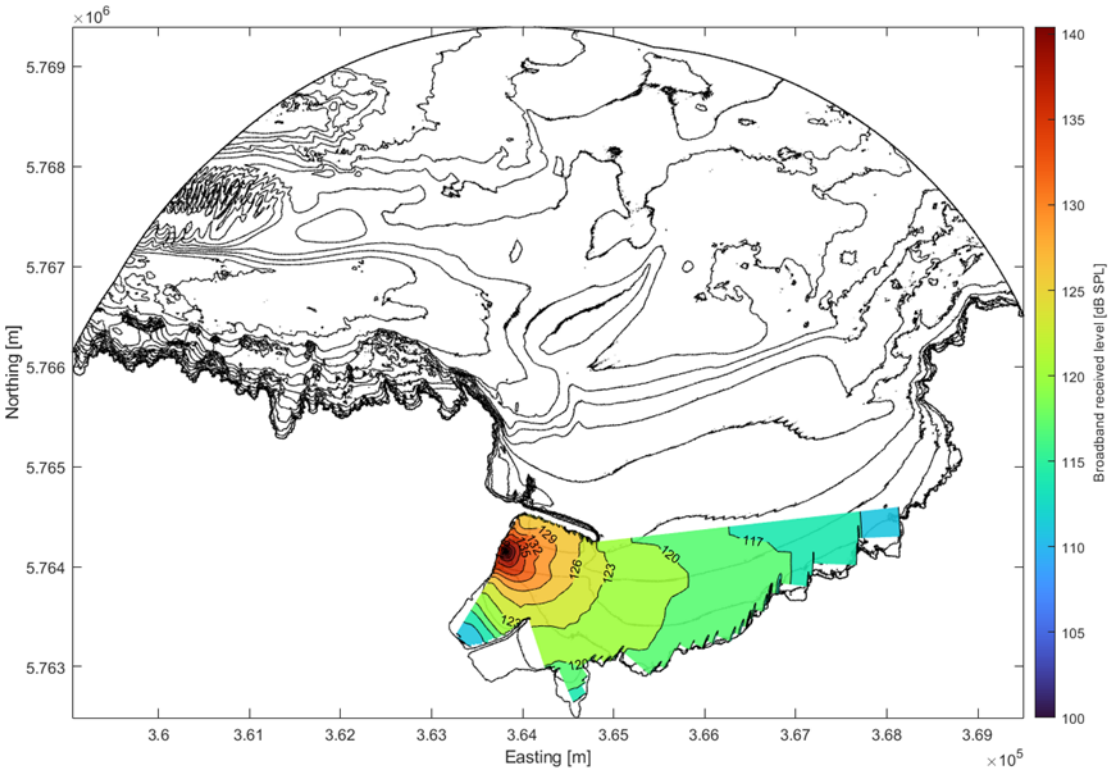

Figure 8-22: Map of Unweighted Levels (SPL) from Dredging near the Quay and Linkspan. UTM 30N.

Impact Piling

The results of the noise modelling indicated that impact piling of the eight support piles had the greatest potential for an adverse effect on fish hearing groups out of all the piling scenarios associated with the construction of the Proposed Development. This activity was modelled as likely to exceed the auditory injury thresholds for all fish hearing groups, in the low tens to hundreds of metres when modelled as stationary receivers (Table 8-22). The peak pressure is likely to exceed the auditory injury threshold of all fish hearing groups to <10 m. The peak pressure is likely to exceed the TTS threshold of fish from 60 m to 70 m (90th percentile range to maximal range; Table 8-22

Ranges for behavioural disturbance were modelled out to 4,900 m (Table 8-22), however, in reality these are limited by line of sight and cover the part of Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island) (Figure 8-23).

Introducing a 20-minute soft start with a 12 dB reduction for 20 minutes prior to impact piling slightly increased the exceedance ranges for the auditory injury threshold for stationary fish from 640 m to 680 m (630 m to 670 m with no soft start; Table 8-22). The exceedance ranges of the TTS threshold are similar with the presence of a soft start. This is an effect of the soft start itself and the effect of increasing the duration of impact piling to 80 minutes (from 60 minutes, 20 minutes of which are from the soft start).

Table 8-22: Fish Threshold Exceedance Ranges for Impact Piling at the Support Piles of the Main Pontoon.

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	90th percentile range [m]	2,200
	Maximal range [m]	4,900
TTS,1 seconds' exposure	90th percentile range [m]	30
	Maximal range [m]	30
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
TTS, sound exposure, stationary receiver, no soft start	90th percentile range [m]	900
	Maximal range [m]	900
Auditory injury, sound exposure, stationary receiver, no soft start	90th percentile range [m]	630
	Maximal range [m]	670
TTS, sound exposure, stationary receiver, 20-minute soft start	90th percentile range [m]	900
	Maximal range [m]	900
Auditory injury, sound exposure, stationary receiver, 20-minute soft start	90th percentile range [m]	640
	Maximal range [m]	680
TTS, peak pressure	90th percentile range [m]	60
	Maximal range [m]	70
Auditory injury, peak pressure	90th percentile range [m]	10
	Maximal range [m]	10

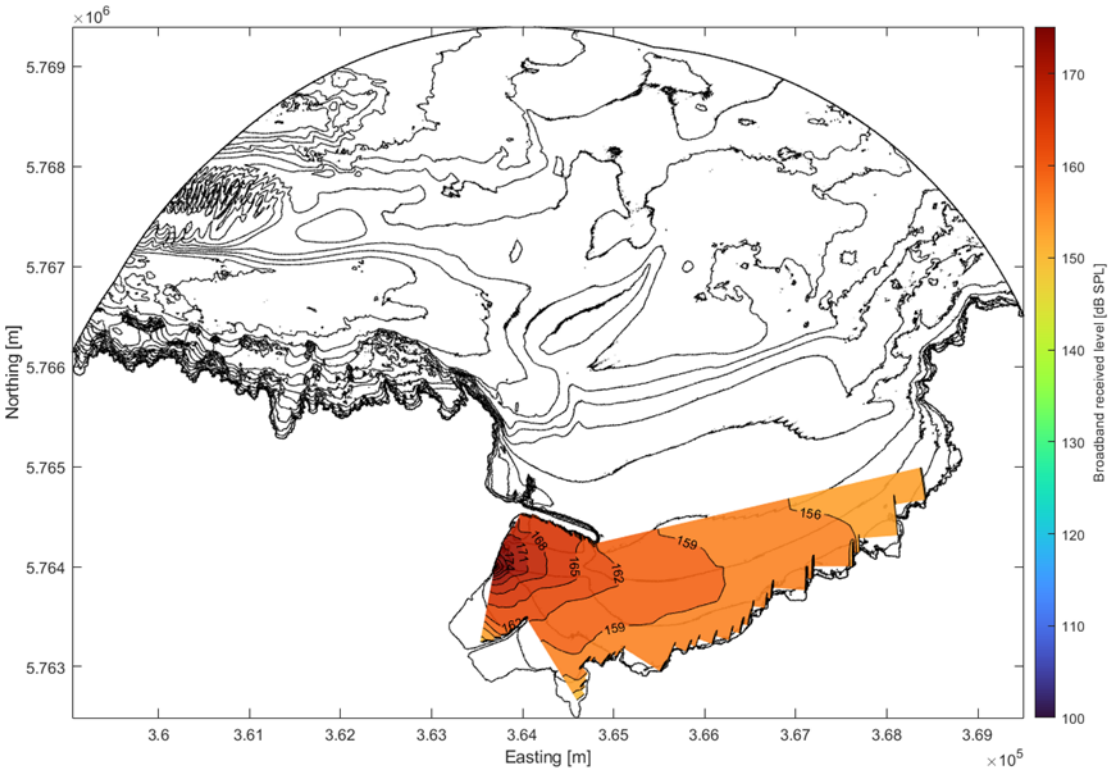

Figure 8-23: Map of Unweighted SPL from Impact Piling of the Support Piles. UTM 30N.

Bankseat Piling

The bankseat piles are wholly separated from the water by at least 1 m of made ground, providing an effective noise barrier. This activity (alongside any necessary demolition activities) has little to no risk of exceeding the auditory injury thresholds for fish, with ranges of <10 m modelled (Table 8-23). The TTS threshold may be exceeded up to 40 m from the source (Table 8-23). Behavioural disturbance ranges were modelled out to 4,800 m, however, in reality these are limited by line of sight and cover the part of Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 8-23: Threshold Exceedance Ranges for Bankseat Piling.

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	90th percentile range [m]	2,200
	Maximal range [m]	4,800
TTS,1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
TTS, sound exposure, stationary receiver, no soft start	90th percentile range [m]	40
	Maximal range [m]	40
Auditory injury, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10

Vibro Piling

Vibro piling for the main pontoon pile and new bankseat (if required) is representative (or louder than) the vibro piling required at the support piles, therefore only the results for the former are presented. These modelling outputs also cover the use of vibro piling for the extraction of the temporary piles. The noise modelling presented in Chapter 14: Underwater Noise suggests that vibro piling has little to no risk of exceeding the auditory injury ranges for the fish hearing groups, with ranges of <10 m predicted (Table 8-24). The TTS threshold may be exceeded up to 30 m from the source (Table 8-24). Ranges for behavioural disturbance were modelled out to 4,800 m but are limited by line of sight and cover the part of Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 8-24: Threshold Exceedance Ranges for Vibro Piling at the Proposed Development.

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	90th percentile range [m]	2,200
	Maximal range [m]	4,800
TTS,1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
TTS, sound exposure, stationary receiver, no soft start	90th percentile range [m]	30
	Maximal range [m]	30
Auditory injury, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10

Coring/Rotary Drilling

Coring/rotary drilling of the main pontoon pile and new bankseat piles (if required) has little to no risk of exceeding the auditory injury or TTS thresholds of fish (Table 8-25). Behavioural disturbance ranges were the lowest of all scenarios modelled for pile installation, at up to 250 m from the source (Table 8-25).

Table 8-25: Threshold Exceedance Ranges for Coring/Rotary Drilling of the Main Ponton and Bankseat Piles.

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	90th percentile range [m]	230
	Maximal range [m]	250
TTS,1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10
	Maximal range [m]	<10
TTS, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10

Condition		Range (m) (all fish hearing groups)
Auditory injury, sound exposure, stationary receiver, no soft start	90th percentile range [m]	<10
	Maximal range [m]	<10

The piling and construction activities proposed during the construction phase of the Proposed Development were assessed in relation to the relevant thresholds for underwater noise effects on fish. Generally, the fact that Fishguard Harbour forms an enclosure, serves to minimise the volume of water for the noise to travel through (see Figure 8-23). Once out of Fishguard Harbour, vessel noise (or general wind and wave noise) from the Irish Sea will likely drown out the noise associated with the Proposed Development. As detailed in Chapter 14: Underwater Noise, baseline noise in Fishguard Harbour is dominated by the Stena Ferry service from/to Rosslare, Ireland. This means probable background broadband levels of 80 to 85 dB SPL with most of this originating from general shipping noise in the Celtic Sea. The existing Stena Ferry service has 13 weekly trips, meaning that approximately twice a day a ferry will enter and exit the harbour, elevating the sound levels within the harbour (taken as within 1,500 m of the Stena Ferry Terminal) to a minimal SPL of 140 to 160 dB of mainly lower frequency noise (<1000 Hz) but potentially enough energy at higher frequencies to have an effect on threshold exceedance ranges.

Overall, the noise modelling suggested that impact piling had the greatest potential to cause auditory injury to fish. Auditory injury was modelled out to 670 m to 680 m for all fish hearing groups when modelled as stationary receivers (Table 8-22). Behavioural effects were modelled out to several kilometres for the different piling activities; however, these may be lower in reality due to the breakwater within Fishguard Harbour.

While some of the IEFs carried forward for assessment have spawning and/or nursery grounds identified within Fishguard Harbour (Table 8-10), the piling activities associated with the Proposed Development will occur intermittently between August to November 2026, and are therefore largely outwith the spawning periods for these species (see Table 8-11). Therefore, it is not likely that auditory injury or behavioural disturbance due construction noise associated with the Proposed Development could disrupt spawning activities. In addition, given the limited temporal scale of the piling activities (such as less than half an hour of impact piling for each support pile, for a total maximal duration of two hours spread over two to ten days), the wider behavioural disturbance ranges are not predicted to have population level effects nor impede migration of the diadromous fish IEFs.

Therefore, for auditory injury, the fish and shellfish IEFs are deemed to be of medium vulnerability, low recoverability and local to international value. The sensitivity of the receptor is therefore, considered to be medium.

For behavioural disturbance, the fish and shellfish IEFs are deemed to be of low vulnerability, high recoverability and local to international value. The sensitivity of the receptor is therefore, considered to be low.

8.9.2.2.3.3 Significance of Effect

For auditory injury, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will therefore be of **minor adverse** significance, which is **not significant** in EIA terms.

For behavioural disturbance, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will therefore be of **minor adverse** significance, which is **not significant** in EIA terms.

8.9.2.3 Assessment of Operational Effects

There were two impacts scoped in for the operational phase of the Proposed Development for fish and shellfish ecology:

- Increased SSCs and associated deposition; and
- Changes in water quality (including release of sediment bound contaminants).

The impacts scoped out of further assessment for the operational phase are detailed in Table 8-26.

Table 8-26: Impacts Scoped Out of the Assessment for Fish and Shellfish Ecology in the Operational Phase.

Impact	Justification for Scoping Out
Temporary habitat loss and/or disturbance	These impacts have been scoped out of the assessment for fish and shellfish ecology as per the justification provided for the construction phase in Table 8-18.
Long term habitat loss and/or disturbance	
Accidental pollution to the surrounding environment	
Increased risk of introduction and spread of INNS	
Underwater noise from vessels	

8.9.2.3.1 Increased SSCs and Associated Deposition

8.9.2.3.1.1 Magnitude of Impact

This impact was proposed to be scoped in for the operational phase in the Scoping Report due to the potential for increased SSCs and associated deposition due to potential maintenance dredging within the operational phase. However, maintenance dredging is no longer proposed as part of the Project and, therefore, this impact is not considered further for the operational phase.

8.9.2.3.2 Changes in Water Quality (including release of sediment bound contaminants)

8.9.2.3.2.1 Magnitude of Impact

This impact was proposed to be scoped in for the operational phase in the Scoping Report due to the potential for changes in water quality due to maintenance dredging within the operational phase. However, maintenance dredging is no longer proposed as part of the Project and, therefore, this impact is not considered further for the operational phase.

8.9.3 Marine Mammals

8.9.3.1 Do Nothing Scenario

As per EIA protocol, the likely evolution of the existing marine mammal baseline in the absence of the Proposed Development (i.e. the 'Do Nothing Scenario') has been assessed. Given that the Proposed Development is located within an active harbour, it is likely that high levels of anthropogenic activity will continue under a Do Nothing Scenario, and that the established marine mammal usage (if any) within Fishguard Harbour will persist.

8.9.3.2 Assessment of Construction Effects

There was one impact scoped in for the construction phase of the Proposed Development for marine mammals:

- Underwater noise from piling (alongside other noise sources, such as dredging and demolition activities).

The impacts scoped out of further assessment for the construction phase are detailed in Table 8-27.

Table 8-27: Impacts Scoped Out of the Assessment for Marine Mammals in the Construction Phase.

Impact	Justification for Scoping Out
Temporary habitat loss and/or disturbance	Temporary and long term seabed habitat loss and/or disturbance could result in a loss of marine mammal foraging habitat. However, this loss and/or disturbance will only represent a very small fraction of the known foraging ranges of these highly mobile species. In addition, as the works associated with the Proposed Development will take place within an active harbour, it is unlikely that this area represented regular foraging habitat for the marine mammal baseline. Therefore, these impacts have been scoped out of the assessment for marine mammals.
Long term habitat loss and/or disturbance	
Increased SSCs and associated deposition	Increases in SSCs and associated deposition could have both direct and indirect impacts on marine mammals. Direct impacts to marine mammals include the reduced visibility and, thus, potentially reduced foraging ability. However, marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. The marine mammal IEFs commonly frequent coastal areas, so would likely be tolerant of turbid and silty water. Harbour porpoise and seals have been documented foraging in areas with high tidal flows (Hastie *et al*., 2016, Pierpoint, 2008), therefore, low light levels and turbid waters associated with SSCs are unlikely to impair foraging success. Furthermore, marine mammals can navigate and forage using other mechanisms than just eyesight. For example, seals can detect water movements and hydrodynamic trails with their mystacial vibrissae (i.e. whiskers); while odontocetes primarily use echolocation to navigate and find food in darkness (Grant *et al*., 2013, Marriott *et al*., 2013, Schulte-Pelkum *et al*., 2007). Although increased SSCs may arise during construction activities, the maximum impact range is expected to be highly localised, and sediments will rapidly dissipate over one tidal excursion. In addition to the large natural variability in SSCs within the Fishguard Harbour and the adaptations of marine mammals to silty, turbid water, this impact has been scoped out of the assessment for marine mammals.
Changes in water quality (including the release of sediment bound contaminants)	Changes in water quality could arise from dredging activities. This includes the potential for the release of sediment bound contaminants. The extent of sediment dispersal is not expected to cause significant elevations in water column contamination. In addition, the temporary and localised changes in water column contamination levels are considered unlikely to produce lethal and sub-lethal effects in these highly mobile species (the concentrations required to produce these effects are generally acquired through long-term, chronic exposure to prey species in which contaminants have bioaccumulated). The potential for water quality impacts to marine mammals has been scoped out of the assessment.
Accidental pollution to the surrounding environment	This impact has been scoped out of the assessment for marine mammals, using the same justification as provided for benthic subtidal and intertidal ecology in Table 8-16.

Impact	Justification for Scoping Out
Underwater noise from vessels	This impact has been scoped out of the assessment for marine mammals, using the same justification as provided for fish and shellfish ecology in Table 8-18.
Increased risk of collision with vessels	Vessels associated with the Proposed Development are unlikely to represent additional disturbance which is discernible above the already high levels of anthropogenic activity in Fishguard Harbour. Given the nature of harbours, vessels will also mainly be stationary or travelling at low speeds making the risk of collision very low. Furthermore, through regular exposure to vessel movements, marine mammals utilising Fishguard Harbour are also expected to be habituated to high levels of vessel presence. Therefore, this impact has been scoped out of the assessment for marine mammals.

8.9.3.2.1 Underwater Noise from Piling and Other Activities

8.9.3.2.1.1 Magnitude of Impact

Within the noise modelling assessment, the zones of auditory injury are of primary interest, along with estimates of behavioural impact ranges. To determine the potential spatial range of injury and behavioural change for marine mammals, a review was undertaken of available evidence, including international guidance and scientific literature (see Chapter 14: Underwater Noise and section 8.7.2). This section summarises the relevant thresholds for the onset of effects for marine mammals.

The zone of auditory injury in this study is classified as the distance over which a fleeing marine mammal can suffer a non-reversible auditory injury. Injury thresholds are based on a dual criteria approach using both un-weighted L_P and marine mammal hearing weighted SEL. The hearing weighting function is designed to represent the sensitivity for each group within which acoustic exposures can have auditory effects (further information on weightings is presented in Chapter 14: Underwater Noise). For the marine mammal IEFs included in this assessment, the categories include:

- High Frequency (HF) cetaceans: Marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales (e.g., bottlenose dolphin and common dolphin).
- Very High Frequency (VHF) cetaceans: Marine mammal species such as true porpoises, river dolphins and pygmy/dwarf sperm whales and some oceanic dolphins, generally with auditory centre frequencies above 100 kHz) (e.g., harbour porpoise).
- Phocid Carnivores in Water (PCW): True seals, earless seals (e.g., grey seal).

As presented in Table 8-8, there are various piling activities associated with the construction of the Proposed Development, with most considered to be non-impulsive noise sources. Impact piling (i.e. an impulsive noise source) will only take place in connection with the installation of eight support piles, each of which will require less than half an hour of impact piling each, for a total maximal duration of two hours of impact piling spread over two to ten days.

The criteria for impulsive and non-impulsive noise are relevant for this study given the nature of the piling activities used during the construction phase of the Proposed Development. The relevant auditory injury and TTS criteria proposed by the National Marine Fisheries Service (NMFS, 2024) are summarised in Table 7 30. NMFS (2024) were chosen over Southall *et al.*, (2019) because these thresholds represent the most up-to-date assessment of auditory sensitivity for marine mammals.

Table 8-28: Auditory Injury and TTS Onset Acoustic Thresholds for the Marine Mammal IEFs (NMFS, 2024).

Hearing Group	Parameter	Impulsive (dB)		Non-impulsive (dB)	
		Auditory Injury	TTS	Auditory Injury	TTS
HF cetaceans (bottlenose dolphin and common dolphin)	L_P, (unweighted)	230	224	-	-
	SEL, (weighted)	193	178	201	181
VHF cetaceans (harbour porpoise)	L_P, (unweighted)	202	196	-	-
	SEL, (weighted)	159	144	181	161
PCW (grey seal)	L_P, (unweighted)	223	217	-	-
	SEL, (weighted)	183	168	195	175

The noise thresholds for disturbance of marine mammals are not as mature as the auditory injury and TTS thresholds and several different approaches exist. For the non-impulsive threshold, a conservative but realistic approach based on a review of Danish and UK guidance documents, as well as scientific reviews has been applied. The general approach reflects the approach recommended by the Danish guidance (Tougaard, 2021), by a review submitted to the JNCC (Nedwell *et al*., 2007), and by a review for NRW (Sinclair *et al*., 2023). These all recommend or acknowledge the use of a weighted received level along with a hearing group specific threshold.

Using 21 suitable studies from these reports, hearing group specific thresholds have been defined in order to determine weighted behavioural disturbance levels for non-impulsive noise (here understood to be noise with a kurtosis <40). These thresholds are compared to the range where the hearing group weighted received level exceeds the relevant threshold and are presented in Table 8-29. Compared to the recommended use of NMFS levels of 120 dB SPL (unweighted) for continuous noise (NRW, 2023a), these limits are comparable, but account for the hearing abilities of each group.

Given the considerable variation in the data (up to 40 dB where both mild disturbance and severe disturbance was included), a conservative value of either the 10th percentile value or the minimal value was selected, whichever was greater (see Chapter 14: Underwater Noise for further information).

Table 8-29: Behavioural Disturbance Criteria for the Marine Mammal IEFs, based on Danish, JNCC, and NRW Guidance (Nedwell *et al*., 2007, Sinclair *et al*., 2023, Tougaard, 2021).

Marine Mammal Hearing Group	Non-Impulsive Threshold (SPL)	Impulsive Threshold
HF cetaceans (bottlenose dolphin and common dolphin)	92	160 dB LP* (NMFS level B-harassment)
VHF cetaceans (harbour porpoise)	95	
PCW (grey seal)	108	

Marine Mammal Hearing Group	Non-Impulsive Threshold (SPL)	Impulsive Threshold
* The NMFS guidance specifies use of SPL but does not mention a measurement duration. This means that the level is not well defined and using the most common legacy use of SPL for impulsive noises (SPL over the duration of 90% of the pulse energy) is problematic given that the duration over which the SPL is measured changes with receptor location (both depth and range) and can vary substantially. The use of dB L_P is conservative as the SPL over any duration will always be lower than the L_P.		

Dredging

The results of the noise modelling indicated that dredging has little to no risk of exceeding TTS or auditory injury thresholds for marine mammals but estimates for exceedance of the behavioural thresholds extend to 5,600 m (Table 8-30). There is considerable variation in the extent of the noise from the dredging depending on the location of the dredging vessel, with the breakwater and headland to the east (Ynys Dinas/Dinas Island), blocking noise transmission (see Figure 8-21 and Figure 8-22).

Table 8-30: Threshold Exceedance Ranges for Dredging for Marine Mammals.

Condition		HF Cetaceans	VHF Cetaceans	PCW
Behavioural disturbance range	90th percentile range [m]	4,000	4,000	4,300
	Maximal range [m]	5,600	5,600	5,600
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
TTS, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10

Impact Piling

The results of the noise modelling indicated that impact piling of the eight support piles had the greatest potential for an adverse effect on marine mammals out of the different piling scenarios involved with the construction of the Proposed Development. The instantaneous injury and TTS risks are presented using dual metrics, SEL (weighted) using a 1 seconds' exposure and SPL_p (unweighted - peak pressure). The worst case is 120 m for VHF cetaceans using the SEL metric, with 10 m predicted for all other species (Table 8-31). The accumulated sound exposure risk worst case is for the no soft start scenario, for the VHF cetacean group at 880 m. In the soft start scenario this is reduced to 630 m (Table 8-31).

Ranges for exceedance of the exposure to behavioural disturbance thresholds are limited by line of sight for all species groups with up to 4,900 m modelled (Table 8-31). These cover the part of

Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island) (see Figure 8-23).

Table 8-31: Marine Mammal Threshold Exceedance Ranges for Impact Piling at the Support Piles of the Main Pontoon.

Condition		HF Cetaceans	VHF Cetaceans	PCW
Behavioural disturbance range	90th percentile range [m]	2,200	2,200	2,200
	Maximal range [m]	4,900	4,900	4,900
TTS,1 seconds' exposure	90th percentile range [m]	20	1,100	260
	Maximal range [m]	20	1,100	260
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10	120	10
	Maximal range [m]	<10	120	10
TTS, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	900	1,900	2,000
	Maximal range [m]	2,500	4,300	4,400
Auditory injury, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	30	870	690
	Maximal range [m]	40	880	720
TTS, sound exposure, fleeing receiver, 20-minute soft start	90th percentile range [m]	170	1,900	2,000
	Maximal range [m]	2,500	4,300	4,400
Auditory injury, sound exposure, fleeing receiver, 20-minute soft start	90th percentile range [m]	<10	600	80
	Maximal range [m]	<10	630	110
TTS, peak pressure	90th percentile range [m]	10	30	10
	Maximal range [m]	10	50	10
Auditory injury, peak pressure	90th percentile range [m]	10	10	10
	Maximal range [m]	10	10	10

Piling

The bankseat piles are wholly separated by the water by at least 1 m of made ground, providing an effective noise barrier. This activity (alongside demolition activities) has little to no risk of exceeding the auditory injury thresholds for marine mammals, with ranges of <10 m modelled (Table 8-32). The TTS threshold may be exceeded up to 830 m and 680 m from the source for the VHF and PCW hearing groups, respectively. However, for the HF hearing group, the TTS threshold was also modelled as being exceeded at <10 m (Table 8-32). Behavioural disturbance ranges were modelled out to 4,800 m, however, in reality these are limited by line of sight and cover the part of Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 8-32: Threshold Exceedance Ranges for Bankseat Piling.

Condition		HF Cetaceans	VHF Cetaceans	PCW
Behavioural disturbance range	90th percentile range [m]	2,200	2,200	2,200
	Maximal range [m]	4,800	4,800	4,800
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
TTS, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	410	310
	Maximal range [m]	<10	830	680
Auditory injury, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10

Vibro Piling

Vibro piling for the main pontoon pile and new bankseat piles (if required) is representative (or louder than) the vibro piling required at the support piles, therefore only the results for the former are presented. These modelling outputs also cover the use of vibro piling for the extraction of the temporary piles. The noise modelling presented in Chapter 14: Underwater Noise suggests that vibro piling has little to no risk of exceeding the auditory injury ranges for the marine mammal hearing groups, with ranges of <10 m predicted (Table 8-33). The TTS threshold may be exceeded up to 30 m and <10 m from the source for the PCW and HF hearing groups, respectively (Table 8-33). However, for the VHF hearing group, the TTS threshold may be exceeded up to 270 m from the source (Table 8-33). Ranges for behavioural disturbance were modelled out to 4,900 m but are limited by line of sight and cover the part of Fishguard bay as enclosed by the northern breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 8-33: Threshold Exceedance Ranges for Vibro Piling at the Proposed Development.

Condition		HF Cetaceans	VHF Cetaceans	PCW
Behavioural disturbance range	90th percentile range [m]	2,200	2,200	2,200
	Maximal range [m]	4,900	4,900	4,900
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
TTS, sound exposure, fleeing	90th percentile range [m]	<10	190	20
	Maximal range [m]	<10	270	30

Condition		HF Cetaceans	VHF Cetaceans	PCW
receiver, no soft start				
Auditory injury, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10

Coring/Rotary Drilling

Coring/rotary drilling of the main pontoon pile and new bankseat piles (if required) has little to no risk of exceeding the auditory injury or TTS thresholds of the marine mammal hearing groups, with ranges of <10 m modelled for all (Table 8-34). Behavioural disturbance ranges were the lowest of all scenarios modelled for pile installation, at up to 480 m to 490 m for the PCW and VHF hearing groups and to 1,600 m for the HF group (Table 8-34).

Table 8-34: Threshold Exceedance Ranges for Coring/Rotary Drilling of the Main Ponton and Bankseat Piles.

Condition		HF Cetaceans	VHF Cetaceans	PCW
Behavioural disturbance range	90th percentile range [m]	1,100	450	460
	Maximal range [m]	1,600	490	480
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, 1 seconds' exposure	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
TTS, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10
Auditory injury, sound exposure, fleeing receiver, no soft start	90th percentile range [m]	<10	<10	<10
	Maximal range [m]	<10	<10	<10

The piling and other construction activities proposed during the construction phase of the Proposed Development were assessed in relation to the relevant thresholds for underwater noise effects on marine mammals. Generally, the fact that Fishguard Harbour forms an enclosure, serves to minimise the volume of water for the noise to travel through (see Figure 8-23). Once out of Fishguard Harbour, vessel noise (or general wind and wave noise) from the Irish Sea will likely drown out the noise associated with the Proposed Development. Overall, the noise modelling suggested that impact piling had the greatest potential to cause auditory injury to the marine mammal IEFs. Auditory injury was modelled out to tens of metres for the HF hearing group (bottlenose dolphin and common dolphin) and to hundreds of metres for the VHF (harbour porpoise) and PCW (grey seal) hearing groups (Table 8-31).

The impact piling, therefore, poses a potential risk of causing auditory injury to the marine mammal IEFs if not properly managed. Mitigation is therefore proposed to ensure that the risk of any auditory injuries in marine mammals is reduced to negligible. The inclusion of a visual watch period before impact piling starts (carried out by a competent Marine Mammal Observer (MMOb)), along

with a period of impact piling of lower noise emissions (e.g. the 20-minute soft start) will reduce the potential for any marine mammals to suffer auditory injury (see further details on these mitigation measures in section 8.10). This will effectively mean that the risk of adverse effects on marine mammals will be reduced to negligible. The impact piling will only take place in connection with the installation of eight support piles, each of which will require less than half an hour of impact piling each, for a total maximal duration of two hours of impact piling spread over two to ten days.

Behavioural effects were modelled out to several kilometres for the different piling and construction activities, out to a maximum of 5.6 km for dredging and 4.9 km for impact piling of the support piles at the main pontoon. However, these may be lower in reality due to the presence of the breakwater within Fishguard Harbour. Given the limited temporal scale of these activities (such as less than half an hour of impact piling for each support pile, for a total maximal duration of two hours spread over two to ten days), the wider behavioural disturbance ranges are not predicted to have population level effects upon the marine mammal IEFs.

Overall, for auditory injury, the impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

For behavioural disturbance, the impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

8.9.3.2.1.2 Sensitivity of the Receptor

Auditory Injury

For harbour porpoise, it has been reported that hearing impairment due to piling noise is likely to occur where the source frequencies overlap the range of peak sensitivity rather than across the whole frequency hearing spectrum (Kastelein *et al*., 2013). This study demonstrated that harbour porpoise hearing at the key frequency for echolocation (around 125 kHz) was not affected by simulated piling sound (broadband spectrum). Instead, a measurable threshold shift in hearing was induced between frequencies of 4 kHz to 8 kHz, although the magnitude of the shift was relatively small (2.3 dB to 3.6 dB at 4 kHz to 8 kHz) (Kastelein *et al*., 2013). Since this study was published, the authors have confirmed that sensitivity declined sharply above 125 kHz (Kastelein *et al*., 2017), providing further information to confirm the hearing range and sensitivities of harbour porpoise.

As described for harbour porpoise above, there are frequency-specific differences in the onset and growth of a sound-induced threshold shift in relation to the characteristics of the sound source and hearing sensitivity of bottlenose dolphin and common dolphin. For example, Finneran and Schlundt (2013) increased susceptibility to auditory fatigue between frequencies of 10 kHz to 30 kHz (from an impulsive source) in two captive bottlenose dolphins.

Although seals are less reliant on hearing for foraging than cetaceans, they may rely on it for communication and predator avoidance (Deecke *et al*., 2002). They use their vibrissae (i.e. whiskers) to detect swimming fish (Schulte-Pelkum *et al*., 2007), however, in certain conditions, they may also use noise produced by fish to forage. Therefore, a reduction in fitness, reproductive output and longevity are potential ecological consequences of a sound induced threshold shift (Kastelein *et al*., 2018). Recently, Reichmuth *et al*. (2019) reported the first confirmed case of auditory injury following a known acoustic exposure event in a seal species. This study assessed the underwater hearing sensitivity of a trained harbour seal before and immediately following exposure to 4.1 kHz tonal fatiguing stimulus. Rather than the expected pattern of TTS onset and growth, an abrupt threshold shift of >47 dB (i.e. the difference between the pre-exposure and post-exposure hearing thresholds in dB) was observed half an octave above the exposure frequency. Hearing at 4.1 kHz recovered within 48 hours, however, there was an auditory injury of at least 8 dB at 5.8 kHz, and hearing loss was evident for more than ten years (Reichmuth *et al*., 2019). Although Hastie *et al*. (2015) suggest a lower sensitivity of seals to auditory injury, based on

uncertainties and the results of Reichmuth *et al*. (2019), a precautionary approach has been taken in the assessment of sensitivity to auditory injury for grey seal.

Auditory injury is permanent and irreversible hearing damage. Therefore, the marine mammal IEFs are sensitive to auditory injury as it could affect key life functions (e.g. communication, predator detection, foraging, mating, and maternal fitness) and lead to a chronic and/or acute health problems (Erbe *et al*., 2018). Due to a lack of empirical data, it is challenging to equate the onset of auditory injury with biologically significant responses, however a potential consequence is a deterioration in health, which could potentially lead to reduced birth rate in females and mortality of individuals (Costa, 2012). The assessment of sensitivity considers the uncertainty surrounding the effects of auditory injury on survival and reproduction of the marine mammal IEFs and the importance of sound for echolocation, foraging and communication. Although a threshold shift may occur outside of the most sensitive hearing range, the occurrence of auditory injury in the marine mammal IEFs, due to the species reliance on hearing, could be detrimental to an individual's capacity for survival and reproduction. Since auditory is irreversible, the marine mammal IEFs are deemed to be of high vulnerability, low recoverability, and international value. The sensitivity of the receptor is therefore considered to be high.

Behavioural Disturbance

Behavioural disturbance due to increased underwater noise from piling may lead to the interruption of normal behaviours (such as feeding or breeding), avoidance behaviour, and/or increased stress levels. The extent to which marine mammal will be behaviourally affected, however, is very much context-dependent and varies both inter- and intra-specifically. Factors such as the activity state of the receiving animal, the nature and novelty of the sound (i.e. previous exposure history), and the spatial relation between sound source and receiving animal are important in determining the likelihood of a behavioural response and therefore their sensitivity (Ellison *et al*., 2012).

Building on earlier work presented in Southall *et al*. (2007) and the growing research in this area, Southall *et al*. (2021) introduced a concept of behavioural response severity spectrum with progressive severity of possible responses within three response categories: survival (e.g. resting, navigation, defence), feeding (e.g. search, consumption, energetics), and reproduction (e.g. mating, parenting). For example, at the point of the spectrum between seven to nine (where sensitivity is highest), displacement is likely to occur. This could result in movement of animals to areas with an increased risk of predation and/or with sub-optimal feeding grounds. A failure of vocal mechanisms to compensate for sound can result in interruption of key reproductive behaviour including mating and socialising, causing a reduction in an individual's fitness leading to potential breeding failure and impact on survival rates. There are limitations of the single step-threshold approach for strong disturbance and mild disturbance as it does not account for interspecific, or intraspecific variance or context-based variance. However, according to Southall *et al*. (2021), marine mammals within an area of 'strong disturbance' would be most sensitive to behavioural effects and therefore may have a response score of seven or above. Mild disturbance (scored from four to six) could lead to effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour. Therefore, at the lower end of the behavioural response spectrum, the potential severity of effects is reduced and whilst there may be some detectable responses that could result in effects on the short term health of animals, these are less likely to impact on the survival rate of the animal.

Harbour porpoise have a high metabolic requirement, with a need to forage frequently to maintain sufficient fat reserves for insulation. A study of six, non-lactating, harbour porpoise demonstrated that they require between 4% and 9.5% of their body weight in fish per day (Kastelein *et al*., 1997). This species forages almost continuously day and night to achieve their required calorific intake (Wisniewska *et al*., 2016), meaning they are vulnerable to starvation if foraging is interrupted. A study of the response of harbour porpoise to piling noise during harbour construction works at the Nigg Energy Park in the Cromarty Firth (Scotland) concluded that individuals were not excluded from the sites in the vicinity of impact of vibration piling (Graham *et al*., 2017). However, some

small effects were detected, such as lower probability of occurrence during periods of harbour construction (Graham *et al*., 2017). Harbour porpoise may be able to avoid disturbed areas and forage elsewhere, there is potential for the reproductive success of some individuals to be impaired. It is anticipated that there would be some adaptability to the elevated underwater noise levels from piling at the Proposed Development and therefore survival rates are not likely to be affected. However, the sensitivity of the receptor has been assessed conservatively, due to uncertainties associated with the effects of behavioural disturbance on vital rates of harbour porpoise.

In contrast, bottlenose dolphin and common dolphin are not considered to be as vulnerable to behavioural disturbance as harbour porpoise, due to their larger body sizes and lower metabolic rates. Therefore, the necessity to forage frequently is lower in comparison. Common dolphin have a largely offshore distribution around Pembrokeshire, which is likely to be seasonal (see Figure 8-17; Evans and Waggitt (2023)). However, the Cardigan Bay bottlenose dolphin population is more likely to be present year-round, and could occur along the coast, in the vicinity of Fishguard Harbour (see Figure 8-16; Evans and Waggitt (2023)).

There is limited information is available regarding the specific sensitivities of bottlenose dolphin and common dolphin to behavioural disturbance from piling noise as most studies have concentrated on harbour porpoise. A study of the response of bottlenose dolphin to piling noise during harbour construction works at the Nigg Energy Park in the Cromarty Firth (Scotland) recorded a measurable (albeit weak) response to impact and vibration piling with animals reducing the amount of time they spent in the vicinity of the construction works (Graham *et al*., 2017). Further, the results of a study by Fernandez-Betelu *et al*. (2021) suggested that impulsive noise generated during piling at the Moray East and Beatrice offshore wind farms did not cause any displacement of bottlenose dolphins from their population range.

The Southall *et al*. (2021) severity spectrum applies across all marine mammals and therefore it is expected that strong disturbance in the near field could result in displacement whilst mild disturbance over greater ranges would result in other, less severe behavioural responses in bottlenose dolphin and common dolphin. These dolphin species may be able to avoid the disturbed area and whilst there may be some impacts on reproduction in closer proximity to the source (i.e. within the area of ‘strong disturbance’), these are unlikely to impact on survival rates as some tolerance is expected to build up over the course of the piling. It is anticipated that animals would return to previous activities once the piling had ceased.

Levels of mild disturbance could also impact grey seals, however this constitutes only slight behavioural changes, such as changes in swimming speed or direction, and is unlikely to result in population level effects. Hastie *et al*. (2021) measured the relative influence of perceived risk of a sound (silence, pile driving, and a tidal turbine) and prey patch quality (low density versus high density), on a grey seal in an experimental pool environment. The study found foraging success was highest under silence, but under tidal turbine and pile driving treatments success was similar at the high-density prey patch but significantly reduced under the low-density prey patch. Therefore, avoidance rates were dependent on the quality of the prey patch as well as the perceived risk from the noise source, and it can therefore be anticipated such decisions are consistent with a risk/profit balancing approach (Hastie *et al*., 2021).

Seal behaviour during piling for offshore wind farm installation has been studied based on empirical data (Russell *et al*., 2016). Within this study, harbour seal abundance significantly reduced from the piling activity over a distance of up to 25 km and there was a 19% to 23% decrease in usage within this range. Nevertheless, displacement was limited to pile driving activity only, and individuals returned rapidly to baseline levels of activity within two hours of cessation of the piling (Russell *et al*., 2016). Although this study focussed on harbour seal, it could be applicable to grey seal, due to the similarities between the two species. Aarts *et al*. (2018) recorded a range of behavioural reactions of tracked grey seal to pile driving during construction of the two wind farms. These reactions ranged from altered surfacing and diving behaviour, changes in swimming direction, or coming to a halt. In some cases, however, no apparent changes in diving

behaviour or movement were observed (Aarts *et al*., 2018). Similar to the conclusions drawn by Hastie *et al*. (2021), the study by Aarts *et al*. (2018) indicated animals were balancing risk with profit. Approximately half of the tracked grey seal were absent from the piling area altogether, but this could have been because they were drawn to other more profitable areas as opposed to active avoidance of the sound, although a small sample size (n = 36 animals) meant that no firm conclusions could be reached (Aarts *et al*., 2018). It was notable that, in some cases, grey seal exposed to pile driving at distances shorter than 30 km returned to the same area on subsequent trips (Aarts *et al*., 2018). This suggested that the incentive to go to the area was stronger than potential deterrence effect of underwater sound from pile driving in some animals.

Changes in behaviour and possible subsequent barrier effects could affect the ability of grey seal to accumulate the energy reserves prior to both reproduction and lactation (Sparling *et al*., 2006). Females increase their foraging effort (including increased diving behaviour) prior to the breeding season, maximising energy allocation to reproduction. Therefore, grey seal foraging at-sea may be most vulnerable in this period, as maternal energy storage is extremely important to offspring survival and female fitness (Mellish *et al*., 1999). However, as presented in Figure 8-19, at-sea density of grey seal is very low in Fishguard Harbour and the wider area, suggesting that piling at the Proposed Development will not cause exclusion from key foraging grounds.

Overall, for behavioural disturbance, the marine mammal IEFs are deemed to be of high vulnerability, high recoverability and international value. The sensitivity of the receptor is therefore, considered to be medium.

8.9.3.2.1.3 Significance of Effect

For auditory injury, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. The effect will therefore be of **minor adverse** significance, which is **not significant** in EIA terms.

For behavioural disturbance, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will therefore be of **minor adverse** significance, which is **not significant** in EIA terms.

8.9.3.3 Assessment of Operational Effects

There were no impacts scoped in for the operational phase of the Proposed Development for marine mammals. Impacts scoped out of further assessment for the operational phase are detailed in Table 8-35.

Table 8-35: Impacts Scoped Out of the Assessment for Marine Mammals in the Operational phase.

Impact	Justification for Scoping Out
Temporary habitat loss and/or disturbance	These impacts have been scoped out of the assessment for marine mammals as per the justification provided for the construction phase in Table 8-27.
Long term habitat loss and/or disturbance	
Increased SSCs and associated deposition	
Changes in water quality (including the release of sediment bound contaminants)	
Accidental pollution to the surrounding environment	
Underwater noise from vessels	
Increased risk of collision with vessels	

8.10 Mitigation

8.10.1 Construction Phase Mitigation Measures

There are a range of mitigation measures associated with the construction phase of the Proposed Development:

- Piling will include a combination of a 20-minute soft start, as detailed in Chapter 14: Underwater Noise, with a 12 dB reduction in source level. This will lower the auditory injury exceedance range to less than 630 m for the VHF group and less than 340 m for the remaining hearing groups (HF, PCW, and fish) for a 60-minute impact piling duration. Additional soft start time will not lessen the effects as the noise from the soft start itself will drive the exceedance ranges. Although soft starts are more appropriate mitigation for marine mammals compared to fish, the 20-minute soft start may also act as a deterrent for fish receptors.
- Adoption of JNCC (2010) guidelines for minimising the risk of injury to marine mammals from piling noise. As per Chapter 14: Underwater Noise, this will involve a 30-minute pre-piling visual watch for absence of marine mammals with a mitigation zone by a qualified MMOb. While the MMOb mitigation zone would be a minimum of 500 m, the calmer waters resulting from the breakwaters would enable the detection of marine mammals to ranges over 630 m. The end of the northern breakwater, approximately 1,100 m away from the linkspan, could be used as a visual que to aid in determining this range.
- Development of and adherence to a Vessel Management Plan (VMP) and Navigation Safety Plan (NSP).
- Development of, and adherence to a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).
- Development of and adherence to an EMP, which will include a MPCP, Marine Mammal Mitigation Plan (MMMP), and an INNS Management Plan.
- All relevant Health and Safety Executive (HSE) procedures will be followed.

8.10.2 Operational Phase Mitigation Measures

There are a range of mitigation measures associated with the operation phase of the Proposed Development:

- Development of and adherence to an EMP.
- Development of and adherence to a VMP and NSP.
- All relevant HSE procedures will be followed.

8.10.3 Future Monitoring

There is no future monitoring proposed for marine biodiversity.

8.11 Assessment of Residual Effects

Underwater noise is a transient pollutant; once the noisy activity stops, the immediate effect ceases. Residual effects associated with underwater noise during piling could include avoidance of the area by marine mammals. However, no significant impacts associated with underwater noise were concluded and the mitigation measures outlined in section 8.10 are considered sufficient to reduce the potential for residual effects.

Residual effects are not predicted to occur for the other impacts considered in section 8.9, due to the limited spatial and temporal scales associated with the Proposed Development, alongside the mitigation measures outlined in section 8.10.

8.12 Cumulative Effects

The Cumulative Effects Assessment (CEA) investigated the potential for impacts associated with the Proposed Development cumulatively with other plans and projects. The plans and projects relevant to the CEA were based upon the results of a screening exercise to produce a CEA long list. A highly precautionary buffer of 100 km was used to identify the plans and projects that formed the CEA long list (Figure 8-24).

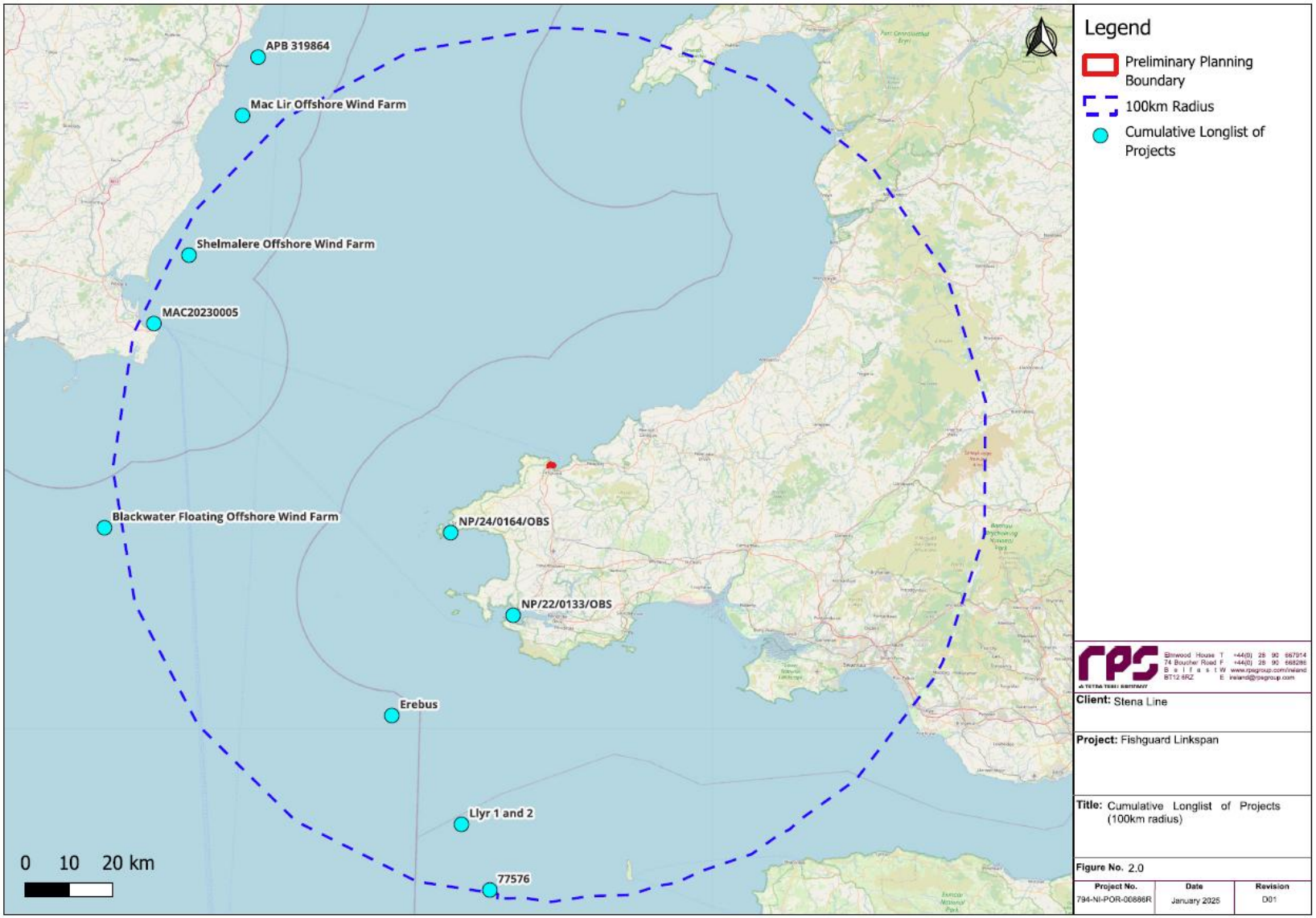

Figure 8-24: CEA Long List of Plans and Projects within 100 km of the Site Boundary.

Further buffers were then used to screen these plans and projects out of further assessment in the CEA:

- Benthic subtidal and intertidal ecology:
  - Of all the impacts considered in the assessment of the Proposed Development alone, the impact of increased SSCs and associated deposition has the potential for the largest ZoI upon benthic receptors. As this impact was assessed using the outputs from Chapter 10: Coastal Processes, the Coastal Processes Study Area (Figure 8-25) was used to screen in/out other plans and projects from the CEA long list. This study area was based on tidal ellipses within Fishguard Harbour and the adjacent coastline and extended out to approximately 7 km from the Site Boundary. This area therefore accounts for one tidal excursion, indicating the maximum distance suspended sediments could travel in one spring tidal cycle. There were no projects from the CEA long list within this buffer, which represents the maximum ZoI upon benthic ecology from the Proposed Development alone; therefore, no plans and projects were carried forwards in the CEA for benthic subtidal and intertidal ecology.
- Fish and shellfish ecology:
  - Behavioural disturbance associated with piling was modelled out to 4.9 km for fish and shellfish (Chapter 14: Underwater Noise and section 8.9.2.2.3). As this is smaller than the Coastal Processes Study Area, i.e. the ZoI associated with the impact of increased SSCs and associated deposition, the screening buffer described above for benthic subtidal and intertidal ecology was also applied to fish and shellfish ecology. As above for benthic subtidal and intertidal ecology, there were no projects from the CEA long list within this buffer; therefore, no plans and projects were carried forwards in the CEA for fish and shellfish ecology.

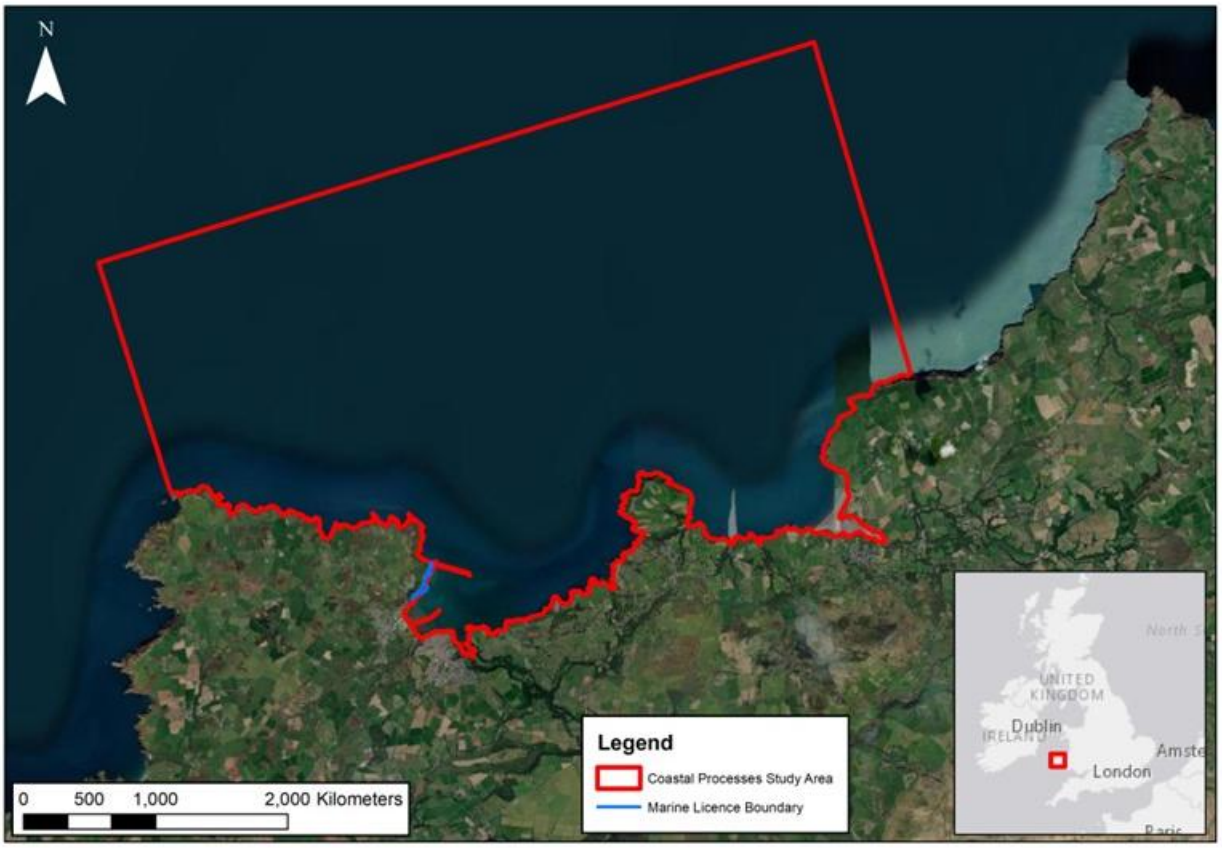

Figure 8-25: Coastal Processes Study Area used to Screen Out Plans and Projects for Benthic Subtidal and Intertidal Ecology and Fish and Shellfish Ecology.

- Marine mammals:
  - Behavioural disturbance associated with piling was modelled out to 4.9 km for marine mammals (Chapter 14: Underwater Noise and section 8.9.3.2.1). Marine mammal MUs and the OSPAR Region III for grey seal are often used to identify plans and projects within a CEA long list for marine mammal receptors. However, given the highly limited spatial and temporal scale of the Proposed Development, screening buffers of that size were not considered appropriate. Therefore, the 100 km buffer used to generate the CEA long list (Figure 8-24) was considered to be suitably precautionary for marine mammals. There were no plans and projects identified within the CEA long list with the potential to produce noise that were within this distance or overlapped temporarily with the noise producing activities associated with the Proposed Development. Therefore, there were no plans or projects from the CEA long list that had the potential to result in cumulative effects on marine mammals with respect to underwater noise, and no plans and projects were carried forwards in the CEA for marine mammals.

Overall, there were no projects on the CEA long list screened into the CEA for any of the marine biodiversity receptor groups. This was due to the following reasons:

- No spatial overlap with the screening buffers defined for the marine biodiversity receptors;
- No temporal overlap with activities associated with the Proposed Development; and/or
- No potential receptor/impact pathway.

Therefore, the no cumulative effects are predicted to occur upon marine biological receptors as a result of the Proposed Development and other plans and projects.

8.12.1 Effects interactions

No inter-related effects are predicted to occur for any of the marine biodiversity receptors. This is due to the limited temporal and spatial scale of the activities associated with the Proposed Development.

8.13 Limitations of the Assessment

The lack of site-specific surveys for the Proposed Development had the potential to be a limiting factor in the marine biodiversity assessment. However, a benthic validation survey is currently being undertaken, and the results of which will be published imminently. This survey will provide further information to support the baseline and support the conclusions of the impact assessment on benthic ecology. Furthermore, a Phase 1 Intertidal Survey was conducted in April 2025, the results of which will also be used to provide further information on the baseline post-submission of the EIA.

As detailed in Chapter 14: Underwater Noise, there were limitations to the underwater noise modelling accuracy. However, these were addressed by assuming conservative values (leading to a larger assessed impact and effect) for inputs that are critical to accuracy (e.g. water depth, sediment characteristics, animal swimming speeds, source levels).

8.14 Summary of Effects and Conclusion

A summary of the assessment of significance for the different marine biodiversity receptors is presented in Table 8-36.

Table 8-36: Impact Assessment Summary Table.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Benthic Subtidal and Intertidal Ecology									
Temporary habitat loss and/or disturbance	✓	×	None applicable	Low	Benthic subtidal community IEF: medium Benthic intertidal IEFs: low	All IEFs: Minor adverse	None required	None	None
Long term habitat loss and/or disturbance	✓	✓	None applicable	Low	Benthic subtidal community IEF: high Benthic intertidal IEFs: low	All IEFs: Minor adverse	None required	None	None
Increased SSCs and associated deposition	✓	×	None applicable	Low	Benthic subtidal and intertidal IEFs: low	All IEFs: Minor adverse	None required	None	None
Changes in water quality (including the release of sediment bound contaminants)	✓	×	None applicable	Low	Benthic subtidal and intertidal IEFs: low	All IEFs: Minor adverse	None required	None	None
Increased risk of introduction and spread of INNS	✓	✓	Development and adherence to an INNS	Low	Benthic subtidal community IEF: low	All IEFs: Minor adverse	None required	None	None

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
			Management Plan		Benthic intertidal IEFs: high				
Fish and Shellfish Ecology									
Increased SSCs and associated deposition	✓	×	None applicable	Low	Low	Minor adverse	None required	None	None
Changes in water quality (including the release of sediment bound contaminants)	✓	×	None applicable	Low	Low	Minor adverse	None required	None	None
Underwater noise from piling and other activities	✓	×	None applicable	Low	Auditory injury: medium Behavioural disturbance: low	Minor adverse	None required	None	None
Marine Mammals									
Underwater noise from piling and other activities	✓	×	20-minute soft start for impact piling and pre-piling survey carried out by a qualified MMOb	Low	Auditory injury: high Behavioural disturbance: medium	Minor adverse	None required	None	None

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8.16 List of Abbreviations / Acronyms

BAP – Biodiversity Action Plan

BGS – British Geological Society

CCW – Countryside Council for Wales

CEA – Cumulative Effects Assessment

CI – Confidence Interval

CIEEM – Chartered Institute for Ecology and Environmental Management

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora

CMS – Construction Method Statement

CoCP – Code of Construction Practice

DDV – Drop Down Video

EcIA – Ecological Impact Assessment

EIA – Environmental Impact Assessment

EMODnet – European Marine Observation and Data Network

EMP – Environmental Management Plan

EPS – European Protected Species

ES – Environmental Statement

GES – God Environmental Status

GeS – Good Ecological Status

HF – High Frequency

HSE – Health and Safety Executive

IAMMWG – Interagency Marine Mammal Working Group

ICES – International Council for the Exploration of the Seas

IEF – Important Ecological Feature

IMO – International Maritime Organisation

INNS – Invasive Non Native Species

JNCC – Joint Nature Conservation Committee

JUB – Jack Up Barge

L_p – Maximal instantaneous Sound Pressure Level (SPL)

MarESA – Marine Evidence Based Sensitivity Assessment

MarLIN – Marine Life Information Network

MARPOL – International Convention for the Prevention of Pollution from Ships

MCZ – Marine Conservation Zone

MDS – Maximum Design Scenario

MMMP – Marine Mammal Mitigation Plan

MMO – Marine Management Organisation

MMOb – Marine Mammal Observer

MPA – Marine Protected Area

MPCP – Marine Pollution Contingency Plan

MU – Management Unit

N/A – Not Applicable

NBN – National Biodiversity Network

NMBAQC – North East Atlantic Marine Biological Analytical Quality Control

NMFS – National Marine Fisheries Service

NRW – Natural Resources Wales

NRW(A) – Natural Resources Wales Advisory

NRW PS – Natural Resources Wales Permitting Service

NSP – Navigational Safety Plan

OSPAR – Oslo Paris Convention

PAH – Polycyclic Aromatic Hydrocarbon

PCB – Polychlorinated Biphenyl

PCW – Phocid Carnivores in Water

PSA – Particle Size Analysis

RIAA – Report to Inform Appropriate Assessment

RNLI – Royal National Lifeboat Institution

SAC – Special Area of Conservation

SCOS – Special Committee on Seals

SCANS – Small Cetaceans in European Atlantic Waters and the North Sea

SEL – Sound Exposure Level

SPA – Special Protection Area

SPL – Sound Pressure Level

SPT – Standard Penetration Testing

SSC – Suspended Sediment Concentration

SSSI – Site of Special Scientific Interest

TSHD – Trailer Suction Hopper Dredger

TTS – Temporary Threshold Shift

UK – United Kingdom

VHF – Very High Frequency

VMP – Vessel Management Plan

WFD – Water Frameworks Directive

WSDOT – Washington State Department of Transport

ZoI – Zone of Impact

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 9 Biodiversity Terrestrial and Ornithology

9 Terrestrial ecology and ornithology

9.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on terrestrial ecology and ornithological receptors. This chapter considers the potential impacts to terrestrial ecology and ornithological receptors from the Project during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study to assess current ecological baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on habitats and species of local importance or higher;
- Define mitigation measures in relation to the proposed construction and operational phases, where necessary; and,
- Predict residual impacts.

The information presented in this document is based upon ecological surveys and assessments of the Site undertaken in 2025. It has been prepared as per Chartered Institute of Ecology and Environmental Management’s Guidelines for Ecological Impact Assessment (CIEEM, 2024).

The assessment presented is informed by the following key chapters of the ES.

- Chapter 2: Project Description
- Chapter 4: Environmental Impact Assessment Process and Methodology
- Chapter 5: Scoping and Consultation
- Chapter 13: Noise and Vibration
- Chapter 14: Underwater Acoustics

Potential effects on the marine environment from the proposed development and the associated mitigation measures in relation to impacts are detailed in Chapter 8 Marine Ecology.

9.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on terrestrial ecology and ornithological receptors. In particular, this ES chapter:

- Defines the relevant study areas and Zone of Influence for the assessment (section 9.3)
- Summarises the legislative and policy background relevant to the assessment (section 9.4)
- Presents a summary of the scoping response and subsequent consultation (section 9.5).
- Describes the surveys undertaken to inform the assessment (section 9.6).
- Defines the impact assessment methodology including defining important ecological features, assigning geographical importance and assessing overall impact significance (section 9.7)
- Identifies the limitations of the baseline information (section 9.8).
- Presents the baseline conditions derived from the habitat survey, external building inspections protected species scoping assessment (Appendix 9.1) and Black guillemot survey (Appendix 9.2) with summaries in section 9.9.

- Gives a brief summary of the Proposed Development (section 9.10).
- Presents an assessment of the potential likely significant effects on terrestrial ecology and ornithological receptors arising from the Proposed Development (section 9.11) based on the information available on the elements of construction and operation of the site.
- Highlights monitoring and/or additional mitigation measures (see section 9.11) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment.
- Describes mitigation that will be implemented both as part of the Proposed Development design and as additional mitigation that will be implemented as part of the Proposed Development to deliver a Net benefit for Biodiversity (section 9.12).
- Presents an assessment of residual effects taking into account all of the proposed mitigation (section 9.13).
- Provides an assessment of cumulative effects with other relevant developments (section 9.14)
- Describes any limitations to the impact assessment (section 9.15)

9.3 Study area

The Study Areas extend from the Proposed Development site boundary.

- International statutory designated sites and component designated sites – 15km;
- National statutory designated sites – 2km;
- Priority Habitats and ancient woodland – 2km;
- Priority and protected species - 2km; and,
- Terrestrial habitats and targeted further survey – Application Site and adjoining terrestrial habitats within 50m.

These Study Areas have been developed based on standard good practice produced by CIEEM (CIEEM, 2017), and (CIEEM, 2024) in addition to professional judgement and to ensure the potential Zone of Influence (ZoI) for the Proposed Development are appropriately covered. The ZoI for the Proposed Development is defined as the area over which ecological features may be affected by biophysical changes because of the activities associated with Proposed Development (CIEEM, 2018).

9.4 Policy context

9.4.1 EU legislation and policy

The following EU legislation relating specifically to ecology and has been considered where relevant:

- The Conservation of Habitats and Species Regulations 2017 (as amended).

9.4.2 National legislation and policy

The following UK and ‘national’ legislation relating specifically to ecology and has been considered where relevant:

- Environment (Wales) Act 2016
- The Wildlife and Countryside Act 1981 (as amended)
- The Countryside and Rights of Way (CRoW) Act 2000

- The Protection of Badgers Act 1992
- The Hedgerow Regulations 1997
- The Well-being of Future Generations Act (Wales) 2015.

The key national planning policy documents relevant to the assessment of Terrestrial Ecology for the Proposed Development are as follows:

- **Future Wales: The National Plan 2040** (Welsh Government, 2021), including Policy 17: Renewable and Low Carbon Energy and Associated Infrastructure and Policy 18: Renewable and Low Carbon Energy Developments of National Significance; and
- **Planning Policy Wales Edition 12** (Welsh Government, 2024), including relevant supplementary Technical Advice Notes (TANs), Circulars and Policy Clarification Letters (PCLs).

Table 9-1 provides a summary of the policies contained within the national planning policy documents listed above relevant to the assessment of terrestrial ecology including how and where these have been considered in the ES.

Table 9-1 Summary of national planning policies

Summary of policy	Inclusion in the ES
Future Wales: The National Plan 2040	
Policy 9 – Resilient Ecological Networks and Green Infrastructure	The landside parts of the Proposed Development are located on previous developed operational land. Ecological Networks and Green Infrastructure have been addressed through the protection of woodland, coastal heath and grassland habitats adjoining the application site.
Planning Policy Wales Edition 12	
Section 6.2, paragraph 6.2.11 – Integrating Green Infrastructure and Development	The Proposed Development does not provide opportunities to create new terrestrial habitat within the operational harbour. Maintenance and enhancement of ecosystem resilience is addressed through the design of the temporary compounds which would lie adjacent to off-site terrestrial habitats.
Section 6.4, paragraph 6.4.3 – Biodiversity and Ecological Networks	
Section 6.4, paragraph 6.4.3 – Protected and Notable Species	The baseline habitat survey has informed the assessment of the potential use of the study area by protected species alongside data obtained from the desk study. The Black guillemot survey has provided additional detail to define the use of the habitats within the site by this species. Species avoidance, protection and mitigation is presented in section 9.12. Enhancement for target species is presented as additional mitigation in section 9.12.
TAN 5 – Nature Conservation and Planning	
Section 4.- 2 Pre-application Discussions	EIA scoping responses provided by specialist consultees have been considered. These are summarised in section 9.5.
Section 5 – Development Affecting Designated Sites and Habitats	No impacts on sites designated for terrestrial ecology nature conservation are anticipated and such impacts have been scoped out of the assessment.

Summary of policy	Inclusion in the ES
Section 6 – Development Affecting Priority Habitats and Species	There is no potential for terrestrial priority habitats to be significantly impacted by the Proposed Development. A small number of species have been classified as important ecological features (IEFs) in the context of the Proposed Development. The ES chapter includes an assessment of the potential for these species to be directly or indirectly affected during construction and/or operation (section 9.11). Potential impacts on these species would be controlled through embedded mitigation (section 9.12). Black guillemot *Cepphus grylle* is Birds of Conservation Concern Wales (BoCCW) Green list species, but it is very rare in Pembrokeshire and has therefore been considered a priority species in this assessment. Where practicable, direct impacts would be avoided but where unavoidable they will be fully compensated (section 9.12). Indirect impacts during construction would be controlled through embedded mitigation (section 9.12).

The Proposed Development site is located within Pembrokeshire County Council. The local planning policy documents relevant to the assessment of Terrestrial Ecology for the Proposed Development are:

- **Pembrokeshire Local Development Plan (LDP) up to 2026** - adopted in February 2013
- **Pembrokeshire Coast National Park Local Development Plan 2 to 2031** – adopted September 2020
- **Supplementary Planning Guidance – Biodiversity-** adopted in May **2021**

Table 9-2 provides a summary of the provisions contained within the LDP and supplementary planning guidance relevant to the assessment of terrestrial ecology including how and where these have been considered in the ES

Table 9-2 Relevant local planning policies

Summary of policy	Inclusion in the ES
Pembrokeshire LDP	
SP.1 Sustainable Development (Chapter 5, page 48) The overarching policy for all development aims to ensure all development is sustainable.	The Proposed Development and construction have been designed to be consistent with the principles of sustainable development.
GN.1 General Development Policy The policy provides a framework for evaluating potential development impacts. Criterion 4 ensures development will respect and protect the natural environment, including protected habitats and species and requires development proposals to demonstrate protection, and where possible the enhancement of the natural environment.	The Proposed Development is sited on land that is already developed. Measures to avoid effects on adjoining habitats form part of the development design and have included avoiding tree loss and damage to adjacent habitats Protection of species is integrated into the Proposed Development. Enhancement for target species (Black Guillemot) nesting birds and bats is provided as additional

Summary of policy	Inclusion in the ES
	mitigation. Embedded and additional mitigation is described in section 9.12.
GN.3 Infrastructure and New Development (Chapter 6, page 82) This policy provides for contributions to be sought where appropriate and necessary, in conjunction with development proposals including in relation to the provision of biodiversity.	The Proposed Development has been designed to minimise effects on terrestrial features that could be used by protected or notable species, maintaining the site's biodiversity value alongside the works. Targeted enhancement (for Black Guillemot), appropriate for the nature and context of the harbour, is integrated into the development proposal (see section 9.12)
GN.37 Protection and Enhancement of Biodiversity (Chapter 6, page 126) All development should demonstrate a positive approach to maintaining and, wherever possible, enhancing biodiversity. Development that would disturb or otherwise harm protected species or their habitats, or the integrity of other habitats, sites or features of importance to wildlife and individual species, will only be permitted in exceptional circumstances where the effects are minimised or mitigated through careful design, work scheduling or other appropriate measures.	Embedded mitigation (see section 9.12) has been included to minimise potential impacts on IEFs, specifically • Pre-construction checks to minimise harm to otter *Lutra lutra,* black guillemot and other nesting birds. • Protection of buildings with potential to have features used by roosting bats • Measures to minimise noise disturbance of species using habitats within and adjacent to the Proposed Development site (otter, bats, birds, black guillemot). • Sensitive lighting design to minimise light spill onto adjacent woodland and scrub to maintain bat flight lines. – aligned to safe operational requirements
Supplementary Planning Guidance – Biodiversity	
The Biodiversity SPG reiterates the legislative and policy background to the consideration of biodiversity in the planning process. The SPG provides guidance on how biodiversity should be considered at each stage of the planning process including: • considering ecology at an early stage, • providing relevant and proportionate surveys and other information to inform the application, and, • following the mitigation hierarchy to ensure there is no loss of biodiversity, followed by enhancement and management to achieve net biodiversity benefit. The SPG also provides advice on appropriate biodiversity enhancement	A protected species scoping assessment has been completed with follow up surveys for black guillemot. Where there are suitable conditions for a species, presence has been assumed in the assessment. Precautionary mitigation is proposed where species could be impacted by the Proposed Development in the form of embedded mitigation to minimise impacts (avoidance and protection of habitats, lighting and noise control and best environmental practice) and additional mitigation to provide a net benefit (black guillemot, bird and bat nest boxes). Mitigation is described in section 9.12.

9.5 Consultation

Table 9-3 summarises the issues raised relevant to terrestrial ecology and ornithology, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation.

Scoping and Consultation provides details on the types of consultation activities undertaken for the Project and the consultees that were contacted.

Table 9-3 Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to terrestrial ecology and ornithology.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
31/01/2025	NRW written response in screening and scoping opinion	Scoping out of impacts on non-marine designated nature conservation sites	Agreed that scoping out of potential effects on designated sites was acceptable
31/01/2025	NRW written response in screening and scoping opinion	Otter	The response welcomes the commitment to otter survey. Scoping assessment including suitability for otter is presented in based on habitat features (see Appendix 9.1). Precautionary mitigation for indirect effects during construction form part of the embedded mitigation (section 9.12).
31/01/2025	NRW written response in screening and scoping opinion	Bats roosts	Welcome the commitment to undertaking bat survey. Preliminary assessment of the structure buildings is presented in Appendix 9.1. Potential impacts on buildings have been avoided through building and tree retention (see Section 9.12). The assessment is based on construction lighting maintaining a dark corridor bat flight line, with no temporary lighting units located close to woodland.
31/01/2025	NRW written response in screening and scoping opinion	Black guillemot	Response welcomes the commitment to undertake surveys in spring/summer 2025 A black guillemot survey visit was undertaken in summer 2025 to assess breeding status (see Appendix 9.2). Embedded mitigation will minimise impacts on black guillemot, while nest box provision will provide an overall benefit for this species.
05/08/2025	NRW written response to draft of Chapter 9		NRW are satisfied with the proposed design and locations of black guillemot boxes.

9.6 Methodology to inform the baseline

9.6.1 Desk study

Information on designations, and species records within the study areas defined in Section 9.3 for different receptors was collected through a detailed desk study to review existing datasets. These are summarised in. Table 9-4. These sources provide the most up to date data for this assessment.

Table 9-4 Summary of key desktop reports.

Title	Source	Year
International and National Designated sites, Wildlife Trust Reserves	MAGIC, West Wales Biodiversity Information Centre (WWBIC)	2025
Ancient woodland, Important Plant Areas, B-lines, NRW Priority Areas	WWBIC	2025
Priority species; species of conservation concern, locally important species	WWBIC	2015 to 2025
Broad scale habitat mapping	WWBIC	2025
Wetland Bird Survey Data Monthly counts between September and March from 2018/2019 to 2022/2023	British Trust for Ornithology	2018/2019 to 2022/2023

Information for the Desk study was obtained for the study areas previously defined in Section 9.3 as follows (N.B, the distances relate to a previous iteration of the Proposed Development site boundary which extends wider than the current Proposed Development):

- International statutory designated sites and component designated sites – 15km
- National statutory designated sites – 2km
- Priority Habitats and ancient woodland – 2km
- Records of priority and protected species and other species of conservation interest - 2km (bats within 5km)

Wetland Bird Survey (WeBS) data was obtained from the British Trust for Ornithology (BTO) covering Fishguard Harbour and the mouth of the Afon Gwaun where it enters Fishguard Bay.

Full desk study information is presented in Appendix 9.1 – Preliminary Ecological Baseline.

9.6.2 Site-specific surveys

The site walkover survey completed in January 2025 comprised the following elements:

- Habitat survey following the Joint Nature Conservation Committee's (JNCC) Phase 1 Habitat Survey Methodology (JNCC, 2016)
- Protected and priority species scoping following Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017) including a review of bird activity within the harbour, and an assessment of the potential for otter resting places
- External building inspections undertaken with reference to Bat Surveys for Professional Ecologists - 4th Edition (Collins et. al, 2023)

The results of these surveys are presented in Appendix 9.1.

Following the site walkover survey, a targeted survey for black guillemot was carried out over one day in July 2025. The survey comprised vantage point observations from three locations with views across the harbour from early morning through to early afternoon to assess whether black guillemot were breeding at the harbour.

The site-specific surveys are summarised in Table 9-5

Table 9-5 Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Habitat survey	Landside and adjoining terrestrial habitat	Assessment of terrestrial habitats within and directly adjoining the application site boundary	RPS	25/01/25	Appendix 9.1
Preliminary Bat Roost Assessment	Buildings (Landside)	External inspection of the structure of buildings within the application site	RPS	25/01/25	Appendix 9.1
Protected and Priority Species Scoping	Landside and adjoining terrestrial habitat	Assessment of the potential for habitats, structures and features within and adjoining the application site to be used by protected or priority species	RPS	25/01/25	Appendix 9.1
Black guillemot survey	Harbourside and open water within the Proposed Development site and along the harbourside up to 850m	Vantage point survey with views across harbour to assess whether black guillemots were breeding in the harbour in 2025.	RPS	24/07/25	Appendix 9.2

9.7 Assessment methodology

9.7.1 Identifying Important Ecological Features

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following the specific guidance defined in the Guidelines for Ecological Impact Assessment - Third Edition' (CIEEM, 2024).Ecological receptors identified in the baseline surveys have been evaluated following these guidelines.

As per best practice guidance, it is not necessary in an assessment to address all ecological features with potential to occur, and instead attention should be focused on those that are of relevance (CIEEM, 2024). For the purposes of this assessment, Identified Ecological Features (IEFs) are classified as features of ‘Local’ importance or higher.

For ‘features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable’ it is ‘not necessary to carry out detailed assessment’ of these ecological features. This would include common and widespread species and habitats that have conservation interest of ‘site or negligible’ importance which have been scoped out of the assessment as they cannot experience significant effects under the definitions of the EIA.

9.7.2 Assigning geographical scale of importance

The geographical scale of importance for statutory and non-statutory designated sites is assigned based on their designation. For example, internationally designated sites and Ramsar sites are considered of international importance, because they are designated on the basis of supporting habitats and / or species which are of importance for nature conservation at an international / European level. Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR) are of 'National' importance because they are designated for supporting habitats, species, and other features of importance for nature conservation at a UK level.

The geographical scale of importance for habitats and species is assigned with reference to all designations or policy provisions that apply. For example, Priority Habitats as identified by the provisions of Section 7 of the Environment (Wales) Act 2016, are considered of particular importance to the conservation of biodiversity in Wales. The importance of these habitats is derived from their condition and extent. However, only where extents of such habitats form an appreciable part of the Welsh resource, would they be considered of 'National Importance'. The same approach to evaluation applies to protected or priority species. Small populations of priority species that are widespread would be of lesser importance than large populations of such species, or than small populations of species with very restricted distribution.

The assignment of a geographical scale of importance is therefore subjective, with the following factors taken into account:

- National and local planning policy
- Distribution including relative to the Proposed Development footprint
- Conservation status
- Historical trends (where available).

Legal protection is also a consideration but not a primary factor in defining ecological importance, for example the badger is legally protected but typically common and widespread which usually limits the importance assigned to this species in an EIA.

Ecological features of 'site/negligible' importance are not considered sufficiently important to experience significant effects and have been scoped out of this assessment.

The definitions of geographical importance used in this assessment are given in Table 9-6.

Table 9-6 Definitions of geographical importance used in this assessment.

Value	Definition
International (Europe)	>1% of the European community species population/area of habitat extent. Internationally designated sites such as a Special Area of Conservation (SAC) or a site meeting the criteria for international designations.
National (United Kingdom/Wales)	>1% of the Welsh or British species population/area of habitat extent. A nationally designated site such as a SSSI or NNR or a site meeting the criteria for national designations.
Regional (West Wales)	Sites which do not meet the criteria for SSSI selection but are of greater than county level importance A considerable population or assemblage of internationally designated species such as those listed on Annex II of the Habitats Directive
County (Pembrokeshire)	Ancient woodland and non-statutory designated sites such as Sites of Importance for Nature Conservation (SINC)

Value	Definition
	Section 7 Priority Habitats or populations of Priority Species that have experienced decline, are sensitive to land use change and considered an appreciable part of the County resource Considerable populations of species listed in Red Data Lists or Biodiversity Action Plan (BAP) on account of their rarity or localisation in the County, particularly those that have an unfavourable or unknown conservation status in their natural range
Local	Local Nature Reserves (LNR) Section 7 Priority Habitats or populations of Priority Species that are present in considerable sizes or numbers and are relatively widespread. Local Biodiversity Action Plan (LBAP) priority species or habitats, where they occur in sufficient abundance to maintain the local resource. Common and widespread habitats and species occurring to a greater extent or number than would be expected within the footprint of the Proposed Development
Site/Negligible (within the footprint of the Proposed Development)	Common and widespread habitats and species that do not occur in population numbers or levels beyond those within the Application Boundary Urban features, bare ground and areas of modified land

9.7.3 Receptor importance and sensitivity

The criteria for defining sensitivity in this chapter of the ES are outlined in Table 9-7 below. Sensitivity criteria are usually associated with geographical importance as part of EIAs, for example Special Areas of Conservation which are internationally important ecological receptors would be assessed as being of very high sensitivity. Notwithstanding this assumption, some receptors of lower geographic importance can be assessed as being of higher sensitivity, particularly those that depend on a specific ecosystem function such as underlying hydrology.

Table 9-7 Definition of terms used to describe the sensitivity of ecological receptors as they relate to geographical importance.

Sensitivity	Geographic Importance	Definition
High	National	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	County	High or medium importance and rarity, regional or county scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Local	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Site	Very low importance and rarity, local scale

Sensitivity	Geographic Importance	Definition
		Those affected are able to adapt easily and maintain pre-impact status.

9.7.4 Duration and magnitude of impacts

The magnitude of an impact refers to the size, intensity, or volume and should be quantified where possible in absolute or relative terms, such as areas of habitat loss or percentage of species population decline (CIEEM, 2024).

The duration, frequency and reversibility of the effects directly influence the magnitude. Frequency and timing are influenced by the number of times an activity could occur and have been considered alongside the ecological traits of relevant species, such as the lifecycles. Where recovery from impacts is possible through natural processes or successful mitigation, it has been is classed as reversible. Conversely an impact from which recovery is not anticipated within a reasonable timescale or there is no chance of action to implement successful mitigation, is classed as irreversible.

The definitions used in this assessment when referring to the duration of impacts are given in Table 9-8.

Table 9-8 Definition of terms used to describe the duration of impacts

Definition	Duration	Definition
Temporary	Short term	Period of months, up to one year.
	Medium term	Period of more than one year, up to five years.
	Long term	Period of greater than five years.
Permanent	Operational lifetime	An impact that occurs throughout the operational lifetime of the Proposed Development.

Four levels of magnitude are used in this assessment.; These are adverse unless stated otherwise. The terms used to define magnitude and sensitivity are based on those described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are given in Table 9-9.

Table 9-9 Definition of terms used to describe the magnitude of impacts.

Magnitude of impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).

Magnitude of impact	Definition
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).

9.7.5 Significance of effect

The significance of the effect upon Terrestrial Ecology and Ornithology is determined by correlating the sensitivity of the receptor and the magnitude of the impact. The EIA matrix in Table 9-10 has been employed for this assessment.

Where a range of significance levels is possible, as derived from the matrix, the final assessment for each effect is based on the derived value and professional judgement.

Professional judgement is used to determine if an effect is significant or not in relation to its importance, sensitivity and the magnitude of effects. Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors.

For the purposes of this assessment, any effects with a significance level of Minor or less have been defined as not significant in terms of the EIA Regulations.

Table 9-10 Matrix used for the assessment of the significance of the effect.

Magnitude of Change	Sensitivity of Receptor / Receiving Environment to Change / Effect				
		High	**Medium**	**Low**	**Negligible**
	High	**Major**	**Major**	**Moderate**	Negligible
	Medium	**Major**	**Moderate**	Minor	Negligible
	Low	**Moderate**	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Where the magnitude of impact is ‘no change’, no effect would arise. The definitions for significance of effect levels are as follows:

- **Major:** These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also fall into this category.
- **Moderate:** These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.

- **Minor:** These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the Proposed Development.
- **Negligible:** No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- **No change:** No loss or alteration of characteristics, features or elements; no observable impact in either direction.

9.8 Baseline data limitations

For the black guillemot survey, observations were made on bird activity around the quay periodically scanning over several hours to assess species presence and activity during the survey. The harbour was viewed at different tide levels with exposed sand and mud present outside the application site towards the end of the survey. The survey provides a snapshot of the black guillemot activity within the harbour sufficient to determine the likely nesting or breeding in 2025.

The BTO data collected over a 5-year period provides information on the assemblage of species that would be expected to be present in winter 2024/2025. The most recent BTO data was collected in 2023 and is considered to give a good indication of how frequently species occur, and the variation in numbers. This BTO data coupled with the scoping assessment in winter 2025 provide a realistic baseline for the assessment of impacts.

The nature of the rock armour and quay wall prevented systematic searches or signs of otter within the survey area. There is no rock armour within the Proposed Development ,and the quay walls lack features that would provide otter with cover. Although the scope of the survey was restricted by the nature of the ground, the inspections with the aid of binoculars were able to effectively assess the suitability of the features within and adjacent to the Proposed Development.

9.9 Baseline Environment

9.9.1 Designated Sites

Part of the Proposed Development site lies within West Wales Marine SAC with harbour porpoise *Phocoena phocoena* the primary qualifying feature. Potential impacts on this qualifying feature are addressed in the Marine section of the scoping report (see Chapter 5: Scoping and Consultation).

There are no biological SSSIs located within 3km of the Proposed Development. A geological designated site, Fishguard Cliffs SSSI, lies to east of Fishguard Harbour beyond the mouth of the Afon Gwaun.

St. David's SAC lies 4.75km northwest of the Proposed Development with the qualifying features being vegetated sea cliffs, European dry heaths, floating water-plantain. Strumble Head – Llechdafad Cliffs SSSI is the closest component SSSI of the SAC and is designated for its floral assemblage, breeding cliff-nesting bird assemblage, and invertebrates.

There are no Non-Statutory Designated Sites within 2km.

There are no potential terrestrial or ornithological receptors associated with the designated sites within the zone of influence of the construction or operational phases of the Proposed Development at Fishguard harbour.

Designated sites (terrestrial ecology) are not considered further in the impact assessment.

9.9.2 Habitats

On-site habitats

The landside area predominately comprises infrastructure and roads associated with the ferry terminal and Pembroke Harbour train station alongside areas of hardstanding, currently used for storage and movement of vehicles.

Pembroke Harbour train station buildings and railway line are located in the central section of the Proposed Development site and directly adjoin the ferry terminal with the existing infrastructure comprising the Jack Up Barge, Linkspan Bridge, Towers and Concrete Buffer Dolphin.

The edge of the quay is primarily defined a vertical block wall. The quay wall has an inset walkway along most of its length, historically used for the movement of livestock being transported by boat.

A concrete loading / unloading area is suspended above the edge of the harbour supported by piled concrete pillars. Below this structure there is rocky slope between the open water and the top of the quay wall, much of which has a dense cover of seaweed indicating that it will below the average high tide level but exposed at low tide.

To the north of the ferry terminal the Proposed Development site includes roads and hardstanding storage areas with the road connecting to a flat area of unsealed hardstanding approximately 5,600m^2 in extent. This area is adjoined by coastal heath / scrub with a rock outcrop extending around the northern side creating separation from the foreshore to the north.

A derelict former RNLI slipway lies adjacent to the ferry terminal infrastructure. The edge of the harbour edge is defined by a rock armour revetment at this point, which extends around the majority of the wider harbour.

A range of buildings are located within the Proposed Development site. Descriptions and photographs of these are presented in Appendix 9.1. The largest building complex is the railway station (B1), the southern end of which lies within the Proposed Development site. The building as a whole is c240m long with a continuous corrugated metal canopy. There are a number of single and double storey building sections below the canopy.

A small brick kiosk (B14) is located on the loading platform beside the ferry terminal. A single storey stone block building with flat roof and ‘portacabin style’ building (B7) lies to the south of the railway station. A further single storey brick building with a flat roof (B8) and a smaller brick built industrial building with a corrugated metal roof (B11) are located with the Proposed Development site to the north of the railway building

Areas of vegetation with the application are limited to a narrow linear strip of butterfly bush *Buddleja davidii*, a between the railway line and long stay car park with two individual young semi-mature ash trees also present in this strip of vegetation.

The western boundary overlaps the scrubby edge of a larger area of broadleaved woodland growing on the steep sloping ground. The habitat within the site comprises semi-mature sycamore with a few self-sown conifer trees. The ground flora is ivy dominated. Sections of low retaining wall and made ground form the boundary between the car park and the woodland.

No stands of non-native invasive plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981 were recorded within the Proposed Development site.

None of the areas of vegetation within the Proposed Development site have higher than site value (negligible sensitivity). Consequently, all non-marine habitats have been scoped out of the terrestrial and ornithology ES chapter and are not considered further.

Off-site habitats

The railway station building (B1) extends outside of the Proposed Development site to the north where it adjoins the Proposed Development site boundary. The two-storey port office building and several smaller ancillary buildings (B2 and B13) are located close to the eastern boundary of the Proposed Development. A two-storey rendered office building (B3), a tall, corrugated metal sided storage shed (B4a) and small timber office building (B5) are located west of the railway line adjacent to the western boundary of the Proposed Development.

Two large warehouse buildings (B9 and B10) adjoin the dock in the northern part of the Proposed Development. A modern RNLI building (B12) and a single storey building lie adjacent to the large warehouse buildings.

North of the ferry terminal the structure of quay wall changes with a different block construction and a slightly angled face with mooring for smaller boats. This section of the harbour wall forms the eastern side of a smaller quay with a slipway in the north-eastern part of the harbour. A further short section of vertical block harbour wall lies between the small quay and the northern breakwater.

Broadleaved woodland adjoins parts of the south-western boundary of the Proposed Development site beyond the long stay car park. Much of the woodland lies on steeply sloping ground and is open structured. The canopy comprises scattered multi-stemmed sycamore and ash with occasional oak trees. The largest tree trunks have a DBH of 50-60cm with signs of decay and the development of cavity features. Ivy forms a continuous dense ground cover with patches of bramble. Several non-native low growing shrub species occur on the boundary of the woodland. The woodland is considered to classify as the priority habitat (lowland mixed deciduous woodland) under Section 7 of the Environment (Wales) Act 2016.

Other parts of the western boundary of the Proposed Development adjoin a rockface which was created by blasting the natural cliff over 100 years ago to create the harbour.

Low growing gorse forms the dominant cover across much of the rockface with less than 20% of the surface remaining as exposed rock. Regenerating scrub and young semi-mature trees occur along much of the base of the cliff. At the northern end of the site beyond the north-western boundary the adjoining rocky ground is more shallowly sloping and coastal heath with gorse and ling heather extend down to the base of the slope. Maritime cliffs and slopes classify as a priority habitat (lowland mixed deciduous woodland) under Section 7 of the Environment (Wales) Act 2016.

The southern section of the harbour is exposed intertidal habitat during low tide periods; with sandflat/mud flat and some exposed rocks. Intertidal habitats are considered in the Chapter 8: Marine Ecology.

A small operational water treatment works adjoins the northern boundary of the Proposed Development site, located between the northern area of hardstanding, northern breakwater and rocky shore.

The priority habitats adjoining the Proposed Development site have local importance for biodiversity (low sensitivity).

9.9.3 Fauna

Otter

A total of four records of otter within the 2 km Study Area were provided by WWBIC with a known otter population in the locality of Fishguard.

The closest otter record was from within Fishguard Harbour, where an otter was seen from the end of East Breakwater. It is assumed that the harbour is a regular used foraging habitat for otters. Prey species (fish, crustacea) will be present and may be abundant in parts of the harbour, along the coastline and in the freshwater watercourses.

Otters hunt primarily at night and typically use holts or couches to lay up during the daytime. These features are generally located in dense cover in undisturbed locations. Searches were made for potential laying-up habitat during the PEA site walkover in 2025.

All the quayside and harbourside habitats within and adjoining the application site were assessed has having a very low potential of use by otter. With negligible terrestrial habitat on the landside of the application site there are no opportunities for otter on the operational land. The broadleaved woodland adjoining the Proposed Development site at the south-western limit, is steeply sloping with areas of outcropping rock and lacks dense scrubby cover. The woodland habitat is also separated from the open water in the harbour by roads, hardstanding and a railway line which are subject to artificially lighting. Given this context this habitat would be very unlikely to be used as a daytime resting place by otters.

The vertical quay wall lacks enclosed cavity features that would provide cover for otter.

The open walkway inset within the quay wall provides minimal cover and lies adjacent to where the ferry docks. The rocky slope below the existing suspended concrete deck creates a localised more enclosed space but lies directly although beneath the roadway used by all vehicles entering and leaving the ferry terminal and will be subject to frequent noise disturbance during the periods of boarding and unloading during the day and night. No fields signs of otter spraint were noted during inspections of the rocks with inaccessible areas viewed with the aid of binoculars.

Small cavities between the stones of the rock armour revetment around the harbour are of sub-optimal value as resting places for otter. The sections of rock armour located within and adjacent to the Proposed Development are localised and situated close to the ferry terminal operations and vehicle movements where frequent noise disturbance would deter otters. Outside the Proposed Development site to the south the section of rock armour revetment is subject to public access including dog walkers during low tide when the foreshore is exposed and this would be a significant deterrent to use by otters.

In the wider area the records of otter provided by WWBIC are from Goodwick Brook and its tributaries to the south-west of the Fishguard, and from the Afon Gwaun, a river flowing into Fishguard Bay to the east of the harbour and of Fishguard town.

Freshwater watercourses that flow into the marine environment typically have very high importance for otters as they require the freshwater to keep their fur free of salt for effective insulation. Wooded habitats alongside the rivers provide dense cover and much higher potential for the establishment of a holt and/or undisturbed daytime laying up places.

Otter numbers have declined in Wales since 2010, with occupancy of sites falling from 90% to 70% between 2015 and 2019 (Kean and Chadwick, 2021). Otter is an EPS and priority species in Wales. The otter population in the local area will have importance in a county context.

The landside habitats within and adjacent to the Proposed Development and the quay wall are considered to have negligible importance for otter.

However, the open water harbour forms part of the extensive foraging territory used by the local otter population. Consequently, the Proposed Development site is classified as having up to local importance for otter (low sensitivity).

Bats – desk study records

The desk study confirmed records of seven species of bats within 2km of the Proposed Development site from the last ten years: noctule *Nyctalus noctula*, brown long-eared *Plecotus auritus*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, whiskered bat *Myotis mystacinus*, Natterer's bat *Myotis nattereri*, and greater horseshoe *Rhinolophus ferrumequinum.* Unspecified species of *Myotis* bat have also been recorded.

Bats - roosts

The closest records of bat roosts are in buildings within the Fishguard Bay Hotel complex, located c35m west of the application site boundary. The hotel is bounded by woodland which extends up to the Proposed Development site. It is assumed that all the bat species that have been recorded in the past will have roosts within 2km of the Proposed Development, although greater horseshoe bats will commute further than 2km from a roost site to feed.

The buildings within the Proposed Development site are parts of the Fishguard Harbour railway station (B1), a small brick kiosk (B14), single storey stone block building with flat roof and adjacent 'portacabin style' building (B7), a single storey brick building with a flat roof (B8) and a smaller brick built industrial building with a corrugated metal roof (B11).

External assessments of bat roost potential undertaken as part of the 2025 site walkover assessed the kiosk (B14) as having negligible suitability to be used by roosting bats due to a lack of features and its exposed location with adjacent floodlights.

Building B7 is a single storey stone block flat roofed industrial building with no windows. The roof is covered in felt matting and there is a fascia board around each side. The blockwork and fascia were in very good condition, and this building was assessed as having negligible potential value for bats.

The single storey brick building with a flat roof (B8) and a smaller brick built industrial building with a corrugated metal roof (B11) had some features that could be used by roosting bats, but their situation reduces the likelihood of use significantly. The buildings are located within built development with no vegetation that would provide a flight line connection within the harbour. Existing artificial lighting, both in proximity to the building and alongside parts of the off-site woodland boundary to the west also reduces the likelihood of the buildings associated with the railway and ferry terminal being used by roosting bats. Building 12 is the modern RNLI building, which is brick built with a shallow pitched corrugated metal roof and UPVc windows. No potential roost features were identified on the building.

Outside the Proposed Development site there are a further 8 buildings associated with the ferry terminal and harbour. The two warehouse buildings (B9 and B10) were assessed as having potential high value for roosting bats due to their size and age with multiple potential roost features externally.

The other buildings within and adjacent to the Proposed Development site had very few potential roost features. Furthermore, their context reduces their suitability to be used by bats, being located within built development with significant artificial lighting and no adjacent potential foraging features or flightlines.

All the buildings within and adjacent to the Proposed Development will be retained intact with no works proposed to the buildings.

Several trees in the off-site broadleaved woodland, adjoining the south-western boundary of the Proposed Development site, were noted as having cavity features which could be used by roosting bats. The size and nature of the internal cavities could not be assessed from the ground, and it is assumed that some of the features would be suitable to be used by groups of bats and could be suitable for use as a maternity roost by species that roost in trees.

The two young trees located within the Proposed Development site had negligible potential value for roosting bats.

Bats – foraging and commuting

A proportion of the bat species that have been recorded within 2km are expected to commute through and potentially forage in habitats adjacent to the Proposed Development site. Common pipistrelle, soprano pipistrelle and brown long eared bat would be expected to commute and forage along the woodland and vegetated cliff with direct connectivity to the adjacent Fishguard Bay Hotel.

The east-facing rock face and woodland will be sheltered from the prevailing south-westerly winds increasing the likelihood of regular bat activity on the western boundary of the Proposed Development Site.

Light columns present along the main access road at the southern end of the Proposed Development site adjacent to the car park (a proposed temporary construction working area) will result in some existing light spill onto the woodland to the west. North of this point there is more extensive lighting at the base of the cliff in extending to the north of the railway station. The adjacent cliff face is steep with patches of woodland at the base but more sparse scrub extending up the slope. There will be some light spill behind the lights at the cliff base but higher up the slope the scattered scrub would remain a dark corridor likely to be used as a flightline and potential foraging feature.

Artificial light associated with lighting columns, particularly where adjacent to the rockface in the harbour are expected to attract airborne insects from the surroundings including the woodland and vegetated rock face with elevated numbers on a proportion of the nights during spring and summer. This may attract bat species which are less sensitive to artificial light, especially pipistrelle species and noctule. Activity levels would be expected to vary as a result of relative prey abundance and weather conditions.

The harbour as a whole including the railway station and ferry terminal will be subject to high light levels with streetlights along the cliff base, along the main access road and railway line, and along the harbour frontage, and with lights on buildings. With no vegetated areas within the Proposed Development site these levels of bat activity are predicted to be low.

All light sensitive species would be likely to avoid all the areas of existing built development that are subject to artificial lighting.

Overall

Overall the Proposed Development site is classified as having the potential to have importance in up to a local context for bat populations (Low sensitivity).

Breeding birds - Black guillemot

The black guillemot is a very localised and uncommon breeding species in Wales, primarily occurring on Anglesey with only very small numbers of birds elsewhere in Wales. The UK population is primarily located in Scotland. It is a BoCCW green list species of least conservation concern and the UK population is considered to be relatively stable.

The Pembrokeshire Bird Group classify the black guillemot as a *sporadic former breeding species* in the county (Pembrokeshire Avifauna https://pembsavifauna.co.uk/). Black guillemot typically breeds in holes in walls of the harbour. Historically the Pembrokeshire Bird Group have records of a single chick being recorded at Fishguard Harbour each year between 2008 and 2011 when access was possible.

During a breeding bird survey carried out within Fishguard harbour between May and July 2017 (RPS, 2018) as part of a previous planning application to replace the linkspan infrastructure at the ferry terminal, two black guillemots were noted. Activity was noted around a timber stanchion in a section of the quay wall alongside the railway station where the ferry docks. The activities associated with ferry movements and the terminal were considered to reduce the likelihood of nesting in this location in 2017.

The Welsh Bird Report 2023 (Welsh Ornithological Society, 2024) states there was a count of two individuals in Pembrokeshire (Fishguard Harbour) between February and August with a peak of three individuals on 26th February. The birds were considered to be individuals and not a breeding pair.

The vantage point counts in July 2025 (Appendix 9.2) recorded two adult black guillemot on the water and on the harbourside adjacent to the linkspan.

Both birds were seen to fly into the entrance to the cattle walkway adjacent to the linkspan. They remained out of sight for 2-3 minutes before flying back out. No other birds were seen to enter or leave the passageway over the course of the survey.

An adult bird was seen to be feeding in open water close to the harbour wall before the ferry docked. Individual adults were subsequently seen briefly in different locations in the wider harbour.

Taking a precautionary approach, it is assumed the black guillemot could roost in the former livestock passageway or other smaller openings in the harbour wall.

Given the rarity of the species, the individuals present in the harbour and potential for nesting in the future should a suitable nest site still be present, the species is classified as having county importance (moderate sensitivity).

Breeding birds assemblage (excluding black guillemot)

A breeding bird survey (BBS) was carried out within the harbour between May and July 2017 as part of a previous replacement of the linkspan infrastructure at the ferry terminal (RPS, 2018). A very small number of species were recorded. Five pairs of feral pigeon *Columba livia domestica* were recorded nesting under the quay wall within or adjacent to the linkspan. Four house martin *Delichon urbica* nests were recorded in an open section of the railway station building.

Other bird species that could nest in buildings and built structures within the Proposed Development site include house sparrow *Passer domesticus* and starling *Sternus vulgaris*; both BoCCW red list as well as green list species including pied wagtail *Motacilla alba* and robin *Erithacus rubecula*. The status of the Proposed Development site and nature of the built structures has not a significantly changed over the last 8 years. The breeding bird assemblage in the Proposed Development site (encompassing a much larger part of the harbour) is therefore expected to be similar to that previously recorded with a limited species diversity.

The anticipated assemblage of breeding species is classified as having Site importance (negligible sensitivity) and this ecological feature is not considered further in this ES chapter.

Wintering bird assemblage

Fishguard Harbour forms part of a Wetland Bird Survey (WeBS) compartment which extends to the east to cover the entrance to Fishguard Bay and the tidal section of the Afon Gwaun. Bird survey data obtained from the BTO for this compartment, provides information on the assemblage of bird species that use the harbour and the immediate vicinity.

The Proposed Development site overlaps with less than 1% of the BTO survey compartment as a whole, relating to an area of open water at the quayside and small areas of stone revetement.

The wider BTO compartment includes intertidal habitat extensive areas of and open water lie within but are located outside the application site.

Eleven species were recorded in BTO survey compartment during most if not all the monthly counts undertaken between August and March each year over a 5 year period from 2018 to 2023.

The highest recorded monthly counts and the 5-year mean peak counts for these species from this period provided below.

- Black headed gull *Croicocephalus ridibundus* with a peak monthly count of 400 and a 5-year mean of 220.
- Herring gull *Larus argentatus* with a peak count of 170 and a 5 year mean of 123
- Lesser black backed gull *Larus fuscus* with a peak count of 40 and a 5-year mean of 12
- Mallard *Anas platyrhynchos* with a peak count of 30 and a 5-year mean of 21
- Oystercatcher *Haematopus ostralegus* with a peak count of 55 and a 5-year mean of 34

- Turnstone *Arenaria interpres* with a peak count of 22 and a 5-year mean of 17
- Curlew *Numenius arquata* with a peak count of 13 and a 5-year mean of 7
- Dunlin *Calidris alpina* with a peak count of 50 and a 5-year mean 14
- Cormorant *Phalacrocorax carbo* with a peak count of 23 and a 5-year mean 13
- Shag *Gulosus aristotelis* with a peak count of 24 and a 5-year mean 6

These numbers reflect the highest levels of activity recorded over an extended monitoring period. The mean numbers overall in the survey compartment for each species will be significantly lower than mean peak counts.

Great crested grebe *Podiceps cristatus*, little grebe *Tachybabptus ruficollis*, and grey heron *Ardea cinerea* are also regularly occurring species. Other wader species that were regularly recorded in small numbers included redshank *Tringa totanus*, and ringed plover *Charadrius hiaticula* and purple sandpiper *Calidris maritima* have occasionally been recorded in small flocks. There are also records of individual or small numbers of long-tailed duck *Clangula hyemalis*, diver species, and common scoter *Melanitta nigra* which move close to the coast from further offshore during poor weather.

The area will also be a resource for passage birds moving between wintering and breeding areas in both spring and autumn. In September 2019 a flock of 23 sandwich tern *Thalasseus sandvicensis*, representing 10% of national breeding population, were recorded in the harbour for a brief period on migration.

During the scoping assessment of the section of the harbour within the Proposed Development site bird activity close to the quay comprised flocks of herring gull and black headed gull. Small numbers of cormorant were feeding in the open water section of the application site with further small flocks of gulls. A flock of 16 turnstone were roosting on the northern breakwater and oystercatcher and curlew were recorded in small numbers, flying between the harbour and the coast. A grey heron was disturbed from beneath the suspended concrete deck structure. A larger flock of gulls was present on intertidal mud/sand beyond the east breakwater at low tide.

The WeBS data includes records of species from the wider harbour and adjoining habitats. The Proposed Development site covers less than 1% of the WeBS compartment, but the zone of influence would extend wider due to the potential effects of noise and visual disturbance of birds outside of the Proposed Development site. In this context the Proposed Development site and adjacent habitats are considered to have up to local importance for wintering and passage species.

9.9.4 Important Ecological Features

Table 9-11 lists the Important Ecological Features (IEF) taken forward into impact assessment. Where a receptor has not been identified in the table below it has been assessed as not being able to experience significant effects from impacts as a result of the Proposed Development. This is based on professional judgement and has been assessed based on the feature's limited geographical importance (i.e. of site importance or below) or likely absence from the Application Boundary.

Table 9-11 Important Ecological Features

Receptor	Description	Value	Sensitivity
Otter	A European Protected Species, listed on Section 7 of the Environment Wales Act , and has experienced population decline in Wales since 2017. Anticipated frequent use of the open water harbour as foraging habitat by otters and forming part of the territory that sustains the local population along with watercourses and surrounding coastline	Local	Low

Receptor	Description	Value	Sensitivity
Bat populations	European Protected Species, with many species listed on Section 7. Anticipated frequent use of the application site as a foraging habitat / commuting route by an assemblage of bat species Potential for adjacent trees within the off-site woodland to the west to be used by roosting bats.	Local	Low
Black guillemot	Green list species of least conservation concern. Very rare breeding species in south and west Wales restricted to Fishguard Harbour. Small number of breeding colonies in Wales, primarily in Anglesey.	County	Medium
Wintering and passage birds	The wider harbour provides a resource that is utilised by a range of species during autumn, winter and early spring.	Local	Low

9.10 Development Design

Stena propose to replace their existing temporary linkspan and jack up barge with a new linkspan and ponton restrained on steel tubular piles.

Civils works will be required to enable access and installation of the replacement pontoon for the ferry traffic. These works will comprise:

Prior to shutdown of ferry operations

- Installation of temporary works in advance of piling.
- Installation of 8 nr. temporary tubular steel piles using vibro / impact piling in front of the quay wall to support a temporary deck and piling gate and facilitate drilling rig access for permanent pile installation.
- Installation of 2 nr. permanent concrete-filled tubular steel guide piles drilled through into bedrock using a combination of vibro and rotary boring, to restrain the new pontoon.
- Installation of 8 nr. temporary steel piles using vibro / impact piling to facilitate installation of a temporary deck and piling gate permanent piles for the new bankseat structure.
- Installation of 6 nr. permanent concrete-filled tubular steel piles using a combination of vibro / impact piling and rotary boring, to support the new bankseat structure.

During shutdown to ferry operations

- Concrete repairs to the underside of the existing approach structure.
- Removal of the existing linkspan bridge, jack up barge, glass kiosk and steel lattice towers from existing buffer dolphins.
- Plough dredging beneath the existing jack up barge to remove soft material to a depth of up to 1.5m, to create sufficient water depth for the installation of rock armour scour protection, with scour material deposited in an existing scour hole north of the pontoon.
- Installation of a new bankseat structure of pre-fabricated steel, from the existing bankside.
- Installation of the new ponton to be towed into place by a tug.

- Installation of the new linkspan bridge to be lifted into place by floating crane.
- Sections of the open walkway within the quay wall to be filled with concrete in discrete locations

The main temporary compound during construction would be located on an area of flat unsealed bare ground / crushed stone in the northern part of the Proposed Development site currently used for overflow parking for trailers and machinery.

A secondary temporary construction compound may be required which would be sited on the long stay car park in the south-western section of the Proposed Development site.

It is anticipated that the northern compound would be used for the Contractor's site office accommodation, welfare facilities and temporary storage of construction materials. Temporary lighting requirements are anticipated in the two temporary compounds in the north and south.

It is anticipated that all elements of the construction phase will be completed over a period of approximately 27 weeks. This would comprise an initial 6-week period to install the temporary works prior to piling. This would be followed by the installation of guide piling over 4 weeks, and a further 2 weeks for temporary works removal. This period is provisionally scheduled from September 2026 to January 2027. If bank seat piling is required this would take approximately 4 weeks within the same period meaning up to 8 weeks piling duration.

Following piling installation there will be a shutdown period of approximately 14 weeks from January to March, during which the following works would be undertaken: removal of dolphin towers and other mechanical and electrical infrastructure, removal of existing linkspan and jack up barge, and installation of the new linkspan, bankseat and pontoon. Due to the need for the ferry terminal shutdown, this phase of the works will require working 24 hours per day, 7 days per week.

Dredging is anticipated to be for 4 hours per day based on two daily cycles of 2 hours of active dredging over one week. Dredging will require 24-hour working due to tidal cycles. Scour protection will be installed immediately after dredging over the course of about one week.

The new pontoon will be equipped with electricity and two lighting columns with additional low-level lighting at barrier hight (<2m) along the linkspan and part of the pontoon. The lighting specifications would be selected to designed to prevent glare to receptors and illumination of night sky.

9.11 Impact Assessment

9.11.1 Do Nothing Scenario

There are no predicted significant impacts on any important ecological receptors under a 'do nothing' scenario. The species utilising the site will be habituated to site operations and conditions including background noise and artificial lighting. The activity of species would not be expected to change significantly over time but with anticipated natural variation during the year and between years.

9.11.2 Assessment of Construction Effects

The potential impacts arising from the construction phase of the Proposed Development are set out below. It should be noted that impacts and effects during the decommissioning stage are considered to be similar or no worse than during construction and have therefore not been considered separately in this ES chapter.

This section sets out Proposed Development stages and the associated impacts and resultant effects, per receptor.

Otter

During the construction period, activities will be primarily associated with the quayside where the majority of the construction activities will be centred.

During the18 to 20-week construction period there will be increased human activity in the harbour, quayside development areas.

Noise, and vibration from the following activities could disturb otter using the aquatic environment in the harbour

- Installation of temporary works prior to piling and removal following piling.
- Installation of temporary and permanent piles (creating underwater noise).
- Removal of existing structures (linkspan, jack up barge, bankseat and steel lattice on the buffer dolphins.
- Dredging activities.
- Concreate repairs including breaking out any damaged areas needing replacing.
- Installation of new structures (linkspan, pontoon and bankseat).

All activities are located on the western margin of the harbour with majority adjacent to the quayside. The zone of elevated noise below water within the harbour will vary depending on the activity.

The highest levels of disturbance would be expected from piling which is expected to be carried out over an initial 4-week period and dredging during the 6 to 8-week shutdown period.

Piling activity will be on the quay edge, where it is required for the installation of temporary piles to support the drilling rig and facilitate installation of the new bankseat (installed from vibro/impact piling) followed by the installation of permanent piles to restrain the new bankseat and ponton with permanent piles installed by a combination of vibro, and rotary boring. Elevated underwater noise levels are anticipated in open water in proximity to the quay during piling which will last 4 to 8 weeks.

Dredging will be undertaken on the western side of the harbour in the approximate location of the existing jack up barge. Periods of active dredging will be 2hrs undertaken twice a day over one week with scour protection installed over the following one-week period. The dredging and scour protection will result in the localised disturbance of the seabed affecting an area of 1600m^2 (the dredging area) and a smaller overlapping area where the dredged material will be deposited. The dredging and depositing are together extended approximately 50m from the quayside and approximately 80m along the quayside. The area of disturbance represents less than 1% of the extent of open water at high tide as defined by the northern and eastern breakwaters.

The section of quayside within the Proposed Development site has negligible potential for the establishment of holts by otters. The localised sections of rock armour revetment within and adjacent to the application site is very sub-optimal as daytime laying up places for otter with no field signs found during the walkover assessment. Consequently, there are no anticipated effects on any places of shelter or resting places used otter.

Following a precautionary approach it is assumed that foraging otters would avoid the using the western part of the harbour during the periods of when activities are generating elevated levels of underwater noise. Additional noise and disturbance from construction activity, particularly the generation of underwater noise, would have the potential to displace otter for longer periods during construction. The duration and extent of that displacement would be task specific and largely defined by area and timing of elevated noise.

Daytime construction activities would be expected to have a limited effect as otter are less likely to be actively hunting within the harbour during the day. The daytime activities associated with the

temporary works and piling over the first 12 weeks are therefore likely to have a very limited impact on the use of the harbour by foraging otter.

Otters are more likely to use the harbour for foraging in the nighttime. The initial 6-week temporary works period is unlikely to result in significant disturbance of the aquatic habitat. Piling will be undertaken during the day with very limited disturbance of open water habits when otter would be typically foraging.

Nighttime working during shutdown would result in intermittent disturbance of open water habitat during dredging, scour protection and installation of new floating structure for up to 5 weeks. Landside works at night during this time may cause localised disturbance of the adjacent open water over the 13-week shutdown period. The working area and adjacent habitat have very limited suitability as otter resting places. Any disturbance of landside habitats would have a minimal effect. Dredging and scour protection likely to have the largest impact with disturbance deterring otter from foraging in the water during while these activities are ongoing.

Otters as a species are species is known to be tolerant of noise with many examples of otters being present in areas subject to industrial activity (Chanin, 2003). The otters that utilise the harbour will be habituated to activities at the ferry terminal.

The anticipated effect of disturbance of the open water habitats would be the displacement of animals to alternative foraging habitat for the duration of the higher noise generating activities. The local otter population will have an extensive territory with multiple foraging areas and while it is recognised that the harbour has the potential to be a frequently used resource of importance to the local otter population, the area of disturbance will be a very small proportion of the harbour and wider extent of suitable foraging habitat.

In addition, individual otters could be present in or adjacent to the working areas when construction starts. In the absence of mitigation measures there is the potential for harm to individual otters if they actively foraging close to the source of noise when it starts. The likelihood of this is very low as otter would likely be deterred by any disturbance and would move away from construction activity before they are harmed.

No aspect of the construction of the Proposed Development will create any physical barriers to the movement of otters through their territory.

In summary potential effects on otter will be limited to indirect disturbance of individuals hunting (primarily related to nighttime working) in the small proportion of the dock within and adjacent to the working area including during dredging and construction of the scour protection areas. Alternative feeding opportunities are present in the wider harbour and farther along the coastline and in the rivers and brooks that flow into Fishguard Bay.

The magnitude of the impact on the otter population from construction related impacts is predicted to be low. The sensitivity of the Proposed Development site for the otter is low and the overall effect on otter population is assessed as minor adverse, which is considered to be not significant.

Bats

Bat Flightlines and Foraging

All of the buildings within and adjacent to the Proposed Development site will be retained in their current condition with no works to buildings proposed. The buildings are currently subject to high levels of artificial illuminations and their current potential value for roosting bats would remain unchanged for the duration of the construction period.

Based on the developed nature of the Proposed Development site and existing artificial lighting, the level of bat activity at the quayside is predicted to be low. Short periods of higher levels of bat activity of less light sensitive species within the application site are possible with activity levels reflecting periods of higher prey abundance around artificial light sources.

Bat activity associated with the vegetated rockface on the western boundary and broadleaved woodland to the south-west should not be affected by construction activities at the quayside.

Lighting requirements in the temporary compounds will depend on the nature of the activities and arrangements in the site compound, storage and working areas. The northern compound area lacks scrub or trees and is relatively exposed so would not be expected to be used by foraging / commuting bats to any significant degree.

In the absence of controls, artificial lighting installed close vegetated rock face and woodland adjoining the south-western boundary could have a localised effect on the behaviour of light sensitive bat species in the immediate vicinity of the southern temporary compound. Minor changes to the behaviour of light sensitive species are possible during construction outside the core daytime working hours.

The context of most of the woodland and vegetated rockface would remain unchanged. No potential flightlines associated with bat roosts in the nearby Fishguard Bay Hotel would be affected and there would be no fragmentation of any existing flightlines beyond the western boundary.

The magnitude of potential construction related impacts on bats is predicted to be negligible. The sensitivity of the receptor is low resulting in a negligible effect on bat populations (all species), which is considered to be not significant.

Bat Roosts

All of the buildings within the Proposed Development site will remain intact with no works proposed to the building fabric. The railway station buildings (B1) closest to the quayside where construction activity will take place are considered to have low likelihood of use by bats due to their location within a wider built area, proximity to port operations and presence of artificial lighting. Construction activity on the quay will not result in disturbance potential bat roosts.

Other buildings within and adjacent to the Proposed Development site are either located next to access routes away from the main areas of construction activity and where there is no proposed construction or additional artificial lighting. The two warehouse buildings with the moderate bat roost potential are situated outside of the Proposed Development site over 50m from the nearest site compound and several hundred metres from the construction area.

Given the retention of all buildings with bat roost potential and the lack of predicted noise or light disturbance of the building, there would be no (negligible) effect on bat roosts in buildings which is considered to be not significant.

Several trees in the broadleaved woodland, adjoining the south-western boundary of the Proposed Development site, had cavity features which could not be assessed from the ground. It is assumed that some of the features would be suitable to be used by groups of bats.

The use of artificial lighting within the adjacent temporary construction compound in the southwest would have the potential to reduce the suitability of features to be used by roosting bats. Of the bat species recorded locally, the most likely to roost in trees are common and soprano pipistrelle and brown long eared bat. The context of the trees on the edge of the developed area would reduce their suitability as roost site. If a roost is present, however, following a precautionary approach artificial lighting of trees adjacent to the southern temporary compound could result in the loss of a roost. Any lighting effect would be temporary, and it is likely that on removal of the lighting, a previously used roost features would remain suitable. The potential loss of a roost would be a potentially high magnitude impact on a low sensitivity receptor resulting in a moderate adverse effect which would be significant.

Assemblage of Wintering and Passage birds

Activities with the harbour will result in indirect disturbance through noise, human activity, movement of equipment/ships and artificial lighting. There would be higher levels of human activity

at the quayside and immediate environs during construction which could influence bird activity in the adjoining part of the harbour. Consequently, during the construction period, wintering and passage birds using the harbour could be affected by noise, and visual disturbance.

Most birds will show a degree of response to noise stimuli (Cutts et al, 2013). For noise disturbance, high level noise is considered to constitute sudden noise events over 60 dB at the bird or a more prolonged noise of over 72 dB. Moderate level disturbance is classified as a consistent elevated noise level between 60-72 dB over long periods. In areas where the existing long-term background noise is regularly above 72 dB, and does not significantly vary, this would be treated as moderate level disturbance as the bird populations would become habituated to it. Low level disturbance is considered to occur where elevated noise is between 45dB and 60dB in rural locations or between 55-72 dB in highly disturbed areas e.g. industrial or urban areas and adjacent to roads.

The Construction Assessment for noise (see Chapter 13, Appendix 13.C Construction Assessment) indicates combined noise levels for all stages of construction ranging between 80 dB and 87 dB at 10 m from the source. The largest contributors to the noise levels based on the modelling will be the use of excavators during removal of fixings during the initial works stage, and the dredging and piling during the initial and shutdown phases.

Noise levels are based on continuous operation, but most plant will not be used either continuously or simultaneously so the modelled noise levels are a worst-case scenario. In practice there will be quieter periods when noise levels are lower than modelled. Therefore, there would be intermittent noise levels of up to 87dB at 10m from the source through the construction period from October to the completion of the installation of the new floating structures in March.

Consequently, there would be elevated noise levels intermittently through a significant part of the winter period when wintering and passage migrant birds would be using intertidal or open water habitats within the harbour. Elevated noise would be intermittent and unlikely to be in a regular pattern to which birds might become habituated.

Birds will be habituated to existing operations in the harbour and quayside. Consequently, low level disturbance would not be expected to result in changes in behaviour or the use of the harbour by wintering bird species.

Higher levels of noise disturbance would therefore only be experienced periodically within the working period in open water closer to the construction area.

During moderate or higher disturbance noise generating construction activities, behavioural change and temporary displacement would be expected in the quayside and open water in the western part of the harbour adjoining the quay. Some behavioural changes and temporary displacement of wintering birds from these areas are likely.

Many of the species recorded in the open water harbour and adjoining section of Fishguard Bay (subject to monthly WeBS counts) are occasional winter or passage visitors.

Fishguard harbour is used opportunistically by sea ducks and divers, usually during poor weather. During periods where there is elevated noise in the harbour, temporary displacement is anticipated. Suitable habitat further from the construction areas will remain in the wider harbour and adjoining sheltered coastal waters for the duration of construction period.

Most, if not all, bird species would be expected to disperse away from the quay during higher level noise generating activities. Temporary displacement of noise sensitive species from the wider harbour is also possible.

Groups of herring gull and black-headed gull were observed in the harbour adjoining the quayside during the period when the ferry was docked and would be expected to be dispersed by sudden high level noise. Visual disturbance would have a minimal effect on gull activity. Minimal bird activity was observed around the rock armour revetment, and concrete supports of the disused RNLI slipway and suspended concrete approach platform, limited to an individual heron during the

walkover assessment. Wintering bird activity in the areas adjacent to construction activities is expected to be limited to a small number of species occurring in small numbers.

An assemblage of waders has been recorded utilising intertidal habitats in the wider BTO survey compartment. Wader species would be expected to be more susceptible to noise disturbance than gulls.

A few wader species were observed flying towards and away from the coastline to the north of the application site during the winter scoping survey (oystercatcher and curlew).

Noise levels were modelled at two harbourside receptors: the Stena Ferry Terminal and the Fishguard Railway Station to the south and north of the main construction area respectively. The modelled noise levels ranged between 44.7 dB and 52.6 dB at distances of up to 350 m from the construction activity. The modelling indicates that at this distance modelled noise levels would fall within the definition of low noise disturbance previously described.

Construction activities will not result in an increase in human activity in locations where waders roost or loaf. The nearest intertidal habitats suitable for waders are located to the south over 400m from the construction area. Therefore, birds in these habitats would be expected to experience no more than intermittent low level noise disturbance based on the noise modelling.

The existing level of wader activity in intertidal area closest to the construction site is likely to be relatively low, partly influenced by public recreation. A car park and leisure facilities adjoin the harbour to the south. Waders using the southern foreshore would be expected to be habituated to human activity including dog walkers and are likely to be less sensitive to the predicted low level noise disturbance than birds in more remote part so the harbour less disturbed by human activity.

The eastern end of northern breakwater and has the potential to be regularly used roost site. This location lies c1km from the areas of construction and 850m from the northern construction compound and would not be subject to significant noise disturbance.

At the distance of 400m (to the nearest intertidal habitat) noise modelling indicates any noise disturbance of intertidal habitats would be no more than low level. Given the distance from the construction areas, noise generating activities during construction would be expected to result in no more than minimal changes in wader behaviour where they currently occur, with the potential for displacement to the extensive less affected areas within the wider harbour.

The magnitude of the effect on the assemblage of wintering bird species is predicted to be low. The sensitivity of the receptor is low (important in a local context). This could result in a minor adverse effect on the assemblage and individual species, which is considered to be not significant.

Black guillemot

The status of black guillemot at Fishguard Harbour is defined as a former breeder with a single pair recorded as successfully nesting in the past but with no recent records. Black guillemots would be expected to occur in open water close to the harbour for extended periods as well as feeding further out into the harbour and around the coast. Features within the harbour will be used as shelter. During the 2017 breeding bird survey and 2025 single day survey, two black guillemot were recorded feeding in the water and landing on the quayside within the Proposed Development site with some activity in the disused livestock passageway under the quayside. There was no evidence of breeding during the surveys.

Black guillemots often use features close to human activity, principally in harbours and ports. These are typically small crevices in made-made structures and drainage pipes. Features in the quay have the potential to be used for roosting and resting close to where the ferry docks within the Proposed Development site, or where smaller boats are moored outside of the Proposed Development site at the northern end of the quay.

The rock armour is considered to be sub-optimal habitat for black guillemot as the cavities between the rocks would be accessible to predators. No works are proposed to the rock armour. Given the

poor suitability as a roost site, disturbance from concrete repairs would not affect roosting black guillemot.

As with the other bird species, the use of parts of the harbour by black guillemot could be affected by construction.

Visual disturbance associated with construction activities would be unlikely to result in adverse effects, given that the species commonly occurs in quays and harbours and the individuals will be habituated to human activity.

During periods of elevated noise at the quayside, it is anticipated that black guillemots would be temporarily displaced from areas around the noise and would utilise parts of the harbour further from the zones of construction. This would be expected during most of the construction period which will entail disturbance either at the quayside or on the water adjacent to the quayside. The most disturbing activities would be piling (over 4 to 8 weeks) and dredging and scour protection (over the 2 weeks) which would be expected to displace birds from the quayside and adjacent open water in early winter when these operations are scheduled.

For both dredging and piling, extensive habitat within the wider harbour will remain available for black guillemot to use away from construction disturbance. The small quay, north-western corner of the harbour and northern breakwater provide sheltered conditions over 300m from the closest areas of construction.

In recent years black guillemot has been recorded in Fishguard Harbour between February and August. The closest records of this species in winter are from North Wales. The construction period is scheduled to begin outside of this period in October when birds are likely to have moved to their winter grounds.

The works are proposed primarily outside of the main breeding season but are expected to continue through February and most of March. This would create a change of context within the harbour in the period when birds would return in late winter. While black guillemot has not been confirmed recently as breeding at the harbour, the quayside provides potential nesting habitat and ongoing disturbance in February and March has the potential to deter returning birds from establishing a nest within suitable habitat in the quayside.

With no confirmation of recent breeding in the harbour, the magnitude of the effect on black guillemot is predicted to be low, with the possibility of dispersing non-breeding birds and / or the reduced suitability of the site for breeding depending on the timing of works. The sensitivity of the receptor is medium (important in a county context). This would result in a Minor adverse effect, which is considered to be not significant.

9.11.3 Assessment of Operational Effects

The potential impacts arising from the operational phase of the Proposed Development, including maintenance tasks are set out below.

Otter

Following completion of the development the types of activity, levels of operational noise, and human activity at the quayside will remain equivalent to the existing operations. New artificial lighting will increase light spill onto the open water adjacent to the quayside to ensure that the ferry terminal is ‘suitably and adequately lit’.

The individual otters that currently use the harbour will be habituated to the operational context, background noise and human activity. Otters can tolerate considerable levels of artificial lighting (they are known to travel through built-up areas), but it is recognised that in some circumstances lighting can affect otter behaviour.

The operational development would not create any additional physical barriers to the movement of otters between the harbour, Fishguard Bay and the nearby watercourses.

Environmental protection measures would ensure that water quality is not adversely affected. There will not be any change the abundance of prey species.

The harbour would remain a foraging habitat available to the local otter population.

The application site has local importance for the otter population. The potential magnitude of effects during operations is negligible and equivalent to existing operations. The significance is classified as negligible with no change to the current baseline conditions. This is considered to be not significant.

Black Guillemot

Small numbers of black guillemot have continued to use the harbour in spring and summer each year. Birds using the harbour will be habituated to the daytime and nighttime activities at the ferry terminal and the regular movement of the ferries and smaller boats. Similar background conditions would have been present at the time when a pair of black guillemot successfully reared young in 2008 to 2022, indicating that the operations within the harbour do not adversely affect this species, which commonly occurs in man-made coastal environments. At Pembroke it is possible that the same individuals have been returning to the harbour each year.

The application site has county importance for black guillemot because of the rarity of the species. Use of the ferry terminal would have a negligible magnitude effect on black guillemot behaviour and would be equivalent to existing operations. The significance is classified as negligible which is not significant.

Assemblage of Wintering and Passage birds

The operational activities at the ferry terminal will not result in any significant change to value of the harbour or entrance to Fishguard Bay as a resource for wintering and nature of use of the harbour

The application site has local importance for wintering and passage birds. Use of the ferry terminal would have a negligible magnitude effect on the assemblage of birds using the harbour. The significance is classified as negligible which is not significant.

Bat Populations

The application site has local importance for bat populations. New permanent lighting will be limited to the quayside with no change to the position or specification of lighting units on the landside of the development. In this context the operational ferry terminal would have a negligible magnitude effect on bat flightlines and foraging activity. The significance is classified as negligible which is not significant.

9.12 Mitigation

9.12.1 Construction Phase Mitigation Measures

Embedded Mitigation

Construction related activities would be implemented pursuant to environmental best practice measures as set out within a Construction Environmental Management Plan (CEMP).

Environmental best practice will be implemented such as pollution prevention, dust minimisation, precautionary working methods to prevent the potential for injury and/mortality to protected and/notable species, and precautionary Working Methods to prevent accidental damage to habitats.

The following specific measures will be employed where the working areas adjoin sensitive habitat.

- Pre-start checks for bird nests (black guillemot and feral pigeon) in the quay wall and suspended concrete approach structure would be made prior to the start of construction related activity
- Pre- start checks for otter resting places in the harbourside working area prior to the start of construction related activity
- Protection of habitats adjoining the temporary working areas including coastal heath adjoining the western boundary of the northern temporary compound and broadleaved woodland and the woodland edge trees along the western edge of the Proposed Development site.
- Protection of the adjoining environment from the movement of surface water from construction and compound areas into the surrounding environment
- Sensitive construction lighting in the northern temporary compound to avoid light spill onto coastal heath beyond the western boundary
- Avoidance of the need for any additional temporary lighting where the southern temporary compound adjoins broadleaved woodland. Where lighting is required within eh southern compound, the lighting will comply with the guidance published by the Institute of lighting Professionals (ILP, 2023) to ensure there is no light spill onto the off-site trees within the adjacent woodland.

The effects of underwater noise on wildlife would be reduced through the adoption of the Soft – Start Procedures for all piling in line with JNCC guidance. Designed to reduce effects on marine mammals this method would ensure any otters active in the harbour would move away from the working area at the outset of periods of piling. In addition, standard noise mitigation would be applied including the use of Noise Reduced equipment and ensuring that plant is not left idling when not in active use.

Additional mitigation measures

Consideration has been given to further or ‘additional mitigation’ over and above the embedded mitigation that may be required and has the potential to mitigate any significant adverse effects identified following the assessment of the Proposed Development inclusive of its embedded mitigation.

Specific measures would be provided for black guillemot prior to the start of construction.

In the 2010s several projects in Northern Ireland were undertaken to provide artificial nest boxes for black guillemots (Leonard, 2015; Greenwood, 2015). More recently nestboxes have been used in Holyhead harbour where the second confirmed use of a nesting box in Wales was recorded in 2023.These projects set a precedent for the successful use of artificial nest boxes for black guillemot.

A minimum of five purpose-built nest boxes would be installed on the remnant vertical block harbour walls on the north-western edge of the harbour and / or on walls in the small quay adjoining the RNLI building. Both locations are sheltered by the northern breakwater. Nest boxes will be installed towards the top of vertical quay walls.

Each nest box would be purpose built following the designs successfully used in Northern Ireland (Leonard, 2015). Box specifications will include a landing area, entrance size small enough to prevent access by larger birds that could prey on the eggs and an internal ‘wooden stop’ to prevent eggs rolling out or being displaced easily by non-parental birds. The length of the internal nesting space would be 40cm with a narrow entrance (9cm x12cm). Robust wooden construction materials would be used to give significant protection from adverse weather. Each box will be strongly weighted and securely fixed to minimise the risk of loss during very high tides.

Integrated nest boxes built into concrete will be adopted as alternative where practical, which is a design that was successful in Bangor pier, Northern Ireland (Greenwood 2010).

The additional mitigation would provide artificial nest sites and refuges for black guillemot within Fishguard Harbour using a design that has been successful in other locations in the past.

9.12.2 Operational Phase Mitigation Measures

Embedded Mitigation

Existing environmental protections and good working practices currently implemented during the operation of the terminal will continue.

Additional mitigation measures

Consistent with the Environment (Wales) Act 2016 and PPW12 the development proposal includes additional measures to provide a net benefit for biodiversity which should leave the biodiversity and the resilience of ecosystems in a significantly better state than prior to development, through securing immediate and long-term, measurable and demonstrable benefit, on or adjacent to a development site.

Net benefit would be delivered through targeted enhancements for black guillemot as described under Construction Phase mitigation measures along with other bird boxes and bat box installation.

Nest boxes installed for black guillemots would be monitored. Damage to boxes would be repaired and next boxes that are lost will be replaced in more secure locations. A minimum of five functional next boxes will be maintained in suitable locations within the harbour for the operational life of the development.

Additional mitigation measures would also include the installation of five long life bat boxes and five bird nest boxes (woodcrete or equivalent) installed within the landholding. The bat boxes would be installed on trees in proximity to the western boundary flight line not subject to artificial light spill. Bird boxes would be installed on buildings, targeting species that have been subject to historic population declines including swift, and house sparrow.

House sparrow nest boxes would be installed on buildings within the land holding at a height of at least 3m and away from direct sunlight or the prevailing winds ideally north or east facing and away from areas subject to regular disturbance or artificial lighting. Swift boxes would be installed in similar situations but at a height of at least 5m

9.12.3 Future Monitoring

During the operational phase the black guillemot nest boxes will be monitored to assess use and where nesting pairs establish breeding success. Activity would be recorded regularly during the breeding season with monthly visits from mid-March to mid-July for the first 3 years after installation. Subsequent monitoring would be sufficient to confirm the presence / absence of nesting pairs and where young successfully fledge.

Locations and positioning of black guillemot nest boxes would be reviewed after 3 years to assess successes and any constraints.

9.13 Assessment of Residual Effects

This section sets out the predicted residual effects on IEFs following the identification of secondary / additional mitigation.

9.13.1 Otter

It is predicted that temporary impacts on otter foraging habitat during construction will be unavoidable but partially moderated by soft start techniques for activities that could generate higher levels of

underwater noise. The residual effect on the otter population is classified as having up to minor adverse based on the assumption that the harbour is a frequently used foraging habitat. The effect would only last for the duration of the construction period and is not a significant residual effect.

There would be negligible residual effects on the otters on the completion of construction and commencement of operations with a residual effect of negligible significance.

9.13.2 Bats

With the implementation of sensitive construction lighting at the temporary construction compounds potential adverse effects on bat flightlines and potential roost features would be avoided.

The implementation of stand offs between buildings that could be used by roosting bats and high noise level generating activities would avoid the potential adverse indirect effects on any bat roosts present within or adjoining the application site during the construction period. There would be no degradation in the value of the application site for foraging bats.

The residual effect would be negligible adverse.

During operation, the provision of long-life bat boxes on the western boundary of the site will increase roosting opportunities for several species of bat. The residual effect on bat populations is classified as up to minor beneficial.

9.13.3 Wintering and passage birds.

No specific embedded or additional mitigation measures are proposed for the assemblage of wintering birds using the Fishguard harbour and the entrance to Fishguard Bay. The residual impacts would remain up to minor adverse significance for the duration of the construction period and the residual impact during operation would remain as having negligible significance.

9.13.4 Black guillemot

Black guillemot occur within the harbour and immediate environs between February and August and are generally not present between September and February. The timing of the start of the construction period could have an influence the effect on black guillemot.

Residual effects during construction in spring would remain as up to minor adverse.

As part of the development, black guillemot nest boxes will be installed within the harbour using a specification that has been successfully used by breeding pairs in Northern Ireland.

Five nest boxes will be installed in selected locations on the walls of the harbour in undisturbed locations away from ferry operations and construction working areas. This would not avoid the effects on construction on this species (primarily noise and visual disturbance to a lesser extent) but would provide a refuge if installed at the start of the construction period. A residual minor adverse effect during construction would not be significant.

During operation the maintenance of functional nest boxes has the potential to result in the re-establishment of breeding pairs of black guillemot in the harbour. With multiple nest boxes there is potential for harbour to support a small breeding population. The residual effect should be minor beneficial in providing additional nesting locations and would have the potential to be moderate beneficial if regular breeding were established.

9.14 Cumulative Effects

9.14.1 Relevant developments

The projects considered in the cumulative assessment, extend up to 100km from Fishguard Harbour with 10 projects considered. Two in Pembrokeshire, seven are offshore developments and one is located on the coast of Ireland.

There are two potential developments on the coast of Pembrokeshire:

- Shellfish Farm expansion at Car-Y-Mor Ocean Farm, St Brides Bay, Pembrokeshire (Reference NP/24/0164/OBS). A planning decision has been made but the outcome is not known
- Jetty berth maintenance at South Hook LNG Terminal Company Ltd, South Hook LNG Terminal, Dale Road, Herbrandston, Milford Haven, SA73 3SU (Reference NP/22/0133/OBS). A planning decision has been made but the outcome is not known.

9.14.2 In-combination effects

The two developments being considered in the Cumulative Impact Assessment have no shoreline or terrestrial connectivity with the proposed development at Fishguard Harbour.

Otter

Although otters have large territories and will move through and between river catchments and around the coast the physical separation of the Proposed Development site from the developments at St Brides and South hook is substantial (~26km and ~60km directly across land respectively).

Otter populations will be present in coastal habitats around St Brides and South Hook. No individual otters would be expected to active in more than one of the three locations and any connectivity between populations would be limited given the geographic separation.

Wintering Birds

Construction at each of the proposed developments during the same winter period would have localised effects on wintering birds in the vicinity of each development. At each location wintering birds would adapt to the construction activities utilising a variety of habitats in the vicinity of the developments while avoiding indirect effects including noise and visual disturbance. The potential combined effects on individual species or the assemblage of species are negligible and not significant.

Other species

Black guillemot would not be affected by the other proposed developments.

Different populations of the same bat species would be expected to be present in the localities of each of the proposed developments. Given the distance between them, there would be no overlap in territories or connection between the bat populations.

It is concluded that there are no significant combined effects of the Proposed Development and other reasonably foreseeable developments on the important terrestrial ecological receptors identified within this ES chapter.

9.15 Limitations of the assessment

Most of the buildings in the application site are not located near proposed construction activities with no potential for features to be lost or negatively impacted by the development. The preliminary bat roost assessment of buildings and the precautionary assessment of overall bat roost potential is considered to be appropriate for buildings that will remain unaffected.

It is concluded that there were no significant limitations that would have affected the robustness of the assessment for EIA purposes.

9.16 Summary of effects and conclusion

Table 9-12 provides a summary of the effects based on the Proposed Development detailed in this of the ES and the conclusions of significance.

This table provides a summary of the effects for each important ecological receptor taking into account the embedded mitigation within the scheme design and the residual effects based on the full implementation of additional mitigation detailed in this Chapter.

The landside areas of the application site comprise development land consisting of the Fishguard Ferry Terminal, associated infrastructure, Fishguard Harbour railway station and railway line, the quay, internal roads and areas of hardstanding. The application site also includes a small part of the harbour open water. The wider harbour is bounded by breakwaters to the north and east. A very steep vegetated rock face, broadleaved woodland and coastal heathland adjoin the application site to the west. The majority of the section of quayside within the Proposed Development site is a vertical engineered block and concrete wall with a small section of rock armour revetment. The margins of the wider harbour are rock armour stone revetments.

The important ecological receptors assessed in this chapter are otter, the wintering/passage bird assemblage, black guillemot and bat populations (multiple species).

Ecological features that have been scoped out with no potential for impacts to arise from development are international and national designated sites, ancient woodland and priority habitats. All species not listed above were scoped out on the basis that if present the population would have importance only in the context of the site (negligible importance) or were considered to be absent from the Proposed Development site and its immediate surroundings.

9.16.1 Otter

Following a precautionary approach the residual effect during construction has been assessed as up to minor adverse significance. There are negligible residual effects on otter during operation. It is anticipated that there will be periods of reduced otter activity in the western side of the harbour as a result of construction noise and physical dredging of the substrate.

9.16.2 Bats

There would be a negligible residual effect on bat populations (roosting and foraging) during construction. None of the buildings within the harbour will be modified or changed under the Proposed Development. The potential to be used by roosting bats would remain unchanged. Lighting controls around the temporary compounds would avoid light spill onto adjoining habitats and in this context the behaviour of light sensitive species should not change during construction. This would protect any potential flightlines associated with the known bat roosts in the nearby Fishguard Bay Hotel. No additional operational lighting would be installed beyond those being installed on the quayside. Provision of bat boxes would result in up to a minor beneficial effect during operation.

9.16.3 Wintering birds

The residual impacts during construction would be up to minor adverse significance. The residual impact during operation would have negligible significance. Impacts primarily relate to noise disturbance and the anticipated movement away from noise generating activities during the construction period.

9.16.4 Black guillemot

Residual effects during construction in spring and summer would be up to minor adverse. The installation of nest boxes in selected locations on the walls of the harbour at the start of the construction period would provide areas of refuge and be suitable for the formation of breeding pairs. The maintenance of functional black guillemot nest boxes during operation has reasonable likelihood of a minor beneficial effect, with a moderate beneficial effect being possible of regular breeding is stablished.

Table 9-12 Summary of Effects

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Effects on otter population – resting, foraging, breeding	C		Soft Start piling Use of noise reduction equipment. Pre-start checks for otter	Low	Low	Minor adverse	None	Minor adverse	None
		O	None	Negligible	Low	Negligible	None	Negligible	None
Effects on wintering and passage bird assemblage	C		Soft Start piling Use of noise reduction equipment	Low	Low	Minor adverse	None	Minor adverse	None
		O	None	O: Negligible	Low	Negligible	None	Negligible	None
Effects on black guillemot population	C		None	Low	Medium	Minor adverse	Nest box provision	Minor adverse	None
		O	None	None	Medium	None	Nest box provision	Minor to moderate beneficial	Breeding success monitoring
Effects on bat populations (flight lines and foraging)	C		Avoidance of buildings with PRFs Avoidance high level noise adjacent to buildings with PRFs Controls on temporary construction lighting	Negligible	Low	Negligible	None	Negligible	None
		O	No increase in landside artificial lighting	Negligible	Low	None	Bat box provision on trees	Minor beneficial	None

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Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 10 Coastal Processes

10 Coastal Processes

10.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") on Coastal Processes and the vulnerability of the Proposed Development to climate change. This chapter considers the potential impacts to Coastal Processes from the Project during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing Coastal Processes trends to assess current environmental baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on Coastal Processes; and
- Recommend mitigation measures in relation to the proposed construction and operational phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

10.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Proposed Development on climate. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 10.8);
- Identifies any limitations encountered in compiling the environmental information (section 10.13);
- Presents an assessment of the potential likely significant effects on Coastal Processes arising from the Proposed Development (section 10.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 0.
- Highlights any necessary monitoring (section 10.10.3) and/or measures (see section 10.10.1 and section 10.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 10.9).

10.3 Study Area

The Coastal Processes Study Area for the Proposed Development as shown in Figure 10.1 is defined as the model domain used to simulate baseline coastal processes and post-baseline scenarios associated with the Proposed Development. This study area is expanded from the EIA Scoping Area (RPS, 2024) which encompassed the area of the Proposed Development, plus a buffer of one tidal excursion, on the basis of conservative assessment. The study area and model domain are further explained in Section 10.6.4.

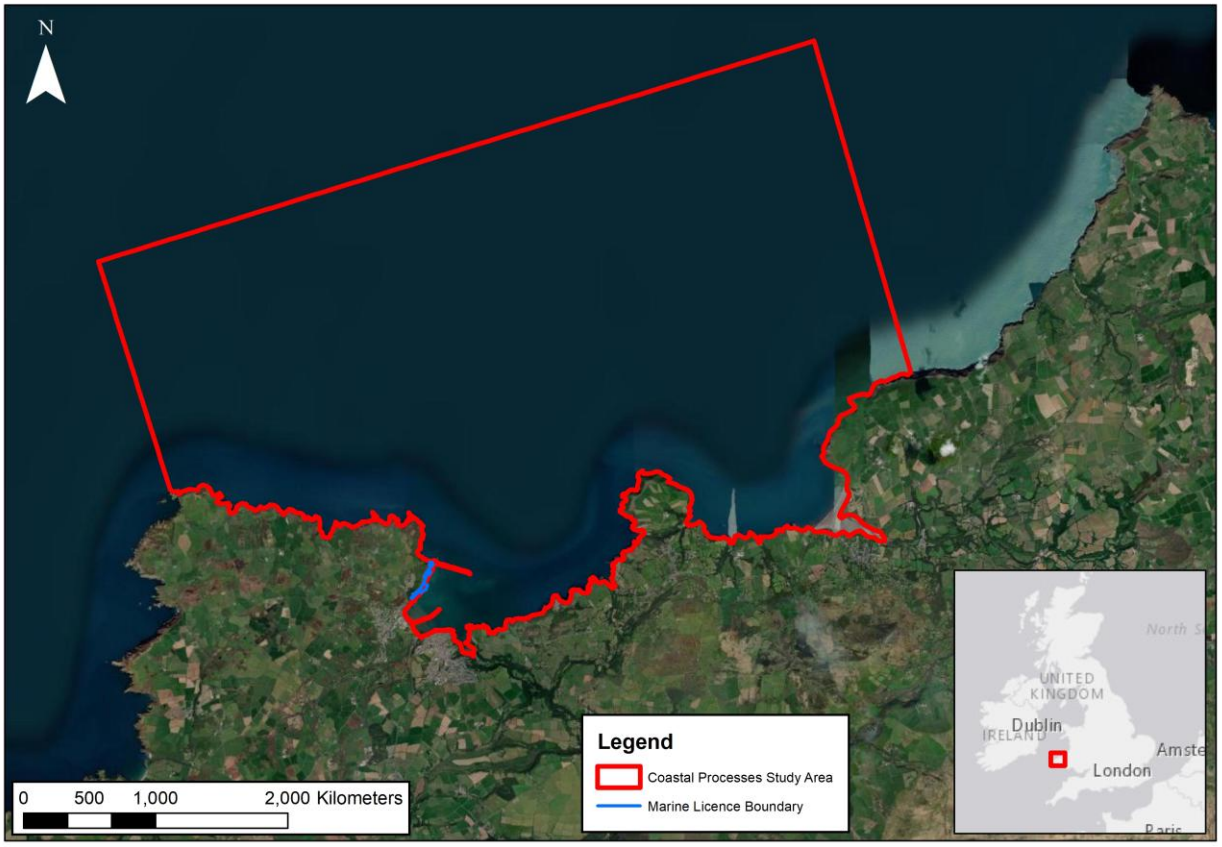

Figure 10.1 Coastal Processes Study Area

10.4 Policy Context

10.4.1 EU legislation and policy

10.4.1.1 Environmental Impact Assessment (EIA) Directive

The legislative framework for EIA is set out by European Directive 2011/92/EU, as amended by Directive 2014/52/EU (collectively referred to as the EIA Directive), introducing minimum requirements, with regard to the type of projects subject to assessment, the main obligations of developers, the content of the assessment and participation of competent authorities and the public.

Directive 2011/92/EU included climate as a criteria for assessment in EIA both in terms of the impact of the project on Coastal Processes (for example the nature and magnitude of suspended sediment concentrations (SSCs) and the vulnerability of the project to climate change (e.g. such as through rising sea levels).

10.4.2 National legislation and policy

10.4.2.1 Environmental Impact Assessment Regulations

EIA is the process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) set out the requirements for EIA under the Planning Act 2008.

This ensures that the determining authority has sufficient information relating to the likely significant effects on the environment arising from a project. The approach to undertaking the EIA for the Proposed Development is set out in section 10.7.

10.4.2.2 The Marine and Coastal Access Act 2009

Parts three and four of the Marine and Coastal Access Act 2009 introduced a new marine planning and licensing system for overseeing the marine environment and a requirement to obtain a marine licence for certain activities and works at sea.

Section 149A of the Planning Act 2008 allows applicants for development consent to apply for 'deemed marine licences' as part of the consenting process. Natural Resources Wales (NRW) are the responsible authority for deemed marine licences in Welsh waters. The NRW also perform regulatory compliance monitoring and act as the enforcement body in respect of the conditions contained within the deemed marine licences.

Part 5 of the Marine and Coastal Access Act 2009 enables the designation of Marine Conservation Zones (MCZs) in England and Wales as well as UK offshore areas. Consideration of MCZs is required for any marine licence application or application for development consent which includes a deemed marine licence.

10.4.2.3 Welsh National Marine Plan

The Welsh National Marine Plan (WNMP) (Welsh Government, 2019) required for under the Marine and Coastal Access Act (MCAA) states the Welsh Governments policies for and in connection with the sustainable development of the marine plan area. This area comprises an inshore and offshore region which consists primarily of approximately 32,000 km2 of sea and 2,120 km of coastline. A number of key provisions are made within the WNMP that are considered within the following ES, namely:

- ENV_01: Proposals should demonstrate how potential impacts on marine ecosystems have been taken into consideration and should, in order of preference:
  - a. avoid adverse impacts; and/or
  - b. minimise impacts where they cannot be avoided; and/or
  - c. mitigate impacts where they cannot be minimised.

If significant adverse impacts cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding. Proposals that contribute to the protection, restoration and/or enhancement of marine ecosystems are encouraged.

- ENV_02: Proposals should demonstrate how they:
  - avoid adverse impacts on individual Marine Protected Areas (MPAs) and the coherence of the network as a whole;
  - have regard to the measures to manage MPAs; and
  - avoid adverse impacts on designated sites that are not part of the MPA network.
- SOC_09: Proposals should demonstrate how they:
  - avoid significant adverse impacts upon Coastal Processes; and
  - minimise the risk of coastal change and flooding;
  - Proposals that align with the relevant Shoreline Management Plan(s) and its policies are encouraged.

- GOV_01: Proposals should demonstrate how they:
  - a. avoid adverse effects; and/or
  - b. minimise effects where they cannot be avoided; and/or
  - c. mitigate effects where they cannot be minimised.

If significant adverse effects cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding. Proposals that contribute to positive cumulative effects are encouraged.

10.4.2.4 UK Marine Policy Statement

The UK-wide Marine Policy Statement (MPS) was published in March 2011, under the Marine and Coastal Access Act 2009, in order to provide a framework for marine spatial planning, specifically for the preparation of Marine Plans and taking decisions that affect the marine environment (HM Government, 2011). The MMO has taken a regional approach to the development of marine plans in Welsh waters.

The Marine and Coastal Access Act 2009 requires all public authorities taking authorisation or enforcement decisions that affect or might affect the UK marine area to do so in accordance with the MPS and the relevant Marine Plans.

The MPS identifies certain environmental topic-specific policy considerations. Those that relate the Proposed Development with respect to Coastal Processes:

- 3.1.6: When developing Marine Plans the marine plan authority will incorporate the identified areas (environmentally designated areas) and features of importance for nature conservation and state policies for or in connection with the sustainable development of the area. These should inform identification of policies and locations for marine activities and developments. Activities or development that may result in unacceptable adverse impacts on biodiversity should be designed or located to avoid such impacts.
- 3.1.8: Marine plan authorities and decision-makers should take account of the regime for marine protected areas (MPAs) and comply with obligations imposed in respect of them. This includes the obligation to ensure that the exercise of certain functions contribute to, or at least do not hinder, the achievement of the objectives of a MCZ or MPA (in Scotland). This would also include the obligations in relevant legislation relating to sites of special scientific interest (SSSIs) and sites designated under the Wild Birds and Habitats Directives.
- 3.6.7: In considering an application, decision makers should undertake a detailed evaluation of the potential adverse effects of any dredging activity or deposit on the marine ecosystem and others using the sea. This should have full regard to any accompanying environmental statement or additional data that may be requested in support of the application and international obligations under the OSPAR Convention 1992 and London Protocol 1996, as well as any other available guidance. Account should also be taken of the views expressed by other consultees before a decision is taken whether to grant approval.
- 3.6.9: Decision makers should consider the potential adverse effects on the marine environment, habitats and wildlife from dredging activity. Particular recognition should be given to the implementation and use of the maintenance dredge protocol 95 to minimise impacts on habitats and wildlife and help meet statutory obligations in relation to European Sites. There also needs to be compliance with requirements of the WFD and other EU Directives.

10.4.2.5 West Wales Shoreline Management Plan

The assessment of potential changes to Coastal Processes has been made with consideration to the specific policies set out within Shoreline Management Plan (SMP) 21 – St Anne's Head to the Great Orme (West of Wales Coastal Group, 2011), established by the West of Wales Coastal Group

whose members include Natural Resources Wales, local maritime authorities, government bodies and relevant stakeholders.

SMPs split the coastline into small sections (called policy units) and describe how these sections will be managed over the:

- Short-term (2005-2025)
- Medium-term (2025-2055)
- Long-term (2055-2105)

There are four approaches that can be applied to each policy unit for each period of time including:

- Hold the line (HTL) by maintaining or changing the existing standard of protection;
- Advance the line (ATL) by building new defences on the seaward side of the original defences (although none applied in Wales);
- Managed realignment (MR), which allows the shoreline to move backwards and forwards with management to control or limit the movement; and
- No active intervention (NAI) where there is no investment in coastal defences and natural processes are allowed to continue to create an evolving coastline.

Table 10-1: Summary of Shoreline Management Policies relevant to the Coastal Processes Study Area

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
4.1	Pen Anglas to Pen Cw	NAI	NAI	NAI	N/A
4.2	Fishguard Harbour	HTL	HTL	HTL/AL	Maintain operation of the port and improve defences. Potential for advance the line to improve sustainability of the head of the harbour through possible joint funding.
4.3	The Parrog and Goodwick Moor	HTL	MR	MR	Potential for opening up the estuary with the road taken across as a bridge.
4.4	Penyraber	NAI	NAI	NAI	N/A
4.5	Hill Terrace	HTL	HTL	HTL	Support to coastal slope.
4.6	Lower Town Centre	HTL	HTL	MR	Redesign of river entrance and development plan for the core of the village in association with highway authority. Subject to joint funding.
4.7	Lower Town Quay	HTL	HTL	HTL	Subject to joint funding.
4.8	Castle Point Cliffs	NAI	NAI	NAI	N/A
4.9	Castle Point to Pwllgwaelod	NAI	NAI	NAI	N/A
4.10	Pwllgwaelod Bay	HTL	NA	NAI	Local maintenance prior to removal of defence.
4.11	Dinas Head	NAI	NAI	NAI	N/A
4.12	Cwm-yr-Eglwys	HTL	HTL	HTL	Subject to funding, with the intent to manage and improve the beach and foreshore.
4.13	Cwm-y-eglwys to Carreg Germain	NAI	NAI	NAI	N/A
4.14	Newport Parrog West	MR	MR	MR	Support local private defence.
4.15	Newport Parrog	HTL	HTL	MR	Subject to further detailed study. The default policy in the third epoch would be NAI.
4.16	Nyfer Estuary	NAI	NAI	NAI	This would not preclude local management.
4.17	The Bennet	NAI	NAI	NAI	N/A
4.18	Newport Sands	HTL	MR	NAI	Retreat defence line in balance with roll back of the Bennet.
4.19	Newport Bay Cliffs	NAI	NAI	NAI	Manning natural function of Cliffs and SSI.
5.1	Pen-y-Bal to Cemaes Head	NAI	NAI	NAI	N/A

Key: HTL - Hold the Line, AL - Advance the Line, NAI – No Active Intervention, MR – Managed Realignment

10.5 Consultation

Table 10-2 summarises the issues raised relevant to Coastal Processes, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Volume 1, Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Proposed Development between 06/12/2024 and 15/01/2025 and the consultees that were contacted. In total responses were received from six relevant consultees, these being:

- Natural Resources Wales
- Marine and Fisheries Division – Welsh Government
- Maritime and Coastal Authority
- Royal Commission on the Ancient and Historical Monuments of Wales
- Royal Yachting Association
- The Crown Estate
- Trinity House

Table 10-2: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to Coastal Processes

Consultee	Issues raised	Response to issue raised and/or where considered in this chapter
NRW	Marine and coastal guidance produced by NRW that may provide useful information to help with your project is available here: https://naturalresources.wales/guidance-and-advice/business-sectors/marine/?lang=en	The relevant guidance used to inform the ES assessment, including that provided by the NRW, have been outlined in Section 10.7 and considered as part of this assessment.
	No consideration has been given to the relevant Shoreline Management Plan. Since you are carrying out works that will affect (change or maintain) the current shoreline position, you will need to identify within your application the relevant Shoreline Management Plan and policy unit for the area of planned work. This information can be found on our website Shoreline Management Plans where you can identify the relevant Plan and Policy Unit (West of Wales and policy unit 4.2 for Fishguard Harbour). Further information for the area of planned work is here https://www.grwparfordirolgorllewincymru.cymru/page/smp2/main-document	The West Wales SMP has been considered within the ES as a piece of national policy, as described in Section 10.4.2.5 and Table 10-1. Policy Unit 4.2 (Fishguard Harbour) defines a Hold the Line Policy which aims to "*Maintain operation of the port and improve defences. Potential for advance the line to improve sustainability of the head of the harbour through possible joint funding*". The Proposed Development therefore aligns with the SMP policy, given it will help to safeguard the port, providing a long term safe berthing location for the Stena Line ferry.
	You must ensure that the ES show clear consideration of compliance with the UK Marine Policy Statement and the Welsh National Marine Plan. You can use the Welsh National Marine Plan signposting document available on our website (Natural Resources Wales / Marine licence application forms) to assess how the project complies with its policies within the Plan. The published Welsh National Marine Plan can be found here: https://gov.wales/welsh-national-marine-plan-document and guidance on the implementation can also be found here: https://gov.wales/welsh-national-marine-plan-implementation-guidance.	
	2D and 3D Numerical modelling requires real-time timeseries data sets of fixed point current velocities and direction normally acquired from a fixed point seabed mounted ADCP. It also requires accurate water depth measurements at a fixed location. Wave data is also required and can be obtained using wave buoys or AWACs. The model is also dependent on accurate high resolution bathymetry for the study area of the model and if used	Correspondence with NRW highlighted that ADCP deployment would only be required if the presence of sensitive habitats was observed, which was not the case for Fishguard Harbour. Nevertheless, the models used to inform this assessment have been

for sediment transport estimates, will require the seabed sediment characteristics (size, distribution, type etc) representative of the study area	calibrated and validated using UK National Tide Gauge Network tide gauge data and UKHO Tidal Diamond information. This process is described in Volume 2, Chapter 10: Technical Appendices. Sediment characteristics have been defined by a site specific survey of Fishguard Harbour. This data is described in Sections 10.8.4 and 10.9.3 respectively.
NRW acknowledge that numerical modelling has been previously conducted for Fishguard Harbour. We request that the previous modelling results for the earlier Fishguard Linkspan in 2018 are shared, as the model outputs have been used to inform the baseline characteristics. NRW would like clarification as to whether hydrodynamic survey data (waves, currents and water levels) and bathymetric surveys were carried out to collect the required data to calibrate and validate the earlier numerical model.	The baseline environment for Fishguard Harbour has been updated for the purposes of this EIAR, as described in Section 10.8. As such, outputs from previous modelling studies have been superseded by the work described in this chapter. Calibration and validation outputs for the numerical models used to assess coastal processes have been included within Volume 2, Chapter 10: Technical Appendices.
NRW(A) request the opportunity to review the model calibration and validation outputs and the model scenarios proposed to assess the physical processes impacts. NRW recommend that the numerical modelling calibration and validation results and the scenario test outputs are included as a separate technical annex to the coastal processes ES chapter.	Calibration and validation outputs for the numerical models used to assess coastal processes have been included within Volume 2, Chapter 10: Technical Appendices.
NRW note that previous modelling shows that the current velocities within the harbour are very low (0.05m/s). There is the potential for very large SSC plumes to develop in Fishguard Harbour from the proposed works during the construction phase. Consideration therefore needs to be given to the length of time that the SSC plumes generated during the dredging and construction works will take to disperse and settle out of suspension and the potential knock on impacts to other receptors (e.g. benthic ecology, water quality, WFD).	A detailed description of the dredging operation and the related modelling scenario are presented in Section 10.9.2. It was concluded sediment can remain suspended for up to four hours after the cessation of release. These outputs have been considered by other specialists when assessing potential impacts on relevant receptors as described in other chapters of this EIAR.
NRW advise that there is insufficient information in the scoping report with regards to the capital dredging activities. There is no inclusion of the amount of sediment to be dredged (dredge volume), no inclusion of the dredge footprint and no inclusion of the sediment type of the dredge material (distribution of sand/mud). The only inclusion to sediment type is a reference to soft sediment.	Sediment type as defined by site specific survey is discussed for Fishguard Harbour and specific dredge operations in Sections 10.8.4 and 10.9.2 respectively. The fate of dredged material is now described in the Project Description chapter of the EIAR.
We advise that is not clear from the scoping opinion where exactly the dredging will take place and over what time period. There is also no information regarding the dredge methodology which will have a bearing on the potential impacts to physical processes and the generation of suspended sediment plumes.	
NRW request clarification as to whether the material dredged during maintenance dredge activities are to be removed and used as fill for the land reclamation. We also request clarification as to whether the present marine licence for the maintenance dredging in Fishguard Harbour permits the removal of dredge material from the marine environment.	

	Placement of scour toe protection in front of the rock armour revetment will prevent undermining of the seabed in front of the toe. NRW notes the intention to include primary scour protection around the toe of the rock armour. We advise that consideration needs also to be given to the potential for secondary scour pits to occur in front of the primary toe protection.	The potential for formation of secondary scour pits is considered within the Assessment of Operational Effects shown in Section 10.9.3.

10.6 Methodology to inform the baseline

10.6.1 Desktop study

Information on climate within the Coastal Processes Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 10-3. These sources provide the most up to date data for this assessment.

Table 10-3: Summary of key desktop reports.

Title	Source	Year
Marine Environmental Data Information Network (MEDIN)	datahub.admiralty.co.uk/portal/apps/sites/#/marine-data-portal	2025
European Marine Observation and Data Network (EMODnet) – Seabed Classification	https://www.emodnet-geology.eu/	2025
British Geological Survey (BGS)	https://mapapps2.bgs.ac.uk/geoindex_offshore**Invalid source specified.**	2025
CEFAS Climatology Report	https://data.cefas.co.uk/view/18133	2016
DHI Metocean Data Portal	https://www.metocean-on-demand.com/	2025
Geology of the seabed and shallow subsurface: The Irish Sea.	British Geological Survey	2015
British Oceanographic Data Centre (BODC) UK tide gauge network. Database of current observation	https://www.bodc.ac.uk/data/hosted_data_systems/sea_level/uk_tide_gauge_network/	2024
United Kingdom Hydrographic Office (UKHO) - Published Charts and Tide tables	https://www.admiralty.co.uk/	2025
JNCC mapping data	https://jncc.gov.uk/mpa-mapper/	2025
West Wales Shoreline Management Plan 2	https://www.grwparfordirolgorllewincymru.cymru/page/smp2/main-document	2011
UK Renewables Atlas	https://www.renewables-atlas.info/explore-the-atlas/	2025

10.6.2 Designated Sites

All designated marine areas within and surrounding the area of the Proposed Development including qualifying features that could be affected by the construction, operation and maintenance phases of the Proposed Development were identified using resources from the Joint Nature Conservation Committee (https://jncc.gov.uk/mpa-mapper/).

As illustrated in Figure 10.1, the Coastal Processes Study Area is situated in the direct vicinity of two designated marine areas, defined in Table 10-4. In this case, both relevant designations were Special Areas of Conservation (SACs). These SACs are as follows:

- West Wales Marine/Gorllewin Cymru Forol SAC (UK0030397): The West Wales Marine SAC is located in the coastal waterbodies between Llŷn peninsula in the north to Pembrokeshire in the

south-west, primarily designated due to the presence of harbour porpoise (Phocoena phocoena) which are listed in Annex II of the Habitats Directive (92/43/EEC).

- Cardigan Bay/Bae Ceredigion SAC (UK0012712): The Cardigan Bay SAC stretches from Ceibwr Bay in Pembrokeshire to Aberarth in Ceredigion, extending c. 20 km from the coast. The site is designated for seven features, those being:
  - Sandbanks which are slightly covered by sea water all the time (Annex I) (1110)
  - Reefs (Annex I) (1170)
  - Submerged or partially submerged sea caves (Annex I) (8330)
  - Bottlenose dolphins (Tursiops truncates) (Annex II) (1349)
  - Sea lamprey (Petromyzon marinus) (Annex II) (1095)
  - River lamprey (Lampetra fluviatilis) (Annex II) (1099)
  - Grey seal (Halichoerus grypus) (Annex II) (1364)

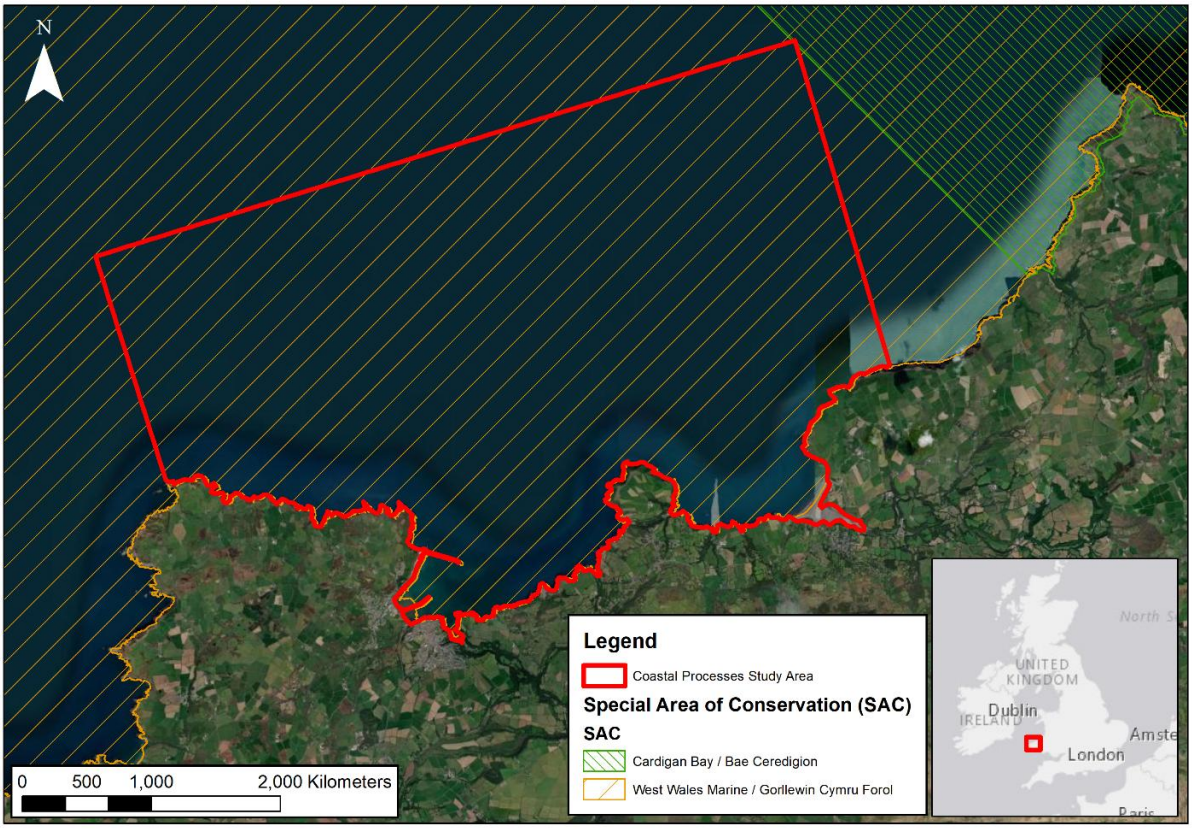

Figure 10.2: Relevant designated marine areas within or near the Coastal Processes Study Area

Table 10-4: Relevant designated marine area within or near the Coastal Processes Study Area.

Name	Status	Feature
West Wales Marine/Gorllewin Cymru Forol	Special Area of Conservation (SAC)	Species: Harbour porpoise (*Phocoena phocoena*)
Cardigan Bay/Bae Ceredigion	Special Area of Conservation (SAC)	Habitats: Sandbanks which are slightly covered by sea water at all times Reefs Submerged or partially submerged sea caves Species: Bottlenose dolphin Sea lamprey River lamprey Grey seal

10.6.3 Site-specific surveys

To inform the ES a range of site-specific surveys were undertaken. A summary of the surveys undertaken to inform the coastal processes impact assessment is presented in Table 10-5 below.

Table 10-5: Summary of site-specific survey data

Title	Extent survey	ofOverview of survey	Survey contractor	Date	Reference to further information
Bathymetric Survey	Contained to Fishguard Harbour	Bathymetric survey carried out using multibeam echosounder and single-beam echosounder techniques.	Shoreline Surveys	December 2024	N/A
Geotechnical Site Investigation for the Fishguard Linkspan Project		Survey was undertaken to determine the ground and ground contamination conditions within Fishguard Harbour, via in situ sampling. Sediment classification and composition were determined through lab analysis (particle size analysis (PSA), using vibrocore collected samples.	In Situ Site Investigation (InSitu) Limited	April 2025	(In Situ Site Investigation Limited, 2025)
Fishguard Marina Marine Ground Investigation: Factual Report		Survey was undertaken to determine the ground and ground contamination conditions within Fishguard Harbour, via in situ sampling. Sediment classification and composition were determined through lab analysis (particle size analysis (PSA), using borehole collected samples.	FUGRO	July 2015	**Invalid source specified.**

10.6.4 Numerical Modelling Methodology

RPS used the MIKE 21 hydrodynamic numerical modelling software package by Danish Hydraulic Institute (DHI)(described in the following section) to address potential coastal processes issues. This was achieved by developing a range of two-dimensional numerical models to represent:

- The pre-project scenario
- The post-project scenario with the Proposed Development in place.

These models were used in conjunction with hydrographic survey data to assess the construction and operational impacts of the Proposed Development in the context of the following coastal processes:

- The tidal regime;
- The inshore wave climate;
- The dispersion and settlement of sediment plumes generated during dredging operations; and
- Sediment dynamics and the morphological response of the seabed around the Proposed Development.

The impact of the Proposed Development on these coastal processes has been quantified using difference plots throughout this chapter, i.e. post-project minus pre-project conditions. As such, the extent and magnitude of potential impacts as a result of the Proposed Development can be identified and compared against baseline conditions.

A suite of coastal process models, based on the MIKE software developed by DHI was used to assess the potential impact of the Proposed Development on the coastal. The MIKE system is a state-of-the-art, industry standard modelling application, based on a flexible mesh approach. This software was developed for applications within oceanographic, coastal and estuarine environments. The model domain is shown in Figure 10.3. The MIKE suite is a modular system that contains several different but complementary modules encompassing different coastal processes, these are summarised in Table 10-6.

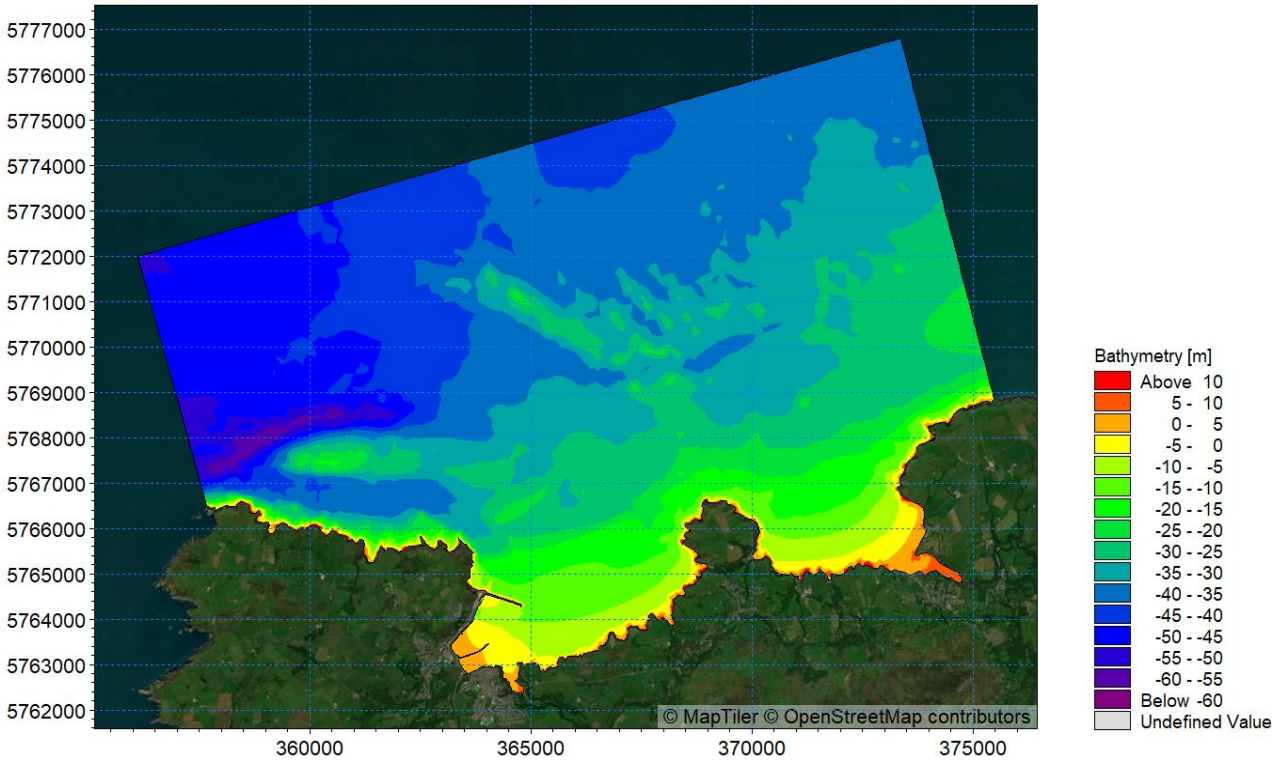

Figure 10.3: Coastal Processes model domain

Table 10-6: MIKE suite of models

Simulation	Model	Description
Baseline and post-construction tidal flow	MIKE21 Flexible Mesh (FM) modelling system	The FM Module is a 2-dimensional, depth-averaged hydrodynamic model which simulates the water level variations and flows in response to a variety of forcing functions in lakes, estuaries and coastal areas. The water levels and flows are resolved on a mesh covering the area of interest when provided with bathymetry, bed resistance coefficient, wind field, hydrodynamic boundary conditions, etc.
Baseline and post-construction wave climate	MIKE21 Spectral Wave (SW)	The wave modelling was undertaken using the spectral wave model, MIKE21 SW. The waves were computed on the same grid as the tidal flows. The model resolves the wave field by simulating wind generation of waves within the model domain and the propagation of externally generated swell waves through the domain.
	MIKE21 Boussinesq Wave (BW)	The BW Module was also utilised given its effectiveness in simulating the propagation and transformation of waves in coastal regions and harbours, as is required in the case of Fishguard.
Construction phase dredging operations	MIKE21 Mud Transport (MT)	The Mud Transport module simulates the erosion, transport, settling and deposition of cohesive and fine-grain non-cohesive material in marine, brackish and freshwater areas. The module can be used to assess the impact of dredging operations, dispersion of material, siltation, and contaminated sediment studies.

10.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following Coastal Processes specific guidance as follows:

- NRW (2021) Marine Physical Processes Guidance to inform Environmental Impact Assessment (EIA)
- NRW (2017) Advice to inform Development of Guidance on Marine, Coastal and Estuarine Physical Processes Numerical Modelling Assessments

10.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in Table 10-7 below.

Table 10-7: Definition of terms relating to the magnitude of an impact.

Model	Description
High	Change in Coastal Processes, which results in the loss of a coastal feature (e.g. blockage of sediment pathway resulting in loss of spit). Persists for a long term duration i.e. more than five years, and is irreversible (Adverse). Change in Coastal Processes, which results in the creation of a coastal feature (e.g., reduction in wave climate giving rise to dune formation). Persists for a long term duration i.e. more than five years, and is irreversible (Beneficial).

Medium	Alteration of Coastal Processes which effects the rate at which a coastal feature is maintained (e.g., reduction in accretion rate). Persists for a long-term duration i.e. more than five years (Adverse). Alteration of Coastal Processes which effects the rate at which a coastal feature is developing (e.g., reduction in erosion rate). Persists for a long-term duration i.e. more than five years (Beneficial).
Low	Some measurable change in Coastal Processes, but does not affect the rate at which a coastal feature is maintained. Persists for a medium-term duration i.e. one to five years (Adverse). Some measurable change in Coastal Processes, but does not affect the rate at which a coastal feature is developing. Persists for a medium-term duration i.e. one to five years (Beneficial).
Negligible	Imperceptible loss to a coastal feature, or alteration to coastal processes of short-term duration (Adverse). Short-term duration i.e. less than one year. Imperceptible gain to a coastal feature, or alteration to coastal processes of short-term duration (Beneficial). Short-term duration i.e. less than one year.

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 10-8: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale and recoverable. Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale and recoverable. Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon Coastal Processes is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 10-9. Where a range of significance of effect is presented in Table 10-9, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 10-9: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

10.8 Baseline Environment

The coastal processes study was undertaken to provide information on potential changes to the existing baseline conditions and the fate of mobilised sediment during the construction phase by means of numerical modelling. Numerical models were developed and calibrated using publicly available datasets. These models were then implemented in comparative studies to determine the potential impact of the infrastructure on tidal flow, wave climate and inform sediment transport patterns.

10.8.1 Tidal Regime

The tidal flow simulations which form the basis of the study were undertaken using the MIKE 21 FM flexible mesh modelling system. The FM Module is a two-dimensional, depth averaged hydrodynamic model which simulates the water level variations and flows in response to a variety of forcing functions in lakes, estuaries and coastal areas. The water levels and flows are resolved on a mesh covering the area of interest when provided with bathymetry, bed resistance coefficient, hydrodynamic boundary conditions, etc.

The tidal model was driven using boundary conditions extracted from RPS' Tide and Storm Surge Forecast (TSSF) model of Irish coastal waters, the extent and bathymetry of which is illustrated in Figure 10.4. This model was also developed using flexible mesh technology, with the mesh size (model resolution) varying from circa 24 km along the offshore boundary to circa 200 m around the Welsh coastline. These boundaries were fully defined ‘flather’ boundaries for which both surface elevation and current vectors are specified.

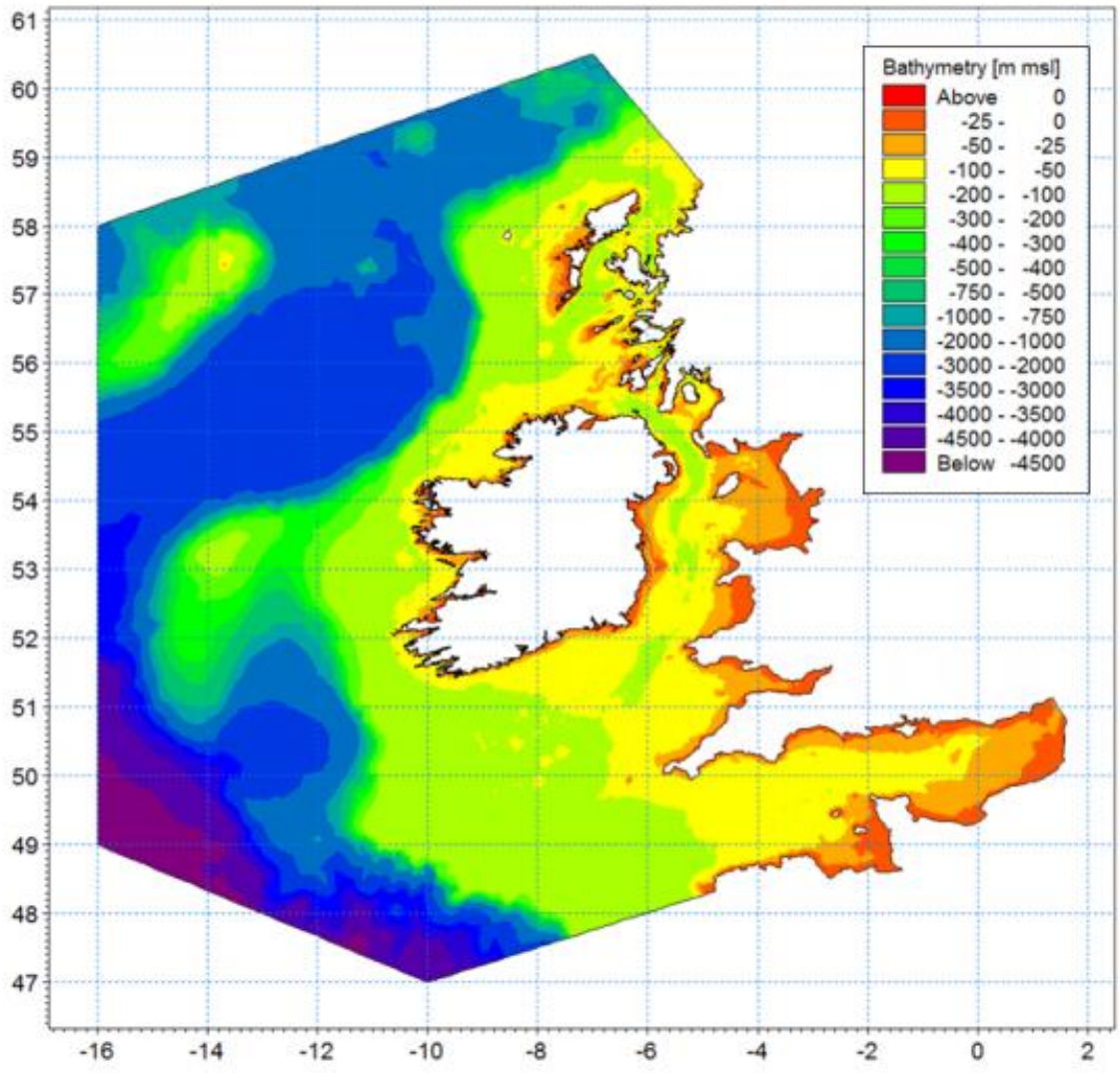

Figure 10.4: Extent and bathymetry of Irish Seas tidal and storm surge model

Admiralty tidal harmonics along with flows derived from Admiralty tidal diamonds and tide gauge information collected within Fishguard Harbour were used as the primary calibration data for hydrodynamics, as presented within Volume 2, Chapter 10: Coastal Processes Technical Appendices.

Figure 10.5 and Figure 10.8 illustrate mid-flood, high water, mid-ebb and low water conditions respectively, within Fishguard Harbour. It will be seen from these figures that current velocities within the harbour and particularly around the Proposed Development are extremely weak, with flows in the vicinity generally not exceeding 0.04m/s. A tidal eddy can be observed to form at the entrance of the harbour during the flood tide and into high water, causing a clockwise direction of tidal flows that pushes water northward out of the harbour at the easternmost extent of the northern breakwater, wherein the highest current speeds are observed at high tide at c. 0.52 m/s. The residual spring tidal current illustrated in Figure 10.9 follows suit, with a very weak clockwise flow which is at its greatest adjacent to the northern breakwater.

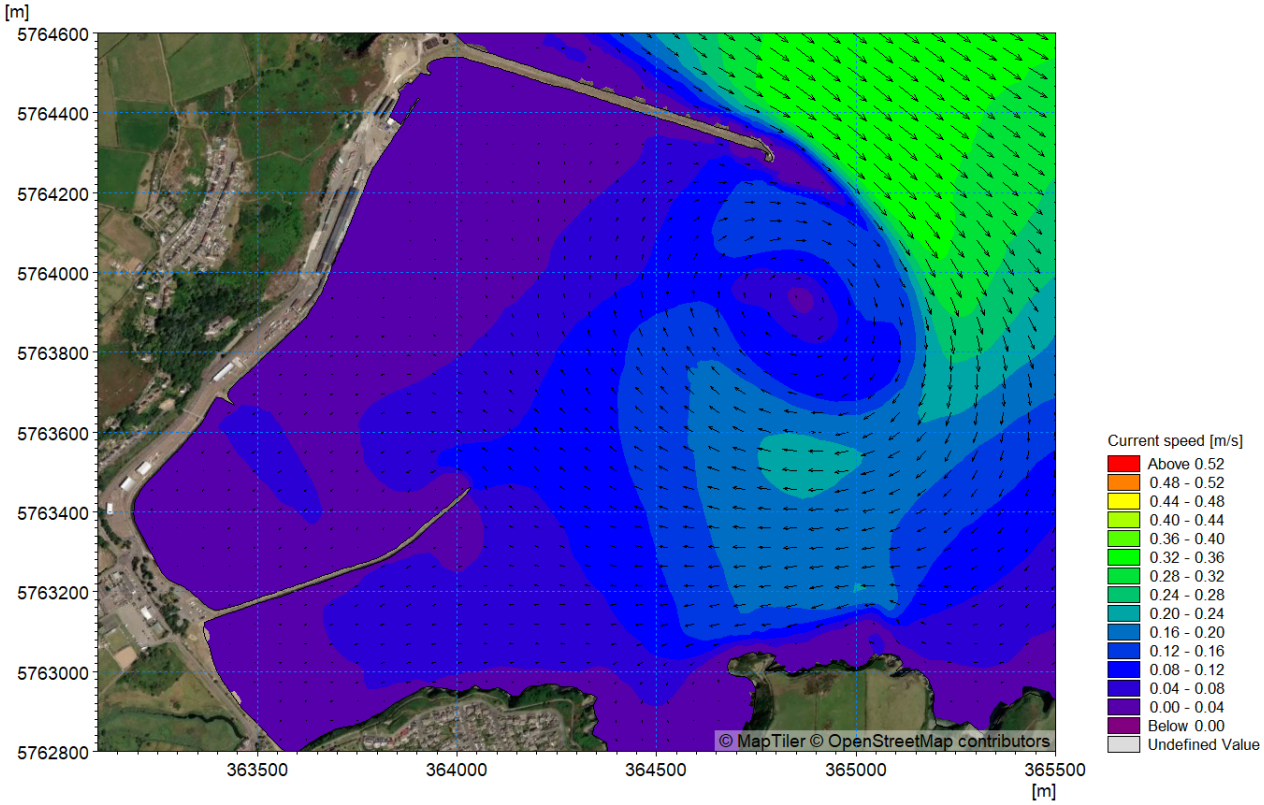

Figure 10.5: Tidal flow patterns – spring tide flood.

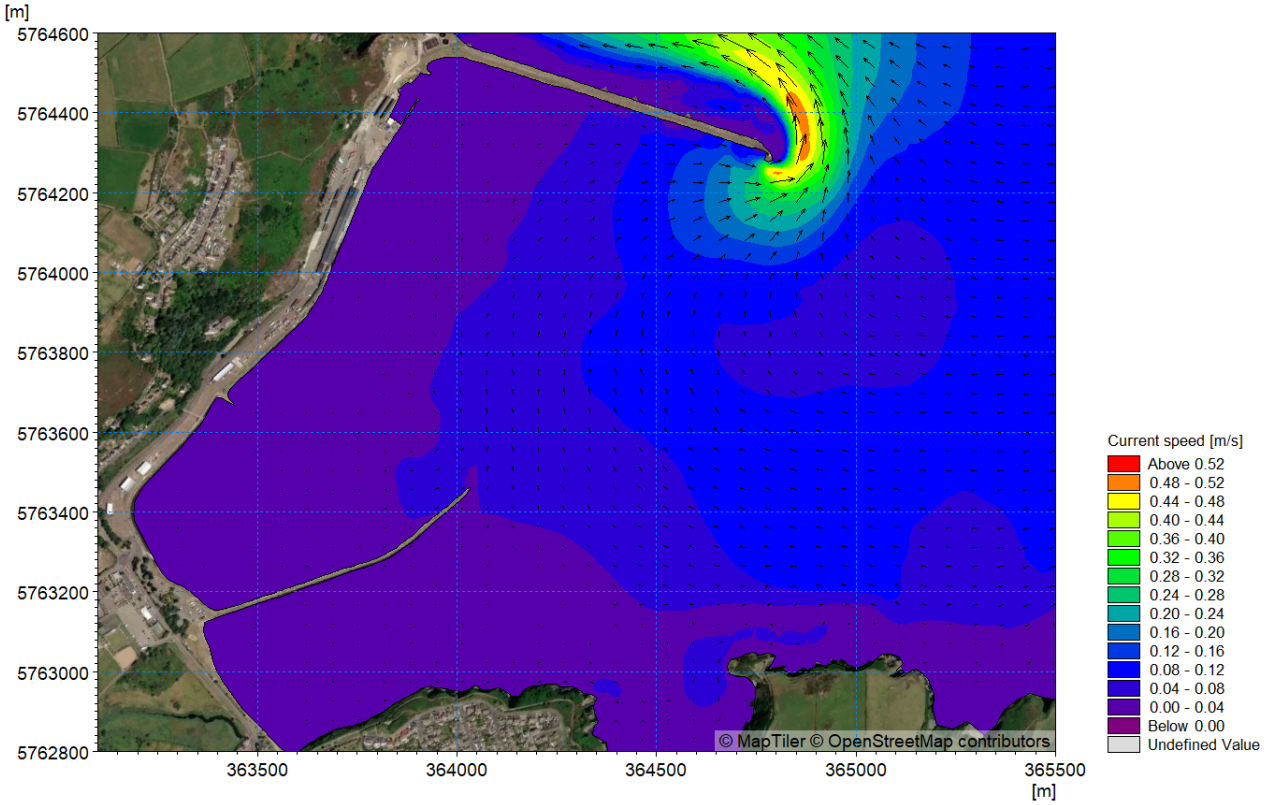

Figure 10.6: Tidal flow patterns – spring high water.

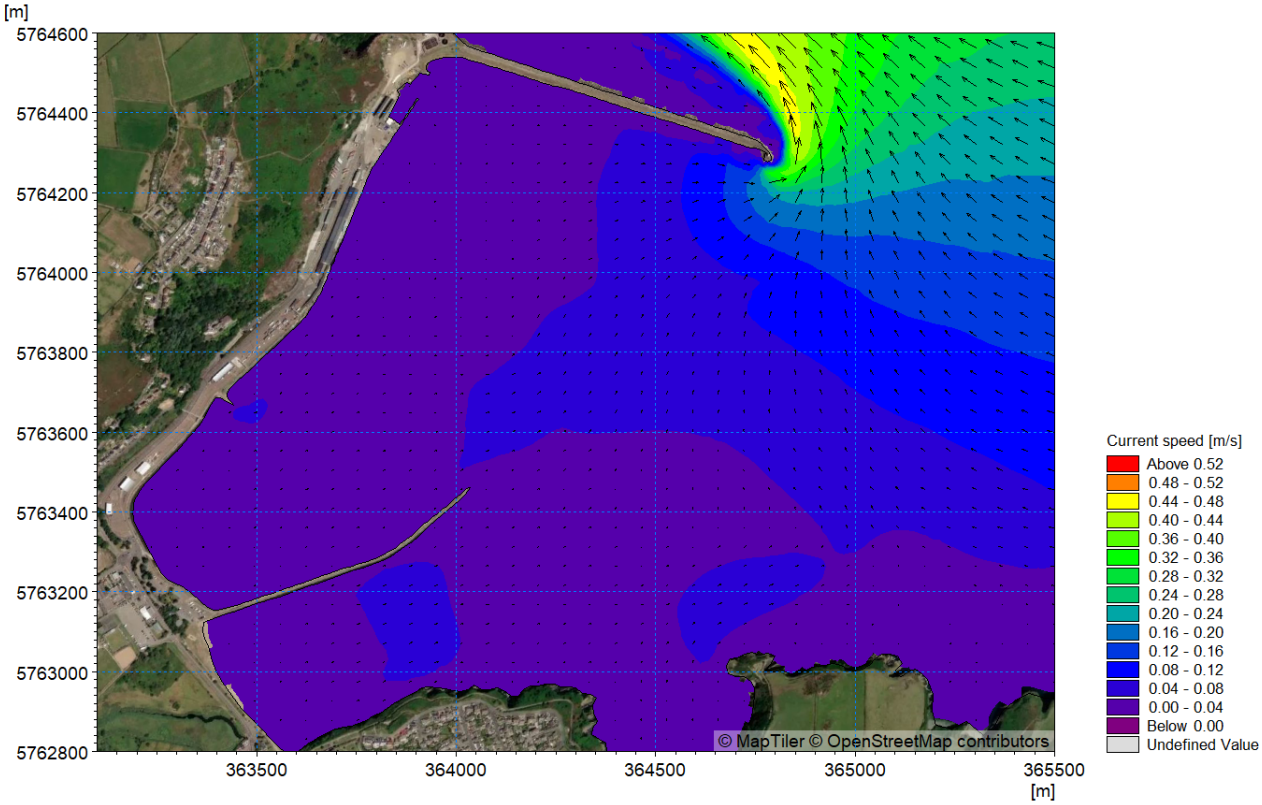

Figure 10.7: Tidal flow patterns – spring tide ebb.

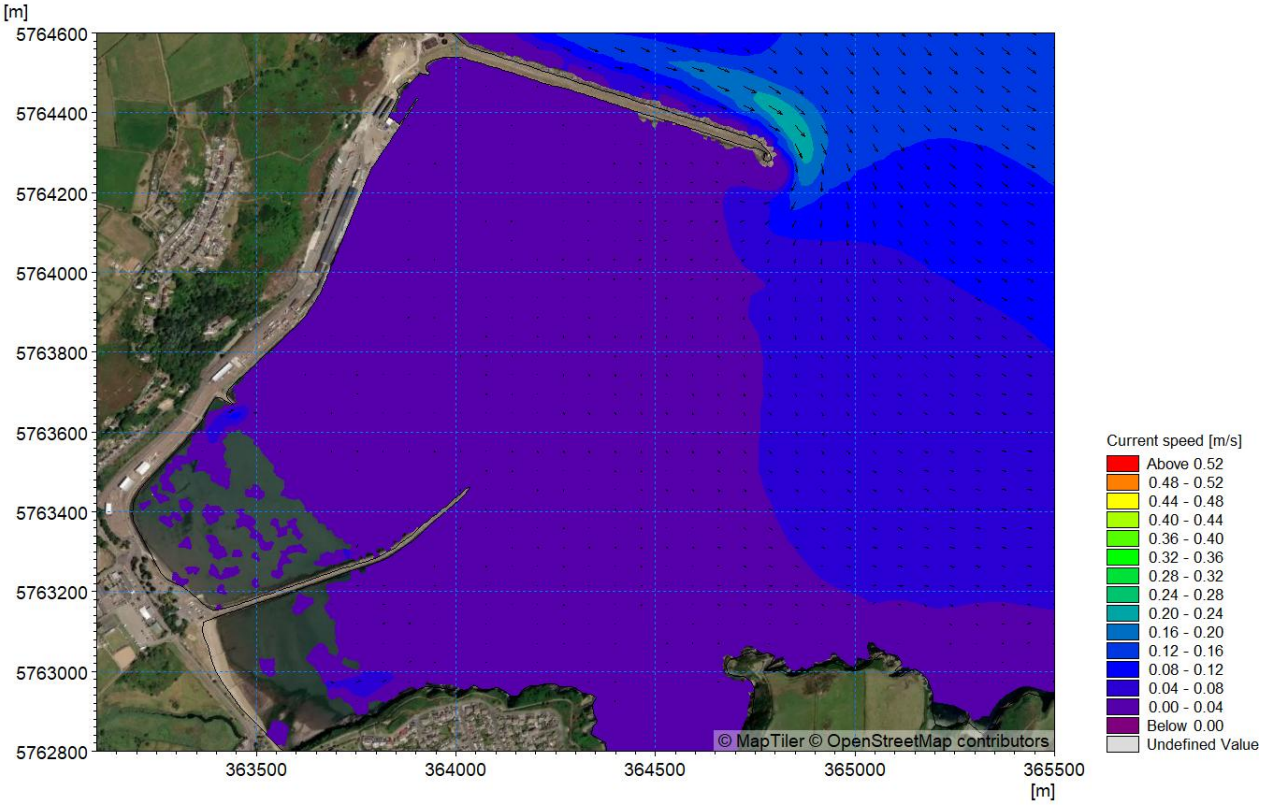

Figure 10.8: Tidal flow patterns – spring tide low water.

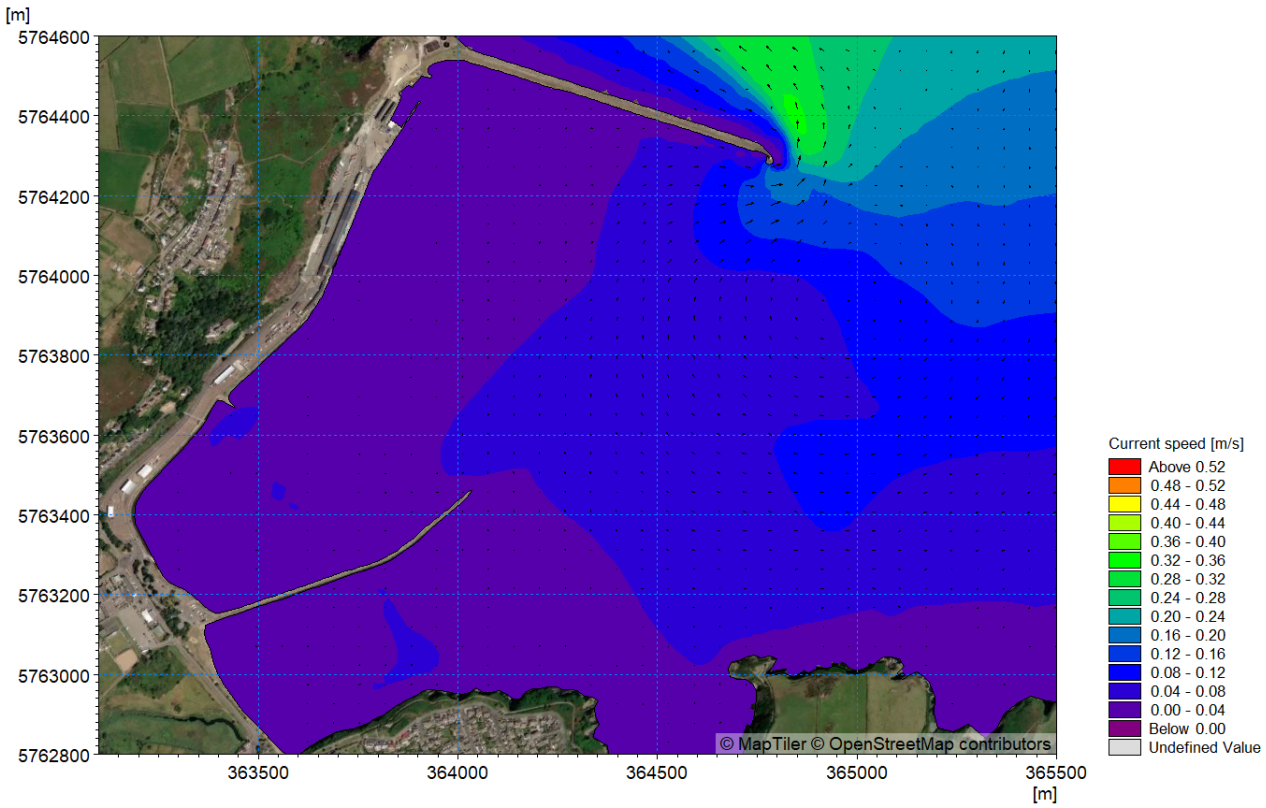

Figure 10.9: Tidal flow patterns – spring tide residual.

10.8.2 Wave Climate

The wave climate at the site of the Proposed Development has been simulated using a combination of the spectral wave energy model, MIKE 21 SW and the harbour disturbance model, MIKE21 BW.

The wave climate approaching Fishguard Harbour from the south west approaches and the Irish Sea was simulated for 1 in 1, 1 in 100 and 1 in 200 year return period storm events from directional sectors south/south west to north east using the spectral wave generation and transformation model, MIKE 21 SW. This model was also used for the generation of wind waves across the local fetches from the east and east-south east. The wave conditions around the harbour were then simulated using the Boussinesq wave disturbance model, MIKE 21 BW.

The most arduous conditions for wave heights at the site of the Proposed Development were found to occur during northerly storm events. During these events, waves were found to diffract around the end of the breakwater and approach the site from the east. Waves of a similar height were also found to occur during storms from the east south east, when waves approached the linkspan site directly across the fetch from the adjoining coast. However, the waves from this direction were relatively short compared to the longer period waves, which can approach the site during northerly storm events.

Figure 10.10 shows the wave patterns around and behind the breakwater during storms from the northerly sector during a 1 in 100 year return period event. It will be seen from this figure that the waves which approach the breakwater are diffracted around the end of the breakwater and approach the site of the linkspan from an easterly sector. The impact of the wave reflections from the quay wall, Goodwick Sea Wall and the cliff faces of the adjoining coastline can also be seen in the diagram.

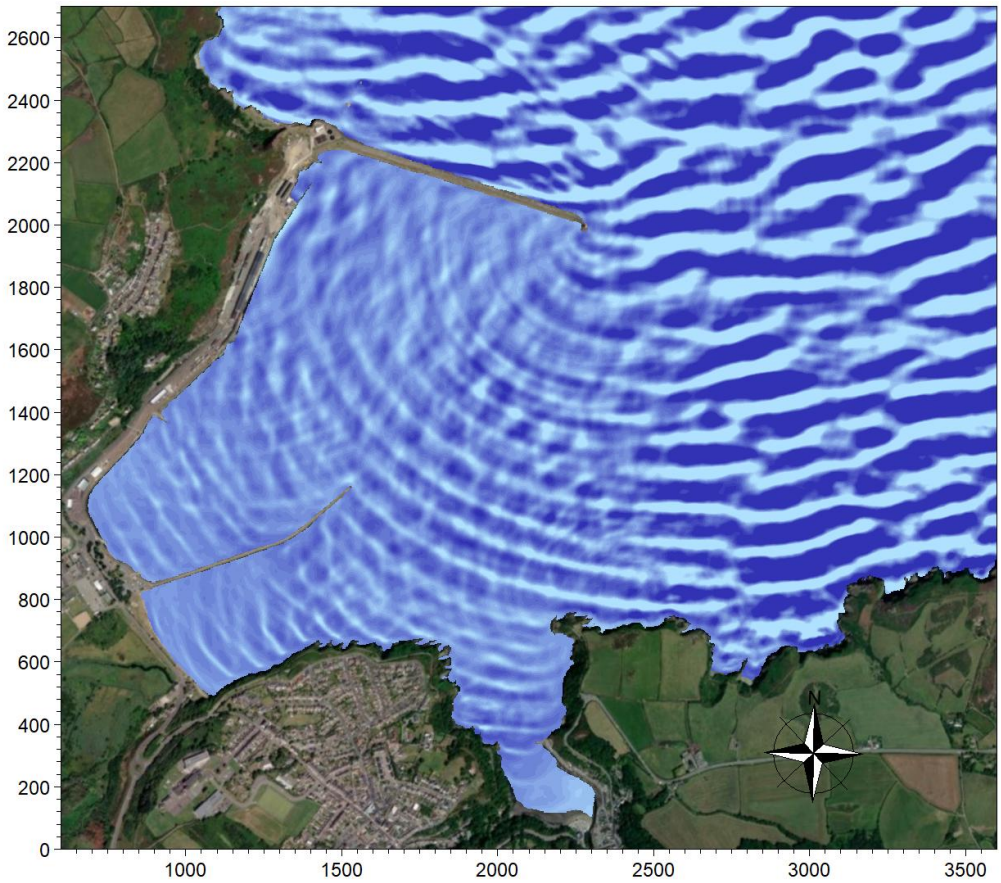

Figure 10.10: Wave disturbance patterns – 1 in 100 year return period storm from 345°.

During 1 in 100 year return period storms from the northernly sector as shown in Figure 10.11, the waves approaching the linkspan will typically have significant wave heights of about 1 m with peak energy wave periods of *c*. 11.3 seconds. Although locally generated waves approaching the Proposed Development from the south east will also have wave heights of about 1 m during the equivalent return period storms, the peak energy wave periods will be in the range of 2.4 to 3.0 seconds, so the disturbance will be of a short steep wave.

An example of the wave heights and directions of the waves approaching the linkspan site during a 1 in 100 year return period storm from 120° is shown in Figure 10.12. In this simulation, the effects of diffraction and wave energy reflection from the harbour walls and breakwater are included in the model.

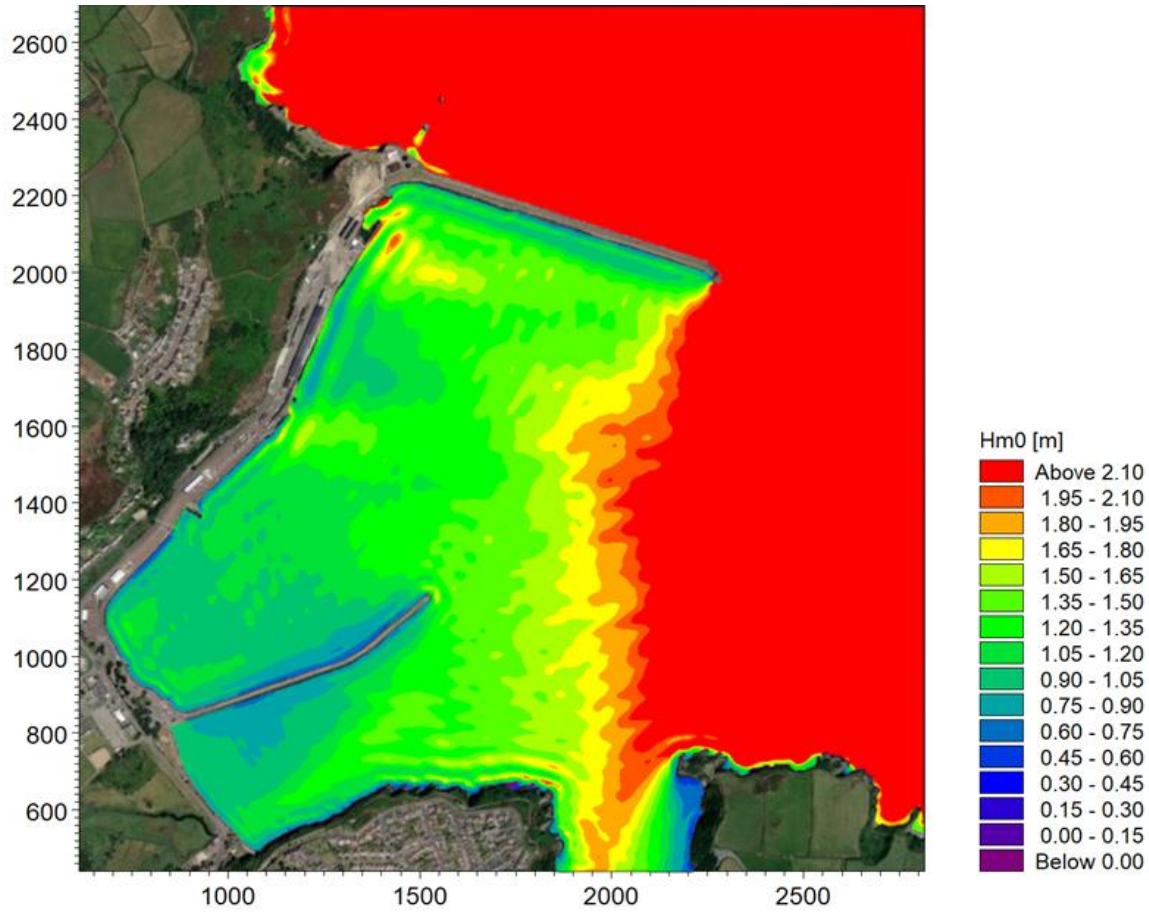

Figure 10.11: Significant wave heights and mean wave direction 1 in 100 year return period storm from 345° N

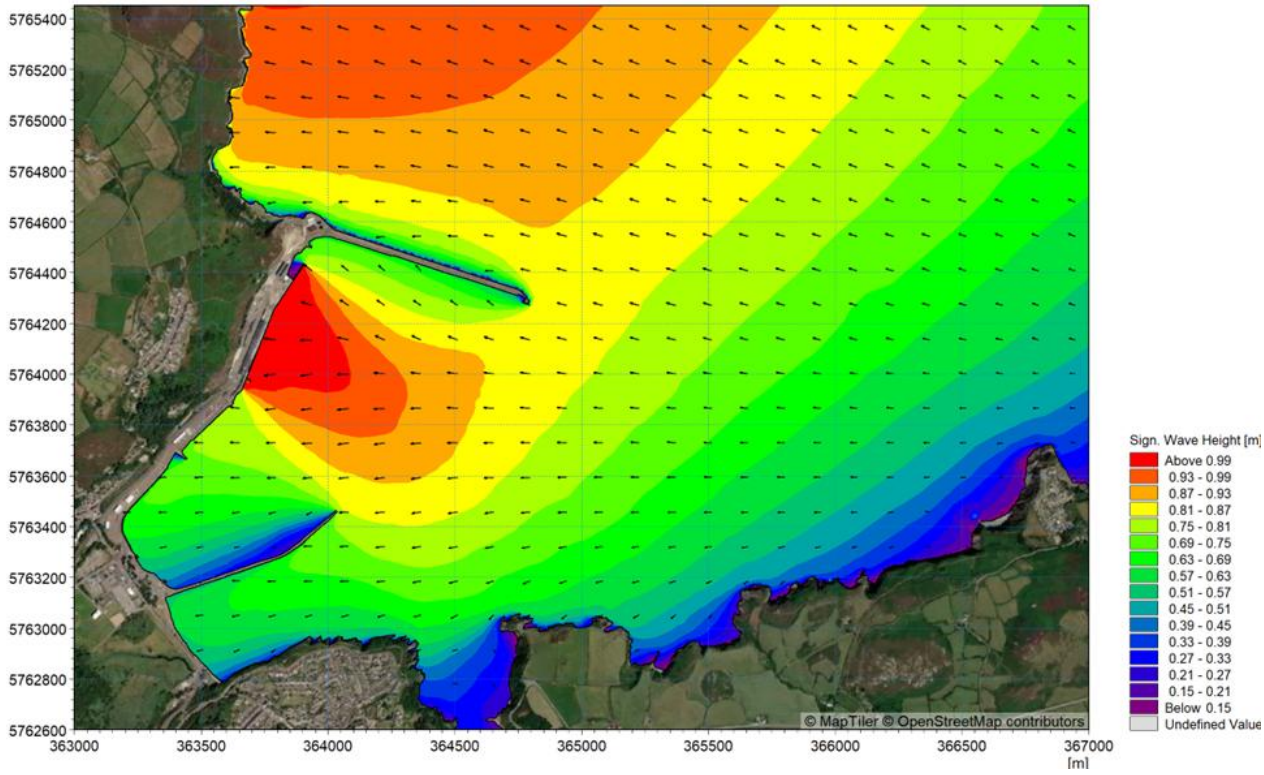

Figure 10.12: Significant wave heights and mean wave direction 1 in 100 year return period storm from 120° N

10.8.3 Sediment Transport

As presented in section 10.8.1, the current speeds around the Proposed Development are weak and the wave climate benign, meaning that there will be limited potential sediment movement due to the coastal processes. During normal conditions (i.e., no storm activity), the limited sediment transport that does occur would do so in a clockwise direction within the harbour, in line with the residual current flow presented in Figure 10.9.

As can be seen from the bathymetry of the sea bed of the harbour around the linkspan, the most significant impact on the seabed sediment regime comes from the movement of ships on and off the berth, particularly at times of low water when the ships' propulsion systems can stir up and redistribute fine sediment.

10.8.4 Geology and Seabed Substrate

Information on the geology of the Coastal Processes Study Area provided an understanding of the origin and stability of the seabed and the geology that will be encountered on the seabed during installation. Pre-Quaternary sediment information indicates that Fishguard Harbour is located in the Ordovician layer, consisting of volcanic rocks and slate. Grab sample data collected by the British Geological Survey characterises the surface substrate within the Coastal Processes Study Area as being primarily sand, muddy sand, gravelly sand and diamicton, as illustrated in Figure 10.13.

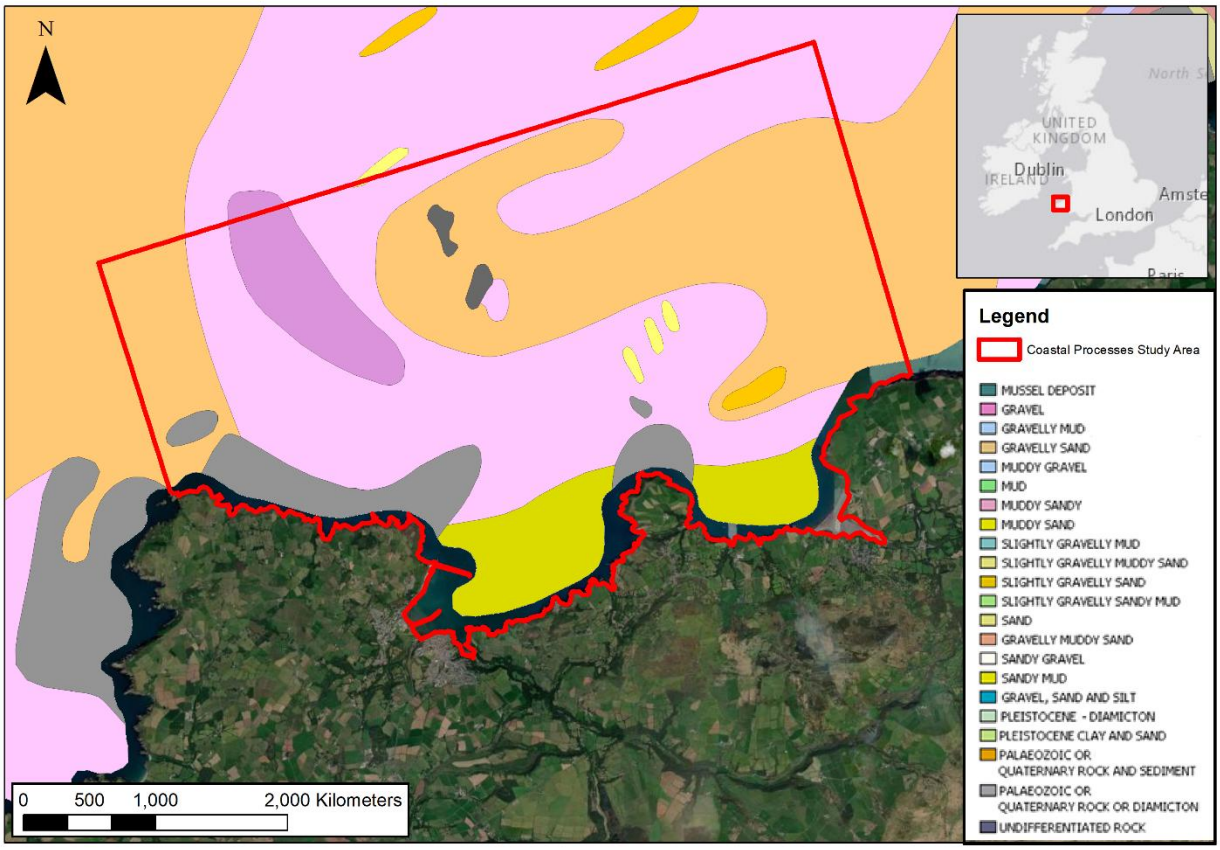

Figure 10.13: Marine sediments along the Offshore Cable Corridor (Contains British Geological Survey materials @UKRI 2024)

As summarised in Table 10-5, site-specific sediment information was also available in the form of a site investigation (SI) survey undertaken by InSitu (In Situ Site Investigation Limited, 2025) within Fishguard Harbour in March 2025. Results from the survey campaign provided more detailed, localised sediment data both at the seabed and below. This information was derived from site-

specific vibrocore collection and subsequent laboratory analysis. The borehole locations included within the survey are presented in Figure 10.14 below. Vibrocore results within the ML boundary indicated in the vicinity of offshore works, local sediments will be comprised predominantly of Figure 10.14.

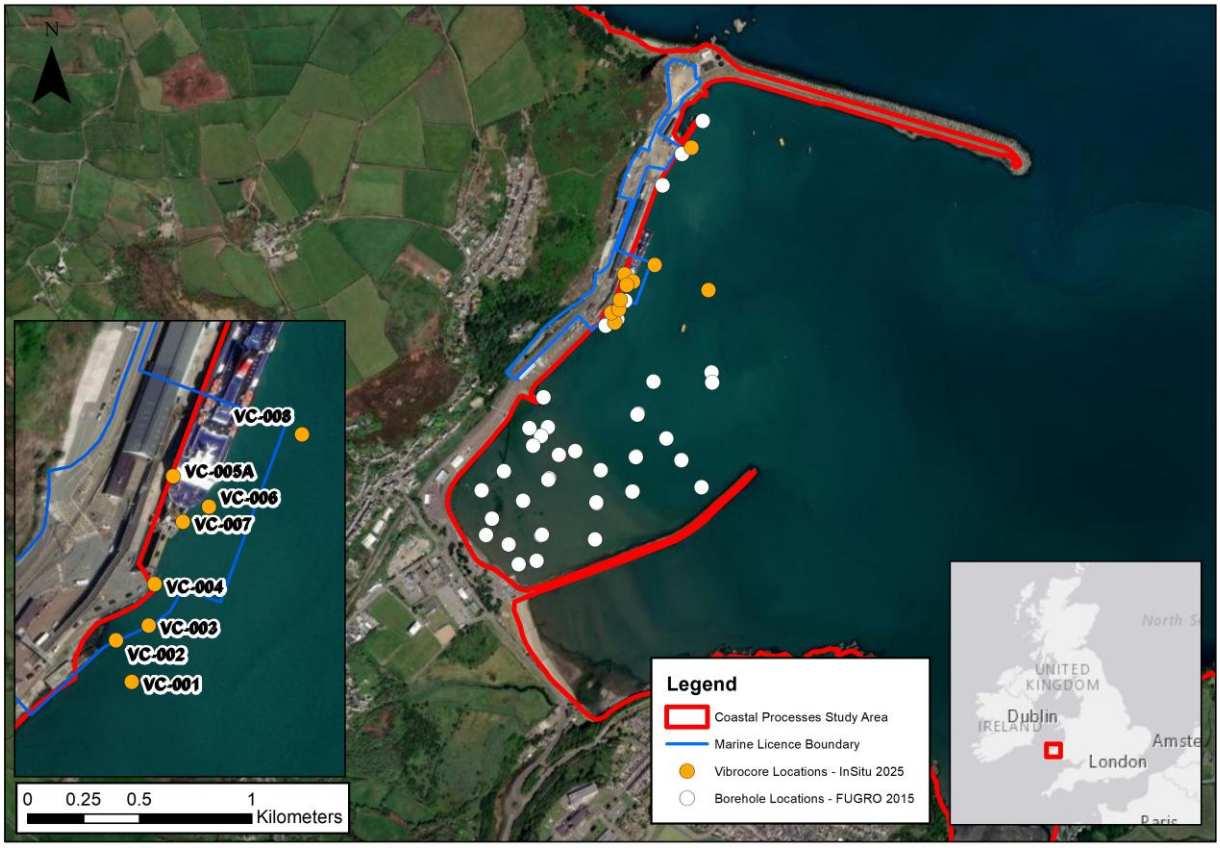

Figure 10.14: Vibrocore and borehole locations analysed within the InSitu and FUGRO site investigation surveys, respectively.

10.8.5 Suspended Sediments

Data from CEFAS presents an analysis of the spatial distribution of non-algal Suspended Particulate Matter (SPM) in UK waters. Within the Coastal Processes Study Area, mean SPM levels were estimated to range between c. 0- 5 mg/l from 1998 to 2015.

During storms, wave-driven currents can temporarily elevate suspended sediment concentrations (SSCs). SSC levels can rise significantly, compared to baseline levels, and then gradually decrease to baseline conditions after storm events. Therefore, SSC levels follow a broadly seasonal pattern, due to the seasonal nature and frequency of storms.

10.9 Impact Assessment

10.9.1 Do Nothing Scenario

If the Proposed Development was not to go ahead (i.e. in the Do-Nothing scenario) there would be no dredging works or alteration to the existing maritime development. As such, there would be a neutral effect on the existing coastal processes, i.e., the tide, wave and sediment transport regime.

10.9.2 Assessment of Construction Effects

The major marine elements of the Proposed Development are outlined in Chapter 2. In the context of coastal processes, the element of the Proposed Development that has the potential to result in construction phase impacts relates to one capital dredging operation.

A total volume of c. 2,500 m^3 of soft material, residing under the proposed pontoon footprint, is anticipated to be redistributed within the harbour via the use plough dredging, with material being deposited in an existing deeper scour pocket within the berth.

The seabed characteristics for the dredge area as established through site-specific survey, are summarised in Table 10-10, modelled dredging parameters are described in Table 10-10. The dredge path along which the sediment material was introduced with source terms is illustrated in Figure 10.15, note based on a 10 m plough width, the dredger would in reality only have four paths (which are repeated to the required depth). However in order to characterise the width of the plough within the model, a representative approach of using three sources per path has been applied, with these sources located at the sides and centre of the plough.

In the aim of a conservative approach, the dredging operation has been simulated over the duration of a full tidal cycle (12 hours and 25 minutes), with simulation time included for the material to be resuspended and deposited on successive tides. The dredging operation was simulated over both a spring and neap tide, as presented overleaf.

Table 10-10: Summarised seabed characteristics

Top of Stratum (mCD)	Thickness (m)	Description
VC-006		
-4.91	0.59	(Very soft) Dark brownish grey slightly clayey sandy **SILT**
VC-007		
-2.76	1.94	Extremely low strength very soft dark brownish grey slightly sandy silty **CLAY**
-4.70	0.80	Dark grey clayey gravelly very silty fine to coarse **SAND**

Table 10-11: Dredge simulation input parameters

Parameter	Value
Dredging Technique	Plough
Plough Width	*c*. 10 m
Bed Levelled per Pass	c. 0.10 m
Target Dredge Volume	2,500 m^3
Dredge Rate	4.21 m^3/hr
Fines Content	71%
Overspill	10%
Active Dredging	6 minutes per cycle
Reset Time	6 minutes per cycle
Total Cycle Time	12 minutes
Cycles	64
Length of Operation	*c*. 12.5 hours

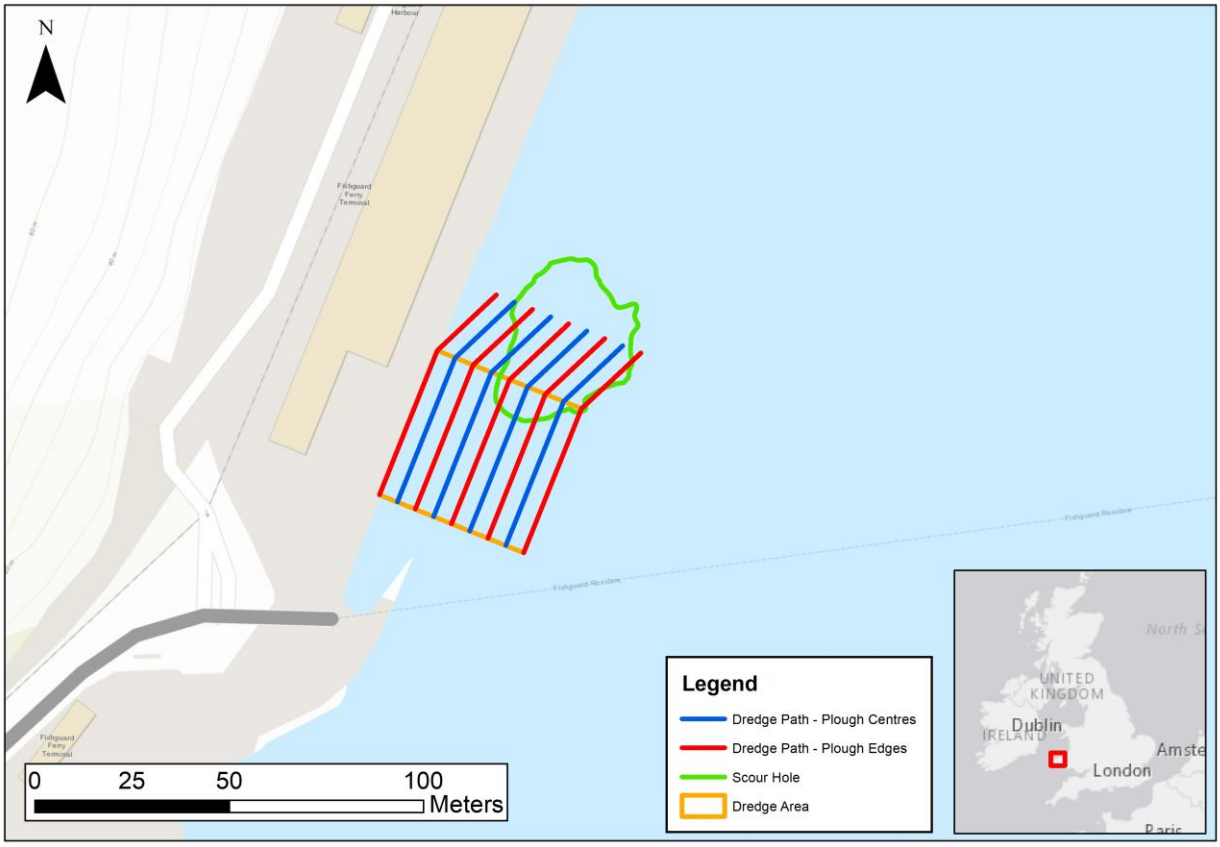

Figure 10.15: Point Source Paths Simulating Dredge Operation

The dispersion of fine material during the dredging operation should it be carried out during a spring tidal cycle or a neap tidal cycle, is illustrated by a series of plume envelope diagrams in Figure 10.16 - Figure 10.19 and Figure 10.22 - Figure 10.25 for the respective tides. These plots show total suspended sediment concentrations (SSCs) within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions.

As demonstrated by these figures, SSCs can reach up to c. 2.1 g/L and 2.8 g/L on the spring and neap tides respectively, with the greatest concentrations observed at low water. These values occur within the immediate vicinity of the dredging source terms, rapidly decreasing with distance from the point of disturbance. Plots of average SSCs during the dredging operation are shown for the spring and neap tides in Figure 10.20 and Figure 10.26, with mean concentrations of up to 1.4 mg/L and 1.75 mg/L within the dredge area during the respective tides. The plots of average SSCs again highlight a rapid reduction in concentration with distance from the dredge area, with the plume generally being less than 100 mg/L outside of this.

As can be seen from all stages of the spring and neap tidal cycles, SSCs across the vast majority of Fishguard Harbour remains within < 5 mg/l background concentrations of suspended matter, with the greatest dispersion being observed at a spring tide mid flood wherein the sediment plume can extend c. 300 m to the southwest and c. 180 m to the north/northeast before being fully dispersed to below background levels.

Sediment deposition as a result of the plough dredge operations on both spring and neap tides is presented in Figure 10.21 and Figure 10.27 respectively. As can be seen, deposition can reach up to a maximum of 0.65 m and 0.70 m on the respective tides, however it should be noted that these large deposition values are contained to the scour hole for which the material is to be used as infill. Across the dredge area itself deposition is no more than 25 cm on the spring tide and 30 cm on the neap tide, reducing to less than 5 cm within a few metres of the dredge paths. Sedimentation reduces rapidly with distance from the dredge area, falling to < 1 mm within 200 m. In reality, the dredging

would proceed until the specified design depth is reached and any material deposited within the dredge area would be removed by the dredger until the specification is met and level bed achieved.

In summary, the modelling of dredging operations at found that:

- Sediment dispersion would be greatest should the dredging occur over a spring tide, with the resultant plume extending up to c. 300 m to the south and c. 180 m to the north east of the dredge area under flood tide conditions. However, the SSC of these plumes do not exceed 2.1 g/L and generally occurs at concentrations of < 100 mg/L.
- The highest suspended sediment concentrations of c. 2.8 g/L occurred at low water during the neap tide, directly at the active dredging source term.
- Average SSCs did not generally exceed c. 1.4 g/L (spring tide) / 1.75 g/L (neap tide) within the immediate vicinity of works and quickly reduce to below background concentrations of 5 mg/L within c. 300 m (spring tide) / 200 m (neap tide).
- The greatest deposition observed, occurred within the scour pit which represents the target destination for the dredged material, deposition within can be up to c. 0.65 m on the spring tide or c. 0.7 m on the neap tide. Within the vicinity of the dredge area, the total deposition of sediment can be up to 0.3 m, however it is typically less than 0.2 m, with deposition beyond c. 5 m of the dredge paths reducing to < 5 cm. Sedimentation falls rapidly with distance from the dredge area, reducing to < 1 mm within c. 200 m.

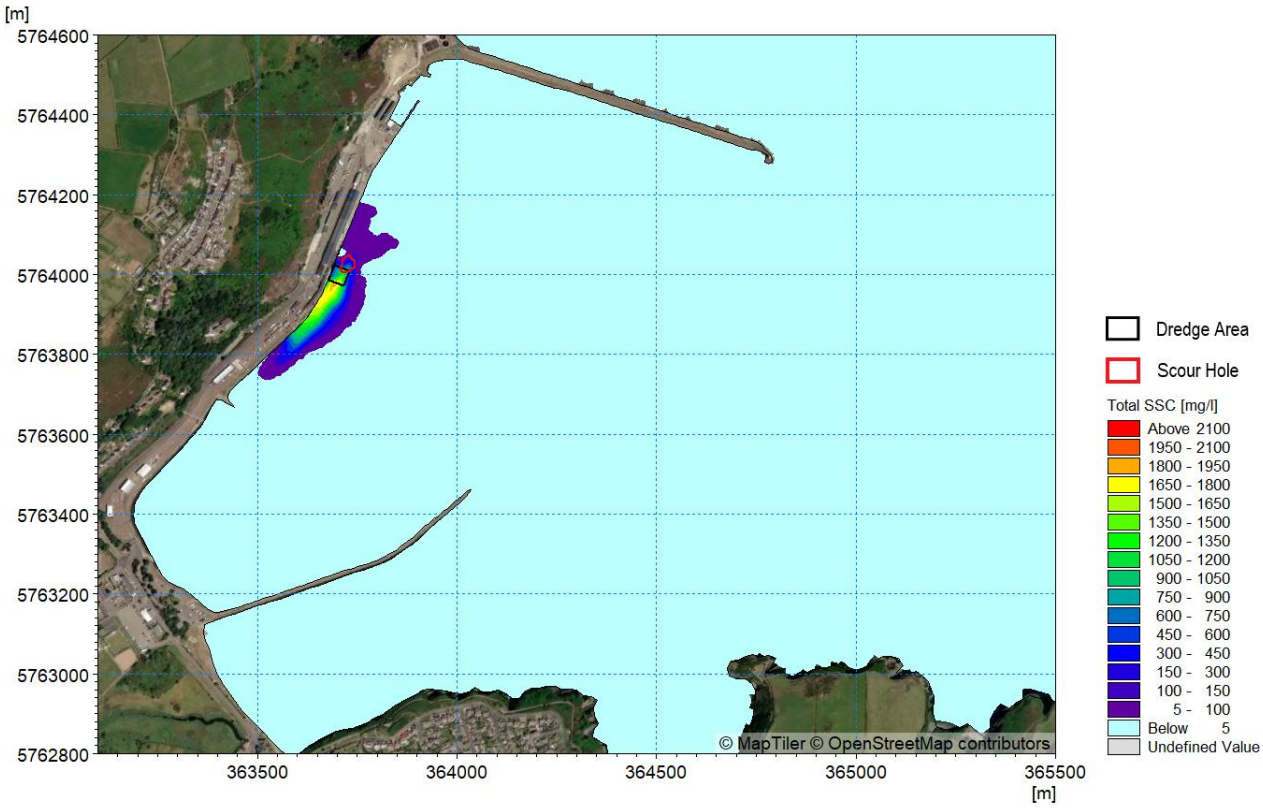

Figure 10.16: Suspended sediment concentration plume during typical spring tide mid-flood conditions.

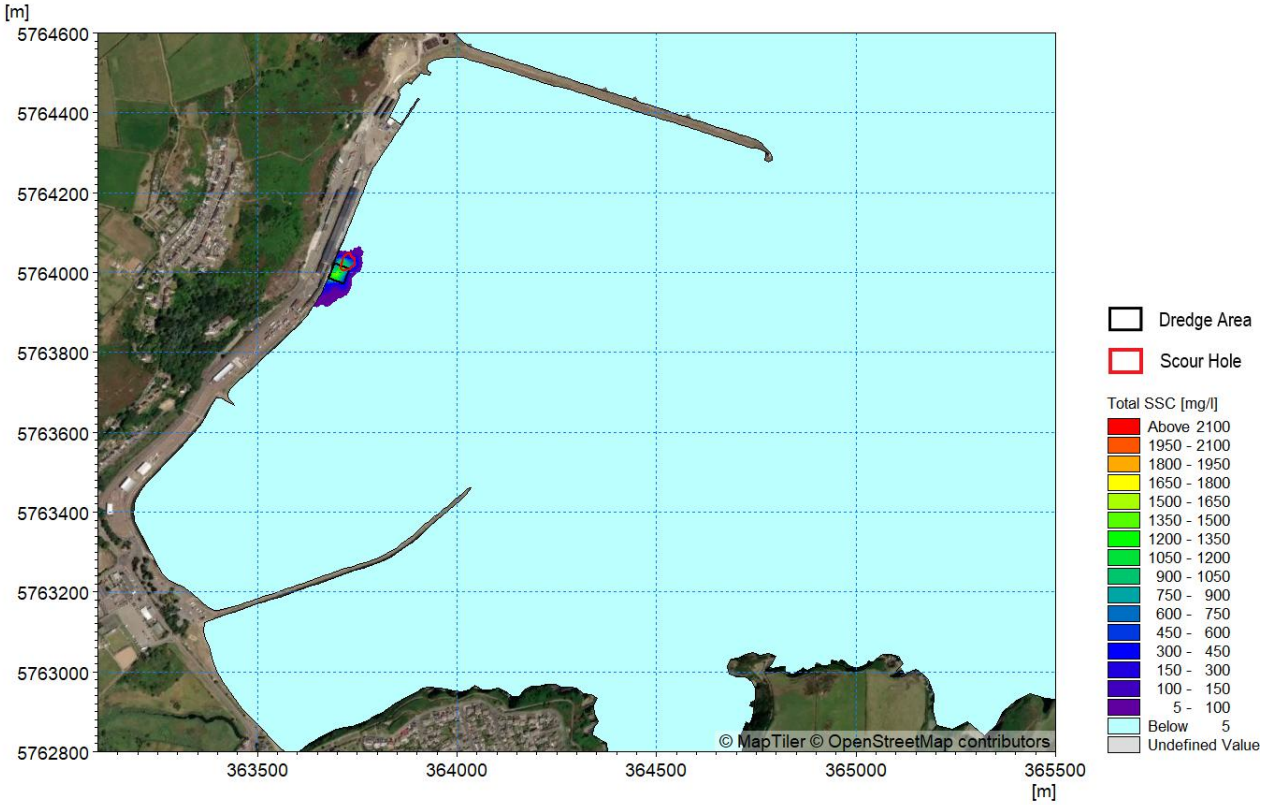

Figure 10.17: Suspended sediment concentration plume during typical spring tide highwater conditions.

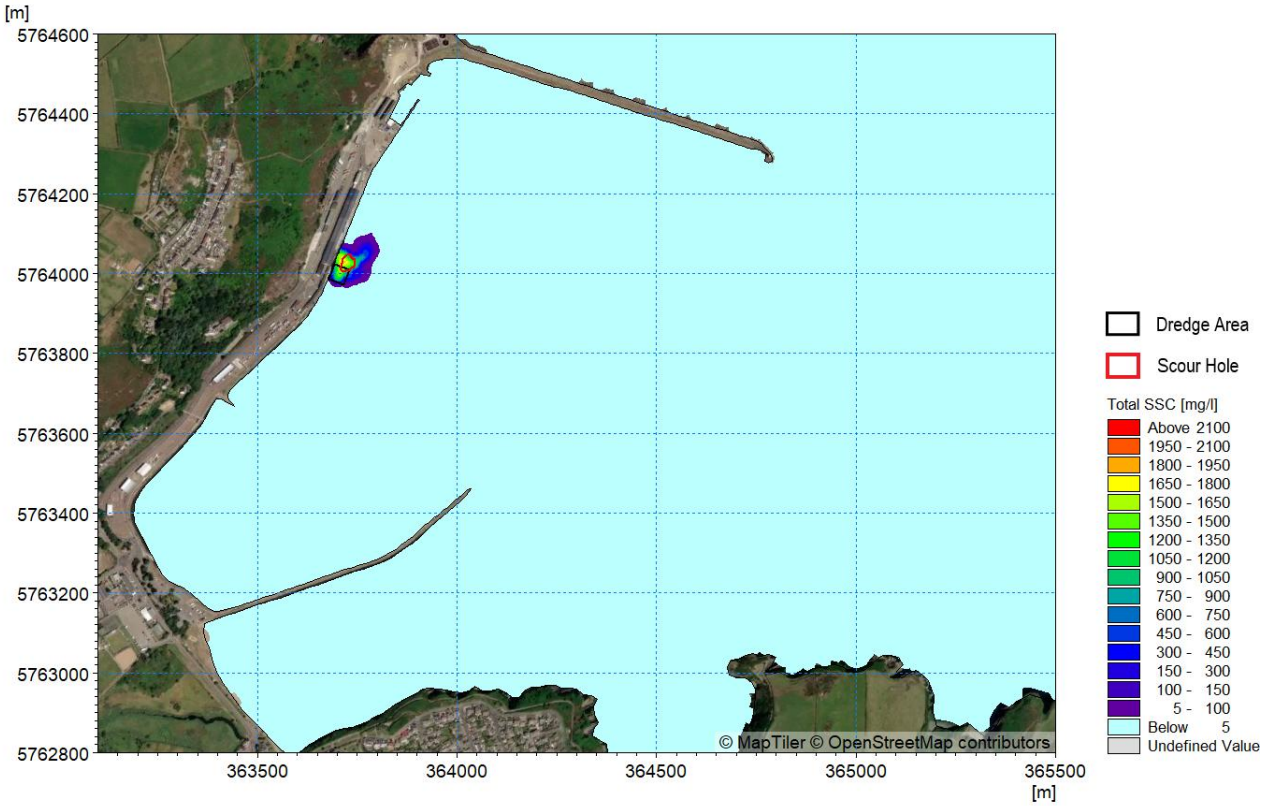

Figure 10.18:Suspended sediment concentration plume during typical spring tide mid-ebb conditions.

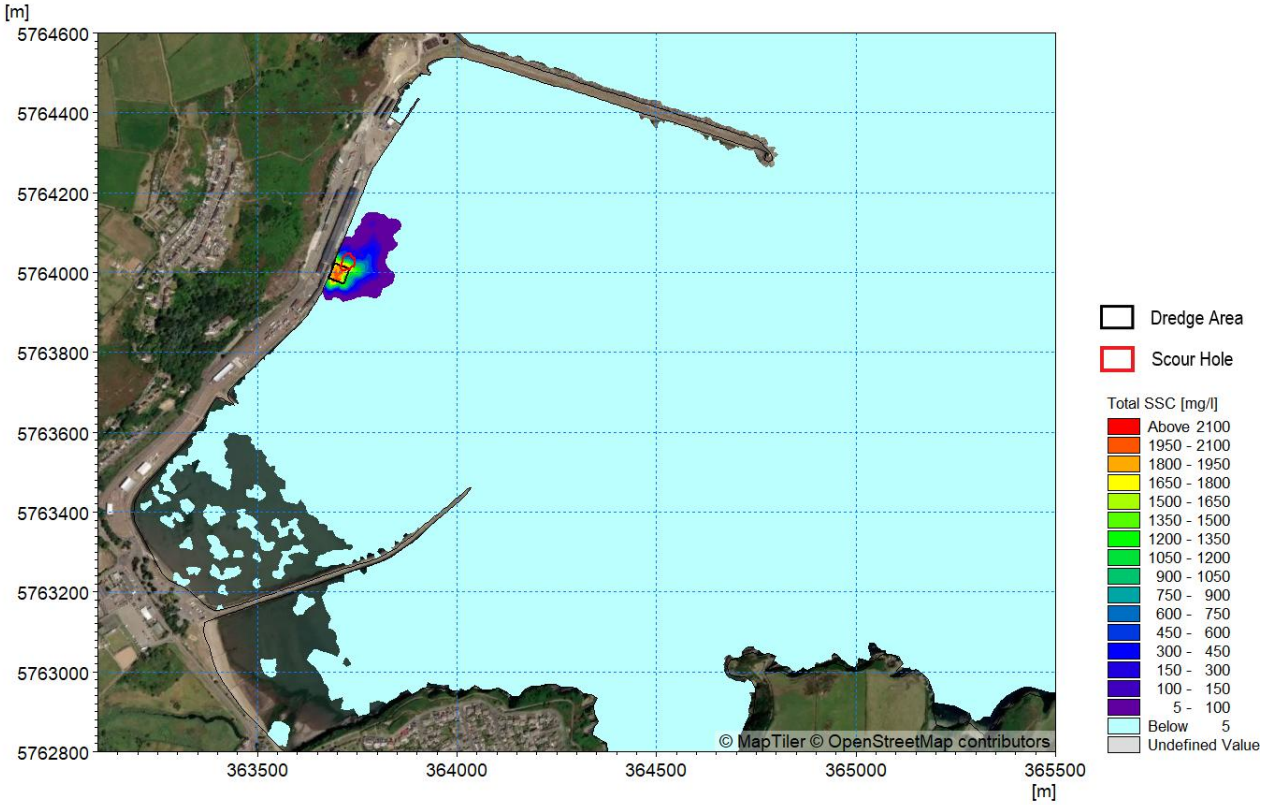

Figure 10.19: Suspended sediment concentration plume during typical spring tide low water conditions.

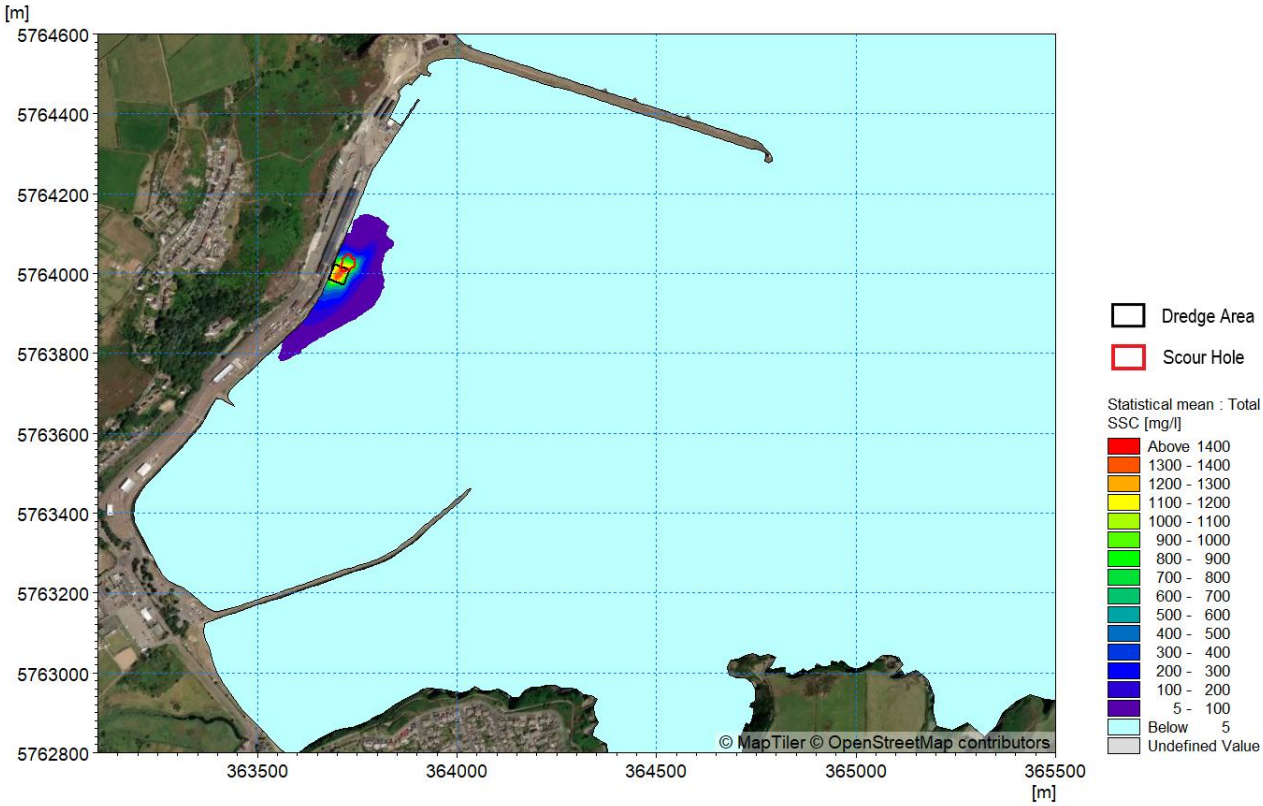

Figure 10.20: Average suspended sediment concentration plume over the course of the dredging operation – spring tide.

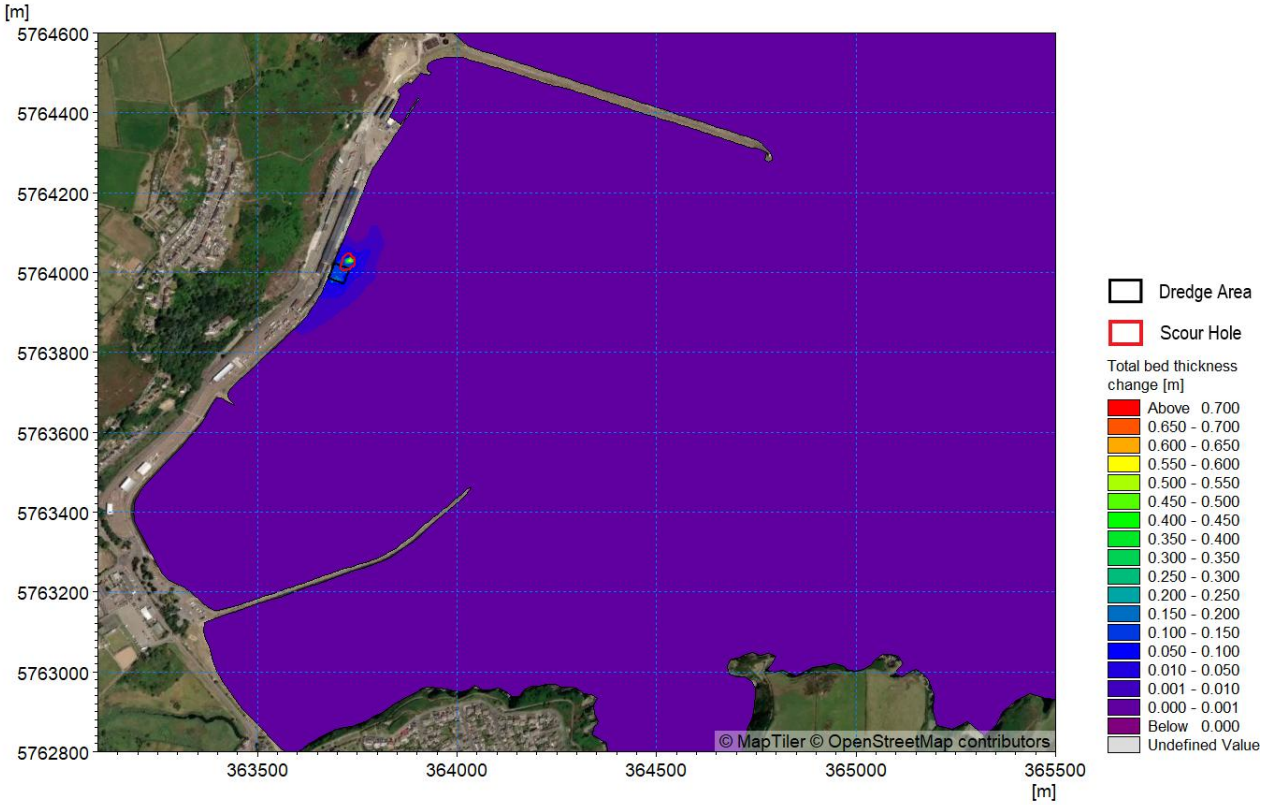

Figure 10.21: Total deposition of sediment upon completion of the dredge works – spring tide.

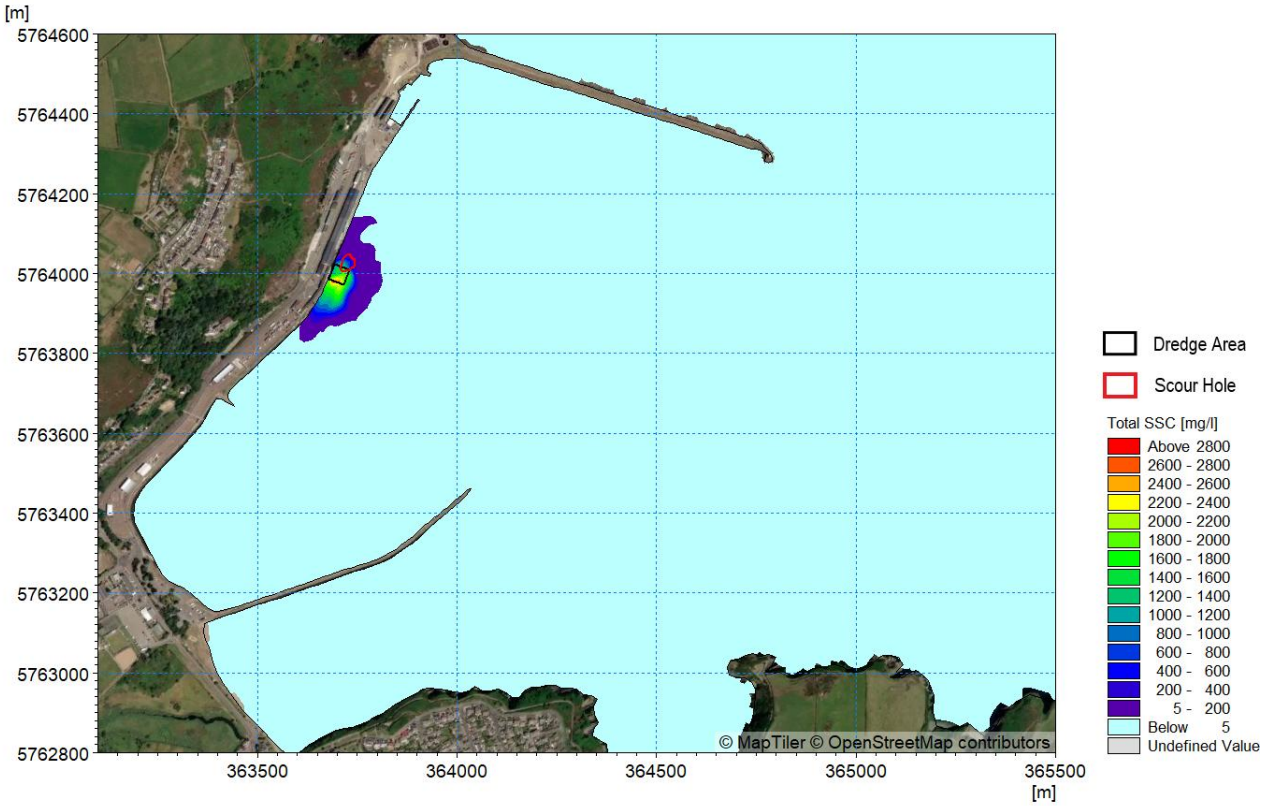

Figure 10.22: Suspended sediment concentration plume during typical neap tide mid-flood conditions.

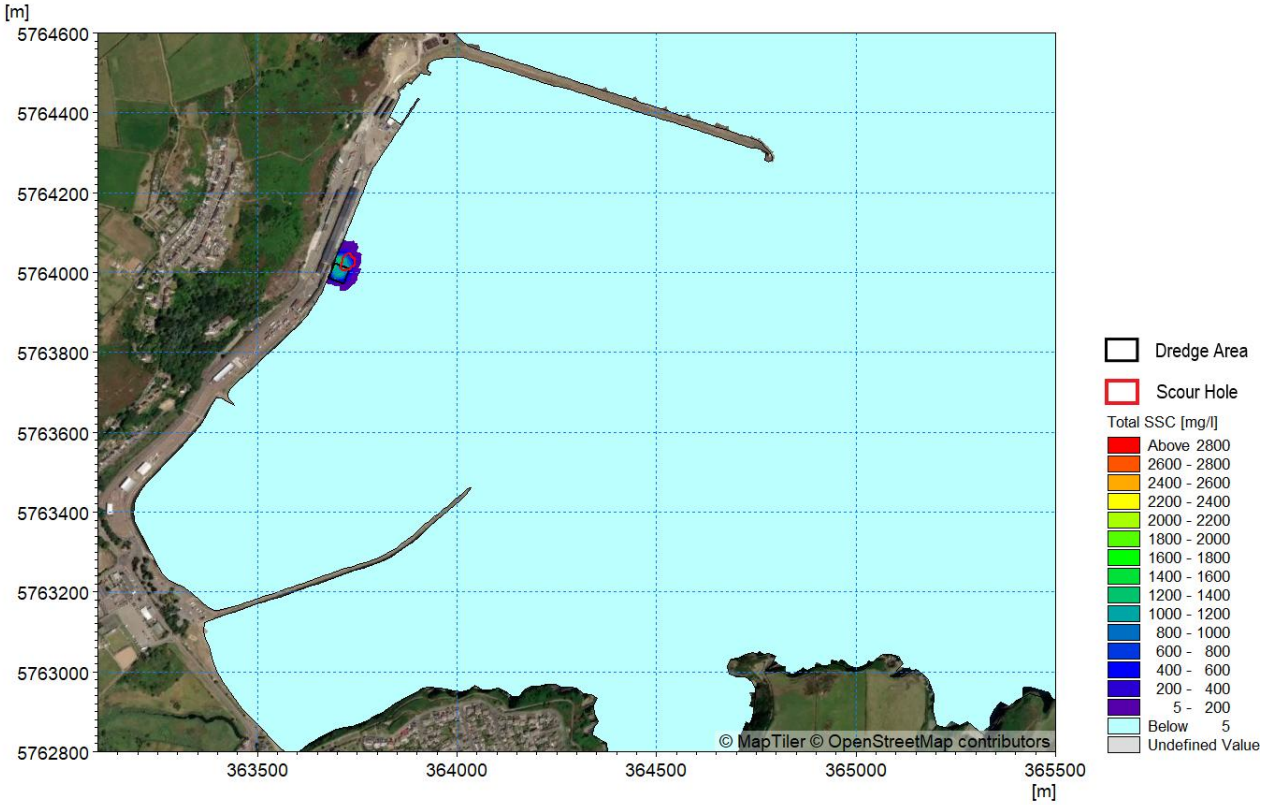

Figure 10.23: Suspended sediment concentration plume during typical neap tide highwater conditions.

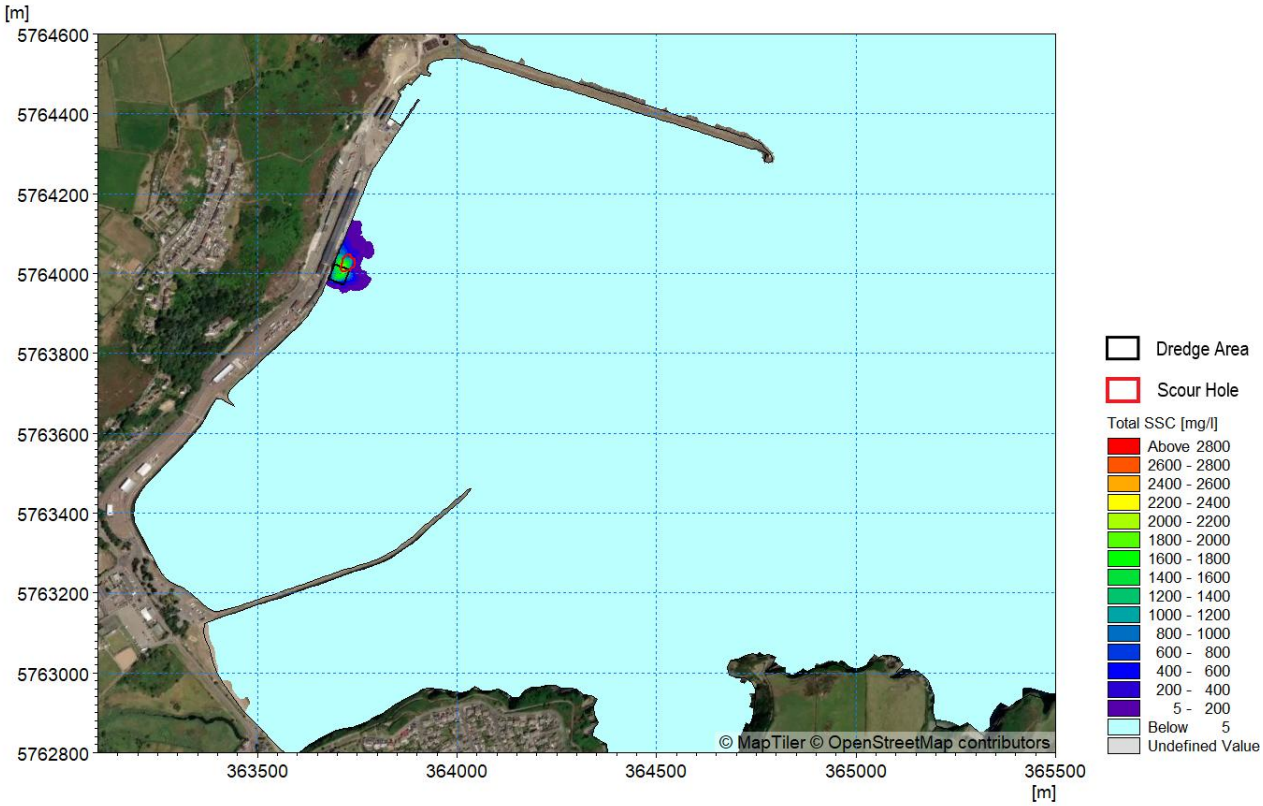

Figure 10.24:Suspended sediment concentration plume during typical neap tide mid-ebb conditions.

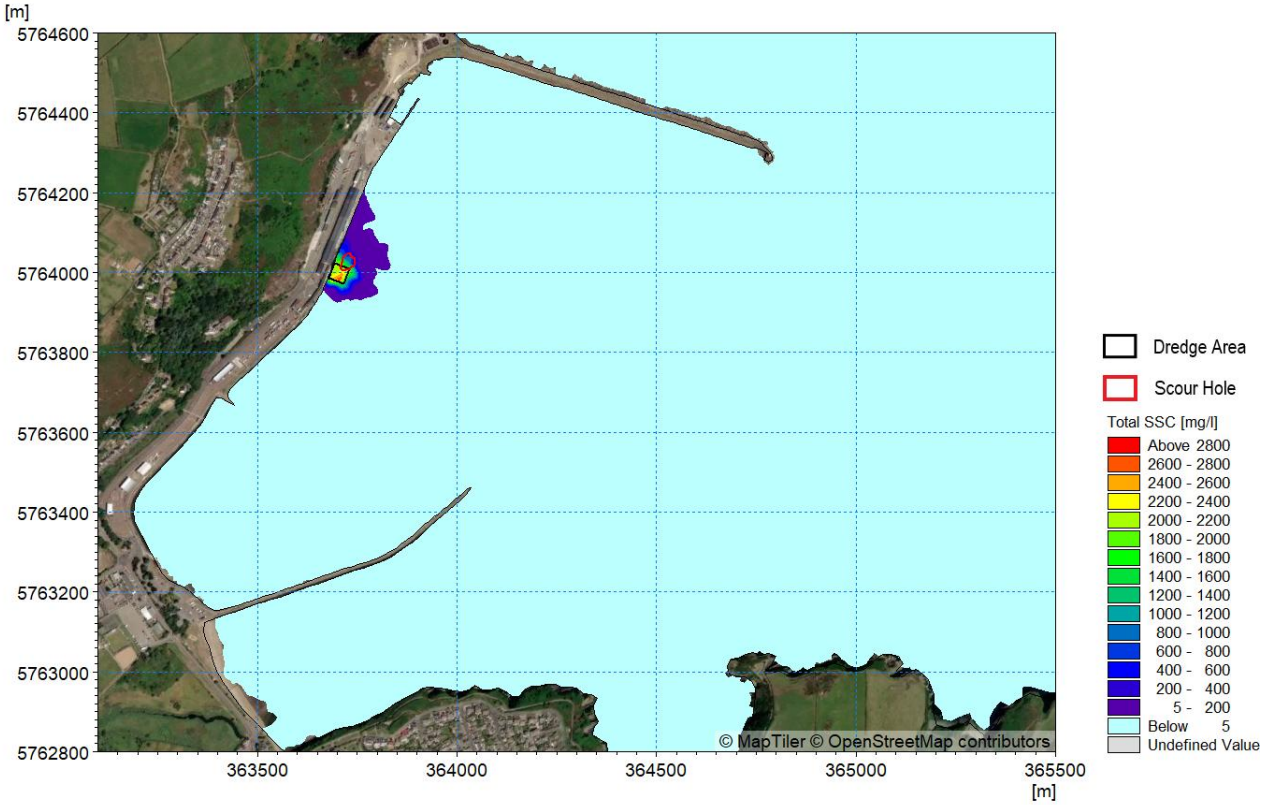

Figure 10.25: Suspended sediment concentration plume during typical neap tide low water conditions.

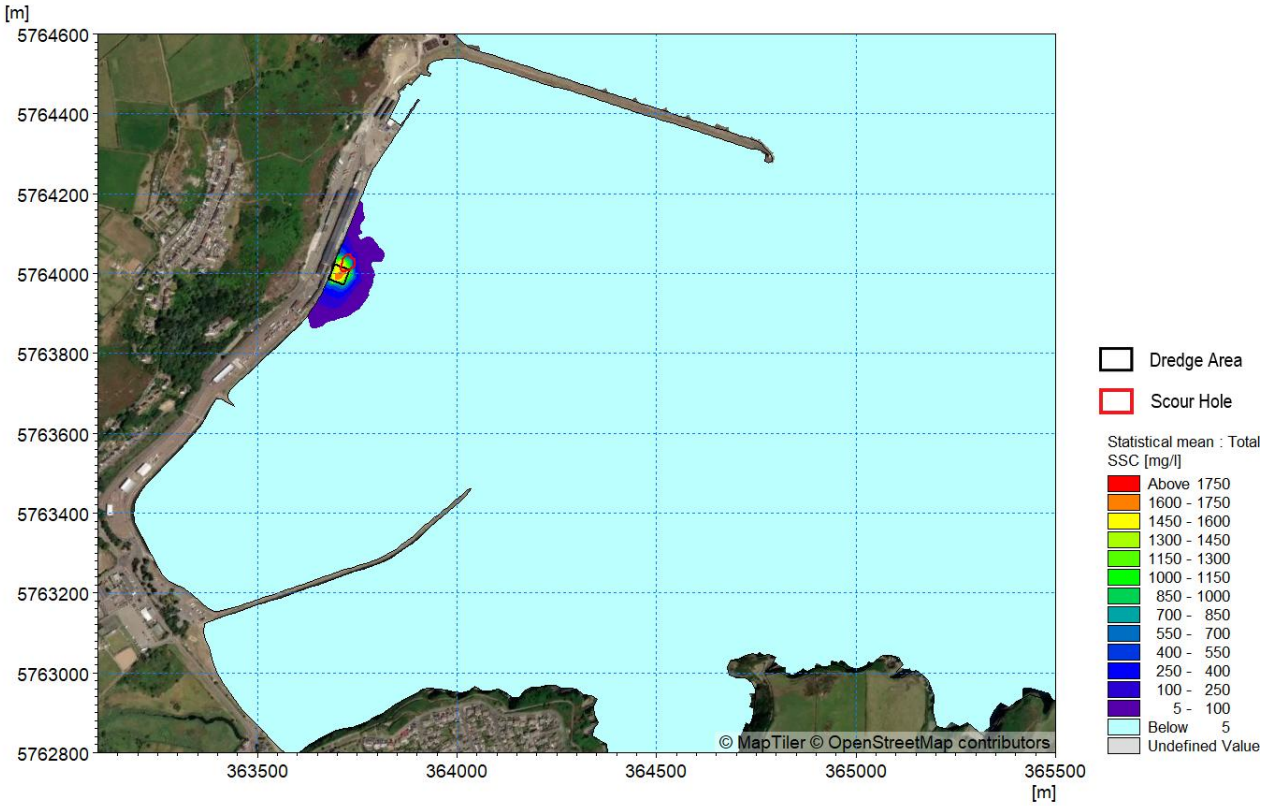

Figure 10.26: Average suspended sediment concentration plume over the course of the dredging operation – neap tide.

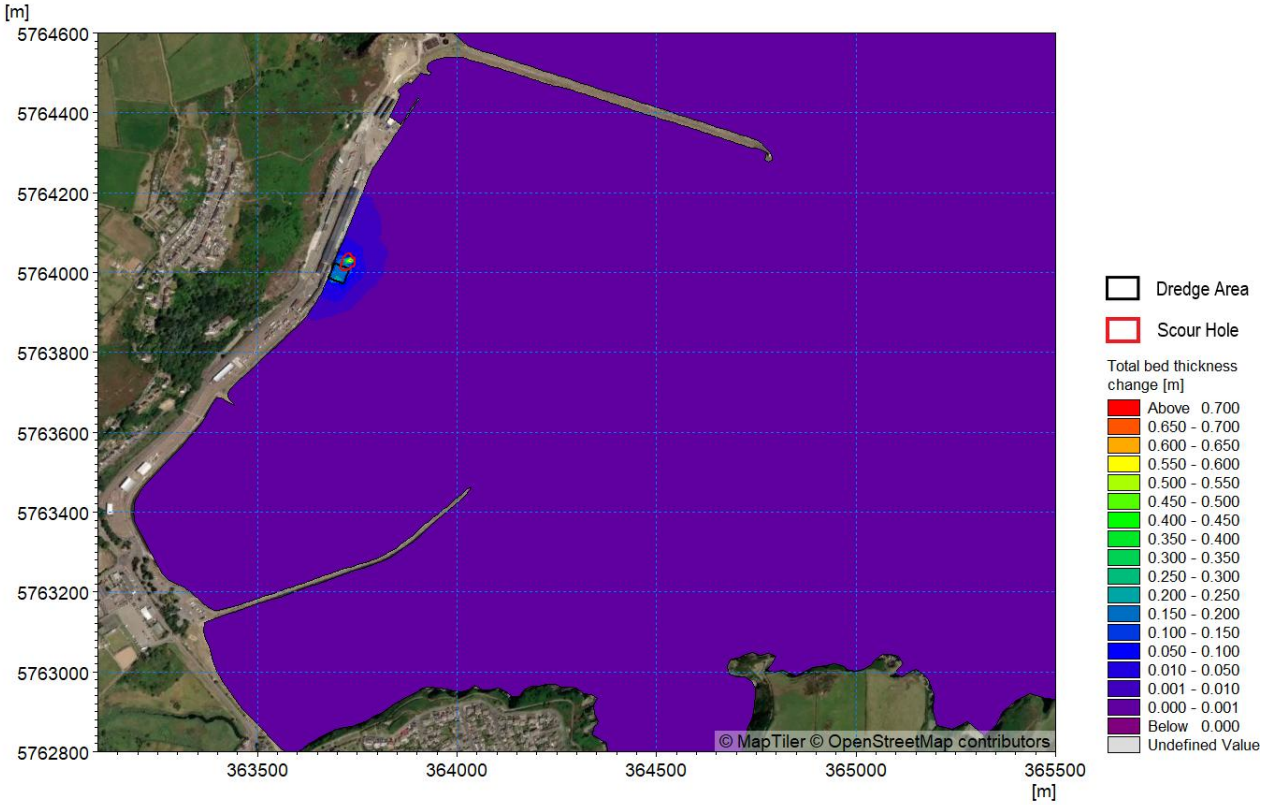

Figure 10.27: Total deposition of sediment upon completion of the dredge works – neap tide.

10.9.3 Assessment of Operational Effects

Development consisting of the construction of structures and/or changes in the configuration of the bathymetry through capital dredging works has the potential to impact coastal processes. In particular, the proposed depth alterations to the seabed have the potential to impact the following coastal processes during the operational phase of the project:

- Tidal current patterns within Fishguard Harbour;
- Sedimentation and erosion patterns;
- The inshore wave climate;
- Prevailing water levels and the existing flood risk.

The operational phase impacts in the context of these coastal processes are assessed in the following Sections.

10.9.3.1 Changes to the Existing Tidal Regime

The potential for changes with the Proposed Development in place was assessed to consider operational phase impacts. The MIKE 21 Hydrodynamic module described in Section 10.8.1 was used in conjunction with the post-development scenario 2D model to simulate the tidal regime within Fishguard Harbour following the construction of the scheme.

Figure 10.28 to Figure 10.31 illustrate tidal currents following the construction of the Proposed Development at typical spring mid-flood, high water, mid-ebb and low tide conditions, respectively. It should be noted that spring tides are periods of greatest current velocities and that any changes in the tidal regime would therefore be greatest during these periods.

It can be seen from Figure 10.28 to Figure 10.31, that changes to the tidal regime are both localised to those areas of altered bathymetry in the post-baseline scenario, and diminutive in nature, with changes in current speed generally limited to +/- < 1 cm/s.

Given these negligible changes to the already weak current flows, scouring along the coastline or proposed structures is not considered to be a significant issue. Nevertheless, the potential for scouring is mitigated by the proposed scour protection works, which will extend below the pontoon. These measures will maintain the structural integrity of the structure and mitigate the risk of undermining.

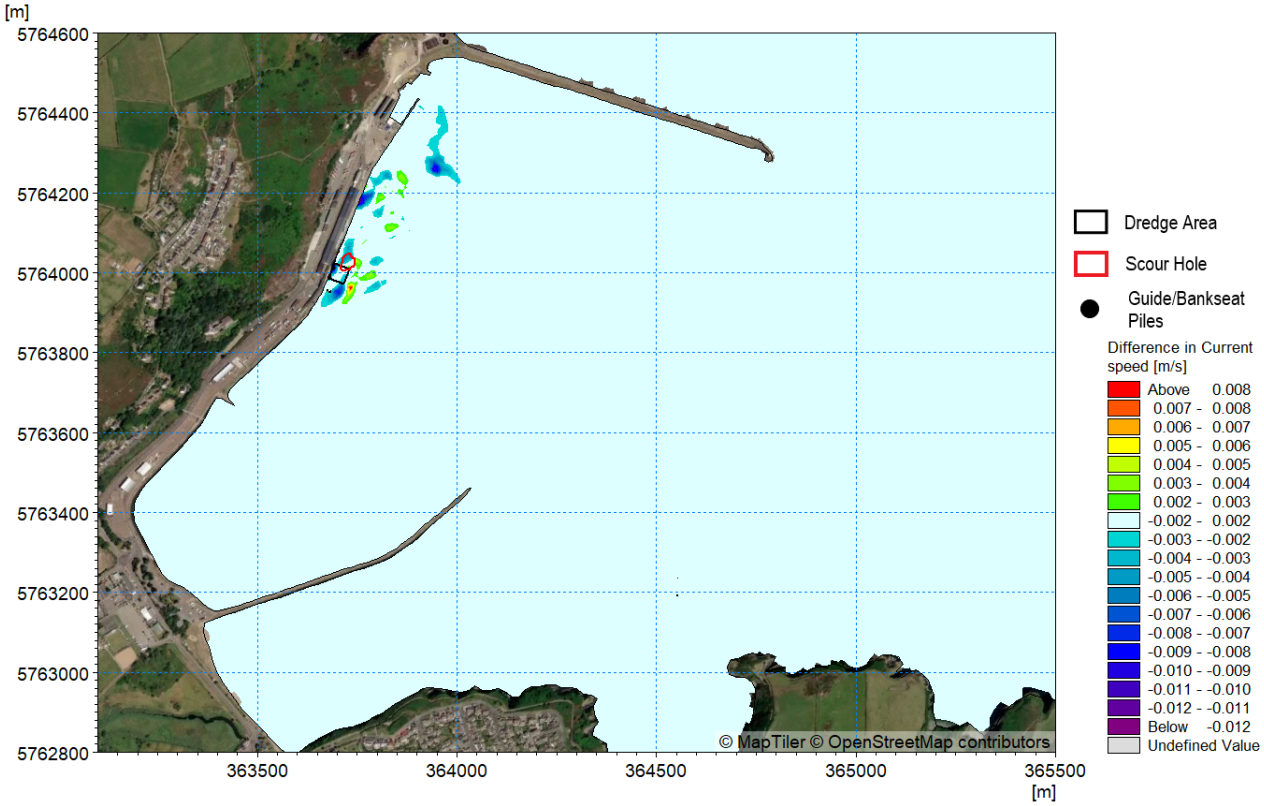

Figure 10.28: Difference in current speed – operational minus baseline – mid flood.

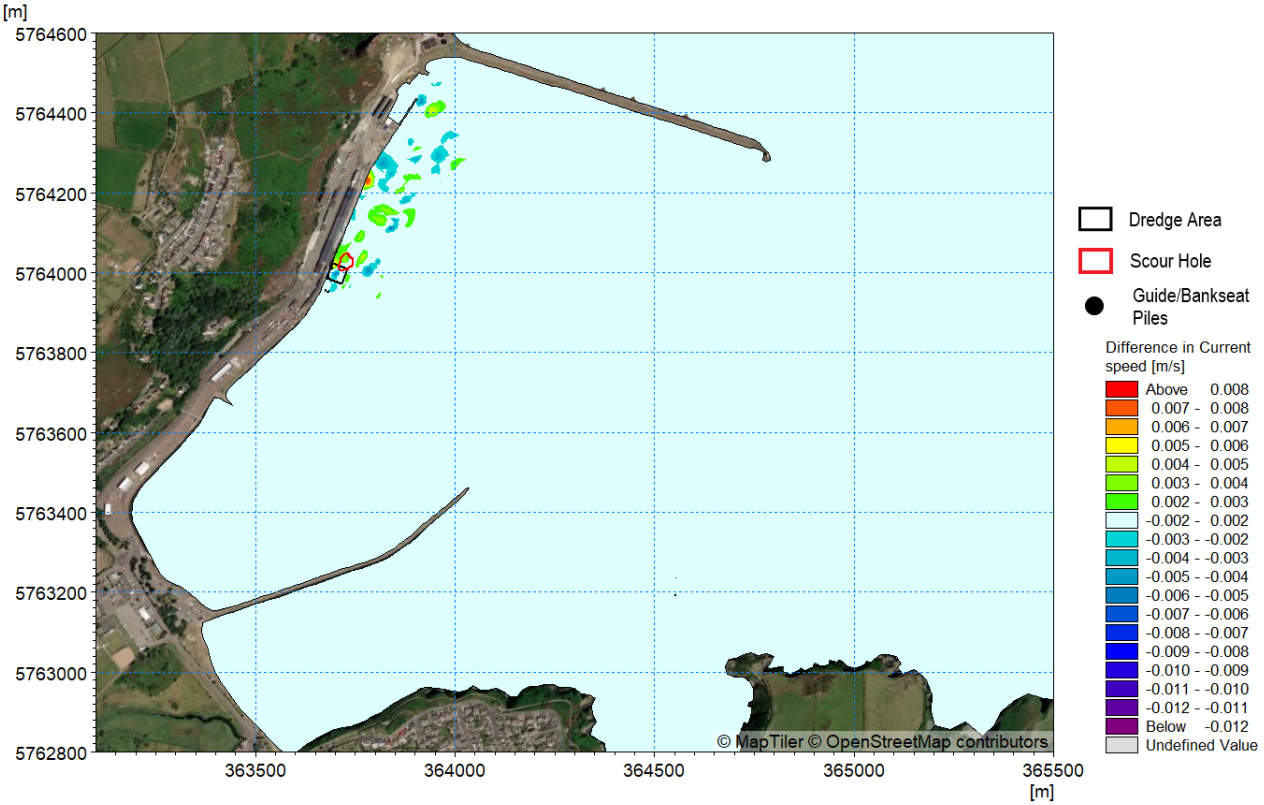

Figure 10.29: Difference in current speed – operational minus baseline – high tide.

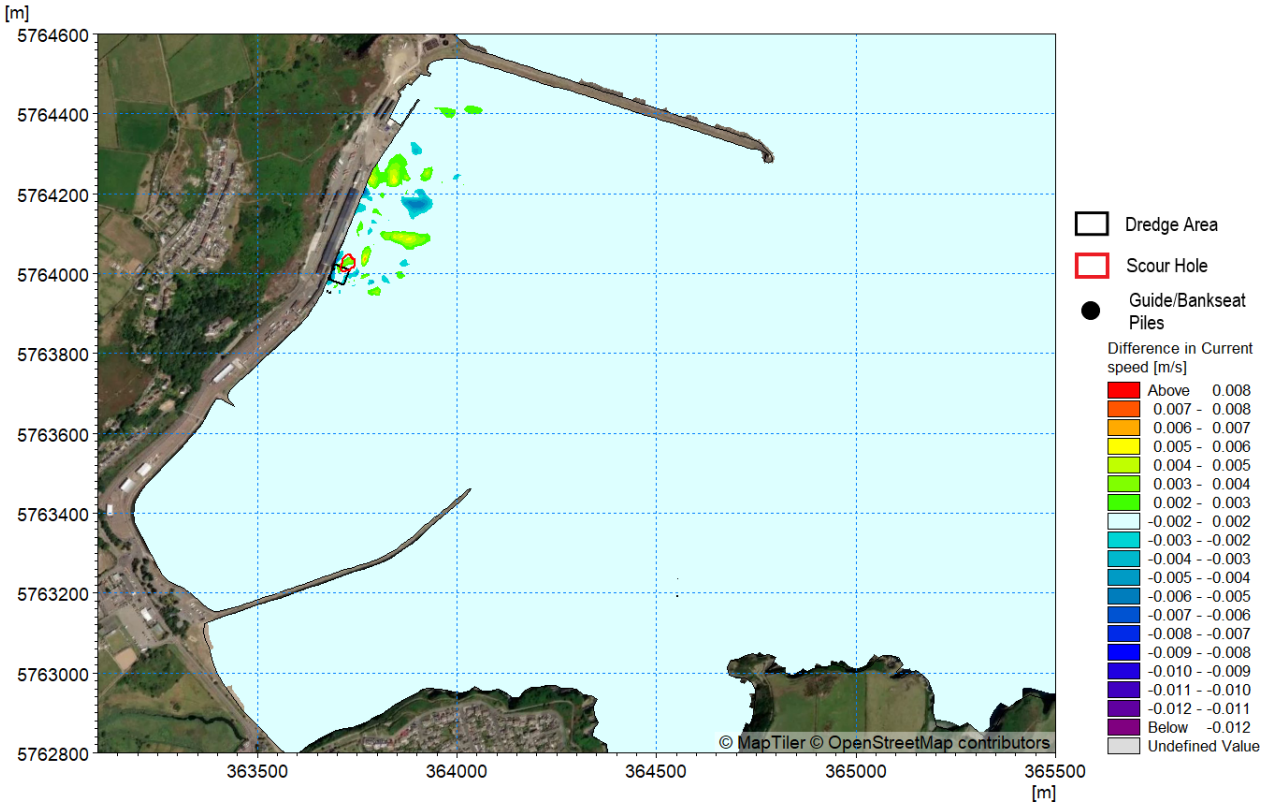

Figure 10.30: Difference in current speed – operational minus baseline – mid ebb.

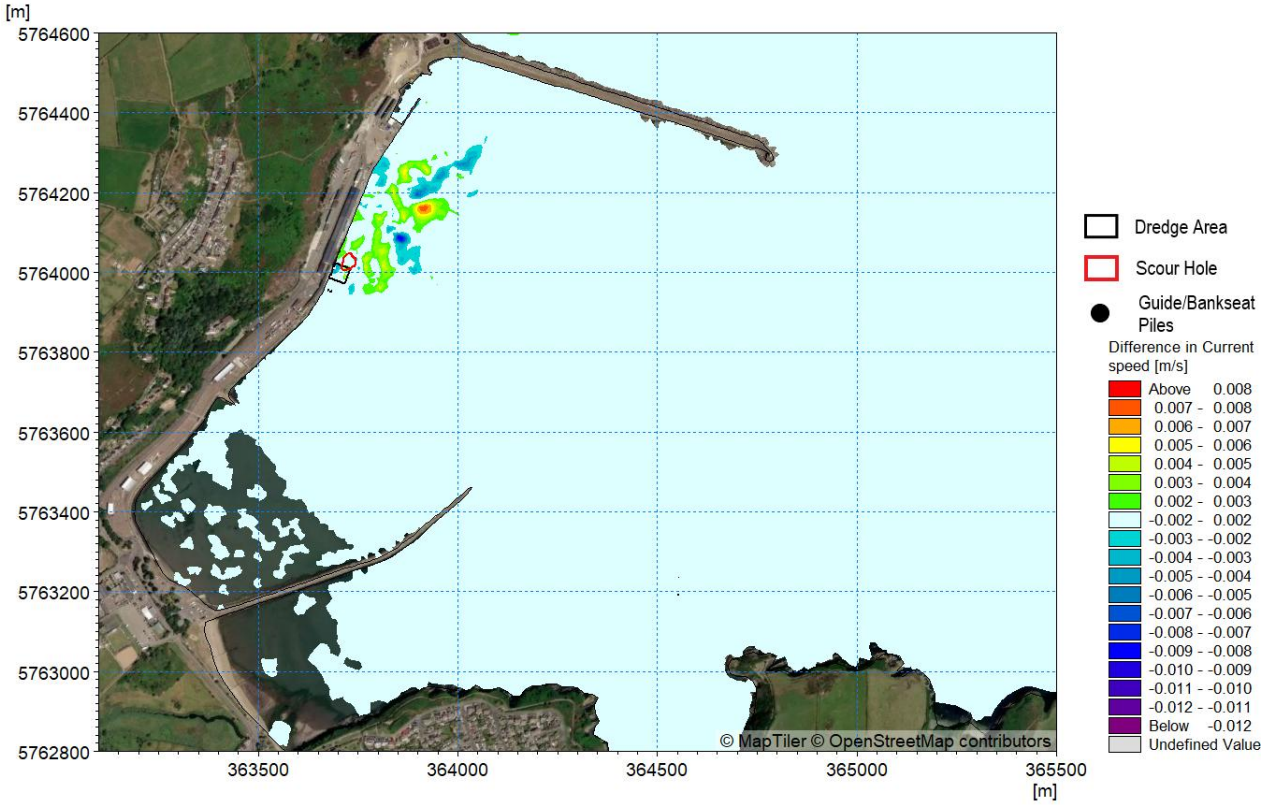

Figure 10.31: Difference in current speed – operational minus baseline – low tide.

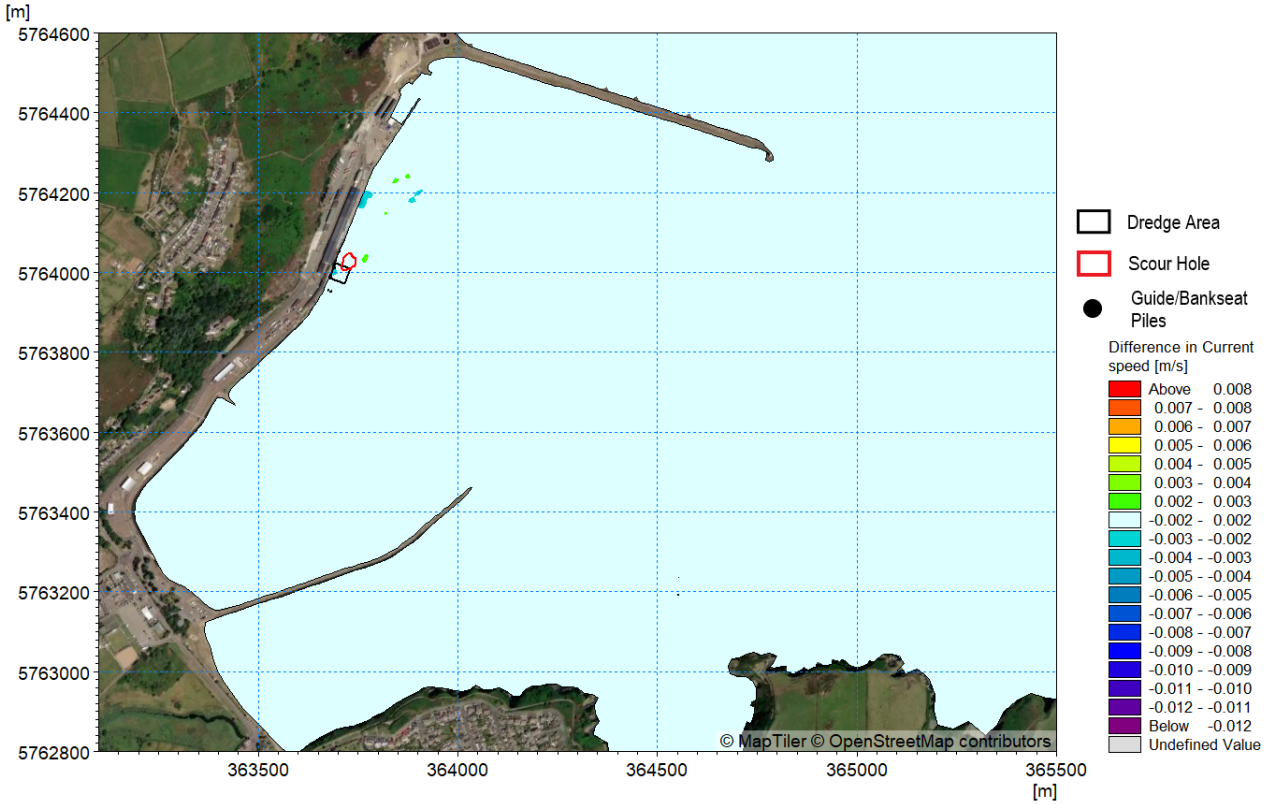

Figure 10.32: Difference in current speed – operational minus baseline – residual

10.9.3.2 Changes to the Existing Wave Climate

As will be seen from section 10.8.2, the Proposed Development is effectively on a “lee shore” during significant wave events thus, the Proposed Development will have no significant impact on the wave climate in the remaining parts of the harbour or its adjoining areas.

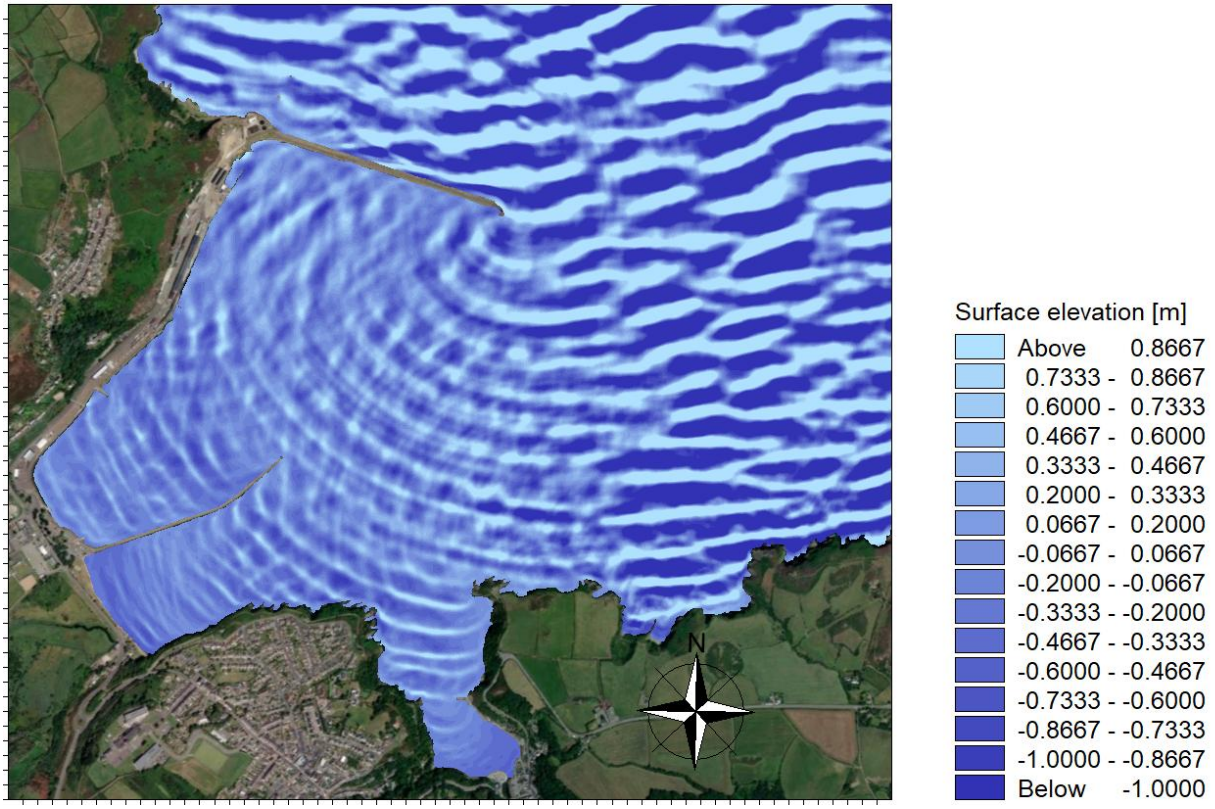

Figure 10.33: Wave disturbance patterns – 1 in 100 year return period storm from 345o N – post construction.

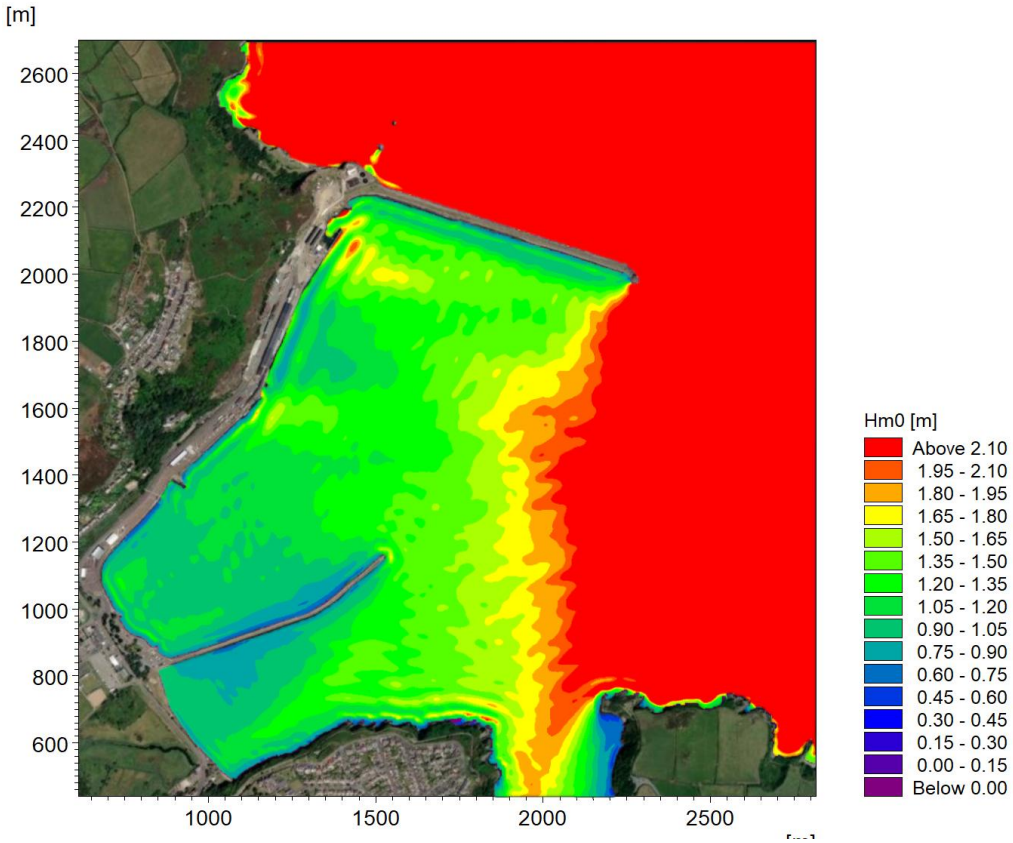

Figure 10.34: Difference in current speed – operational minus baseline – mid ebb.

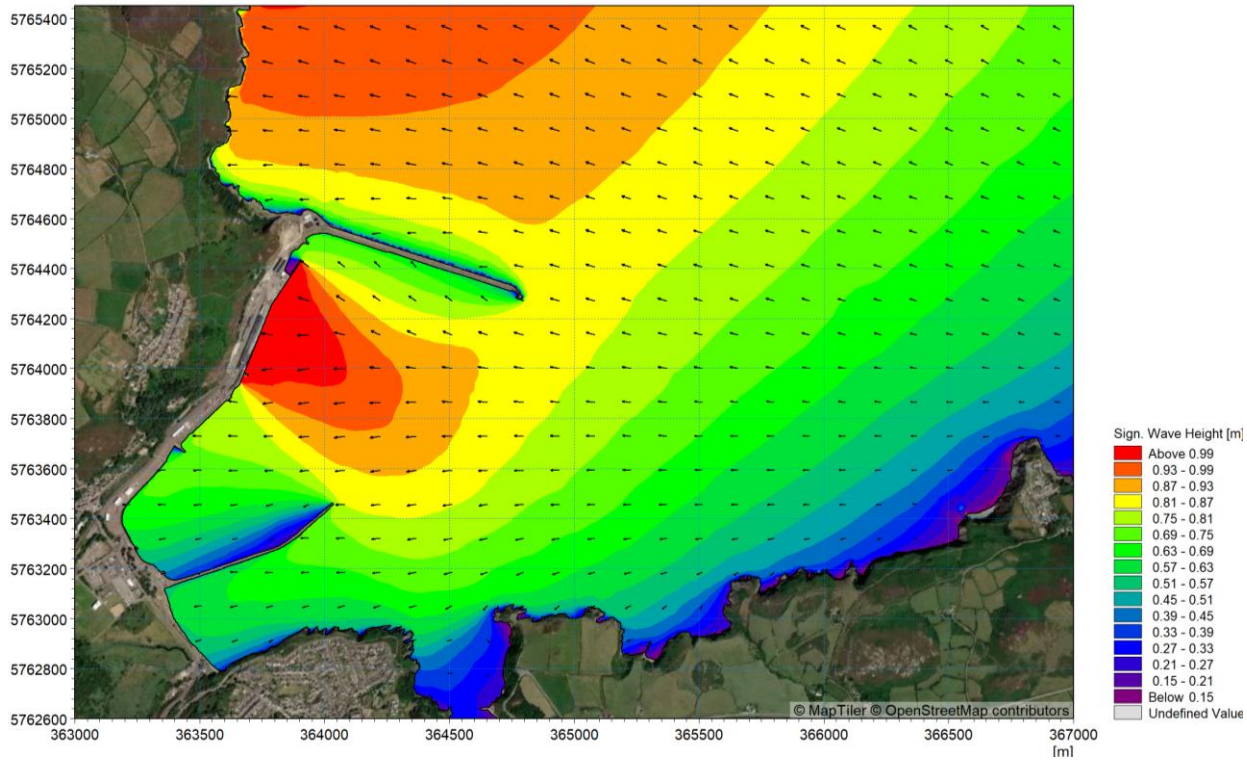

Figure 10.35: Significant wave heights and mean wave direction 1 in 100 year return period storm from 120° N - post construction

10.9.3.3 Changes to the Existing Sediment Transport Regime

Given the limited nature of sediment transport within Fishguard Harbour and particularly within the area of the Proposed Development, together with the negligible predicted changes to both the tidal regime and wave climate, the potential for changes to sedimentation processes as a result of the presence of the Proposed Development is considered negligible.

10.9.3.4 Significance of Effect

Sections 10.9.3.1 - 10.9.3.3 demonstrate that there is a limited spatial change to tides, waves, and sediment transport processes within Fishguard Harbour as a result of the Proposed Developments.

Given both the spatial scale and order of magnitude of change, the impact to coastal processes is therefore considered **negligible**. Likewise, the receiving physical environment is considered to be of **negligible** sensitivity, with such changes to tidal currents and the wave regime having no resulting impact on the distribution of sediments within the harbour.

Therefore, the resulting effect of the Proposed Development on coastal processes has been assessed as **negligible** and **not significant**.

10.10 Mitigation

10.10.1 Construction Phase Mitigation Measures

Given the insignificant impact on existing coastal processes, no mitigation measures are considered necessary during the construction phase of the Proposed Development.

10.10.2 Operational Phase Mitigation Measures

Given the insignificant impact on existing coastal processes, no mitigation measures are considered necessary during the operational phase of the Proposed Development.

10.10.3 Future Monitoring

Given the lack of potential impacts to coastal processes as a result of the Proposed Development, no monitoring measures have been proposed.

10.11 Assessment of Residual Effects

Given that no significant effects were identified within Sections 10.9.2 or 10.9.3, it can be determined that there will be no residual effect upon coastal processes as a result of the Proposed Development.

10.12 Cumulative Effects

The Cumulative Effect Assessment (CEA) takes into account the impact associated with the Proposed Development together with other projects and plans. However, of those projects outlined within the CEA , none share a spatial proximity to Fishguard Harbour that could cause a potential cumulative effect with the Proposed Development, with the nearest identified project situated 26 km to the southwest.

Given both the distance of relevant external developments and the magnitude of impact, sensitivity of receptors, and significance of effect can be considered to be in line with those assessed for the Proposed Development alone, as presented in Section 10.9.

10.13 Limitations of the Assessment

It is the view of the author that no limitations arose that affect the robustness of the assessment of coastal processes for EIA purposes.

10.14 Summary of Effects and Conclusion

Information on coastal processes within the coastal processes study area was collected through a detailed desktop review of existing studies and datasets, and supported by numerical modelling.

Table 10-12 presents a summary of the potential impacts, measures adopted as part of the Proposed Development and residual effects in respect of coastal processes. The impacts assessed include:

- Increase in suspended sediments due to construction activities, and the potential impact to relevant environmental receptors.
- Impacts to coastal processes due to the presence of infrastructure related to the Proposed Development within the water column.

Overall, it is concluded that there will be no significant effects arising from the Proposed Development during the construction or operational phases, as all impacts have a significance level of negligible.

Similarly, it was concluded that there will be no significant cumulative effects from the Proposed Development alongside other projects/plans.

No significant potential transboundary impacts have been identified in regard to effects of the Transmission Assets.

Table 10-12: Summary of environmental effects, mitigation and monitoring.

Description of impact	Phase C	Phase O	Measures included in Project	Magnitude of the impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Increase in suspended sediments due to construction activities, and the potential impact to relevant environmental receptors.	✓	×	None	C: Negligible	C: Negligible	C: Negligible	None	C: Negligible	None
Impacts to coastal processes due to the presence of infrastructure related to the Proposed Development within the water column.	×	✓	None	O: Negligible	O: Negligible	O: Negligible	None	O: Negligible	None

10.15 References

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10.16 List of Abbreviations / Acronyms

BW – Boussinesq Wave

CEA – Cumulative Effect Assessment

CEFAS – Centre for Environment, Fisheries and Aquaculture Science

DHI – Danish Hydraulic Institute

EIA – Environmental Impact Assessment

ES – Environmental Statement

FM – Flexible Mesh

MCAA – Marine and Coastal Access Act

MCZ – Marine Conservation Zones

MPA – Marine Protected Area

MPS – Marine Policy Statement

MT – Mud Transport

NRW – Natural Resources Wales

SAC – Special Area of Conservation

SI – Site Investigation

SMP – Shoreline Management Plan

SPM – Suspended Particulate Matter

SSC – Suspended Sediment Concentration

SSSI – Site of Special Scientific Interest

SW – Spectral Wave

TSSF – Tide and Storm Surge Forecast model

WNMP – Welsh National Marine Plan

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 11 Water Quality

11 Water Quality

11.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on Water Quality during the construction and operational phases of the Proposed Development.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description
- Chapter 9: Coastal Processes

Other aspects relevant to Water Quality are addressed in the specific chapters of the ES, namely:

- Chapter 16: Soils, Geology and Hydrogeology

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

11.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on Water Quality. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 11.6.1 and section 11.5);
- Identifies any limitations encountered in compiling the environmental information (section 11.13);
- Presents an assessment of the potential likely significant effects on Water Quality arising from the Proposed Development (section 11.9.2 and section 11.9.3) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 11.12.
- Highlights any necessary mitigation measures (see section 11.10.2 and section 11.10.3) and/or monitoring (section 11.10.4) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 11.8.3).

11.3 Water Quality Study Area

The location of the proposed development lies within Cardigan Bay South coastal water body (GB621009580000) in the Western Wales River Basin District (WWRBD). Within the development area there are no direct surface freshwater inputs from rivers or streams. Potential inputs of freshwater in the vicinity of the development are restricted to direct precipitation (rainfall) and the entry of two surface water drainage outfalls (one of 500mm diameter and the other of 900mm diameter pipes) at the southern end of the harbour. There are two rivers which ultimately flow into the Cardigan Bay South water body to the south of this development, namely Goodwick Brook (GB110061038490) and Gwan River (via Gwaun Estuary) (GB11061038460). As the rivers are upstream of the development, it is unlikely that they will be impacted in terms of water quality and therefore have not been included in this assessment. The Gwaun Estuary has been included in this assessment, as it is hydrologically connected to Cardigan Bay South.

11.4 Policy Context

11.4.1 EU legislation and policy

11.4.1.1 Water Framework Directive

The key focus of the water quality assessment is to ensure that the proposed development is undertaken in a manner which is consistent with the objectives of the Water Framework Directive (2000/60/EC) (WFD).

The WFD (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) was adopted by the European Commission in December 2000. The WFD is transposed into law in England and Wales by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (hereafter referred to as 'the 2017 WFD Regulations'). The WFD is retained EU legislation and is still applicable in England and Wales as set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 and the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019. The 2017 WFD regulations require Secretary of State (SoS), Welsh Ministers, the Environment Agency and Natural Resource Wales (NRW) to exercise their 'relevant functions' so as to secure compliance with the WFD (Regulation 3). Under the regulations the SoS, the Welsh Ministers, NRW, and each public body have a specific duty to have regard to the relevant River Basin Management Plan (RBMP), and any supplementary plans made under it, in exercising their functions. 'Having regard to' river basin management plans includes taking account of and considering the environmental objectives and summary of measures contained within the plan when exercising any functions and the effects of those functions on the objectives and measures within the plan (Planning Inspectorate, 2018).

A key requirement of the WFD is that surface water bodies attain at least good, and that there should be no deterioration in existing status.

For groundwater, the objective is to achieve good groundwater status, requiring both quantitative status and chemical status to be at least good. Therefore a WFD assessment must be conducted to ensure that the proposed development does not compromise these fundamental requirement of the WFD.

The aim of conducting a WFD Assessment is to determine if specific components or activities related to the proposed development will compromise the attainment of a WFD objective or result in the deterioration in the overall status of any water body. This will determine whether it is possible to proceed with the scheme or whether amendments or mitigation measures are necessary. A separate WFD Assessment has been prepared (Appendix 11.A, i.e. Volume III, Appendices) based on the NRW guidance note GN078 - Complying with the WFD Regulations 2017.

The WFD requires the preparation of a Programme of Measures (POMs) outlining the steps that will be taken to meet WFD objectives as applicable to each water body. This Programme is contained within an overarching River Basin Management Plan (RBMP). One RBMP is prepared for each RBD and also contains information on water body status, objectives, and timescales. The RBMPs were published in 2009 in Wales for the first river basin management cycle from 2009 – 2015. The third cycle of river basin management plans (2021 – 2027) are now finalised and available on the Natural Resources Wales website.

In the context of the RBMPs, this development concerns the Cleddau and Pembrokeshire Coastal Rivers Management Catchment within the Western Wales RBD. Natural Resources Wales is responsible for producing the RBMP, there are, however a number of public authorities and organisations that are required to undertake their functions with due regard for the RBMP and the requirements of the WFD. These include regulators, deliverers, experts, and organisations representing the public in particular the voluntary sectors though Non-Governmental Organisations.

The proposed development proposals have been scoped to determine potentially significant effects in terms of current status and the WFD objectives for the Cardigan Bay South Coastal water body to

determine what elements of the project have the potential to have a significant effect on the water environment and the environmental objectives of the water bodies affected. If the assessment concludes, after taking account of the mitigation proposed, that the proposal may either reduce the quality of any of the contributing elements of the status of the water bodies or prevent the quality elements from achieving the standards required in the RBMP, then this represents a failure to achieve the WFD objectives and the proposal should not go ahead unless justification for the new modification is demonstrated under Article 4.7 of the Directive. The four objectives of the WFD compliance assessment are:

1. Objective 1: To prevent deterioration of any contributing quality element to the status of the water body
2. Objective 2: To prevent the introduction of impediment to the attainment of Good WFD status for the water body
3. Objective 3: To ensure the attainment of the WFD objectives for the water body are not compromised
4. Objective 4: To ensure the achievement of WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.

11.4.1.2 Marine Strategy Framework Directive

Marine Strategy Regulations 2010 transpose the requirements of the EU's (Marine Strategy Framework Directive) into domestic law requires the UK to put in place measures to achieve or maintain Good Environmental Status (GES) in the marine environment.

The overarching aim of the Directive is to protect Europe's marine waters by applying an ecosystem-based approach to the management of human activities while enabling the sustainable use of the marine environment for present and future generations. The Directive establishes a legal framework for the development of marine strategies designed to achieve GES in the marine environment by the year 2020 (EU, 2008). The marine strategy involves defining GES, setting environmental targets and indicators, implementing monitoring programmes for ongoing assessment, and developing and implementing programmes of measures to achieve or maintain GES.

GES is defined as 'the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.'

The assessment of GES is undertaken by reference to qualitative descriptors which define overarching objectives in respect of key socio-economic or ecological aspects of the marine environment. Those relevant to water quality include:

- eutrophication; and
- contaminants

11.4.2 National legislation and policy

11.4.2.1 The Environmental Permitting (England and Wales) Regulations 2016

These regulations were introduced to provide a framework for controlling activities that may affect the water environment including engineering activities, discharges, and abstractions.

11.4.2.2 The Bathing Water Regulations 2013

The Bathing Water Regulations 2013 details quality standards for bathing water sites across Wales. It is a requirement for each bathing location and maintain a bathing water profile for each designated

site to monitor water quality and to inform the public of water quality incidents that may arise at these locations.

11.4.2.3 The Urban Waste Water Treatment (England and Wales) Regulations 1994

The Urban Waste Water Treatment (England and Wales) Regulations 1994, these regulations implement the Urban Waste Water Treatment Directive (91/271/EC) in Wales aiming to protect the environment from the adverse effects of the collection, treatment, and discharge of urban waste water.

11.5 Consultation

Table 11.1 summarises the issues raised relevant to this chapter of the ES, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project between 6 December 2024 and 15 January 2025 and the consultees that were contacted. A further information request from NRW was received on 8 August 2025 following the initial submission of the ES and is included in Table 11.1.

NRW and the project team held further meetings after the scoping opinion (January 2025) to clarify dredging and disposal assessments; dredging/disposal elements have largely been removed from the current submission. A Marine Licence application was submitted in May 2025. NRW issued a formal request for further information/technical clarifications on 15 August 2025; RPS TetraTech responded on 22 September 2025 (request and response are in Appendix 5.C). There were ongoing discussions about whether additional sampling was needed in dredge areas with elevated zinc and Polyaromatic hydrocarbons (PAH); those dredging areas have since been removed from the submission and no potentially contaminated areas will be disturbed. From September 2025 to February 2026, RPS TetraTech and NRW held bi-monthly discussions on design options and consenting. NRW advised withdrawing the earlier application (ML2533) and resubmitting a new application for the re-designed Proposed Development that this Environmental Statement covers.

Table 11.1: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to Water Quality.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
31 January 2025	Natural Resource Wales (NRW) EIA Scoping Response	NRW agree that potential impacts on water and benthic environment from resuspension of sediment bound contaminants from dredging activities in construction and operation phase to be included in EIA	To be included in EIA Water Quality chapter
8 August 2025	NRW Response to ES Impact Assessment for original application	NRW (A) has stated, the location for storage of diesel, oil and chemicals are unclear and the if prevention measures or emergency plans will be in place in case of a spillage. We acknowledge drip trays will be used and diagrams of tanks provided. In addition, the implications for the marine environment and associated mitigation should be included.	To be addressed in EIA Water Resources and WFD chapter and under construction phase mitigation measures and in the CEMP

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		NRW (A) states that mitigation measures for concrete and cement are unclear. NRW (A) request a CEMP before making full assessment of the risks associated with concrete and cement. The CEMP is to outline the best practise and incorporated mitigation measures. We advise that the CEMP must cover activities both in the harbour, and the works compounds and associated activities including cement/concrete and diesel/oil storage and use.	

11.6 Methodology to inform the baseline

11.6.1 Desktop study

Information on climate within the Water Quality Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 11.2. These sources provide the most up to date data for this assessment.

Table 11.2: Summary of key desktop reports.

Title	Source	Year
WFD Cycle 3 Coastal Waterbodies 2021 Status Classification	NRW, 2021a	2021
WFD Cycle 3 Transitional Waterbodies 2021 Status classification	NRW, 2021b	2021
WFD Cycle 3 River Waterbodies 2021 Status Classification	NRW, 2021c	2021
WFD Cycle 3 Coastal Waterbodies Interim 2024 Status Classification	NRW, 2024a	2024
WFD Cycle 3 Transitional Waterbodies Interim 2024 Status Classification	NRW, 2024b	2024
WFD Cycle 3 River Waterbodies Interim 2024 Status Classification	NRW, 2024c	2024
Dee and Western Wales River Basin Management Planning (RBMP) Measures and Objectives	NRW, 2021d	2021
RBMPs 2021-2027 Register of Protected Areas	NRW, 2022	2022
Wales Bathing Water Quality Report 2025	NRW, 2025	2025
Joint Nature Conservation Committee (JNCC) Natura 2000 Sites Conservation Management Objectives	JNCC (JNCC 2008, 2009a, 2009b, 2019)	2008, 2009, and 2019

11.6.2 Site-specific surveys

No site-specific water quality baseline surveys were undertaken as part of the assessment. The baseline data presented in this section is derived from Natural Resource Wales and JNCC and may be taken as representative of the background conditions.

Sediment sampling was undertaken as part of the agreed Sampling Plan for the development and analysed against action levels. These Action Levels are used to determine the contaminant loading of the material.

11.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following specific guidance as follows:

- NRW Guidance Note (GN078);
- Institute of Environmental Management and Assessment (IEMA, 2015) Guidance for Environmental Impact Assessment.

11.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in Table 11.3 below.

Table 11.3: Definition of terms relating to the magnitude of an impact.

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

The criteria for defining receptor sensitivity in this chapter are outlined in Table 11.4 below.

Table 11.4: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon Water Quality is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 11.5. Where a range of significance of effect is presented in Table 11.5, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 11.5: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	Low	Medium	High
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
	High	Negligible or Minor	Minor or Moderate	Moderate or Major	Major

11.8 Baseline Environment

11.8.1 WFD Status

Cardigan Bay South coastal water is a large coastal water body of 163.84km^2 and is currently at Good ecological status and High chemical status. The typology of the water body is exposed mesotidal, which means the water body has an intermediate tidal range, where the difference in height between high and low waters is between 1 and 5 metres.

The Gwaun Estuary is a small transitional water body of only 0.18km^2 and is currently at Moderate ecological status and High chemical status. The typology of the water body is considered ‘Mixed, meso, extensive intertidal. The Nyfer Estuary is a transitional waterbody and is currently at Moderate

ecological status and High chemical status. The typology of the water body is considered ‘Mixed, meso, extensive intertidal.

Despite Port activities, no waterbody of the TraC (Transitional or Coastal) water bodies included in this assessment have been designated as Heavily Modified Water Bodies (HMWB). Table 11.6 and Figure 11.1 outline the WFD baseline data including current overall, ecological, and chemical status for 2024 and its supporting elements.

Table 11.6: WFD water body status 2021 classification and water body interim status 2024 classification

WBID	GB521006110500		GB621009580000		GB5110066115200	
Name	Gwaun Estuary		Cardigan Bay South		Nyfer Estuary	
Country	Wales		Wales		Wales	
RBD Description	Western Wales		Western Wales		Western Wales	
WB Type	Transitional		Coastal		Transitional	
Catchment	Cleddau and Pembrokeshire Coastal Rivers TraC		Cleddau and Pembrokeshire Coastal Rivers TraC		Cleddau and Pembrokeshire Coastal Rivers TraC	
Region	WA South West		WA South West		WA South West	
Area (km2)	0.18		163.8		2.7	
HMWB	No		No		No	
	2021 Status	**Interim 2024 Status**	**2021 Status**	**Interim 2024 Status**	**2021 Status**	**Interim 2024 Status**
Overall Status	Moderate	Moderate	Good	Good	Moderate	Moderate
Chemical Status	High	High	High	High	Moderate	High
Ecological Status	Moderate	Moderate	Good	Good	Moderate	Moderate
Mitigation Measures Assessment	N/A	N/A	N/A	N/A	N/A	N/A
Macroalgae	High	Not Available	High	Not Available	Good	Good
Opportunistic Macroalgae	High	Not Available	High	Not Available	Good	Not Available
Invertebrates	Not Available	Not Available	Good	Good	Moderate	Not Available
Morphology	Not High	Not High	Not High	Not High	High	High
Hydrological Regime	Not High	Not High	Not High	Not Available	Not Available	High
Flow	Not Available	Not High	Not Available	Not Available	Not Available	Not Available
DO	Not Available	High	High	High	High	High

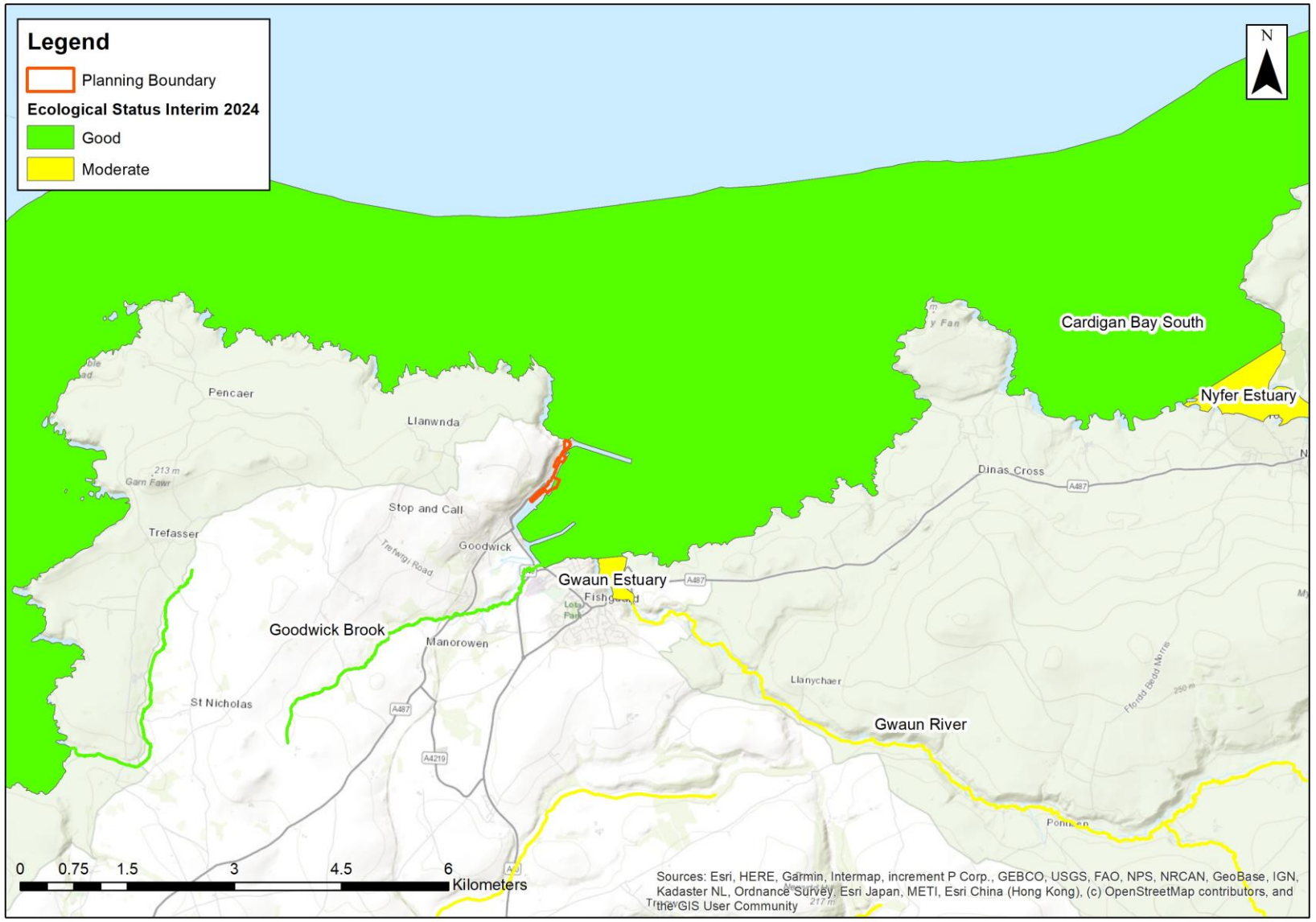

Figure 11.1: WFD Water Body Interim Status 2024

11.8.2 WFD Protected Areas

A significant proportion of waters in the Western Wales RBD are protected under existing EU legislation requiring special protection due to their sensitivity to pollution or their particular economic, social, or environmental importance (Figure 11.2). All these areas requiring special protection in the RBD have been identified by Natural Resources Wales, then mapped and listed in a register of protected areas (required under Article 5 of the WFD Directive). The register of protected areas includes:

- Drinking water protected areas;
- Economically protected areas;
- Recreational waters;
- Nutrient Sensitive areas;
- Special Protection Areas (SPAs); and
- Special Areas of Conservation (SACs).

A number of protected areas, listed on the register are located within or in water bodies adjacent to the Cardigan Bay South water body and therefore the proposed development site. These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation. For example, faecal coliform levels are assessed within shellfish and bathing waters. It is important that proposed mitigation ensures the standards required for these protected areas are met, otherwise a water body which otherwise meets the requirements of the WFD, may have the status reduced to “less than good” as it is not meeting the protected area objectives.

11.8.2.1 Shellfish Water Protected Areas

Shellfish Waters Protected Areas are designated as a protected area under the WFD and all shellfish protected waters have an objective that ‘good’ water quality as defined by (Council Directive 2006/113/EC), is maintained within these areas to ensure the production of high-quality shellfish.

There are no shellfish areas designated under the Shellfish Water Directive (2006/113/EC) within 20km of Fishguard Bay.

11.8.2.2 Bathing Water Protected Areas

The closest designated EU bathing water beach is at Abermawr, 7.6km SW, and Newport North, 9km NE of the Proposed Development, respectively. Bathing water quality is monitored at both Abermawr and Newport North which typically achieves a high-water quality standard. Abermawr and Newport North bathing waters were classified as having ‘Excellent’ and ‘Good’ water quality for the 2025 bathing water season. The Wales Bathing Water Report 2025 includes a comparison for the 2025 and 2024 bathing water seasons (NRW, 2025).

The bathing water profile for Newport North states that there are short term pollution events that are a result of heavy rainfall transporting faecal material from livestock, sewage and urban drainage via rivers and streams to the sea at Newport. The catchment is highly agricultural with numerous towns located upstream in the catchment. In 2025, Newport North was classified as ‘Good’ water quality, a deterioration from ‘Excellent’ water quality in 2024. Abermawr bathing waters is also subject to short pollution events from agricultural related discharges in the upper catchment. However, these events have not been significant to cause a deterioration in status from excellent water quality at Abermawr for 2025.

11.8.2.3 National Site Network (Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)

The National Site Network for SACs and SPAs are included in the Register of Protected Areas included within the RBMP which helps to ensure that water bodies within these areas are managed and that they achieve the objectives required by the Water Environment (Register of Protected Areas) (Wales) Regulations (2017) to protect the Conservation Objectives of water dependant SACs and SPAs.

Cardigan Bay South hosts important protected areas such as the West Wales Marine/Gorllewin Cymru Forol SAC, Cardigan Bay SAC and the Pembrokeshire Marine/Sir Benfro Forol SAC. Ramsey and St David's Peninsula Coast SPA is also within the Cardigan Bay South water body. Table 11.7**Error! Reference source not found.** outlines the distance from the proposed development to each protected area. The location of the protected areas close to the Proposed Development are illustrated in Figure 11.2.

Table 11.7: SACs and SPAs in the context of the Proposed Development

WFD Protected Areas	Distance and Direction to the Proposed Development
West Wales Marine/Gorllewin Cymru Forol SAC	Proposed Development located within this waterbody
Afonydd Cleddau/Cleddau Rivers SAC	4 km SE
St David's/Ty Ddewi SAC	4.6 km W
North Pembrokeshire Woodlands/Coedydd Gogledd Sir Benfro SAC	4.6 km SE
Cardigan Bay SAC	15.4 km NE
Pembrokeshire Marine/Sir Benfro Forol SAC	16.7 km SW
Ramsey and St David's Peninsula Coast SPA	20.6 km SW

11.8.2.4 Marine Protected Areas

A marine protected area is any area of sea or shore that is protected by law for the conservation of habitats, species, or other natural features. The UK has signed up to international agreements that aim to establish an 'ecologically coherent network of Marine Protected Areas (MPAs).' This network will be made up of current MPAs as well as newly designated Marine Conservation Zones (MCZs). Each of the UK Administrations is responsible for designating Marine Conservation Zones, for the protection of nationally important habitats and species, in their territorial waters (out to twelve nautical miles). The Marine and Coastal Access Act 2009 allows for the designation of Marine Conservation Zones (MCZs) anywhere in English and Welsh territorial and UK offshore waters for the protection of nationally important marine wildlife, habitats, geology, and geomorphology.

In Wales there are a total of 132 MPAs which protects species and habitats including those already listed in the National Sites network. Proposed and Candidate SPAs and SACs are protected under MPA Legislation. The West Wales Marine SAC has been identified as an area of importance for harbour porpoise. The site is three times the size of Snowdonia National Park covering 7,376km^2. The SAC encompasses the entire Cardigan Bay South water body and thus the Proposed Development site. The area included within the site covers important summer habitat for harbour porpoise, while part of the site in Cardigan Bay was also identified as important during the winter.

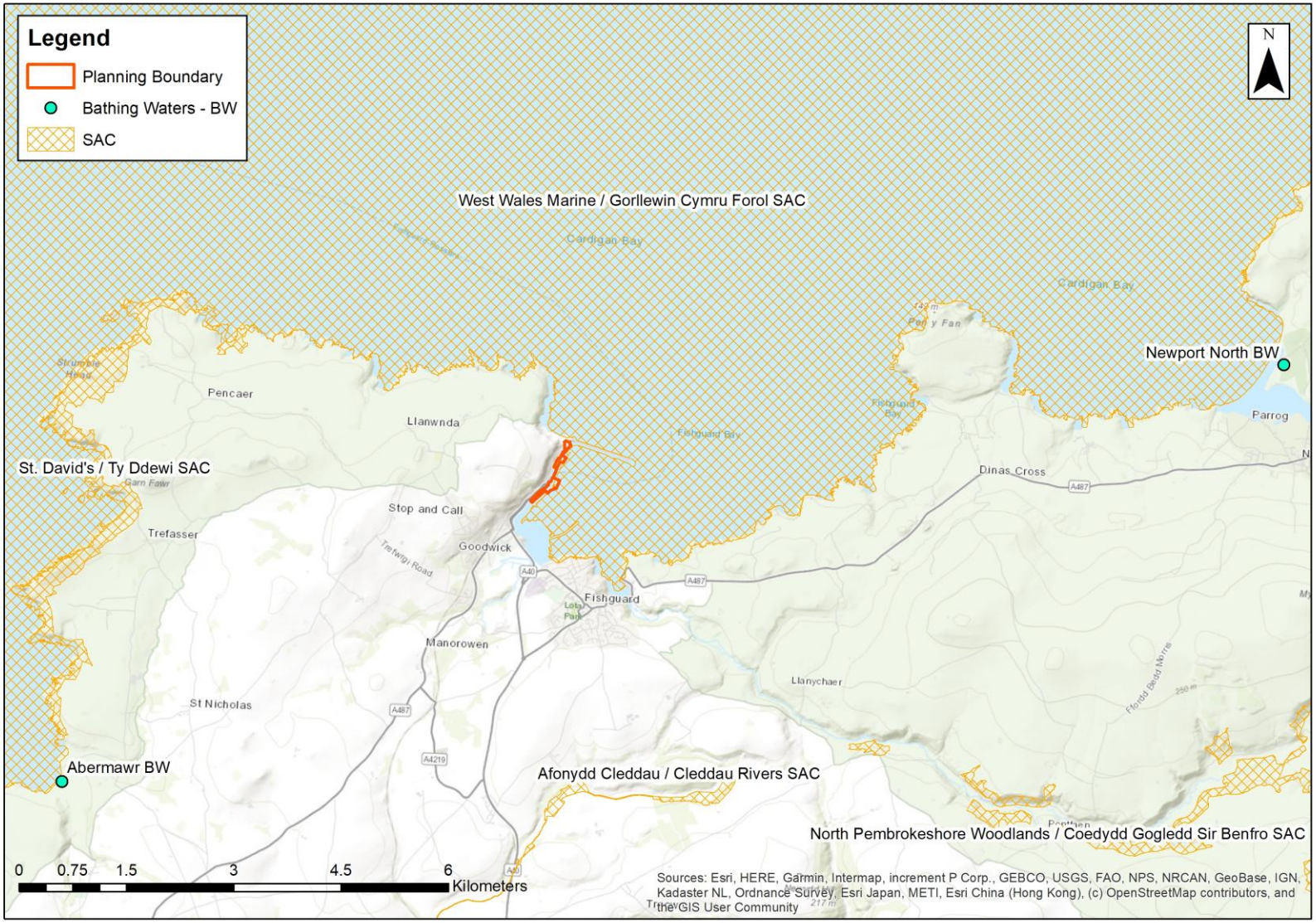

Figure 11.2: WFD Protected Areas

11.8.3 MSFD Status

The Proposed Development is located within the Celtic Seas MSFD sub region. A summary of progress towards the achievement of Good Environmental Status (GES) for 2024 under the MSFD is provided in Table 11.8.

Table 11.8: Progress towards GES

Qualitative Descriptor	GES Achieved	Commentary
Biodiversity – cetaceans	GES not met	Overall, cetaceans have not met GES across both the Celtic Seas and Greater North Sea sub-regions. Data availability limits our capacity to confidently assess status, particularly for abundance and distribution, but where good evidence exists the UK picture is mixed.
Biodiversity - birds	GES not met	Despite a reduced threat from invasive mammals at important marine bird island breeding sites, overall marine birds in both the Greater North Sea and Celtic Seas regions have not met GES.
Biodiversity - fish	GES not met	Fish biodiversity has not met GES across UK seas despite the improving status of some individual populations of sensitive fish. Most assessed populations of sensitive fish species were no longer declining in both the Greater North Sea and Celtic Seas (stable or increasing). However, there are long-term declines in the proportion of large demersal fish found in both regions.
Biodiversity – pelagic habitats	GES uncertain	The environmental status for pelagic habitats in UK seas is uncertain. There is currently no suitable model for assessing GES for pelagic habitats, this results in lower confidence with the GES assessment. However, all currently available evidence suggests that pelagic habitats in both the Greater North Sea and the Celtic Seas are both in “not good” status.
Biodiversity – benthic habitats	GES uncertain	Although there have been some improvements, the overall picture for benthic habitats is still one of deterioration, particularly for sensitive habitats. As a result, benthic habitats in both the Greater North Sea and Celtic Seas regions have not met GES.
Non-indigenous species (NIS)	GES uncertain	The achievement of GES with respect to NIS is uncertain for both the Celtic Seas and the Greater North Sea due to data limitations and a lack of comprehensive NIS monitoring in UK waters. .
Commercially exploited fish and shellfish	GES partially met	Overall, commercially exploited fish and shellfish have partially met GES. By integrating the criteria for both indicators (fishing pressure and reproductive capacity), our assessment shows 42% of marine quota fish stocks and 11% of non-quota shellfish stocks achieving GES. This is a GES increase of 9% for marine quota and 6% for non-quota shellfish stocks from previous assessment period.
Food webs	GES not met	Overall, food webs have not met GES across the marine strategy area. Demersal communities have not achieved GES

Qualitative Descriptor	GES Achieved	Commentary
		in either the Greater North Sea or Celtic Seas. Plankton community indicators show decreasing productivity trends in both seas. Change in fish feeding guild biomass was mixed, with increases in benthivores, piscivore and pisco-crustivore biomass in southern North Sea and Celtic Seas, but decreases in the biomass of planktivores, pisco-crustivores and piscivores in the northern North Sea.
Eutrophication	GES met	Eutrophication has met GES in UK seas. The majority (95%) of UK coastal, shelf and oceanic areas are found to be in Good Environmental Status. However, 3% of coastal waterbodies have not achieved GES, with a further 2% achieving only partially GES due to levels of nutrients giving a higher risk of not achieving GES into the future.
Changes in hydrographic conditions	Achieved	The UK continues to achieve its aim of Good Environmental Status for hydrographical conditions in the 2019 assessment. This drew on evidence from case studies that examined existing or potential future planning applications. The current regulatory regime continues to be sufficiently robust to ensure that any significant long-term impacts to the criteria listed for this descriptor are mitigated.
Contaminants	GES Not met	Overall, contaminant concentrations in UK seas have not achieved GES. This is because four heavy metals (lead, mercury, copper, zinc) and two other persistent pollutants (PBC and PBDE) were above environmental thresholds in sediments and/or biota, in at least one assessed biogeographic region.
Contaminants in seafood	GES partially met	Contaminant concentrations in UK seafood have met GES for shellfish. Recent surveys (2016 – 2020) of contaminant concentrations only contained data from shellfish, but not for finfish. Therefore, we cannot determine GES for contaminant concentrations in UK seafood for finfish.
Litter	GES not met	The UK has not met GES for marine litter. Overall marine litter levels remain high, although there are encouraging reductions in beach litter and in plastics found in the stomachs of fulmar. However, litter on the seafloor remains high and has shown an increasing trend in the Greater North Sea.
Introduction of anthropogenic sound	GES uncertain	The environmental status for underwater noise in UK seas is uncertain. This is because threshold values for GES have yet to be defined. Both underwater noise indicators (impulsive and continuous) show an increasing trend in the assessment period, suggesting our seas are becoming noisier.

11.8.4 Sediment Sampling Plan

In the UK, chemical action levels (cAL) are used as part of a 'weight of evidence' (WOE) approach to licencing the disposal of dredged material. The NRW are advised on the application of action levels in marine licencing by their scientific advisors, the Centre for Environment, Fisheries and Aquaculture Science (CEFAS). Contaminant levels in dredged material below chemical Action Level 1 (cAL1) are generally assumed to be of no concern and are unlikely to influence the licencing decision (MMO, 2015).

Grab sediment samples at shallow depths and vibrocore samples taken at depth were collected in 2025 within wider the footprint of the development in accordance with the sampling plan agreed with NRW. The sediment samples were analysed for several parameters and compared against the chemical action levels, namely:

- Arsenic, Mercury, Cadmium, Chromium, Copper Nickel, Lead, Zinc, Organotins (Tributyltin (TBT) and Dibutylin (DBT)), Polyaromatic Hydrocarbons (PAHs), Polychlorinated biphenyls (PCBs), Organochlorine pesticides (OCPs) and Polybrominated diphenyl ethers (PBDEs).

The sediment analysis results of the sample (VC006) taken from the proposed dredging area (Area A) at various depths contained the following contaminants which are all PAHs (Table 11.9).

Table 11.9: Sediment Analysis results from Vibrocore VC006

Contaminant	Depth detected at (m)	Concentration detected (mg/l)	Exceedance limit (mg/kg)	Contaminant exceeding cAL1/cAL2
Benzo[b]fluoranthene (BFF)	0.9-1.0 1.9-2.0 2.9-3.0	0.1 0.1 0.1	0.1	Equal to cAL1
C1-phenanthrene (C1PHEN)	0.9-1.0 1.9-2.0	0.1 0.1	0.1	Equal to cAL1
Phenanthrene (PHENANT)	0.9-1.0 2.9-3.0	0.1 0.1	0.1	Equal to cAL1
Pyrene	0.9-1.0 2.9-3.0	0.1 0.2	0.1	Equal to cAL1 Marginally above cAL1
Flourant	1.9-2.0 2.9-3.0	0.1 0.2	0.1	Equal to cAL1 Marginally above cAL1

11.9 Impact Assessment

11.9.1 Do Nothing Scenario

If the Proposed Development does not proceed as planned, there would be no impact upon water bodies achieving their water body objectives where the Fishguard ferry terminal is located. However, long term berthing of the Fishguard to Rosslare ferry service would not be possible which would negatively impact upon the operations and overall future development and expansion of the Fishguard Port. The Cardigan Bay South coastal water body is not a heavily modified coastal water body and is not significantly affected by port activities. The water body is currently achieving its environmental objective of good status.

11.9.2 Assessment of Construction Effects

Given the WFD Status of Cardigan Bay South, which is currently at good status and therefore must not be allowed to deteriorate, and the associated water dependent protected areas of international and national importance the sensitivity of the receiving environment is considered to be high based on the criteria outlined in Table 11.4 and therefore the significance of effect is assessed on this basis.

It should be noted that impacts and effects during the decommissioning phase are considered to be similar to no worse than during the construction phase and have therefore not been separately considered during this chapter of the ES.

The key issues identified with regard to water quality are associated with the physical disturbance in the marine environment and adjacent lands due to, dredging, construction activities and the required removal of waste materials off-site. The potential impact arising from the physical disturbance includes sediment dispersal from dredging activities, concrete or fuel/chemicals entering the port. During the operational phase, the potential for the Proposed Development to impact on coastal processes and morphology of Fishguard Port is considered; additional pressures associated with sewage, storm water drainage and accidental spillages potentially impacting on water quality are also assessed.

11.9.2.1 Suspended Sediment and Dredging

Removal of Structures

The jack-up barge, kiosk, existing linkspan bridge and buffer dolphin supporting towers are all to be removed to enable the installation of the new pontoon and bridge. 500mm of the towers inside face of the towers will be removed over a vertical length of 7.5m. Total reinforced concrete to be removed is 46m^3 with an allowance of tolerance, equivalent to a weight of 110 tonnes. These structures are to be demolished by wire saw and lifted off by floating crane and/or landslide plant and removed from the site by pontoon towed away by tugboat. The jack-up barge legs will be lifted from the seabed and barge lowered to be towed away by tugboat. There is a total of 250m^3 of infrastructure to be removed. All arisings shall be disposed of to an appropriate offsite disposal facility.

Surface water quality could be impacted during the removal of these structures. The removal of the jackup barge legs from the seabed may cause the generation of sediment plumes within the water column. During site clearance surface water quality may be affected by exposing soils/rubble to erosion by rainwater and drainage water run-off from the site.

Dredging

Plough dredging is proposed in the area of the footprint of the pontoon to allow for the installation of scour protection. The area to be dredged is approximately 40m x 40m and the material consists of loose silts and sands (Area A) which has not been dredged for at least 10 years. The area is to be dredged to a depth of 1.5m of which 2,500m^3 of material is to be distributed within the berth area. The dredge material is to be placed within a scour pocket and tracked over to achieve the appropriate depth. These activities have the potential to cause dispersal of sediment within the Cardigan Bay South coastal water body and to adjacent water bodies.

Suspended sediment can hold potentially hazardous contaminants such as heavy metals. In Area A, where dredging activities are proposed, a series of PAHs were detected at various depths (Table 11.9). The contaminants BFF, C1PHEN and PHENANT were all equal to cAL1 (0.1 mg/l), meaning there is no contamination of sediment from these pollutants which were found at depths of 0.9-3.0 metres.

The PAHs, Pyrene and Flourant were found to be above cAL1 at depth (both 0.2mg/l). These contaminants are held within sediments found at depths of 2.9-3.0 metres which is deeper than the depths plough dredging will take place (1.5m). Therefore, there will be no mobilisation of any contamination that are above cAL 1 associated with dreading activities within Area A.

Coastal processes modelling outlined in Chapter 9 Coastal Processes provides an assessment of the impact of the Proposed Development on coastal processes and includes sediment plume and deposition modelling undertaken for dredging during the construction phase of the proposed development. The modelling and studies for coastal processes have shown the proposed development will have no significant impact on coastal processes away from the immediate area around the site.

The following are the conclusions of coastal processes modelling

Sediment dispersion is greatest during a spring tide, producing a plume that can extend about 300 m to the south and about 180 m to the northeast of the dredge area on the flood tide; plume suspended sediment concentrations (SSCs) generally remain below 100 mg/L and do not exceed 2.1 g/L. The highest suspended sediment concentration measured was about 2.8 g/L at low water during a neap tide, directly at the source of dredging.

Average SSCs in the immediate vicinity of the works are approximately 1.4 g/L on a spring tide and 1.75 g/L on a neap tide, and SSCs decrease to background levels (~5 mg/L) at roughly 300 m from the dredge during spring tides and about 200 m during neap tides. The greatest deposition occurs within the targeted scour pit up to roughly 0.65 m on a spring tide and 0.70 m on a neap tide while total deposition in the vicinity of the dredge can reach about 0.3 m but is typically less than 0.2 m; beyond about 5 m from the dredge paths deposition falls to under 5 cm and sedimentation declines rapidly with distance to below 1 mm by around 200 m.

Therefore, there will be a negligible effect where increases in suspended sediment concentrations are very localised within the harbour area and do not extend into the wider Cardigan Bay South coastal water body.

Guide pile construction for Bankseat and Pontoon Restraint

Pile construction is proposed for the new bankseat and the pontoon restraint. Remedial works are to be carried out on the existing bankseat to allow installation of new linkspan bridge. If required the new bankseat will consist 6 permanent steel tubular guide piles (diameter: 914mm) with 8 temporary piles (0.610m diameter) to support the temporary steel frame for the bankseat. The piles for the bankseat structure will be installed via vibro and/or impact driving techniques

For the pontoon restraint, eight temporary steel piles are to be installed adjacent to the pontoon to support the piling rig. These temporary support piles will each be approximately 1.22m in diameter and will be installed via vibro and/or impact driving techniques. The piles will be installed using a crawler crane on the quay edge and temporary steel piling platform will be provided to enable additional working are for the crane. Permanent steel piles will be tabular piles with diameter of 2.032m. All temporary piles will be removed once guide piles are installed.

Pile installation operations as outlined above have the potential to cause temporary increases in suspended sediment due to the disturbance of seabed materials. This causes the resuspension of sediments in the water column leading to localised reduction in water quality within Fishguard Bay and the wider Cardigan Bay coastal waterbody.

The magnitude of impact of increased suspended sediment from the removal of structures, construction of hard infrastructure, and dredging activities on water quality is considered to be negligible given the uncontaminated nature of the sediment to be dredged the limited bed disturbance and the extent of the suspended solids plume will be localised and contained within the harbour area. The significance of effect is therefore negligible based on a high sensitivity of the receiving environment. The impact duration is temporary and for short term. On this basis there is no risk of deterioration in the ecological or chemical status of the coastal water bodies within the Water Quality Study Area. Furthermore there is no significant effects predicted for the water dependant protected areas.

11.9.2.2 Cement and Concrete Pollution

The construction of the bankseat structure, concrete piling works and remedial works to concrete structures can contribute to cement and concrete pollution.

Construction works can generate high volumes of high alkaline dust and fresh cement and concrete can contribute to contaminant runoff in the absence of mitigation. Runoff may be transported into the water column and pose detriment to the water environment, especially marine life. Therefore, it is essential that the use of wet concrete and cement in or close to any water body is carefully controlled so as to minimise the risk of any material entering water courses.

Mitigation for concrete and cement pollution is included in section 11.10 and is addressed in the outline Construction and Environmental Management Plan (oCEMP) included in Appendix 2.A of the ES.

The magnitude of impact of concrete and cement is considered to be high. The significance of effect is therefore major based on a high sensitivity of the receiving environment in the absence of mitigation measures. The impact duration is temporary and for short term. On this basis there is no risk of deterioration in the ecological or chemical status of the coastal water bodies within the Water Quality Study Area once mitigation measures have been considered. Furthermore there are no significant effects predicted for the water dependent protected areas.

11.9.2.3 Accidental Spillages of Oils, Fuels and Chemicals

During construction works, there is potential for accidental spillages of oils, fuels and chemicals from plant and equipment adjacent to the Cardigan Bay South coastal water body. There is potential for such substances to contribute to surface runoff and may enter the marine environment in the absence of mitigation measures.

The magnitude of the potential impact arising from the accidental spillages of oils, fuels and chemicals is considered to be high. The significance of effect is therefore major based on a high sensitivity of the receiving environment in the absence of mitigation measures. The impact duration is temporary and for short term. On this basis there is no risk of deterioration in the ecological or chemical status of the coastal water bodies within the Water Quality Study Area once mitigation measures have been considered Furthermore there are no significant effects predicted for the water dependent protected areas.

11.9.3 Assessment of Operational Effects

11.9.3.1 Maintenance Dredging

There is no maintenance dredging proposed as plough dredging under the construction phase is to level out the seabed to 1.5m before the installation of scour protection. There is no requirement to maintain dredged depths.

The magnitude of the potential impact arising from maintenance dredging is considered to be negligible. The significance of effect is therefore negligible based on a high sensitivity of the receiving environment. The impact duration is temporary and for short term. On this basis there is not risk of deterioration in the ecological or chemical status of the coastal water bodies within the Water Quality Study Area. Furthermore there are no significant effects predicted for the water dependent protected areas.

11.10 Mitigation

11.10.1 Dredge Mitigation

The following key relevant mitigation measures will apply to each dredging campaign in the Proposed Development:

- A documented Accident Prevention Procedure will be put in place prior to commencement.
- A documented Emergency Response Procedure will be put in place prior to commencement.

11.10.2 Construction Phase Mitigation Measures

The following mitigation measures have been considered to protect the water environment during construction:

A protocol for regular communication between the appointed contractor, the engineer's representatives, statutory agencies, such as Natural Resources Wales and Fishguard & Goodwick Town Council, and other third parties shall be established;

- Management and auditing procedures, including toolbox talks to personnel, shall be put in place to ensure that any works which have the potential to impact on the aquatic environment are being conducted in accordance with required, licences, certificates and planning permissions;
- A contingency plan for the construction works shall be prepared by the appointed contractor, in accordance with GPP 21 Pollution Incident Response Planning (Netregs, 2021) to be included in the oCEMP. The Plan should also detail the procedures to be followed if there is a breach in any licence conditions or non-compliance. The Environmental Manager should be notified in breaches in agreed environmental management procedures. Training should be provided to relevant personnel detailed within the Pollution Incident Response Plan to ensure that appropriate and timely actions will be taken; and,

Mitigation and control measures to address the impact of suspended sediments include;

- Technical Guidance C648: Control of Water Pollution from Linear Construction Projects, (CIRIA, 2006);
- Technical Guidance C532: Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors (CIRIA, 2001); and,
- GPP 6: Working on construction and demolition sites.

Mitigation and control measures to address the impact of oils, fuels and chemicals;

- Fuel, oil and chemical storage must be sited on an impervious base with a bund and secured within the temporary Site Compound located in Area 1 or 2. The base and bund walls must be impermeable to the material stored and of adequate capacity. GPP 2 shall be implemented to ensure safe storage of oils and chemicals.
- The Port Authority have in place an Oil Spill Contingency Plan which is adhered to by all staff including those employed to carry out works on behalf of the Port Authority. This plan is provided to assist the Harbour Master, or in his absence the Deputy Harbour Master in dealing with an accidental discharge of oil and/or HNS (Hazardous Noxious Substances). Its primary purpose is to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. Effective planning will ensure that the necessary actions are taken in structured, logical and timely manner.
- An outlined Construction Environmental Management Plan (oCEMP) has been included as Appendix 2A of the ES. As outlined in Sections 7, 8 and 9 of the oCEMP dedicated specific areas for oil storage and refuelling will be provided within the site compound, separated a minimum of 10m from any adjacent waterbodies (50 metres from a borehole) including providing bunds sized to contain 110% of fuel storage capacity. There are two potential areas identified for the Site Compound (see Chapter 2, Project Description, Figure 2.10). Area 1 is sited along the eastern edge of the Terminal area. The area is currently in use as a carpark for staff and passengers. It is envisaged that this area could be used throughout works for site cabins and parking. Area 2 comprises a large area of gravel on the north end of the Port which is currently in use for overflow parking for trailers and machinery.

- Prevention measures that will be in place in the event of a spill are outlined in Chapter 8 of the oCEMP, Construction Method Statement and Chapter 9 of the oCEMP, Environmental Mitigation Measures. The safe operation of refuelling activities shall be in accordance with GPP 8 Safe storage and disposal of used oils (Netregs, 2017). With regard to potential oil spills during construction, an emergency spill kit and oil spill containment equipment will be located at strategic locations adjacent to the works.
- Emergency Procedures are outlined in Section 7.2.3 of the oCEMP, and an example Emergency Response & Environmental Plan is included in Appendix G of the oCEMP.

Mitigation and control measures to address the impact of concrete and cement;

- The oCEMP includes the measures to mitigate the impact from concrete and cement, particularly Sections 7, 8 and 9.
- Concrete use and production shall adhere to control measures outlined in GPP 6 Working at demolition & construction sites (Netregs, 2023) particularly if on-site concrete production is proposed and careful initial siting of concrete mixing facilities is required with no production within a minimum of 50 metres from the aquatic zone.
- GPP 6 Working at demolition and construction sites (Netregs, 2023) shall be adhered to particularly in relation to safe and secure decommissioning of existing structures, onsite storage and minimising storage timing, wheel washing, placing of concrete and dealing with silty water. Other relevant guidance exists, including:
  - GPP 1: Understanding your environmental responsibilities – good environmental practises
  - GPP 2: Above Ground Oil Storage
  - GPP 5: Works and maintenance in or near water
  - GPP 8: Safe storage and disposal of used oils
  - GPP 13: Vehicle washing and cleaning
  - GPP 21: Pollution incident response planning
  - GPP 26: Safe storage – drums and intermediate bulk containers

11.10.3 Operational Phase Mitigation Measures

In order to ensure adequate protection of water environment during the operational phase, the following key mitigation measures are proposed;

- Compliance with oil spill contingency plan as outlined above to be deployed for the duration of the operational phase;

11.10.3.1 Maintenance dredging

Similar mitigation to that applied for the capital dredging (see Section 11.10.2) will be applied to the maintenance dredging to ensure that the impact of maintenance dredging is not significant.

11.10.4 Future Monitoring

Monitoring will be undertaken during the construction to ensure that the mitigation measures contained within the contractors construction environmental management plan are being effectively implemented. This monitoring protocols will be agreed with the contractor and the statutory bodies in advance of the construction commencing and will include visual checks by contractor's staff and engineering representatives and water quality monitoring using water quality monitoring probes.

11.11 Assessment of Residual Effects

In circumstances where the appropriate mitigation measures are fully implemented during the construction and operational phases as outlined in the previous section, the magnitude of the impact of the Proposed Development on the water quality in the area will be negligible as indicated in Table 11.10. Therefore given the highly sensitive nature of the receiving water bodies and the negligible magnitude of impact the overall significance of effect has been assessed to be negligible.

Accordingly, the Proposed Development will not have a significant effect on the water quality of the receiving waters or make a significant change to the existing ecological or chemical status of the Cardigan Bay South coastal waterbody and adjacent waterbodies nor will Proposed Development compromise the achievement of the environmental objectives of these water bodies.

In all the circumstances as outlined, it can therefore be concluded that the proposed works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for this water body.

Table 11.10: Residual Impacts (with mitigation)

Significance of Environmental Effect			
Construction Phase	**Backseat and Pontoon**	**Installation of Scour Protection**	**Removal of jack-up barge, buffer dolphin structure**
Suspended Sediment and Dredging	Negligible	Negligible	Negligible
Cement and Concrete Pollution	Negligible	Negligible	Negligible
Accidental Spillages of Oils, Fuels and Chemicals	Negligible	Negligible	Negligible
Operational Phase	**Backseat and Pontoon**	**Installation of Scour Protection**	**Berth Operation**
Maintenance Dredging	Negligible	Negligible	Negligible

11.12 Cumulative Effects

Other proposed developments within the Fishguard harbour area have been considered in the context of cumulative impacts on Water Quality. Other relevant projects taking place with Cardigan Bay South coastal water body and adjacent coastal waterbodies have been included within this assessment (Table 11.11).

Table 11.11: Project included in the Cumulative Assessment

Reference	Description	Status	Location	Coordinates	EIA Submitted	Distance from Proposed Development
NP/24/0164/OBS	Shellfish Farm expansion	Decision made (outcome unknown) 03/04/2024	Cârr Y Môr, Ocean Farm, St Brides Bay, Pembrokeshire	E: 172504 N:223350	Environmental Impact Statement submitted in 2021	26

There is one other project located within the adjacent Pembrokeshire South coastal water body (GB611008590003) which is the proposed expansion of an existing shellfish farm; Cât Y Môr which involves construction of new seaweed processing facility and the provision of a three hectare site located in Ramsay South, north of St. Brides Bay.

The environmental impact statement submitted by Cât Y Môr (Cât Y Môr, 2021) states effects from the development will not contribute to those from other developments. The following are water quality effects that are likely to arise from the shellfish expansion project:

Deposition of sediment and particulate organic matter (POM)

The introduction of new infrastructure into the marine environment creates suspended sediments within the water column which may contain contaminants. Organic matter derived from shellfish may be deposited on the seabed which increases the risk of nutrients causing eutrophication. Coastal processes within the Ramsey Sound demonstrate suspended sediment is subject to high tidal flow patterns. The area has medium-high suspended sediment transport (>1m^2s^{-1}) meaning deposition of potential organic matter and suspended sediment is unlikely to impact upon the Proposed Development in Fishguard Bay. In addition, any sediment disturbed will be deposited within the confines to the boundary where the works are taking place. Therefore, there will be no cumulative effects from this project.

11.12.1 In-combination effects

There will be no in-combination effects between these developments.

11.12.2 Effects interactions

There will be no interactions from the Proposed Development and the shellfish farm development due to the size of the proposed expansion of the shellfish farm and the considerable the distance from Fishguard Bay to the shellfish farm in the Ramsey sound (approximately 26 km). There will be no significant cumulative effects from these projects.

11.13 Limitations of the Assessment

There were no limitations that would affect the robustness of the assessment for EIA purposes.

11.14 Summary of Effects and Conclusion

The baseline environment has been established for the Proposed Development within the Cardigan Bay south coastal waterbody and adjacent coastal water bodies. The likely significant effects from the Proposed Development have been described for the construction and operational phase. All impacts will have a short term duration. A series of the mitigation measures have been proposed for each phase. With the implementation of mitigation measures, each likely significant effect will be reduced to negligible and will ensure the Proposed Development will not cause deterioration in status of each water body. There will be no cumulative effects with any other project. Table 11.12 shows a summary of effects for the construction and operational phases.

Table 11.12: Summary of Effects

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional Mitigation measures	Residual effect	Proposed monitoring
Suspended Sediment and Dredging	✓	×	Limiting depth of dredging and using plough dredging to redistribute sediment to scour hole	Negligible	High	Negligible	None	Negligible	None
Cement and Concrete Pollution	✓	×	Remedial works to the existing bankseat rather than replacement	High	High	Major	Yes, if replacement is required the use of pre-cast concrete if the new Bankseat and pollution prevention measures as outline in the oCEMP	Negligible	None
Accidental Spillages of Oils, Fuels and Chemicals	✓	×	None	High	High	Major	Yes, pollution prevention measures as outline in the oCEMP	Negligible	None

*C: Construction Phase O: Operation Phase

11.15 References

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11.16 List of Abbreviations / Acronyms

cAL – Chemical Action Level

BFF – Benzo[b]fluoranthene

C1PHEN – C1-phenanthrene

CEFAS - Centre for Environment, Fisheries and Aquaculture Science

GES – Good Environmental Status

MMO – Marine Management Organisation

MSFD – Marine Strategy Framework Directive

MPA - Marine Protected Area

NRW - Natural Resource Wales

oCEMP – Outline Construction and Environmental Management Plan

PAH – Polyaromatic Hydrocarbons

PHENANT – Phenanthrene

SAC – Special Area of Conservation

SPA – Special Protection Area

TraC – Transitional or Coastal Waterbodies

WOE - Weight of Evidence

WFD - Water Framework Directive

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 12 Flood Risk

12 Flood Risk

12.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on flood risk and the vulnerability of the Proposed Development to flooding. This chapter considers the potential impacts to flood risk from the Project during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing flood risk to assess current environmental baseline conditions;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on flood risk; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

Other aspects relevant to flood risk are addressed in the specific chapters of the ES, namely:

- Chapter 10: Coastal Processes

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

12.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on flood risk. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 12.8);
- Identifies any limitations encountered in compiling the environmental information (section 12.13);
- Presents an assessment of the potential likely significant effects on flood risk arising from the Proposed Development (section 12.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 12.12.
- Highlights any necessary monitoring (section 12.10.3) and/or measures (see section 12.10.1 and section 12.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment.

12.3 Study Area

The Study Area is the site location as shown in Figure 2.1 which spans an area of approximately 0.9 hectares of the harbour, to include the existing linkspan, hinterland and within the foreshore of Fishguard Bay.

12.4 Policy Context

12.4.1 National legislation and policy

Planning Policy Wales sets out the land use planning policies of the Welsh Government. Planning Policy Wales is supplemented by a series of Technical Advice Notes (TAN). **Technical Advice Note (TAN) 15 'Development, flooding and coastal erosion'** ensures that flooding is accorded appropriate consideration in plan making and development management decisions. A key requirement of TAN 15 is that a Flood Consequence Assessment (FCA) must be produced for any development at risk of river or coastal flooding. The results of the FCA should be used to inform the final design of a development and to demonstrate that all risks have been identified and appropriately mitigated for. This is vital to ensure that the development will be safe for people to live in or use for all its proposed lifetime. TAN 15 is supported by the **Flood Map for Planning**, which shows how climate change will affect flood risk extents over the next century and indicates the potential extent of flooding assuming no defences are in place. The Flood Map for Planning represents the best available information on flood risk and is the framework for assessing risks to and from new development.

12.5 Consultation

The Natural Resources Wales Screening and Scoping Opinion (January 2025) noted that they had received no comments in relation to Flood Risk and agreed that an assessment of impacts should be carried out as set out in the Scoping Report.

12.6 Methodology to inform the baseline

12.6.1 Desktop study

Information on flood risk within the Flood Risk Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 12.1. These sources provide the most up to date data for this assessment.

Table 12.1 Summary of key desktop reports.

Title	Source	Year
Flood Map for Planning	Natural Resources Wales	2026
Coastal Flood Boundary Conditions for the UK Study	Environment Agency	2018
Flood Consequences Assessments: Climate change allowances	Welsh Government	2021

12.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for flood risk. The baseline data presented in this section is derived from published flood maps as representative of the background conditions.

12.7 Assessment Methodology

The following tasks will be implemented to complete the assessment:

- identify and assess the hazard from all sources of flooding to the Proposed Development;
- consideration of the consequences of flooding on the Proposed Development;
- consideration of the consequences of the Proposed Development on flood risk elsewhere;
- identification of any mitigation measures that can be incorporated into the design of the Proposed Development to ensure that the risk to life, damage to property and disruption to people is minimised;
- assessment of any residual impacts;
- demonstrate that the Proposed Development complies with planning policy and guidance.

12.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in below.

Table 12.2 Definition of terms relating to the magnitude of an impact.

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

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 12.3 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon flood risk is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table . Where a range of significance of effect is presented in Table , the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 12.4 Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

12.8 Baseline Environment

12.8.1 River Flood Risk

There are no watercourses in the vicinity of the site so there is no flood risk from fluvial sources. An extract from the Flood Map for Planning (River) is shown in Figure 12.1.

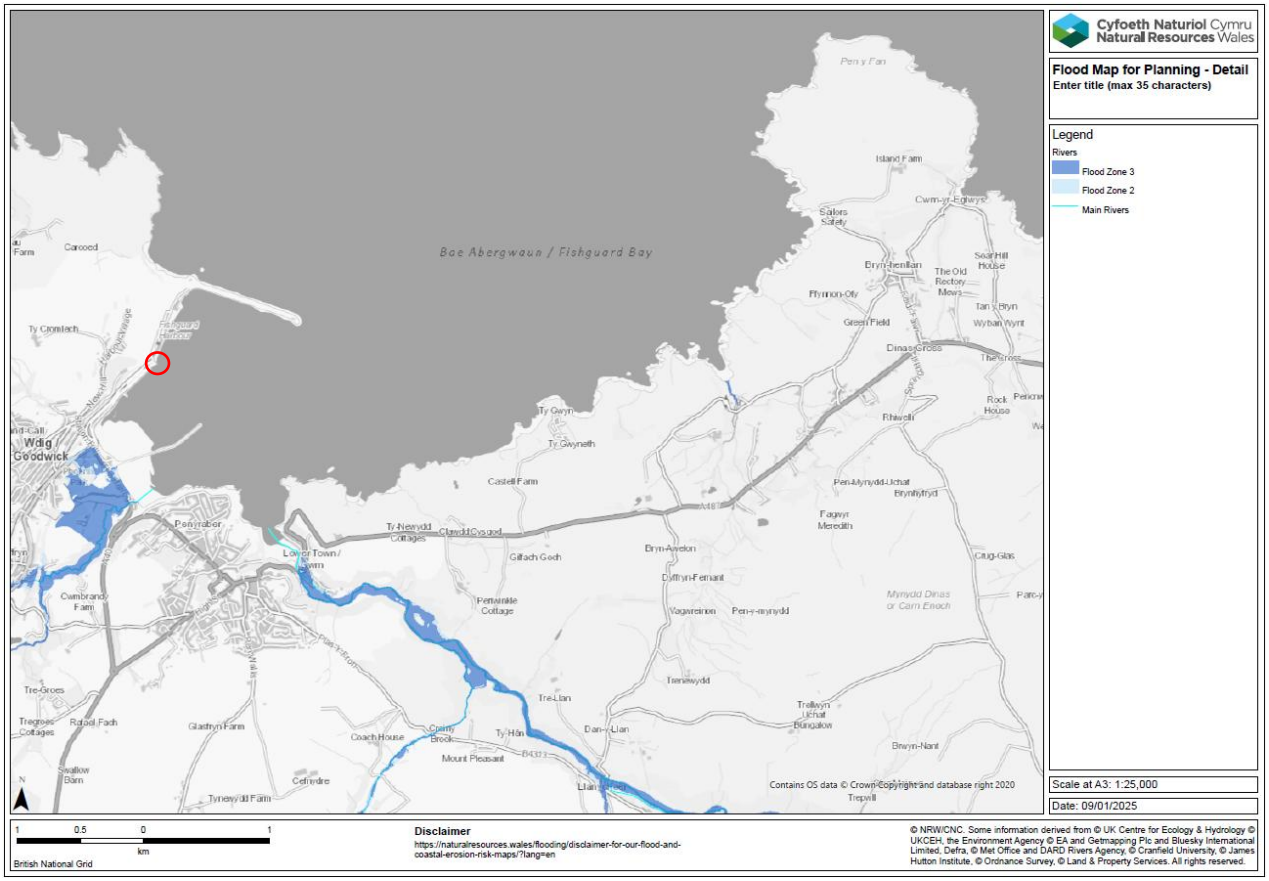

Figure 12.1 Extract from Flood Map (Rivers)

12.8.2 Coastal Flood Risk

The site is located adjacent to and within Fishguard Harbour in Fishguard Bay.

An extract from the Flood Map for Planning (Sea) is shown in Figure 12.2. The map shows that the Proposed Development lies within Zone 3 - areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.

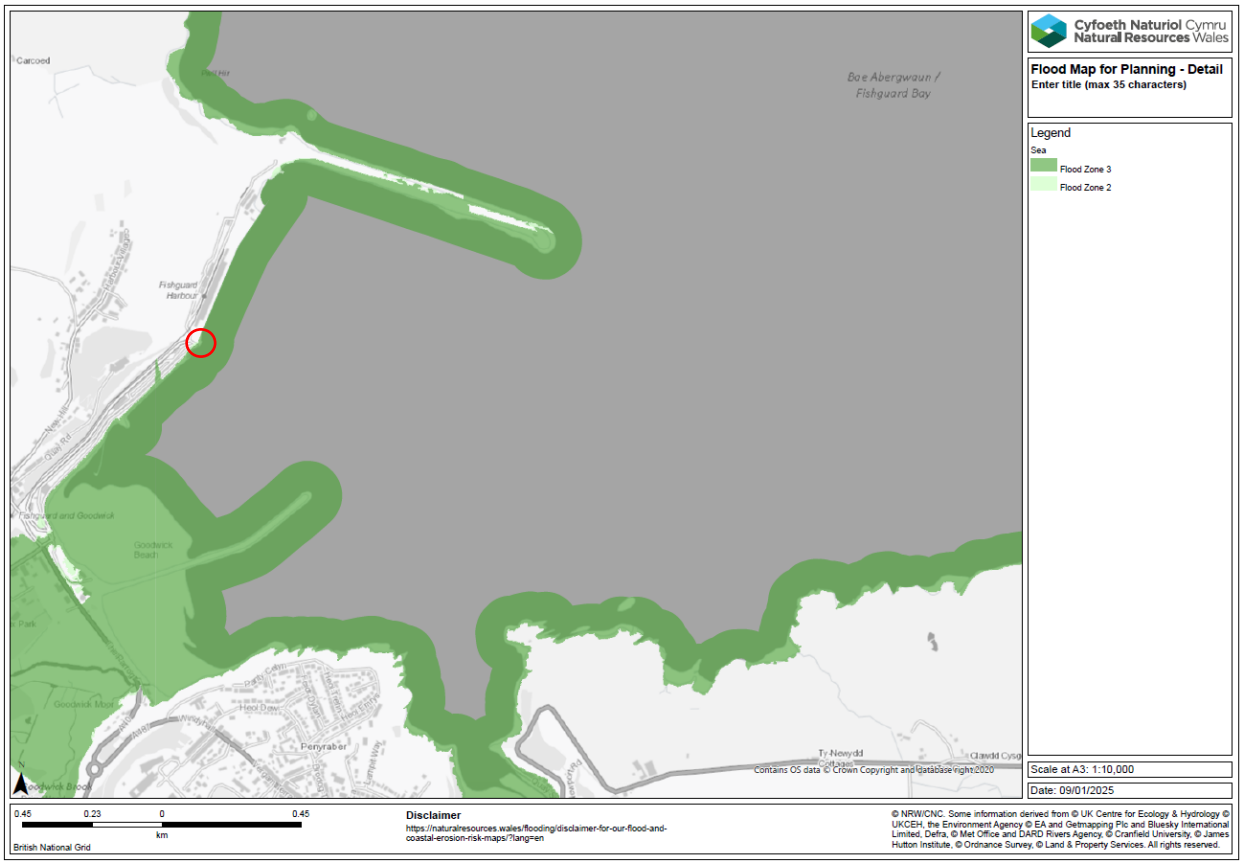

Figure 12.2 Extract from Flood Map (Sea)

The map in Figure 12.2 shows the potential extent of flooding assuming no defences are in place. Flood Map for Planning shows that there is a private flood defence (wall) along the quay although there is no defended area attributed to the defence. The location of the flood defence is shown in Figure 12.3.

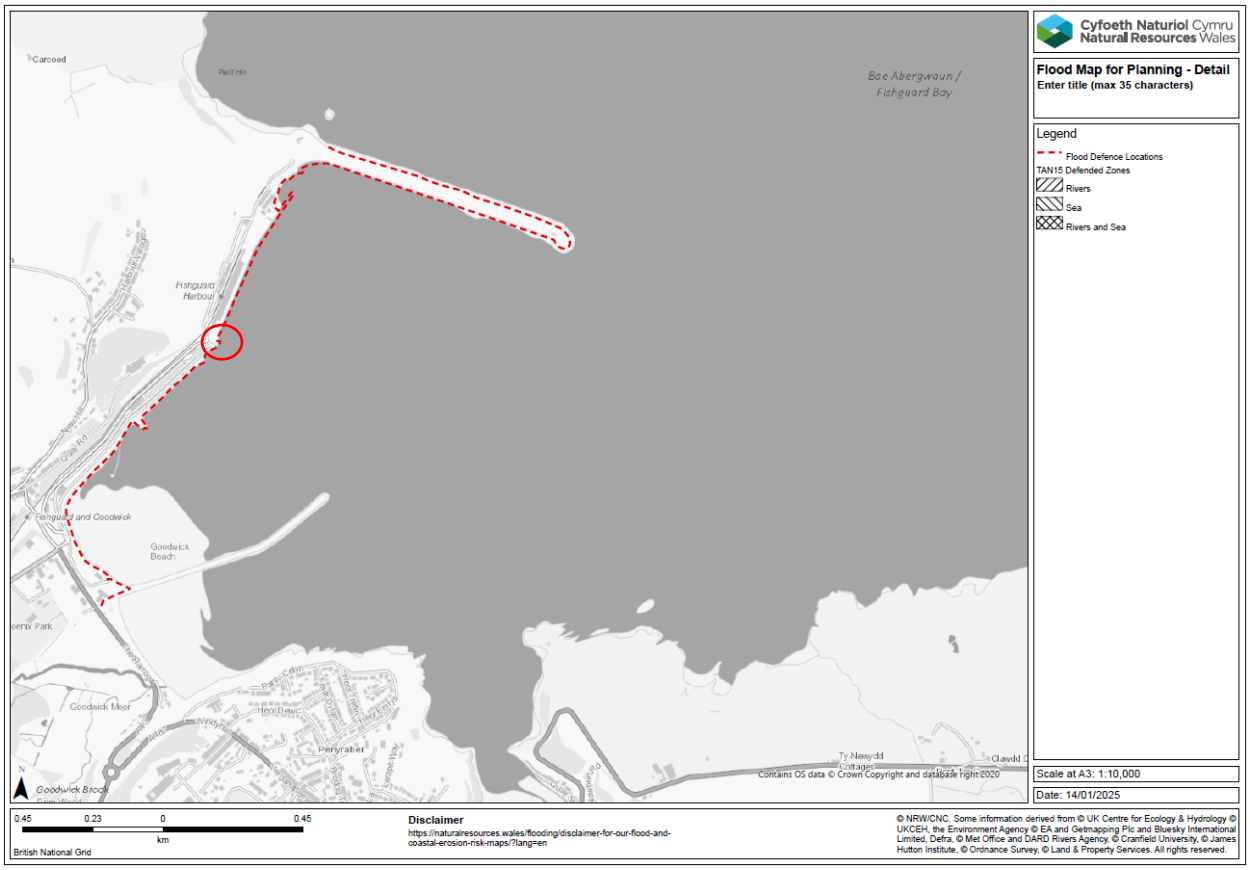

Figure 12.3 Extract from Flood Map (Flood Defence locations)

Extreme sea levels were obtained from the Coastal Flood Boundary Conditions for the UK Study. The latest study was published in 2018, and extreme sea levels are available as an online dataset which provides extreme sea level and typical surge information around the coast of Wales under present day conditions. The extreme sea levels (to Ordnance Datum) are shown in Table 12.5 at the point closest to Fishguard Harbour which is Chainage 714. The location of this point is shown in Figure 12.4 Locations of extreme water levels. For infrastructure of this type a 0.5% AEP tidal event should be considered, so a tidal level of 3.62m OD (6.06m Chart Datum).

Table 12.1 Extreme Sea levels at Fishguard

Tidal event	Water level (mOD)
1 in 100 year (1% AEP)	3.55
1 in 200 year (0.5% AEP)	3.62
1 in 1000 year (0.1% AEP)	3.77

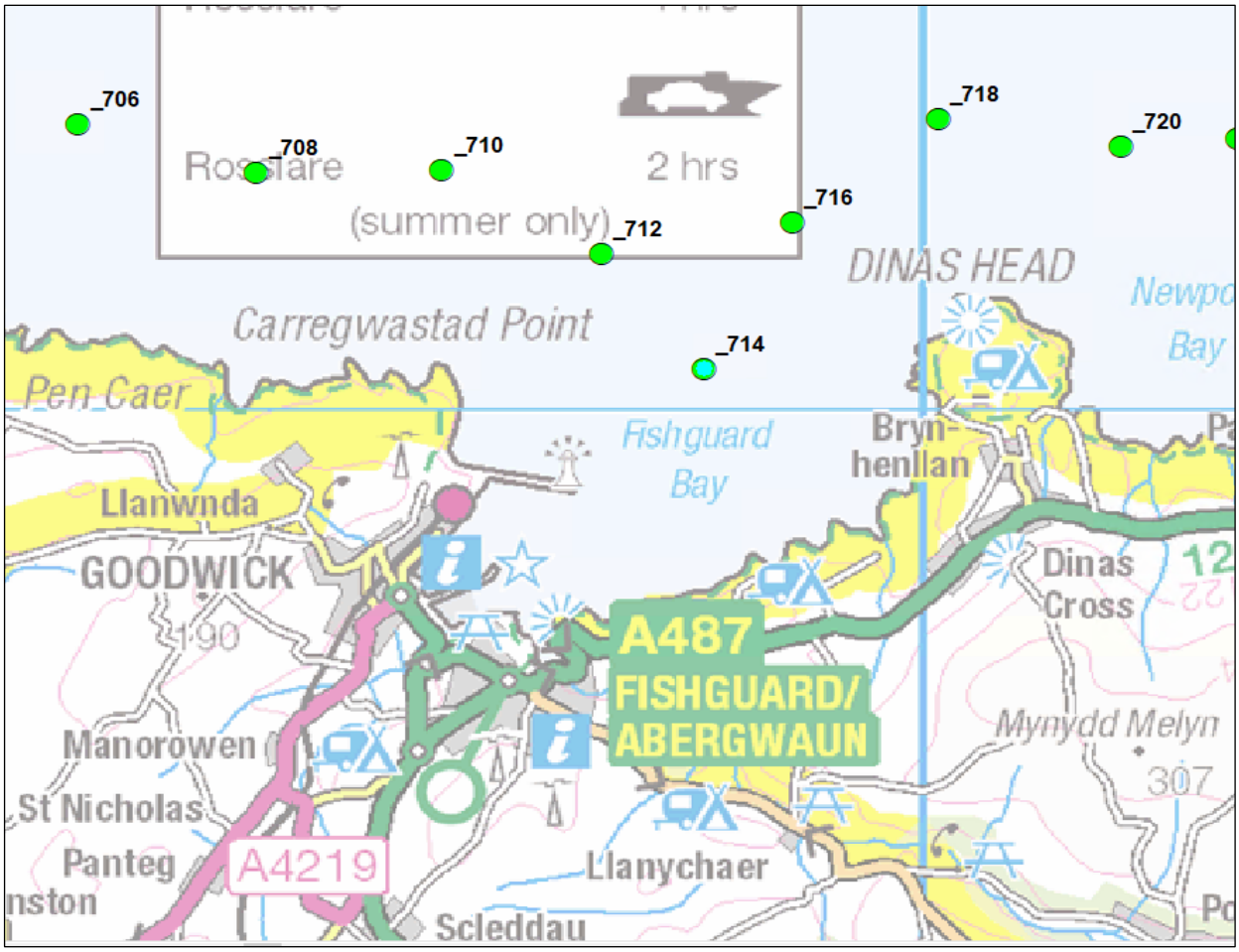

Figure 12.4 Locations of extreme water levels

An allowance must be made for the effect of future climate change on tidal flood risk. 'Flood Consequences Assessments: Climate change allowances' published by Welsh Government (September 2021) describes how climate change allowances should be considered. The Guidance sets out estimates of cumulative sea level rise for each local authority area to 2100 and 2120. The allowances are derived using the UKCP18 2100 dataset. The allowances for Pembrokeshire are shown in Table 12.6.

Table 12.2 Estimates of mean sea level rise for Pembrokeshire

Allowance (percentile)	Mean sea level rise by 2100(m)	Mean sea level rise by 2120(m)
70th	0.83	0.99
95th	1.10	1.31

The Proposed Development has a range of design life periods for different elements, so the 2120 value has been used in this assessment as a worst-case scenario. The Guidance states that as a minimum, development should be assessed against the relevant regional 70th percentile to inform design levels. This would equate to a 0.5% AEP level of 4.61m OD (7.05m CD). The Guidance also states that an assessment should be made against the 95th percentile to inform mitigation

measures, access and egress routes and emergency evacuation plans. This would equate to a 0.5% AEP level of 4.93m OD (7.37m CD).

12.8.3 Surface Water Flood Risk

An extract from the Flood Map for Planning (Surface water) is shown in Figure 12.5. The map shows that there is some flood risk from surface water close to the site of the Proposed Development, but not at the site itself.

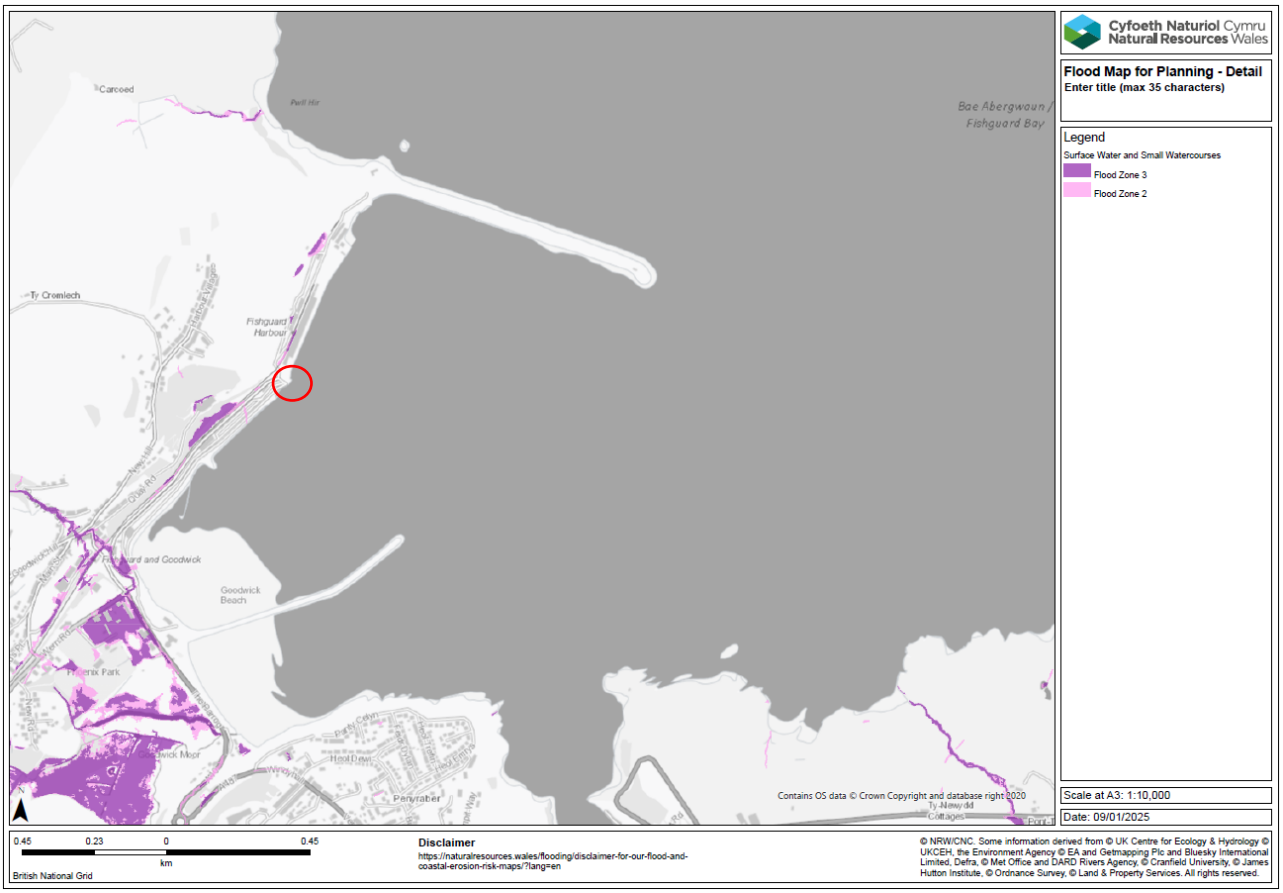

Figure 12.5 Extract from Flood Map (Surface Water)

12.8.4 Reservoir Flood Risk

Flood Map for Planning shows that the site is not located within an area potentially at risk of reservoir flooding.

12.8.5 Recorded Flood Events

Flood Map for Planning does not show any recorded flood events in the vicinity of the site.

12.8.6 Summary of Flood Risk

The flood risk to the Proposed Development has been assessed and the predominant source of flood risk emanates from coastal flooding from Fishguard Bay. This will be considered further in the following sections.

12.9 Impact Assessment

12.9.1 Assessment of Construction Effects

As the construction works will be at sea, there is a risk of flooding to the works from extreme tidal events that will need to be managed. Impacts would include flooding of the works, flooding of plant and machinery, and a risk to construction workers.

The vulnerability of the construction works to flooding is High and the recoverability of any affected receptors is High. The impacted receptors are of High value/ importance. The overall sensitivity is therefore **High**. The duration of impacts is only expected in the short-term during the construction phase. The effects are not expected to occur often, and any longer-term impacts are reversible. The overall magnitude of effects is likely to be **Negligible**. Therefore, according to the matrix in Table 12.4, the overall significance of effects on settlement is **Negligible.**

12.9.2 Assessment of Operational Effects

As shown in the Flood Map for Planning, the Proposed Development lies within Zone 3. TAN 15 identifies the vulnerability of different land uses to flooding, and development has been sub-divided into three categories in Figure 4 of TAN 15. 'Boatyards, marinas and essential works required at mooring basins' are classified as 'Water compatible development'. TAN 15 describes 'Water compatible development' as developments which are required to be located near water by virtue of their nature, and developments which are resilient to the effects of occasional flooding (Paragraph 9.4). The description covers the Proposed Development. TAN 15 states that water compatible development is acceptable in all flood zones (Paragraph 10.24).

Consequences of flooding to the Proposed Development

The only above water elements of the Proposed Development are a replacement bridge (in the footprint of the old), a new reinforced concrete bankseat to support the bridge and a new pontoon restrained by two guide piles. The preferred minimum level for flood risk is 4.93m OD (0.5% AEP level) as identified in Section 12.8.2. The bridge is fixed in level at the deck and lifts/ lowers on top of the pontoon. The existing quay is at a level of approximately 6m OD (8.44m CD), which is above The pontoon will move with the tidal level. It sits 3m out of the water so at HAT its surface level is 6.06m OD (8.5m CD). The consequences of flooding are at an acceptable level and therefore no mitigation measures are required.

Consequences of the Proposed Development on flood risk elsewhere

Modelling of the Proposed Development on coastal processes is described in Chapter 10. This has demonstrated that there is a limited spatial change to tides, waves, and sedimentation processes within Fishguard Harbour because of the Proposed Developments' bathymetric changes, owing to the plough dredge operation, along with the presence of both pontoon guide piles and bankseat piles within the water column. The change in risk of potential coastal flooding due to the Proposed Development at neighbouring sites is negligible and no mitigation is required.

The sensitivity of the coastal floodplain to an increase in flood risk is **Low**. The extent of the potential effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are short-term. The effects are not expected to occur often, and any longer-term impacts are reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**. Therefore, according to the matrix in Table 12.4, the overall significance of effects on river flood risk is **Negligible**.

12.10 Mitigation

12.10.1 Construction Phase Mitigation Measures

Temporary works may be required to prevent coastal waters interacting with works activities throughout the duration of the construction period. The temporary works design to ensure the method of temporary flood protection is stable and avoids seepage will be the responsibility of the appointed Contractor.

Met Office and Natural Resources Wales both provide a weather warnings alert service. The Pembrokeshire Coast is a Flood Alert Area for Natural Resources Wales. These warnings can be used during construction to manage the risk of flooding to the works from extreme events.

12.10.2 Operational Phase Mitigation Measures

The Proposed Development has been designed for extreme tidal events. There will be no damage caused to the new pontoon or replacement bridge if they are flooded, and there will be no major clean up required. Therefore, no mitigation measures are proposed to manage flood risk to the development itself.

The impact of the Proposed Development on the existing tidal regime is determined to be negligible, and no mitigation measures are required to avoid an increase in flood risk elsewhere.

There is an existing linkspan in place and the site currently operates in a similar manner, so the flood risk exists at present. If an extreme event is forecast, any sailings from the port are likely to be cancelled meaning that the replacement linkspan will not be in operation so there will be no risk to life. The entire port area will be at risk, so it is likely to have been closed and evacuated in accordance with any existing emergency plans. Tidal warning will be the key mitigation measure for the operation of the site.

As required by TAN 15, it has been demonstrated that there is:

- minimal risk to life;
- minimal disruption to people living and working in the area;
- minimal potential damage to property;
- minimal impact of the Proposed Development on flood risk generally; and
- minimal disruption to the sustainable management of natural resources.

12.10.3 Future Monitoring

Following an extreme tidal event, the Proposed Development will be checked for damage, and any repairs will be made as soon as possible.

12.11 Assessment of Residual Effects

The main residual risk is for extreme coastal flood events. If an extreme event is forecast, any sailings from the port are likely to be cancelled meaning that the linkspan will not be in operation. The entire port area will be at risk, so it is likely to have been closed. Safe access/ egress from the port area is available. The Proposed Development is resilient to flooding in that no damage will be caused by extreme tidal events. The overall residual risk is low.

12.12 Cumulative Effects

To gain planning permission, all new developments must show that they do not increase flood risk elsewhere to comply with TAN 15. There will therefore be no cumulative impacts on flood risk because of neighbouring developments.

12.13 Limitations of the Assessment

There were no limitations that would affect the robustness of the assessment for EIA purposes.

12.14 Summary of Effects and Conclusion

The Proposed Development requires a waterfront location. The main source of flood risk for the Proposed Development site is from coastal flooding.

Temporary works may be required to prevent coastal waters interacting with works activities throughout the duration of the construction phase. The temporary works design to ensure the method of temporary flood protection is stable and avoids seepage will be the responsibility of the appointed Contractor. Met Office and Natural Resources Wales both provide a weather warnings alert service. The Pembrokeshire Coast is a Flood Alert Area for Natural Resources Wales. These warnings can be used during construction to manage the risk of flooding to the works from extreme events.

The Proposed Development has been designed for extreme tidal events. There will be no damage caused to the replacement linkspan if it is flooded, and there will be no major clean up required. Therefore, no mitigation measures are proposed to manage flood risk to the development itself. The impact of the Proposed Development on the existing tidal regime is determined to be negligible, and no mitigation measures are required to avoid an increase in flood risk elsewhere. There is an existing linkspan in place and the site currently operates in a similar manner, so the flood risk exists at present. If an extreme event is forecast, any sailings from the port are likely to be cancelled meaning that the replacement linkspan will not be in operation so there will be no risk to life. The entire port area will be at risk, so it is likely to have been closed and evacuated in accordance with any existing emergency plans. Tidal warning will be the key mitigation measure for the operation of the site. Met Office and Natural Resources Wales both provide a weather warnings alert service. The Pembrokeshire Coast is a Flood Alert Area for Natural Resources Wales.

This assessment has shown that the consequences of flooding resulting from the Proposed Development are acceptable, therefore meeting the TAN 15 flood risk and development requirements.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Coastal flooding	✓	✓	Yes	C: Negligible O: Negligible	C: High O: Low	C: Negligible O: Negligible	None	Extreme coastal event	Tidal warning. Visual inspection of infrastructure following extreme event

12.15 References

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Flood Map for Planning: https://flood-map-for-planning.naturalresources.wales/

Flood Consequences Assessments: Climate change allowances. Welsh Government, 2021: https://www.gov.wales/climate-change-allowances-and-flood-consequence-assessments

Met Office UK weather warnings: https://www.metoffice.gov.uk/weather/warnings-and-advice/uk-warnings#?date=2024-10-17

Natural Resources Wales Flood warnings and alerts: https://flood-warning.naturalresources.wales/

Technical Advice Note 15 (TAN 15) Development, flooding and costal erosion. Planning Policy Wales, 2025: https://www.gov.wales/technical-advice-note-tan-15-development-flooding-and-coastal-erosion

12.16 List of Abbreviations / Acronyms

AEP	Annual exceedance probability
CD	Chart Datum
FCA	Flood Consequence Assessment
HAT	Highest Astronomical Tide
OD	Ordnance Datum
TAN	Technical Advice Note

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 13: Noise and Vibration

13 Noise and Vibration

13.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) in terms of Noise and Vibration. This chapter considers the potential impacts to noise and vibration sensitive receptors from the Proposed Development during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing baseline;
- Conduct baseline noise monitoring to quantify the existing noise environment;
- Assess the potential impact of the proposed construction and operational phases of the Proposed Development on receptors; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and determine residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description
- Chapter 7: Traffic and Transport

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

13.2 Purpose of this chapter

The primary purpose of this ES chapter is to provide an assessment of the likely direct and indirect significant Noise and Vibration effects of the Proposed Development. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, baseline noise survey, relevant datasets and consultation (section 13.8);
- Identifies any limitations encountered in compiling the environmental information (section 13.13);
- Presents an assessment of the potential likely significant effects due to noise and vibration arising from the Proposed Development (section 13.9) based on the information gathered and the analysis undertaken. An assessment of potential cumulative impacts is provided in section 13.12.
- Highlights any necessary monitoring (section 13.10.3) and/or measures (see section 13.10.1 and section 0) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 13.9).

13.3 Study Area

The assessment of noise and vibration impact includes several elements, each with an associated Study Area, as dictated by the relevant guidance documents. The Study Area for each aspect of the noise and vibration assessment relevant to the Proposed Development is described in this section.

A map of the Study Area for each element of the noise and vibration impact assessment, please refer to Volume III Figure 13.1: Study Area.

The Study Area for construction noise is based upon guidance detailed in Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration:

"A study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors"

With regard to construction vibration, DMRB LA 111 notes that

"A study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors".

Therefore, the Study Area for construction noise and vibration has been set as 300m from the Proposed Development boundary.

13.4 Policy Context

13.4.1 EU legislation and policy

13.4.1.1 Environmental Noise Directive (2002/49/EC)

The Environmental Noise Directive is an European Union law to identify noise pollution levels and act on them. It focuses on four action areas:

- determining exposure to environmental noise and assessing its health effects at single dwelling level
- ensuring that information on environmental noise and its effects is made available to the public
- preventing and reducing environmental noise
- preserving environmental noise quality in areas where it is good

The Directive requires European Union countries to prepare and publish noise maps and noise management action plans every 5 years

When developing noise management action plans, national authorities must consult the concerned public. The plans are available here by selecting: the Member State, European Union obligations, Environmental Noise Directive, Noise maps/Action plans. The Directive does not set limit or target values for environmental noise, nor does it prescribe the measures to be included in the action plans. This is for the competent Member State authorities to decide. The Directive serves as a knowledge base to amend or introduce noise limits on road, railway and aircraft vehicles.

13.4.2 National legislation and policy

13.4.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) states in Paragraph 180, that planning policies and decisions should aim to: *"mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life."*

The Revised NPPF states that the significance of adverse impacts should be determined in accordance with the Noise Policy Statement for England (NPSE) (2010). The NPSE policy aims are as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and

- Where possible, contribute to the improvement of health and quality of life."

The NPPF advises that significant adverse impacts on health and the quality of life as a result of noise from new development should be avoided. It also advises that other adverse impacts on health and quality of life arising from noise from new development should be reduced to a minimum.

Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst other considerations): "Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability".

The NPPF goes on to state in Paragraph 185 that "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: A) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; B) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

13.4.2.2 National Planning Policy (Wales)

Planning Policy Wales (PPW) 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. PPW promotes action at all levels of the planning process to maximising its contribution to the well-being of Wales and its communities. It encourages a wider, sustainable and problem-solving outlook which focuses on integrating and addressing multiple issues rather than an approach which is fragmented, uncoordinated and deals with issues in isolation.

13.4.2.3 Technical Advice Note (Wales) 11:1997 Noise

The Technical Advice Note (Wales) (TAN) provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

13.4.2.4 Future Wales: The National Plan 2040

Future Wales – the National Plan 2040 is the national development framework, setting the direction for development in Wales to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.

13.4.2.5 Noise and Soundscape Plan for Wales 2023 -2028 (Edition 12 February 2024)

The Noise and Soundscape Plan 2023-2028 is Wales's national strategy on soundscapes, meaning the sound environment as perceived or experienced and/or understood by a person or people, in context.

All forms of airborne sound that may be heard by the people of Wales are considered to be within scope of this document.

The plan outlines strategies for monitoring noise levels, engaging with communities, and implementing measures to reduce harmful noise. The focus on placemaking in PPW requires that policy topics such as air quality, noise and soundscape be considered alongside all other relevant policy topics when preparing development plans and designing and determining planning proposals.

13.5 Consultation

Table 13.1 summarises the issues raised relevant to noise and vibration, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project and the consultees that were contacted.

Table 13.1: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to noise and vibration.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
5th November 2024	Natural Resources Wales	Site investigation works and marine licence for construction and dredging and disposal	The response stated that an Environmental Statement should include an assessment of the construction phase of the proposed development in relation to noise and vibration. As the Proposed Development will not result in any additional sailings or increased usage of the Ferry Terminal over the existing levels and therefore the operational phase noise and vibration will have a negligible impact upon the surrounding noise sensitive receptors.

13.6 Methodology to inform the baseline

13.6.1 Desktop Study

Information on receptors within the Noise and Vibration Study Area was collected through a detailed desktop review of existing datasets. These are summarised in Table 13.2. These sources provide the most up to date data for this assessment.

Table 13.2: Summary of key desktop data.

Title	Source	Year
Noise sensitive receptors	Google Maps / Google Earth / Bing Maps	2025

13.6.2 Site-Specific Surveys

In order to inform the ES, site-specific surveys were undertaken. A summary of the surveys undertaken to inform the noise and vibration chapter assessments is outlined in Table 13.3

Table 13.3: Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Dates	Reference to further information
Baseline Noise Monitoring Survey	The surveying consisted of unattended baseline noise measurements at three locations and weather station at one location	The baseline noise monitoring survey was undertaken to determine the baseline noise levels at the nearest noise sensitive receptors. Simultaneous unattended wind speed and rainfall monitoring at 1 location	Irwin Carr	21/01/2025 to 11/02/2025	ES Volume II Appendix 13.B

13.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an Environmental Impact Assessment (EIA), as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following noise and vibration specific guidance as follows:

- British Standard (BS) 5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 1: Noise
- BS 5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 2: Vibration
- BS 7445:2003 Description and Measurement of Environment Noise – Part 1: Guide to Quantities and Procedures.

13.7.1 Impact Assessment Criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in below.

Table 13.4: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).

Magnitude of impact	Definition
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).

Table 13.5 outlines the applicable noise threshold limits that apply at the nearest noise sensitive receptors. The determination of what category to apply is dependent on the existing baseline ambient (L_{Aeq}) noise level (rounded to the nearest 5dB) at the nearest noise sensitive property.

For daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e. 65dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e. 70dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. 75dB) applies.

Table 13.5: Noise Threshold Limits at Nearest Sensitive Receptors for Construction Activities

Time Period	Construction Noise Thresholds [dB(A))]		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Evening and Weekends*	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

*19:00 – 23:00 Weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays

Table 13.6 shows the magnitude of impact mapped to various values of predicted daytime, evening/weekend and night-time noise, based on the category assigned. The magnitude of impact values are based on the statements within BS 5228 Annex E definitions of potentially significant noise levels, as discussed above, and have been extrapolated to include higher values of total noise level.

Table 13.6: Construction Noise Magnitude of Impact

Noise Level (dB $L_{Aeq,T}$)									Magnitude of Impact
Category A			Category B			Category C			
Daytime/ Saturdays	Evening/ Weekend	Night-time	Daytime/ Saturdays	Evening/ Weekend	Night-time	Daytime/ Saturdays	Evening/ Weekend	Night-time	
< 65	<55	<45	< 70	<60	<50	< 75	<65	<55	Negligible
65 - 70	55-60	45-50	70 – 75	55-60	50-55	75 - 80	65-70	55-60	Low
70 –75	60-65	50-55	75 –80	60-65	55-60	80 –85	70-75	60-65	Medium
> 75	>65	>55	> 80	>70	>60	> 85	>75	>65	High

Humans are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of 0.14 mm/s to 0.3 mm/s. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety lest some structural mishap might occur.

BS 5228-2 does not assign magnitude of impact to vibration levels, however the DMRB LA 111 sets out a LOAEL and a SOAEL, as shown in Table 13.7, which is based on the Table B.1 from BS 5228-2.

Table 13.7: Construction Vibration LOAELs and SOAELs

Time Period	LOAEL	SOAEL
All time periods	0.3 mm/s PPV	1.0 mm/s PPV

The prediction methodology presented in BS 5228-2 has been used, where applicable, to calculate construction vibration levels for all activities with the potential to adversely affect vibration sensitive receptors. Magnitude of impact for construction vibration is determined using the matrix shown in Table 13.8.

Table 13.8: Construction Vibration Magnitude of Impact

Magnitude of Impact	Vibration Level
Major	Above or equal to 10 mm/s PPV
Moderate	Above or equal to SOAEL and below 10 mm/s PPV
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL
Magnitude of Impact	Vibration Level

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 13.9 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon noise and vibration receptors is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 13.10. Where a range of significance of effect is presented in Table 13.10, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 13.10 Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
	High	Negligible or Minor	Minor or Moderate	Moderate or Major	Major

13.8 Baseline Environment

13.8.1 Desktop Study

The Proposed Development site lies within the northern fringes of Goodwick which is a coastal town immediately west of its twin town of Fishguard, within Fishguard Bay. The Proposed Development site and the external road network includes:

- A487 Wern Road / A40 The Parrog / Station Hill / Local Road
- Local Road / Fishguard Ferry Port / Fishguard Pier Car Park
- Fishguard Ferry Port Access.

To discharge the Welsh Ministers' 2022 duties under Environmental Noise (Wales) Regulations 2006, the Welsh Government generated strategic road noise maps for Wales in 2022. Within the Study Area, mapped road noise levels range from 40 to 60 dB L_{den}.

The current Stena Line operation includes a twice daily ferry service to Rosslare forpublic ferry car and foot passengers and accompanied and unaccompanied freight. The berth is also infrequently used by cruise vessels and historic steamboats. Fishguard Port accommodates vehicles and freight that travel on and off the vessel on wheels and are directly linked to the number of sailings per day, the time of the sailings, and the throughput of each vessel i.e. the number of passenger vehicles and freight vehicles. Currently, the peak ferry activity, and therefore the peak traffic activity associated with the harbour, occurs between 11:15 - 13:10 and between 21:25 - 23:45.

The train line servicing Fishguard Harbour Station runs parallel to the ferry port access road. To discharge the Welsh Ministers' 2022 duties under Environmental Noise (Wales) Regulations 2006, the Welsh Government generated strategic railway noise maps for Wales in 2022. Within the Study Area, mapped railway noise levels range from 40 to 55 dB L_{den}.

There are no known existing significant sources of vibration within the Study Area.

The majority of noise and vibration sensitive receptors are residential and located within Harbour Village which lies to the west elevated above Fishguard Bay. Receptor locations within the Study Area are shown in Volume III Figure 13.1 Noise Sensitive Receptors and detailed in Volume II Appendix 13.C Construction Noise Assessment. There are 155 residential receptors located within the 300m study area. There are a number of hotels and bed & breakfasts within the Study Area. This have been considered as residential properties and included as noise sensitive receptors. Within the Study Area, there are two industrial properties: Stena Line Fishguard Ferry Terminal and Fishguard Harbour Train Station.

13.8.2 Site-Specific Surveys

To inform the assessments, representative baseline data describing the ambient noise environment in the vicinity of the nearest and representative receptors to the Proposed Development was undertaken during January 2025. The locations of the noise monitoring locations (NMLs) are shown in Volume III Figure 13.3 Noise Monitoring Locations. Full methodology and results of the noise monitoring are provided in Appendix 13.A Noise Monitoring Survey.

Noise monitoring was undertaken at three locations between 21st January and 11th February 2025. NMLs are summarised in Table 13.11 below.

Table 13.11: Summary of Noise Monitoring Locations

NML	Address	Easting	Northing	Commencement Date & Time	Completion Date & Time
1	76 Harbour Village, Goodwick, SA64 0DZ	194908	239048	21st January 2025 11:45	3rd February 2025 11:15
2	Fishguard Bay Hotel, Quay Road, Goodwick, SA64 0BT	194899	238691	21st January 2025 11:45	3rd February 2025 11:45
3	30 Heol Dewi, Fishguard, SA65 9DY	195394	237600	3rd February 2025 14:15	11th February 2025 19:00

13.9 Impact Assessment

The noise and vibration impact assessment has considered the following aspects:

- Impact of construction noise on existing noise-sensitive receptors;
- Impact of construction vibration on existing noise-sensitive receptors.

Impact of construction traffic noise impact and assessment on existing noise-sensitive receptors has been scoped out of this chapter.

Operational noise and vibration have been scoped out of the noise and vibration impact assessment, as there are no new significant sources of noise or vibration associated with the Proposed Development.

13.9.1 Do-Nothing Scenario

The Do-Nothing Scenario will result in no impact upon the existing baseline noise climate as the Ferry Port will continue to operate as it currently does.

13.9.2 Assessment of Construction Effects

A summary of the construction noise and vibration assessment is presented within this section. Details of construction noise and vibration calculations can be found in Volume II Appendix 13.C Construction Noise Assessment.

13.9.2.1 Construction Assessment Assumptions

Assumptions used within the construction assessment have been detailed in Volume II Appendix 13.C Construction Assessment. Worst case assumptions were made for these calculations as follows:

- Free field conditions are assumed and ground effects are ignored;

- Equipment is assumed to be operational at closest point to noise sensitive receptor, and;
- No barrier effects have been applied.

The total construction period is expected to be approximately nine months with the ferry service being suspended for approximately one of these months. Construction work is expected to be carried out throughout the day, evening and night-time periods.

13.9.2.2 Construction Noise Assessment

Based on the guidance in BS 5228-1 and the results of the baseline noise survey, the sensitive within the Study Area of the Proposed Development are assigned as category.

The ambient noise levels (reference to Table 13.B.1 in Volume II Appendix 13.B) when rounded to the nearest 5dB are compared to the Category A threshold values (found in Table 13.5). If the round ambient noise levels are less than the Category A threshold values Category A threshold value should be used. If round ambient noise levels are the same as the Category A threshold values, Category B threshold values should be used. If the round ambient noise levels are more than the Category A threshold values, Category C threshold values should be used.

During the daytime, all receptors have been assigned as Category A as the ambient noise levels at each monitoring location are less than 65 dB $L_{Aeq,T}$. During the evening and weekend time period, the receptors have assigned as Category B or A. as the ambient noise levels are equal to or less than 55dB $L_{Aeq,T}$. To provide a conservative assessment, all receptors have been assigned Category A threshold values during the evening and weekend period. NML 1 has been considered representative of all receptors located on Harbour Village Road and these receptors have been assigned Category B during this time period. NML 2 is has been considered representative of all receptors located on Quay Road and New Hill Road and these receptors have been assigned Category A during this time period. During the night-time, all receptors have been assigned as Category C as NML 1 and NML 2, which are representative of sensitive receptors within the Study Area have ambient noise levels greater than 45dB $L_{Aeq,T}$.

A construction noise assessment has been carried out and full details of the assessment are included in Volume II Appendix 13.C. The assessment has been summarised below in Table 13.12. The assessment found that all receptors are predicted to experience negligible impacts during each activity within each time period. The highest noise levels are predicted during Activity 4 (guide pile installation). A negligible magnitude of impact corresponds to a Negligible or Minor significance of effect.

Table 13.12: Summary of Magnitude of Impact

Activity	Range of Predicted Sound Pressure Levels (dB $L_{Aeq,T}$)	Magnitude of Impact (all receptors)		
		Daytime	Evening and Weekend	Night-time
1	23-50	Negligible	Negligible	Negligible
2	19-46	Negligible	Negligible	Negligible
3	23-48	Negligible	Negligible	Negligible
4	24-52	Negligible	Negligible	Negligible
5	26-52	Negligible	Negligible	Negligible
6	19-45	Negligible	Negligible	Negligible
7	20-46	Negligible	Negligible	Negligible

Activity	Range of Predicted Sound Pressure Levels (dB $L_{Aeq,T}$)	Magnitude of Impact (all receptors)		
		Daytime	Evening and Weekend	Night-time
8	30-52	Negligible	Negligible	Negligible

To ensure a complete assessment of the impacts of noise on receptors, predicted noise levels at the two industrial properties have been assessed. Noise levels at these properties ranging from 20 to 52 dB $L_{Aeq,T}$. This corresponds to a negligible impact during the daytime (Category A thresholds values), evening and weekend (Category A thresholds values) and night-time (Category C threshold values). A negligible magnitude of impact corresponds to a Negligible or Minor significance of effect.

13.9.2.3 Construction Vibration Assessment

A construction vibration assessment has been carried out and full details of the assessment are included in Volume II Appendix 13.C. PPV has been predicted for vibratory piling during all operations, startup/shut down and steady state operations. This assessment assumed that vibratory piling will be used during construction as this type of piling will result in the highest level of vibration. If any other type of piling is used during construction, PPV levels will be less than predicted at receptors. All receptors are predicted to experience vibration levels less than the LOAEL (PPV ≤ 0.3mm/s). Based on the criteria set out in Table 13.8, all receptors are predicted to experience a negligible magnitude of impact.

A negligible magnitude of impact corresponds to a Negligible or Minor significance of effect.

13.9.3 Assessment of Operational Effects

As the Proposed Development will not result in any additional sailings or increased usage of the Ferry Terminal over the existing levels and therefore the operational phase noise and vibration will have a negligible impact upon the surrounding noise sensitive receptors.

13.10 Mitigation

13.10.1 Construction Phase Mitigation Measures

Although not relied upon within the noise and vibration impact assessment, the following best practice measures are recommended based upon the guidance contained in BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 to reduce the likelihood of significant effects on nearby sensitive receptors:

- Standard Construction Hours: Where possible, noisiest construction activity should be carried during daytime hours (07:00 to 19:00 Monday to Friday, and 07:00 to 13:00 on Saturday) where possible;
- the site contractors shall be required to employ the best practicable means of reducing noise and vibration emissions from plant, machinery and construction activities, as advocated in BS 5228;
- a ‘buy / hire quiet’ policy will be implemented during the procurement stage, to ensure the quietest items of suitable plant are used for each task;
- static plant will be located as far as possible from residential dwellings, and shielded with a suitable noise barrier (see above) where possible;
- plant will be well-maintained and all enclosure / access panels secured before use;

- when not in use, all plant / vehicles should be turned off and not left idling;
- no unnecessary revving of engines;
- minimise the requirement for vehicles to reverse, thereby minimising the use of reversing alarms; and
- no shouting or the use of horns on site unless in an emergency.

All sub-contractors appointed by the Infrastructure Contractor will be legally obliged, and required through contract, to comply with all environmental noise conditions. Application of the above measures to manage construction noise will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant legislation.

Due to the topography of the Study Area, noise barriers will not provide attenuation to sensitive receptors; therefore, have not been recommended.

It is recommended that use of the south site compound (located within the car park for the Fishguard Harbour) should be limited to daytime time period only, where possible. As this will reduce the potential for noise impacts for receptors located on the Quay Road and New Hill Road.

Piling should only be completed during the daytime period to reduce the impact on nearby receptors.

A construction noise and vibration plan should to prepared in advance of construction commencing which includes the relevant thresholds of noise and vibration and provides guidance on a complaints procedure.

13.10.2 Operational Phase Mitigation Measures

No mitigation measures required during the operational phase.

13.10.3 Future Monitoring

No future monitoring required.

13.11 Assessment of Residual Effects

The residual effect of the Proposed Development remains unchanged from the conclusion of Section 13.7 Impact Assessment. Negligible magnitude of impact is predicted at all receptors within the Study Area from noise and vibration as a result of the Proposed Development. A negligible magnitude of impact corresponds to a Negligible or Minor significance of effect. Based on the assessment, it can be concluded that there is no significant noise and vibration effects from the Proposed Development.

13.12 Cumulative Effects

13.12.1 In-combination Effects

It is unlikely that all construction activities will be in operation simultaneously. The maximum predicted cumulative noise levels (assuming all plant items within all activities are in operation together) is 59 dB $L_{Aeq,T}$ which is below the daytime & Saturdays Category A threshold. Care should be taken when planning cumulative activities to ensure that significant effects are caused at sensitive receptors outside of the daytime period.

The site compounds (Activity 8) are likely to be in operation congruently with other activities. The maximum predicted cumulative noise levels (assuming Activity 4, which has the highest predicted noise levels and Activity 8 are in operation simultaneously) is 55 dB $L_{Aeq,T}$ at NSR 138 which us below the daytime & Saturdays and evening & weekend Category A threshold and night-time Category C thresholds.

NSR	Predicted Sound Pressure Level (dB $L_{Aeq,T}$)		
	Activity 4	Activity 8	Activity 4 + Activity 8
138	51.8	51.9	54.9

Based on this, it can be concluded that the cumulative effects will have a negligible magnitude of impact corresponds to a Negligible or Minor significance of effect.

13.12.2 Effects Interactions

This Chapter interacts with the following topics and further information can be found within these chapters:

- Chapter 7 Population and Human Health
- Chapter 9 Terrestrial Ecology and Ornithology
- Chapter 19 Transport.

13.13 Limitations of the Assessment

This Noise and Vibration assessment has been prepared based on assumptions made from the construction methodology available at the time of writing.

13.14 Summary of Effects and Conclusion

The assessment predicted that construction noise and vibration as a result of the Proposed Development would result in a Negligible Magnitude of Impact which corresponds to a Negligible or Minor significance of effect.

No operational noise or vibration impacts resulting from the operation of the Proposed Scheme are anticipated. There will be no significant effects arising from the operational phase.

Therefore, it can be concluded that no there are no significant effect predicted due to noise and vibration from the Proposed Development.

Table 13.13: Summary of Effects

Description impact	Phase of C	Phase of O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction Noise	✓	×	None	C: Negligible O: -	C: High O: -	C: Negligible or Minor Adverse O: -	None	C: Negligible or Minor Adverse O: -	None
Construction Vibration	✓	×	None	C: Negligible O: -	C: High O: -	C: Negligible or Minor Adverse O: -	None	C: Negligible or Minor Adverse O: -	None

13.15 References

British Standard (2009) BS 5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 1: Noise

British Standard (2009) BS 5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 2: Vibration

British Standard (2003) 7445:2003 Description and Measurement of Environment Noise – Part 1: Guide to Quantities and Procedures

Department for Environment, Food and Rural Affairs (2010) Noise Policy Statement for England

European Commission (2022) Directive 2002/49/EC Environmental Noise Directive

Google (2026) Google Map Imagery

Google (2026) Google Earth

Ministry of Housing Communities & Local Government (2024) National Planning Policy Framework

Standards for Highways (2019) Highways Design Manual for Roads and Bridges LA 111 Noise and Vibration

Welsh Government (2024) Planning Policy Wales

Welsh Government (2023) Noise and Soundscape Plan for Wales Our National Strategy on Soundscapes

Welsh Government (2022) Environmental Noise Mapping 2022

Welsh Government (2021) Future Wales. The National Plan 2040

Welsh Government (1997) Planning Guidance (Wales) Technical Advice Note (Wales) 11, Noise

13.16 List of Abbreviations / Acronyms

BS	British Standard
dB	Decibels
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
$L_{A90,T}$	A-weighted noise level exceeded for 90% of the measurement time period
$L_{Aeq,T}$	A-weighted, equivalent continuous sound level during the measurement time period
L_{den}	the average sound level around the clock with extra weighting given to the evening and night periods
LOAEL	Lowest Observed Adverse Effect Level
mm/s	millimeters per second
NMLs	Noise monitoring locations
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
PPV	Peak Particle Velocity
PPW	Planning Policy Wales

Environmental Statement

SOAEL Significant Observed Adverse Effect Level

TAN Technical Advice Note

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 14 Underwater Acoustics

14 Underwater Acoustics

14.1 Introduction

The main objectives of this assessment are to:

- Undertake a desktop study of the existing noise and environmental conditions relevant acoustics near the Proposed Development;
- Assess the potential impact and effects of the proposed construction and operational phases of the Proposed Development against marine mammal and fish auditory thresholds; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary.

The assessment presented is informed by the following key chapters of the ES:

- Chapter 2: Project Description

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

14.2 Purpose of this Chapter

The primary purpose of this chapter is to provide an assessment of the likely direct effects of the Proposed Development on marine mammals and fish.

This ES chapter presents:

- The current best scientific guidance for assessing effects on hearing in marine mammals and fish from noise (section 14.6);
- Identifies any limitations encountered and assumption made (14.6.4.1);
- An assessment of the likely ranges to auditory threshold exceedances for marine mammals and fish arising from the Proposed Development (section 14.7). This is based on the information gathered, and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 14.10.
- Highlights any necessary mitigation (section 14.8) and/or other measures to prevent, minimise, reduce or offset the potential noise impacts identified in the assessment (section 14.7).

14.3 Study Area

The Proposed Development is located just north of Fishguard, Pembrokeshire, Wales. The boundary of the Proposed Development sits almost wholly within the north and south breakwaters of Fishguard Harbour (Figure 14 1). The water is generally shallow, up to c. 15 m depth at high tide, with a moderate (for the UK) tidal range of c. 5 m.

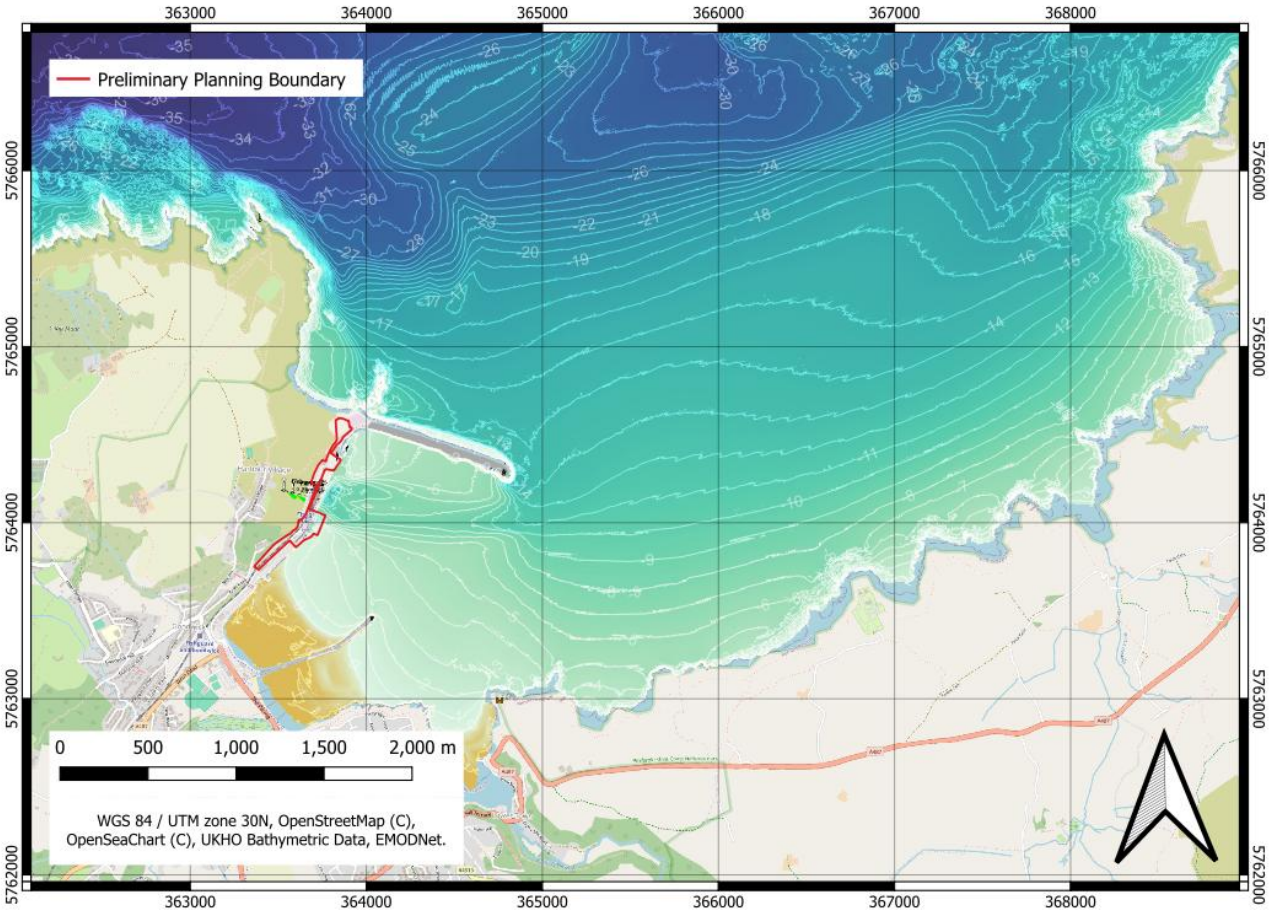

Figure 14-1. Overview map of the Proposed Development boundaries and adjacent Fishguard Bay.

Most of the noisy activities relevant to this assessment will take place within the harbour walls, with the noisiest activities (piling) taking place at the Stena Line linkspan at the western centre of the harbour.

14.4 Policy Context

14.4.1 EU legislation and policy

The EU Marine Strategy Framework Directive (MSFD) of June 17th 2008[1], stipulates that all EU Member States marine waters must develop marine strategies to achieve or maintain Good Environmental Status (GES). An expert group, the Technical Group on underwater noise (TG Noise) was established to provide guidance on its implementation.

The MSFD underwater noise descriptor number 11 sets out[2]:

- Impulsive noise criterion D11C1:
  The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056
[2] https://mcc.jrc.ec.europa.eu/main/dev.py?N=29&O=140&titre_chap=D11%20Energy%20and%20Noise

- Continuous low-frequency noise criterion D11C2:
  The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.

The UK is legally required to take measures to achieve or maintain GES and implements this through the UK marine strategy (UKMS). Whilst threshold levels (dB) relative to species (level of onset of biological adverse effects) are not defined yet, the EU have set high level spatial and temporal thresholds. The new limits state that any given marine area cannot be exposed to continuous noise for more than 20 % of the year, and for impulsive noise no more than 20 % of any given day and no more than 10 % over a year.

14.4.2 National legislation and policy

There are two key pieces of legislation relevant to species protection. These are:

- The UK Wildlife and Countryside Act 1981, as amended.
- The EC Habitats Directive as enacted through the England and Wales Conservation of Habitats and Species Regulations

Whilst there are slight differences in wording within these laws; in general, this legislation provides that it is illegal to kill, injure individual animals, or disturb a significant group of the species.

The Joint Nature Conservation Committee (JNCC) has developed a suite of mitigation guidance to reduce potential impacts to marine mammals. JNCC guidance relevant to the Proposed Development:

- “Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise” (2010)

14.5 Baseline Underwater Noise Conditions

The main noise contributor in Fishguard Harbour is presumed to be the existing ferry service, as a review of AIS data and large marine infrastructure found no comparatively noisy activities. A desktop study to estimate vessel density and noise was undertaken to determine likely baseline noise levels based on vessel activity.

Baseline noise in Fishguard Harbour is dominated by the ferry service from/to Rosslare, Ireland (Figure 14-2). This means probable background broadband levels of 80-85 dB SPL with most of this originating from general shipping noise in the Celtic Sea. The visiting Stena Line Ferry service (Rosslare, Ireland to Fishguard, Wales) has 13 weekly trips, meaning that approximately twice a day a ferry will enter and exit the harbour, elevating the sound levels within the harbour (taken as within 1500 m of the ferry terminal) to a minimal SPL of 140-160 dB of mainly lower frequency noise (<1000 Hz) but potentially enough energy at higher frequencies[3] to have an effect on threshold exceedance ranges.

[3] Within -20 dB of loudest band or >110 dB in any band from 10-30 kHz

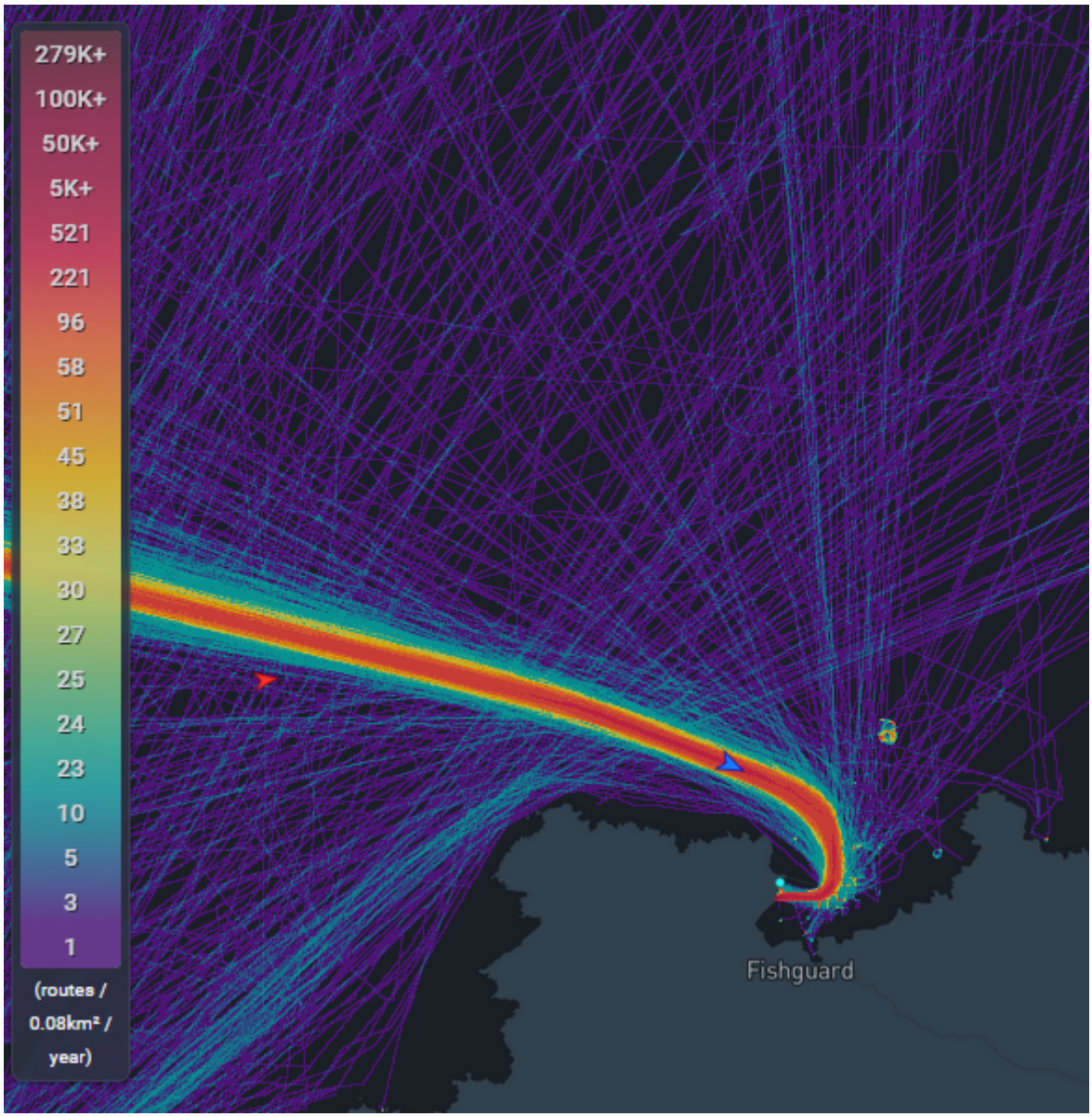

Figure 14-2. Traffic density from AIS data, showing the annual mean traffic per 0.08 km². Data from marinetraffic.com

14.6 Assessment Methodology

To determine the potential spatial range of injury and disturbance, assessment criteria have been developed based on a review of available evidence including national and international guidance and scientific literature. The following sections summarise the relevant assessment criteria and describe the evidence base used to derive them.

Underwater noise has the potential to affect marine life in different ways depending on its noise level and characteristics. Assessment criteria generally separate sound into two distinct types, as follows:

- **Impulsive sounds** which are typically transient, momentary (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 2005; ANSI, 1986; NIOSH, 1998). This category includes sound sources such as

seismic surveys, impact piling and underwater explosions. Additionally included here are sounds under 1 second in duration with a weighted kurtosis over 40 (see note below*).

- **Non-impulsive** (and continuous) sounds which can be broadband, narrowband or tonal, momentary, brief or prolonged, continuous or intermittent and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI, 1995; NIOSH, 1998).This category includes sound sources such as continuous vibro-piling, running machinery, vessels, and some sonar equipment. Additionally included here are sounds over 1 second in duration with a weighted kurtosis under 40 (see note below*).

* Note that the European Guidance: "Monitoring Guidance for Underwater Noise in European Seas, Part II: Monitoring Guidance Specifications" (MSFD Technical Subgroup on Underwater Noise, 2014) includes sonar as impulsive sources (see Section 2.2 in the reference). However, the guidance suggests that *"all loud sounds of duration less than 10 seconds should be included"* as impulsive.

This contradicts research on impact from impulsive sounds suggesting that a limit for "impulsiveness" can be set at a kurtosis[4] of 40 (Martin, et al., 2020). See examples in APPENDIX 14.A, Impulsiveness.

This latter criterion (kurtosis >40) has been used for classification of impulsive versus non-impulsive for sonars and similar sources. The justification for departing from the MSFD criterion is that the Southall et al. 2019, NMFS 2024 and the Popper et al. 2014 frameworks thresholds are based on the narrower definition of impulsive as given in "Impulsive sounds" above.

There is scope for some sounds to be classified as both impulsive and non-impulsive, depending on the criteria applied. Examples are pulses from sonar-like sources that can contain very rapid rise times (<0.5 ms), sweep a large frequency range and have high kurtosis. However, given that the scientific work carried out to identify impulsive thresholds were done with "pure" impulses (from a near instantaneous event), sonar-like sounds are sometimes not included in this, impulsive, category. This argument ignores that sounds used for establishing the non-impulsive thresholds (often narrowband slowly[5] rising pulses), are markedly less impulsive (lower kurtosis, narrower bandwidth) than what is sometimes seen in pulses from sonar-like sources and are thus also not representative for all sonar-like pulses.

Given impulsive sounds' tendency to become less impulsive with increased range, a minimal range can be established where the noise is no longer impulsive (here kurtosis <40 is used as the criterion) (APPENDIX 14.A, Impulsiveness). This range is established using raytracing with sources placed at multiple depths to account for variation in final source setup.

The acoustic assessment criteria for marine mammals and fish in this report has followed the latest international guidance (based on the best available scientific information), that are widely accepted for assessments in the UK, Europe and worldwide (Southall, et al., 2019; Popper, et al., 2014; NMFS, 2024).

14.6.1 Impact assessment criteria

14.6.1.1 Effects on Marine Animals

Underwater noise has the potential to affect marine life in different ways depending on its noise level and characteristics. Richardson *et al.* (1995) defined four zones of noise influence which vary with distance from the source and level, to which an additional zone has been added "zone of

[4] Statistical measure of the asymmetry of a probability distribution.
[5] Slowly in this context is >10 ms – slow relative to the integration time of the auditory system of marine mammals.

temporary hearing loss".
These are:

- **The zone of audibility**: This is defined as the area within which the animal can detect the sound. Audibility itself does not implicitly mean that the sound will affect the animal.
- **The zone of masking**: This is defined as the area within which sound can interfere with the detection of other sounds such as communication or echolocation clicks. This zone is very hard to estimate due to a paucity of data relating to how animals detect sound in relation to masking levels (for example, humans can hear tones well below the numeric value of the overall sound level). Continuous sounds will generally have a greater masking potential than intermittent sound due to the latter providing some relative quiet between sounds. Masking only occurs if there is near-overlap in sound and signal, such that a loud sound at e.g., 1000 Hz will not be able to mask a signal at 10,000 Hz[6].
- **The zone of responsiveness**: This is defined as the area within which the animal responds either behaviourally or physiologically. The zone of responsiveness is usually smaller than the zone of audibility because, as stated previously, audibility does not necessarily evoke a reaction. For most species there is very little data on response, but for species like harbour porpoise there exists several studies showing a relationship between received level and probability of response (Graham IM, 2019; Sarnoci´nska J, 2020; Booth, 2017; Benhemma-Le Gall A, 2021). This zone is quantified here with the use of behavioural thresholds (Table 14-2, section 14.6.1.2.1 & Table 14-3, section 14.6.1.3).
- **The zone of temporary hearing loss**: The area where the sound level is sufficient to cause the auditory system to lose sensitivity temporarily, causing loss of "acoustic habitat": the volume of water that can be sensed acoustically by the animal. This hearing loss is typically classified as Temporary Threshold Shift ("TTS", see section 14.6.1.2 & 14.6.1.3).
- **The zone of injury / permanent hearing loss**: This is the area where the sound level is sufficient to cause permanent hearing loss in an animal. This hearing loss is classified as Auditory Injury ("AUD INJ", see section 14.6.1.2 & 14.6.1.3). At even closer ranges, and for very high intensity sound sources (e.g., underwater explosions), physical trauma or acute mortal injuries are possible.

For this study, it is the zones of injury (here "AUD INJ") that are of primary interest, along with estimates of behavioural impact ranges. To determine the potential spatial range of injury and behavioural change, a review has been undertaken of available evidence, including international guidance and scientific literature. The following sections summarise the relevant thresholds for onset of effects and describe the evidence base used to derive them.

14.6.1.2 Thresholds for Marine mammals

The zone of injury in this study is classified as the distance over which a fleeing marine mammal can suffer AUD INJ leading to non-reversible auditory injury. Injury thresholds are based on a dual criteria approach using both un-weighted L_P (maximal instantaneous SPL) and marine mammal hearing weighted SEL. The hearing weighting function is designed to represent the sensitivity for each group within which acoustic exposures can have auditory effects. The categories include:

- **Low Frequency (LF) cetaceans**: Marine mammal species such as baleen whales (e.g. minke whale *Balaenoptera acutorostrata*).

[6] The exact limit of how near a noise can get to the signal in frequency before causing masking will depend on the receivers' auditory frequency resolution ability, but for most practical applications noise and signal frequencies will need to be within 1/3rd octave to start to have a masking effect.

- **High Frequency (HF) cetaceans**: Marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales (e.g., bottlenose dolphin *Tursiops truncatus* and white-beaked dolphin *Lagenorhynchus albirostris*).
- **Very High Frequency (VHF) cetaceans**: Marine mammal species such as true porpoises, river dolphins and pygmy/dwarf sperm whales and some oceanic dolphins, generally with auditory centre frequencies above 100 kHz) (e.g., harbour porpoise *Phocoena phocoena*).
- **Phocid Carnivores in Water (PCW)**: True seals, earless seals (e.g., harbour seal *Phoca vitulina* and grey seal *Halichoreus grypus*); hearing in air is considered separately in the group PCA.
- **Other Marine Carnivores in Water (OW)**: Including otariid pinnipeds (e.g., sea lions and fur seals), sea otters and polar bears; in-air hearing is considered separately in the group Other Marine Carnivores in Air (OCA).
- **Sirenians (SI)**: Manatees and dugongs. This group is only represented in the NMFS guidelines.

These weightings are used in this study and are shown in Figure 14-3. It should be noted that not all of the above hearing groups of marine mammals will be present in the Proposed Development area, but all hearing groups are presented in this report for completeness.

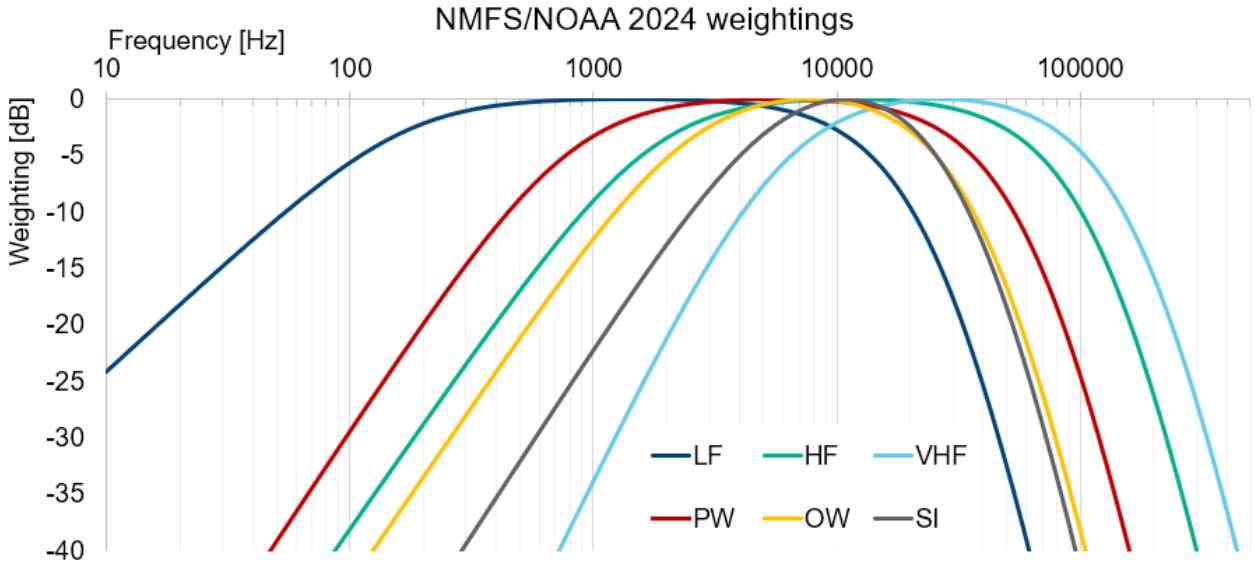

Figure 14-3: Auditory weighting functions for seals, whales and sirenians (NMFS, 2024).

The criteria for impulsive and non-impulsive sound are relevant for this study given the nature of the sound sources used during the Proposed Development. The relevant AUD INJ and TTS criteria proposed by NMFS 2024 are summarised in Table 14-1.

Table 14-1: AUD INJ and TTS onset acoustic thresholds (NMFS, 2024)

Hearing Group	Parameter	Impulsive [dB]		Non-impulsive [dB]	
		AUD INJ	TTS	AUD INJ	TTS
Low frequency (LF) cetaceans	L_P, (unweighted)	222	216	-	-
	SEL, (weighted)	183	168	197	177

Hearing Group	Parameter	Impulsive [dB]		Non-impulsive [dB]	
		AUD INJ	TTS	AUD INJ	TTS
High frequency (HF) cetaceans	L_P, (unweighted)	230	224	-	-
	SEL, (weighted)	193	178	201	181
Very high frequency (VHF) cetaceans	L_P, (unweighted)	202	196	-	-
	SEL, (weighted)	159	144	181	161
Phocid carnivores in water (PCW)	L_P, (unweighted)	223	217	-	-
	SEL, (weighted)	183	168	195	175
Other marine carnivores in water (OCW)	L_P, (unweighted)	230	224	-	-
	SEL, (weighted)	185	170	199	179
Sirenians (SI) (NMFS only)	L_P, (unweighted)	225	219	-	-
	SEL, (weighted)	186	171	186	180

14.6.1.2.1 Disturbance to Marine Mammals

The noise thresholds for disturbance of marine mammals are not as mature as the AUD INJ and TTS thresholds and several different approaches exist. A conservative but realistic approach based on a review of Danish and UK guidance documents, as well as scientific reviews has been applied.

The general approach reflects the approach recommended by the Danish guidance (Danish Centre for Environment and Energy, 2021), by a review submitted to the JNCC (Joint Nature Conservation Committee) of the UK (Nedwell, et al., 2007) and by a review for Natural Resources Wales (Sinclair, et al., 2023). These all recommend or acknowledge the use of a weighted received level along with a hearing group specific threshold.

Using 21 suitable studies from these reports, we have arrived at hearing group specific thresholds (Table 14-2) to determine weighted behavioural disturbance levels for non-impulsive noise (here understood to be noise with a kurtosis <40). These thresholds are compared to the range where the hearing group weighted received level exceeds the relevant threshold.

Table 14-2: Disturbance criteria for marine mammals used in this assessment, based on Danish, UK and USA guidance.

Effect	Non-Impulsive Threshold [SPL]	Impulsive Threshold
Low frequency (LF) cetaceans	118	160 dB L_P* (NMFS level B-harassment)
High frequency (HF) cetaceans	92	
Very high frequency (VHF) cetaceans	95	
Phocid carnivores in water (PCW)	108	
Other marine carnivores in water (OCW)	110	

* The NMFS guidance specifies use of SPL but does not mention a measurement duration. This means that the level is not well defined and using the most common legacy use of SPL for impulsive noises (SPL over the duration of 90 % of the pulse energy) is problematic given that the duration over which the SPL is measured changes with receptor location (both depth and range) and can vary substantially. The use of dB L_P is conservative as the SPL over any duration will always be lower than the L_P.

Given the considerable variation in the data (up to 40 dB where both mild disturbance and severe disturbance was included) we have opted to select a conservative value of either the 10th percentile value or the minimal value, whichever is greater[7] (Figure 14-4).

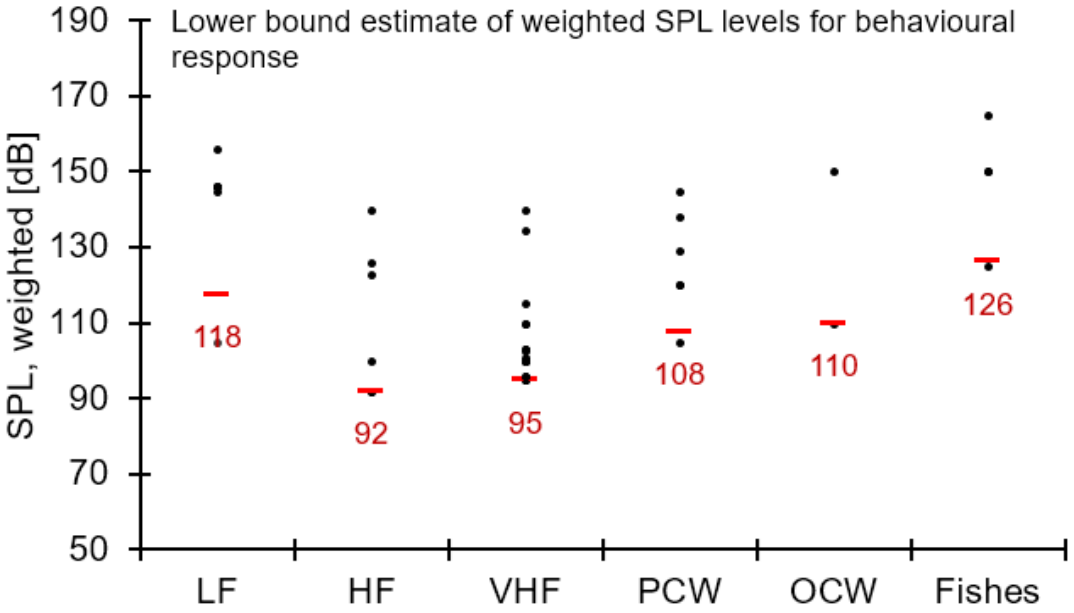

Figure 14-4. Data and behavioural disturbance thresholds. Red lines/values are 10th percentile values or the minimal value, whichever is greater.

Compared to the widespread use of NMFS levels of 120 dB SPL (unweighted) for continuous noise, these limits are comparable, but account for the hearing abilities of each group. This means that high-frequency source such as multibeam echosounders operating over 200 kHz that are not audible to the LF hearing group or fishes is correctly excluded from causing behavioural disturbance to those groups.

14.6.1.3 Injury and Disturbance to Fishes

The injury criteria used in this noise assessment for fish are given in Table 14-3 and Table 14-4 for impulsive noises (L_P) and continuous noise (SEL) respectively. L_P and SEL criteria presented in the tables are unweighted.

It's important to clarify that this lack of weighting for fishes reflects a lack of scientific consensus about the best method for applying frequency dependence to received levels for fishes, rather than a statement that fishes can hear all frequencies equally. Thus, fishes generally cannot hear above 10 kHz, and if they can, the sensitivity is generally very poor (Figure 14-5, (Nedwell, et al., 2004)).

[7] Where there is large data variation the 10th percentile of the equivalent normal distribution can be lower than the minimal value, in these cases we have used the minimal value observed to cause disturbance.

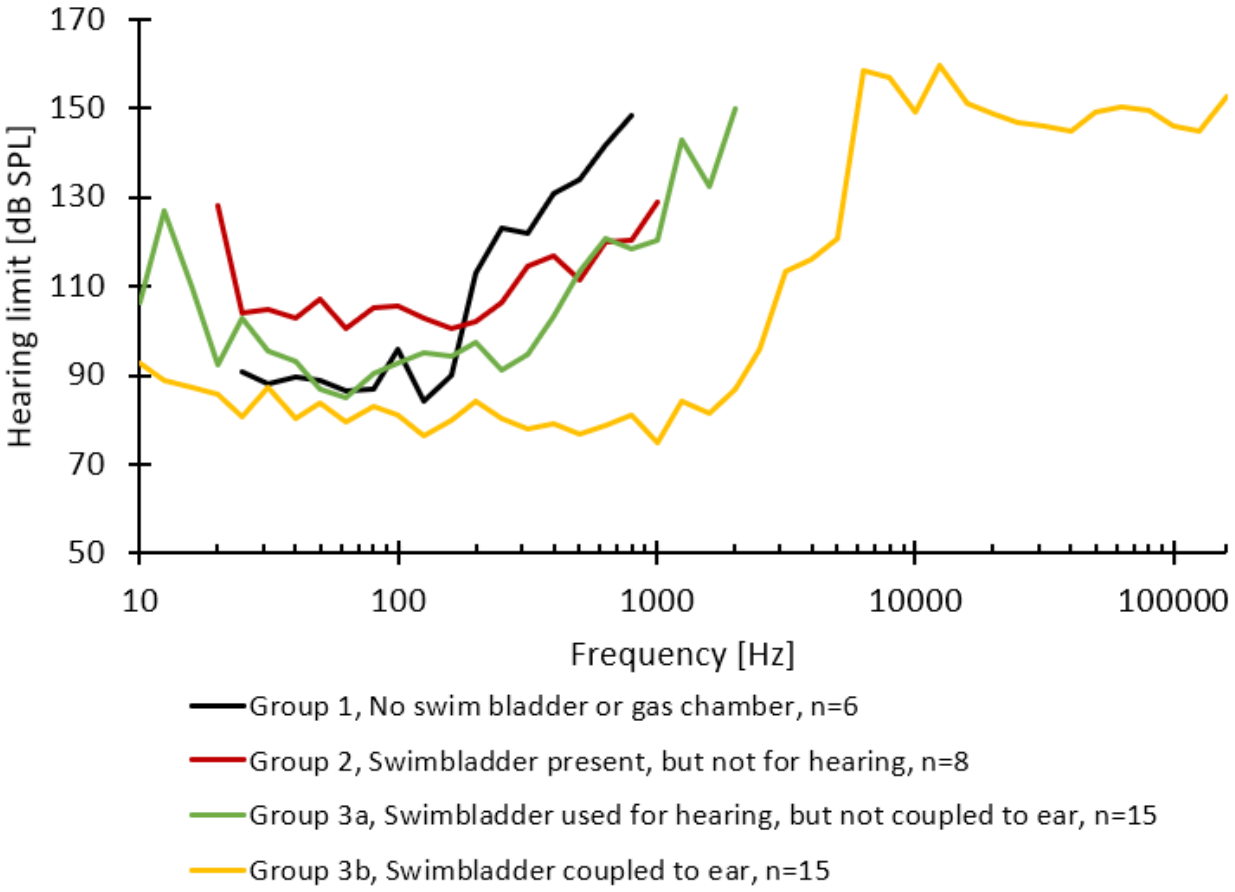

Figure 14-5 Generalised hearing thresholds for fishes grouped by the presence of a swim bladder and its role in hearing.

Physiological effects relating to injury criteria are described below (Popper, et al., 2014):

- **Mortality and potential mortal injury**: either immediate mortality or tissue and/or physiological damage that is sufficiently severe (e.g., a barotrauma) that death occurs sometime later due to decreased fitness. Mortality has a direct effect upon animal populations, especially if it affects individuals close to maturity.

- **Recoverable injury ("AUD INJ" in tables and figures)**: Tissue damage and other physical damage or physiological effects, that are recoverable, but which may place animals at lower levels of fitness, may render them more open to predation, impaired feeding and growth, or lack of breeding success, until recovery takes place.

  The AUD INJ term is used here to describe this, more serious impact, even though it is not strictly permanent for fish. This is to better reflect the fact that this level of impact is perceived as serious and detrimental to the fish.

- **Temporary Threshold Shift (TTS)**: Short term changes (minutes to few hours) in hearing sensitivity may, or may not, reduce fitness and survival. Impairment of hearing may affect the ability of animals to capture prey and avoid predators, and also cause deterioration in communication between individuals, affecting growth, survival, and reproductive success. After termination of a sound that causes TTS, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of sound exposure.

Popper et al. 2014 does not set out specific TTS limits for L_P and for disturbance limits for impulsive noise for fishes, but has equal threshold for mortality and recoverable injury for both

seismic sources and impact piling, indicating that both are sufficiently similar to be treated similarly in respect to thresholds. Therefore publications: “Washington State Department of Transport Biological Assessment Preparation for Transport Projects Advanced Training Manual” (WSDOT, 2020) and “Canadian Department of Fisheries and Ocean Effects of Seismic energy on Fish: A Literature review” (Worcester, 2006) on effects of seismic noise on fish are used to determine limits for these for impulsive noise in general:

- The Washington State Department of Transport Biological Assessment Preparation for Transport Projects Advanced Training Manual (WSDOT, 2020) suggests an un-weighted sound pressure level of 150 dB SPL (assumed to be duration of 95 % of energy) as the criterion for onset of behavioural effects, based on work by (Hastings, 2002). Sound pressure levels in excess of 150 dB SPL are expected to cause temporary behavioural changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area. The document notes that levels exceeding this threshold are not expected to cause direct permanent injury but may indirectly affect the individual fish (such as by impairing predator detection). It is important to note that this threshold is for onset of potential effects, and not necessarily an ‘adverse effect’ threshold. The threshold is implemented here as either single impulse SEL or 1 second SEL, whichever is greater.
- The report from the Canadian Department of Fisheries and Ocean “Effects of Seismic energy on Fish: A Literature review on fish” (Worcester, 2006) found large differences in response between experiments. Onset of behavioural response varied from 107-246 dB L_P, the 10th percentile level for behavioural response was 160 dB L_P (rounded to nearest 5 dB to reflect large variation in data).

Thus, the behavioural threshold for fishes for impulsive sound is 160 dB L_P, and for non-impulsive sound 150 dB SPL.

Note that while there are multiple groups of fish presented, we have used the thresholds of the more sensitive group for all fish thus covering all fishes (203/186 AUD INJ/TTS for impulsive sound & 222/204 AUD INJ/TTS for non-impulsive sound). These lower thresholds also cover “Eggs and Larvae.

Table 14-3: Criteria for onset of injury to fish and sea turtles due to impulsive noise. For this assessment the lowest threshold for any group is used for all groups (shown in bold).

Type of animal	Unit	Mortality and potential mortal injury [dB]	Recoverable injury (AUD INJ) [dB]	TTS [dB]	Behavioural [dB]
Fish: no swim bladder (particle motion detection) Example: Sharks.	SEL	219[1]	216[1]	186[1]	150[3]
	L_P	213[1]	213[1]	193[2]	160[2]
Fish: where swim bladder is not involved in hearing (particle motion detection). Example: Salmonoids.	SEL	210[1]	203[1]	186[1]	150[3]
	L_P	207[1]	207[1]	193[2]	160[2]
Fish: where swim bladder is involved in hearing (primarily pressure detection). Example: Gadoids (cod-like).	SEL	207[1]	**203[1]**	**186**	**150[3] [SPL]**
	L_P	207[1]	**207[1]**	**193[2]**	**160[2]**
Sea turtles	SEL	210[1]	(*Near*) High* (*Mid*) Low (*Far*) Low	-	-
	L_P	207[1]		-	-
Eggs and larvae	SEL	210[1]	(*Near*) Moderate (*Mid*) Low	-	-
	L_P	207[1]		-	-

		(*Far*) Low			

[1] (Popper et al. 2014) table 7.4, [2] (Worcester, 2006), [3] (WSDOT, 2020)

* Indicate (range) and risk of effect, e.g., "(Near) High", meaning high risk of that effect when near the source.

Where Popper et al. 2014 present limits as ">" 207 or ">>" 186, we have ignored the "greater than" and used the threshold level as given.

Relevant thresholds for non-impulsive noise for fishes relating to AUD INJ, TTS, and behaviour are given in Table 14-4.

Table 14-4: Criteria for fish (incl. sharks) due to non-impulsive noise from Popper et al. 2014, (Table 7.7. in guidance)

Type of animal	Unit	Mortality and potential mortal injury	Recoverable injury (AUD INJ) [dB]	TTS [dB]	Behavioural [dB]
All fishes	SEL	(*Near*) Low (*Mid*) Low (*Far*) Low	222†	204†	126 [SPL]*

*Based on review in Section 14.6.1.2.1, also Figure 14-4.

†Based 48 hours of 170 dB SPL and 12 hours of 158 dB SPL

14.6.2 Site Environment

The site is characterised to the west by anthropogenic influence (concrete quays, dredged channels/bays) and further to the east by the rugged coastline of Fishguard bay. The bay is generally shallow (<20 m depth) with a steady increase in depth with an increase in distance from the shore (Figure 14-1).

14.6.2.1 Sediment Properties

Grab sample data was sourced from the "Sediment Analysis Information", RPS Consulting Engineers report No 17-67594-1 from 17/01/2018. The report presents data for six grab samples from the immediate vicinity of the linkspan and data shows that c. 78 % of the sediment was "fine sand" (grain diameter of 0.063-0.2 mm, ISO 14688-1:2017) and c. 17 % "medium sand" (grain diameter of 0.2-0.63 mm). The remaining 5 % were mainly silty or clayey particles smaller than 0.063 mm in diameter.

The sediment for modelling uses the "fine sand" grain diameter and a sediment properties model (Ainslie, 2010) to estimate acoustics properties.

Table 14-5: Sediment properties.

Sediment name (ISO 14688-1:2017)	Grain size [mm]	Density [kg/m^3]	Compressional soundspeed [m/s]
Fine sand	0.18	1992	1739

Finer sediment (silt/clay) will tend to have higher transmission losses, therefore using the coarser sediment (sand) represents a conservative approach.

14.6.2.2 Water Properties

Water properties were determined from historical data for the area. Where a range of values are expected or observed, the value resulting in the lowest transmission loss was chosen for a more conservative assessment (more noise at range). For example, the water temperature varies throughout the year, and as higher water temperatures lead to less transmission loss in the water, but more transmission loss due to sediment interactions, both summer and winter temperatures are modelled, with the most conservative results reported. Therefore, the assessment also covers seasonal variation.

- Temperature: 7-17°C –Temperatures were sourced from seatemperature.org[8] .
- Salinity: 34 psu – The minimal salinity was sourced from (Hadziabdic, et al.).
- Soundspeed profile: It has been assumed to be generally uniform as a conservative measure (a typical summer sound speed profile would increase transmission loss by refracting sound towards the sediment. The shallow water in the area means any soundspeed gradient is negligible when compared to surface and bottom reflections.
- The tidal range at Fishguard is 5 m based on the maximal tide from tide-forecast.com[9]

14.6.3 Noise Sources

Underwater noise sources are usually quantified in dB scale with values referenced to 1 µPa pressure amplitude as if measured at a hypothetical distance of 1 m from the source (called the Source Level). In practice, it is not usually possible to measure at 1 m from a source, but the metric allows for comparison and reporting of different source levels on a like-for-like basis. In reality, for a large sound source, this imagined point at 1 m from the acoustic centre does not exist. Furthermore, the energy is distributed across the source and does not all emanate from an imagined acoustic centre point. Therefore, the stated sound pressure level at 1 m does not occur for large sources. In the acoustic near-field (i.e. close to the source), the sound pressure level near the source will be lower than the value predicted by the back-calculated source level (SL).

The noise sources and activities investigated during this assessment are summarised in Table 14-6.

14.6.3.1 Source Models

Source models are generally either:

- Empirical – relying on a best fit to recorded data with some statistical uncertainty,
- Numerical – using physical properties of the source and the environment to predict sound output, or
- Hybrid – using physical properties of the source and the environment to adjust an empirical model.

For all models we assess the statistical uncertainty and use the 90th percentile levels as a representative but conservative model of the source levels.

More detail on each source model can be found in the sections below.

[8] https://www.seatemperature.org/europe/united-kingdom/fishguard.html
[9] https://www.tide-forecast.com/locations/Fishguard-Wales/tides/latest)

14.6.3.2 Summary of Source Levels

A summary of source level can be found in Table 14-6, with details in the following sections.

Table 14-6: Summary of Sound Sources and Activities Included in the Subsea Noise Assessment

Equipment	Source level	Comments/details	Impulsive/non-impulsive
Dredging	174 dB SPL	Based on a 90 m generic Trailing Suction Hopper Dredger (TSHD) vessel. Also covers backhoe and plough dredging.	Non-impulsive
Demolition, wire-saw based on rock breaking, pecking used as conservative proxy	194 dB SPL	Based on SPT testing, down-the-hole hammering and hydraulic rock breakers. This also covers the use of wire saws and drilling in relation to the demolition.	Non-impulsive
Vibro piling, main pontoon piles	194 dB SPL	Assuming diameter of 2 m. Also covers vibro extraction of piles.	Non-impulsive
Coring, main pontoon piles	163 dB SPL	Assuming diameter of 2 m.	Non-impulsive
Impact piling, support piles (8 no of piles)	209 dB SEL (245 dB L_P)	Assuming a blow rate of 0.6 Hz, diameter of 1.22 m, 110 kJ hammer. Max daily duration of 2x30 min.	Impulsive to 900 m range then non-impulsive*
Vibro piling, support piles (8 no of piles)	194 dB SPL	Assuming diameter of 1.22 m.	Non-impulsive
Impact piling, Bank seat piles (piles installed in made ground)	194 dB SPL in water *Based on 209 dB SEL (245 dB L_P)*	Assuming diameter of 1.22 m. not assessed separately, see “Demolition, Rock breaking etc.”	Non-impulsive (due to land-water interface effects)
Coring, Bank seat piles	159 dB SPL	Assuming diameter of 1.22 m.	Non-Impulsive
Rock dumping	185 dB SPL	Based on “Demolition, Rock breaking”, but adjusted for recorded broadband levels.	Impulsive to 100 m range then non-impulsive*

*See section 14.6 and Appendix 14.A for details on transition from impulsive to non-impulsive.

14.6.3.3 Dredging

A dredging vessel of 90 m in length with a hopper capacity of 4000 m³ and installed power of 6000 kW has been modelled. The assessment also covers vessels of shorter length or less installed power/capacity. The band levels are based on an ensemble model for vessels (Wittekind, 2014; Liefvendahl, et al., 2015; Simard, et al., 2016; Jong, 2021) adjusted for active dredging based on 14 recordings of Trailer Suction Hopper Dredger (TSHD) vessels. The broadband level for the dredging is expected to be below 174 dB SPL with a -20 dB bandwidth from 10-50,000 Hz.

Other dredging methods that are less noisy underwater, meaning backhoe and plough dredging are also covered under this source.

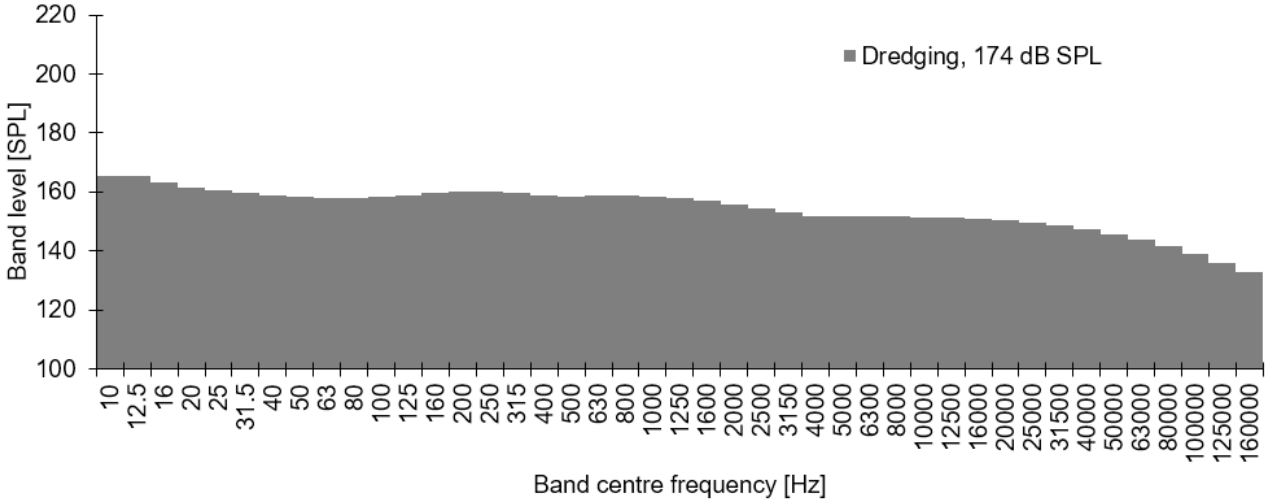

Figure 14-6. Band levels for a representative TSHD vessel.

14.6.3.4 Demolition, Drilling, Rock Breaking, Pecking

Proposed demolition method is using wire saw to cut the existing dolphin. This activity will be overed under the activities outlined below. The wire saw option was added late in the project and as not much data exists on the underwater noise rom wire saws, using the rock breaking or pecking as proxy, remains a conservative and suitable choice.

The source band levels for demolition are based on levels from recordings of standard penetration testing (Erbe, et al., 2017; L-F, et al., 2023), hydraulic rock breaking (“Xcentric Ripper XR-60” or “IHC S70”) and down-the-hole hammering (“Epiroc HB 10000”) (Barham, 2018; Connell, et al., 2023). It’s assumed that these together will cover the same frequencies as present during the demolition of the old linkspan support structure. The broadband level is 194 dB SPL with a -20 dB bandwidth from 12.5-8000 Hz.

This also covers the use of “pecking” during dredging, which involves a fast-oscillating impact hammer (>250 blows/minute) to break rock or sediment too hard to be dredged otherwise.

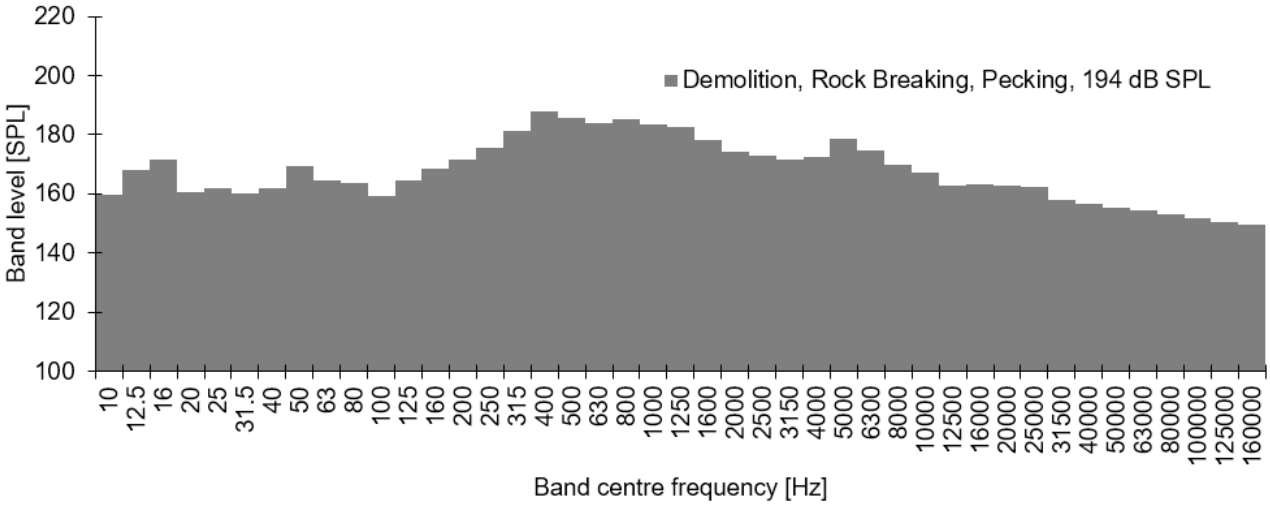

Figure 14-7. Band levels for demolition activity.

14.6.3.5 Impact Piling – Temporary Support piles

Impact piling band levels are modelled using our in-house hybrid model "Taranis" (APPENDIX 14.B) which models both the band levels, time series and blow-for-blow levels during a pile installation. The model has been validated against piles of 0.5-9 m diameter for a wide range of hammers and sediment conditions.

The source level for impact piling of the support piles is expected to have a broadband level up to 211 dB $SEL_{single\ blow}$ (at a blow rate of 0.6 Hz this equates to 209 dB SPL). The noise is broadband and has most energy around 500 Hz and a -20 dB bandwidth from 10-12,500 Hz (Figure 14-8).

A soft start of 20 minutes with a reduced level is also modelled. This is based on using the hammer at minimal blow energy for 20 minutes, given an effective broadband reduction of 12 dB, when compared to normal impact piling. The total number of support piles are assumed to be eight, with maximally a single piling rig active at any given time.

14.6.3.5.1 Support Piles

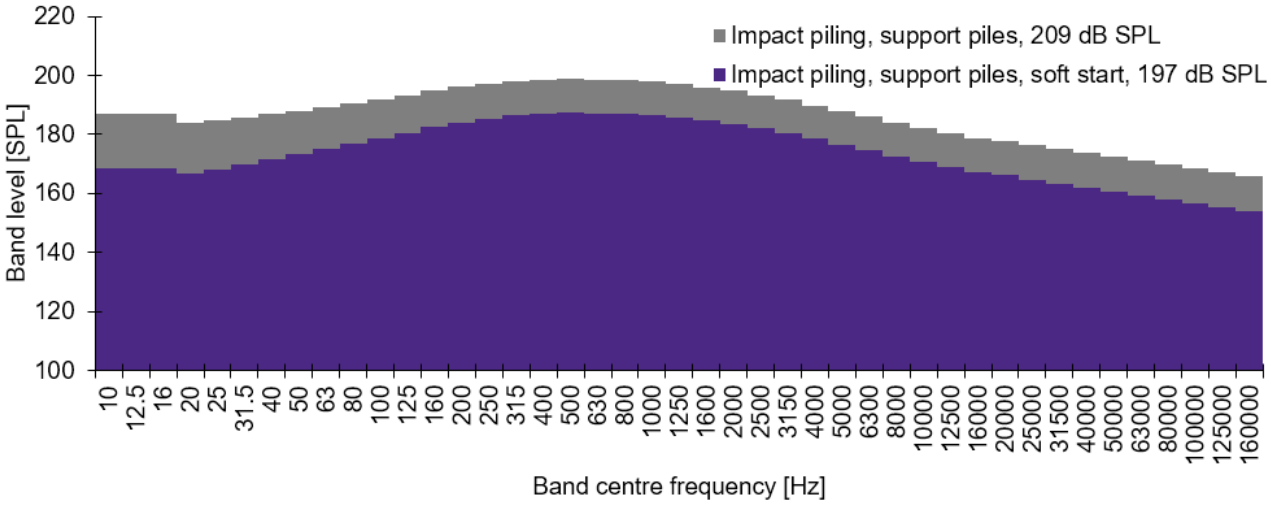

Figure 14-8. Band levels for impact piling of support piles.

14.6.3.5.2 Bank Seat Piles

The impact piling of the bank seat piles has been assumed to have the same source levels as the impact piling of the support piles. However, given that they are installed wholly in made ground (in the bank seat), there is a high transmission loss into the water and across the soil/water interface, meaning that the realised in-water level will be near 194 dB SPL.

From previous work[10] this effect has been observed to be well described by:

$$SPL_{Water} = SPL_{Soil} - 29.7 \cdot \log_{10}(35m) - \frac{0.25dB}{m} \cdot 35m - 13.6 \qquad (3)$$

Assuming 1 m in-soil propagation:

$$209\ dB\ SPL - 29.7 \cdot \log_{10}(1m) - \frac{0.25dB}{m} \cdot 1m - 13.6 \approx 194\ dB\ SPL$$

This broadband level is sufficiently similar to the source levels from section 14.6.3.4, Demolition, Drilling, Rock Breaking, Pecking, that it can be represented by the same modelling.

[10] Modelling of transmission losses through soil using normal mode and parabolic equation methods.

14.6.3.6 Vibratory piling

Vibro piling band levels are based on recordings of installations using vibro piling from inhouse work and published literature (Dahl, et al., 2015; Illingworth & Rodkin Inc., 2016; Matuschek, et al., 2009). No dependence on pile size, sediment or vibratory hammer was found[11], so both the main pontoon piles and the support piles have the same band levels (Figure 14-9 & Figure 14-10).

14.6.3.6.1 Main Pontoon Pile

The broadband level is expected to be below 194 dB SPL with a -20 dB bandwidth from 10-12,500 Hz.

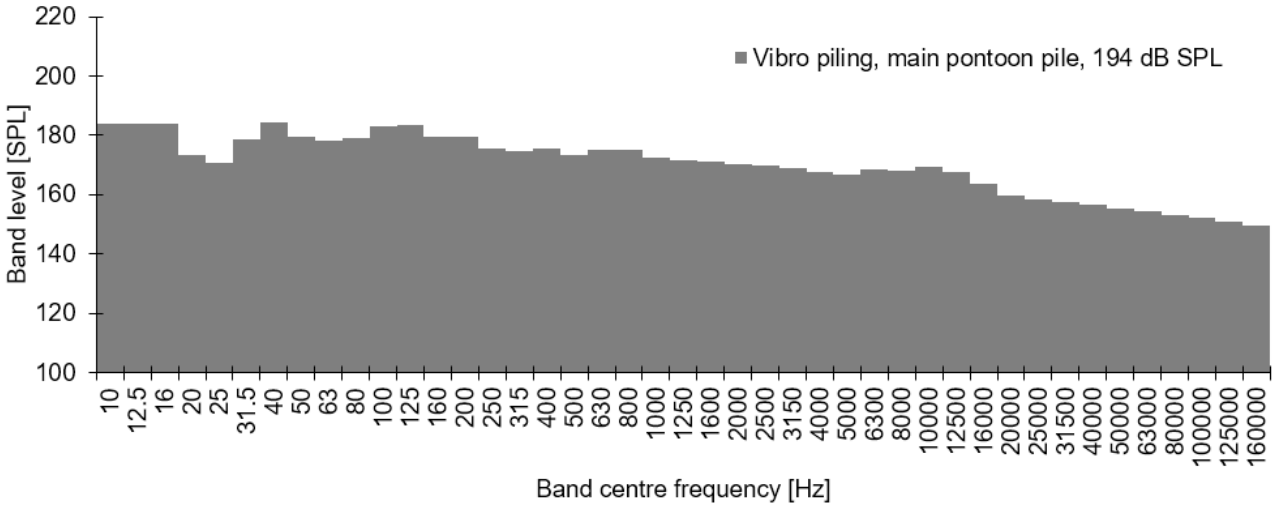

Figure 14-9. Band levels for installation vibro piling of main pontoon piles.

14.6.3.6.2 Support Piles

The broadband level is expected to be below 194 dB SPL with a -20 dB bandwidth from 10-12,500 Hz. A total of eight support piles are assumed being installed.

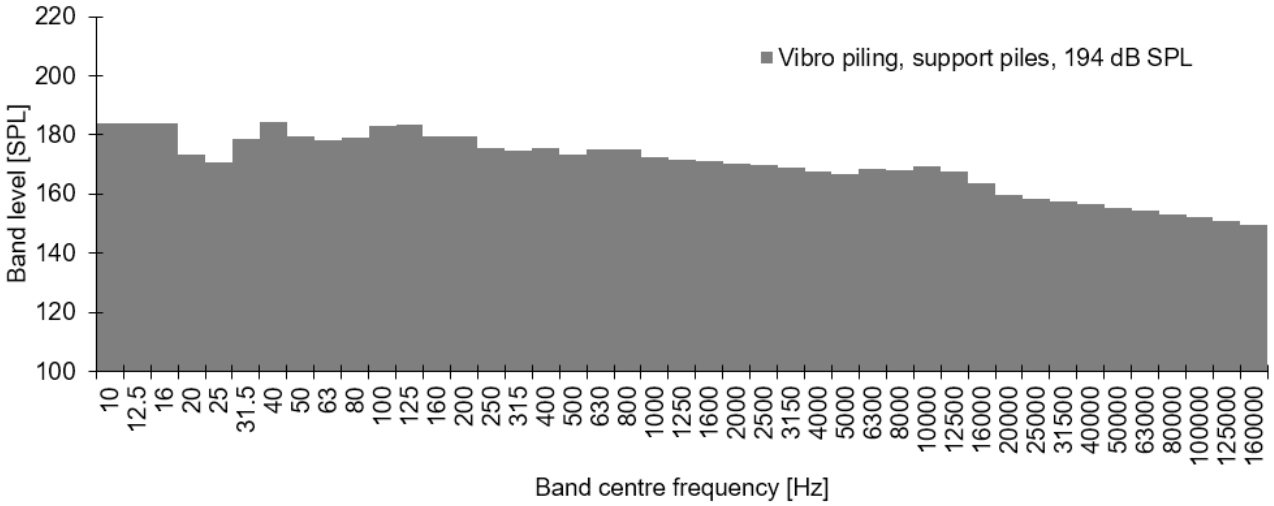

Figure 14-10. Band levels for installation vibro piling of support piles.

[11] Not all installation are identical, but no empirical relationship could be made with variables like driver energy, soil conditions and pile dimensions.

14.6.3.7 Coring/Rotary Drilling

Band levels for rotary drilling/coring are based on an empirical model of 16 recordings (Erbe, et al., 2017; Fisheries and Marine Service, 1975; MR, et al., 2010; L-F, et al., 2023; Ward, et al., 2012). The model is dependent on the coring diameter.

14.6.3.7.1 Main Pontoon Piles

The noise from the coring for the main pontoon piles is expected to have a maximum broadband level of 163 dB SPL with a -20 dB bandwidth from 10-2000 Hz.

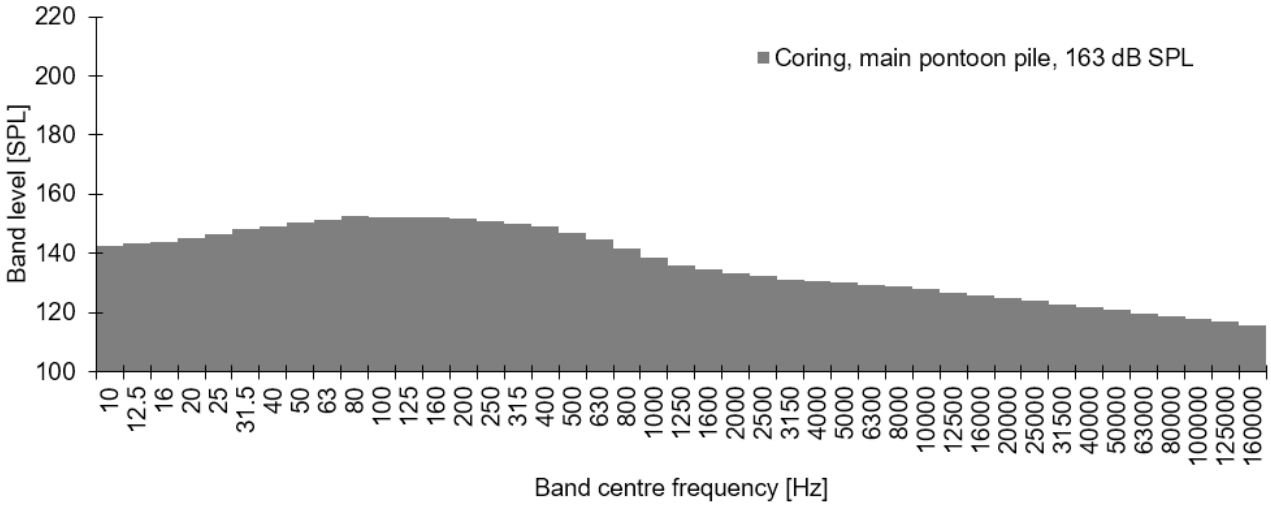

Figure 14-11. Band levels for coring of main pontoon piles.

14.6.3.7.2 Bank Seat Piles

The noise from the coring for the bank seat piles is expected to have a broadband level of maximally 159 dB SPL with a -20 dB bandwidth from 10-8000 Hz.

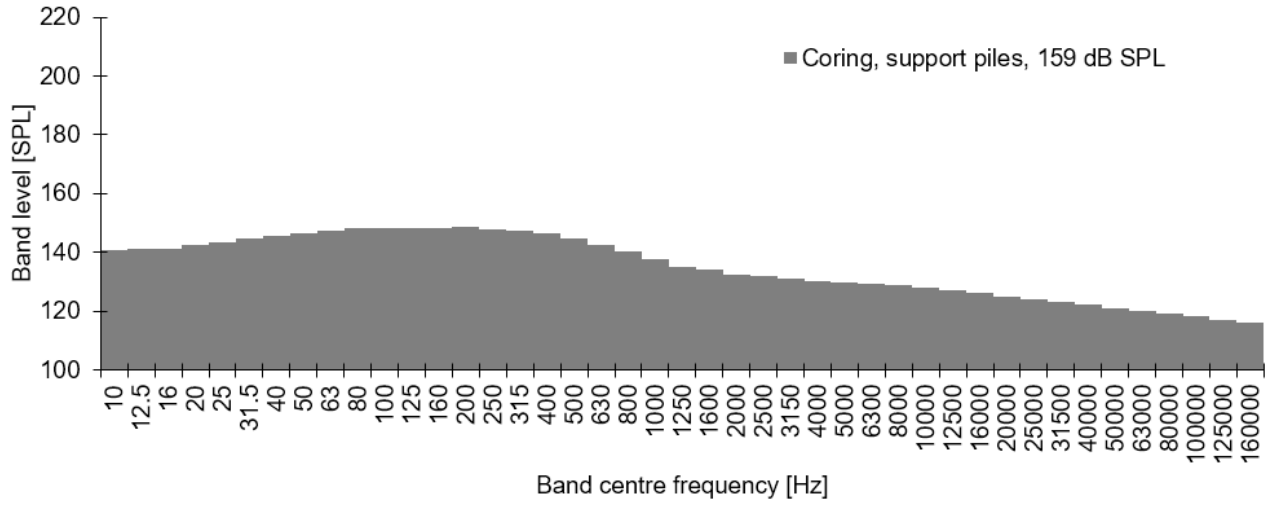

Figure 14-12. Band levels for coring of bank seat piles.

14.6.3.8 Rock Dumping

Rock dumping band levels are based on the SPT (standard penetration testing) and rock breaking band levels as given in section 14.6.3.4, but adjusted to fit with recorded broadband levels found in literature (JASCO, 2013; JIP, 2020). The broadband level is expected to be below 185 dB SPL, with the main energy (-20 dB bandwidth) within 12.5-8000 Hz. The rock dumping is modelled as impulsive to 100 m, after which raytracing indicates that the noise has transitioned to non-impulsive (see section 14.6 and Appendix 14.A for reasoning).

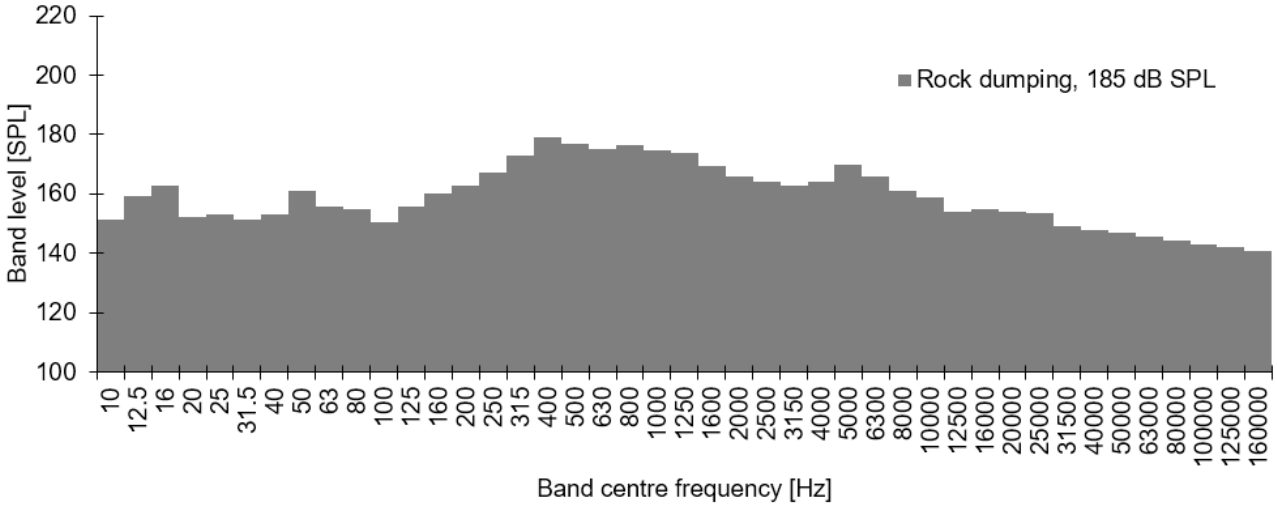

Figure 14-13. Band levels for Rock dumping.

14.6.4 Sound Propagation Modelling Methodology

There are several methods available for modelling the propagation of sound between a source and receiver ranging from very simple models which simply assume spreading according to a $10\times\log_{10}$(range) or $20\times\log_{10}$(range) relationship, to full acoustic models (e.g., ray tracing, normal mode, parabolic equation, wavenumber integration and energy flux models). In addition, semi-empirical models are available which lie somewhere in between these two extremes in terms of complexity (e.g., (Rogers, 1981; Weston, 1971)).

For simpler scenarios, such as this one, where the sediment is relatively uniform and mostly flat or where great detail in the sound field is not needed, the computational speed of these simpler models is preferred over the higher accuracy of numerical models and are routinely used for these types of assessments. For this assessment, we have used the Weston model (Weston, 1971), which is suitable to depths of c. 200 m and generally softer sediments.

This model will tend to underestimate the transmission losses (leading to estimates greater than actual impact), primarily due to the omission of surface roughness, wind effects and shear waves in the sediment.

Validation examples of the model can be found in APPENDIX 14.C

14.6.4.1 Modelling Assumptions

The main assumptions made for the modelling are:

1. Animals fleeing the area will not return within a 24-hour period.
2. Animals flee for up to 2 hours, after which they will be up to 10.8 km and 3.6 km away for marine mammals and fish, respectively.
3. Results assume a transition from impulsive (kurtosis >40) to non-impulsive (kurtosis <40) at some distance from the source (source, sediment and depth dependant).
   This means that for impact piling, at ranges greater than 900 m the received noise will have become non-impulsive, and for rock dumping the transition occurs at ranges below 100 m. After the transition to non-impulsive noise the noise is assessed against the non-impulsive thresholds (see Appendix 14.A).

   This assumption is also applicable for the assessment of behavioural disturbance.
4. Sources are modelled as point sources. While piles are *not* point sources, the source model ("Taranis") generates source levels appropriate for use with this assumption.
5. Modelling is done for high tide (LAT + 5 m), being the tidal state with the least transmission loss.

14.6.4.2 Exposure Calculations (dB SEL)

To compare modelled levels with the two impact assessment frameworks (NMFS 2024 & Popper et al. 2014) it is necessary to calculate received levels as exposure levels (SEL), weighted for marine mammals and unweighted for fishes. For ease of implementation, sources have been presented as an SPL source level, meaning it was necessary to convert from SPL to SEL for a single, or multiple events.a

To convert from SPL to SEL, the following relation can be used:

$$SEL = \mathrm{SPL} + 10 \cdot Log_{10}(t_2 - t_1) \qquad (1)$$

Or, where it is inappropriate to convert SEL from one event to SEL cumulative by relating to the number of events as:

$$SEL_{,n\ events} = SEL_{\ single\ event} + 10 \cdot Log_{10}(n) \quad (2)$$

And SPL from SEL:

$$SPL = SEL_{\ single\ event} + 10 \cdot Log_{10}\left(\frac{n}{t_2 - t_1}\right) \quad (3)$$

As an animal swims away from the sound source, the noise it experiences will become progressively more attenuated; the cumulative, fleeing SEL is derived by logarithmically adding the SEL to which the mammal is exposed as it travels away from the source. This calculation is used to estimate the approximate minimum start distance for an animal in order for it to be exposed to sufficient sound energy to result in the exceedance of a threshold, or to check if a set exclusion zone is sufficient for an activity (e.g. will an exclusion zone of 500 m be sufficient to prevent exceeding an AUD INJ threshold). It should be noted that the sound exposure calculations are based on the simplistic assumption that the animal will continue to swim away at a constant speed. The real-world situation is more complex, and the animal is likely to move in a more varied manner. Reported swim speeds are summarised in Table 14-7 along with the source papers for the assumptions.

For this assessment, a swim speed of 1.5 m/s for marine mammals, and 0 m/s for fishes (including sharks) is assumed.

For very long fleeing durations, the ambient sound itself can exceed the thresholds, e.g., an ambient sound level of 122.4 dB, weighted for the VHF group, will exceed the non-impulsive TTS threshold of 161 dB SEL after 2 hours' exposure[12]. For this assessment, we consider fleeing durations of 2 hours (7200 seconds, allowing 10800 m of fleeing), meaning that weighted levels of 122.4 dB SPL will exceed the VHF group's non-impulsive TTS threshold in the fleeing model.

Table 14-7: Swim speed examples from literature

Species	Hearing Group	Swim Speed (m/s)	Source Reference
Harbour porpoise	VHF	1.5	Otani *et al.,* 2000
Harbour seal	PCW	1.8	Thompson, 2015
Grey seal	PCW	1.8	Thompson, 2015
Minke whale	LF	2.3	Boisseau *et al.,* 2021
Bottlenose dolphin	HF	1.52	Bailey and Thompson, 2010
White-beaked dolphin	HF	1.52	Bailey and Thompson, 2010
Basking shark	Fish (unweighted)	1.0	Sims, 2000
All other fish groups	Fish (unweighted)	0.5	Popper *et al.,* 2014
Sea turtles	Fish (unweighted)	0.56-0.84 & 0.78-2.8	(F, et al., 1997; SA, 2002)

14.6.4.3 Cumulative Effects

The following sections present the impact ranges based on the modelling for each activity in isolation. While cumulative effects from overlapping activities are possible, for this project there is no planned temporal overlap between the noisiest activities (demolition, impact piling and vibro piling). Were these activities to overlap in time, the fact that the main sound energy is at different frequencies means that the overall weighted levels don't change significantly leading to insignificant changes in impact ranges (compared to the already conservative assessment structure). Overlap with less noisy activities such as dredging will have no meaningful effects of impact ranges as the source levels for dredgings are far below levels for both vibro piling and

[12] 122.4 dB SPL + 10*$\log_{10}$(3600 seconds) = 161 dB SEL, TTS non-impulsive threshold for the VHF group is 161 dB SEL.

demolition. Overlap with impulsive noise sources is not relevant as impulsive and non-impulsive sources are assessed against two different thresholds, and assessing these as cumulative is not a meaningful exercise.

14.7 Impact Assessment

14.7.1 Assessment of Construction Effects

Results are presented here as the geographical "risk range" to an auditory threshold (AUD INJ/ TTS/ Behavioural), as given in Table 14-1, Table 14-2, Table 14-3 and Table 14-4.

A given risk range specifies the expected range, within which, a fleeing receiver would exceed the relevant threshold. Risk ranges are given for the 90th percentile value and the maximal value.

Several result types are presented for each activity in Table 14-8 to inform this assessment and to provide flexibility in mitigation.

Table 14-8. Result types summary.

Condition	
Behavioural disturbance range	The range at which the behavioural limit for the marine mammals or the fishes (including sharks) is exceeded.
TTS,1 seconds' exposure	This is the range of acute risk of impact from the activity (a one second exposure) and is presented to indicate instantaneous risk and for comparison with other studies. This assumes a stationary animal (during the 1-second exposure) with all equipment operating at full power and does not include a soft start.
AUD INJ,1 seconds' exposure	
TTS, sound exposure, fleeing receiver, no soft start	The minimal range a fleeing animal needs to start fleeing from to avoid being exposed to noise exceeding its TTS/ AUD INJ threshold. Animals are moving in a straight line away from the source at a constant speed of 1.5m/s (0 m/s for fish, including sharks).
AUD INJ, sound exposure, fleeing receiver, no soft start	
TTS, sound exposure, fleeing receiver, 20-minute soft start	Minimal starting range for a fleeing animal with a 20 min soft start, where the piling is 12 dB lower than normal operation (lowest power).
AUD INJ, sound exposure, fleeing receiver, 20-minute soft start	
TTS, peak pressure	This is the range of immediate risk of impact from the activity and indicate instantaneous risk. This criterion is based on a single exposure to peak pressure compared with the L_P threshold for impulsive noise. Only relevant for impulsive noise sources.
AUD INJ, peak pressure	

14.7.1.1 Assumptions and Notes on Results

The results should be read while keeping the following in mind:

- The harbour is enclosed by the breakwater and the headland to the east (Ynys Dinas/Dinas Island Figure 14-1), meaning there is a natural limit to ranges of effect from noise. Thus, the ranges for behavioural disturbance are limited by the geometry of the site, not by the sound reducing to levels below the threshold.
- Given the enclosed nature of the site, two types of results are given:
    - 90th percentile ranges – 90% of models show results below this range, and 10% show result larger than this range.
    - Maximal ranges – the maximal range of exceedance modelled. For this site, these ranges will be in the eastward direction.

- Results are rounded up to the nearest two significant digits. This can lead to apparent overlaps in risk ranges.
- The modelling resolution of 10 metres means that were results are lower than this, “<10” is stated to mean “below 10 metres”.
- Where risk ranges are large (often the case for TTS risk ranges), an increase in soft start duration will not be effective to lower the TTS risk range. This is due to the logarithmic nature of transmission losses:
  For a marine mammal that starts fleeing at 500 m range:
  - Increasing the soft start from 0 to 10 minutes allows a marine mammal to swim an additional 900 m (1.5 m/s * 600 seconds), from 500 m range to 1400 m range. This result in a c. 6.5 dB reduction in received level for the animal.
  - Increasing the soft start from 10 to 20 minutes allows the animal to swim an additional 900 m, from 1400 m range to 2300 m range.
    This results in a c. 3.5 dB reduction in received level for the animal.
  - Increasing the soft start from 20 to 30 minutes (2300 to 3200 m), results in a c. 2 dB reduction in received level for the animal.
- As the impulsive noise transitions to non-impulsive noise with increased ranges, the appropriate behavioural threshold for the assessment changes from 160 dB to 92-126 dB (a likely >10-fold increase in range). This means that there are large ranges of disturbance, but should be considered in relation to, for example, the radiated noise from common vessels, which will exceed this threshold to ranges of 500-10000 m (assuming 160-180 dB SPL source level).
- Animals are modelled as fleeing in straight lines (except fish, no fleeing). Where sites are very confined, the maximal risk ranges will be restricted by line-of-sight ranges (and cut short where they meet land).
- Modelling assumed a maximal fleeing time of 7200 seconds (2 hours). This allows for 10.8 km of fleeing for marine mammals.
- Modelling is limited to a range of 5 km from the site boundary.

14.7.1.2 Results Tables

14.7.1.2.1 Dredging

The dredging has little to no risk of exceeding TTS or AUD INJ thresholds (Table 14-9) but estimates for exceedance of the behavioural thresholds extend to ranges of 5600 m – coinciding with the extend of the modelled area (Proposed Development boundary +5 km).

The breakwater and headland to the east (Ynys Dinas/Dinas Island), is efficient at blocking noise transmission (Figure 14-14).

Table 14-9. Threshold exceedance ranges for dredging.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	2800	4000	4000	4300	2600	1100
	Maximal range [m]	4200	5600	5600	5600	4300	1100
TTS,1 seconds’ exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ,1 seconds’ exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10

TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10

* Fish are modelled as stationary

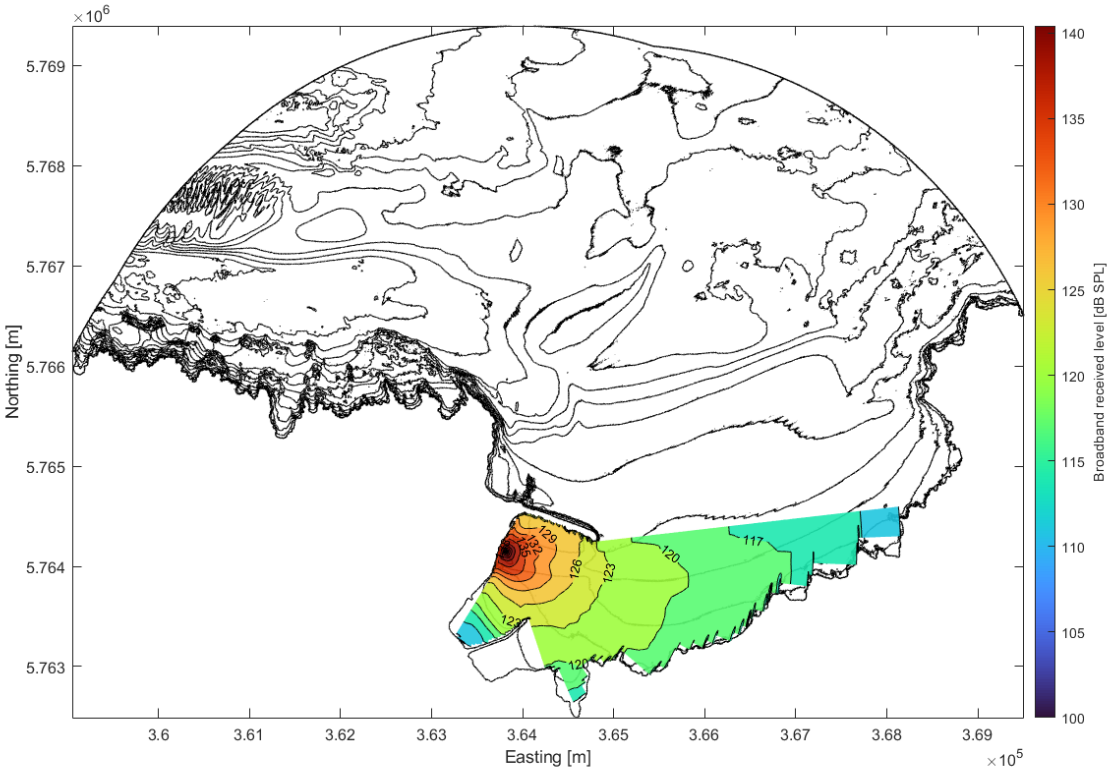

Figure 14-14. Map of unweighted levels [SPL] from dredging near the quay and linkspan. UTM 30N.

14.7.1.2.2 Demolition, wire saw, Drilling, Rock Breaking, Pecking

The demolition has little to no risk of exceeding AUD INJ thresholds (Table 14-10).

Note that the following is valid for demolition happening below the water line, and where demolition takes place above the waterline, results from dredging should be used instead as a proxy for the vessel carrying out the demolition.

The activity is likely to exceed TTS thresholds for the PW group from 310 to 680 m (90th percentile range to maximal range) and TTS for the LF and VHF groups from 410 m to 1400 m (90th percentile range to maximal range).

Exceedance of the behavioural thresholds is expected for all species within line of sight (4800 m), limited by the headland to the east (Ynys Dinas/Dinas Island) and the breakwater to the north.

These results are also representative for pecking during dredging and for the in-soil impact piling during installation of the bank seat piles.

Table 14-10. Threshold exceedance ranges for demolition.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	2200	2200	2200	2200	2200	2200
	Maximal range [m]	4800	4800	4800	4800	4800	4800
TTS,1 seconds' exposure	90th percentile range [m]	10	<10	<10	<10	<10	<10
	Maximal range [m]	10	<10	<10	<10	<10	<10
AUD INJ,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10

	Maximal range [m]	<10	<10	<10	<10	<10	<10
TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	580	<10	410	310	20	40
	Maximal range [m]	1400	<10	830	680	20	40
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10

* Fish are modelled as stationary

14.7.1.2.3 Impact piling

14.7.1.2.3.1 Support Piles

This activity is limited in time to 30-minute intervals, occurring maximally twice daily, thus the modelling assumes 60 minutes activity daily.
The planned total number of occurrences will be eight – 30 minutes impact piling per support pile over two days.

The impact piling at the pontoon support piles is likely to exceed AUD INJ thresholds for all species groups (Table 14-11), and to ranges of several hundred meters for most groups.

The species groups most strongly affected are the LF, VHF, PW and Fishes groups that have likely exceedance ranges for the AUD INJ threshold from 630 m to 880 m (90th percentile range to maximal range).

The OW hearing groups have likely exceedance up to 280 m and the HF hearing group up to 40 m.

The peak pressure is likely to exceed the AUD INJ threshold of all groups to <10 m.

Ranges for exceedance of the exposure TTS thresholds are limited by line of sight for all species groups with a range of 4900 m.

The peak pressure is likely to exceed the TTS threshold of Fishes from 60 m to 70 m and the VHF group from 30 m to 50 m (90th percentile range to maximal range).

Ranges for behavioural disturbance are limited by line of sight and cover the part of Fishguard bay as enclosed by the norther breakwater and the headland to the east (Ynys Dinas/Dinas Island) (Figure 14-15).

Effects of a 20-minute soft start

Introducing a 20-minute soft start with a 12 dB reduction for 20 minutes prior to piling decreases exceedance ranges for the AUD INJ threshold for the VHF group from 600 to 630 m (up to 880 m with no soft start). The remaining groups have exceedance range for AUD INJ reduced to less than 340 m, with exception of the stationary Fishes hearing group who see a small increase[13] from 640 to 680 m (630 m to 670 m with no soft start).

The exceedance ranges of the TTS threshold are similar with the presence of a soft start. This is an effect of the soft start itself and the effect of increasing the duration of impact piling to 80 minutes (from 60 minutes, 20 minutes of which are from the soft start).

Table 14-11. Threshold exceedance ranges for impact piling at the main pontoon pile.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	2200	2200	2200	2200	2200	2200
	Maximal range [m]	4900	4900	4900	4900	4900	4900

[13] The soft start will increase cumulative received noise for a stationary receiver.

TTS,1 seconds' exposure	90th percentile range [m]	530	20	1100	260	80	30
	Maximal range [m]	530	20	1100	260	80	30
AUD INJ,1 seconds' exposure	90th percentile range [m]	40	<10	120	10	<10	<10
	Maximal range [m]	40	<10	120	10	<10	<10
TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	2000	900	1900	2000	960	900
	Maximal range [m]	4500	2500	4300	4400	2700	900
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	810	30	870	690	270	630
	Maximal range [m]	840	40	880	720	280	670
TTS, sound exposure, fleeing receiver*, 20-minute soft start	90th percentile range [m]	2000	170	1900	2000	520	900
	Maximal range [m]	4500	2500	4300	4400	2700	900
AUD INJ, sound exposure, fleeing receiver*, 20-minute soft start	90th percentile range [m]	280	<10	600	80	<10	640
	Maximal range [m]	340	<10	630	110	<10	680
TTS, peak pressure	90th percentile range [m]	10	10	30	10	10	60
	Maximal range [m]	10	10	50	10	10	70
AUD INJ, peak pressure	90th percentile range [m]	10	10	10	10	10	10
	Maximal range [m]	10	10	10	10	10	10

* Fish are modelled as stationary

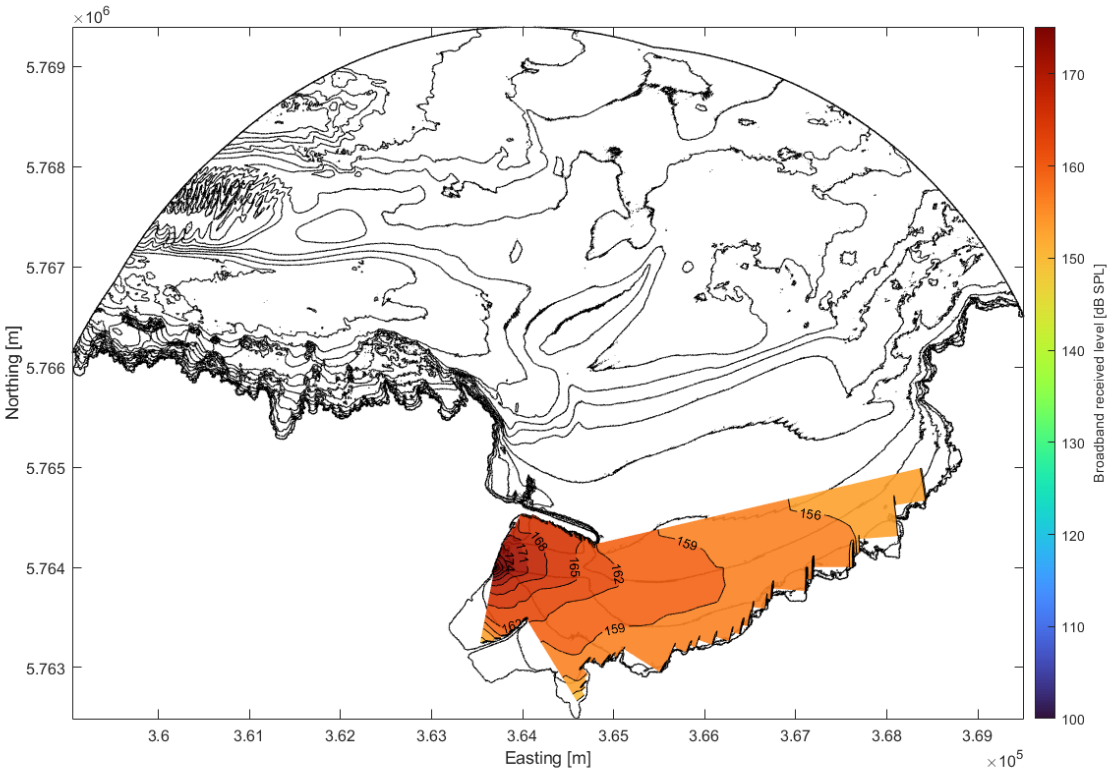

Figure 14-15. Map of unweighted levels [SPL] from impact piling the support piles. UTM 30N.

14.7.1.2.3.2 Bank Seat Piles

The bank seat piles are wholly separated by the water by at least 1 m of made ground, providing an effective noise barrier.

The results for Demolition, Drilling, Rock Breaking, Pecking, section 14.6.3.4 are representative for the impact piling of the bank seat piles.

14.7.1.2.4 Vibratory piling

14.7.1.2.4.1 Main Pontoon Piles & Support Piles

The vibro piling for the main pontoon piles is also representative of (or louder than) the vibro piling of the support piles. Only results for vibro piling of the main pontoon piles are presented.

This also covers the use of vibro piling for extraction of the temporary piles.

The vibro piling has little to no risk of exceeding AUD INJ threshold for any species group (Table 14-12).

For the VHF species group, it's likely that the TTS threshold will be exceeded to ranges from 190 m to 270 m (90th percentile range to maximal range).

The PW and Fishes groups has a risk of exceedance of the TTS threshold to ranges up to 30 m.

The LF hearing group has TTS exceedance risk ranges from 90 to 130 m.

Ranges for behavioural disturbance are limited by line of sight and cover the part of Fishguard bay as enclosed by the norther breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 14-12. Threshold exceedance ranges for vibratory piling at the main pontoon pile and support piles.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	2200	2200	2200	2200	2200	2200
	Maximal range [m]	4900	4900	4900	4900	4900	4800
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	90	<10	190	20	<10	30
	Maximal range [m]	130	<10	270	30	<10	30
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10

* Fish are modelled as stationary

14.7.1.2.5 Coring/Rotary Drilling

14.7.1.2.5.1 Main Pontoon Piles & Bank Seat Piles

The coring has little to no risk of exceeding TTS or AUD INJ thresholds (Table 14-13) but is causing possible exceedance of the behavioural thresholds to ranges of 1600 m for the HF species group. The remaining groups have exceedance ranges for the behavioural thresholds of 110 m to 500 m.

The higher ranges of the HF group are a result of the weighting excluding less lower frequencies (compared to the VHF group) and lower behavioural disturbance threshold overall (92 dB SPL weighted).

The results are for coring at the main pontoon pile. The noise from the bank seat piles will be much lower (lower source level and additional loss through land/water interface) and have not been modelled separately.

Table 14-13. Threshold exceedance ranges for coring at the main pontoon pile.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	490	1100	450	460	110	230
	Maximal range [m]	500	1600	490	480	120	250
TTS,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	<10	<10	<10	<10

	Maximal range [m]	<10	<10	<10	<10	<10	<10

* Fish are modelled as stationary

14.7.1.2.6 Rock Dumping

The rock dumping is unlikely to exceed AUD INJ thresholds at any range for all species groups expect the VHF hearing group which has AUD INJ exceedance to a range of 50 m for sound exposure and to 40 m for the Fishes hearing group.

The activity is likely to exceed the TTS thresholds for the LF, VHF, PW and Fishes groups from 80 m to 120 m (90th percentile range to maximal range).

Groups HF and OW TTS threshold exceeded to ranges of up to 20 m.

Ranges for behavioural disturbance are limited by line of sight and cover the part of Fishguard bay as enclosed by the norther breakwater and the headland to the east (Ynys Dinas/Dinas Island).

Table 14-14. Threshold exceedance ranges for rock dumping.

Condition		LF	HF	VHF	PW	OW	Fishes
Behavioural disturbance range	90th percentile range [m]	2200	2200	2200	2200	2200	2100
	Maximal range [m]	5200	5200	5200	5200	5200	5200
TTS,1 seconds' exposure	90th percentile range [m]	10	<10	50	<10	<10	<10
	Maximal range [m]	10	<10	50	<10	<10	<10
AUD INJ,1 seconds' exposure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
TTS, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	110	<10	100	80	20	100
	Maximal range [m]	120	<10	100	80	20	100
AUD INJ, sound exposure, fleeing receiver*, no soft start	90th percentile range [m]	<10	<10	50	<10	<10	40
	Maximal range [m]	<10	<10	50	<10	<10	40
TTS, peak pressure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10
AUD INJ, peak pressure	90th percentile range [m]	<10	<10	<10	<10	<10	<10
	Maximal range [m]	<10	<10	<10	<10	<10	<10

* Fish are modelled as stationary

14.7.2 Assessment of Operational Effects

After construction has completed, it's assumed that activities will revert to what they were before the Proposed Development commenced, with no meaningful changes to the noise from the activities (i.e. dominated by the ferry service).

14.8 Mitigation

14.8.1 Construction Phase Mitigation Measures

14.8.1.1 Impact Piling

During impact piling protocols from the JNCC document “Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise” (JNCC, 2010) should be applied, specifically a 30-minute pre-piling survey for absence of marine mammals with a mitigation zone by a qualified Marine Mammal Observer (MMO).

In addition to this a 20-minute soft start, with a 12 dB reduction in source level will lower the AUD INJ exceedance range to less than 630 m for the VHF group and less than 340 m for the remaining groups for a 60-minute impact piling duration.

Note that adding a soft start has no effect on the effects on fish which have risk of exceeding the AUD INJ threshold to 680 m. A non-fleeing animal will instead experience more noise overall if a soft-start is introduced.

While the MMO pre-piling survey would normally be limited to a range of 500 m, the calmer waters resulting from the breakwaters could assist in spotting marine mammals to ranges over 630 m. The end of the northern breakwater, c. 1100 m away from the linkspan, can be used as a visual que to aid in determining this range.

Additional soft start time will not lessen the effects as the noise from the soft start itself will drive the exceedance ranges.

14.8.1.2 Remaining Construction Activities

Vibro piling, coring, demolition and dredging all have AUD INJ exceedance ranges <10 m for all hearing groups, meaning than no mitigation is required to mitigate against this effect. Rock dumping has AUD INJ exceedance ranges to 50 m for the VHF group and 40 m for the Fishes group with the remaining groups <10 m, meaning that if an animal is very near this activity there is some risk of the animal experiencing auditory injury. Given the conservativeness of the assessment, it’s unlikely that this will be realised, and no mitigation is recommended for non-impact piling activities.

14.8.2 Operational Phase Mitigation Measures

No significant change in noise patterns is expected following the Proposed Development, therefore no mitigation is needed.

14.9 Assessment of Residual Effects

Noise is a transient pollutant, once the noisy activity stops, the immediate effect ceases. Residual effects may include learned avoidance of the area for marine mammals. Comments on other residual effects to be found in Chapter 8 – Biodiversity Marine

14.10 Cumulative Effects

No other Proposed Developments with significant underwater noise emissions are known to have been planned for the relevant area.

14.11 Limitations of the Assessment

There are limitations to the modelling accuracy. These have been addressed by assuming conservative values (leading to a larger assessed impact and effect) for inputs that are critical to accuracy (e.g. water depth, sediment characteristics, animal swimming speeds and source levels).

See sections 14.6.3.1, 14.6.4 and 14.7.1.1 for examples and details.

14.12 Summary of Effects and Conclusion

14.12.1 Impact piling

The impact piling to install the support piles for the installation of the main pontoon piles is the only activity assessed with the risk of exceeding acoustic thresholds for injury for marine mammals to ranges over 50 m.

Given that the recommended JNCC mitigation for impact piling is implemented (30-minute pre piling watch for absence of marine mammals, 20-minute soft start) the risk range for exceedance of the auditory injury range for the VHF group (porpoises) can be reduced to <630 m and <340 m for the remaining animal groups assessed. The exception to this is fish, which given the lack of fleeing will have risk of auditory injury to ranges of 680 m.

Further increase of soft start duration will not decrease this risk range, as the soft start itself is noisy (relative to noise thresholds).

14.12.2 Remaining Activities

The remaining activities assessed included dredging, demolition, drilling, rock breaking, pecking, vibro piling, coring and rock dumping. Rock dumping is the activity with the greatest potential impact and has a risk range for exceedance of auditory injury of <50 m. All remaining activities have risk ranges for exceedance of auditory injury of <10 m.

No mitigation is recommended for these activities

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14.14 List of Abbreviations / Acronyms / Technical Terms

Technical Terms

Term	Meaning
Decibel (dB)	A relative scale most commonly used for reporting levels of sound. The actual sound measurement is compared to a fixed reference level and the "decibel" value is defined to be $10 \cdot \log_{10}$(“actual”/”reference”), where (“actual”/”reference”) is a power ratio. The standard reference for underwater sound pressure is 1 micro-Pascal (µPa), while 20 micro-Pascals is the standard for airborne sound. The dB symbol is often followed by a second symbol identifying the specific reference value (i.e. re 1 µPa).
Grazing angle	A glancing angle of incidence (the angle between a ray incident on a surface and the line perpendicular to the surface).
Auditory Injury (AUD INJ)	A total or partial permanent loss of hearing caused by some kind of acoustic trauma. AUD INJ results in irreversible damage to the sensory hair cells of the ear and thus, a permanent reduction of hearing acuity.
Temporary Threshold Shift (TTS)	Temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there

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	may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.
Sound Exposure Level (SEL)	The cumulative sound energy in an event, formally: “ten times the base-ten logarithm of the integral of the squared pressures divided by the reference pressure squared”. Equal to the often seen “L_E” or “dB SEL” quantity. Defined in: ISO 18405:2017, 3.2.1.5
Sound Pressure level (SPL)	The average sound energy over a specified period of time, formally: “ten times the base-ten logarithm of the arithmetic mean of the squared pressures divided by the squared reference pressure”. Equal to the deprecated “RMS level”, “dB_{rms}” and to L_{eq} if the period is equal to the whole duration of an event. Defined in ISO 18405:2017, 3.2.1.1
Peak Level, Peak Pressure Level (L_P)	The maximal sound pressure level of an event, formally: “ten times the base-ten logarithm of the maximal squared pressure divided by the reference pressure squared” or “twenty times the base-ten logarithm of the peak sound pressure divided by the reference pressure, where the peak sound pressure is the maximal deviation from ambient pressure”. Defined in ISO 18405:2017, 3.2.2.1
Source Level (SL)	Taken here to mean the level (SEL/SPL/L_P) at 1 meter range. If not otherwise stated, it is assumed the source is omnidirectional (equal level in all directions). For sources larger than 1m in radius, the Source Level is back calculated to 1m.
Decidecade	Refers to a set step in frequency, similar to “one-third-octave”, defined as a ratio of $10^{0.1} \approx 1.259$ (one third octave is $21/3 \approx 1.260$). Used interchangeably with “3rd octave”.
Noise	Sound that is irrelevant, unwanted, or harmful to the organism(s) in question. Noise is often detrimental, but not necessarily so.
Kurtosis	A statistical measure of “peakedness” of a distribution (of e.g. pressure values in a sound pulse). Defined in ISO 5479:1997

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Acronyms/Abbreviations

Term	Meaning
LF	Low Frequency (Cetaceans)
HF	High Frequency (Cetaceans)
VHF	Very High Frequency (Cetaceans)
MF	Mid Frequency (Cetaceans) – **DEPRECATED** only for reference to NOAA/NMFS 2018 groups
OW/OCW	Otariid pinnipeds/Other Carnivores in water (refers to the same weighting and animal groups)
PW/PCW	Phocid pinnipeds
NMFS	National Marine Fisheries Service
RMS	Root Mean Square
SEL	Sound Exposure Level, [dB]
SPL	Sound Pressure Level, [dB]
L_P	Peak Pressure Level, [dB]
SL	Source Level [dB]
TTS	Temporary Threshold Shift
PTS	Permanent Threshold Shift – **DEPRECATED**, see “AUD INJ”
AUD INJ	Auditory Injury (synonymous with deprecated “PTS”)
c.	Circa, i.e., approximately
MMO	Marine Mammal Observer https://jncc.gov.uk/our-work/marine-mammal-observer-training/

Units

Unit	Description
dB	Decibel (Sound)
Hz	Hertz (Frequency)
kHz	Kilohertz (Frequency)
kJ	Kilojoule (Energy)
km	Kilometre (Distance)
km^2	Kilometre squared (Area)
m	Metre
ms	Millisecond (10^{-3} seconds) (Time)
ms^{-1} or m/s	Metres per second (Velocity or speed)
kn	Knots (speed), 1 kn = 0.514 m/s, 1 m/s = 1.944 kn
µPa	Micro Pascal
Pa	Pascal (Pressure: newton/m^2)
psu	Practical Salinity Units (parts per thousand of equivalent salt in seawater, weight-based)
kg/m^3	Specific density (of water, sediment or air)
Z	Acoustic impedance [$kg/(m^2 \cdot s)$ or $(Pa \cdot s)/m^3$]

Units will generally be enclosed in square brackets e.g.: “[m/s]”

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 15 Air Quality

15 Air Quality

15.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on Air Quality and the vulnerability of the Proposed Development to climatic factors. This chapter considers the potential impacts to Air Quality from the Project during the construction and operational phases of the Proposed Development.

Directive 2011/92/EU included air quality as a criterion for assessment in EIA in terms of the impact of the project on air quality through the release of pollutants with potential to affect human health and ecosystems at a local level (this includes a construction phase dust and emissions assessment). Potential effects to air quality may arise during the construction phase, such as from the generation of dusts and from construction traffic. The construction activities have been examined to identify those that have the potential for air emissions. Each of these potential sources has been identified and emissions have been evaluated using standard procedures.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing Air Quality trends to assess current environmental baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on Air Quality; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

Other aspects relevant to Air Quality are addressed in the specific chapters of the ES, namely:

- Chapter 7: Traffic and Transport

This chapter should be read in conjunction with:

- Volume II Appendix 15.A – Detailed Dust Assessment
- Volume II Appendix 15.B – Air Quality Impacts on Designated Nature Conservation Sites

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

15.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on climate. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 15.8);
- Identifies any limitations encountered in compiling the environmental information (section 15.13);
- Presents an assessment of the potential likely significant effects on Air Quality arising from the Proposed Development (section 15.7.5) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section15.12.

- Highlights any necessary monitoring (section 15.10.3) and/or measures (see section 15.10.1 and section 15.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 15.9).

15.3 Study Area

The site is a parcel of land spanning an area of approximately 0.9 hectares of the harbour, to include the existing linkspan, hinterland and within the bay foreshore. The Proposed Development lies within the northern fringes of Goodwick which is a coastal town immediately west of its twin town of Fishguard, within Fishguard Bay. It is bound by steep cliff faces and the Fishguard Train Station to the western extents; a breakwater to the north and RNLI Lifeboat Station. Residential properties of Harbour Village lie to the west elevated above Fishguard Bay. The site is accessed from the A40/Station Hill to the south.

For dust, the Institute of Air Quality Management (IAQM) 2024 guidance states that a dust assessment is typically required where there is:

- A ‘human receptor’ within:
    - 250 metres of the boundary of the site; or
    - 50 metres of the route(s) used by construction vehicles on the public highway, up to 250 metres from the site entrance(s).
- An ‘ecological receptor’ within:
    - 50 metres of the boundary of the site; or
    - 50 metres of the route(s) used by construction vehicles on the public highway, up to 250 metres from the site entrance(s).

In consideration of the distances outlined above, an Air Quality Study Area of 250m from all possible on-site components of the Proposed Development has been selected for the purposes of this assessment, with a visual representation of the resulting Air Quality Study Area illustrated in Figure 15-1

Figure 15-1: Air Quality Study Area

15.4 Policy Context

Air pollution can have an effect on people's health. Exposure to air pollution can have long-term effects on health, it also has negative impacts on the environment. The UK government's and devolved administrations' primary objective is to ensure that all members of the public should have access to outdoor air without significant risk to their health, where this is economically and technically feasible.

15.4.1 EU legislation and policy

The following EU Directives set limits for air pollutants in ambient air:

- Cleaner air for Europe (CAFÉ directive – 2008/50/EC); and,
- Air quality 4th daughter directive.

15.4.2 National legislation and policy

15.4.2.1 UK Air Quality Strategy

Local authorities are responsible for reviewing the state of air quality in their district council area. To assist them with this process, an Air Quality Strategy (AQS) has been devised for the UK. This sets out standards and objectives for the air quality pollutants causing the problems and enables councils to review air quality in their area against these. Wales departments also have a responsibility to ensure limit values, target values and alert thresholds for specified pollutants are not exceeded. The AQS is presented in two volumes:

- Volume 1 of the UK air quality strategy,
- Volume 2 of the UK air quality strategy.

In most cases, the AQS objectives are identical to the EC Directive limit values, the only differences being the more stringent dates by which the former must be achieved.

15.4.2.2 Air Quality (Wales) Regulations 2000, as amended by the Air Quality (Wales) (Amendment) Regulations 2002

The national air quality objectives for Wales represent pragmatic thresholds above which the Welsh Government considers the health risks associated with air pollution to be unacceptable. However, air just barely compliant with the objectives should not be considered 'clean' and still carries long-term health risks. The lower the concentration of pollutants such as nitrogen dioxide and particulate matter, the lower will be the risks of adverse health effects in the exposed population. Therefore, while compliance with the national air quality objectives is essential, it is desirable to keep levels of pollution as low as reasonably practicable.

The national air quality objectives contained in the Air Quality (Wales) Regulations 2000, as amended by the Air Quality (Wales) (Amendment) Regulations 2002 are detailed below in Table 15-1.

Table 15-1: National Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration	Measured as
Benzene	16.25 µg/m^3	running annual mean
	5 µg/m^3	annual mean
1,3-Butadiene	2.25 µg/m^3	running annual mean
Carbon Monoxide	10 mg/m^3	maximum daily running 8-hour mean
Lead	0.25 µg/m^3	annual mean
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times per year	1-hour mean
	40 µg/m^3	annual mean
Particles (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times per year	24-hour mean
	40 µg/m^3 (WHO guideline 20 µg/m^3)	annual mean
Sulphur Dioxide	266 µg/m^3, not to be exceeded more than 35 times per year	15-minute mean
	350 µg/m^3, not to be exceeded more than 24 times per year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times per year (WHO guideline 20 µg/m^3)	24-hour mean

15.4.2.3 Well-being of Future Generations (Wales) Act 2015

Air quality management is a public health and environmental priority, and integrated action to improve the air people breathe and to which we expose the natural environment must be taken internationally, nationally, regionally and locally. The Welsh public sector is driving air quality improvements in a number of ways, including through local air quality management, land use and transport planning, environmental permitting, active travel, investment in cleaner technologies and education and awareness-raising.

Public bodies in Wales need to carry out air quality and noise management in accordance with the five ways of working set out in the Well-being of Future Generations (Wales) Act 2015 ("the WFG Act"). This means:

- looking to the long term when making decisions so they do not compromise the ability of future generations to meet their own needs;
- taking an integrated approach, such as by joining up action to reduce air and noise pollution with action to improve road safety, make transport more sustainable, reduce greenhouse gas emissions and enhance the built environment with appropriately sited trees and hedgerows;
- taking every opportunity to talk to the public, including businesses, about the challenges associated with air and noise pollution, listen to their concerns and seek their views on potential solutions and their involvement in delivering them;
- collaborative working between environment, public health, transport and planning professionals and others to find shared sustainable solutions to air quality and noise problems; and,
- keeping exposure to air and noise pollution as low as reasonably practicable across the whole of the population, looking out in particular for areas where the national air quality objectives might be at risk of being breached, a nuisance created, or a critical load for wildlife exceeded at some point in the future and acting pre-emptively to prevent those situations from occurring.

15.4.2.4 Environment (Air Quality and Soundscapes) (Wales) Act 2024

The Environment (Air Quality and Soundscapes) (Wales) Act 2024 (the 2024 Act) became law on 14 February 2024. The 2024 Act seeks to improve the quality of our air environment and reduce the impacts of airborne pollution on human health, nature, the environment and our economy.

The 2024 Act creates a framework for the Welsh Ministers to set targets in relation to air quality and amends existing air quality legislation in relation to local air quality management, road user charging, anti-idling and smoke control such as the Environment Act 1995. The Act also creates new duties for the Welsh Ministers to take steps to promote awareness of the risks to human health and the natural environment caused by air pollution, and ways of reducing or limiting air pollution.

The 2024 Act also places the Welsh Ministers and local authorities under a duty to promote active travel as a way of reducing or limiting air pollution and makes provision for this duty to be imposed by regulations, on other public authorities. The Act also requires the Welsh Ministers to produce a national strategy on soundscapes.

15.4.2.5 Local Air Quality Management (LAQM) Technical Guidance (TG22) 2025

Local Air Quality Management Technical Guidance LAQM.TG22 supersedes all previous versions. It is designed to support local authorities in carrying out their duties under the Part IV of the Environment Act 1995 as amended by the Environment Act 2021, and subsequent regulations.

Authorities will continue to appraise air quality, with the main emphasis on those pollutants shown to be challenging in respect of compliance i.e. Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10}) and Sulphur Dioxide (SO_2), whilst introducing a new role for local authorities to work towards reducing

levels of $PM_{2.5}$ in England and a statutory objective for this pollutant in Scotland. At the core of LAQM delivery are three pollutant objectives; these are:

- Nitrogen Dioxide (NO_2),
- Particulate Matter (PM_{10}), and;
- Sulphur Dioxide (SO_2).

All current AQMA's across the UK are declared for one or more of these pollutants, with NO_2 accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

Reflecting feedback under the LAQM review process, the UK and Welsh Governments have decided to retain Benzene, 1,3-Butadiene, Carbon Monoxide and Lead in regulations for England and Wales. However, in recognition of the fact that all of the objectives for these pollutants have been met for several years and are well below objective values, local authorities in England and Wales do not have to report on these pollutants (or SO_2, in the case of Wales) unless local circumstances indicate otherwise. These pollutants remain a statutory reporting requirement in Scotland and Northern Ireland.

As of February 2022, there were more than 600 AQMAs currently declared across the UK (over 500 of which are in England). There are currently 214 Local Authorities that have one or more AQMAs declared within their jurisdiction. Of these, the vast majority (over 95%) are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely, sometimes in association with exceedances of the 24-hour mean PM_{10} objective, or in Scotland the annual mean PM_{10} objective.

Examples of where air quality objective may apply is given in Table 15-2.

Table 15-2: Example of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expected to be short-term
Hourly-mean	All locations where the annual and 24-hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and bus stations etc which were not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer	Kerbside sites where the public would not be expected to have regular access

15.4.2.6 The Clean Air Plan for Wales

The aim of the Clean Air Plan for Wales is to improve air quality and reduce the impacts of air pollution on human health, biodiversity, the natural environment and our economy. This Plan supports delivery of commitments under Prosperity for All: our national strategy. In particular, 'reducing emissions and delivering vital improvements in air quality' to support 'healthier communities and better environments. Wales are undertaking work to understand the impact of COVID-19 on air quality. As this is an emerging picture, they will take account of any impacts of COVID-19 when reviewing this Plan and implementing actions within it. Their first Clean Air Plan for Wales brings together work across many Government departments and public sector organisations. It includes ambitions to meet and where possible exceed requirements set down in UK and international guidance and legislation.

This Plan sets out a 10-year pathway to achieving cleaner air. We have structured the Plan around four core themes, with actions to enable collaborative approaches to reducing air pollution.

- People: Protecting the health and well-being of current and future generations
- Environment: Taking action to support our natural environment, ecosystems and biodiversity
- Prosperity: Working with industry to reduce emissions, supporting a cleaner and more prosperous Wales
- Place: Creating sustainable places through better planning, infrastructure and transport.

The themes were designed through the lens of the Well-being of Future Generations Act to enable collaborative and integrated approaches to improving air quality, across a range of policy areas and sectors. The timescales for delivering actions are framed within three Senedd periods, short term: 2020 to 2021, medium term: 2021-26 and longer term: 2026-2031.

15.4.2.7 The Merchant Shipping (Prevention of Air Pollution from Ships) (Amendment) Regulations 2021

Draft Regulations, laid before Parliament under paragraph 13(1) of Schedule 8 to the European Union (Withdrawal) Act 2018, amend the Merchant Shipping (Prevention of Air Pollution from Ships) Regulations 2008 to implement a series of International Maritime Organization (IMO) Marine Environment Protection Committee resolutions.

Key changes include revised definitions (notably of "fuel oil"), formal recognition of electronic record books, and the designation and clarification of emission control areas (Baltic, North Sea, North American, United States Caribbean and any future IMO-designated areas). The amendments strengthen controls on nitrogen oxides (introducing and applying NOx Tier I–III standards) and sulphur (including a 0.10% m/m limit inside emission control areas and updated provisions on emission abatement methods), adjust application and certification requirements, broaden enforcement and detention powers and create new offences to improve compliance, and insert an ambulatory provision to enable more efficient domestic adoption of future IMO amendments. Schedule 3 (bunker delivery note information) is revoked. The instrument extends to England and Wales, Scotland and Northern Ireland and is set to come into force 22 days after being made.

15.5 Consultation

No specific comments regarding air quality have been received during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project.

15.6 Methodology to inform the baseline

15.6.1 Desktop study

Information on climate within the Air Quality Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 15-3 These sources provide the most up to date data for this assessment.

Table 15-3 Summary of key desktop reports.

Title	Source	Year
Pembrokeshire County Council 2025 Air Quality Progress Report	Pembrokeshire County Council	2025
Air Quality in Wales 2023/2024 Report	Senedd	2024
DEFRA 2021 based background maps	Defra - Department for Environment Food and Rural Affairs	2025

15.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for air quality. The baseline data presented in this section is derived from the following:

- Air Quality in Wales 2023/2024 Report;
- Pembrokeshire County Council 2025 Annual Progress Report; and,

Department for Environment, Food & Rural Affairs (DEFRA) Mapped Concentration Estimates

15.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following Air Quality specific guidance as follows:

- Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction www.iaqm.co.uk January 2024 (Version 2.2);
- Institute of Air Quality Management (IAQM) A guide to the assessment of air quality impacts on designated nature conservation sites May 2020 (Version 1.1);
- Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning for Air Quality January 2017; and
- Design Manual for Roads and Bridges (DMRB) Sustainability and Environment, LA105 Air Quality June 2024.

15.7.1 Applicable Guidance for Assessment

15.7.1.1 Land Use Planning & Development Control: Planning for Air Quality (IAQM)

This IAQM document sets out indicative criteria for requiring an air quality assessment. These points are set out in Table 15-4 below.

Table 15-4: IAQM Indicative Criteria for Requiring an Air Quality Assessment

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment:	Does this Proposed Development satisfy the criteria?
1. 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 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere	**No**
2. 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 - more than 100 AADT elsewhere.	**No**
3. 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.	**No**
4. Introduce a new junction or remove an existing junction near to relevant receptors	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.	**No**
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere	**No**
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).	**No**
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping	Typically, any combustion plant where the single or combined emission rate is less than 5 mg/sec* is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.	**No**

**As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.*

The Proposed Development does not satisfy the criteria requiring a proposal to be supported with an air quality assessment. Therefore, in accordance with this IAQM guidance an operational air quality assessment may be screened out.

15.7.1.2 Design Manual for Roads and Bridges (DMRB) Sustainability and Environment, LA105 Air Quality

The approach to considering an assessment (local assessment) or screening it out follows the guidance set out by the DMRB Sustainability & Environment, LA105 Air Quality (Standards for Highways, 2024). Requirements for a local air quality assessment emanate from the following criteria being met:

- annual average daily traffic (AADT) ≥ 1,000; or
- heavy duty vehicle (HDV) AADT ≥ 200; or
- a change in speed band; or
- a change in carriageway alignment by ≥ 5 m.

For this Proposed Development none of the 4 criteria are met. There is not predicted to be any significant change in traffic volumes when the Proposed Development is operational compared to the existing baseline scenario.

In addition to this, in terms of designated ecological sites, the Proposed Development is partly located within the West Wales Marine / Gorllewin Cymru Forol Special Areas of Conservation (SACs). There are no biological SSSIs located within 3km from the development. A geological designated site, Fishguard Cliffs SSSI, lies to east of Fishguard Harbour beyond the mouth of the Afon Gwaun. St. David's SAC lies 4.75km northwest of the proposed development with the qualifying features being vegetated sea cliffs, European dry heaths, floating water-plantain. Strumble Head – Llechdafad Cliffs SSSI is the closest component SSSI of the SAC and is designated for its floral assemblage, breeding cliff-nesting bird assemblage, and invertebrates. There are no Non-Statutory Designated Sites within 2km.

Designated site that should be considered for assessment are those which the designated features are sensitive to air pollutants, either directly or indirectly, and which could be adversely affected by the effect of local air quality on vegetation with the following nature conservation sites: SACs (SCIs or SACs), SPAs, pSPAs, ASSIs and Ramsar sites.

The Wales National Application Annex for Air Quality (LA 105, WNAA) specifies that the Welsh Government requires nothing in addition to, or different from, LA 105.

15.7.2 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

Table 15-5 describes sensitivity of receptor and may be used in an environmental impact assessment to ensure a standardised approach. In this instance the assessment of air quality employs standards set out in the IAQM guidance document[1] is used and compliments this standard approach presented in Table 15-6.

Table 15-5: Definitions of Sensitivity or Value

Sensitivity	Example Descriptor
Very High	Very high importance and rarity, international scale and very limited potential for substitution.

[1] Institute of Air Quality Management Guidance on land-use planning and development control: Planning for air quality 2017

Sensitivity	Example Descriptor
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium 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 15-6: Definitions of Magnitude

Sensitivity	Example Descriptor
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Both sensitivity/value and magnitude are taken into account in determining the significance of effect.

15.7.3 Construction Phase – Methodology

15.7.3.1 Dust and Particulates

Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

The effects of dust are linked to particle size, and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and,
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, windowsill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

The IAQM Guidance on the assessment of dust from demolition and construction sets out 250 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 250 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. These distances are set to be deliberately conservative

15.7.3.2 Human Receptors Definition

A 'human receptor' refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to particulates over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management Technical Guidance (LAQMTG22). In terms of annoyance effects, this will most commonly relate to dwellings but may also refer to other premises such as buildings housing cultural heritage collections (e.g. museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production).

15.7.3.3 Sensitivities of People and Property Receptors to Dust

For the sensitivity of people and their property to soiling, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, considering the following general principles.

High sensitivity receptor

- Users can reasonably expect enjoyment of a high level of amenity.
- The appearance, aesthetics or value of their property would be diminished by soiling; and
- The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.

Indicative Examples: Dwellings, Museums and other culturally important collections. Medium and long-term car parks and car showrooms.

Proposed Development Examples: There are residential properties west of the Proposed Development located on Quar Road, New Hill and Harbour Village.

Medium sensitivity receptor

- Users would expect a to enjoy a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home.
- The appearance, aesthetics or value of their property could be diminished by soiling.
- The people or property wouldn't reasonably be expected a to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.

Indicative Examples: Parks, Places of work

Proposed Development Examples: Offices and places of work located within the proposed development however recognise that these may not be operational during construction. Ocean Lab - Sea Trust Wales is located south of the proposed development.

Low Sensitivity

- The enjoyment of amenity would not reasonably be expected.
- There is property that would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling.

- There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.

Indicative Examples: Playing fields, farmland (unless commercially sensitive horticultural). Footpaths and roads. Short-term car parks and roads.

Proposed Development Examples: There are numerous footpaths surrounding the Proposed Development. Fishguard Pier Car Park is south of the proposed development. East of the proposed development is primarily agricultural land.

15.7.3.4 Sensitivities of People and Property Receptors to PM_{10}

For the sensitivity of people to the health effects PM_{10}, the IAQM recommends that the air quality practitioner assumes that there are three sensitivities based on whether the receptor is likely to be exposed to elevated concentrations over a 24-hour period, consistent with the Defra's advice for local air quality management (Defra 2022, LAQM Technical Guidance LAQMTG.22).

High sensitivity receptor

- Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).

Indicative Examples: Residential properties, Schools, hospitals, and residential care homes.

Proposed Development Examples: There are residential properties west of the Proposed Development located on Quay Road, New Hill and Harbour Village.

Medium Sensitivity

- Locations where people are occupationally exposed over a full working day.

Indicative Examples: Office and shop workers (but generally exclude workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).

Proposed Development Examples: Offices and places of work located within the proposed development however recognise that these may not be operational during construction. Ocean Lab - Sea Trust Wales is located south of the proposed development.

Low Sensitivity

- Locations where human exposure is transient.

Indicative Examples: Public footpaths, playing fields, parks. Shopping streets.

Proposed Development Examples: There are numerous footpaths surrounding the Proposed Development. Fishguard Pier Car Park is south of the proposed development.

15.7.3.5 Sensitivities of Receptors to Ecological Effects

A Habitat Regulation Assessment of the site maybe required as part of the planning process if the site lies close to an internationally designated site.

Professional judgement is required to identify where on the spectrum between high and low sensitivity a receptor lies, considering the likely effect and the value of the ecological asset. A habitat may be highly valuable but not sensitive, alternatively it may be less valuable but more sensitive to dust deposition. For the sensitivity of ecosystems to dust deposition the IAQM recommends that an ecologist is consulted to determine the potential effects on plant communities.

High sensitivity receptor

- Locations with an international designation and the designated features may be affected by dust soiling.

- Locations where there is a community of a particular dust sensitive species such as vascular species included in the Red Data List for Great Britain.

Indicative Examples: Special Area of Conservation (SAC) designated for acid heathlands adjacent to a mineral's development releasing alkaline dusts. The following designation is located in close proximity to the proposed development:

- West Wales Marine / Gorllewin Cymru Forol SAC

Further detail on ecological impact is considered in Chapter 8 and 9.

Medium sensitivity receptor

- Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown.
- Nationally designated site and the designated features may be affected by dust deposition;

Indicative Examples: Areas of Special Scientific Interest (ASSIs) or a local wildlife site with very specific sensitivities. The following designation is located in close proximity to the proposed development:

- Creigiau Abergwaun (Fishguard Cliffs) SSSI

Further detail on ecological impact is considered in Chapter 8 and 9.

Low sensitivity receptor

- Locations with a local designation where the features may be affected by dust deposition.

Indicative Examples: Local Nature Reserve with dust sensitive features.

In terms of designated ecological sites, the Proposed Development is located partly within the West Wales Marine / Gorllewin Cymru Forol Special Areas of Conservation (SACs). Further detail on ecological impact is considered in Chapter 8 and 9.

15.7.3.6 Source Pathway Receptor

Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.

The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and track-out) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented; the resultant effects of the dust

exposure will normally be “not significant”. This assessment does not consider the air quality impacts of dust from any contaminated land. If contaminated land is identified on the site of the Proposed Development, the impacts will be assessed in other technical discipline reports. This is not detailed further in this chapter.

15.7.4 Significance Criteria for Development Impacts on the Local Area

The rationale for describing the impact of the Proposed Development is derived from the Environmental Protection UK (EPUK) and IAQM guidance (EPUK & IAQM) “Land-Use Planning & Development Control: Planning for Air Quality (Jan 2017)” (paragraphs 6.25-6.39), which has replaced “Development Control: Planning for Air Quality (2010 Update)”.

There is a two-stage process to be followed in the assessment of air quality impacts;

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

The suggested framework for describing the impacts is set out in Table 6.3 of the EPUK & IAQM guidance document and is shown in Table 15-7: Impact Descriptors for Individual Receptors. in this chapter. The term Air Quality Assessment Level (AQAL) has been adopted as it covers all pollutants, i.e. those with and without formal standards. AQAL is used to include air quality objectives or limit values where these exist. The Environment Agency uses a threshold criterion of 10% of the short term AQAL as a screening criterion for the maximum short-term impact. The EPUK & IAQM guidance adopts this as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect.

Table 15-7: Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Moderate
103-109% f AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Explanation

1. *AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency ‘Environmental Assessment Level (EAL)’.*
2. *The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as Negligible.*
3. *The Table is only designed to be used with annual mean concentrations.*
4. *Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a ‘moderate’ adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.*
5. *When defining the concentration as a percentage of the AQAL, use the ‘without scheme’ concentration where there is a decrease in pollutant concentration and the ‘with scheme;’ concentration for an increase.*
6. *The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.*
7. *It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration*

without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

The rationale for the assessment of significance is derived from the EPUK & IAQM Guidance (paragraphs 7.1-7.12 referring to Table 6.3) and relates to Table 15-8. Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as 'significant' or 'not significant'. An 'impact' is the change in the concentration of an air pollutant, as experienced by a receptor. This may have an 'effect' on the health of a human receptor, depending on the severity of the impact and other factors that may need to be taken into account. The impact descriptors are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.

Any judgement on the overall significance of effect of a development will need to take into account factors such as:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts, and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Other factors may be relevant in individual cases. In this case, the development is not within an AQMA. The impacts descriptor table acknowledges this and points to a conclusion of significant effect in cases where concentrations of a regulated pollutant are in excess of the objective value. Where the baseline concentrations are close to the objective value at a receptor, but not exceeding it, a case may be made for the development's predicted contribution being significant. It will always be difficult, however, to attribute the exceedance of an objective to any individual source.

15.7.5 Significance of Effects

The assessment of significance is based on the matrix illustrated in Table 15-8.

Table 15-8: Assessment of Significance Matrix (Simple)

Sensitivity	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major

- ***Substantial***: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- ***Major***: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- ***Moderate***: These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.

- ***Minor***: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- ***Negligible***: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

15.8 Baseline Environment

Potential effects to air quality may arise during the construction phase, such as from the generation of construction dusts and construction traffic. The construction activities have been examined to identify those that have the potential for air emissions. Each of these potential sources has been identified and emissions have been evaluated using standard procedures. The measures to reduce, avoid and prevent these likely significant effects are proposed, where they are necessary. Thereafter, the likely significant residual effects of the project on air quality are predicted. To establish baseline conditions, the following key sources of information were referred to as part of the assessment on air quality:

- Air Quality in Wales 2023/2024 Report;
- Pembrokeshire County Council 2025 Annual Progress Report; and,
- Department for Environment, Food & Rural Affairs (DEFRA) Mapped Concentration Estimates.

15.8.1 Primary Atmospheric Pollutants

Atmospheric pollution within the surrounding area of the Proposed Development is largely dominated by emissions associated with operational activities at the Stena Line Fishguard, agricultural emissions from the nearby farms, road traffic exhaust fumes and residential emissions. The current Stena Line operation includes a twice daily ferry service to Rosslare, covering public ferry passengers and accompanied and unaccompanied freight. The berth is also infrequently used by cruise vessels and historic steamboats.

Therefore, the primary contaminants of concern identified were Nitrogen Oxides (NO_X) and Particulate Matter (PM_{10} and $PM_{2.5}$). NO_X is primarily produced during combustion at high temperatures with contributions from traffic, residential heating, and industry. PM_{10} are particles in air with diameters of 10µm (microns) or less. These particles can consist of direct emission from combustion engines and burning solid fuels, while natural sources can be windblown salt, plant spores, and pollens. $PM_{2.5}$ or fine particulate matter is composed of varying components depending on its source but can include nitrates, sulphates, volatile organic compounds (VOCs), metals and soil or dust particles.

15.8.2 International Convention for the Prevention of Pollution from Ships (MARPOL)

From 1st January 2020, a new global emissions limit on all maritime vessels came into force, capping the amount of sulphur (SO_x) emissions that ships can emit. Sulphur emissions are associated with a number of environmental risks, including increased acidification of oceans, acid rain as well as respiratory and other impacts on human health. Efforts to reduce the amount of sulphur emitted from ships is expected to reduce these potential impacts.

In 2008, members of the global body responsible for shipping safety, security, and the prevention of shipping pollution – the UN agency known as the International Maritime Organisation (IMO) – agreed to reduce SO_x emissions from ship exhausts. The requirements regarding air pollution from ships are stipulated under Annex VI of the MARPOL Convention. It was agreed that the sulphur cap was to come into force in either 2020 or 2025, depending on when it was feasible to do so.

In 2016, the IMO confirmed that the global limit would be reduced to 0.50% by mass (m/m) of sulphur in marine fuels, which came into effect on January 1st, 2020. However, since 2015 the EU (including the UK) and others have gone even further to set more stringent Emissions Control Areas on shipping emissions in territorial waters, with a 0.10% m/m sulphur limit.

Due to this being a globally enforced change as one that affects a very large industry that is key for a large volume of global trade movements, it is possible that the effects could be felt outside of just the shipping industry. For fuel suppliers such as United Kingdom Petroleum Industry Association

(UKPIA's) members, there are choices to be made by their customers about what fuels they may want to use. Low sulphur fuels come in different forms, but ships who can remove sulphur themselves could use high sulphur (<3.5% m/m) fuels and still comply, and a change in production of one fuel could affect the rest of the product mix too.

15.8.3 Air Quality in Wales 2023/2024 Report

The Welsh Government and the Welsh Air Quality Forum (WAQF) maintain a close collaborative relationship with air quality experts and the Department for Environment, Food and Rural Affairs (Defra) to actively oversee and mitigate air pollution within Wales. Figure 15-2 illustrates the annual average long-term trends for nitrogen dioxide (NO_2), fine particles (PM_{10}) and ozone (O_3) concentrations across Wales. These trends are derived from measurements taken at monitoring sites affiliated with local authorities and the Automatic Urban and Rural Network (AURN), where annual data capture was 75% or greater. With the exception of O_3, concentrations of pollutants have exhibited an overall decline since the pollutant records began. It is worth noting that O_3 qualifies as a regional pollutant, with transboundary characteristics, and as such its regulation falls beyond immediate purview of the Welsh Government and local authorities

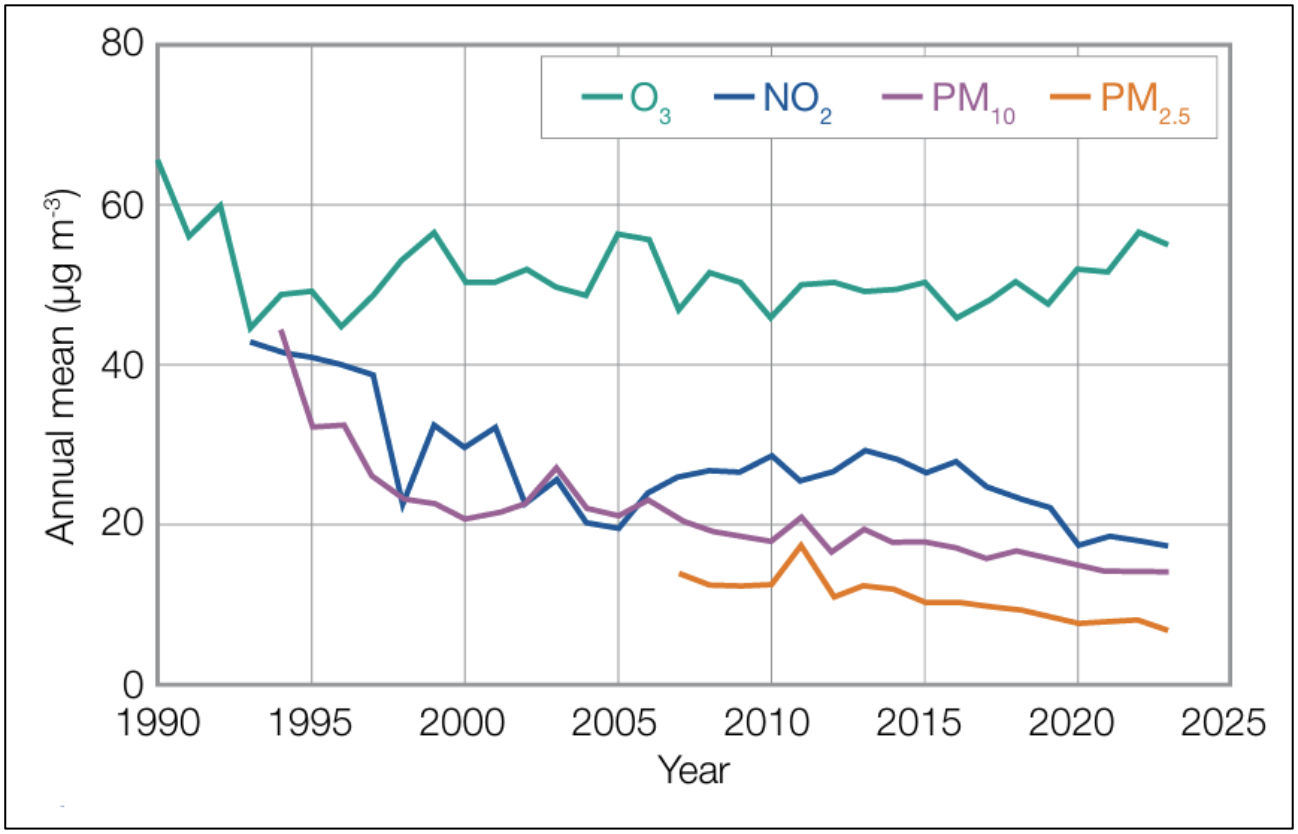

Figure 15-2: Key Ambient Air Pollutant Trends in Wales 1990-2023

In 2023, ambient concentrations of PM_{10} were 'moderate' on 59 days, 'high' on 11 days and 'very high' on 9 days (as defined by the Daily Air Quality Index bandings). For $PM_{2.5}$ there was 1 day with 'moderate' concentrations, and no days were recorded as 'high' or 'very high'. There were no recorded days with 'moderate', 'high' or 'very high' NO_2 concentrations. SO_2 also had no 'moderate', 'high' or 'very high' levels recorded. For O_3, there were 47 days with 'moderate' levels, 1 day recorded as 'high' and no days recorded as 'very high'. Overall, pollution levels in Wales were low for 257 days, moderate for 90 days, high for 9 days and very high for 9 days. Therefore, 70% of the time, pollution levels were low across the whole of Wales. Details of the Daily Air Quality Index banding system used can be found

.

Exceedance statistics, generated from the Welsh Air Quality database, indicate that in 2023 no monitoring sites in Wales exceeded any Air Quality Strategy (AQS) Objective for NO_2, $PM_{2.5}$, CO, SO_2, benzene or lead. For PM_{10}, one site (Port Talbot Prince Street 2) recorded daily mean PM_{10} concentrations above 50 µg/m^3 on 45 days, thereby exceeding the daily mean objective of 35 days. These exceedances were spread evenly throughout the year.

Table 15-9: Air Pollution Bands and Indices µ/m³

Pollutants	Band	Low			Moderate			High			Very High
	Index	1	2	3	4	5	6	7	8	9	10
Ozone - running 8 hourly mean	µg/m^3	0-33	34-66	67-100	101-120	121-140	141-160	161-187	188-213	214-240	241 or more
Nitrogen Dioxide - hourly mean	µg/m^3	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	601 or more
Sulphur Dioxide - 15-minute mean	µg/m^3	0-88	89-177	178-266	267-354	355-443	444-532	533-710	711-887	888-1064	1065 or more
$PM_{2.5}$ Particles - 24 hour running mean	µg/m^3	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more
PM_{10} Particles - 24 hour running mean	µg/m^3	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	92-100	101 or more

A health descriptor is associated with each band based upon current understanding and research studies (Department of Health). Current descriptors are presented below in **Table 15-10**.

Table 15-10: Air Pollution Bandings and Health Descriptor Impacts on Sensitive Receptors

Air Pollution Banding	Value	Accompanying health messages for at-risk groups and the general population	
		At-risk individuals*	General Population
Low	1-3	Enjoy your usual outdoor activities.	Enjoy your usual outdoor activities.
Moderate	4-6	Adults and children with lung problems, and adults with heart problems, who experience symptoms, should consider reducing strenuous physical activity, particularly outdoors.	Enjoy your usual outdoor activities.
High	7-9	Adults and children with lung problems, and adults with heart problems, should reduce strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they	Anyone experiencing discomfort such as sore eyes, cough or sore throat should consider reducing

Air Pollution Banding	Value	Accompanying health messages for at-risk groups and the general population	
		At-risk individuals*	General Population
		need to use their reliever inhaler more often. Older people should also reduce physical exertion.	activity, particularly outdoors.
Very High	**10**	Adults and children with lung problems, adults with heart problems, and older people, should avoid strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	Reduce physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

**Adults and children with heart or lung problems are at greater risk of symptoms. It is possible that very sensitive individuals may experience health effects even on Low air pollution days.*

15.8.4 Air Quality in Pembrokeshire County Council [2]

Narberth Monitoring Station is the only automatic monitoring location within Pembrokeshire County Council and resides approximately 32km southeast of the Proposed Development (as illustrated in Figure 15-3). The monitoring station is within a self-contained, air-conditioned housing located at the edge of a field adjacent to a hedgerow. A quiet rural road runs to the south of the site at a distance of approximately 90 metres.

The manifold inlet is approximately 3 metres high at a distance of approximately 5 metres from the nearest obstruction. The surrounding area is open and comprises fields with a small amount of light industry at distances of up to 0.5 - 1.8 km distance.

Figure 15-3: Automatic Monitoring Location

This monitoring location is Air Pollution Banding “Low” and the ambient concentrations of pollutants recorded between the 24th January 2026 – 25th March 2026 are illustrated below in Figure 15-4, with the latest values are based on provisional data from 14:00am 25th March 2026 detailed in Table 15-11.

[2] https://www.airquality.gov.wales/

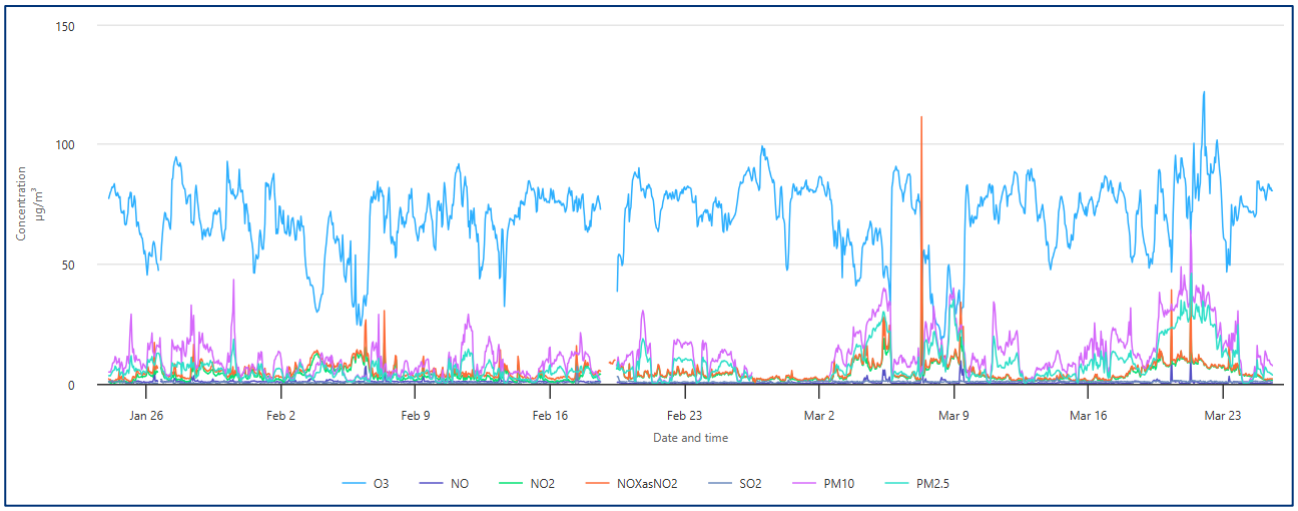

Figure 15-4: Narberth Monitoring Location Ambient Concentrations of Pollutants Recorded over the Previous 60 Days[3]

Table 15-11: Narberth Monitoring Location Latest Data Updated 04/02/2025 10:00 GMT

Parameter	Index	Band	Concentration	Period
O_3	3	**LOW**	81 µg/m^3	8 Hour mean
$PM_{2.5}$	1	**LOW**	5 µg/m^3 (Ref.eq)	24 Hour mean
PM_{10}	1	**LOW**	9 µg/m^3 (FIDAS)	24 Hour mean
NO_2	1	**LOW**	2 µg/m^3	hourly mean
SO_2	1	**LOW**	1 µg/m^3	15 Minute mean
NO	No Data		0 µg/m^3	hourly mean
NO_XasNO$_2$	No Data		2 µg/m^3	hourly mean

[3] https://www.airquality.gov.wales/air-pollution/site/PEMB

15.8.5 Pembrokeshire County Council 2025 Air Quality Progress Report

15.8.5.1 Description of Local Authority Area

Pembrokeshire is a predominantly rural county, with a strong maritime influence and has a history of development based on agriculture, tourism, defence, energy and port activities centred on the Milford Haven Waterway. The area is characterised by a series of distinct, yet interdependent settlements. The unique environment and strong sense of community is attractive to both residents and visitors and provides a distinctive sense of place. The Pembrokeshire Ports and the Haven Waterway are international assets, critical to the future energy security of the UK.

15.8.5.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment Act 1995, as amended by the Environment Act 2021, and associated government guidance. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas and to determine whether or not the air quality objectives are being achieved. Where exceedances occur, or are likely to occur, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) within 18 months of declaration, setting out the measures it intends to put in place in pursuit of the objectives. Action plans must then be reviewed and updated no later than every five years; or if a local authority considers there is a need for further or different measures to be taken in order to achieve air quality standards; or if significant changes to sources occur within your local area. For Local Authorities in Wales, an Annual Progress Report replaces all other formal reporting requirements and has a very clear purpose of updating the general public on air quality, including what ongoing actions are being taken locally to improve it if necessary.

15.8.5.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Wales are contained within the Air Quality (Wales) Regulations 2000, as amended by the Air Quality (Wales) (Amendment) Regulations 2002, and are shown in Table 15-12 below. This table shows the objectives in units of micrograms per cubic metre µg/m^3 (milligrammes per cubic metre, mg/m^3 for carbon monoxide) together with the number of exceedances in each year that are permitted.

Table 15-12: Air Quality Objectives included in Regulations for the purpose of LAQM in Wales

Pollutant	Air Quality Objective	
	Concentration	Measured as
Benzene	16.25 µg/m^3	Running annual mean
	5 µg/m^3	Annual mean
1,3-butadiene	2.25 µg/m^3	Running annual mean
Carbon monoxide	10 mg/m^3	Maximum daily running 8-hour mean
Lead	0.25 µg/m^3	Annual mean
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate matter (PM_{10})	50 µg/m^3 , not to be exceeded more than 35 times a year	24-hour mean

(gravimetric)	40 µg/m^3 (WHO guideline 20 µg/m^3)	Annual mean
Sulphur dioxide	350 µg/m^3 , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3 , not to be exceeded more than 3 times a year (WHO guideline 20 µg/m^3)	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

15.8.5.4 Air Quality Management Areas (AQMAs)

Pembrokeshire County Council currently have two declared AQMAs (Haverfordwest and Pembroke). All AQMAs have been declared due to exceedances of the NO_2 annual mean AQS objective. All AQMA boundaries are either close to, or have busy roads within them, recognising the influence vehicle emissions have upon local air quality. Both Pembroke and Haverfordwest AQMAs have been compliant for three and four years respectively.

Neither of the declared AQMAs are in close proximity to the Proposed Development.

15.8.5.5 Automatic Monitoring Sites

Pembrokeshire County Council undertook automatic (continuous) monitoring at one site during 2024. Narberth Monitoring Station is the only automatic monitoring location within Pembrokeshire County Council and resides approximately 32km southeast of the Proposed Development (as illustrated in Figure 15-3). The details of which are summarised in Table 15-13.

Table 15-13: Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	Associated with (Named) AQMA?	X OS Grid Y OS Grid	Pollutants Monitored	Monitoring Technique	Inlet Height (m)
PEMB	Narberth	Rural	N/A	214374 212774	NO_2, O_3, PM_{10}, $PM_{2.5}$, SO_2	API Analysers, Fidas, Echotech Serinus	2.5

15.8.5.6 Non-Automatic Monitoring Sites

Pembrokeshire County Council undertook non-automatic (passive) monitoring of NO_2 at 45 sites during 2024; however, none are in close proximity to the proposed development. The location of the nearest non-automatic monitoring sites to the Site are shown in Figure 15-5 and summarised in Table 15-14 below.

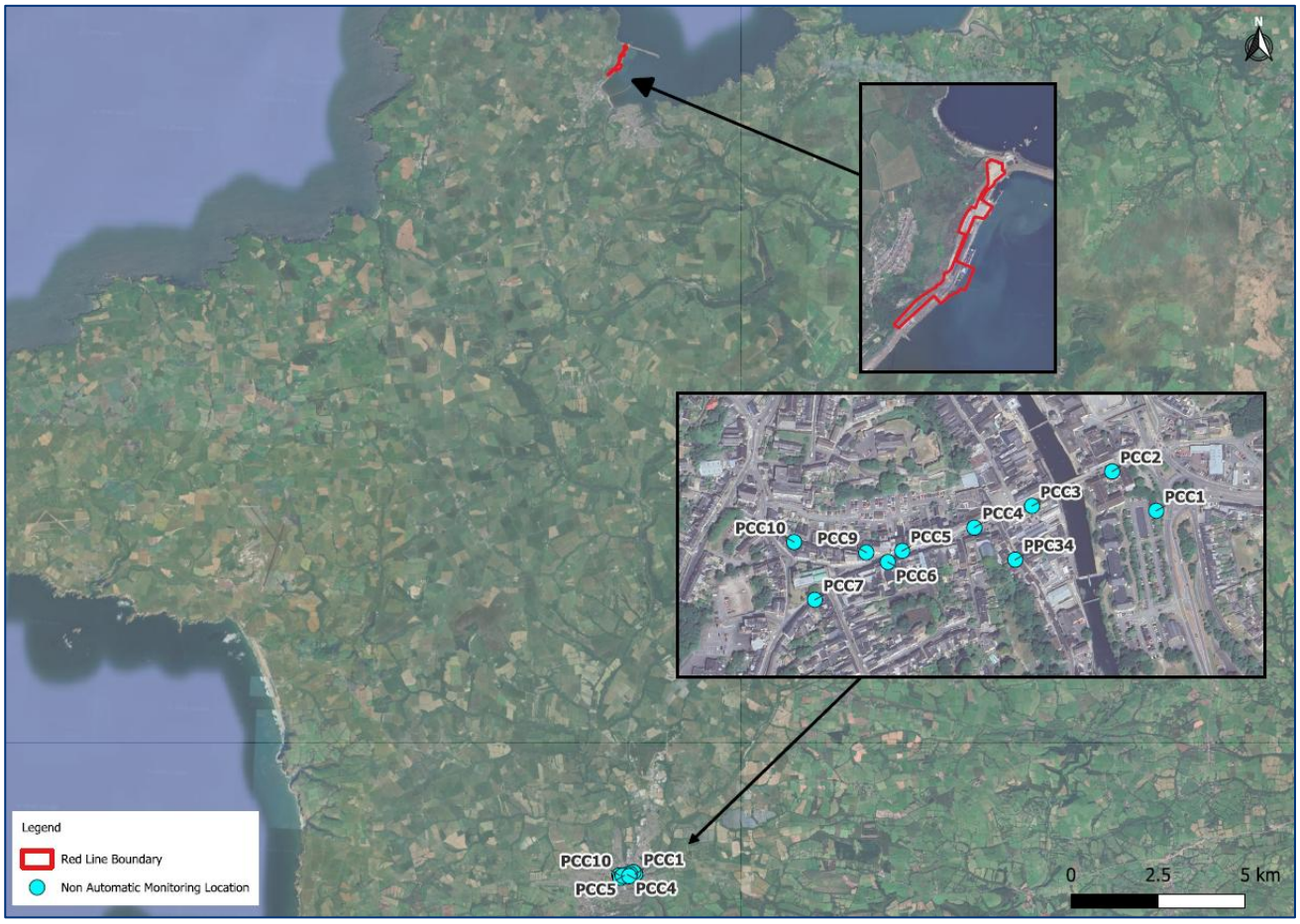

Figure 15-5: Non – Automatic Monitoring Sites Nearest to the Proposed Development

Table 15-14: Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	Associated with Named AQMA?	X OS Grid	Y OS Grid	Tube Height (m)	Collocated with a Continuous Analyser?	Distance from monitor to nearest relevant exposure (m)	Distance to Kerb of Nearest Road (m)	Pollutants Monitored
PCC1	Salutation Square	Roadside	N	195629	215655	2.0	N	N/A	N/A	NO_2
PCC2	Picton Place	Roadside	Y - Haverfordwest AQMA	195574	215704	2.0	N	1.0	2.0	NO_2
PCC3	Victoria Place	Roadside	Y - Haverfordwest AQMA	195474	215661	2.0	N	1.0	1.0	NO_2
PCC4	High St	Roadside	Y - Haverfordwest AQMA	195402	215634	2.0	N	1.0	2.0	NO_2
PCC5	High St	Roadside	Y - Haverfordwest AQMA	195312	215605	2.0	N	1.0	2.0	NO_2
PCC6	High St	Roadside	Y - Haverfordwest AQMA	195294	215591	2.0	N	1.0	2.0	NO_2
PCC7	High St	Roadside	Y - Haverfordwest AQMA	195203	215544	2.0	N	1.0	2.0	NO_2
PCC9	Dark St	Roadside	N	195267	215603	2.0	N	1.0	2.0	NO_2
PCC10	Dark St	Roadside	N	195177	215616	2.0	N	1.0	2.0	NO_2
PPC34	Quay St	Roadside	N	195453	215594	2.0	N	1.0	2.0	NO_2

15.8.5.7 Comparison of Monitoring Results with Air Quality Objectives

15.8.5.7.1 Automatic Monitoring Data

15.8.5.7.1.1 Nitrogen Dioxide

Table 15-15 and Table 15-16 summarises recent monitoring data from the council's nitrogen dioxide automatic analysers for 2024 and preceding years from 2020. In all cases, exceedances of the Air Quality Strategy Objectives are highlighted in bold. The automatic monitoring station located in Narberth continues to report compliance with the annual mean NO_2 AQS objective, with stable concentrations fluctuating between 3 to 4 µg/m^3. This is expected due to the rural nature of the monitoring site.

Table 15-15: Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [1]	Valid Data Capture 2024% [2]	Annual Mean Concentration (µg/m^3)				
					2020	2021	2022[c]	2023	2024
PEMB	Rural	N	97.2	97.2	3.1	3.1	2.9	2.4	2.3

*In **bold**, exceedance of the NO_2 annual mean AQS objective of 40µg/m^3*

*NO2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold** and underlined.*

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table 15-16: Results of Automatic Monitoring for NO_2: Comparison with the 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [1]	Valid Data Capture 2024% [2]	Number of Hourly Means > 200µg/m^3				
					2020	2021	2022[c]	2023	2024
PEMB	Rural	N	97.2	97.2	0	0	0	0	0

*In **bold**, exceedance of the NO_2 hourly mean AQS objective (200 µg/m^3 – not to be exceeded more than 18 times per year)*

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

15.8.5.7.1.2 Particulate Matter (PM10)

Table 15-17: Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [1]	Valid Data Capture 2024% [2]	Annual Mean Concentration (µg/m³)				
					2020	2021	2022[c]	2023	2024
PEMB	Rural	N	100	100	10.5	10.1	11.3	10.0	10.0

*In **bold**, exceedance of the PM_{10} annual mean AQS objective of 40µg/m³*

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%.

(1) Data captures for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table 15-18: Results of Automatic Monitoring for PM_{10} Comparison with the 24-Hour Means Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [1]	Valid Data Capture 2024% [2]	Number of Hourly Means > 50µg/m³				
					2020	2021	2022[c]	2023	2024
PEMB	Rural	N	100	100	1	0	2	0	0

*In **bold**, exceedance of the PM_{10} 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year)*

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

15.8.5.7.1 Particulate Matter ($PM_{2.5}$)

Table 15-19 summarises recent monitoring data from the council's $PM_{2.}$ automatic analysers for 2024 and preceding years from 2020. During 2024 the Narberth automatic monitoring site recorded $PM_{2.5}$ concentrations well below the $PM_{2.5}$ AQS target of 20 µg/m³. There is a minor increase of 0.4 µg/m³ from 2021, but overall, the annual mean concentrations remain relatively stable and consistent over the last five years. There is no LAQM air quality objective for $PM_{2.5}$, however concentrations continue to remain low and consistent.

Table 15-19: Results of Automatic Monitoring for $PM_{2.5}$: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [1]	Valid Data Capture 2024% [2]	Annual Mean Concentration (µg/m³)				
					2020	2021	2022[c]	2023	2024
PEMB	Rural	N	100	100	5.9	6.0	6.4	5.6	6

.All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

15.8.5.7.1.1 Other Pollutants Monitored

The number of 8-hour mean O_3 concentrations greater than 100 µg/m^3 reported at the Narberth automatic monitoring location in 2024 was 37. There is no LAQM air quality objective for O_3, however this does exceed the UK National air quality objective of 100 µg/m^3 not to be exceeded more than 10 times a year.

In relation to SO_2 and associated LAQM air quality objectives the Narberth automatic monitoring station has reported for 2024 a 96% data capture for SO_2 with its Air Pollution Band category detailed as being Low, no exceedances of any of the relevant objectives having taken place. There are three LAQM air quality objectives for SO_2, and Pembrokeshire is compliant for all 3 air quality objectives.

15.8.5.7.2 Diffusion Tube Data

In order to obtain a better understanding of how levels of nitrogen dioxide are varying across the area over time and to investigate those locations where previous rounds of the review and assessment process have highlighted areas of concern, Pembrokeshire County Council undertook non-automatic (passive) monitoring of NO_2 at 45 sites during 2024. Historical data from the nearest tubes to the Proposed Development where it is available is summarised in Table 15-20. Table 15-21 provides a full summary of monthly concentrations for 2024.

Table 15-20: Results of NO_2 Diffusion Tubes (2020 to 2024)

Site ID	Site Location	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				2020	2021	2022	2023	2024
PCC1	Salutation Square	Roadside	N	13.7	17.3	16.2	14.4	14.6
PCC2	Picton Place	Roadside	Y - Haverfordwest AQMA	16.2	19.3	20.6	19.8	18.3
PCC3	Victoria Place	Roadside	Y - Haverfordwest AQMA	15.8	18.9	16.4	18.5	16.4
PCC4	High St	Roadside	Y - Haverfordwest AQMA	24.8	26.9	22.9	22.2	22.2
PCC5	High St	Roadside	Y - Haverfordwest AQMA	28.9	29.1	26.8	26.4	24.9
PCC6	High St	Roadside	Y - Haverfordwest AQMA	24.2	27.9	25.9	24.7	23.9
PCC7	High St	Roadside	Y - Haverfordwest AQMA	25.2	29.6	27.5	26.2	25.5
PCC9	Dark St	Roadside	N	16.3	18.5	18.9	17.3	13.4

Site ID	Site Location	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				2020	2021	2022	2023	2024
PCC10	Dark St	Roadside	N	13.4	12.1	13.4	12.9	10.2
PPC34	Quay St	Roadside	N	13.1	16.1	16.4	15.5	14.8

In bold, exceedance of the NO_2 annual mean AQS objective of 40µg/m^3

Underlined, annual mean > 60µg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table 15-21: Full Monthly Diffusion Tube Results for 2024 (µg/m^3)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.83) and Annualised
PCC1	24.7	16	16.2	15.9	15.5	13.9	14.8	11.3	19.4	21.7	23.3	16.3	17.4	14.6
PCC2	27.1	24.1	23.1	20.2	19.5	17.6	18.9	20.1	22.2	-	27.3	20.1	21.8	18.3
PCC3	26.2	22.1	20.4	17.5	15.6	14.9	15.6	-	-	22.1		20.6	19.5	16.4
PCC4	29.5	30.9	22.4	25.5	25.5	26.5	25.8	24.1	-	-	26.5	27.2	26.4	22.2
PCC5	31.8	33.3	30.5	28.7	30.5		29.1	25.4	28.6	29.3	31	28.2	29.7	24.9
PCC6	33	33.3	30.7	26.1	26.3	23.3	25.4	-	-	29.6	30.4	26.8	28.5	23.9
PCC7	31.1	32.8	-	28.8	31.9	-	28.5	25.7	29.6	35	33.1	27.6	30.4	25.5
PCC9	25.3	22.4	19.6	16.4	15.6	14.2	-	10	15.4	13.8	10.8	12.6	16	13.4
PCC10	18.4	16.2	16.2	12.3	10.7	9.5	10.7	7	9.2	12.2	14.3	9.6	12.2	10.2
PPC34	24.2	20.6	16.6	16.6	13.7	14.7	15.2	13.8	18.3	16.7	21.6	19.8	17.6	14.8

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in bold.

NO_2 annual means exceeding 60µg/m^3 , indicating a potential exceedance of the NO_2 1-hour mean objective are shown in bold and underlined.

15.8.6 DEFRA Mapped Concentration Estimates

DEFRA issued revised 2021 based background maps for Oxides of Nitrogen - NO_X, Nitrogen Dioxide - NO_2, Particulate Matter - PM_{10} and Particulate Matter - $PM_{2.5}$ which incorporate updates to the input data used for modelling. The main purpose of the background maps is to provide estimates of background concentrations for specific pollutants. These can then be used in air quality assessments to better understand the contribution of local sources to total pollutant concentrations. They provide information on how pollutant concentrations change over time and across a wide area; they also provide an estimated breakdown of the relative sources of pollution.

The total concentration of a pollutant comprises those from explicit local emission sources such as, roads, chimneystacks, etc., and those that are transported into an area by the wind from further away. If all the local sources were removed, all that would remain is that which comes in from further away; it is this component that is called 'background'.

In many situations the background contribution may represent a significant or dominant proportion of the total pollutant concentration, so it is important that authorities give this careful consideration. A good understanding of background concentrations is important when completing air quality assessments as it allows for a good understanding of local pollutant sources.

The current background concentration maps for Wales (2021 reference year) are available. A file is also available for each year between 2021 and 2040 covering all Wales that provides the maps for on the British Grid. The use of background concentrations within the air quality concentration prediction process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants within the vicinity of the study site include industrial, domestic and rail emissions.

The DEFRA results for the six closest locations to the Proposed Development site, shown in Figure 15-6 below are detailed in Table 15-22 -Table 15-27.

Figure 15-6: DEFRA Results for the Six Closest Locations to the Site

Table 15-22: DEFRA Location 1 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 - 2029

DEFRA Location 1							
	X Co-ordinates: 194,500			Y Co-ordinates: 239,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	2.73	2.63	2.53	2.45	2.36	2.28	2.19
NO_2	2.23	2.15	2.07	2.01	1.94	1.87	1.80
PM_{10}	9.00	8.92	8.85	8.77	8.70	8.62	8.55
$PM_{2.5}$	4.81	4.74	4.68	4.62	4.55	4.49	4.42

Table 15-23: DEFRA Location 2 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 – 2029

DEFRA Location 2							
	X Co-ordinates: 195,500			Y Co-ordinates: 239,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	2.87	2.76	2.64	2.56	2.47	2.38	2.29
NO_2	2.35	2.26	2.16	2.09	2.02	1.95	1.88
PM_{10}	8.28	8.21	8.14	8.06	7.99	7.91	7.84
$PM_{2.5}$	4.72	4.65	4.59	4.53	4.46	4.40	4.33

Table 15-24: DEFRA Location 3 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 – 2029

DEFRA Location 3							
	X Co-ordinates: 196,500			Y Co-ordinates: 239,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	2.72	2.61	2.51	2.43	2.34	2.26	2.18
NO_2	2.22	2.14	2.06	1.99	1.92	1.85	1.79
PM_{10}	8.12	8.04	7.97	7.90	7.82	7.75	7.67
$PM_{2.5}$	4.68	4.61	4.55	4.49	4.42	4.36	4.30

Table 15-25: DEFRA Location 4 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 – 2029

DEFRA Location 4							
	X Co-ordinates: 194,500			Y Co-ordinates: 238,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	3.01	2.89	2.78	2.68	2.57	2.47	2.37
NO_2	2.46	2.36	2.27	2.19	2.11	2.03	1.95
PM_{10}	8.61	8.53	8.45	8.37	8.29	8.22	8.14
$PM_{2.5}$	4.96	4.89	4.82	4.75	4.69	4.62	4.56

Table 15-26: DEFRA Location 5 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 – 2029

DEFRA Location 5							
	X Co-ordinates: 195,500			Y Co-ordinates: 238,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	3.15	3.00	2.86	2.76	2.66	2.56	2.46
NO_2	2.57	2.45	2.33	2.26	2.18	2.10	2.02

DEFRA Location 5							
	X Co-ordinates: 195,500			Y Co-ordinates: 238,500			
PM_{10}	8.35	8.28	8.20	8.12	8.05	7.97	7.90
$PM_{2.5}$	4.81	4.74	4.68	4.61	4.55	4.48	4.42

Table 15-27: DEFRA Location 6 Background Results (NO_x, NO_2, PM_{10}, $PM_{2.5}$) 2023 - 2029

DEFRA Location 6							
	X Co-ordinates: 196,500			Y Co-ordinates: 238,500			
	2023	2024	2025	2026	2027	2028	2029
NO_x	2.82	2.71	2.60	2.51	2.42	2.33	2.24
NO_2	2.31	2.22	2.13	2.06	1.98	1.91	1.84
PM_{10}	8.25	8.18	8.11	8.03	7.96	7.88	7.81
$PM_{2.5}$	4.73	4.67	4.61	4.54	4.48	4.42	4.35

Based on the DEFRA Background Mapping data for Wales from 2023 to 2029, DEFRA Location 1 exhibits the highest predicted overall concentrations of PM_{10} while DEFRA Location 3 recorded the lowest levels. Predicted elevated levels of PM_{10} in locations near ports and ferry terminals can be attributed to several interrelated factors. High volumes of vehicular traffic, including trucks and passenger vehicles, contribute to emissions from exhaust, brake wear, and tire wear, particularly in congested areas where vehicles may idle. Additionally, industrial activities associated with loading and unloading cargo can generate dust, while marine emissions from vessels, especially those using heavy fuel oil, release significant amounts of particulate matter into the atmosphere. Environmental factors, such as geographical location and seasonal variations, can exacerbate these emissions, as wind patterns may carry dust from nearby industrial sites. Furthermore, while DEFRA locations 1 and 4 are situated in more rural settings, they can still experience elevated PM_{10} levels due to their proximity to urban areas and the influence of regional traffic and agricultural activities. Collectively, these factors create a complex interplay that leads to higher PM_{10} concentrations, necessitating targeted air quality management strategies to mitigate their impact. Over the years, all locations show a decreasing trend in pollutant levels.

15.9 Impact Assessment

15.9.1 Do Nothing Scenario

In the event of a 'do-nothing' scenario regarding the proposed replacement of the existing temporary linkspan structure at the Stena Line ferry terminal in Fishguard, the current air quality conditions would remain unchanged. The existing temporary linkspan, which is nearing the end of its useful life, would continue to operate, potentially leading to increased emissions from idling vehicles and inefficient ferry operations during peak times. Without the proposed floating linkspan pontoon, the ferry terminal would face ongoing operational limitations, resulting in prolonged shutdowns and delays that could exacerbate congestion and air pollution in the surrounding area. Furthermore, the absence of necessary civil engineering works, such as dredging and land reclamation, would hinder the terminal's ability to accommodate modern vessels, ultimately affecting the efficiency of transport services and contributing to a stagnant air quality situation. Overall, the do-nothing approach would perpetuate existing air quality issues without providing any improvements or mitigation measures that the new infrastructure could offer.

15.9.2 Sensitive Receptors

15.9.2.1 People and Property

The air quality residential and non-residential sensitive receptors are illustrated in Figure 15-7, with a summary of their receptor ID and distance from site boundary demonstrated in Table 15-28 and Table 15-29. The nearest residential sensitive receptor is Residential Receptor ID 1 at approximately 16m. The nearest non-residential sensitive receptor has been chosen for completeness however are workspaces associated with the ferry terminal. Which may not be in operation during construction.

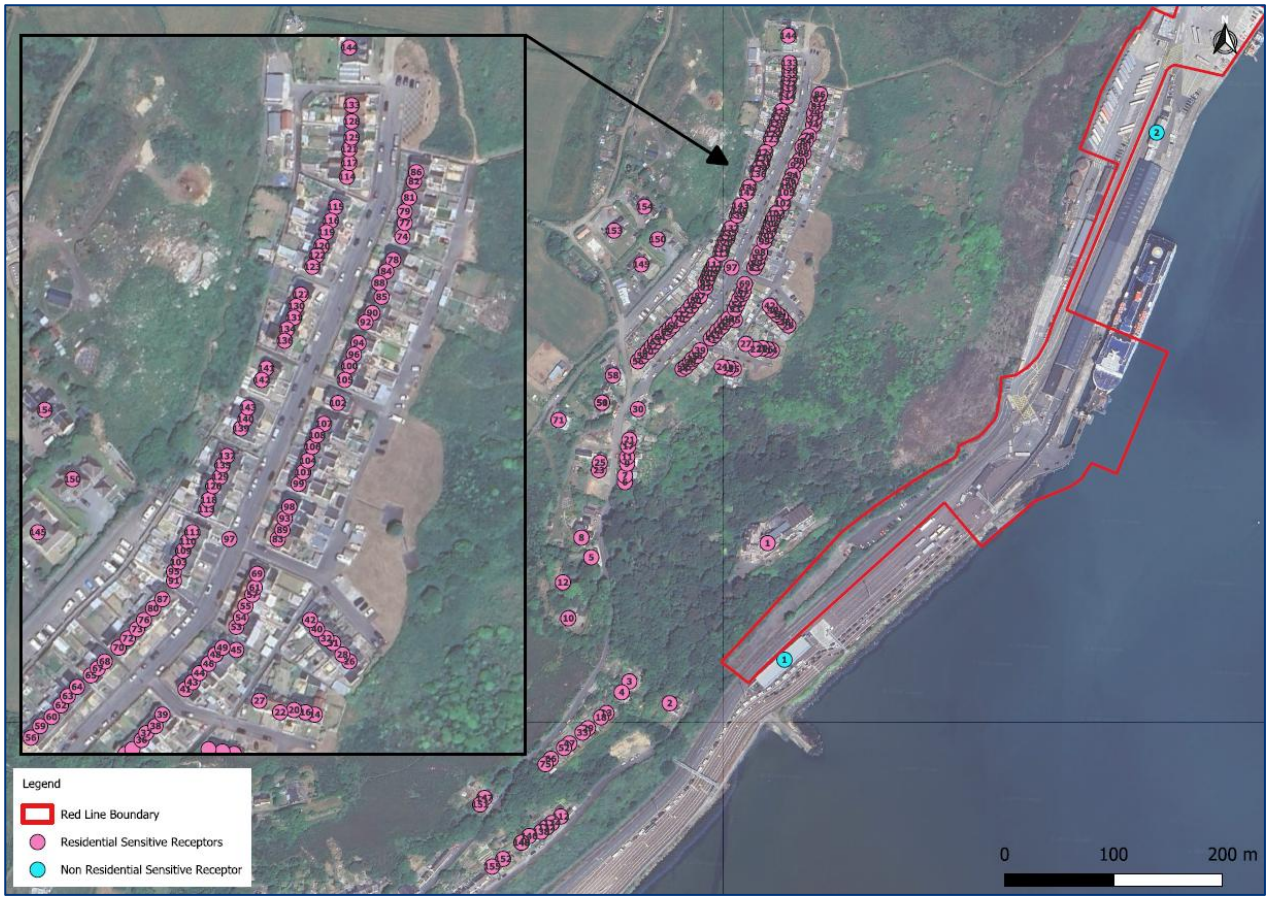

Figure 15-7: Residential and Non-Residential Sensitive Receptors

Table 15-28: Residential Sensitive Receptors within 100m of Proposed Development

Receptor ID	Eastings	Northings	Distance to Boundary (m)
1	194871	238678	43
2	194781	238531	61
3	194744	238551	86
4	194737	238541	96
5	194709	238665	154
6	194740	238734	177
7	194740	238740	181
8	194700	238683	172
9	194742	238751	187
10	194688	238609	146
11	194742	238757	191
12	194683	238642	163
13	194723	238522	115
14	194875	238855	172
15	194840	238838	179
16	194871	238856	175
17	194743	238767	197
18	194718	238518	122
19	194835	238839	183
20	194866	238857	178
21	194744	238773	201
22	194860	238856	181
23	194716	238745	202
24	194829	238840	187
25	194717	238752	206
26	194890	238878	182
27	194851	238861	191
28	194887	238881	187
29	194706	238508	137
30	194752	238801	214
31	194883	238886	193
32	194880	238888	196
33	194701	238504	143
34	194793	238838	209
35	194796	238840	209
36	194800	238844	209
37	194802	238847	210
38	194806	238850	210
39	194809	238855	212
40	194876	238892	202
41	194819	238866	214
42	194873	238896	207
43	194822	238869	215
44	194825	238873	216
45	194841	238883	214

Receptor ID	Eastings	Northings	Distance to Boundary (m)
46	194829	238877	217
47	194689	238494	158
48	194832	238881	218
49	194835	238884	219
50	194719	238807	242
51	194719	238807	242
52	194684	238490	164
53	194841	238893	222
54	194843	238897	224
55	194845	238902	227
56	194752	238845	244
57	194848	238907	230
58	194729	238832	252
59	194756	238850	244
60	194761	238854	243
61	194849	238910	232
62	194765	238859	244
63	194768	238863	245
64	194772	238867	245
65	194778	238872	244
66	194672	238480	180
67	194781	238875	245
68	194784	238878	245
69	194850	238916	236
70	194790	238884	246
71	194679	238791	261
72	194794	238888	247
73	194798	238892	248
74	194913	239062	246
75	194667	238475	187
76	194801	238896	249
77	194914	239068	245
78	194909	239052	249
79	194914	239073	246
80	194805	238901	250
81	194916	239079	245
82	194918	239086	244
83	194859	238931	244
84	194906	239047	252
85	194904	239036	254
86	194919	239090	244
87	194809	238905	251
88	194903	239042	255
89	194861	238935	246
90	194900	239029	258
91	194814	238913	254
92	194897	239025	261

Receptor ID	Eastings	Northings	Distance to Boundary (m)
93	194862	238940	249
94	194894	239016	265
95	194814	238917	257
96	194892	239011	265
97	194838	238931	255
98	194864	238945	249
99	194868	238955	251
100	194890	239006	263
101	194870	238960	251
102	194885	238990	256
103	194816	238921	259
104	194872	238965	252
105	194888	239000	260
106	194874	238971	254
107	194879	238981	256
108	194876	238976	255
109	194818	238926	262
110	194820	238930	264
111	194822	238934	267
112	194681	238427	204
113	194828	238944	272
114	194889	239088	273
115	194884	239075	276
116	194882	239069	277
117	194890	239094	273
118	194829	238948	274
119	194880	239064	279
120	194878	239058	280
121	194890	239100	274
122	194876	239054	282
123	194874	239049	284
124	194673	238421	214
125	194891	239105	275
126	194831	238954	278
127	194869	239037	289
128	194891	239112	276
129	194834	238958	280
130	194867	239032	291
131	194866	239027	292
132	194668	238417	221
133	194891	239119	278
134	194863	239022	294
135	194835	238963	283
136	194862	239017	291
137	194837	238967	284
138	194663	238413	227
139	194843	238979	284

Receptor ID	Eastings	Northings	Distance to Boundary (m)
140	194845	238983	285
141	194854	239005	290
142	194852	239000	289
143	194846	238988	287
144	194890	239144	287
145	194755	238934	307
146	194652	238409	238
147	194611	238444	251
148	194645	238403	247
149	194645	238403	247
150	194770	238957	316
151	194607	238438	257
152	194628	238388	270
153	194730	238965	347
154	194758	238987	347
155	194618	238381	282

Table 15-29: Non-Residential Sensitive Receptors within 100m of Proposed Development

Receptor ID	Eastings	Northings	Distance to Boundary (m)
1	194887	238571	7
2	195228	239055	13

15.9.2.2 Ecological

The air quality ecological sensitive receptors are illustrated in Figure 15-8, with a summary of their receptor ID and distance from site boundary demonstrated in Table 15-30. The Proposed Development resides within West Wales Marine / Gorllewin Cymru Forol SAC.

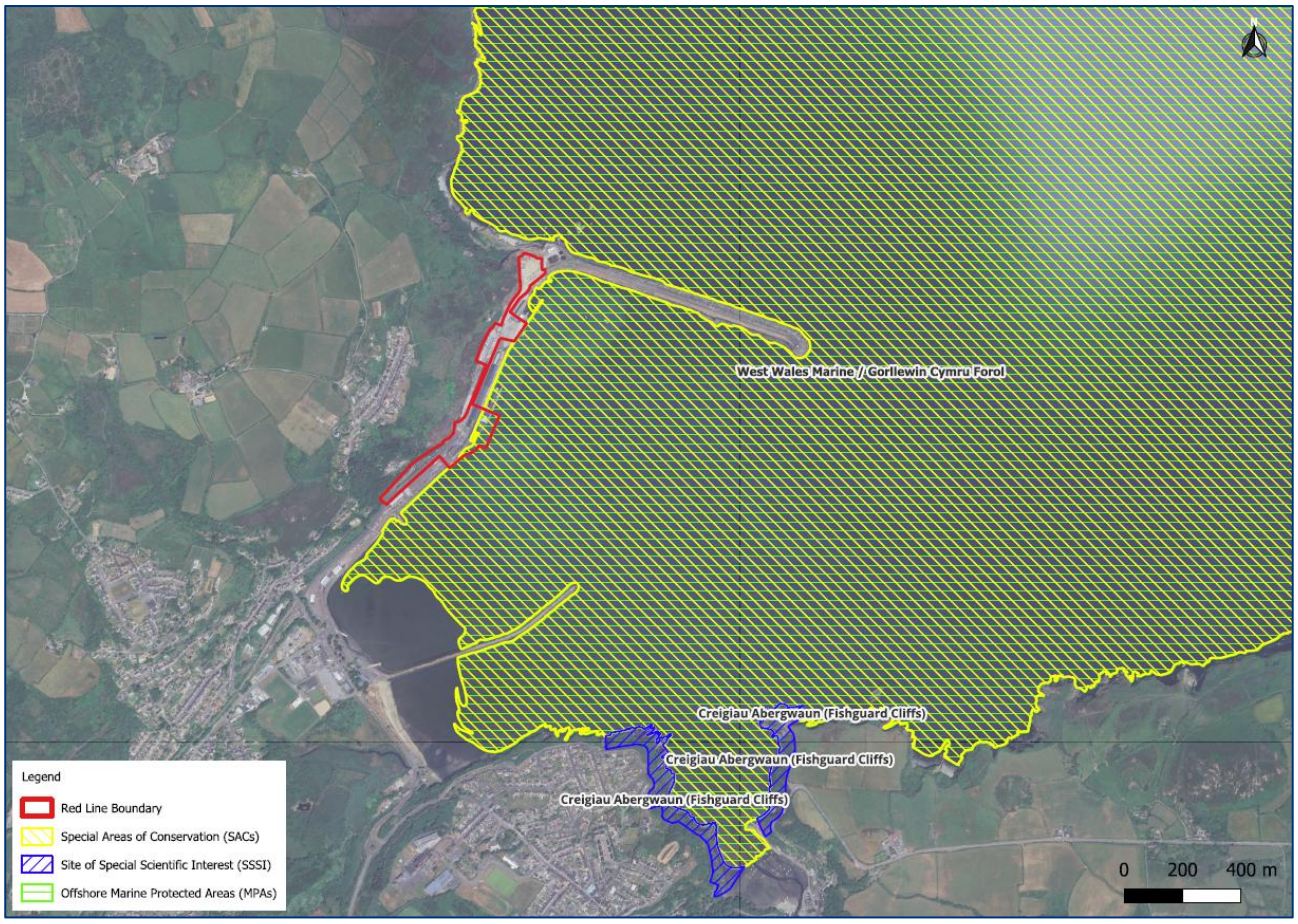

Figure 15-8: Ecological Sensitive Receptors

Table 15-30: Ecological Sensitive Receptor Distances

Receptor ID	Distance to Boundary (km)
West Wales Marine / Gorllewin Cymru Forol SAC	0
Creigiau Abergwaun (Fishguard Cliffs) SSSI	1.0

15.9.3 Assessment of Construction Effects

The terms effect and impact are defined here, where the definitions are drawn from the glossary of terminology within the IAQM Guidance on the assessment of dust from demolition and construction:

- **Impact**: The changes in airborne concentrations and/or dust deposition;
- **Effect**: The consequences of the changes in airborne concentrations and/or dust deposition for a receptor. These might manifest as annoyance due to soiling, increased morbidity or mortality due to exposure to PM_{10} or $PM_{2.5}$ or plant dieback due to reduced photosynthesis. The term 'significant effect' has a specific meaning in EIA regulations. The opposite is an insignificant effect. In the context of construction impacts any effect will usually be adverse, however, professional judgement is required to determine whether this adverse effect is significant based on the evidence presented.

In terms of this construction assessment the following IAQM guidance was used:

- Guidance on the assessment of dust from demolition and construction (January 2024); and
- A guide to the assessment of air quality impacts on designated nature conservation sites (May 2020).

These set out definitions against specific construction phase (setting our magnitude of impact, sensitivity of receptor and significance of effect). These are detailed in the following sections.

15.9.3.1 Construction Dust

The type of activities that could cause fugitive dust emissions are earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site. The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

15.9.3.1.1 Risk of Impact and Sources

In accordance with the IAQM guidance the main sources of dust from construction sites are earthworks, construction and track-out. All earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m and 250 m of the site boundary have been identified and are illustrated in Figure 15-9 and Figure 15-10. The sensitivity of the area has been classified and the results are provided in Table 15-31 -

Table 15-32.

Figure 15-9: Construction Dust Assessment – Distance Bandings(m) from Site Boundary (Human)

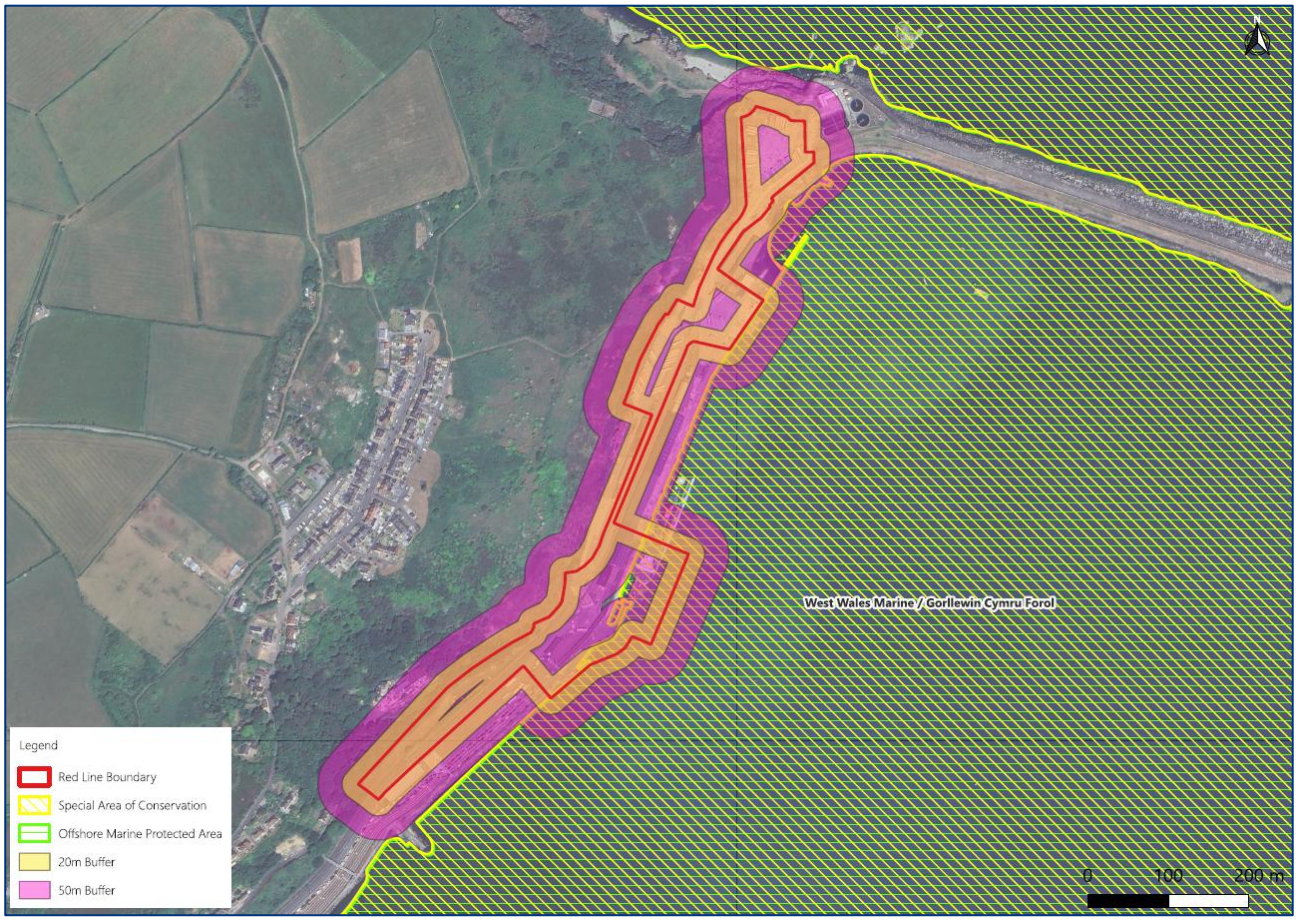

Figure 15-10: Construction Dust Assessment – Distance Bandings(m) from Site Boundary (Ecology)

Table 15-31: Sensitivity of the Surrounding Area for Demolition Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	**Medium**	1-10 High sensitivity receptor located within 20m of the site boundary
Human Health	**Low**	Background annual-mean PM_{10} concentration for the assessment = 8.06 $\mu g.m^{-3}$ (taken from nearest DEFRA Location 2 within Table 15-23) 1-10 High sensitivity receptor located within 20m of the site boundary
Ecological	**High**	High Receptor Sensitivity is within the site boundary

The dust emission magnitude for track-out is classified as low and track-out may occur on roads up to 200m from the site. The sensitivity of the area has been classified, and the results are provided in Table 15-32 below.

Table 15-33 summarises the dust impact.

Table 15-32: Sensitivity of the Surroundings Area for Track-out

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	**Medium**	1-10 High sensitivity receptor located within 20m of the site boundary
Human Health	**Low**	Background annual-mean PM_{10} concentration for the assessment = 8.06 $\mu g.m^{-3}$ (taken from nearest DEFRA Location 2 within Table 15-23) 1-10 High sensitivity receptor located within 20m of the site boundary
Ecological	**High**	High Receptor Sensitivity is 2km of the site boundary

Table 15-33: Dust Impact Risk for Demolition, Earthworks, Construction and Track-out

Source	Dust Emission Magnitude	Receptor Sensitivity (Soiling, PM_{10})	Receptor Sensitivity (Ecological)	Risk of Dust Impacts (People and Property)	Risk of Dust Impacts (Ecology)
Demolition	Small	Medium	High	**Low Risk**	**Medium Risk**
Earthworks	Medium	Medium	High	**Medium Risk**	**Medium Risk**
Construction	Medium	Medium	High	**Medium Risk**	**Medium Risk**
Trackout	Small	Medium	High	**Negligible**	**Low Risk**

Taking the site as a whole, the overall risk is deemed to be **Medium Risk**. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Section 15.10.1. Mitigation measures are detailed in this report that will control dust during the construction phases of the Proposed Development this will reduce the risk to negligible/not significant. Provided this package of mitigation measures (set out in this report) are implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that;

"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'." (IAQM, 2024).

The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

Demolition could cause fugitive dust emissions. The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place. Areas of demolition are illustrated below in Figure 15-11.

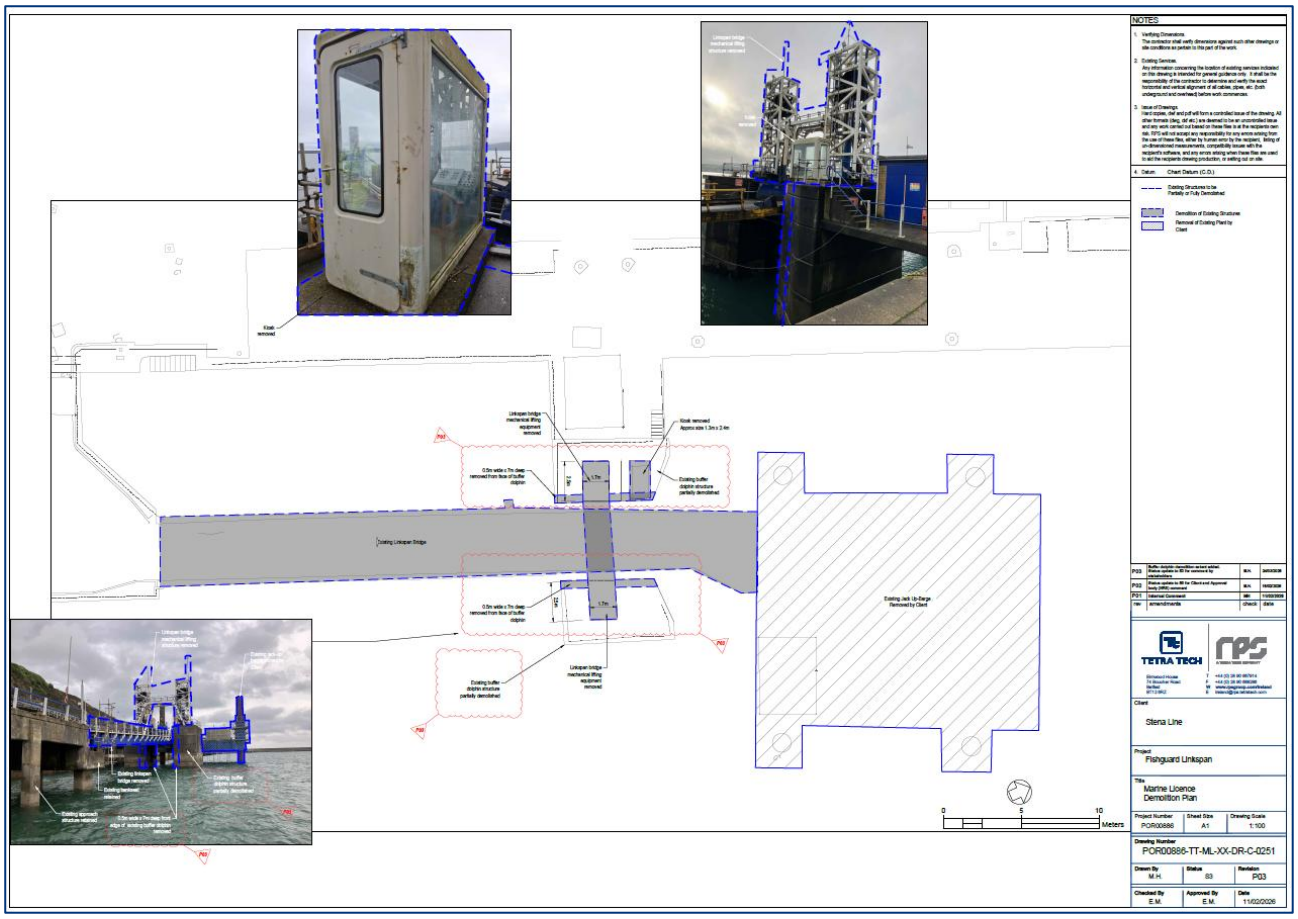

Figure 15-11: Site Clearance

15.9.3.2 Dredged Material

No dredging activities have been conducted in the harbour for the past ten years. Plough dredging is proposed in the area of scour protection to remove a layer of soft material before the scour protection is installed.

It will be necessary to demolish or dismantle a number of structures to enable the construction of the civil engineering works and the installation of the linkspan pontoon using a plough dredger.

The dredged material will be placed in an area within the berth that has experienced scour. It is anticipated that approximately 2500m^3 of material will be redistributed in the berth.

The dredge material is expected to be loose silts and sands.

It is important to note at the outset that one of the principal factors affecting dust generation and dust deposition relates to moisture content. Moisture increases the mass of a dust particle meaning particles are less friable and hence, less prone to dust dispersion. In most construction projects, the principal means of dust suppression is through maintaining a high moisture level on dust particles. In the case of the proposed works at Fishguard, all dredged material will inherently have high moisture content and hence a lower risk of dust impact.

The dredging operations are considered very low risk for dust impacts given that this material will have very high moisture content (circa 50% by weight). This is also the case for the transport of this material. As such, these operations are considered to have negligible dust impacts and are not considered further in this assessment.

15.9.4 Assessment of Operational Effects

15.9.4.1 Operational Phase Shipping Emissions

In addition to road transport, marine transport is also a potential source of GHG from the proposed development. Given the existing legal requirements around fuel and emissions for shipping, the extent of emissions per vessel are gradually reducing and will continue to reduce in future years. Given the existing legal requirements around fuel and emissions for shipping, the extent of emissions per vessel are gradually reducing and will continue to reduce in future years. Therefore, operational impacts are not likely to be significant.

In Wales, shipping emissions from ferries are governed by several key pieces of legislation, including the Clean Air Act, which provides a framework for air quality management; the Marine and Coastal Access Act 2009, which addresses environmental protection in marine resources; and the Environment (Wales) Act 2016, which promotes sustainable management of natural resources. Additionally, the Pollution Prevention and Control (PPC) Regulations require ports to obtain permits that manage emissions, while the EU's Marine Strategy Framework Directive influences policies on marine environmental protection. Internationally, the International Maritime Organization (IMO) regulations, particularly the MARPOL convention, set global standards for shipping emissions, which are implemented through UK national legislation, including in Wales. Together, these laws create a comprehensive regulatory framework for managing ferry emissions and protecting air quality.

The Local Air Quality Management Technical Guidance (TG22) highlights the significant impact of shipping and port operations on local air quality due to emissions from vessels, cargo handling equipment, and associated land transport activities. It identifies ships as major sources of pollutants such as nitrogen oxides (NOx), sulphur dioxide (SO_2), particulate matter (PM), and volatile organic compounds (VOCs). The guidance emphasizes the necessity for thorough assessments of air quality impacts, including operational emissions from vessels at berth and land-based activities. It recommends implementing mitigation measures, such as using cleaner fuels and shore power, optimizing logistics to reduce idling, and ongoing monitoring of air quality to ensure compliance with standards. Additionally, TG22 encourages collaboration among stakeholders, including port authorities and local communities, to develop effective air quality management strategies, ultimately aiming to protect public health and the environment.

15.9.4.2 Operational Phase Traffic Emissions

Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel size are not expected to increase above existing levels. The related number of generated vehicle movements are also not expected to increase above existing levels.

Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed and no requirement for an assessment of operational effects.

15.10 Mitigation

15.10.1 Construction Phase Mitigation Measures

The 2024 IAQM dust guidance list mitigation measures for low, medium and high dust risks.

As summarised in

Table 15-33, the predicted Dust Impact Risk is classified as **Medium Risk** for Demolition, **Medium Risk** for Earthworks, **Medium Risk** for Construction and **Low Risk** for Trackout. Table 15-34 and Table 15-35 detailing specific mitigation for Demolition, Earthworks, Construction and Trackout.

Key to tables:

- **H** Highly recommended
- **D** Desirable
- **N** Not required

Table 15-34: Mitigation for all Sites: Communications

Mitigation measure	Low Risk	Medium Risk	High Risk
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.		**H**	
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.		**H**	
Site Management			
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.		**H**	
Make the complaints log available to the local authority when asked.		**H**	
Monitoring – No Dust Monitoring Proposed			
Preparing and Maintaining the Site			
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.		**H**	
Erect solid screens or barriers along boundaries nearest sensitive receptors, or the site boundary that are at least as high as any stockpiles on site.		**H**	
Avoid site runoff of water or mud.		**H**	

Mitigation measure	Low Risk	Medium Risk	High Risk
Keep site fencing, barriers and scaffolding clean using wet methods.		H	
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.		H	
Cover, seed or fence stockpiles to prevent wind whipping.		H	
Operating Vehicle/Machinery and Sustainable Travel			
Ensure all vehicles switch off engines when stationary - no idling vehicles.		H	
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.		H	
Operations			
Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.		H	
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate.		H	
Use enclosed chutes and conveyors and covered skips.		H	
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.		H	
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.		H	
Waste Management			
Avoid bonfires and burning of waste materials.		H	

Table 15-35: Measures Specific to Demolition, Earthworks, Construction and Trackout

Mitigation Measure	Low Risk	Medium Risk	High Risk
Demolition			
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can		H	

Mitigation Measure	Low Risk	Medium Risk	High Risk
produce fine water droplets that effectively bring the dust particles to the ground.			
Avoid explosive blasting, using appropriate manual or mechanical alternatives.		H	
Bag and remove any biological debris or damp down such material before demolition.		H	
Earthworks			
Minimise drop heights from loading or handling equipment/materials and use fine water sprays on such equipment wherever appropriate.		D	
Dampening methods will be used where necessary.		D	
Methods and equipment will be in place for immediate clean-up of spillages of dusty or potentially dusty materials.		D	
Construction			
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.		H	
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.		D	
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.		D	
Trackout			
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D		

The IAQM guidance on dust states that residual impacts are usually *"not significant"* where recommended mitigation is applied, and suggests securing those measures by planning condition, legal undertaking, or statutory provision.

15.10.1.1 Complaints Procedure

All complaints received in relation to air quality and dust are during construction phases of the Proposed Development will be referred to the appointed contractor. Contact details of the appointed contractor foreman will be visible and accessible to nearest surrounding receptors. All complaints regarding dust emissions will be recorded and reported to the Site Manager, who will investigate the circumstances and ensure that the necessary corrective measures are taken.

15.10.2 Operational Phase Mitigation Measures

There is no operational mitigation measures predicted as there are no significant adverse impacts associated with the operational phase of the scheme and emissions to air.

15.10.3 Future Monitoring

No future monitoring is required during either the construction or the operational phase of the Proposed Development.

15.11 Assessment of Residual Effects

Construction stage impacts will be short duration, and upon completion, will have no further impact on the local environment. Mitigation measures have been outlined to control dust during the construction stage, to minimise the potential for impact. Following implementation of these measures, a short term, and localised minor impact is likely. Having considered the characteristics of the proposed development, the predicted impact from the operational phase on air quality are expected to be minimal. The new linkspan pontoon will enhance operational efficiency, reducing vehicle idling times and emissions during ferry operations. Additionally, the upgraded infrastructure will facilitate smoother traffic flow and improved access for both vehicles and pedestrians, further contributing to better air quality in the surrounding area.

15.12 Cumulative Effects

Should the construction phase of the proposed development coincide with the construction of any other proposed or permitted developments within 250m of the site then there is the potential for cumulative dust impacts to the nearby sensitive receptors. The mitigation measures outlined in Section 15.10 of this chapter should be applied throughout the construction phase of the proposed development, with similar mitigation measures applied for other proposed or permitted developments which will avoid significant cumulative impacts on air quality.

With appropriate mitigation measures in place, the predicted cumulative impacts on air quality associated with the construction phase of the proposed development are deemed short-term and not significant. If additional residential or commercial developments are proposed in the future in the vicinity of the proposed development, this has the potential to add further additional vehicles to the local road network. However, due to the location of the proposed development and as the traffic impact for the proposed development has an imperceptible impact on air quality, it is unlikely that other future developments of similar scale would give rise to a significant impact during the construction and operational stages of those projects.

15.12.1 In-combination effects

Future projects of a large scale would need to conduct an EIA to ensure that no significant impacts on air quality will occur as a result of those developments.

15.12.2 Effects interactions

All environmental factors are inter-related to some extent. Interactions within the study area can be one-way interactions, two-way interactions and multiple-phase interactions may be influenced by the Proposed Development. An assessment of the interaction between environmental factors are required under Article 3(1)(e) of the EIA Directive – 1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

a. Population and human health;

b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

c. Land, soil, water, air and climate;

d. Material assets, cultural heritage and the landscape;

e. The interaction between the factors referred to in points (a) to (d).

The interactions between impacts on different environmental factors will be considered, addressed and outlined as relevant throughout the ES. Air quality is most likely to have an inter relationship with traffic, geology and soils (including contaminated land) and human health.

15.13 Limitations of the Assessment

In preparing this AQ chapter the best available data has been used to undertake the assessment. However, the assessment is subject to limitations which introduce uncertainty into the results.

Key limitations include gaps in local monitoring data and the spatial resolution of background concentration datasets; assumptions in traffic, shipping and operational forecasts and associated emission factors (including fuel type and engine operating modes); dependence on selected meteorological years; and simplifications inherent in dispersion modelling and receptor representation. Predicted residual effects also assume timely and effective implementation of mitigation measures. Changes in legislation, future IMO amendments, or unplanned cumulative developments could affect outcomes. These limitations mean that quantitative results should be interpreted as indicative; and secured mitigations are recommended to manage uncertainty

15.14 Summary of Effects and Conclusion

In relation to air quality, for the construction phase, an important consideration is dust. In the absence of mitigation there is the potential for significant, negative, short-term impacts to nearby sensitive receptors as a result of dust emissions from the Proposed Development. The mitigation measures provided within this assessment will ensure that the risk of adverse dust effects is reduced to a level categorised as “**negligible**”. Another important issue during the construction phase is construction traffic but due to the nature and scale of the project the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is “negligible”, as detailed in 15.14.

Pollutant concentrations are predicted to be within the relevant health-based air quality objectives. Therefore, air quality is acceptable at the receptors surrounding the development site, making it suitable for its proposed uses. The operational impact of the Proposed Development on existing receptors is predicted to be ‘negligible’ taking into account the changes in pollutant concentrations and absolute levels. Using the significance criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be ‘not significant’ overall.”

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Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Dust Soiling	✓	×	The project includes measures to manage dust soiling during construction, such as using water sprays and dust suppressants during demolition and dredging and implementing traffic management to reduce congestion to ensure minimal impact on air quality and the surrounding community.	C: Medium O: N/A	C: High O: N/A	C: Moderate but with mitigation "**negligible**" O: N/A	None	None	None
Human Health	✓	×	The project incorporates measures to protect human health during construction by implementing dust control strategies, such as water sprays and dust suppressants, managing traffic to minimize congestion and emissions to ensure that any potential impacts on local residents are kept to a minimum.	C: Low O: N/A	C: High O: N/A	C: Minor but with mitigation "**negligible**" O: N/A	None	None	None
Ecological	✓	×	Refer to Chapter 7 Biodiversity Marine and 8 Biodiversity Terrestrial & Birds	C: High O: N/A	C: High O: N/A	C: Moderate but with mitigation "**negligible**" O: N/A	None	None	None

15.15 References

- Air Quality (Wales) Regulations 2000, as amended by the Air Quality (Wales) (Amendment) Regulations 2002;
- Air Quality in Wales 2023/2024 Report;
- Clean Air for Europe (CAFE) Directive (2008/50/EC) (European Parliament, 2008);
- Design Manual for Roads and Bridges. (National Highways, 2019);
- Environment (Air Quality and Soundscapes) (Wales) Act 2024;
- Local Air Quality Management (LAQM) Technical Guidance 2022;
- Pembrokeshire County Council 2025 Air Quality Progress Report;
- Well-being of Future Generations (Wales) Act 2015; and
- World Health Organisation Air Quality Guidelines 2005 (WHO, 2005).

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 16 Cultural Heritage

16 Cultural Heritage

16.1 Introduction

This chapter assesses the likely significant effects of the Proposed Development relating to historic assets, including archaeology and built heritage. It considers all phases of the Proposed Development's lifespan and impacts relating to both physical fabric and changes in setting.

The main objectives of this assessment are to:

- Set out the baseline conditions with regards to known cultural heritage assets within the study area to assess baseline conditions;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on cultural heritage assets;
- Identify mitigation measures which could reduce proposed construction and operational impacts where possible, and identify residual impacts; and
- Consider and assess potential cumulative impacts against an agreed set of schemes.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description
- Chapter 20: Landscape and Visual Impact Assessment.

This chapter should be read in conjunction with the following appendices and figures, which have been used to inform the assessment:

- Appendix 16.1 Cultural Heritage Desk-Based Assessment;
- Figure 16.1 Heritage Assets Plot

This chapter has been prepared by Tetra Tech Consulting, one of the UK's largest heritage consultancies. The Tetra Tech heritage team have extensive experience of undertaking impact assessments in the context of EIA for a wide range of developments including residential, logistics, infrastructure and renewables throughout the UK. Tetra Tech is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA)

16.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on cultural heritage assets. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk-based studies, relevant datasets and consultation (section 15.8);
- Presents an assessment of the likely significant effects on cultural heritage assets arising from the Proposed Development (section 15.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 15.12.
- Highlights any necessary mitigation measures (see section 15.10) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 15.9).

16.3 Study Area

The baseline studies comprise a review of known historic assets within a 1km radius of the Site for non-designated heritage assets; a 2km radius for designated heritage assets; and a 5km radius for

marine heritage assets. These study areas were agreed with the relevant heritage consultees from Heneb, Cadw, and the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), with the study areas considered proportionate to identify historic assets in the surrounding area that might be adversely affected by the Development, taking into account their existing setting, its contribution to their cultural significance and intervisibility with the Proposed Development. It should be noted that the study area has been applied with a degree of professional judgement and not as an absolute cut off.

16.4 Policy Context

16.4.1 National legislation and policy

- The Historic Environment (Wales) Act 2023
- Well-being of Future Generation (Wales) Act 2015
- Future Wales – the National Plan 2040 (February 2021)
- Planning Policy Wales (PPW)

16.4.2 Local planning policy

- Local Development Plan (LDP) for Pembrokeshire

16.5 Consultation

Table 15.1 summarises the issues raised relevant to the historic environment, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project and the consultees that were contacted.

Table 16-1: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to cultural heritage.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
12/11/2024	Neil Maylan, Cadw. By email	Scope of Study Area with regards to designated heritage assets,	Agreed that a 2km Study Area was appropriate for designated heritage assets. This was incorporated within the Cultural Heritage desk based assessment (Appendix 15.1 and in Section 15.6 below)
12/11/2024	Mike Ings, Heneb. By email	Scope of Study Area with regards to undesignated heritage assets.	Agreed that a 1km Study Area was appropriate for undesignated heritage assets. This was incorporated within the Cultural Heritage desk based assessment (Appendix 15.1 and in Section 15.6 below). The Cultural Heritage Desk Based Assessment was undertaken in

			line with a Written Scheme of Investigation submitted to, and approved by, both Heneb and the RCAHMW.
18/11/2024	Dr Julian Whitewright RCAHMW. By email.	Scope of study area and any particular assets of concern with regards to maritime heritage assets	Email of Scoping response of 19/11/2024 identifying a number of assets to consider in the assessment, and 08/01/2025 email informing Scoping response requesting a 5km Study Area for marine heritage assets. The assets and Study Area were incorporated within the Cultural Heritage desk based assessment (Appendix 15.1) and the latter incorporated within Section 15.6 below. The Cultural Heritage Desk Based Assessment was undertaken in line with a Written Scheme of Investigation submitted to, and approved by, both Heneb and the RCAHMW.

16.6 Methodology to inform the baseline

16.6.1 Desktop study

This chapter should be read in conjunction with the Cultural Heritage Desk Based Assessment (Appendix 15.1), which has been used to inform the assessment.

The baseline studies comprise a review of known historic assets within agreed study areas- 1km for undesignated terrestrial heritage assets, 2km for designated heritage assets and 5km for undesignated marine assets. The latter is proportionately larger to reflect the lack of accurate data when dealing with the location of shipwrecks. These study areas are considered appropriate to identify historic assets in the surrounding area that might be adversely affected by the development, taking into account their existing setting, its contribution to their cultural significance and intervisibility with the Site. It should be noted that the study area has been applied with a degree of professional judgement and not as an absolute cut off.

The following data sources were used in informing the assessment:

- Cadw data sets on designated historic assets;
- Heneb Historic Environment Record (HER);
- the National Monuments Record for Wales (NMRW), held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW);
- Coflein – The online catalogue of archaeology, buildings, industrial and maritime heritage in Wales
- Satellite imagery;
- Historic mapping;

- A model Zone of Theoretical Visibility (ZTV); and
- British Geological Survey.

16.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following historic environment specific guidance as follows:

- Cadw (2011) Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment in Wales;
- Cadw (2017a) Heritage Impact Assessment in Wales;
- Cadw (2017b) Setting of Historic Assets in Wales
- Welsh Government (2016) TAN12 Design; and
- Welsh Government (2017) TAN24 The Historic Environment.

16.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

Receptor Sensitivity/Value

The sensitivity of heritage receptors reflects their relative importance, which will depend on factors such as condition, rarity, potential as a data source, associations with events or people, architectural or historic interest. Importance, and hence sensitivity, has been defined here with reference to designation, where applicable, and professional judgement. Table 15-2 sets out the guideline criteria for assessing sensitivity.

Table 16-2 Definitions of Sensitivity or Value.

Magnitude of impact	Definition
Very High	Historic assets of international importance. World Heritage Sites and the individual attributes that convey their Outstanding Universal Value. Areas associated with intangible heritage and areas with associations with particular innovations, scientific developments, movements or individuals of global importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments, Listed Buildings (Grade I, II*), Registered Historic Parks and Gardens (Grade I, II*), Registered Historic Landscapes, Registered Battlefields, Protected Wrecks, Protected Military Remains. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in the listing grade. Unscheduled sites and monuments of schedulable quality and/or importance including those discovered through the course of evaluation or mitigation. Archaeological assets that can contribute significantly to acknowledged national research objectives. Conservation Areas containing very important buildings. Undesignated structures of clear national importance. Deposits with a demonstrable high potential to contain artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.

	Intertidal or maritime wreck sites and remains demonstrably of national importance
Medium	Conservation Areas, Grade II Listed Buildings and Registered Historic Parks and Gardens. Undesignated archaeological assets that can contribute to regional research objectives. Historic townscapes and landscapes with reasonable coherence, time depth and other critical factor(s). Unlisted assets that can be shown to have exceptional qualities or historic association. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factors. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment. Intertidal or maritime wreck sites and remains demonstrably of regional importance
Low	Historic assets with importance to local interest groups or that contribute to local research objectives. Locally Listed Buildings and Sites of Importance within a district level. Robust undesignated assets compromised by poor preservation and/or poor contextual associations. Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment. Intertidal or maritime wreck sites and remains demonstrably of local importance

Magnitude of Impact

The magnitude of impact is assessed with reference to the degree of change in the receptor's cultural significance. Guideline criteria for assessing magnitude of predicted change on historic assets are given in Table 15-3 below.

Table 16-3 Definitions of Magnitude.

Sensitivity	Typical descriptors
High	Change to most or all key elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is lost or substantially harmed.
	Change to most or all key elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is substantially enhanced.
Medium	Change to elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is clearly harmed.
	Change to elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is clearly enhanced.
Low	Change to elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is slightly harmed.
	Change to elements of the historic asset, or changes within the setting of the asset, such that the cultural significance of the asset is slightly enhanced.
Negligible	Change to elements of the historic asset, or changes within the setting of the asset, such that the significance of the asset is barely affected.
	Change to elements of the historic asset, or changes within the setting of the asset, such that the significance of the asset is barely affected.
No change	Change to elements of the historic asset or its setting that leave its cultural significance unchanged.

Significance of effect

The sensitivity of the heritage receptor, together with the magnitude of impact, defines the significance of the effect (Table 15-4). The impacts could potentially be adverse, neutral or beneficial. The matrix (Table 15-4) is not intended to mechanise judgement of the significance of effect, but to act as a check to ensure that judgements regarding sensitivity, magnitude of impact and significance of effect are reasonable and balanced and hence aid professional judgement. In some cases, the matrix allows a choice of significance of effect when a magnitude of impact and a value are combined. In these cases, the individual attributes of a specific asset, along with any relevant Site-specific factors and consideration of other influencing elements, have been taken into account when considering which is the most appropriate significance of effect to apply.

Table 16-4 Assessment Matrix.

	Magnitude of impact					
Sensitivity of Receptor		No Change	**Negligible**	**Low**	Medium	**High**
	Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
	Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
	High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
	Very high	No change	Minor	Moderate or Major	Major or Substantial	Substantial

16.8 Baseline Environment

The following section provides a summary of the baseline conditions and identifies the historic assets that may be affected by the Proposed Development and hence have been carried through to assessment. The information presented here is summarised from the Cultural Heritage Desk-Based Assessment (Appendix 15.1).

Designated Historic assets within the site and the 2km Study area

The Fishguard Bay Hotel Registered Historic Park & Garden and Goodwick Conservation Area partially extend into the southern part of the Proposed Development. Both of these were scoped in for assessment.

There are no other designated historic assets (Registered Landscape of Outstanding Historic Interest, Scheduled Monuments, or Listed Buildings) located within the Site.

There are no World Heritage Sites, protected wrecks or Historic Battlefields within the 2km study area.

The designated historic assets within a 2km radius of the Site (see Appendix 15.1) comprise the following:

- One Registered Landscape of Outstanding Historic Interest of national significance
- Six Scheduled Monuments of national significance
- One Registered Historic Park & Gardens of national significance
- 126 Listed Buildings of national significance
- Three Conservation areas of regional significance

In keeping with the approach espoused in Cadw guidance (2017b), the above have been reviewed in order to identify those that might be affected by the Proposed Development. This has been informed by a Zone of Theoretical Visibility (ZTV) that took into account the screening effect of buildings and woodland supported by site visits where necessary. A detailed description of the methods used in the production of the ZTV is presented in Chapter 19: Seascape, Landscape and Visual. This review concluded that the proposed development would result in change in the setting of seven designated heritage assets (Figure 15.1) comprising:

- Castle Point Old Fort Scheduled Monument (Cadw PE096)
- Fishguard Fort Grade II Listed Building (Cadw 12331)
- Fishguard Bay Hotel Grade II Listed Building (Cadw 12345)
- Fishguard Bay Hotel Registered Park and Garden (Cadw PGW(Dy)63(PEM))
- Bridge Cottages Grade II Listed Building (Cadw 12339)
- Goodwick Conservation Area
- Lower Town Conservation Area.

Non-Designated Historic assets

Known Historic assets within the Site and Archaeological Potential

There is no evidence for Prehistoric, Roman, Early Medieval, or Medieval activity recorded on the HER within the Site. The terrestrial element of the Site comprises Modern made ground, reclaimed in the early 20th century from the former coastline to form the quayside of Fishguard Harbour. On this basis, the potential for any hitherto unknown archaeological remains from these periods is considered to be negligible.

The HER data records several Post-Medieval and Modern features within the Site. The earliest features comprise the original lifeboat station (HER 30840 & 32129) located within the northern part of the Site. Following construction of Fishguard Harbour in 1902 additional features are recorded as an artificial quay (HER 32133); rail lines (HER 27970); a landing stage, rail sheds and railway station (HER 27973); engine sheds and marshalling yard (HER 32138); customs house (HER 27972); slipway (HER 32132); possible warehouses in addition to other smaller ancillary buildings (HER 30849 & 32135); and breakwater (HER 30842).

World War 1 saw additional war time related activities take place at Fishguard Harbour. A maritime factory was established at the northern end of the harbour facilities which converted steamships into hospital ships (HER 109300), alongside a flying boat base (HER 32131).

With the exception of the recorded rail sheds and railway station (HER 27973), and quay itself (HER 32133), a walkover of the study site has demonstrated that all remaining historic features recorded on the HER have been demolished. These features are considered to be of local significance. As the Proposed Development will not have a physical impact to the surviving non-designated heritage assets, they have been scoped out of further assessment.

Historic documents have identified that a replacement lifeboat station was constructed within the Site in 1930 (NMR 801200, Appendix 15.1; Figures 8 & 10). The lifeboat house was subsequently demolished, although the platform on which it sat, and the associated slipway is still present within

the southern part of the Site (Appendix 15.1). These incomplete remains of the mid-20th century lifeboat station are considered to be of local to significance and therefore of low sensitivity.

The RCAHMW and Heneb record multiple potential shipwrecks and artificial intertidal features within the associated study areas. These are discussed in greater detail in the Cultural Heritage Desk Based Assessment (Appendix 15.1). The intertidal features comprise a number of possible fish traps along the beach at Goodwick. Such intertidal features comprise the remains of several wrecks (NMR 416723, NMR 704003), in addition to another immediately to the south east of Goodwick Quay (HER 32127). At Goodwick Beach the RCAHMW records two Post-Medieval fish traps (NMR 407699 & NMR 401338). A third features consisting of a possible fish trap or wall (NMR 409081|), is located between the aforementioned fish traps. All of these lie some way from the proposed linkspan and any associated dredging or construction work, and it is highly unlikely that there will be any changes to their depositional environment as a consequence of the proposed construction works or the operation of the linkspan.

In addition to these the RCAHMW records a number of wreck sites in the vicinity of the site, although the exact location of many of these wrecks is not known. These include the Constitution, a wooden sailing vessel reported as being driven ashore near Goodwick Quay in 1825 (HER 273344), and the Crystal, a wooden ketch built in 1863 and recorded as being lost in 1905 when driven onto the rocks close by the quay wall during a gale (HER 272671). An unnamed wreck is shown in 29ft of water marked on an historic chart within the study area (NMR 507266). The remaining shipwrecks recorded within the 5km study area are either located based on the converted documented latitude and longitude coordinates of the ships foundering, with the records scattered along the wider shoreline of Fishguard Bay (with a notable concentration within the bay at Lower Town c1km to the southeast of the study site) or recorded centrally within Fishguard Bay where the documentary sources have mentioned the bay in general. These records demonstrate that there is considered to be a moderate potential for the remains of Post-Medieval shipwrecks to be present within the Site. these could be of local or regional significance, and therefore potentially of low to medium sensitivity, although it must be noted that this potential is based on documentary sources alone, and there are no certainly located wrecks within the redline boundary for the site.

16.9 Impact Assessment

16.9.1 Do Nothing Scenario

In a Do Nothing Scenario any non-designated heritage assets located within the Site would remain in their current form, while the setting of designated heritage assets within the study area would remain unaltered. Overall, there would be no impact in relation to cultural heritage assets.

16.9.2 Assessment of Construction Effects

The Proposed Development may adversely affect heritage assets during the construction phase, when significance may be lost as a result of physical removal of a heritage asset or as a result of change in the setting of the asset.

Castle Point Old Fort is both a Scheduled Monument (Cadw PE096) and a Grade II Listed Building (12331) and is of high sensitivity. It was built to defend Fishguard in the late 18th century following an attack from an American privateer, and fired its guns once, to deter the French fleet in the failed invasion of 1797. It holds evidential value as a well preserved late 18th century coastal artillery fortification and historical value as a result of its role in deterring the French invasion force, as well as some aesthetic value as a result of its prominent headland location in the bay at the entrance to Fishguard Old Harbour. As a monument open to the public, and well served with interpretational material, it also has some communal value. Although sited on the other side of the bay to the ferry port, the entirety of the bay can be considered part of its setting. it still commands long views across the waters it was intended to protect. Its prominent physical location, the views it commands and the direct historical relationship it has with the bay all form part of its setting, and

that setting contributes in a positive fashion to its significance. However, the long views across the bay already encompass the entirety of the busy ferry port and its infrastructure. Against this very busy and active backdrop the construction work will not alter the setting negatively. All construction will occur at a distance from the asset, and within the context of modern port activities, resulting in a **no change** magnitude of impact. As a result, the Proposed Development would result in a **no change** significance of effect. This is not significant in EIA terms.

The Grade II Listed Fishguard Bay Hotel (Cadw 12345) and its associated Registered Park and Garden (PGW(Dy)63(PEM) are both of medium sensitivity. The hotel incorporates an early 19th century gentleman's residence, which was first modified for use as a hotel late in the 19th century, and was then subsequently enlarged and purchased by the Great Western Railway for use as a railway hotel. It is a fine and substantial buildings designed to take advantage of views over Fishguard Bay to the east. The park and garden was designed around the house, and comprises an ornamental garden and tennis court on the lower level and a heavily wooded park with paths, small streams and large specimen trees. Cadw have identified a number of key views associated with this park and garden, predominantly to the east over Fishguard Bay, but also to the north east toward the ferry port. Although the redline boundary for the development partly overlaps the boundary of the Registered Park and Garden, there will be no related activities undertaken within the bounds of the Registered Park and Garden.

The hotel's heritage value lies largely in its evidential value – in the form and fabric of the building- in its historical value, through its history of use as a railway hotel, and in its aesthetic value, as a substantial late Victorian and early 20th century hotel. The setting of the hotel largely comprises the park and garden, which is heavily wooded and restricts many longer views, but does allow longer views of Fishguard Bay to the east and oblique views to the north east, which do form part of the setting. This setting as a whole contributes positively to the significance of the hotel, both providing it with an enclosed secluded setting, as well as affording access to wider coastal views. The views to the north east, encompassing the ferry port do not contribute positively to the significance however, despite forming part of the overall setting. The construction works will add to the activity visible within the ferry port, and may add some additional noise, but these are unlikely to be noticeable within the context of the operation of the ferry port, resulting in a **negligible adverse** magnitude of impact of, resulting in **a negligible adverse** significance of effect. This is not significant in EIA terms.

The Registered Park and Garden has a relatively restricted setting, bound as it is by high ground to the west and north and the port and sea to the east. It lies on a heavily wooded slope, and the only wider views achievable are those to the east and north east, including towards the ferry port, and it was clearly designed both to provide an enclosed parkland setting for the hotel, and to take advantage of these longer views. Cadw has identified these as key views and overall they do contribute to the setting of the park and garden, Construction works will take place within these views, but will be hard to distinguish from the normal operations of a busy ferry port. As a result, it is considered that there will be a **negligible adverse** magnitude of impact resulting in a **negligible adverse** significance of effect. This is not significant in EIA terms.

Bridge Cottages (Cadw 12339) is a small rubble built domestic house built at the south eastern end of Goodwick beach, close to Goodwick Bridge. It is Grade II Listed and of medium sensitivity. The main façade of the house faces north west towards Goodwick, and there are only oblique views towards the proposed development as a result of nearby buildings. Its heritage value is largely evidential, arising from the form, fabric and siting of the building, and aesthetic. It has little in the way of historical or communal value. Its setting comprises the small group of buildings within which it sits, Goodwick Bridge and the longer views afforded across Goodwick Moor to Goodwick. Although oblique longer views are possible towards the ferry terminal, these do not form part of the setting and do not contribute to the significance of the building. Any construction activities will occur at a distance from the asset, and within the context of modern port activities, resulting in a **no change** magnitude of impact. As a result, the construction phase would result in a **no change** significance of effect.

The Goodwick Conservation Area partially extends into the redline boundary for the proposed development. It is of medium sensitivity. The Conservation area appraisal identified a number of key special characteristics for the conservation area, relating to the landform, diverse and unusual building form and type, architecturally distinct landmark buildings, a coherent central Victorian core, and the historic relationship with the sea, initially through fishing and latterly through the ferry port. This relationship with the ferry port and associated railway terminus is identified as a key driver to the town's development and success. It also identifies a number of key views from and towards the conservation area, but does not positively identify views towards the ferry port, which are limited from as a result of topography and heavily wooded slopes. There is clearly an historic relationship between Goodwick and the ferry port, and therefore the port does form part of its setting, and contributes positively to its setting. However, the construction phase of works will have no visual or other impact on the conservation area, and continued upgrading of port facilities will not impact the historical association between the two. As a result, it is considered that there will be a **no change** magnitude of impact resulting in a **no change** significance of effect. This is not significant in EIA terms.

The Lower Town Conservation Area covers the historic old harbour and lower town of Fishguard. It is of medium sensitivity. The Conservation area appraisal identified a number of key special characteristics for the conservation area, relating to the unique landform, diverse and unusual 18th and 19th century buildings, architecturally distinct landmark buildings, Victorian buildings and terraces, industrial buildings, Listed Buildings, narrow streets, sheltered harbour and river mouth, the marsh to the south of the bridge and the long historic relationship with the sea. It also identified a number of key views, but none in the direction of Fishguard Bay and the ferry terminal. Despite this, there is a fine view from the southern end of the Old Harbour looking north which takes in the harbour, breakwater and harbourside terraces and incorporates the ferry terminal in the background. However, the ferry port is only visible in long view, and the proposed construction works on the new linkspan will not have an impact upon the significance of the conservation area. As a result, it is considered that there will be a **no change** magnitude of impact resulting in a **no change** significance of effect. This is not significant in EIA terms.

The remains of the non-designated 1930s lifeboat platform and slipway (NMR 801200) is located within the site and is considered to be of low sensitivity. This asset will be affected negatively by construction traffic and noise during the construction of the Proposed Development, albeit within the context of a busy ferry port, which will result in a **low adverse** magnitude of impact. As a result, and exercising professional judgement, the construction phase would result in a **negligible adverse** significance of effect to this historic feature. This is not significant in EIA terms

The assessment also has identified the potential for the remains of Post-Medieval shipwrecks of low to medium sensitivity to be present within the Site. The proposed dredging within the Site could result in an a potentially **medium to high adverse** magnitude of impact. As a result, the construction phase would result in a potentially **moderate adverse** significance of effect to such archaeological features, if present. This is not significant in EIA terms.

16.9.3 Assessment of Operational Effects

The Proposed Development may adversely or positively affect heritage assets during the operation phase, when significance may be lost or enhanced as a result of changes within the setting of the asset.

The Castle Point Old Fort Scheduled Monument (Cadw PE096) and Listed Building is of high sensitivity. The proposed linkspan is less visually obtrusive than the current infrastructure it will replace, and will represent a slight improvement to the longer views from the fort in the direction of the ferry port. This will result in a **negligible beneficial** magnitude of impact and a **negligible beneficial** significance of effect for both the Scheduled Monument and Listed Building.

The Fishguard Bay Hotel (Cadw 12345) and Registered Park and Garden PGW(Dy)63(PEM), both have limited intervisibility with the proposed development and it forms part of their setting, albeit

one which does not contribute positively to their significance. The proposed new linkspan will be less visually intrusive than the infrastructure it replaces, and as a result should represent a slight improvement to views of the ferry port both from the hotel and the park and garden. This will result in a **negligible beneficial** magnitude of impact for both assets during the operational phase, culminating in a **negligible beneficial** significance of effect for both the Fishguard Bay Hotel and the Registered Park and Garden.

Bridge Cottages (Cadw 12339) are of medium sensitivity, and the proposed development is not considered part of their setting and does not contribute to their significance. Therefore, although the proposed linkspan will be slightly less visually intrusive than the infrastructure replacing it, the operational phase will result in a **no change** magnitude of impact and a **no change** significance of effect.

The setting of the remains of the 1930s lifeboat station platform and slipway (NMR 801200) will be very slightly improved as a result of the removal of some of the more visible elements of the current infrastructure during the construction phase. This will result in a **negligible beneficial** magnitude of impact and a **negligible beneficial** significance of effect

There will be no further impacts on this or on any maritime archaeological remains on the sea floor during its operational phase. There will therefore be no significance of effect for the operational phase of the scheme on archaeological remains on the sea floor.

16.10 Mitigation

The assessment contained within this chapter has identified that construction impacts will result in a **moderate adverse** significance of effect in relation to any Post-Medieval maritime shipwrecks present within the Site.

There is a theoretical potential that the site may contain archaeological remains, including possible wrecks within the seabed. In order to guard against the possibility that dredging as part of construction work might disturb or damage such remains, it is recommended that a Protocol for Archaeological Discoveries to be agreed with the maritime archaeological advisor at the RCAHMW prior to construction, and that all construction activities with the potential to affect buried archaeological remains on the seabed be undertaken in accordance with it. This will ensure that any archaeological remains encountered during the course of the construction works can be recorded appropriately, and the results of that recording can be disseminated publicly in order to realise their archaeological potential.

It is anticipated that once construction is complete, the proposed linkspan will be less visually intrusive that the infrastructure it replaces, and therefore no further mitigation is proposed for the operational phase.

16.11 Assessment of Residual Effects

Residual effects identified include a negligible beneficial significance of effect for the Castle Point Old Fort Scheduled Monument and Listed Building, the Fishguard Bay Hotel and Registered Park and Garden and the 1930's lifeboat station and slipway. No residual effects are identified for the Bridge Cottages Listed Building, the Goodwick Conservation Area or the Lower Town Conservation Area, or any potential marine remains within the site following the construction phase and implementation of the proposed mitigation.

16.12 Cumulative Effects

A list of other similar major projects has been agreed for assessment for cumulative effects (Appendix 4.A). None of these projects are sufficiently close to the heritage assets identified within

this chapter to have any impact upon them. As a result, no intra site effects have been identified and there will be no cumulative effects.

16.13 Limitations of the Assessment

This assessment relies partially on the accuracy of third-party datasets and sources, although such limitations are unlikely to affect the conclusions reached.

16.14 Summary of Effects and Conclusion

This chapter has considered the likely significant effects of the Proposed Development upon cultural heritage receptors (both archaeological and built heritage) during its construction and operation.

In relation to the assessment of designated heritage assets, it has been determined that the construction phase will result in a **no change** significance of effect to the Castle Point Old Fort Scheduled Monument and Grade II Listed Building, to the Grade II Listed Bridge Cottages and to the Goodwick and Lower Town Conservation Areas. There will, however, be a **negligible adverse** significance of effect to the Grade II Listed Fishguard Bay Hotel and Grade II Registered Park and Garden. None of these are significant in EIA terms.

The construction phase would also have a **negligible adverse** significance of effect on the remains of an undesignated former lifeboat station and slipway within the site, and a theoretical **moderate adverse** significance of effect on any maritime remains beneath the seabed. These will not be significant in EIA terms.

With regards to the operational phase, it is considered that there will be a **no change** significance of effect to the Grade II Listed Bridge Cottages and to the Goodwick and Lower Town Conservation Areas and a **negligible beneficial** significance of effect on the Castle Point Old Fort Scheduled Monument and Grade II Listed Building, the Fishguard Bay Hotel, Registered Park and Garden and the 1930's lifeboat house and slipway. None of these are significant in EIA terms.

Following the implementation of mitigation measures comprising a programme of survey and recording, and as the agreement and provision of a Protocol for Archaeological Discoveries, it is considered that the Proposed Development will have no significant effects upon archaeological receptors.

No potential cumulative effects have been identified.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Castle Point Old Fort Scheduled Monument and Listed Building	✓	✓	None	C: No Change O: Negligible beneficial	C: High O: High	C: No Change O: Negligible Beneficial	N/A	Negligible Beneficial	None
Fishguard Bay Hotel Listed Building and Registered Park and Garden	✓	✓	None	C: Negligible adverse O: Negligible beneficial	C: Medium O: Medium	C: Negligible adverse O: Negligible Beneficial	N/A	Negligible Beneficial	None
Bridge Cottages Listed Building	✓	✓	None	C: No change O: No change	C: Medium O: Medium	C: No change O: No change	N/A	None	None
Goodwick Conservation Area	✓	✓	None	C: No change O: No change	C: Medium O: Medium	C: No change O: No change	N/A	None	None
Lower Town Conservation Area	✓	✓	None	C: No change O: No change	C: Medium O: Medium	C: No change O: No change	N/A	None	None
1930s lifeboat slipway	✓	×	None	C: Low adverse O: Negligible beneficial	C: Low O: Low	C: Negligible adverse O: Negligible beneficial	N/A	None	None
Post-Medieval maritime shipwrecks	✓	×	None	C: Medium to High O: N/A	C: Low to Medium O: N/A	C: Moderate adverse O: N/A	Provision of Protocol for Archaeological Discoveries	None	None

16.15 References

Cadw (2011) Conservation Principles for the Sustainable Management of the Historic Environment in Wales, March 2011.

Cadw (2017a) Heritage Impact Assessment in Wales, May 2017.

Cadw (2017b) Setting of Historic Assets in Wales, May 2017.

Cadw (2017c) Managing Historic Character in Wales, May 2017.

Cadw (2018) Managing Scheduled Monuments in Wales, November 2018.

Cadw (2020) Managing the Marine Historic Environment of Wales.

CIfA (2020a) Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment, Chartered Institute for Archaeologists, October 2020

CIfA (2020b) Standard and guidance for historic environment desk-based assessment, Chartered Institute for Archaeologists, October 2020.

IEMA (2021) Principles of Cultural Heritage Impact Assessment in the UK (Available at: https://www.iema.net/articles/principles-of-cultural-heritage-impact-assessment).

Welsh Government (2016) Technical Advice Note 12: Design, March 2016.

Welsh Government (2017) Technical Advice Note 24: The Historic Environment, May 2017.

Welsh Government (2021a) Planning Policy Wales, Edition 12, February 2024.

Welsh Government (2021b) Future Wales: The National Plan 2040, February 2021.

16.16 List of Abbreviations / Acronyms

HER – Historic Environment Record

RCAHMW - Royal Commission on the Ancient and Historical Monuments of Wales

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 17 Soils, Geology & Contaminated Land

17 Soils, Geology & Contaminated Land

17.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on Soils, Geology and Contaminated Land. This chapter considers the potential impacts to soils and geology from the Project during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing soils, geology and contaminated land to assess current environmental baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on soils, geology and contaminated land; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

Other aspects relevant to soils, geology and contaminated land are addressed in the specific chapters of the ES, namely:

- Chapter 11: Water Quality
- Chapter 21: Waste Management

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

17.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on climate. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 18.8);
- Identifies any limitations encountered in compiling the environmental information (section 18.13);

- Presents an assessment of the potential likely significant effects on soils, geology and contaminated land arising from the Proposed Development (section 18.9) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 18.12
- Highlights any necessary monitoring and/or measures to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 18.10).

17.3 Study Area

The site is located within Goodwick/Fishguard, Pembrokeshire (central grid reference 195171.227: 238812.970). The site is a parcel of land spanning an area of approximately 36 hectares of the harbour, to include the existing linkspan, hinterland and within the bay foreshore.

17.4 Policy Context

17.4.1 EU legislation and policy

European legislation is a significant consideration in assessing the effects of a scheme on the geological and hydrogeological attributes of a site and is outlined below.

The Water Framework Directive (2000/60/EC), which was transposed into Welsh law in The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242) for England and Wales, establishes a framework for community action in the field of water policy. The main objective of the Directive is for all groundwater, surface water and coastal water bodies to achieve ‘good’ status by 2015. The Directive introduced new broader ecological objectives as well as aims to prevent deterioration of all water bodies. The Directive must be considered in any scheme that has the potential to impact on any part of the water environment.

Directive 2004/35/EC of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage (“the Environmental Liability Directive”) was transposed into Welsh legislation by the Environmental Damage (Prevention and Remediation Regulations) (Wales) Regulations 2009, SI 2009/995. The Regulations require those carrying out certain activities to prevent, limit and remediate significant environmental damage to protected species, natural habitats, ASSIs, surface water, groundwater and land. Operators of activities such as discharges to water sources and water impounding are liable for any significant environmental damage, regardless of whether or not they intended to cause the damage or were negligent.

The Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration, transposed into Welsh law by The Groundwater (England and Wales) Regulations 2009, classifies groundwater bodies, establishes pollutant threshold values, and identifies trends and starting points for their reversal.

17.4.2 National legislation and policy

Part 2A of the Environmental Protection Act defines contaminated land as;

> "any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that –
>
> (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
>
> (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused."

The Contaminated Land (Wales) Regulations 2006, The Contaminated Land (Wales) (Amendment) Regulations 2012, Contaminated Land Statutory Guidance for Wales 2012 (Welsh Government, 2012) and the Defra Circular 01/2006 (Defra 2006) also govern contaminated land assessment in Wales.

17.5 Consultation

This chapter has been informed by screening opinions provided by Natural Resources Wales. This screening opinion consulted with the bodies deemed relevant by Natural Resources Wales and reached the conclusions that an Environmental Impact Assessment was required.

Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project and the consultees that were contacted.

No specific consultation issues were raised with regard to soils, geology and contaminated land.

17.6 Methodology to inform the baseline

17.6.1 Desktop study

Information on soils, geology and hydrogeology within the Study Area was collected through a detailed desktop review of existing studies and datasets. The Preliminary Risk Assessment (PRA) desk study is contained within Appendix 18.A. These sources provide the most up to date data for this assessment.

Table 17.1 Summary of key desktop reports.

Title	Source	Year
Linkspan Replacement – Fishguard Harbour. Preliminary Risk Assessment (Desk Study) Report	Tetra Tech RPS	2025

17.6.2 Site-specific surveys

In order to inform the ES, site-specific surveys were undertaken. A summary of the surveys undertaken to inform the soils, geology and contaminated land impact assessment is outlined in Table 17.2

Table 17.2 Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Fishguard Marina Marine GI	Marine Ground Investigation	Thirteen (13) light cable tool percussion boreholes to a maximum depth below sea bed level of 25.00 metres continued with rotary coring to a maximum depth below sea bed level of 37.50 metres Seven (7) light cable tool percussion boreholes to a maximum depth below sea bed level of 4.00m to obtain CEFAS (Centre for Environment Fisheries and Aquaculture Science) samples A single rotary open hole with rotary coring follow on	Fugro Seacore Ltd	2015	See Chapter section 18.8.5

		to a maximum depth below sea bed level of 33.50 metres Seven (7) static cone penetration tests to a maximum depth below sea bed level of 21.13 metres			
Fishguard Port Linkspan Replacement. Factual Report on Ground Investigation	Land based ground investigation	Excavation of two (2) land based boreholes (BHL02 and BHL03) advanced to a maximum depth of 21.20m bgl (metres below ground level) using cable percussion drilling technique	Geotechnical Engineering Ltd	2017	See Chapter section 18.8.6
Geotechnical Site Investigation for the Fishguard Linkspan Project	Marine ground investigation	Five (5) sediment grab samples for environmental testing Ten (10) vibrocores to a maximum depth of 6m	In Situ Site Investigation Ltd	March 2025	See Appendix 18.B and Section 18.8.7

17.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following soils, geology and contaminated land specific guidance as follows:

- Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination. Environment Agency, 2020 (Latest Update June 2025)

Underpinning the guidance within LCRM is a source-pathway-receptor methodology, which is used to identify Significant Pollutant Linkages (SPLs). The following definitions apply:

- Source: identification of contamination source;

- Pathway: the means by which the contamination can come into contact with the receptor; and,
- Receptor: the entity which is vulnerable to harm from the contamination source.

A phased approach in line with LCRM guidance has been taken with regard to the assessment of contaminated land at the proposed development site. As part of this phased approach, a Preliminary Risk Assessment (PRA) desk study of available information was carried out. The PRA desk study report is provided in Appendix 18.A.

An important thread throughout the overall process of risk assessment is the need to formulate and develop a conceptual model for the site, which supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of the PRA, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process. A risk is present only when a source-pathway-receptor linkage is present and active

17.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in below.

Table 17.3 Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition	Examples
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).	Irreversible loss of high proportion of local high fertility soils/sediments. Large loss/ degradation of Agricultural Land Classification (ALC) Grade 1 or 2 soils. Pollution of potable sources of water abstraction.

		Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Loss of, or extensive change, to nationally important geological features. Sterilisation of high quality mineral resource. Long-term (chronic) risk to human health or short-term (acute) risk to human health. Short- term risk of pollution of sensitive water resources. Extensive damage to buildings / infrastructure (on or off site). Generation of significant quantities of waste sediment or soils for landfill. Contamination of offsite soils. Substantial geomorphology changes due to cutting.
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).	Irreversible loss of moderate proportion of local high fertility soils/sediments. Large loss/ degradation of ALC Grade 3 soils, minor loss/ degradation of ALC Grade 1 or 2 soils.

		Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Partial loss or change to an aquifer. Partial loss of the integrity of groundwater supported designated wetlands. Permanent loss of, regionally important geological features, or substantial changes to nationally important geological features. Sterilisation of low quality mineral resources. Easily preventable, permanent health impacts on humans or medium-term (chronic) risk to human health. Medium long-term risk of pollution of sensitive water resources. Localised damage to buildings/ infrastructure (on or off site).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).	Irreversible loss of small proportion of local high fertility soils/sediments and/or high proportion of local low fertility soils/sediments. Moderate loss/ degradation of ALC Grade 4 or 5 soils. Minor or moderate loss/ degradation of ALC Grade 3 soils. Changes to made ground deposits only.

		Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Minor effects on groundwater supported wetlands. Loss of, or extensive change, to locally important geological features. Easily preventable, non-permanent health impacts on humans. Minor low-level and localised contamination of on-site soils/sediments. Pollution of non-sensitive water resource or low long term risk of pollution to sensitive water resource. Easily repairable damage to buildings / infrastructure
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).	No measurable impact upon surface waters or groundwater. No measurable impact on geological features. No measurable impact on soils/sediments. No discernible change with regards to contaminated land.

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 17.4 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition	Examples
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.	Geology: World Heritage Sites or site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site). Soils: Agricultural land of Grade 1 or 2 quality. Controlled Water: Groundwater vulnerability is classified as high; Principal aquifer providing a regionally or locally important resource or supporting site protected under wildlife legislation. Future site users: Sensitive land uses proposed such as residential housing with gardens, allotments, schools. Built Environment: Sites of international Importance, World Heritage Sites, Listed Buildings, and Scheduled Monuments.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.	Geology: Regionally Important Geological Sites (RIGS). Soils: Agricultural land of Grade 3 quality. Controlled Water: Moderate classification of groundwater vulnerability; Secondary aquifer providing water for agricultural or industrial use with limited connection to surface water. Future site users: Moderately sensitive land uses such as residential housing

		without gardens, commercial developments and open spaces. Built Environment: Sites with local interest for education or cultural appreciation.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.	Geology: Rock exposures. Soils: Agricultural land of Grade 4&5 quality. Controlled Water: Deep Secondary aquifer with poor water quality not providing baseflow to rivers; Aquifer not used for water supplies (public or private). Future Site Users: Low sensitivity land use such as Industrial Sites, highways, ports and rail. Built Environment: Infrastructure (e.g. Roads, railways, ports and tramways).
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.	Geology: No rock exposures. Soils: Urban classified soils. Controlled Water: Non-aquifer/Unproductive Strata Future Site Users: No sensitive land use proposed

The significance of the effect upon soils, geology and contaminated land is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 17.5. Where a range of significance of effect is

presented in Table 17.5, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 17.5 Matrix used for the assessment of the significance of the effect.

		Magnitude of impact			
Sensitivity of Receptor		**Negligible**	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

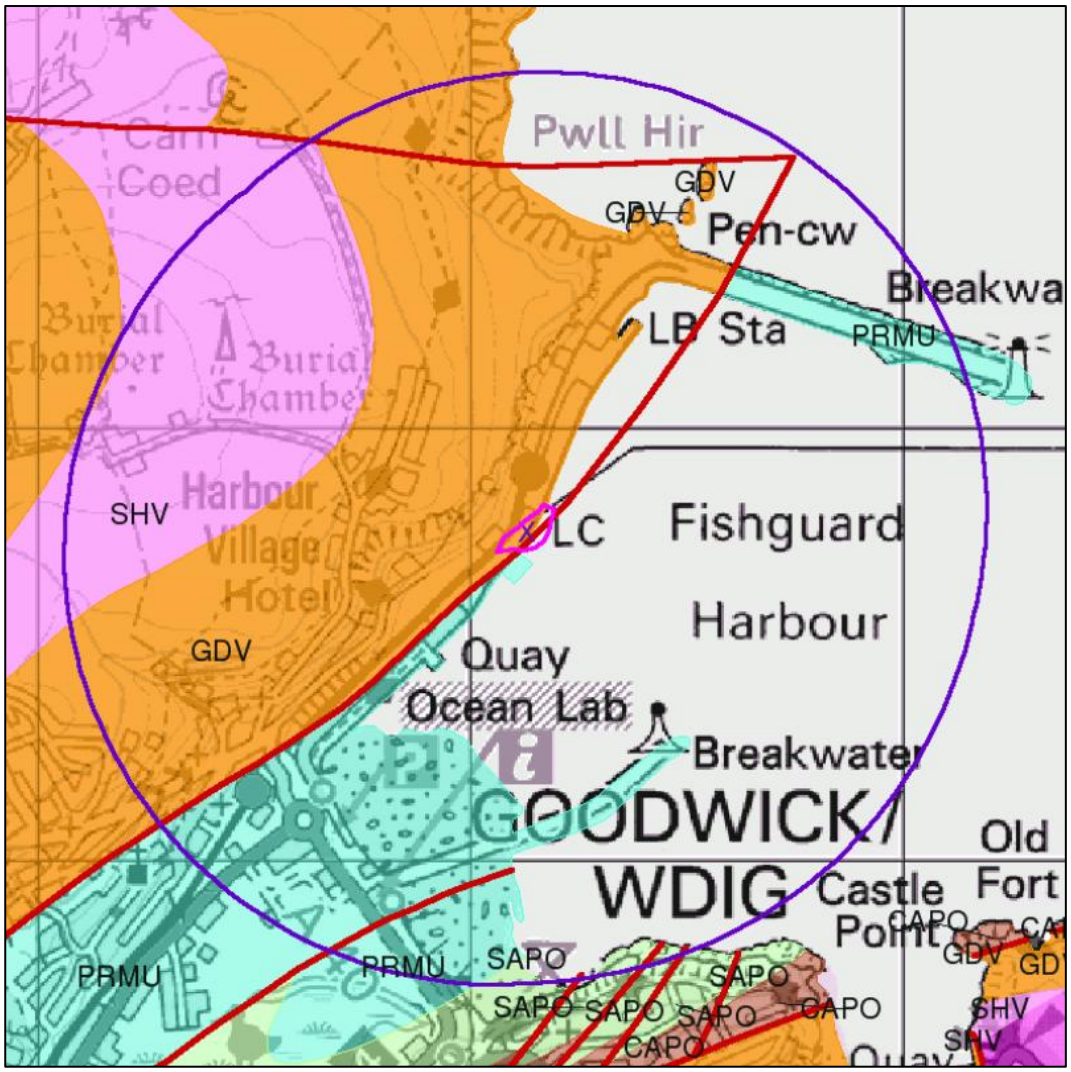
17.8 Baseline Environment

A Preliminary Risk Assessment (PRA) desk study of available information was carried out. The PRA desk study report is provided in Appendix 18.A. A marine ground investigation was undertaken to sample and test sediment material which will be dredged as part of the proposed development. The ground investigation report is provided in Appendix 18.B.

17.8.1 Bedrock Geology

As shown on Figure 18.1, the proposed development site falls on a fault line which separates the Penyraber Mudstone Formation to the south east from the Goodwick Volcanic Formation to the north west.

Figure 17.1 Bedrock Geology

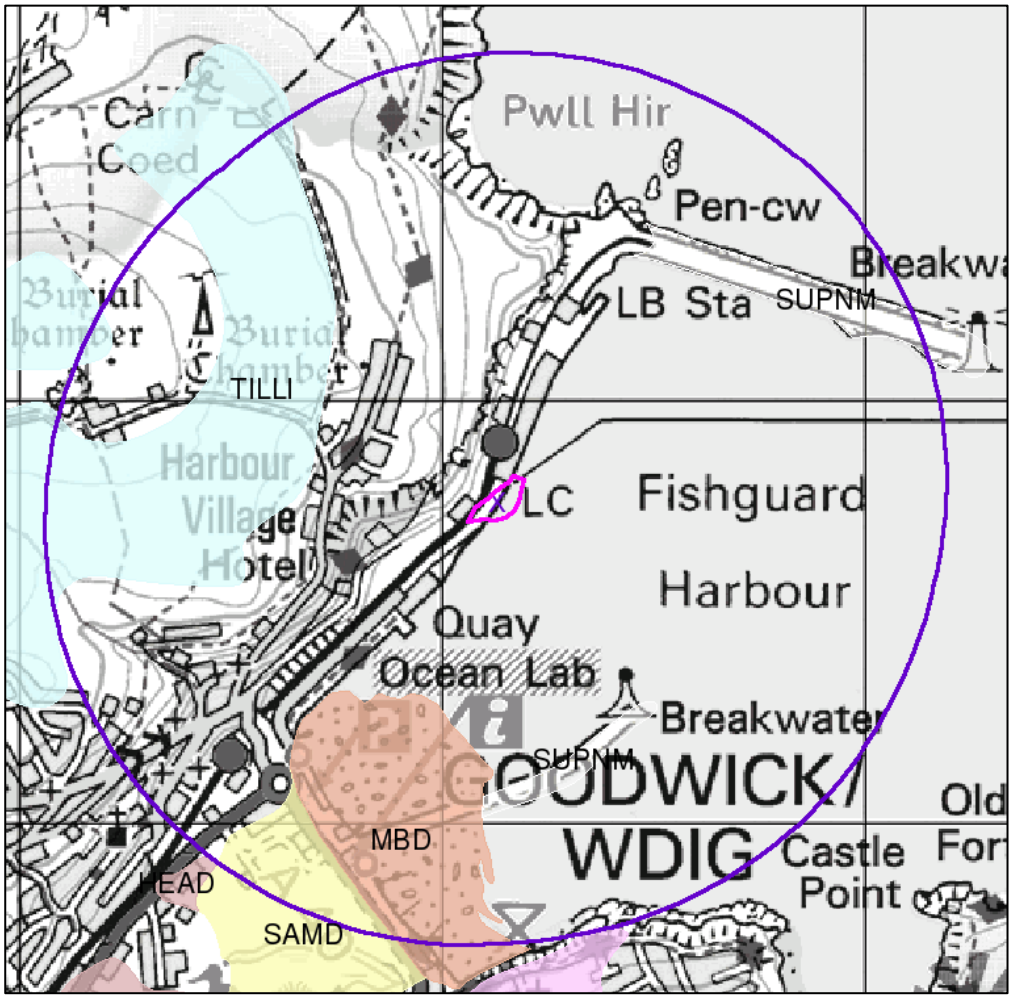


Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	PRMU	Penyraber Mudstone Formation	Mudstone	Caradoc - Caradoc
	SAPO	Saddle Point Member	Siltstone	Caradoc - Caradoc
	CAPO	Castle Point Member	Sandstone	Caradoc - Caradoc
	GDV	Goodwick Volcanic Formation	Rhyolite	Abereiddian - Abereiddian
	SHV	Strumble Head Volcanic Formation	Basalt, Lava-Pillowed	Abereiddian - Abereiddian
	GDV	Goodwick Volcanic Formation	Sandstone	Abereiddian - Abereiddian
		Faults		

17.8.2 Superficial Geology

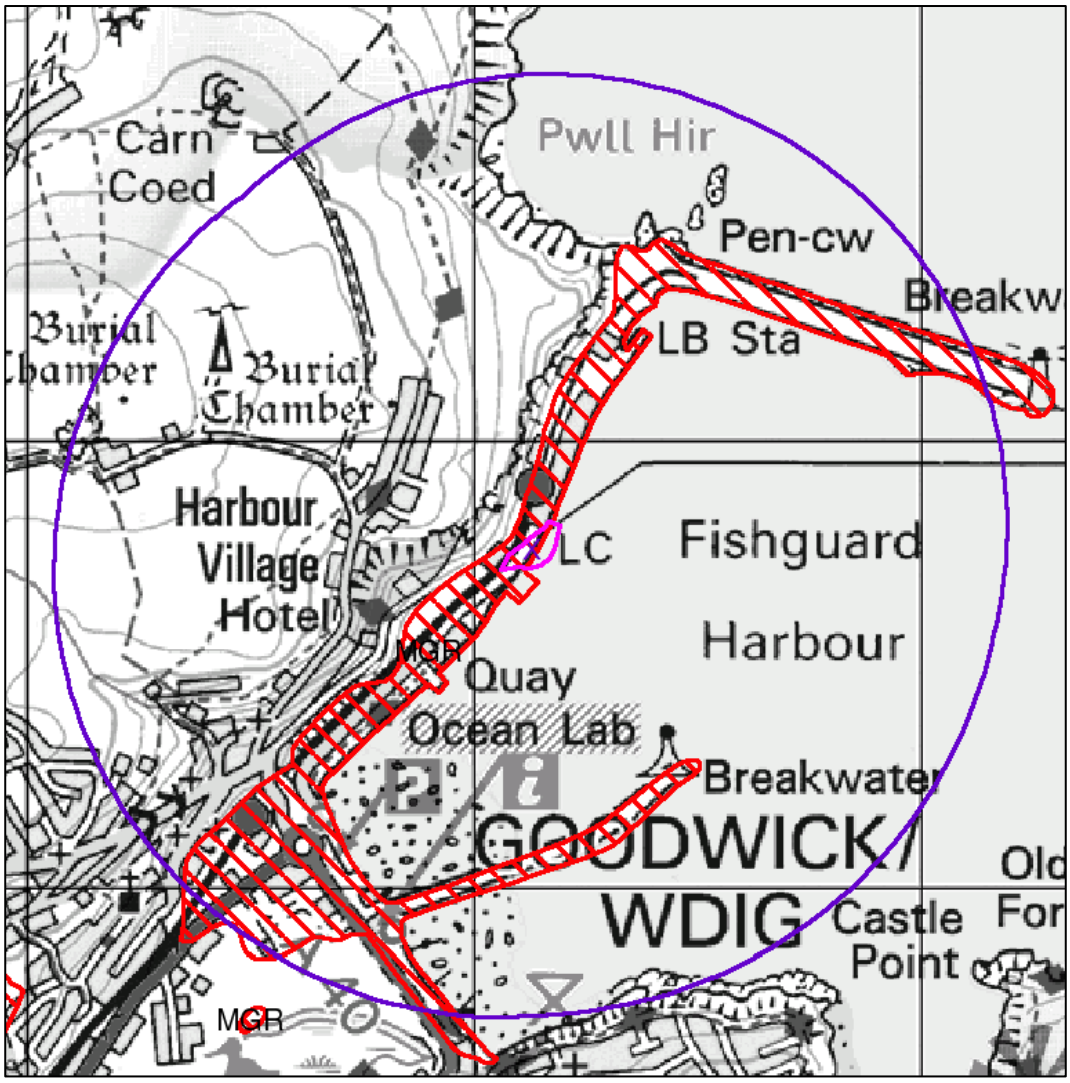
As shown on Figure 17.2 and Figure 17.3, made ground is anticipated to overlie bedrock in the vicinity of the site.

Figure 17.2 Superficial Geology



Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	SAMD	Saltmarsh Deposits	Sand, Silt and Clay	Holocene - Holocene
	GFICI	Glaciofluvial Ice Contact Deposits, Devensian (Irish Sea Ice)	Sand and Gravel	Devensian - Devensian
	GFDIS	Glaciofluvial Deposits, Devensian (Irish Sea Ice)	Sand and Gravel	Devensian - Devensian
	TILLI	Till (Irish Sea Ice)	Diamicton	Pleistocene - Pleistocene
	MBD	Marine Beach Deposits	Sand and Gravel	Quaternary - Quaternary
	HEAD	Head	Clay, Silt, Sand and Gravel	Quaternary - Quaternary

Figure 17.3 Infilled or Made Ground



Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene

17.8.3 Hydrogeology & Groundwater Vulnerability

As shown in Figure 17.4, the bedrock aquifer underlying the site is categorised as a Secondary B aquifer. This refers to predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water bearing parts of the former non-aquifers.

A superficial aquifer is not considered to be present in the vicinity of the proposed development site. No source protection areas were identified within a 1000m buffer of the site.

As shown on Figure 17.5, this is considered to be a non-aquifer of negligible permeability.

Figure 17.4 Bedrock Aquifer

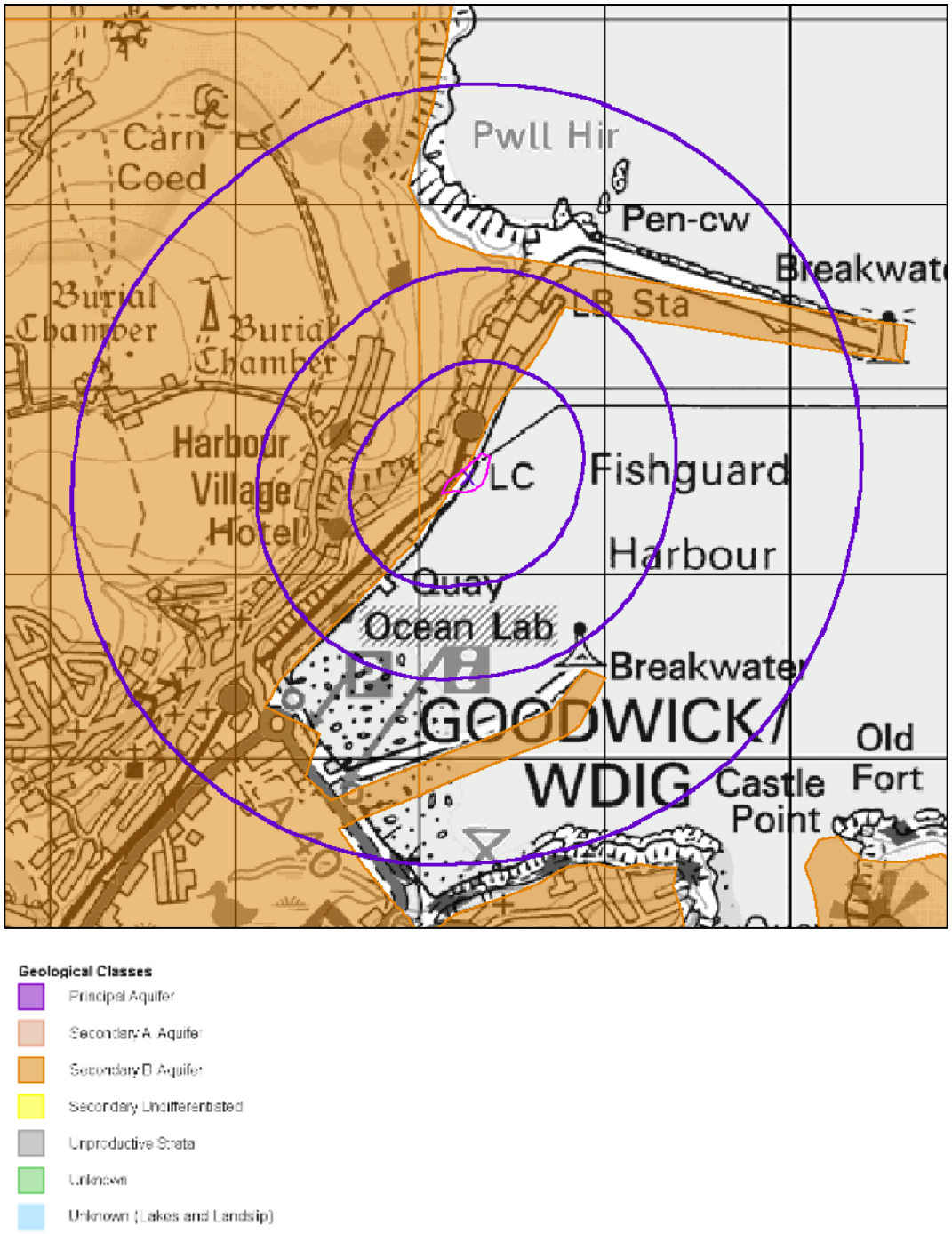
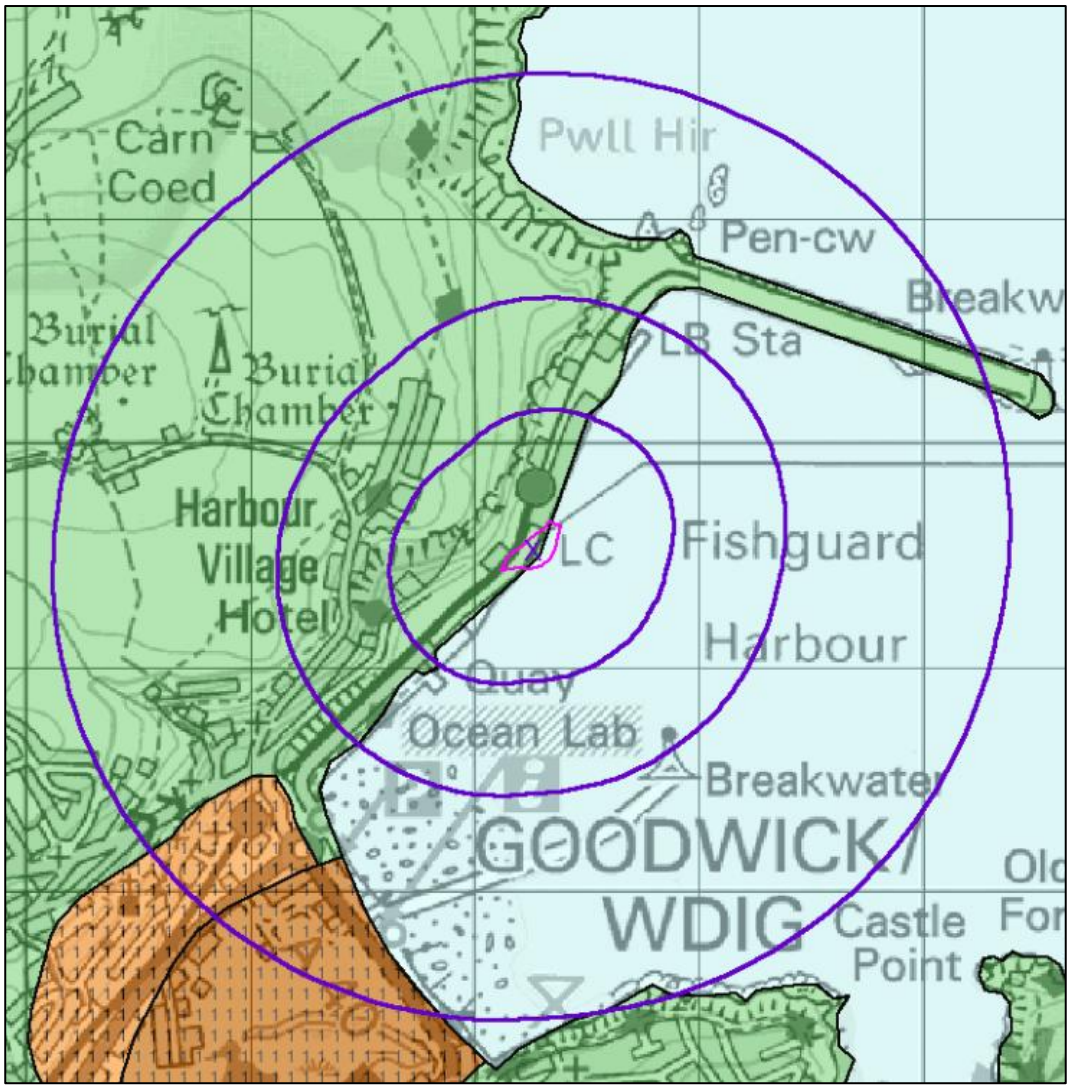
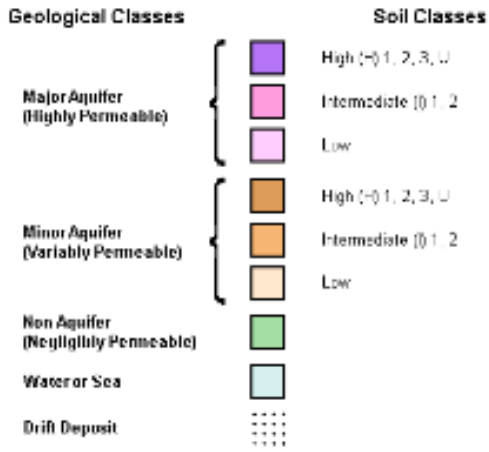


Figure 17.5 Groundwater Vulnerability

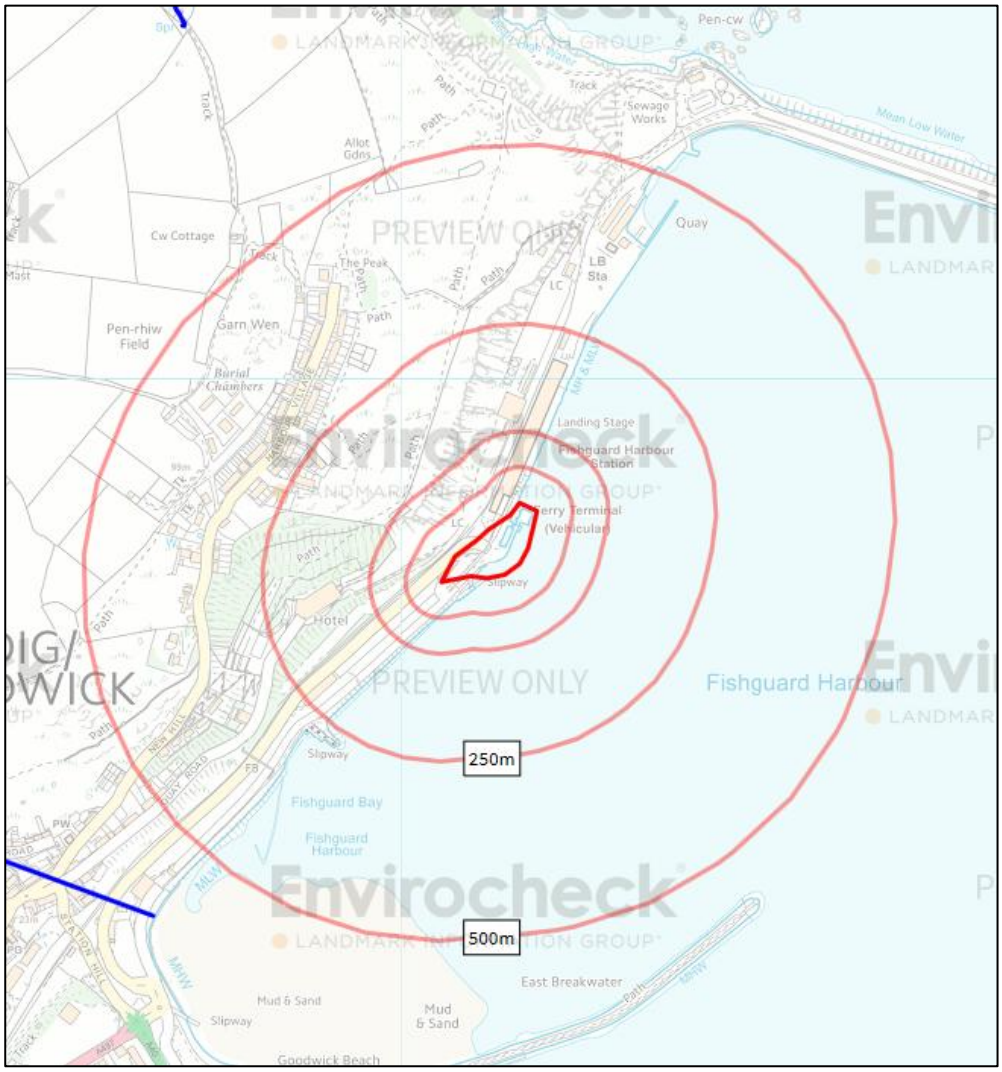




17.8.4 Hydrology

No inland watercourses are present within 500m of the proposed development site – see Figure 17.6.

Figure 17.6 Hydrology



17.8.5 Previous Ground Investigation – 2015

An intrusive land and marine ground investigation was undertaken by Fugro Seacore Ltd (FSCL) at Fishguard Marina in April and May 2015. The investigation comprised;

- Thirteen (13) light cable tool percussion boreholes to a maximum depth below sea bed level of 25.00 metres.
- Seven (7) light cable tool percussion boreholes to a maximum depth below sea bed level of 4.00m to obtain CEFAS (Centre for Environment Fisheries and Aquaculture Science) samples.
- Thirteen (13) light cable tool percussion boreholes continued with rotary coring to a maximum depth below sea bed level of 37.50 metres.
- A single rotary open hole with rotary coring follow on to a maximum depth below sea bed level of 33.50 metres

- Seven (7) static cone penetration tests to a maximum depth below sea bed level of 21.13 metres.

Three marine boreholes (BH09, BH10 and BH33) were advanced in the area of the Stena Line terminal. The sediment material comprised, silts, sands and gravels to a maximum depth of 22.30m bgl whereby strong light grey basalt was encountered.

17.8.6 Previous Ground Investigation – 2017

An intrusive land and marine based ground investigation was undertaken by Geotechnical Engineering Limited in September 2017. The ground investigation comprised the following;

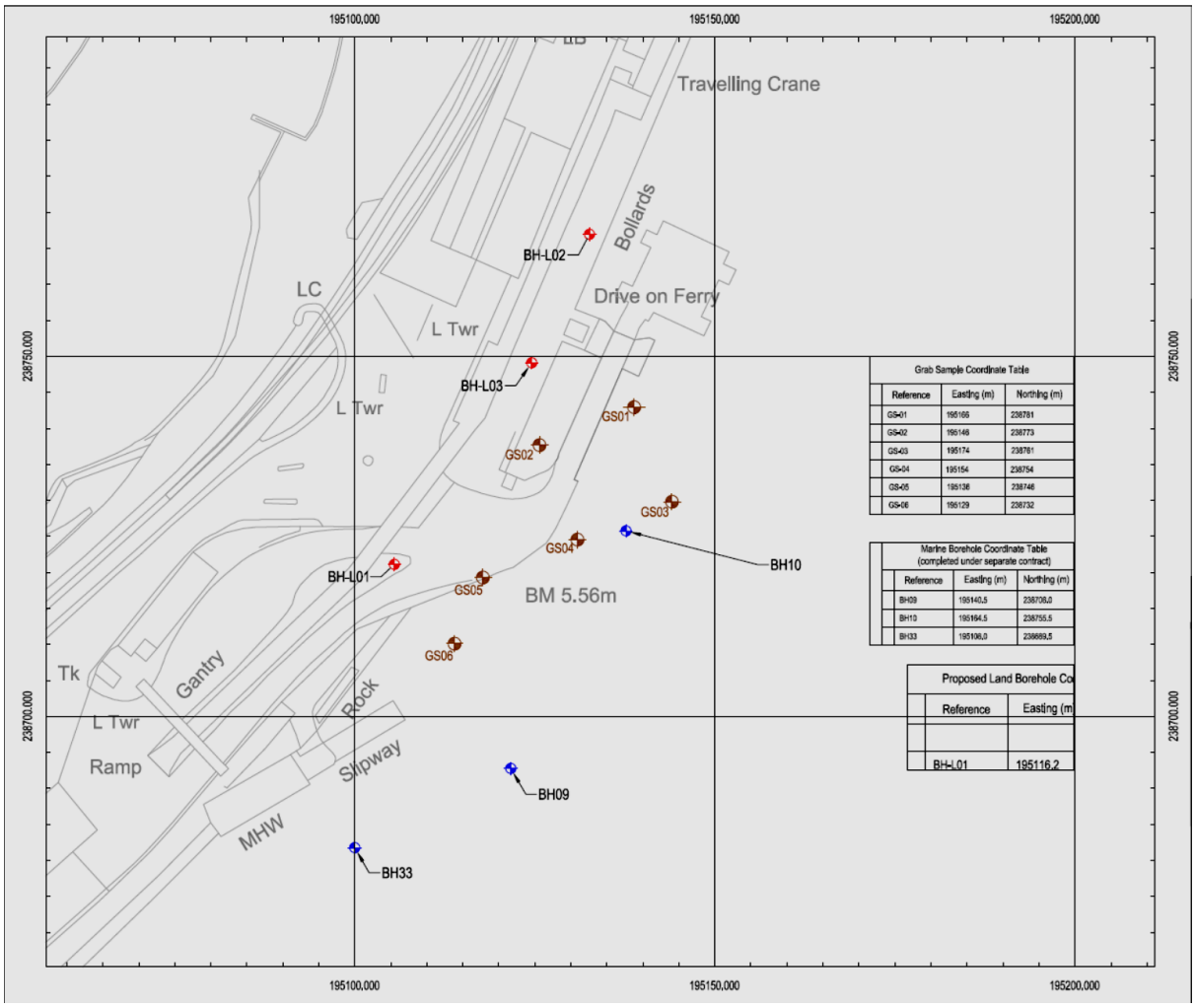
- Excavation of two (2) land based boreholes (BHL02 and BHL03) advanced to a maximum depth of 21.20m bgl (metres below ground level) using cable percussion drilling technique.
- Six (6) Sediment Grab Samples.

The site investigation identified that the proposed development site is underlain by made ground and in-filled material with a mixed lithology. The made ground ranges from ground level to a maximum recorded depth of 16.20mbgl in BHL02.

The made ground encountered comprises; steel reinforced concrete, fine to coarse sand and gravel and cobbles and boulders. The in-filled material is directly underlain by bedrock comprising medium strong dark grey basalt. Groundwater strikes and seepages were encountered in BHL02 and BHL03 at a depth of 7-8m bgl

The investigation locations are shown in **Figure 17.7**.

Figure 17.7 2017 Ground Investigation Locations



17.8.7 2025 Ground Investigation

An intrusive marine ground investigation was undertaken in March 2025 by In Situ Site Investigation Ltd. The investigation comprised the following;

- Five (5) sediment grab samples (GS003, GS006, GS008, GS009 and GS010) for environmental testing
- Ten (10) vibrocores (VC001 – VC101) to a maximum depth of 6m

The ground investigation report is included in Appendix 18.B.

17.8.7.1 Ground Conditions Encountered

The ground conditions encountered in the vibrocores are summarised below.

Surface Layer (0.00 - 0.35 m)

Composed of dark brownish grey silty fine to medium sand with occasional angular to subangular fine gravel size shell fragments. This layer is non-calcareous.

Subsurface Layers (0.35 - 5.22 m)

Silty Clay and Sand Layers - The subsurface is characterized by extremely low strength, very soft dark grey sandy silty clay, and dark grey and brownish grey silty fine to medium sand. These layers contain occasional angular to subangular gravel size shell fragments and are non-calcareous.

Gravelly Sand Layers - There are layers of dark grey and black silty gravelly sand, with gravel being a mix of angular to subangular shell fragments and black coal. These layers are slightly calcareous.

Organic Material - Some layers contain organic debris, such as black fibrous organic material and rootlets, indicating past biological activity^1^.

Deeper Layers (3.35 - 5.22 m)

Gravelly Sand with Limestone - The deeper layers include dark grey slightly clayey silty gravelly sand with a significant portion of dark grey limestone fragments. These layers are calcareous.

17.8.7.2 Sediment Sampling and Laboratory Analysis

Twenty-Four (24) sediment samples were taken and analysed for a suite of parameters. The suite followed the requirements of a sampling plan provided by Natural Resources Wales, to support the Marine Licence application for dredging and subsequent disposal of material, under license, at sea. The samples were analysed by Socotec which is a UKAS accredited, and Marine Management Organisation (MMO) approved laboratory.

The 24 sediment samples were analysed for the following parameters. The laboratory analytical certificates are contained within Appendix 18.B.

Table 17.6 Sediment Testing Suites

Determinant	Limit of Detection
Organic Matter (Total Organic Carbon) 0.02 %	0.02 %
Total Organic Matter by LOI 0.20 %	0.20 %
Particle Size Distribution %	%
Metals Suite (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn) 0.01 – 2 mg/kg	0.01 – 2 mg/kg
Chromium VI 0.1 mg/kg	0.1 mg/kg
Organotins (DBT, TBT) 0.001 mg/kg	0.001 mg/kg

PAHs (DTI 2-6 Ring Aromatics + EPA 16) 1 µg/kg	1 µg/kg
Total Hydrocarbon Content 1 mg/kg	1 mg/kg
PCBs (25 Congeners inc. ICES 7) 0.00008 mg/kg	0.00008 mg/kg
Brominated Flame Retardents (inc. BDE209) 0.0001 mg/kg	0.0001 mg/kg
Organochlorine Pesticides 0.0001 mg	0.0001 mg/kg

17.8.7.3 Sediment Contamination

In accordance with the OSPAR Guidelines for the Management of Dredged Material at Sea, contaminant levels for a number of primary contaminants (as indicated within Technical Annex I of the OSPAR Guidelines) were screened against Action Levels. The Action Levels have been set by CEFAS and are provided as Level 1 and Level 2 Action Levels. The action levels are used to determine the contaminant loading of the material with Level 1 being most conservative and Level 2 less conservative.

The screening tables are contained within Appendix 18.C.

A number of samples recorded concentrations above Action Level 1 for metals including Nickel, Mercury, Lead, Cadmium and Zinc. One sample from VC003 recorded a concentration for Zinc above Action Level 2. Samples from VC003 and VC009 also recorded PAH concentrations above Action Level 1. VC003 is in a area where sediment will need to be removed to facilitate the pontoon and therefore sediment from around VC003 will not be considered for disposal at sea.

A drawing showing a summary of the contamination exceedances is provided in Appendix 18.C.

17.8.8 Preliminary Risk Assessment

A Preliminary Risk Assessment (Appendix 18.A) was prepared to ascertain the potential for contaminated land pollutant linkages to be present at the site of the proposed development. The PRA report concluded that no potential pollutant linkages are present in relation to human health and environmental receptors.

17.9 Impact Assessment

17.9.1 Do Nothing Scenario

The ‘Do Nothing’ scenario will have a **Negligible** impact on soils, geology and hydrogeology as there will be no impact on geology, soils, sediments and groundwater

17.9.2 Assessment of Construction Effects

Plough dredging will be carried out over the footprint of the scour protection where required. A layer of soft material up to 1.5m in depth shall be removed and displaced to a deeper 'scour pocket' close by within the berth. It is anticipated that the plough dredger will track over the area a number of times to achieve the appropriate depth. The impact of dredging is considered to be **Negligible** as sediment will not be lost but will be moved to a different area within the berth.

No significant land based earthworks will be undertaken. Piling will be undertaken to support the construction of the following;

- Guide piles and Pontoon – Two stell tubular piles, approximately 2.032m in diameter, socketed into bedrock and will be filled with concrete. The installation of the guide piles will also require eight temporary stell piles of diameter 1.22m (the temporary piles will be removed once the guide pile has been installed)
- New Bankseat – steel tubular piles approximately 0.914m in diameter filled with concrete. The piles will be installed using vibro, impact driving and rotary boring techniques.

The impact to soils, geology and groundwater from these piling activities is considered to be **Negligible** as there will be no measurable impact on soils, geology or groundwater receptors.

17.9.3 Assessment of Operational Effects

As part of the preliminary contamination assessment, the Conceptual Site Model (CSM) developed for the site could not identify any soil source-pathway-receptors linkages in relation to human health and therefore the risk to human health (future site workers and site users) from ground contamination is considered to be negligible. It is anticipated that there will be no impacts on the geology during the operational phase of the site.

Groundwater will not be extracted as part of the proposed development, therefore the proposed development will have a **Negligible** impact on groundwater during the operational phase of the development.

17.10 Mitigation

17.10.1 Construction Phase Mitigation Measures

The construction activities should be conducted in a safe environmentally conscious manner and in line with all health and safety guidelines. The following practical steps will be followed:

- Fuel storage tanks, paints and oils will be stored in clearly labelled and bunded areas.

- Refuelling of all plant and machinery will only take place in designated areas away from surface waters and drains. Spill kits will be placed within the designated re-fuelling areas to contain any accidental spillages of fuel.
- An emergency plan to deal with accidental spillages will be drafted prior to construction and implemented to prevent contamination of groundwater and surface water.

17.10.2 Operational Phase Mitigation Measures

No operational mitigation measures are required.

17.10.3 Future Monitoring

No future monitoring is required.

17.11 Assessment of Residual Effects

The residual effects of the Proposed Development considering the mitigation measures are determined to be **Not Significant.**

17.12 Cumulative Effects

17.12.1 In-combination effects

An assessment of the cumulative effects with other projects (listed in Appendix 4.A) has been undertaken. No cumulative effects are predicted

17.12.2 Effects interactions

Dredging, piling, and disturbance of sediments can interact with water quality, marine ecology and coastal processes. These impacts are discussed further in Chapters 11, 8 and 10 respectively.

17.13 Limitations of the Assessment

There are no known limitations to the assessment presented in this chapter of the ES

17.14 Summary of Effects and Conclusion

The proposed development will have a **Negligible** effect on soils, geology and hydrogeology during both the construction and operational phase of the development. The effects are summarised in Table 18.7

.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Plough dredging of sediments	✓	×	None	C: Negligible	C: Negligible	C: Negligible	None	Not significant	None
Piling for guide piles/pontoon and new bankseat	✓	×	None	C: Negligible	C: Negligible	C: Negligible	None	Not significant	None

17.15 References

1. Fugro Seacore Ltd (2015). "Fishguard Port Linkspan Replacement. Factual Report on Ground Investigation."

2. Geotechnical Engineering Ltd (2017). "Geotechnical Site Investigation for the Fishguard Linkspan Project."

3. In Situ Site Investigation Ltd (March 2025). "Marine ground investigation."

4. Environment Agency (2023). "Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination."

17.16 List of Abbreviations / Acronyms

ES - Environmental Statement

OSPAR - Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic

CEFAS - Centre for Environment Fisheries and Aquaculture Science

PAH - Polycyclic Aromatic Hydrocarbons

bgl - Below Ground Level

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 18 Land Use and Material Assets

18 Land Use and Material Assets

18.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on land use and material assets. This chapter considers the potential impacts on land use and material assets from the Project during the construction and operational phases of the Proposed Development.

The phrase ‘material assets’ has a broad scope, which may include assets of human or natural origin, valued for socio-economic or heritage reasons. This may include physical resources and infrastructure, including land, buildings, utilities and land use that contribute to the socio-economic, cultural, and environmental framework of the area.

In this context, this assessment focuses on land use and existing infrastructure within and directly adjoining the study area.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing land use services and infrastructure;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on land use and material assets; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

Material assets in the context of land and soil are addressed within Chapter 17: Soils

Material assets in relation to traffic infrastructure are addressed within Chapter 19: Traffic and Transport.

Architectural and archaeological heritage was previously considered to be a subcategory of material assets under Directive 2011/92/EU. However, Directive 2014/52/EU amended this to consider those as components of cultural heritage. Cultural assets of a physical type and cultural heritage of a social type are addressed in Chapter 15 Cultural Heritage.

This chapter is supported by the following Figures located in Volume III Design Drawings & Figures.

- Figure 18.1 - Water & Sewage Infrastructure
- Figure 18.2 - Electrical infrastructure
- Figures 18.3 - Figures 18.5 - Openreach Telecoms Assets
- Figures 18.6 – 18.7 Lighting

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

18.2 Purpose of this Chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on land uses and material assets. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 18.8);
- Identifies any limitations encountered in compiling the environmental information (section 18.13);
- Presents an assessment of the potential likely significant effects on land uses and material assets arising from the Proposed Development (section 18.10.3) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 18.12.
- Highlights any necessary monitoring (section 18.10) and/or measures (see section 18.10.1 and section 18.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 18.9).

18.3 Study Area

There are no guidelines or criteria to define the size of the study area for the assessment of material assets. The material assets study area has been defined by RPS for the purpose of this assessment as the area in which there is potential for direct and indirect impact on material assets as a result of the Proposed Development. This includes the area within the proposed planning application boundary as shown in **Figure 18.1 Material Assets Study Area** below.

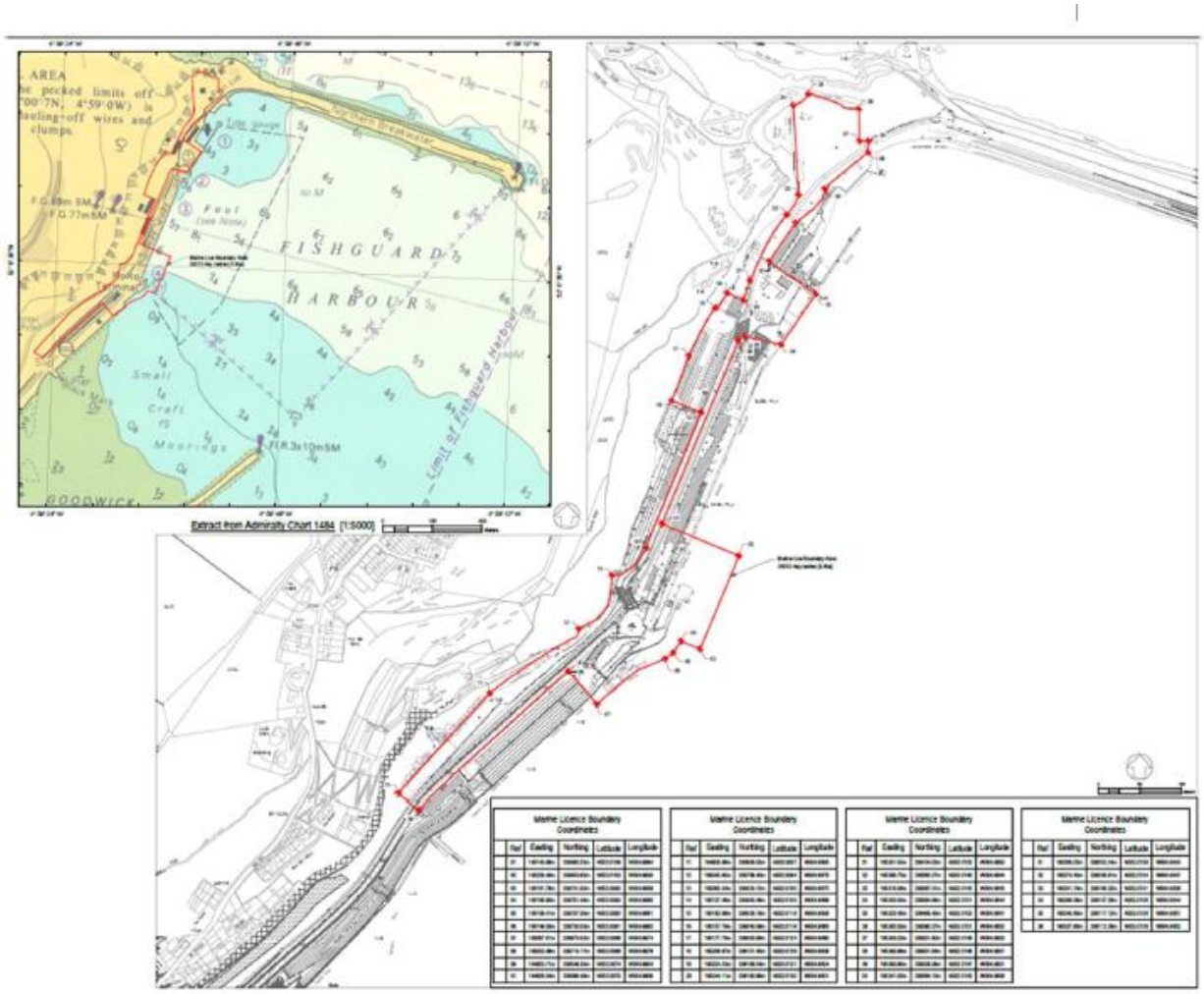


Figure 18.1 Material Assets Study Area

18.4 Policy Context

The consideration of land use and material assets has followed the overall methodology and guidance relating to EIA process and preparation as set out in Chapter 4 EIA Methodology. Theis section summarises the legislation, policy, and guidance applicable to land use and material assets.

18.4.1 EU Legislation and Policy

The EIA Directive 2014/52/EU sets out the requirements to consider the vulnerability of a project (or Development) on land and material assets. With regard to materials assets;

'*material assets can be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils'*.

Reg 5(2) and (3) of the EIA Regs:

5(2) The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the proposed development on the following factors —

(d)material assets

(e)the interaction between the factors referred to in sub-paragraphs (a) to (d).

(3) The effects referred to in paragraph (2) on the factors set out in that paragraph shall include—

(a)the operational effects of the proposed development, where the proposed development will have operational effects;

The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development…

18.4.1.1 European Union Guidance 2017 - Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)

The 'European Union Guidance 2017 - Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report' provides useful guidance on the key changes from Directive 2011/92/EU as amended by Directive 2014/52/EU specifically Annex IV points 4 and 8. It specifically emphasises natural resources as an environmental factor to be considered.

18.4.2 National Legislation and Policy

18.4.2.1 The Welsh Marine Plan 2019

The Welsh National Marine Plan was published in 2019 with the vision that Welsh seas are clean, healthy, safe, productive and biologically diverse. The Plan sets out areas of potential sector resource around the coastline identifying Fishguard as an aquaculture: water column area.

Policy ECON 01: sustainable economic growth encourages proposals that provide employment opportunities for coastal communities; and protecting and creating employment.

Policy ECON 02: Coexistence seeks proposals to demonstrate coexistence with other compatible sectors and potential opportunities at the land-sea interface.

Policy SOC 01: Access to the marine environment ensures people get to take part in activities and services provided by the marine environment and therefore supporting recreation and wellbeing.

Policy SOC 02: Wellbeing of coastal communities recognises that development has the potential to effect socio-economic factors including cultural identify and wellbeing.

Policy GOV 02 cross border and plan compatibility seeks regards to applicable policy in the marine plan; applicable policy in terrestrial development plans or related documents; the Natural Resources Policy; relevant well-being plans and assessment and any relevant NRW Area Statements.

Policy T&R 01 Tourism and recreation policy supports proposals that demonstrate positive contribution on these opportunities

18.5 Consultation

Table summarises the issues raised relevant to land use and material assets, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project between 16.12.24 and 16.01.25 and the consultees that were contacted.

Table 18-1: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to land use and material assets.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
31.01.25	NRW	Include assessment of the impacts	Section 18.9

18.6 Methodology to inform the baseline

18.6.1 Desktop Study

Information on material assets within the Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 18-2 Summary of key desktop reports. These sources provide the most up to date data for this assessment.

Table 18-2 Summary of key desktop reports.

Title	Source	Year
Built service provider's existing assets datasets to inform baseline mapping for the assessment	Openreach	2025

Built service provider's existing assets datasets to inform baseline mapping for the assessment	National Grid	2025
Built service provider's existing assets datasets to inform baseline mapping for the assessment	Welsh Water	2025

18.6.2 Site-Specific Surveys

No site-specific baseline surveys were undertaken as part of the assessment for climate. The baseline data presented in this section is derived from National Grid, Openreach and Welsh Water.

18.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology.

The scope for the assessment will be informed by desktop analysis, consultation with statutory consultees, bodies with environmental responsibility and other interested parties at scoping stage and during the pre-application community consultation.

With regards to existing land uses, consideration will be given to the existing character and type of land use, and the location of any sensitive neighbouring occupied premises likely to be directly affected by the proposed development. This includes educational, community, recreational, health care and those uses related to religious groups / activities. The assessment will focus on direct land take which would occur through the implementation of the proposed development. This will be undertaken following a desktop study, review of aerial photography, and review of OS base mapping.

With respect to land with development potential, future planned changes to land use following the grant of planning permission are relevant to the assessment. A planning history search will be carried out to establish planning applications within and directly adjacent to the study area.

18.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in below.

Table 18-3 Definition of terms relating to the magnitude of an impact.

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

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 18-4 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.

Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon material assets and land use is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 18-5. Where a range of significance of effect is presented in Table 18-5, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 18-5 Matrix used for the assessment of the significance of the effect.

Magnitude of impact					
Sensitivity of Receptor		**Negligible**	**Low**	**Medium**	**High**
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

18.8 Baseline Environment

The land use study area within Fishguard Port is dominated by the built form of the two closely associated settlements of Goodwick and Fishguard. Both settlements have a strong coastal and maritime association and character with extensive and elevated views across Fishguard Bay and along the Pembrokeshire Coast. The existing Port at Fishguard lies at the western side of the Harbour and consists of extensive tarmac area used by traffic queuing for ferries. Fishguard train station and platform lies to the west of the harbour and a number of buildings serving the RNLI and Stena offices to the North. The baseline environment is defined as the existing environment against which future changes can be measured.

The assessment of potential impacts on existing and future land use considers if there will be severance, loss of rights of way or amenities, conflicts, or other changes likely, which may alter the character and use of the surroundings.

The assessment of potential impacts on material assets focuses on resources that are valued and are intrinsic to a place - these may be of either human or natural origin, and the value may arise for either economic or cultural reasons.

The assessment of potential impacts for utilities and services will comprise all areas of proposed construction work including areas where utility and infrastructural diversions are proposed.

The matters assessed within this section of the EIA focus on the environmental effects on the following resources:

- Existing Land Use (e.g. Education / community/ open space);
- Land with development potential and adjoining land use;
- Facilities used by the local community and
- Utilities and services.

The following forms a summary of the data collated, and work undertaken to date.

- Preliminary review of legislative and policy context;
- Review of the land use designations (extant and emerging)
- Initial planning application history search
- Preliminary utility provision baseline

With regards to existing land uses, consideration will be given to the existing character and type of land use, and the location of any sensitive neighbouring occupied premises likely to be directly affected by the proposed development. This includes educational, community, recreational, health

care and those uses related to religious groups / activities. The assessment will focus on direct land take which would occur through the implementation of the proposed development. This will be undertaken following a desktop study, review of aerial photography, and inspection of planning and land registry records.

With respect to land with development potential, future planned changes to land use following the grant of planning permission are relevant to the assessment. A planning history search will be carried out to establish planning applications within and directly adjacent to the study area.

The assessment of material assets will involve a desk study to identify properties, resources, amenities etc. that may be affected by the proposed development. Consultation will be made with stakeholders in the local area.

Consultation will take place with the relevant utility providers to determine the exact location and depth, prior to commencement of works. Utility providers will be consulted well in advance and provided with design drawings to determine the extent of their utilities. If present, they may be required on site to monitor the works. All proposed designs and diversions will be undertaken in agreement with the service providers to ensure that the network and assets are protected, and customer service is maintained and safeguarded.

18.8.1 Land Use

18.8.1.1 Existing Land Use

The existing land use comprises the Fishguard Harbour, lies within Fishguard Bay, Pembrokeshire. It is a privately run Port, owned by Stena Line who operate a twice daily Ro Ro ferry service to Rosslare, Co. Wexford. Access to the ferry is currently via a single lane linkspan, which is accessed via the A40 to the south. The Port area is protected by two large man-made breakwaters.

The existing Port lies at the western side of the Harbour and consists of extensive tarmac area used by traffic queuing for ferries. There are no proposed changes to the train station and associated infrastructure nor the RNLI building or Stena office buildings.

During the construction of the Proposed Development, the existing linkspan and vehicle ramp will be removed through site clearance and therefore directly and permanently impacted.

18.8.1.2 Adjoining Land Use

To the south of Fishguard Port lies the settlement of Goodwick and the A40 that follows the shoreline in lower-lying flat land and promenade area with car parking to the rear. The watersports centre and visitor / information centre (Ocean Lab) are located in this area adjacent to the A40. The settlement of Goodwick is largely located on steep wooded cliffs with houses set out across the hillside

overlooking Fishguard Bay. Fishguard Bay Hotel is a Grade II listed building set within a Grade II registered park / garden located immediately west of the ferry terminal area. above the existing ferry terminal on the cliff tops to the north is Harbour Village that consists of small cottages overlooking the Bay.

Buildings and infrastructure associated with the ferry terminal are also very noticeable in views along and across the Harbour area.

To the east of the Port lies rocky cliffs that are not as steep as those on the western side and the small settlement of Fishguard with small bungalows hugging the rocky cliffs at Penyraber. Fishguard is closely associated with Goodwick but is separated from Goodwick by a small green area of woodland and fields.

Further east lies the rocky promontory of Fishguard Fort with direct views across Fishguard Harbour and Bay and towards the existing ferry terminal area. This section of the coast is crossed by the Pembrokeshire Coastal Path.

The existing adjoining areas may experience construction noise during the construction phase of the Proposed Development. A detailed noise impact assessment has been undertaken in Chapter 13: Noise and Vibration. As construction noise is temporary, there is no long-term noise impact on noise sensitive receptors. Although adjoining areas will experience impact from construction noise, this will not affect the use of the lands.

18.8.2 Material Assets

Indicative information in relation to their existing services within or adjacent to the Proposed Development site has been provided by a number of the main utility providers. Please refer to Volume III Figures.

18.8.2.1 Water & Sewage Infrastructure

Details of the existing Water assets within and adjacent to the Proposed Development can be found in Volume III Figure 18.1. The existing infrastructure is as follows:

- Main sewer line runs along the western boundary
- Storm water runs along the eastern side gable of railway station building to the south
- Sewer line dissects the mid portion of the site (land side)
- Outfall located within mid portion of site (land side)

There are no private water supplies located within or in close proximity to the Proposed Development site.

18.8.2.2 Electrical Infrastructure

Information was provided by National Grid with respect to the existing underground electrical infrastructure.

Details of existing National Grid assets within the adjacent to the Proposed Development can be found in Volume III Figure 18.2. The existing infrastructure is as follows:

- High voltage Cable (11kV) runs along the western boundary of the site
- Lighting masts within the existing linkspan structure

18.8.2.3 Telecommunications Infrastructure

Information was provided by Openreach Maps on demand portal with respect to the existing telecommunication infrastructure.

Details of existing Openreach assets within the adjacent to the Proposed Development can be found in Volume III Figure 18.3 – 18.5. The existing infrastructure is as follows:

Duct running along the western boundary with associated joint boxes.

18.9 Impact Assessment

This section sets out effects that would occur during the construction and operational phase of the Proposed Development, with respect to land use and material assets.

18.9.1 Do Nothing Scenario

The "do nothing scenario" refers to the potential outcomes if the project does not proceed. Without the Proposed Development, it is assumed the site would remain unchanged and there would be no anticipated change to the baseline conditions. Ongoing issues would continue, and no benefits would be realised from investment in infrastructure and amenities.

The "do nothing scenario" highlights the importance of the Proposed Development in aligning with the Pembrokeshire County Council Local Development Plan objectives.

18.9.2 Assessment of Construction Effects

18.9.2.1 Existing Land Use

The nature of the development requires the whole of the site to be impacted temporarily during construction from a material assets and land use perspective.

The predicted magnitude of impact is considered to be **Medium** with a receptor sensitivity of **Low**, as the site is currently a Port. The significance of the environmental effect is therefore considered to be **Minor**.

18.9.2.2 Adjoining Land Use

The existing residential and commercial areas in close proximity to the Proposed Development site will be impacted by construction noise and traffic during the construction phase of the Proposed Development. A detailed noise impact assessment has been undertaken in Chapter 13: Noise and Vibration. As construction noise is temporary, there is no long-term noise impact on noise-sensitive receptors. Noise mitigation measures are recommended, as discussed in Section 13.10 of Chapter 13.

Although the adjoining areas will experience impact from construction noise and traffic, this will not affect the use of the land as residential and commercial. The predicted magnitude of impacts is considered **Negligible**, with a receptor sensitivity of **High**. The significance of the environmental effect is therefore considered to be **Negligible**.

18.9.2.3 Material Assets

18.9.2.3.1 Water & Sewage

One proposed outfall from the Proposed revetment will connect into the existing water infrastructure.

The predicted magnitude of impacts is considered low, with a receptor sensitivity of low. The significance of the environmental effect is considered to be low/minor beneficial.

18.9.2.3.1.1 Electrical Infrastructure

Underground cables run through the Proposed site as detailed in Figures 18.3 – 18.5.

Existing 12m lighting column within the present linkspan will be removed and replaced within the Proposed linkspan with columns as detailed in Figures 18.6 – 18.8 and Appendix 18.A.

The predicted magnitude of impacts is considered low, with a receptor sensitivity of medium. The significance of the environmental effect is considered to be Moderate given the possible disruption to essential electrical infrastructure.

18.9.2.3.1.2 Telecommunications Infrastructure

Any telecommunication infrastructure in or surrounding the Proposed Development site, including poles and boxes, and any planned proposals.

The predicted magnitude of impacts is considered Medium, with a receptor sensitivity of medium. The significance of the environmental effect is considered to be Minor given the possible disruption to essential telecommunications.

18.9.3 Assessment of Operational Effects

18.9.3.1 Existing Land Use

The majority of the existing land use of the site will see a positive, permanent change from the existing Fishguard linkspan once the Proposed Development is operational. The existing linkspan pontoon and jack up barge does not provide a long-term solution for the ferry at the berth as it is approaching its practical end of life. Therefore, the proposed replacement linkspan pontoon and associated civil and marine infrastructure to allow the continuation of ferry service from the Fishguard Port.

The vision of the Pembrokeshire County Council Local Development Plan states;

““To ensure that Pembrokeshire is prosperous and that it remains vibrant and special by creating: a network of strong urban and rural communities in Hub Towns, Service Centres, Service and Local Villages supported by a robust, sustainable, diverse high value-adding economy underpinned by the Area’s unique environment, maritime access to the Milford Haven Waterway and Fishguard Harbour and internationally important energy and tourism opportunities.”

As such the predicted magnitude of impacts are considered **High Beneficial**. The significance of the environmental effect is therefore considered the land use is considered to be **highly beneficial** impact

18.9.3.2 Adjoining Land Use

There will be **No Impact** to adjoining land use during the operational phase of the Proposed Development.

As such the predicted magnitude of impacts of considered No change. The significance of the environmental effect is therefore considered to be Negligible.

18.9.3.3 Material Assets

18.9.3.3.1 Water & Sewage Infrastructure

One proposed outfall from the Proposed revetment will connect into the existing water infrastructure.

This will provide an efficiency, designed to current standards and protocols. Once an adequate connection is operational the magnitude of the impact is considered to be Low. The significance of the environmental effect is therefore Minor beneficial.

18.9.3.3.2 Electrical Infrastructure

Installation of additional lighting masts and underground cabling will improve the safety and security of the Harbour and embarkment of passengers and traffic.

This work will be undertaken in accordance with industry standard construction methods with minimal disruption to the surrounding area. Works will adhere to specific guidelines to ensure safety and accessibility.

The predicted magnitude of impacts is considered Low. The significance of the environmental effect is therefore considered to be low.

18.9.3.3.3 Telecommunications Infrastructure

There is telecoms infrastructure in the surrounding the Proposed Development site, including ducts and boxes. Works will adhere to specific guidelines to ensure safety and accessibility, and to avoid interference with telecoms infrastructure.

The predicted magnitude of impacts is considered Low. The significance of the environmental effect during the operational phase is considered to be negligible.

18.10 Mitigation

18.10.1 Construction Phase Mitigation

18.10.1.1 Adjoining Land Use

The existing residential areas adjoining the Proposed Development site, or in close proximity will be impacted by construction noise during the construction phase of the Proposed Development. A detailed noise impact assessment has been undertaken in Chapter 13: Noise and Vibration. As construction noise is temporary, there is no long-term noise impact on noise-sensitive receptors. Noise mitigation measures are recommended, as discussed in Section 13.10 of Chapter 13.

18.10.1.2 Water & Sewage Infrastructure

In respect of the water infrastructure, further surveys will be undertaken during the final detailed design stage, to confirm and verify the location of all services within the site. Methods such as

Ground Penetrating Radar (GPR) within the Proposed Development site will be used to verify and locate any previously unidentified existing services.

In relation to any water installation work, this is be carried out by Welsh Water or Welsh Water contractors using their pre-established safe systems of work and procedures. Mitigation measures will be for Welsh Water to determine at a later stage of the scheme redevelopment. These will include any specific environmental issues determined within this report. Where mitigation measures above are employed, the potential magnitude of the impact on water infrastructure will be reduced to minor and thus reducing the significance of environmental effect to Minor beneficial/negligible.

18.10.1.3 Electrical Infrastructure

Proposed lighting masts and associated underground cables will be constructed in accordance with industry standard construction methods with minimal disruption to the surrounding area.

In relation to electrical installation work, this will be carried out by National Grid or their approved contractors using their pre-established safe systems of work and procedures. Mitigation measures will be for National Grid to determine at a later stage of the Proposed Development.

A proactive and consistent communication process will be established and maintained with the key statutory agencies in regard to the potential impacts and disturbance on existing infrastructure. This will ensure that works are discussed and planned in a collaborative manner and programmed accordingly to ensure minimal disruption to existing residents, neighbouring land users and service provision.

Where mitigation measures listed above are employed, the potential magnitude of the impact on electrical infrastructure will be reduced to *low* thus reducing the significance of environmental effect to Negligible.

18.10.1.4 Telecommunications Infrastructure

To ensure the protection of telecommunication infrastructure during the construction phase, a comprehensive survey of existing telecommunication assets should be conducted to identify and map out all relevant infrastructure within the construction zone. This will allow for careful planning and avoidance of any potential damage.

Clear communication protocols must be established, ensuring that all construction personnel are aware of the locations of these assets and the importance of avoiding them. It is crucial that telecoms engineers are consulted prior to any works to assess the condition of the infrastructure and provide guidance on best practices for safeguarding it during construction.

Protective barriers and signage should be erected around sensitive areas to deter unauthorized access and minimise the risk of accidental disruption. Regular monitoring and coordination with telecommunication providers throughout the construction process will address any issues and maintain service continuity. Where mitigation measures listed above are employed, the potential magnitude of the impact on telecoms will be reduced to low thus reducing the significance of environmental effect to Negligible.

18.10.2 Operational Phase Mitigation Measures

No mitigation measures are proposed in relation to material assets for the operational phase as there are no significant adverse impacts expected as a result of the operation of the Proposed Development.

18.10.3 Future Monitoring

During the operational phase of the Proposed Development, monitoring under the terms and conditions of the discharge consents (if applicable) in relation to drainage and sewer networks will be conducted to ensure compliance with the emission limit values set which will ensure the quality of the receiving environment is not impacted.

On completion, the storm drainage network for the site will be offered to Welsh Water for adoption. They will then become responsible for the monitoring and maintenance of the network.

18.11 Assessment of Residual Effects

The residual effects associated with the change in land use of the scheme during the construction and operational phase are considered highly beneficial and align with policies within the Pembrokeshire County Council Local Development Plan. Some of these policies include:

- SP 2 Port and Energy Related development
  - Development at the Ports of Milford Haven and Fishguard will be permitted for port related facilities and infrastructure, including energy related development.
- GN.21 Marinas
  - Sites for marinas are located within the existing harbours and docks at Fishguard Harbour and Pembroke Dock.
  - Proposals for new of extended marinas will be permitted where the following criteria are met:
    1. The development is located within or adjoining an existing settlement;

2. The development would not have a significant detrimental impact on the landscape character of the coast;
3. Ancillary proposals will not undermine the vitality or viability of facilities in existing centres; and
4. The proposal would not conflict with the sustainable management of the coast.

The residual effects are therefore deemed **'Significant'** beneficially, for both the construction and operation of the Proposed Development after considering the mitigation outlined above.

18.12 Cumulative Effects

Consideration has been given to a number of other projects which may have the potential to overlap with the Proposed Development based on available information. The scope of the other projects that have been considered as part of this cumulative assessment have been identified through a desk study involving general internet searches and in particular, scrutiny of the Citizen Portal Planning for Pembrokeshire County Council (https://planning.agileapplications.co.uk/pembrokeshire/) and Pembrokeshire Coast National Park (https://planning.agileapplications.co.uk/pcnpa). These are detailed in **Table 18-6** below.

Table 18-6: Cumulative projects

Planning Application Reference	Description of Development	Site Address	Status of Application	Distance	Direction
11/0739/PA	Mixed use development comprising commercial marina, residential apartments, ancillary retail/commercial facilities, together with land reclamation (including the provision of a development platform), infrastructure (including accesses) and landscaping.	Fishguard Harbour, The Parrog, Goodwick, SA64 0DE	Approved	1.5km	South
15/1049/PA	Construction of reclamation platform, breakwaters and revetments, dredged marina basin & channel, public slipway, boat hoist/jetty & service quay, and floating pontoons (Phase 1 Reserved matters of Planning Consent reference 15/1283/PA).	Fishguard Harbour, The Parrog, Goodwick, SA64 0DE	Approved	0.5km	Northeast
15/1283/PA	Variation of conditions and removal of conditions of reference 11/0739/PA	Fishguard Harbour, The Parrog, Goodwick, SA64 0DE	Approved	0.5km	Northwest

18.12.1 In-combination effects

No significant cumulative effects on land use or material assets are expected to arise during either the construction or operational phases of the Proposed Development. However, it is recognized that future developments requiring a connection to Welsh Waters network will need to ensure that adequate infrastructure is in place to accommodate the additional demand.

18.12.2 Effects interactions

The combined or synergistic effects caused by the combination of a number of effects on a particular receptor (taking into consideration effects at the site preparation and earthworks, construction and operational phases), which may collectively cause a more significant effect than individually. A theoretical example is the culmination of disturbance from dust, noise, vibration, artificial light, human presence and visual intrusion on sensitive fauna (e.g. certain bat species) adjacent to a construction site.

18.13 Limitations of the Assessment

There were no limitations that would affect the robustness of the assessment for EIA purposes.

18.14 Summary of Effects and Conclusion

The Proposed Development will not be changing the land use of the site, it will be improving the existing Fishguard linkspan. The redevelopment of the land use once the Proposed Development is in operation is considered highly beneficial and aligns with objectives within the Pembrokeshire County Council Local Development Plan. The improved public utilities will enhance accessibility and functionality, further benefiting the surrounding area.

Provided mitigation measures identified are adhered to the Proposed Development will have no adverse significant impact on material assets and land use. Consultation with relevant utility providers and government bodies will be necessary to minimise disruption to existing infrastructure within and surrounding the site during the construction phase. A summary of the effects of the Proposed Development is included below in Table 18-7.

Table 18-7: Summary of Effects

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Water and Sewage Infrastructure	✓	×	Outfall to tie in with existing carried out by Welsh Water or contractor	C: low	C: low	C: Low	None	Negligible	N/A
Electrical Infrastructure	✓	×	Lighting assessment undertaken	C: low	C: medium	C: medium	None	Negligible	N/A
Telecommunication Infrastructure	✓	×	Survey and mapped prior to construction Safety barriers and controls	C: medium	C: Medium	C: Minor	None	Negligible	N/A

18.15 References

The Welsh Marine Plan (Welsh Government, 2019)

Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017)

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 19 Transport

19 Transportation

19.1 Introduction

This chapter of the ES comprises a transportation assessment of the proposed replacement linkspan at Fishguard Port.

Natural Resource Wales (NRW) have confirmed that Transport should be scoped into the EIA and considers that the ES should include an assessment of the impacts as set out in the Scoping Report which focused on the impacts during the construction phase of the project as the Proposed Development will not result in any additional sailings or increased usage of the Ferry Terminal over the existing levels and therefore the operational phase will have a negligible impact upon the surrounding road network.

The traffic flows generated by Fishguard Port relate to the number vessel sailings and the times of the sailings. Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel sizes will not increase above existing levels, therefore the number of vehicle movements generated by the Port are also not expected to increase above existing levels, resulting in a negligible traffic impact in the operational phase of the Proposed Development.

The construction works will occur over a 12-month period with a 2-month ferry service shutdown. For the first 7 months the ferry services will remain online while the construction works are being carried out, then the ferry services will be offline for 2no. months and then back online for the last month of the construction period. The works will be carried out by approximately 10-15no. construction related staff that will be present at the site.

This chapter contains an assessment which determines that the impact of this construction traffic on the road network during peak times will be negligible, and when the ferry services are offline (2no. months) there will be a temporary increase in road capacity.

Ferry services will return to normal service following the works. The transport networks are not affected by the proposed development, either during the construction stage or the operational stage.

The potential cumulative impact of the proposed development with the committed neighbouring mixed-use development has been considered in this chapter and determines that the cumulative impact will also be negligible.

19.2 Purpose of this chapter

The primary purpose of this chapter of the ES is to provide an assessment of the likely direct and indirect significant effects of the Project on traffic and transport during the construction period as the operational period will be no more onerous in traffic terms than currently occurs on the highway network.

19.3 Study Area

The study area has considered the following junctions which provide the direct linkage between the Proposed Development site and the external road network.

- A487 Wern Road / A40 The Parrog / Station Hill / Local Road
- Local Road / Fishguard Ferry Port / Fishguard Pier Car Park
- Fishguard Ferry Port Access

19.4 Policy Context

The report takes account of the methodology set out in the Chartered Institution of Highways & Transportation (CIHT) Guidelines for Traffic Impact Assessment 1994.

19.4.1 National legislation and policy

The following legislation and policy has been considered within this assessment:

- Planning Policy Wales (2002)
- Technical Advice Note 12: Design (2002)
- Technical Advice Note 18: Transport (2007)
- Guidelines for Traffic Impact Assessment (Chartered Institution of Highways & Transportation; 1994)
- Draft Regional Transport Plan (RTP) South West Wales.

19.5 Consultation

Natural Resource Wales (NRW) have confirmed that Transport should be scoped into the EIA and considers that the ES should include an assessment of the impacts as set out in the Scoping Report which focused on the impacts during the construction phase of the project as the Proposed Development will not result in any additional sailings or increased usage of the Ferry Terminal over the existing levels and therefore the operational phase will have a negligible impact upon the surrounding road network.

The authors have also liaised closely with Stena Line and EIA team to understand the site specific construction methodology being proposed at the site. This has allowed an estimation of construction related vehicles to be calculated for the duration of the construction programme.

19.6 Methodology to inform the baseline

The following data has been acquired to carry out this assessment:

- The existing number of vessel sailings and the sailing schedule;
- The existing traffic volumes at the double access roundabout at the Harbour Access / A40 The Parrog / A487 Wern Road / Station Hill junction;
- The proposed construction programme and associated estimated volumes of construction related vehicles;
- Proposed numbers of construction related staff and the associated traffic flows;
- Proposed working hours for the construction of the scheme.

19.6.1 Desktop study

A desktop study was undertaken of the existing access routes to the operational port. Given that the existing port does accommodate HGV freight, then the surrounding road network is suitable to accommodate construction related traffic.

19.6.2 Site-specific surveys

In order to inform the ES, site-specific traffic surveys were undertaken at a number of junctions on the surrounding road network to inform the traffic and transport assessment as indicated in Table 19-1.

Table 19-1 Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Traffic & Queue Surveys	Local Road / A40 The Parrog / A487 Wren Road / Station Hill	Classified Junction Count & Queue Length Survey	MHC Traffic Limited	30/01/2025 & 31/01/2025	-
	Local Road / Ferry Port Access Road	Classified Junction Count & Queue Length Survey	MHC Traffic Limited	30/01/2025 & 31/01/2025	-
	Ferry Port Access	Classified Junction Count & Queue Length Survey	MHC Traffic Limited	30/01/2025 & 31/01/2025	-

19.7 Assessment Methodology

The assessment methodology has followed the approach set out in the Guidelines for Traffic Impact Assessments (CIHT). These guidelines indicate a 10% threshold for uncongested roads and this is the threshold considered within this assessment.

19.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in Table 19-2

Table 19-2 Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).

Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).

The criteria for defining receptor sensitivity in this chapter are outlined in Table 19-3 below.

Table 19-3 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon traffic and transport is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 19-4. Where a range of significance of effect is presented in Table 19-4, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of low or less have been concluded to be not significant in terms of the EIA Regulations.

Table 19-4 Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
		Negligible	Low	Medium	High
	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor

	Low	Negligible	Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High		Negligible or Minor	Minor or Moderate	Moderate or Major	Major

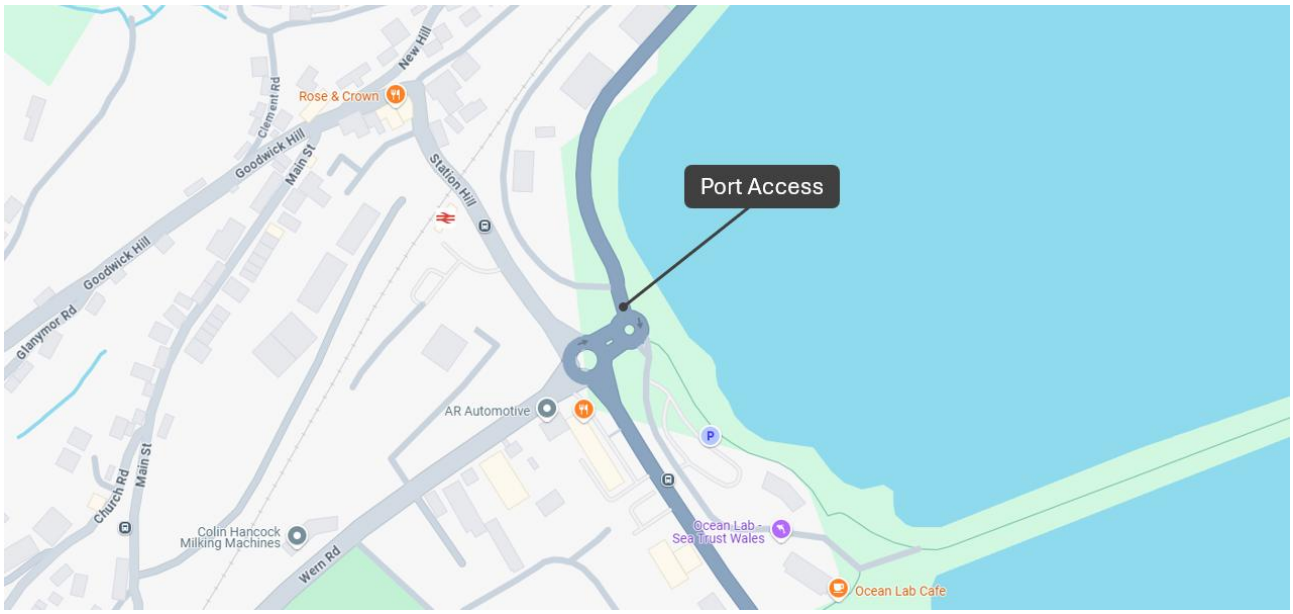
Based on the proposed volume of traffic associated with the construction phase the magnitude of impact is predicted to be negligible and the sensitivity is also deemed to be negligible. Therefore, the overall significance of effect in relation to traffic and transport is deemed to be negligible.

19.8 Baseline Environment

19.8.1 Existing Vehicular Access to Fishguard Harbour

Vehicular access to the port is currently provided via a double roundabout at the Harbour Access / A40 The Parrog / A487 Wern Road / Station Hill junction. The junction location is shown in Figure 19.1.

Figure 19.1: Location of Existing Port Access (Source - Google Maps)



The eastern roundabout of the double configuration currently serves as the primary port access and access to an adjacent public car park. The western roundabout acts as the main through route connecting to the wider road network and towards Fishguard town centre.

The western roundabout is approximately 31 metres in diameter, with single lane approaches on the north, west and south arms, and a singular circulatory carriageway. The eastern approach arm, which serves as an exit route from the public car park and port, has a two-lane approach, approximately 12 metres in length. Splitter islands are also provided on all approach arms of the roundabout as shown in Figure 19.2.

Figure 19.2: Illustration of Existing Port Roundabout Access (Google Maps)

The existing site is very well located in relation to access to the strategic road network. Near the site, the A40 is a single carriageway two-way road, which is subject to a 30mph speed limit. The carriageway is approximately 7.3 metres wide with footways provided on both sides of the carriageway. Street lighting is also provided to the east of the carriageway. As well as providing access to Fishguard Port, the A40 The Parrog serves as a link between Fishguard town centre and residents areas to the north and west of the site.

19.8.2 Identify Peak Traffic Times Using Ferry Sailing Times

Fishguard Port accommodates vehicles and freight that travel on and off the vessel on wheels. These are known as Ro-Ro movements - an abbreviation of Roll On - Roll Off. Traffic generated by Ro-Ro ports is directly linked to the number of sailings per day, the time of the sailings, and the throughput of each vessel i.e. the number of passenger vehicles and freight vehicles. Therefore, an understanding the vessel sailings timetable helps to interpret the likely traffic flow profile and identify the peak traffic times.

Currently, Fishguard Port provides services using the Ro-Ro ferry MS Stena Europe, which is 149 metres long and has 1,120 lane metres.

Table 19-5 Sailing Timetable Over a Typical Day between Fishguard & Rosslare

24 Hours	Fishguard Harbour	Rosslare Harbour
00:30	Check in for next departure (closes at 00:30)	
01:00		
01:30	Vessel departs Fishguard at 01:30	
02:00		
03:00		
04:00		
05:00		
05:30		Vessel arrives at Rosslare at 05:30

06:00		
07:00		
08:00	*Typical AM peak hour period for external traffic 08:00 – 09:00*	
08:15		Vessel departs Rosslare at 08:15
09:00		
10:00		
11:00		
11:45	Vessel arrives at Fishguard at 11:45	
12:00	Traffic will disembark from vessel shortly after	
13:00	Check in for next departure closes at 13:00	
14:00	Vessel departs Fishguard at 14:00	
15:00		
16:00		
17:00	*Typical PM peak hour for external traffic 17:00 – 18:00*	
17:30		Vessel arrives at Rosslare at 17:30
18:00		
19:00		
19:30		Vessel departs Rosslare at 19:30
20:00		
21:00		
22:00		
23:00	Vessel arrives at Fishguard at 23:00	
24:00	Traffic will disembark from vessel shortly after	

Table 19-5 shows that the peak ferry activity, and therefore the peak traffic activity associated with the harbour, will occur between 11:15 - 13:10 and between 21:25 - 23:45.

The peak times on an external road network occur during the typical weekday AM and PM commuter peak hour periods. Therefore, the ferry schedule already contributes towards minimising the impact of port traffic on the local external road network at peak times simply by the nature of the sailing times.

The analysis shown on Table 19-5 identifies the 3 peak traffic periods that will occur while the proposed development is under construction:

- External Road Network Weekday AM peak hour;
- Inter-peak caused by the Midday sailing activity at the Port;
- External Road Network Weekday PM peak hour.

The nighttime sailing, causing activity between 21:25 - 23:45, will occur at an off-peak time for the external road network and won't be considered as a peak period. In addition, the proposed construction working hours finish at 19:00 for the weekday and there won't be any interaction between harbour traffic and construction traffic after this time.

19.8.3 Existing Traffic Flows

Stena Line has advised that typically the highest freight and passenger flows occur on Thursday / Friday and therefore in order to determine the existing traffic flows at the harbour, new classified traffic count surveys were undertaken by MHC Traffic Ltd on Thursday 30th January and Friday 31st January 2025 at the A40 The Parrog / A487 Wern Road / Station Hill / Fishguard Port double roundabout access junction and the existing access to the Ferry Port. Traffic surveys were carried out for the 12-hour period between 07:00-19:00 on both days to ensure that the AM, PM and interpeak times were surveyed and to cover the 12-hour working day proposed for the construction works. The traffic flows diagrams are contained in Volume III, Appendix 19.1.

The surveyed traffic flows have been converted to Passenger Carrier equivalent Units (PCU) using the conversion factors from the Transport for London (TfL) Traffic Modelling Guidelines as shown in Table 19-6. PCUs are industry standard unit for traffic flows.

Table 19-6 PCU Conversion Factors: TfL Traffic Modelling Guidelines

Mode	PCU Value
Pedal Cycle	0.2
Motorcycle	0.4
Passenger Car	1.0
Light Goods Vehicle (LGV)	1.0
Medium Goods Vehicle (MGV)	1.5
Buses and Coaches	2.0
Heavy Goods Vehicles (HGV)	2.3
Articulated Buses	3.2

Figure 19.3 below indicates the traffic flow profile (in 15-minute time segments) for the 12-hour period 07:00 to 19:00 (both Thursday and Friday). The flows shown are the two-way flows at the harbour access arm of the roundabout.

Figure 19.3: Two-Way Traffic Flows at Fishguard Port Access – Thursday 30th & Friday 31st January 2025 (0700 – 1900)

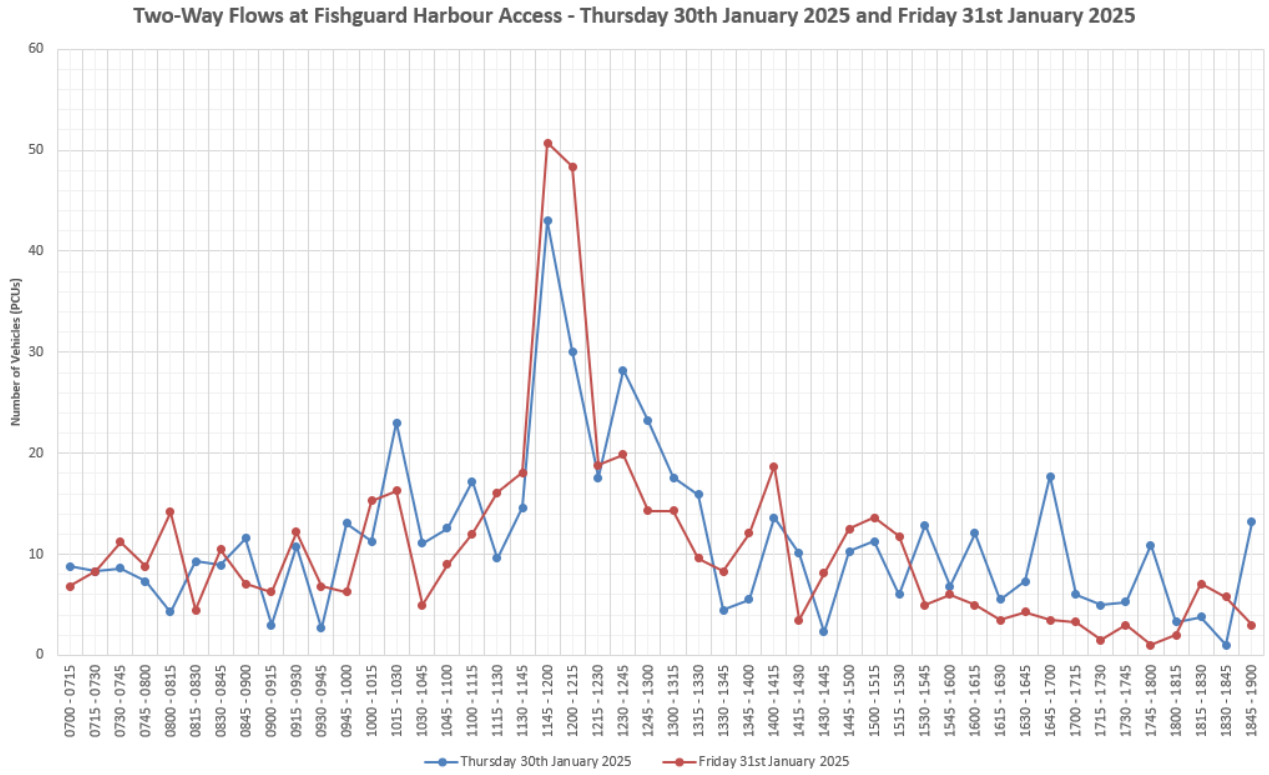


Figure 19.3 confirms that the traffic profile at the access is consistent with the ferry timetable summarised in Table 19-5 above. Figure 19.3 indicates that there is a continuous low flow of traffic associated with the Ferry Port access throughout the day with traffic activity increasing in connection with the ferry sailing timetable, spiking to a maximum of 51PCU in the 15-minute period (1145 – 1200) when the vessel disembarks shortly after arriving at the harbour.

Table 19-7 below summarises the total number of vehicles in PCUs at the harbour access between 07:00 and 19:00 for Thursday 30th and Friday 31st January 2025. These figures are confirmed in the traffic flow diagram contained in Volume III, Appendix 19.1.

Table 19-7 Two-Way Traffic Flows at Fishguard Port Access for Thursday 30th January 2025 & Friday 31st January 2025 – 12hrs between 0700 - 1900

Date	No. of Vehicles – 12no. Hours (0700 – 1900)		
	Arrivals	Departures	Totals
Thursday 30th January 2025	298	248	546
Friday 31st January 2025	264	249	513

The results in Table 19-7 indicate a similar level of overall traffic (arrivals and departures) on both Thursday and Friday survey days.

The traffic survey found that the peak hours on the road network surveyed as part of this Proposed Development (for both days) are:

- 0815 - 0915 External Road Network Weekday AM peak hour
- 1145 - 1245 (associated with the Midday sailing activity at the port)

- 1645 - 1745 External Road Network Weekday PM peak hour

Peak hour traffic flows at the at the A40 The Parrog / A487 Wern Road / Station Hill / Fishguard Port double roundabout access junction for each of the peak hours are contained in Volume III, Appendix 19.1.

19.9 Impact Assessment

19.9.1 Do Nothing Scenario

The Do-Nothing Scenario will result in no impact upon the surrounding highway network as the Ferry Port will continue to operate as it currently does.

19.9.2 Assessment of Construction Effects

The construction works are anticipated to occur over a 9no. month period. For months 1-6no. and month 9no. the ferry service will remain online while the construction works are being carried out. For the months 7-8no. of the construction period the existing ferry services will be suspended. The construction programme is seen in Table 19-8.

During the proposed construction, working hours will be:

- Monday to Sunday – 07:00 to 19:00 hrs;

No significant construction noise activities shall be permitted outside of these hours except as necessary for operational or safety reasons.

Table 19-8 Estimation of Construction Traffic during the 9 Month Construction Programme

									Ship Online					Ship Offline			Ship Online
Construction Activity	**Unit**	**Quantity (Approx)**	**Unit Weight (t)**	**Density**	**Total Weight (t)**	**Wgt per Veh**	**Total No. of Veh**	**Total No. of Two-Way Trips**	**Sept 2026**	**Oct 2026**	**Nov 2026**	**Dec 2026**	**Jan 2027**	**Mid Jan 2027**	**Feb 2027**	**To Mid-March 2027**	**Late March / April 2027**
Mobilisation	nr	1					20	40	20								20
Pile Setup & Temp Works	nr						20	40		6	14			20			
Steel Deliveries for Piling	t	266			266	20	21	42			28		14				
Concrete (Pile infill)	m^3	60	2.4	t/m^3	144	6	10	20				20					
Asphalt	m^3	50	2.4	t/m^3	120	20	3	6								6	
Rock Armour Deliveries	m^3	500	2.65	t/m^3	1325	26	20	40						40			
Rockfill Core Deliveries	m^3	0	1.8	t/m^3	0	26	0	0									
Demolition Vehicles							20	40						20	20		
Linkspan Services / Personnel							40	80						10	60	10	
Onshore Works							20	40					5	10	10	10	4
Site Cars (Staff)							1230	2460	260	260	260	260	300	300	300	260	260
Total (All Vehicles)							**1404**	**2808**	**280**	**266**	**302**	**280**	**320**	**400**	**390**	**286**	**284**

Total HGVs	**20**	**6**	**42**	**20**	**20**	**100**	**90**	**26**	**24**
Total No. of Construction Related Vehicles (Cars + HGVs) Two-Way Trips Per Day	9	9	10	9	10	13	14	9	9
Total No. of Site Cars (staff) Two-Way Trips Per Day (working 7 days per week)	9	8	9	8	10	10	11	8	8
Total No. of HGVs Two-Way Trips Per Day	0.7	0.2	1.4	0.6	0.6	3.2	3.2	0.8	0.8
HGV Trips Per Hour (12no. hour working days)	0.06	0.02	0.12	0.05	0.05	0.27	0.27	0.07	0.06

19.9.2.1 Proposed Construction Staff Vehicles

The proposed development will be carried out by approximately 10-15 construction related staff that will be present at the site.

On a workday, when the working hours are 07:00 to 19:00, a worst-case assumption would be that 10-15 private staff vehicles arrive prior to 07:00 and depart after 19:00. This could be considered as a robust assessment as it assumes that each staff member arrives in their own car with no shared trips by staff and all members of construction staff don't necessarily start at the same time.

These traffic volumes are low, and as the arrivals and departures would fall outside of the peak hour traffic flows on the external road network and therefore would have a negligible impact. For months 1-6no. and month 9no. of the construction period, when the ferry services remain online, the construction staff vehicles avoid the midday interpeak traffic activity at the Port and therefore are a negligible impact.

For the 2no. months of the construction period when the ferry service is offline there will be large overall decrease in traffic flows at the port.

In summary, even for a worst-case assessment the impact of the traffic generated by the 10-15 staff members would be minimal and occur at off peak times.

19.9.2.2 Proposed Construction Vehicles

Table 19-8 provides an estimation of construction related vehicles during the 9no. month construction period. It breaks the programme into monthly activities and indicates the number of construction vehicles (two-way trips) per month, then the average per day and per hour.

As indicated in Table 19-8 the most onerous construction period is identified as Month 5 (January 2027) when there is predicted to be an average of 3.9no. total (two-way trips) HGVs per working day (working 7 days a week) and 0.32no. HGVs per hour (based on a 12no. hour working day). The other months of the construction programme generate significantly less HGVs and therefore the assessment is based on the worst-case month for a robust assessment.

Assuming that each construction vehicle has a PCU value of 2.3, which is the most robust conversion value selected from Table 19-8 above, equates to (3.9 x 2.3) 8.97no. total PCUs at the site per day and therefore 5no. PCUs arriving to the site and 5no. PCUs departing the site each day between 07:00 and 19:00.

Table 19-9 below summaries the existing traffic flows for the 12 hours between 07:00 and 19:00, as shown diagrammatically in Volume III, Appendix 19.1. It adds in the worst case construction traffic, 5 PCUs arriving and 5 PCUs departing while the vessels are still online and operational. Table 19-9 also identifies the percentage impact on the three main approaches to the Ferry Port (assuming the total volume of construction traffic uses each route – i.e. assessing 10no. PCUs on each approach route and therefore treble the worst case traffic), and shows the percentage impact in traffic flows on the three approach roads to the site – Station Hill, A40 The Parrog and A487 Wren Road.

Table 19-9 Two-Way Traffic Flows at Fishguard Port Access Junction for Thursday 30th January 2025 & Friday 31st January 2025 – 0700 – 1900 hours

Approach Road to Port	Peak Day	12no. Hour Traffic Flow (0700 – 1900)											
		No. of Existing Vehicles (PCUs)			Worst Case Construction Vehicles (PCUs)			Proposed No. of Vehicles (PCUs) during Construction			Worst Case Percentage Impact		
		Arr	Dep	Tot	Arr	Dep	Tot	Arr	Dep	Tot	Arr	Dep	Tot
Station Hill	Friday	1393	1687	3080	5	5	10	1398	1692	3090	0.36%	0.30%	0.32%
A40 The Parrog	Friday	2735	2819	5555	5	5	10	2740	2824	5565	0.18%	0.18%	0.18%
A487 Wren Road	Friday	1642	1243	2885	5	5	10	1647	1248	2895	0.30%	0.40%	0.35%

Table 19-9 indicates that the proposed construction traffic will have a minimal impact upon the surrounding highway network during the construction period.

The Chartered Institution for Highways & Transportation has published Guidelines for undertaking Traffic Impact Assessments. These Guidelines have been used as a basis for the assessment of the traffic generated by the proposed development. Guidelines recommend that a Traffic Impact Assessment should be produced when one or more of the following thresholds are exceeded:

- Traffic to and from the development exceeds 10% of the existing two-way flow on the adjoining highway;
- Traffic to and from the development exceeds 5% of the existing two-way flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period, or in other sensitive locations.

In this context the robust worst case percentage impacts of less than 1% on any of the 3no. approach routes do not breach the identified thresholds and therefore indicates an insignificant impact with no further analysis required.

The percentage impacts shown in Table 19-9 are based on existing traffic flows collected in 2025. The construction is anticipated to occur over a 9-month period. During this time background traffic growth may be experienced on the road network, but this will only serve to reduce the percentage impacts further.

19.9.3 Assessment of Operational Effects

Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel size are not expected to increase above existing levels. The related number of generated vehicle movements are also not expected to increase above existing levels.

Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed and no requirement for an assessment of operational effects.

19.10 Mitigation

As is typical to the construction process, the appointed Contractor will liaise with the Local Highway Authority to agree the proposed construction traffic management measures prior to the start of the construction period. This will ensure the proposed construction activities and working hours assessed within this chapter can be implemented. However, there is no mitigation associated with the proposed construction period as the surrounding road network can accommodate the predicted levels of HGV traffic.

19.10.1 Construction Phase Mitigation Measures

There is no mitigation associated with the proposed construction period as the surrounding road network can accommodate the predicted levels of HGV traffic.

19.10.2 Operational Phase Mitigation Measures

There is no mitigation associated with the operational phase of the proposed development as the proposal will not result in an increase in the number of trips associated with the Ferry Port.

19.10.3 Future Monitoring

There are no proposals for future monitoring as once the Proposed Development is completed the Ferry Port will continue to operate as it currently does.

19.11 Assessment of Residual Effects

The Proposed Development will not result in any increase in operational traffic at the Ferry Port once the construction phase is completed and therefore it is predicted that there will be no residual impacts from the Proposed Development in relation to traffic and transport.

19.12 Cumulative Effects

There are no cumulative projects which could result in a cumulative effect on the surrounding highway network.

19.12.1 In-combination effects

It is considered that there will be no in combination effects in transportation terms associated with the proposed development.

19.12.2 Effects interactions

It is predicted that there will be no effects interactions associated with the Proposed Development in relation to traffic and transport. The Ferry Port currently accommodates HGV traffic volumes and therefore the predicted increase associated with the construction phase is well within the identified daily variance as indicated in the Guidelines for Traffic Impact Assessments.

19.13 Limitations of the Assessment

There are no known limitations which would affect the robustness of this assessment for the purposes of the EIA.

19.14 Summary of Effects and Conclusion

Traffic generated by Ro-Ro ports is directly linked to the number of sailings per day, the time of the sailings, and the throughput of each vessel i.e. the number of passenger vehicles and freight vehicles. This chapter has undertaken an assessment of the vessel sailings timetable to interpret the likely traffic flow profile and identify the peak traffic times.

In order to determine the existing traffic flows at the harbour, new classified traffic count surveys were undertaken by MHC Traffic Ltd on Thursday 30th and Friday 31st January 2025 at the A40 The Parrog / A487 Wern Road / Station Hill / Port double roundabout access junction and the access to the Ferry Port for the 12-hour period between 07:00 and 19:00. This time period covered:

- External Road Network Weekday AM peak hour;
- Interpeak caused by the Midday sailing activity at the Port;
- External Road Network Weekday PM peak hour;
- The 12-hour proposed weekday construction working hours of 07:00-19:00.

Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel sizes are not expected to increase above existing levels, therefore the number of vehicle movements generated by the Ferry Port (the operational phase) are also not expected to increase above existing levels, resulting in a negligible traffic impact.

An estimation of construction related vehicles calculated for the duration of the construction programme has been derived based on the proposed working hours for the construction phase.

The construction works will occur over a 9-month period. For 7no. months of the 9no. month construction period the Ferry Port will remain operational and will only be offline for 2no. months. During the most onerous month of construction, it is predicted that there will be an average of 3.9no. total HGV movements at the site per day (working 7 days a week) and an average of 0.32no. total HGV movements per hour (based on a 12no. hour working day). Therefore, this has been assessed above and determine to have an insignificant impact upon the surrounding road network.

The works will be carried out by approximately 10-15 construction related staff that will be present at the site, the staff are likely to arrive and depart outside of the main construction hours and will have an insignificant impact upon the surrounding highway network.

As part of the construction phase, the appointed Contractor will liaise with the Local Highway Authority to agree the proposed construction traffic management measures prior to the start of the construction period. This will ensure the proposed construction activities and working hours assessed within this chapter can be implemented.

This chapter therefore concludes that the impact of the scheme in transportation terms is negligible.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	✓	×	None	C: Medium O: Low	C: Medium O: Low	C: Moderate adverse O: Minor adverse	None	Slight beneficial	None
Traffic Impact During Construction	C		None	O	O	O	None	Nil Net Change	None
Operational Impacts	O		None	O	O	O	None	Nil Net Change	None

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 20: Seascape, Landscape and Visual Impact Assessment

20 Seascape, Landscape and Visual Impact Assessment

20.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") on Seascape, Landscape and Visual (SLV) resources in the area surrounding the Proposed Development. This chapter considers the potential impacts to SLV resources from the Proposed Development during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study to identify existing landscape resources and visual receptors within the study area to assess current baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on landscape and visual resources; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES:

- Chapter 2: Project Description

Other aspects relevant to flood risk are addressed in the specific chapters of the ES, namely:

- Chapter 5: Scoping and Consultation
- Chapter 7: Human Health and Population
- Chapter 9: Terrestrial Ecology
- Chapter 10: Coastal Processes; and
- Chapter 16: Archaeology, Architectural and Cultural Heritage.

The details and competencies of the specialist who prepared this chapter can be found in Volume I, Chapter 1: Introduction of this ES.

20.2 Purpose of this chapter

The primary purpose of this ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Proposed Development on seascape, landscape and visual receptors. This ES chapter:

- Presents the existing seascape, landscape and visual baseline established from desk studies, relevant datasets and consultation (Section 20.3);
- Identifies any limitations encountered in compiling the information;
- Presents an assessment of the potential likely significant effects on seascape and landscape receptors (Section 20.6) and visual receptors (Section 20.7) arising from the Proposed Development based on the information gathered and the analysis and assessments undertaken.
- Highlights any necessary monitoring and/or measures to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment.

20.3 Study Area

Using terrain-modelling techniques combined with the Proposed Development specification a map has been created which identified areas from which the Proposed Development may theoretically be visible. This Zone of Theoretical Visibility (ZTV) is the area within which views of the Proposed Development can theoretically be obtained, determined by the topography of the area and is representative of a theoretical worst-case scenario in line with current guidance.

The ZTV (refer to Volume III; Appendix 20.1; Figure 20.1) forms the basis for the Seascape, Landscape and Visual Impact Assessment (SLVIA) study area associated with the Proposed Development. It is noted that the ZTV does not consider local features such as; hedgerows, field boundary hedgerows, woodland planting, coniferous forestry or buildings. In practice the actual visibility of the Proposed Development is considerably less in extent than the theoretical one, since individual elements of the proposal are difficult to focus on at long distances and localised changes in topography, hedges, trees, woodland and built form tend to restrict views.

The ZTV was assessed against the elements of the Proposed Development, the footprint of the Proposed Development, the receiving landscape and the perceptibility of elements of the Proposed Development. Site surveys and assessment established that vertical elements associated with the Proposed Development are not easily perceived within the wider landscape.

20.4 Policy Context

The overarching policy and legislation applicable to the Proposed Development is presented in Volume I, Chapter 6: Policy and Legislation.

20.4.1 EU legislation and policy

Legislation specific to Seascape, Landscape and Visual Impact Assessment (SLVIA) is contained within the European Landscape Convention (ELC).

At the highest level, the ELC seeks to *"promote landscape protection, management and planning, and to organise European co-operation on landscape issues" (Ch. 1 Art. 3)* and encompasses *"the entire territory of the Parties and covers natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that might be considered outstanding as well as every day or degraded landscapes." (Ch. 1 Art. 2),* and therefore considers that all landscapes are important, not just the outstanding but also the everyday landscapes where most people live, work and spend much of their time.

20.4.2 National legislation and policy

Policy specific to SLVIA is contained in the Future Wales - The National Plan 2040 (FWNP) (Welsh Government, 2019) was first published in August 2019 and updated in February 2026.

Following a review of the FWNP, the following Policies are considered relevant to this SLVIA;

Policy 10 – International Connectivity

The Welsh Government identifies the following Strategic Gateways to facilitate international connectivity:

- *Cardiff Airport*
- *Holyhead Port*
- *Haven Waterway, including the Ports of Milford Haven and Pembroke Dock*
- *Fishguard Port*

The Welsh Government will work with the operators, investors and local authorities to support Strategic Gateways and maintain their international connectivity roles. Strategic and Local Development Plans should support the Strategic Gateways by maximising the benefits they provide to their respective regions and Wales.

New development around the Strategic Gateways should be carefully managed to ensure their operation is not constrained or compromised.

Policy 21 – Regional Growth Area – North Wales Coastal Settlements

The Welsh Government supports sustainable growth and regeneration in regionally important towns along the northern Coast. Holyhead, Caernarfon, Bangor, Llandudno, Colwyn Bay, Rhyl and Prestatyn will be a focus for managed growth and they have an important sub-regional role complementing the National Growth Area of Wrexham and Deeside.

Strategic and Local Development Plans should recognise the roles of these places as a focus for housing, employment, tourism, public transport and key services within their wider areas and support their continued function as focal points for sub-regional growth.

20.4.3 Local Planning Policy

The site for the Proposed Development falls within Pembrokeshire County Council, and as such the policies contained within the Pembrokeshire County Council Local Development Plan (PCCLDP) are of relevance to this Seascape, Landscape and Visual Impact Assessment (SLVIA).

The current PCCLDP, adopted in February 2013, is currently under review by Pembrokeshire County Council, but it is expected that the findings of the review and the adoption of the LDP2 will not take place until May 2026. Until then, the current PCCLDP that was adopted in 2013 is still the extant PCCLDP and has been used for this assessment and policy review. Additionally, the Pembrokeshire Coast National Park LDP 2 is also applicable to this development.

Following a review of the PCCLDP and the Pembrokeshire Coast National Park LDP 2, the following Policies are considered relevant to this SLVIA;

Policy GN.1 General Development Policy:

Development will be permitted where the following criteria are met:

1. *The nature, location, siting and scale of the proposed development is compatible with the capacity and character of the site and the area within which it is located;*
2. *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;*
3. *It would not adversely affect landscape character, quality or diversity, including the special qualities of the Pembrokeshire Coast National Park63 and neighbouring authorities;*
4. *It respects and protects the natural environment including protected habitats and species;*
5. *It would take place in an accessible location, would incorporate sustainable transport and accessibility principles and would not result in a detrimental impact on highway safety or in traffic exceeding the capacity of the highway network;*
6. *Necessary and appropriate service infrastructure64, access and parking can be provided;*
7. *It would not cause or result in unacceptable harm to health and safety;*
8. *It would not have a significant adverse impact on water quality; and*
9. *It would neither contribute to the coalescence of distinct settlements nor create or consolidate ribbon development.*

Policy GN.2 Sustainable Design:

Development will be permitted where relevant criteria are met:

1. *It is of a good design which pays due regard to local distinctiveness and contributes positively to the local context;*
2. *It is appropriate to the local character and landscape/townscape context in terms of layout, scale, form, siting, massing, height, density, mix, detailing, use of materials, landscaping and access arrangements / layout;*
3. *It incorporates a resource efficient and climate responsive design through location, orientation, density, layout, land use, materials, water conservation and the use of sustainable drainage systems and waste management solutions;*
4. *It achieves a flexible and adaptable design;*
5. *It creates an inclusive and accessible environment for users that addresses community safety;*
6. *It provides a good quality, vibrant public realm that integrates well with adjoining streets and spaces and*
7. *It contributes to delivering well-designed outdoor space with good linkages to adjoining streets, spaces and other green infrastructure.*

Policy GN.34 Protection and Creation of Outdoor Recreation Areas:

Outdoor recreation areas, which include public open spaces, leisure routes and recreational facilities, are protected. Development will be permitted on outdoor recreation areas where:

1. *The area has no significant public recreational value; or*
2. *A suitable replacement facility is to be made available; or*
3. *The recreational facilities will be enhanced through the redevelopment of part of the site.*

New outdoor recreation area(s) will be permitted where the following criteria are met:

1. *It is well located to serve community needs;*
2. *It is of appropriate size, design and form to meet the needs of the people it is intended to serve; and*
3. *Provision is made for the future management and maintenance of the site / route.*

Policy GN. 35 Protection of Open Spaces with Amenity Value:

Development which would adversely affect the appearance, character or local amenity value of areas of public and private open space will not normally be permitted. In exceptional circumstances, where the proposal will bring clear social and/or economic benefits to the local community and make a positive contribution to the built environment, development may be permitted where it can be demonstrated that no suitable alternative site is available.

Policy GN. 36 Green Wedges

In order to prevent the In order to prevent the coalescence of settlements Green Wedges have been identified at the following locations:

- *Haverfordwest / Merlins*
- *Bridge (east)*
- *Haverfordwest / Merlins*

- *Bridge (west)*
- *Haverfordwest / Portfield*
- *Gate*
- *Neyland / Llanstadwell*
- *Fishguard / Goodwick*
- *Fishguard / Lower Town*
- *Tenby / Penally*

These areas have particular importance in maintaining the distinct identities of separate communities. Within the Green Wedges there will be a general presumption against inappropriate development.

Policy GN. 37 Protection and Enhancement of the Historic Environment

Development that affects sites and landscapes of architectural and/or historical merit or archaeological importance, or their setting, will only be permitted where it can be demonstrated that it would protect or enhance their character and integrity.

Policy 8 Special Qualities

The special qualities of the Pembrokeshire Coast National Park will be conserved and enhanced. The priorities will be to ensure that:

a) *The sense of remoteness and tranquillity is not lost and is wherever possible enhanced (see Policy 9).*
b) *The identity and character of towns and villages is not lost, through coalescence and ribboning of development or through the poor design and layout of development and is wherever possible enhanced. The identification of Green Wedges will assist in achieving this priority.*
c) *The pattern and diversity of the landscape is protected and wherever possible enhanced (see Policy 14).*
d) *The historic environment is protected and where possible enhanced.*
e) *Development positively enhances the National Park's ecosystems and the components that underpin them. The protection and enhancement of links between sites or the creation of links where sites have become isolated is of particular importance (see Policy 10, Policy 11, Policy 12 and Policy 29).*
f) *Development conserves and wherever possible enhances Geological Conservation Review sites or any other important geological resource (see Policy 12).*
g) *Species and habitats are conserved and enhanced for their amenity, landscape and biodiversity value.*
h) *The Welsh language remains an important component in the social, cultural and economic life of many communities in the Park (see Policy 13).*
i) *Development of the undeveloped coast is avoided and sites within stretches of the developed coast are protected for uses that need a coastal location (see Policy 17, Policy 18, Policy 33) and Policy 38).*
j) *The National Park's network of green infrastructure both new and existing is protected and enhanced (see Policy 10, Policy 11, Policy 12, and Policy 15).*

In assessing the impact upon the special qualities of the National Park, matters of detail and cumulative impact will be given special consideration.

20.5 Methodology to inform the baseline

20.5.1 Desktop study

Information on seascape, landscape and visual resources within the SLVIA Study Area was collected through a detailed desktop review of existing studies and datasets.

Baseline conditions have been identified and assessed through an analysis of;

- Up to date digital copies of Ordnance Survey Discovery Series raster and OS vector maps, to aid in the identification of existing soft and hard landscape features including woodland areas and areas of built form;
- Aerial photography, to aid in the identification of features contained within the surrounding landscape context such as hedgerows, woodland planting, areas of built form and scattered residential development and road networks; Pembrokeshire Coast National Park Local Development Plan;
- LANDMAP;
- Supplementary Planning Guidance: Seascape Character Assessment December 2023;
- Natural Resources Wales. Guidance and advice - Marine development; and
- Local Development Plans to identify and review the policies applicable to the development site and the proposed development form. Review of the local development plan also undertaken to identify any landscape designations within the study area associated with the Proposed Development; and
- Drawings of the Proposed Development to aid in the assessment of the potential impacts of the Proposed Development on landscape features and elements contained within and adjacent of the development site boundary.

20.5.2 Site-specific surveys

To inform this chapter of the ES, a site visit was undertaken to assess the existing environment, to establish the existing visual resource and to identify sensitive receptors, i.e. residential properties, scenic viewpoints. The site visit was also used to consider the potential effects on seascape / landscape character and visual impacts arising because of the Proposed Development as indicated in Table 20-1.

Table 20-1: Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Photographic Survey	SLVIA Study Area	Undertaking site photography and visual appraisal within the SLVIA Study Area	RPS	24/10/2024	Photomontages provided in Volume III

20.6 Assessment Methodology

20.6.1 General approach

The methodology and approach to the assessment contained within this chapter has been based on the relevant guidance described in the following documents;

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (The Landscape Institute and Institute of Environmental Management & Assessment, 2013) (GLVIA3);
- Technical Guidance Note LITGN-2024-01 Notes and Clarifications on Aspects of Guidelines for Landscape and Visual Impact Assessment Third edition (GLVIA3) (The Landscape Institute, 2024); and
- Technical Guidance Note 06/19 Visual Representation of Development Proposals (The Landscape Institute, 2019).

GLVIA3 Technical Guidance Note LITGN-2024-01 states at Clarification 2(2), in relation to the application of GLVIA3 in seascape/coastal and visual impact assessment (SVIA) that an "*SVIA should follow the same processes as LVIA (but within a seascape setting), so SVIA should be undertaken using an appropriate methodology based on GLVIA3*."

GLVIA3 recommends that an LVIA "*concentrates on principles and process*" and "*does not provide a detailed or formulaic 'recipe'' to assess effects, it being the 'responsibility of the professional to ensure that the approach and methodology adopted are appropriate to the task in hand*" (preface to the third edition).

The effects on the landscape resources or visual receptors (people) are assessed by considering the proposed change in the baseline conditions (the impact of the proposal) against the type of landscape resource or visual receptor (including the importance and sensitivity of that resource or receptor). The methodology is set out in detail below and summarised Figure 20-1 Assessment Methodology Summary.

These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement.

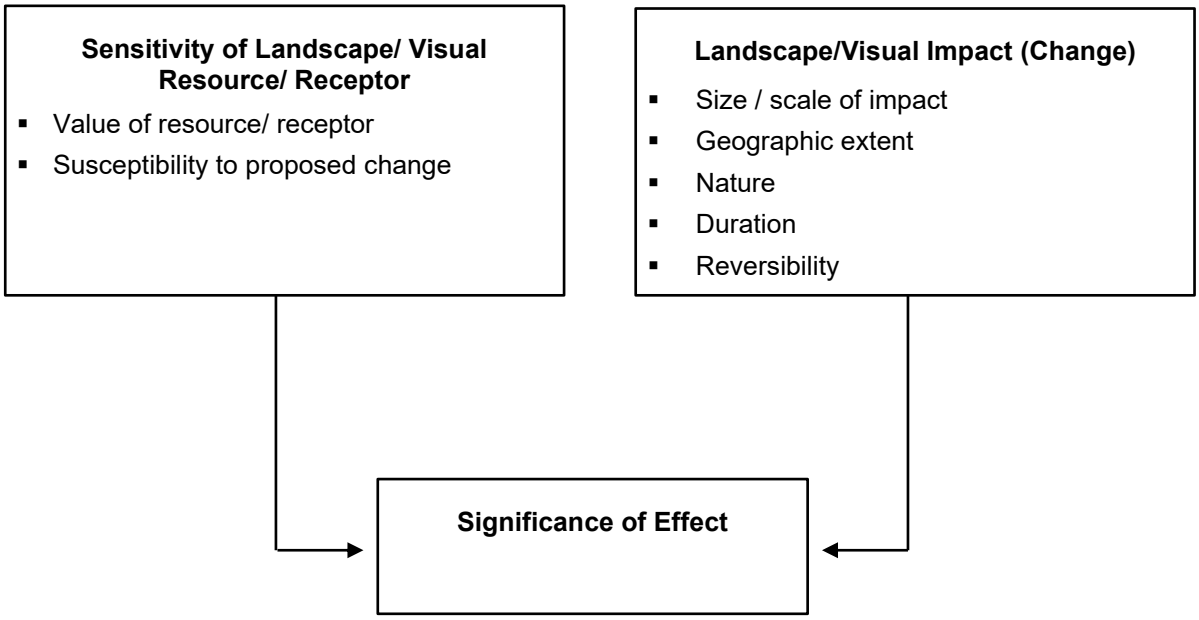


Figure 20-1 Assessment Methodology Summary

The SLVIA considers the potential effects of the project upon:

- Individual landscape features and elements;
- Landscape and seascape character; and

- Visual amenity and the people who view the landscape.

20.6.2 Identifying effects

Assessing the significance of an effect is a key component of the assessment and is an evidence-based process combining professional judgment on the nature of a seascape, landscape or visual receptor's sensitivity, their susceptibility or ability to accommodate change and the value attached to the receptor. It is important to note that judgments in this SLVIA are impartial and based on professional experience and opinion informed by best practice guidance.

The effects of a proposed development are of variable duration and have been assessed as being of either short-term, medium-term or long-term duration, and permanent or reversible. Effects are long-term during the operational phase of the development, whilst operations and infrastructure work apparent during the construction and initial operating period have been assessed as temporary, short-term effects.

The reversibility of an effect is also variable. The effects on the seascape, landscape and visual resource that occurs during the construction period, such as the use of construction machinery have been considered as being reversible.

Where effects arise during the construction period, these are most likely to be because of the movement of construction machinery within the seascape, landscape; construction activities associated with the formation of new structures and construction activities within the site boundary all of which are considered to be short-term in duration.

To avoid repetition, the duration and reversibility of effects are not reiterated throughout the assessment.

20.6.3 Impact assessment criteria

The objective of the assessment process is to identify and evaluate the predicted significant effects arising from a proposed development. Significance is a function of the:

- Sensitivity of the affected seascape, landscape or visual receptor, determined through consideration of the susceptibility of the receptor to the type of change arising from the specific proposals and the value attached to the receptor; and
- Secondly its Scale or Magnitude, derived from a consideration of the size / scale, geographical extent, duration and reversibility of the Proposed Development.

These definitions recognise that seascape and landscape resources vary in their capacity to accommodate different forms of development according to the nature of the receiving seascape or landscape and the type of change being proposed.

As with any new development, it is acknowledged that the introduction of a development into the existing seascape, landscape or visual context could cause either a deterioration, improvement or neutral impact on the existing landscape or visual resource.

20.6.4 Impact assessment

The SLVIA firstly assesses how a development would impact directly on any seascape and or landscape features and resources. This category of effect relates to specific elements and features (e.g. woods, trees, walls, hedgerows, watercourses) that are components of the seascape / landscape that may be physically affected by the development, such as the removal or addition of trees and or alterations to ground cover or elements.

The SLVIA then considers impacts on seascape and or landscape character at two levels. Firstly, consideration is given to how the character of the seascape or landscape is affected by the

removal or alteration of existing features and the introduction of new features. This is a direct impact on seascape or landscape character.

Secondly, the indirect impacts of a development on the wider seascape and or landscape character is considered. The assessment of impacts on the wider character is discussed using the surrounding character areas identified in the relevant seascape or landscape character assessments. It is acknowledged that there is an overlap between perception of change to the seascape or landscape character and visual amenity, but it should be remembered that seascape or landscape character is generally derived from the combination and pattern of elements within the view.

The significance of effects on seascape and or landscape features and character is determined by considering both the sensitivity of the feature or character and the magnitude of impact.

Consideration of the sensitivity of the seascape or landscape resource against the magnitude of impact caused by the proposed development is fundamental to the assessment and these two criteria are defined in more detail below.

20.6.5 Seascape/ Landscape Sensitivity

The determination of the sensitivity of the seascape/ landscape receptor is based upon an evaluation of the elements or characteristics of the seascape/ landscape likely to be affected. The evaluation reflects such factors as its quality, value, contribution to character and the degree to which the element or characteristic can be replaced or substituted.

GLVIA 3 at paragraph 5.39 states that "*landscape receptors need to be assessed firstly in terms of their sensitivity, combining judgments of their susceptibility to the type of change or development proposed and the value attached to the landscape*".

Susceptibility is defined by GLVIA 3 at paragraph 5.40 as: "*the ability of the landscape receptor (whether it be the overall character or quality/ condition of a particular landscape type or area, or an individual element and/ or feature, or a particular aesthetic and perceptual aspect) to accommodate the Proposed Development without due consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*".

The value of a seascape/ landscape receptor is determined with reference to the presence of relevant seascape/ landscape designations, such as Areas of Outstanding Natural Beauty (AONB) and their level of importance.

For this assessment, seascape/ landscape value is categorised as:

- Very High: Areas of seascape/ landscape acknowledged through designation such as AONB or other seascape/ landscape based sensitive areas. These are of seascape/ landscape significance within the wider region or nationally;
- High: Areas that have a very strong positive character with valued and consistent distinctive features that gives the seascape/ landscape unity, richness, and harmony. These are of seascape/ landscape significance within the district;
- Medium: Areas that exhibit positive character, but which may have evidence of alteration/degradation or erosion of features resulting in a less distinctive seascape/ landscape. These may be of some local seascape/ landscape significance with some positive recognisable structure; and
- Low: Areas that are generally negative in character, degraded and in poor condition. No distinctive positive characteristics and with little or no structure. Scope for positive enhancement.

As previously discussed, seascape/ landscape sensitivity is influenced by several factors including susceptibility to change, value and condition. To assist with bringing these factors together

judgements regarding susceptibility and value have been used which define the seascape/ landscape resource as being either, negligible, low, medium, high or very high.

Table 20-2 defines the criteria that have guided the judgement as to the overall sensitivity of the Landscape Resource.

Assessments of susceptibility and value of a particular seascape/ landscape resource may be different, and professional judgement will always be used to conclude on the judgement of sensitivity. For example, value may be high, and susceptibility may be low, and a professional judgement will be made to determine whether sensitivity is high, low or in between, supported by narrative explanation.

Table 20-2: Seascape/ Landscape Sensitivity.

Seascape/ Landscape resource susceptibility	Seascape/ Landscape resource value	Sensitivity
Exceptional seascape/ landscape quality, no or limited potential for substitution. Key elements / features well known to the wider public. Little or no tolerance to change	Nationally / internationally designated/ valued seascape/ landscape, or key elements or features of national/ internationally designated landscapes. Little or no tolerance to change	Very High
Strong/ distinctive landscape character; absence of seascape/ landscape detractors. Low tolerance to change.	Regionally/ nationally designated/ valued countryside and seascape/ landscape features. Low tolerance to change.	High
Some distinctive seascape/ landscape characteristics; few seascape/ landscape detractors. Medium tolerance to change.	Locally' regionally designated/ valued countryside and seascape/ landscape features. Medium tolerance to change.	Medium
Absence of distinctive seascape/ landscape characteristics; presence of seascape/ landscape detractors. High tolerance to change	Undesignated countryside and seascape/ landscape features. High tolerance to change	Low
Absence of positive seascape/ landscape characteristics. Significant presence of seascape/ landscape detractors. High tolerance to change	Undesignated countryside and seascape/ landscape features. High tolerance to change	Negligible

20.6.6 Magnitude of Seascape/ Landscape Impact

The magnitude of impact or change affecting landscape receptors depends on the size or scale, geographical extent of the area influenced and its duration and reversibility. These factors are described below:

- Size or scale: "*The extent of the existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape…; the degree to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones…*" and, "*whether the effect [impact] changes the key characteristics of the landscape, which are critical to its distinctive character*" (GLVIA3, para 5.49).

- Geographical extent: Distinct from scale or size, this factor considers the geographical area over which the landscape impacts will be felt, it might, for example, be a moderate loss of seascape/ landscape receptors or character over a large area, or a large loss of receptors or character over a very localised area. At para 5.50 GLVIA3 notes that "*in general effects [impacts] may have an influence at the following scales, although this will vary according to the nature of the project and not all may be relevant on every occasion: at the site level within the development site itself; at the level of the immediate setting of the site; at the scale of the landscape type or character area within which the proposal lies; and, on a larger scale, influencing several landscape types or character areas.*" For the purposes of this SLVIA, the assessment considers the impact of the Proposed Development on the published landscape character areas, at local level, i.e. the fourth landscape scale.
- Duration and reversibility: Duration is categorised as short, medium or long-term. GLVIA3 explains that as there are no standard lengths of time within these categories, the appraisal must state what these are and why these have been chosen (GLVIA3, para 5.51). Reversibility is described as "*a judgement about the prospects and practicality of the particular effect being reversed in, for example, a generation*" (GLVIA3, para 5.52). Projects can be permanent (irreversible), partially reversible or fully reversible.

For the purposes of this SLVIA assessment, duration is; temporary (less than 1 year), short term (1 to 7 years), medium term (7 to 15 years), long term (15 – 60 years) and permanent (effects lasting over 60 years). The photomontages in support of this chapter (refer to Volume III Figure 20.6) have been provided to illustrate the existing view available from each location along with illustrative imagery depicting a completed scheme scenario.

The magnitude of seascape/ landscape impact has been classified on a five-point scale (Large, Medium, Small, Negligible and No Change). The definitions of terms relating to the magnitude of landscape impact are set out in Table 20-3 below.

Table 20-3: Magnitude of Seascape/ Landscape Impact.

Definition	Magnitude of Impact
Total loss or addition or/ very substantial loss or addition of key elements / features / patterns of the baseline, i.e., pre-development seascape/ landscape and/ or introduction of dominant, uncharacteristic elements with the attributes of the receiving seascape/ landscape.	Large
Partial loss or addition of or moderate alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development seascape/ landscape and / or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic with the attributes of the receiving seascape/ landscape.	Medium
Minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development seascape/ landscape and or introduction of elements that may not be uncharacteristic with the surrounding seascape/ landscape.	Small
Very minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development seascape/ landscape and/or introduction of elements that are not uncharacteristic with the surrounding seascape/ landscape approximating to a 'no-change' situation.	Negligible
No loss, alteration or addition to the receiving seascape/ landscape resource	No change

20.6.7 Visual Impact Assessment

As outlined in GLVIA 3 (Paragraph 6.1) "*An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity"*. The assessment of effects on views is an assessment of how the introduction of a proposed development will affect views within the study area.

The Assessment of visual effects therefore needs to consider:

- Direct impacts of a proposed development upon views of the seascape/ landscape through intrusion or obstruction;
- The reaction of viewers who may be affected, e. g. residents, walkers, road users; and
- The overall impact on visual amenity.

20.6.8 Sensitivity of Visual Receptors

The sensitivity of visual receptors (the particular person or group of people likely to be affected at a specific viewpoint) "*should be assessed in terms of both their susceptibility to change and in views and visual amenity and also the value attached to particular views*" (GLVIA3, para 6.31).

For this assessment, susceptibility and value of visual receptors are defined as follows:

- Visual susceptibility: "*The susceptibility of different visual receptors to changes in views and visual amenity is mainly a function of: The occupation or activity of people experiencing views at the particular locations; and, the extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations*" (GLVIA3, para 6.32).
- Value of views: Judgements made about the value of views should take account of: "*recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations; and, indicators of value attached to views by visitors, for example through appearances in guidebooks or on tourist maps, provision of facilities for their enjoyment (such as parking places, sign boards or interpretive material) and references to them in literature or art…*" (GLVIA3, para 6.37).

Sensitivity is not readily graded in bands and GLVIA3 notes, with regards to visual sensitivity, that the division of who may or may not be sensitive to a particular change "*is not black and white and in reality, there will be a gradation in susceptibility to change*" (GLVIA3, para 6.35).

In order to provide both consistency and transparency to the assessment process, however, Table 20-4 below defines the criteria which have guided the judgement as to the intrinsic susceptibility and value of the resource/receptor and subsequent sensitivity to the Proposed Development.

Table 20-4: Visual Resource Sensitivity.

Visual resource susceptibility	Visual resource value	Sensitivity
Views of remarkable scenic quality, of and within internationally designated seascapes/ landscapes or key features or elements of nationally designated seascapes/ landscapes that are well known to the wider public. Little or no tolerance to change.	Observers, drawn to a particular view, including those who have travelled to experience the views. Little or no tolerance to change	Very High

Visual resource susceptibility	Visual resource value	Sensitivity
Views from residential property. Public rights of way, National Trails, Long distance walking routes and nationally designated countryside/ seascapes/ landscapes with public access. Low tolerance to change.	Observers enjoying the seascape/ landscape from their homes or pursuing quiet outdoor recreation are more sensitive to visual change. Little tolerance to change	High
Views from local roads and routes crossing designated countryside / seascapes/ landscapes features and 'access land' as well as promoted paths. Medium Tolerance to change.	Observers enjoying the seascape/ landscape from vehicles on quiet/ promoted routes are moderately sensitive to visual change. Medium tolerance to change	Medium
Views from workplaces, main roads and undesignated countryside / seascapes/ landscapes features. High tolerance to change.	Observers in vehicles or people involved in frequent or infrequent repeated activities are less sensitive to visual change. High tolerance to change	Low
Views from within and of undesignated seascapes/ landscapes with significant presence of seascapes/ landscapes detractors. High tolerance to change.	Observers in vehicles or people involved in frequent or frequently repeated activities are less sensitive to visual change. High tolerance to change	Negligible

20.6.9 Magnitude of Impact on Visual Receptors

As with the magnitude of seascape/ landscape impacts, the magnitude of impact or change affecting visual receptors depends on the size or scale, geographical extent of the area influenced and its duration and reversibility. These factors are described below:

- Size or scale: Judgements need to take account of: "*the scale of the change [impact] in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the proposed development; the degree of contrast or integration of any new features or changes in the landscape with existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture; and, the nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses*" (GLVIA3, para 6.39).
- Geographical extent: This will vary from viewpoint to viewpoint and will reflect: "*the angle* [orientation] *of view in relation to the main activity of the receptor; the distance of the viewpoint from the proposed development; and, the extent of the area over which the changes* [impacts] *would be visible*" (GLVIA3, para 6.40).
- Duration and reversibility of visual effects: As with seascape/ landscape impacts, duration should be categorised as short, medium or long-term and projects considered to be permanent (irreversible), partially reversible or fully reversible (GLVIA3, para 6.41). For the purposes of this appraisal the impacts on views of the Proposed Development are considered to be temporary and fully reversible.

The magnitude of visual impact has been classified on a five-point scale (Large, Medium, Small, Negligible and No Change). The definitions of terms relating to the magnitude of visual impact are set out in Table 20-5 below.

Table 20-5: Magnitude of Visual Impact.

Definition	Magnitude of Impact
Complete or very substantial change in view dominant involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g., through removal of key elements	Large
Moderate change in view: which may involve partial obstruction of existing view or partial change in character and composition of baseline, i.e., pre-development view through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter scale and character of the surroundings and the wider setting. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant	Medium
Minor change in baseline, i.e., pre-development view - change would be distinguishable from the surroundings whilst composition and character would be like the pre change circumstances.	Small
Very slight change in baseline, i.e., pre-development view - change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.	Negligible
No alteration to the existing view	No change

20.6.10 Significance of Effect

The purpose of this SLVIA is to determine, in a transparent way, the likely significant seascape/ landscape and visual effects of the Proposed Development. It is accepted that, due to the nature and scale of development, the Proposed Development could potentially give rise to some notable landscape and visual effects.

GLVIA3 identifies that: "*… a final judgment is made about whether or not each effect is likely to be significant. There are no hard and fast rules about what effects should be deemed 'significant' but LVIAs should always distinguish clearly between what are considered to be significant and non-significant effects*".

Significance can only be defined in relation to each development and its specific location. The relationship between receptors and effects is not typically a linear one. It is for each SLVIA to determine how judgements about receptors and effects should be combined to derive significance and to explain how this conclusion has been arrived at.

The identification of significant effects would not necessarily mean that the effect is unacceptable in planning terms. What is important is that the likely effects on the seascape/ landscape and visibility of the development are transparently assessed and understood in order that the determining authority can bring a balanced, well-informed judgement to bear when making the planning decision.

The significance of effects on seascape/ landscape, views and visual amenity have been judged according to a six-point scale: Substantial, Major, Moderate, Minor, Negligible or None as presented in Table 20-6, which contains a description of the Significance of Effect Criteria.

Table 20-6: Significance of Effect Criteria

Significance of Effect	Seascape/ Landscape Resource	Visual Resource
None	Where the project would not alter the character of the area.	Where the project would retain existing views.
Negligible	Where proposed changes would have an indiscernible effect on the character of an area.	Where proposed changes would have a barely noticeable effect on views/visual amenity.
Minor	Where proposed changes would be at slight variance with the character of an area.	Where proposed changes to views, although discernible, would only be at slight variance with the existing view.
Moderate	Where proposed changes would be noticeably out of scale or at odds with the character of an area.	Where proposed changes to views would be noticeably out of scale or at odds with the existing view.
Major	Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of a (or a high quality) seascape/ landscape.	Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality.
Substantial	Where proposed changes would be uncharacteristic and/or would significantly alter a seascape/ landscape of exceptional quality (e.g., internationally designated landscapes), or key elements known to the wider public of a nationally designated seascape/ landscape (where there is no or limited potential for substitution nationally).	Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated seascapes/ landscapes or key features or elements of nationally designated seascapes/ landscapes that are well known to the wider public.

For the purposes of this assessment those effects indicated, in Table 20-7 below, as being Substantial or Major to Substantial are regarded as being significant. Effects of 'Minor to Moderate' and lesser significance have been identified within the assessment, though are not considered significant.

For those effects indicated as being of 'Moderate' or 'Moderate to Major' the assessor has exercise professional judgement in determining if the effect is significant, taking account of site specific or location specific variables which are given different weighting in each instance according to location.

Table 20-7: Matrix used for the assessment of the significance of the effect.

Magnitude of Impact	Sensitivity				
	Negligible	Low	Medium	High	Very High
No Change	No Change	No Change	No Change	No Change	No Change
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor	Minor
Small	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate	Moderate to Major
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major	Major to Substantial
Large	Minor	Minor to Moderate	Moderate to Major	Major to Substantial	Substantial

20.7 Baseline Environment

20.7.1 General Overview

The site for the Proposed Development lies wholly within the existing infrastructure associated with Fishguard Harbour, Fishguard Bay, in north Pembrokeshire. The Proposed Development is located on the western side of the inner Harbour area at the location of an existing linkspan and associated infrastructure used by ferries operated by Stena Ltd. Ferries are observed frequently coming and going from the Harbour.

Fishguard Harbour is defined to the west by rising topography and steep cliffs. To the south lies the settlement of Goodwick and the A40 that follows the shoreline in lower-lying flat land and promenade area with car parking to the rear. The watersports centre and visitor/information centre (Ocean Lab) are located in this area adjacent to the A40. The settlement of Goodwick is largely located on steep wooded cliffs with houses set out across the hillside overlooking Fishguard Bay. Fishguard Bay Hotel is a Grade II listed building set within a Grade II registered park/garden located immediately west of the ferry terminal area. The central and northern part of Goodwick is designated as a Conservation Area. Sitting above the existing ferry terminal on the cliff tops to the north is Harbour Village that consists of small cottages overlooking the Bay.

The existing ferry terminal lies at the western side of the Harbour and consists of extensive tarmac area used by traffic queuing for ferries. High mast lights are very noticeable. Buildings and infrastructure associated with the ferry terminal are also very noticeable in views along and across the Harbour area.

To the east of the Harbour lies rocky cliffs that are not as steep as those on the western side and the small settlement of Fishguard with small bungalows hugging the rocky cliffs at Penyraber. Fishguard is closely associated with Goodwick but is separated from Goodwick by a small green area of woodland and fields.

Further east lies the rocky promontory of Fishguard Fort with direct views across Fishguard Harbour and Bay and towards the existing ferry terminal area. This section of the coast is crossed by the Pembrokeshire Coastal Path

20.7.2 Seascape, Landscape and Visual Baseline

20.7.2.1 Seascape, Landscape Character Baseline

Landscape and Seascape character can be defined at a variety of scales, and a substantial amount of existing published information is available at national and county / regional levels.

20.7.2.2 National Landscape Character Areas and Marine Character Areas

There are 48 National Landscape Character Areas (NLCA), each with their own descriptive profile, setting out the unique combination of natural, cultural, and perceptual characteristics. Meanwhile, marine character assessments at national and local scale highlight the key natural, cultural and perceptual influences affecting marine and coastal areas.

A review of the NLCAs indicates the that Proposed Development lies within one NLCA; NLCA 43 - West & North Pembrokeshire Coast (refer Volume III; Figure 20.2). Additionally, the Proposed Development lies within one Marine Character Area (MCA); MCA 16 – Cardigan Bay (South) (refer Volume III; Figure 20.2).

NLCA 43 – West & North Pembrokeshire Coast

The key characteristics identified from the NCLA description are as follows:

- *Coastal features - varied and rugged, exposed, highly indented coastline, with rocky coastal cliffs, punctuated by sandy bays and sheltered inlets, some larger bays, a number of remote islands and islets, and a number of raised beaches.*
- *Varied geology - the coastline cuts across the geology, informing coastal geometry and the range of coastal features. Old Red Sandstone rocks in the south meet the western extent of the South Wales Coalfield at St Brides Bay. Further north around St David's, hard Cambrian rocks and igneous intrusions form craggy outcrops. Ordovician shales stretch across the north coast, interrupted by volcanic rock in places.*
- *Dissected plateau landscape – comparatively gentle, settled, farmed land, compared to the coastline.*
- *Coastal heath - although the rugged and windswept coastal heaths are common grazed, inland areas are enclosed: with larger mixed arable land in the south and smaller fields in parts of the north, some of these bounded hedgebanks with proven origins in the prehistoric period.*
- *Inland larger mixed arable fields – with hedgerows and fences and smaller fields in rougher ground - with hedgebanks and walls.*
- *Coastal wildlife - The coastal landscape is nationally and internationally important for marine habitats and species, including species-rich maritime grasslands. The islands off the coast are the home of internationally important sea bird colonies.*
- *Rural villages and scattered farms – nucleated villages, often around a church, and with historic character in places. Often quiet, settled, well established, agricultural, away from the coast, but busier with tourism and marine activity focus on the coast.*
- *Ferry port and road/rail transport terminal – major feature by Fishguard, together with nearby development and periodic busyness as ferries arrive.*
- *Tourist related 'honeypots' - of activity and busyness along the coast. The area's rugged coastline and high scenic qualities make the area a popular tourist destination. Rural roads can become busy with traffic in the peak season.*

NLCA 43 is described as having the following character: "*The area represents the western and northern extents of the Pembrokeshire coastline and hinterland. Much of the area is within the*

Pembrokeshire Coast National Park. The gently undulating, productive, agricultural landscape is edged by some of the most spectacular and rugged coastline in southern Britain. The landscape dramatically terminates with steep cliffs, and includes a number of remote islands, being remnants of peninsulas. The coastal areas also include a number of distinctively shaped rocky hills, that together with coastal slopes, include areas of heather and heath, stone walls or hedgebanks, and a far more remote feeling than many of the nearby inland landscapes."

MCA 16 – Cardigan Bay (South)

The key characteristics identified from the MCA description are as follows:

- *Diverse coastline of exposed rugged cliffs and rocky headlands punctuated by small coves, sheltered sandy bays and a few sinuous estuaries fringed by mudflats.*
- *Gently shelving seabed reaching a maximum of 30 metres, with Holocene-derived sediments providing some evidence for the legendary lost kingdom of Cantref y Gwaelod.*
- *Overfalls and strong tidal streams associated with exposed rocky headlands, with islets and shallow reefs in the west creating further hazards.*
- *Highly designated stretch of coastline and surrounding waters, with valued sandbanks, reefs and sea caves supporting species such as the bottlenose dolphins.*
- *Rich historic seascape with evidence for occupation and defence since prehistory. These include promontory forts on headlands and Norman castles.*
- *Hubs of activity at Aberystwyth and Fishguard, including commercial fishing and leisure craft. Ferries travelling to and from Fishguard link Swansea and Ireland.*
- *Much coastal and marine recreation, including leisure sailing, beach angling, sea kayaking and use of Celtic longboats, swimming and beach-based activities, as well as dolphin spotting trips.*
- *The Coast Path provides access for walkers along the cliff tops and headlands, affording expansive views out to sea across Cardigan Bay to Snowdonia National Park, Llŷn AONB and Bardsey Island.*
- *Coastal landmarks visible in landward views include Cemaes and Dinas Heads, fronting a backcloth of coastal hills including Mynydd Carningli.*

20.7.2.2.1 Pembrokeshire County Landscape Character Assessment 2022

This Landscape Character Assessment (LCA) is for areas of Pembrokeshire which lie outside of the Pembrokeshire Coast National Park (PCNP). The primary source of desk-based information is LANDMAP information covering Pembrokeshire. LANDMAP stands for Landscape Assessment and Decision Making Process and is the formally adopted approach to baseline landscape assessment throughout Wales developed by Natural Resources Wales and advocated by the Welsh Government.

There are 29 LCAs within the Pembrokeshire County Landscape Character Assessment, which are unique individual geographical areas primarily based on the Quality Assured LANDMAP Visual and Sensory aspect areas refined by consideration of other aspect layers, site assessment and local stakeholder input.

A review of Pembrokeshire County Landscape Character Assessment indicates that the Proposed Development lies in one LCA; LCA 3 – Fishguard Coastal (refer Volume III; Figure 20.2).

LCA 3 – Fishguard Coastal

The key characteristics identified from the LCA description are as follows:

- *An undulating chalky boulder clay plateau is dissected by numerous river valleys, giving a topography of gentle slopes in the lower, wider valleys and steeper slopes in the narrower upper parts.*
- *The headland to the north above Goodwick rises to 141mAOD at Pen-rhiw whilst Fishguard rises to around 100m AOD to the south from 50m high coastal cliffs and just above sea level at the Lower Town and Goodwick Moor.*
- *The steep headland and cliffs are formed mostly of resistant Ordovician volcanic gabbros striking east– west while mudstones and sandstones dominate in the harbour areas. To the west, glacial boulder clay / till sits within the river flood plain system. To the south of Fishguard, sedimentary Ordovician slate dominates.*
- *Fishguard town is set on top of exposed north facing rocky cliffs with semi-natural vegetation including rough grasses, bracken and scrub and forming part of Fishguard Cliffs SSSI which lies either side of the old harbour.*
- *Fishguard has medieval origins, but development is generally 18th and 19th century, with most building having taken place once the town was connected to the railway network. Nineteenth century terraced housing lies further out, and 20th century housing estates have been developed at the edge of the town.*
- *There is a distinct difference between upper town and lower town although both lie within Fishguard Conservation Area. In Upper Town listed buildings are concentrated along High Street, Main Street and West Street such as the fine Town Hall. In the Lower Town, the focus is on the picturesque intimate harbour with its moored boats, stone harbour walls, listed cottages along Quay Street and Newport Road.*

LCA 3 is described as having the following character: "*The settlements of Fishguard, Fishguard Lower Town and Goodwick, with their respective old and new harbours and cliffs are separated by a beach backed by the flat wetland of Goodwick Moor. Goodwick and Fishguard Harbour are an active ferry port with infrastructure and a major breakwater. The area includes part of the setting of the built-up area with steep slopes of pastoral land and moorland extending to the National Park boundary to the north beyond Goodwick and to the south of Goodwick Moor. The enclosed Gwaun valley and its slopes provides the landscape setting to the east. Both settlements have strong historic maritime character with Conservation Areas and listed buildings, particularly Fishguard*."

20.7.2.2.2 Pembrokeshire Coast National Park Seascape Character Assessment 2023

Pembrokeshire Coast National Park Authority has undertaken separate seascape character assessments which describe the variations in character between the different seascape types within the National Park area. The assessment process has identified 44 seascape character areas, and each distinct area has been mapped and includes a description of the seascape character, key characteristics, physical influences and historical and cultural influences and an evaluation of the condition and robustness of the landscape character area. Guidelines in relation to strategy for managing change is also included within each of the assessments.

A review of the landscape character area assessments has identified that the Proposed Development is wholly located within the Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town (SCA 7) seascape character area defined by Pembrokeshire Coast National Park Authority (refer Volume III; Figure 20.2).

SCA 7 - Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town

The Pembrokeshire Coast National Park Seascape Character Assessment (December 2013) identifies that the proposed site is located within Seascape Character Area (SCA) 7 Fishguard and Goodwick Harbours. The SCA states that Fishguard Harbour including the ferry port and the old harbour, located on the north Pembrokeshire coast, is one of most intensively used areas along the coast, with significant settlement, commercial and recreational use. It is an area of contrasts between the more open and commercial Goodwick area and the contained and picturesque Lower Town harbour, with wooded valleys and sea edge to Fishguard.

The SCA identifies the key features as;

- *A sheltered bay with substantial breakwaters enclosing a modern harbour and ferry terminal to the east and an old harbour with quay to the west;*
- *50m high cliffs and steeply sided, wooded sea edges;*
- *Narrow and steep sided valleys at Lower Town and broad, flat valley and wetland at Goodwick;*
- *A busy seascape with regular ferries including catamaran and traditional ferries linking to Rosslare and recreational boating and fishing [mainly from the old harbour] with two slipways including rowing and sailing and bases for diving charters;*
- *Traditional village and harbour at Lower Town, elevated town of Fishguard, and mixed commercial and residential areas with modern landscaped seafront and facilities at Goodwick; and*
- *Long breakwaters, boat moorings and boats drying.*

Factors contributing to the SCA sensitivity include;

- *Historic character of settlements and old harbour.*
- *Focal point for visitor activity.*
- *Open views in main area of bay and number of urban receptors.*
- *Initial impressions of Wales for Irish visitors on ferry.*
- *Pembrokeshire Coast Path as a sensitive receptor.*

20.7.3 Designations

This section reviews relevant landscape designations and their proximity to the Proposed Development (refer Volume III; Figure 20.3). A brief explanation of these has been given below:

20.7.3.1 National Parks

The Proposed Development site lies between two sections of the Pembrokeshire Coast National Park, with the nearest part of the boundary approx. 850m to the east and approx.875m to the west.

The Pembrokeshire Coast National Park Local Development Plan 2 (adopted September 2020) identifies the special qualities of the National Park as:

- *Coastal splendour;*
- *Diverse geology;*
- *Diversity of landscape;*

- *Distinctive settlement character;*
- *Rich historic environment;*
- *Cultural heritage;*
- *Richness of habitats and biodiversity;*
- *Islands;*
- *Accessibility;*
- *Space to breathe;*
- *Remoteness, tranquillity and wildness;*
- *The diversity of experiences and combination of individual qualities.*

A review of the Pembrokeshire Coast National Park Local Development Plan 2 has been undertaken, and it is considered that the following Policies are of relevance to this SLVIA;

Policy 8 Special Qualities (Strategic Policy)

The special qualities of the Pembrokeshire Coast National Park will be conserved and enhanced.

The priorities will be to ensure that:

a) *The sense of remoteness and tranquillity is not lost and is wherever possible enhanced (see Policy 9).*

b) *The identity and character of towns and villages is not lost, through coalescence and ribboning of development or through the poor design and layout of development, and is wherever possible enhanced. The identification of Green Wedges will assist in achieving this priority.*

c) *The pattern and diversity of the landscape is protected and wherever possible enhanced (see Policy 14).*

d) *The historic environment is protected and where possible enhanced.*

e) *Development positively enhances the National Park's ecosystems and the components that underpin them. The protection and enhancement of links between sites or the creation of links where sites have become isolated is of particular importance (see Policy 10, Policy 11, Policy 12 and Policy 29).*

f) *Development conserves and wherever possible enhances Geological Conservation Review sites or any other important geological resource (see Policy 12)*

g) *Species and habitats are conserved and enhanced for their amenity, landscape and biodiversity value.*

h) *The Welsh language remains an important component in the social, cultural and economic life of many communities in the Park (see Policy 13).*

i) *Development of the undeveloped coast is avoided and sites within stretches of the developed coast are protected for uses that need a coastal location (see Policy 17, Policy 18, Policy 33) and Policy 38).*

j) *The National Park's network of green infrastructure both new and existing is protected and enhanced (see Policy 10, Policy 11, Policy 12, and Policy 15).*

In assessing the impact upon the special qualities of the National Park, matters of detail and cumulative impact will be given special consideration.

Policy 14 Conservation and enhancement of the Pembrokeshire Coast National Park

Development will not be permitted where this would have an unacceptable adverse effect on the qualities and special landscape and seascape character of the Pembrokeshire Coast National Park including locally distinctive characteristics by:

a) *causing visual intrusion; and/or,*

b) *introducing or intensifying a use which is incompatible with its location; and/or*

c) *failing to harmonise with, or enhance the landform, landscape and seascape character of the National Park; and/or*

d) *losing or failing to incorporate important traditional features.*

In assessing the impact upon the National Park, matters of detail and cumulative impact will be given special consideration.

Policy 16 Green Wedges

In order to prevent the coalescence of Centres, protect the setting of Centres and safeguard the countryside Green Wedges are designated at the following locations:……..

Within these areas there is a presumption against inappropriate development.

20.7.3.2 Historic Landscapes

The Register of Landscapes of Historic Interest in Wales states that all landscape areas identified on the Register are of national importance in the Welsh context and identifies the nearest historic landscape to the proposed development site as (ref:43) Pen Gaer: Garn Fawr and Strumble Head located approx. 340m north. This area is located on the higher ground northwest of the Proposed Development. The historic interest for this landscape relates to the distinctive settlement forms, early ecclesiastical monuments, Neolithic burial chambers and to Iron Age hillforts and field systems found across this landscape.

20.7.3.3 Heritage Coasts

Heritage Coasts occupy about a third of the Welsh coastline and were established up to protect coastlines from insensitive developments. Most are defined simply by the coastline between two named points; however, some have clearly defined inland boundaries. Their status carries no legal protection, but planning authorities must take the designation into account when making decisions on development.

The Proposed Development site lies between two Heritage Coasts, namely the St David's Peninsula, which extends along the coast north and west of the North Breakwater and Dinas Head, which covers the coast east of Fishguard within Pembrokeshire Coast National Park.

20.7.3.4 Registered Parks and Gardens

The site for the Proposed Development is located in proximity to PGW (Dy) 63 (PEM) Fishguard Bay Hotel that is registered as a Grade II listed building and park/garden.

The description provided within the register identifies that "*the Fishguard Bay Hotel (formerly known as 'Wyndcliffe') is situated on a levelled shelf on the steep, rocky slope above the west side of Fishguard Harbour, with panoramic views across the bay towards Dinas Head. Its gardens lie mainly on the steep slope above the hotel, to its west, with smaller areas on the same level, to its south-east and north-east. The gardens were mainly developed, with the hotel, between 1900 and 1910 though the earlier house had ornamental gardens in the mid-nineteenth century*".

The report provides further detail in relation the grounds surrounding the hotel, describing them as "*largely wooded, both above and below the hotel, and to its north the steep slope becomes a cliff. The main area of the gardens lies on the steep slope to the north, west and south-west of the hotel, bounded by a high stone wall and occupying the slope up to the lane to Harbour Village which bounds its west side. This area is entered through an iron gate on the west side of the forecourt, and up steps to a zig-zag path which climbs the steep slope. The ground is densely wooded, with some fine specimen coniferous and deciduous trees in the lower part and a deciduous canopy in the upper part. Laurel and rhododendron form an extensive understorey but their unrestricted growth has made parts of the gardens inaccessible. The lower part of the gardens is divided into two main areas: the northern half, which was purely ornamental and the southern half, which originally contained the utilitarian gardens and a tennis court. Above is deciduous woodland*."

20.7.3.5 Listed Buildings / Conservation Areas

The Proposed Development site is in proximity to Fishguard Bay Hotel (Grade II) that is in Goodwick Conservation Area as designated by Pembrokeshire County Council. The Conservation Area extends along the western boundary of the Proposed Development site and covers most of the settlement of Goodwick.

A further Conservation Area is located at the settlement of Fishguard.

20.7.3.6 Long Distance Footpaths & Cycle Routes

National Cycle Route 4 runs above the A40 to the south of the proposed development site. Clear views are available looking northwards towards the site and the wider Bay area. At the foot of the embankment to the north, the Route follows the Pembrokeshire Coast National Trail before terminating at the edge of Goodwick.

The National Trail continues north-westwards and crosses the existing ferry terminal area via a footbridge. Clear views into the site are available from this area. The Trail then passes through the heavily wooded area immediately south of the Fishguard Hotel and then follows the minor road through Harbour Village.

20.8 Impact Assessment

20.8.1 Do Nothing Scenario

It is considered that a Do Nothing scenario would result in no material alteration to the existing infrastructure, access routes or linkspan elements associated with the existing Stena Line facility at Fishguard other than operations required to maintain the current condition of the transport corridors.

As such a Do Nothing scenario is predicted to have a negligible to minor, assessed as negligible, localised and not significant magnitude of impact as the existing port infrastructure would not be altered and would remain as per current conditions experienced by receptors.

20.8.2 Description of the Sources of Impact

The assessment of seascapes effects follows the methodology previously described in Section 20.6 and considers those effects which are predicted to occur during the construction and operational phases of the Proposed Development.

The assessment of the construction phase effects relates to the following identified activities:

- Construction works associated with the formation of the Proposed Development;
- Delivery of materials to working areas; and

- Localised site clearance and reinstatement/ upgrade to existing linkspan infrastructure.

The construction phase of the Proposed Development will result in new built elements being introduced into the existing baseline seascape resource. The operational phase of the Proposed Development will result in new built elements being perceived within the surrounding seascape resource, though new built form will be integrated and read in combination with the existing baseline resource.

20.8.3 Assessment of Seascape Effects

The assessment of seascape effects follows the methodology previously described in Section 20.6 and considers those effects which are predicted to occur during the construction and operational phases of the Proposed Development.

To avoid repetition, an assessment of construction phase impacts and predicted operational phase impacts is included within the seascape assessments provided in Table 20-8 and

Table 20-9 which have been based upon the susceptibility and sensitivity of the seascape character as described within the Marine Character Area Assessment and the Pembrokeshire Coast National Park Seascape Character Assessment 2023.

Table 20-8: MCA 16 - Cardigan Bay (South); Predicted Impacts

MCA 16 – Cardigan Bay (South)	
Sensitivity	The Proposed Development is located entirely within the Cardigan Bay (South) MCA. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this seascape within proximity of the Proposed Development site and the type of development proposed include; – Diverse coastline of exposed rugged cliffs and rocky headlands punctuated by small coves, sheltered sandy bays and a few sinuous estuaries fringed by mudflats. – Highly designated stretches of coastline and surrounding waters, with valued sandbanks, reefs and sea caves. – Rich historic seascape with evidence for occupation and defence since prehistory, including forts on headlands and Norman castles. – Hubs of activity at Aberystwyth and Fishguard, including commercial fishing and leisure craft. Ferries travelling to and from Fishguard linking further afield. – Coastal and marine recreation, including leisure sailing, beach angling, sea kayaking and use of Celtic longboats, swimming and beach-based activities, as well as dolphin spotting trips. – The Coast Path provides access for walkers along the cliff tops and headlands, affording expansive views out to sea across Cardigan Bay to Snowdonia National Park, Llŷn AONB and Bardsey Island. – Coastal landmarks visible in landward views include Cemaes and Dinas Heads, fronting a backcloth of coastal hills including Mynydd Carningli. The susceptibility of this MCA to the type of development proposed is judged to be **medium**. The assessment undertaken identifies that this MCA is a *"highly designated stretch of coastline and surrounding waters, with valued sandbanks, reefs and sea caves."* The value of the MCA is judged to be **medium**. Overall, considering the susceptibility and value attached to the MCA, the overall sensitivity of this MCA is judged to be **medium**, as whilst there are some distinctive characteristics present, there are also many manmade structures in the seascape associated with, and directly adjacent to the Proposed Development site.

MCA 16 – Cardigan Bay (South)	
Magnitude of Impact – Construction Phase	Direct impacts on this MCA will arise from the physical construction of the Proposed Development, resulting in the introduction of new manmade elements into the existing seascape, however it is considered that new elements will be perceived in combination with existing manmade elements within the harbour. New built form and associated ancillary features will require construction equipment and activities that will be locally conspicuous during the construction phase of the Proposed Development. It is considered that construction phase activities associated with the Proposed Development will have a localised, short-duration temporary effect. Localised portions of the MCA adjacent to, but beyond the site boundary of the Proposed Development are predicted to experience indirect effects only because of the formation of the new features, though such features are not considered to alter the existing character as new features will be similar to and read in combination with the existing elements of the harbour. The predicted magnitude of change associated with the construction stage of the Proposed Development is localised and **small**, restricted to land contained within the site boundary.
Magnitude of Impact – Operational Phase	During the operational phase, new features associated with the Proposed Development will be difficult to perceive separate to and distinct from the existing infrastructure. Where perceived the Proposed Development will form a very minor alteration locally, particularly when visible in southern views from the A507, though generally not obvious within the wider context due to its development form and similarity to the existing harbour infrastructure. The predicted magnitude of change in the seascape resource during the operational phase is judged to be localised and **negligible** during the operational phase.
Significance of Seascape Effect during Construction Phase	**Minor**, localised, temporary, short-term duration assessed as not significant effects are predicted to be experienced during the construction phase of the Proposed Development and limited to lands contained within the site boundary. Remaining portions of the MCA outside of the Proposed Development boundary are predicted to experience no significant, indirect effects.
Significance of Seascape Effect during Operational Phase.	Negligible to minor, assessed as **negligible** localised long-term effects, assessed as not significant are predicted to be experienced during the operational phase of the Proposed Development. Predicted effects arising because of the Proposed Development are limited in extent as new elements are similar in form and colouration to the existing elements of Fishguard Harbour. New built form is considered not to be easily perceived and is well integrate into the existing seascape and not perceived as a noticeable alteration or change to the seascape character.

Table 20-9: SCA 7 - Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town; Predicted Impacts.

SCA 7 - Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town	
Sensitivity	The Proposed Development is located entirely within the Fishguard and Goodwick Seascape Character Area, which includes the existing Fishguard Harbour and the Quayside at Lower Town. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this landscape within proximity of the Proposed Development site and the type of development proposed include; A sheltered bay with substantial breakwaters enclosing a modern harbour and ferry terminal to the east and an old harbour with quay to the west. – 50m high cliffs and steeply sided, wooded sea edges. – Narrow and steep sided valleys at Lower Town and broad, flat valley and wetland at Goodwick. – A busy seascape with regular ferries including catamaran and traditional ferries linking to Rosslare and recreational boating and fishing [mainly from the old harbour] with two slipways including rowing and sailing and bases for diving charters.

SCA 7 - Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town	
	– Traditional village and harbour at Lower Town, elevated town of Fishguard, and mixed commercial and residential areas with modern landscaped seafront and facilities at Goodwick. – Long breakwaters, boat moorings and boats drying. Susceptibility of this SCA to the type of development proposed is judged to be **low**. The assessment undertaken within the Pembrokeshire Coast National Park Seascape Character Assessment 2023 identifies that this SCA is "*one of most intensively used areas along the coast, with significant settlement, commercial and recreational use."* The value of the SCA is judged to be **medium**. Overall, considering the susceptibility and value attached to the SCA, the overall sensitivity of this SCA is judged to be **low**, as whilst there are some distinctive seascape characteristics present, there are also many manmade structures present within the Seascape which are prominant locally.
Magnitude of Impact – Construction Phase	Direct impacts on this SCA will arise from the localised, physical construction of the Proposed Development, resulting in the introduction of new manmade elements into the existing seascape, however it is considered that new elements will be perceived in combination with existing manmade elements within the harbour. New built form and associated ancillary features will require construction equipment and activities that will be locally conspicuous during the construction phase of the Proposed Development. It is considered that construction phase activities associated with the Proposed Development will have a localised, short-duration temporary effect. Localised portions of the SCA adjacent to, but beyond the site boundary of the Proposed Development are predicted to experience indirect effects only because of the formation of the new features, though such features are not considered to alter the existing character as new features will be similar to and read in combination with the existing elements of the harbour. The predicted magnitude of change associated with the construction stage of the Proposed Development is localised and **small**, restricted to land contained within the site boundary.
Magnitude of Change – Operational Phase	During the operational phase, new features associated with the Proposed Development will be difficult to perceive separately to the existing features and infrastructure associated with the harbour and generally read as part of the wider harbour facility. The predicted magnitude of change in the seascape resource during the operational phase is judged to be localised and **negligible** during the operational phase.
Significance of Seascape Effect during Construction Phase	Negligible to Minor, assessed as **Minor** localised temporary, short-term duration effects which have been assessed as not significant effects are predicted to be experienced during the construction phase of the Proposed Development and limited to lands contained within the site boundary. Remaining portions of the SCA outside of the Proposed Development boundary are predicted to experience no significant, indirect effects.
Significance of Seascape Effect during Operational Phase.	Negligible to minor, assessed as **Negligible** localised long-term effects, assessed as not significant are predicted to be experienced during the operational phase of the Proposed Development. Predicted effects arising because of the Proposed Development are limited in extent as new elements are similar in form and colouration to the existing elements of Fishguard Harbour. New built form is considered not to be easily perceived and is well integrate into the existing seascape and not perceived as a noticeable alteration or change to the seascape character.

20.8.4 Assessment of Landscape Effects

The assessment of landscape effects follows the methodology previously described in Section 20.6 and considers those effects which are predicted to occur during the construction and operational phases of the Proposed Development.

To avoid repetition, an assessment of construction phase impacts and predicted operational phase impacts is included within the landscape assessments provided in Table 20-10 to

Table 20-11 inclusive, which have been based upon the susceptibility and sensitivity of the landscape character areas described within the National Landscape Character Assessment and the Pembrokeshire Council Landscape Character Assessment 2022.

Table 20-10: NLCA 43 - West & North Pembrokeshire Coast; Predicted Impacts

NLCA 43 – West & North Pembrokeshire Coast	
Sensitivity	The Proposed Development is wholly located within the existing coastal area adjacent to this NLCA. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this landscape within proximity of the Proposed Development site and the type of development proposed include; – Coastal features - varied and rugged, exposed, highly indented coastline, with rocky coastal cliffs, punctuated by sandy bays and sheltered inlets, some larger bays, several remote islands and islets, and several raised beaches. – Coastal area associated with the Proposed Development defined by existing port development, including jetties, breakwater sections and port development. – Varied geology - the coastline cuts across the geology, informing coastal geometry and the range of coastal features. Old Red Sandstone rocks in the south meet the western extent of the South Wales Coalfield at St Brides Bay. Further north around St David's, hard Cambrian rocks and igneous intrusions form craggy outcrops. Ordovician shales stretch across the north coast, interrupted by volcanic rock in places. – Dissected plateau landscape – comparatively gentle, settled, farmed land, compared to the coastline. – Coastal heath - although the rugged and windswept coastal heaths are common grazed, inland areas are enclosed: with larger mixed arable land in the south and smaller fields in parts of the north, some of these bounded hedge banks with proven origins in the prehistoric period. – Inland larger mixed arable fields – with hedgerows and fences and smaller fields in rougher ground - with hedge banks and walls. – Rural villages and scattered farms – nucleated villages, often around a church, and with historic character in places. Often quiet, settled, well established, agricultural, away from the coast, but busier with tourism and marine activity focus on the coast. – Ferry port and road/rail transport terminal – major feature of Fishguard, together with nearby development and periodic water based and land based movements associated with ferry traffic arrival/ departure and vehicular arrival / departure. – Tourist related 'honeypots' - of activity and busyness along the coast. The area's rugged coastline and high scenic qualities make the area a popular tourist destination. Rural roads can become busy with traffic in the peak season. The susceptibility of this NLCA to the type of development proposed is judged to be **medium**. This NLCA places value in the sense of place and biodiversity, however the NLCA notes no important landscape features in proximity to the Proposed Development. The value of the NLCA is judged to be **medium**. Overall, considering the susceptibility and value attached to the NLCA, the overall sensitivity of this NCA is judged to be **medium**.
Magnitude of Impact – Construction Phase	Direct impacts on this NLCA will arise from the physical construction of the Proposed Development, resulting in the introduction of new manmade elements into the existing landscape, however it is considered that new elements will be perceived in combination with existing manmade elements within the harbour. New built form and associated ancillary features will require construction equipment and activities that will be locally conspicuous during the construction phase of the Proposed Development.

NLCA 43 – West & North Pembrokeshire Coast	
	It is considered that construction phase activities associated with the Proposed Development will have a localised, short-duration temporary effect. Localised portions of the NLCA adjacent to, but beyond the site boundary of the Proposed Development are predicted to experience indirect effects only because of the formation of the new features, though such features are not considered to alter the existing character as new features will be similar to and read in combination with the existing elements of the harbour. The predicted magnitude of change associated with the construction stage of the Proposed Development is localised and **small**, restricted to land contained within the site boundary.
Magnitude of Change – Operational Phase	During the operational phase, new features associated with the Proposed Development will be difficult to perceive separately to the existing features and infrastructure associated with the harbour and generally read as part of the wider harbour facility. The predicted magnitude of change in the landscape resource during the operational phase is judged to be localised and **negligible** during the operational phase.
Significance of Landscape Effect during Construction Phase	Negligible to Minor, assessed as **Minor** localised temporary, short-term duration effects which have been assessed as not significant effects are predicted to be experienced during the construction phase of the Proposed Development and limited to lands contained within the site boundary. Remaining portions of the NLCA outside of the Proposed Development boundary are predicted to experience no significant, indirect effects.
Significance of Landscape Effect during Operational Phase.	Negligible to minor, assessed as **Negligible** localised long-term effects, assessed as not significant are predicted to be experienced during the operational phase of the Proposed Development. Predicted effects arising because of the Proposed Development are limited in extent as new elements are similar in form and colouration to the existing elements of Fishguard Harbour. New built form is considered not to be easily perceived and is well integrate into the existing seascape and not perceived as a noticeable alteration or change to the landscape character.

Table 20-11: LCA 3 – Fishguard Coastal; Predicted Impacts

LCA 3 – Fishguard Coastal	
Sensitivity	The Proposed Development is located entirely within the Fishguard Coastal LCA. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this landscape within proximity of the Proposed Development site and the type of development proposed include; – An undulating chalky boulder clay plateau is dissected by numerous river valleys, giving a topography of gentle slopes in the lower, wider valleys and steeper slopes in the narrower upper parts. – Fishguard town is set on top of exposed north facing rocky cliffs with semi-natural vegetation including rough grasses, bracken and scrub and forming part of Fishguard Cliffs SSSI which lies either side of the old harbour. – Fishguard has medieval origins, but development is generally 18th and 19th century, with most building having taken place once the town was connected to the railway network. Nineteenth century terraced housing lies further out, and 20th century housing estates have been developed at the edge of the town. – There is a distinct difference between upper town and lower town although both lie within Fishguard Conservation Area. In Upper Town listed buildings are concentrated along High Street, Main Street and West Street such as the fine Town Hall. In the Lower Town, the focus is on the picturesque intimate harbour with its moored boats, stone harbour walls, listed cottages along Quay Street and Newport Road. The susceptibility of this LCA to the type of development proposed is judged to be **medium**. The value of the LCA is judged to be **medium**.

LCA 3 – Fishguard Coastal	
	Overall, considering the susceptibility and value attached to the LCA, the overall sensitivity of this LCA is judged to be **medium**, as whilst there are some distinctive landscape characteristics present, there are also many manmade structures in the landscape as well.
Magnitude of Impact – Construction Phase	Direct impacts on this LCA will arise from the physical construction of the Proposed Development, resulting in the introduction of new manmade elements into the existing landscape, however it is considered that new elements will be perceived in combination with existing manmade elements within the harbour. New built form and associated ancillary features will require construction equipment and activities that will be locally conspicuous during the construction phase of the Proposed Development. It is considered that construction phase activities associated with the Proposed Development will have a localised, short-duration temporary effect. Localised portions of the LCA adjacent to, but beyond the site boundary of the Proposed Development are predicted to experience indirect effects only because of the formation of the new features, though such features are not considered to alter the existing character as new features will be similar to and read in combination with the existing elements of the harbour. The predicted magnitude of change associated with the construction stage of the Proposed Development is localised and **small**, restricted to land contained within the site boundary.
Magnitude of Impact – Operational Phase	During the operational phase, new features associated with the Proposed Development will be difficult to perceive separately to the existing features and infrastructure associated with the harbour and generally read as part of the wider harbour facility. The predicted magnitude of change in the landscape resource during the operational phase is judged to be localised and **negligible** during the operational phase.
Significance of Landscape Effect during Construction Phase	Negligible to Minor, assessed as **Minor** localised temporary, short-term duration effects which have been assessed as not significant effects are predicted to be experienced during the construction phase of the Proposed Development and limited to lands contained within the site boundary. Remaining portions of the LCA outside of the Proposed Development boundary are predicted to experience no significant, indirect effects.
Significance of Landscape Effect during Operational Phase.	Negligible to minor, assessed as **Negligible** localised long-term effects, assessed as not significant are predicted to be experienced during the operational phase of the Proposed Development. Predicted effects arising because of the Proposed Development are limited in extent as new elements are similar in form and colouration to the existing elements of Fishguard Harbour. New built form is considered not to be easily perceived and is well integrate into the existing seascape and not perceived as a noticeable alteration or change to the landscape character.

20.8.5 Assessment of Landscape Designation Impacts

20.8.5.1 National Park

As stated in Section 20.7.3 previously, the Proposed Development site is located between 2 sections of the Pembrokeshire Coast National Park (refer Volume III; Figure 20.3). The Proposed Development is located within the existing ferry terminal area, and harmonises with its setting and context, and consequently is not considered to adversely affect the qualities and special character of the Pembrokeshire Coast National Park.

The Proposed Development is screened from the western area of National Park by a combination of existing vegetation cover and topographical changes, with the Proposed Development sited at the base of the existing coastal fringe, at a lower elevation when compared with western portions of the National Park.

While views from the exposed coastal area within the National Park to the east of Fishguard will be available the Proposed Development will blend with the existing ferry terminal features and replaces an existing facility so that it will be very difficult to discern any changes.

It is therefore considered that none of the special qualities of the National Park would be affected by the Proposed Development.

20.8.5.2 Historic Landscape

As stated in Section 20.7.3 previously, the Proposed Development site is located approximately 340m south of the Pen Gaer: Garn Fawr and Strumble Head historic landscape.

The identified historic landscape area is located on higher ground to the north-west of the Proposed Development, and following a review of the ZTV (refer Volume III: Figure 20.1) it is considered that the Historic Landscape will not experience visibility of the Proposed Development as the location of the Proposed Development at the base of the coastline means that the Proposed Development will not be visible.

It is therefore considered that this Historic Landscape will not be affected by the Proposed Development.

20.8.5.3 Heritage Coasts

As stated in Section 20.7.3 previously, the Proposed Development site lies between two Heritage Coasts, namely the St David's Peninsula, which extends along the coast north and west of the North Breakwater and Dinas Head, which covers the coast east of Fishguard within Pembrokeshire Coast National Park.

Following a review of the ZTV (refer Volume III: Figure 20.1) it is considered that the Heritage Coast section identified as St David's Peninsula will not experience any impact because of the Proposed Development due to screening provided by intervening topographical changes.

The Dinas Head section of the Heritage Coast is predicted to experience indirect effects because of the Proposed Development, however as stated previously the change in visual context is so limited as to be un-noticeable and the Proposed Development will blend with the existing ferry terminal facilities in western views with no change predicted for the Dinas Head Heritage Coast.

20.8.5.4 Registered Parks and Gardens

As stated previously in Section 20.7.3, the Proposed Development is in proximity to the PGW (Dy) 63 (PEM) Fishguard Bay Hotel that is registered as a Grade II listed building and park/garden.

As illustrated by Viewpoint 7 (refer Volume III: Figure 20.6), Fishguard Bay Hotel and its associated grounds are located on elevated lands above the Proposed Development site and are physically and visually separated by the railway line and ferry terminal infrastructure which occupy lands at a lower elevation.

In addition there are existing woodlands with mature trees located on the steep slopes from the Hotel down to the railway line. The views from the Hotel and grounds across the wider Harbour will remain unaffected by the Proposed Development. The Proposed Development is well screened by a combination of intervening topographical changes and vegetation cover, and where visible will be difficult to discern from the existing ferry terminal infrastructure.

It is therefore considered that this Registered Park and Garden will not be affected by the Proposed Development.

20.8.5.5 Listed Buildings/ Conservation Areas

As stated above the Proposed Development site is in proximity to Fishguard Bay Hotel (Grade II) which is located within Goodwick Conservation Area. Goodwick Conservation Area extends along a portion of the western boundary associated with the Proposed Development site and covers most of the settlement of Goodwick as illustrated in Volume III Figure 20.3.

As illustrated in Viewpoint 7 (refer Volume III: Figure 20.6), that is the nearest point of this Conservation Area to the Proposed Development, the Proposed Development is well screened in views and available panoramic views across the Harbour will remain unaffected. The remainder of the Conservation Area is set further back than the Hotel and views of the Proposed Development are restricted and screened by intervening built form and existing vegetation.

No significant landscape or visual effects are predicted for the Goodwick Conservation Area.

A further Conservation Area is located south-east of the Proposed Development site within the settlement of Fishguard, but this area is visually and physically separated from the Proposed Development by the headland at Penyraber and built development and no alteration to views will occur.

No significant landscape or visual effects are predicted for the Fishguard Conservation Area.

20.8.5.6 Long Distance Footpaths and Cycle Routes

National Cycle Route 4 runs above the A40 to the south of the Proposed Development site.

Open views from this identified route are available northwards towards the site and the wider Bay area (refer Volume III; Figure 20.6). The National Trail continues north-west and crosses the existing ferry terminal area via a footbridge (refer Volume III; Figure 20.6).

In views from the National Cycle Route the Proposed Development will not noticeably alter the visual context of the existing view due to the limited nature of the proposals and their location at the site of the existing ferry terminal infrastructure.

No significant landscape or visual effects are predicted for Long Distance Footpaths and Cycle Routes.

20.8.6 Summary of Predicted Seascape and Landscape effects

Table 20-12: Summary of Predicted Seascape and Landscape Effects

Seascape/ Landscape Character / Designation	Predicted Construction Phase Effects	Predicted Operational Phase Effects
MCA 16 – Cardigan Bay (South)	**Minor**, localised, temporary, short-term duration assessed as not significant.	Localised **Negligible**, long-term effects assessed as not significant.
SCA 7 - Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town	**Minor**, localised, temporary, short-term duration assessed as not significant.	Localised **Negligible**, long-term effects assessed as not significant.
NLCA 43 – West & North Pembrokeshire Coast	**Minor**, localised, temporary, short-term duration assessed as not significant.	Localised **Negligible**, long-term effects assessed as not significant.
LCA 3 – Fishguard Coastal	**Minor**, localised, temporary, short-term duration assessed as not significant.	Localised **Negligible**, long-term effects assessed as not significant.
National Parks	No Change	No Change
Historic Landscapes	No Change	No Change
Heritage Coasts	No Change	No Change
Long Distance Footpaths & Cycle Routes	No Change	No Change
Registered Parks and Gardens	No Change	No Change
Listed Buildings / Conservation Areas	No Change	No Change

20.8.7 Assessment of Visual Effects

A series of 8 representative viewpoints have been selected to illustrate the visual context of the Proposed Development and as an aid to the visual assessment. All the viewpoints have been located on publicly accessible roads, footways and verges within the study area associated with the Proposed Development, from locations where it is theoretically possible to view the Proposed Development (refer to Volume III Figure 20.4).

Visual effects from the representative viewpoints considered in the SLVIA are described in Table 20-20 below and are supported by visualisations (refer Volume III; Figure 20.6) from each of the viewpoint locations (refer Volume III; Figure 20.4).

To avoid repetition, an assessment of construction phase impacts and predicted operational phase impacts is included within the following viewpoint assessment tables.

Table 20-13: Viewpoint 1 – Station Hill

Viewpoint 1 – Station Hill			
Grid Reference	194552; 238232	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North-east	**Approx. distance to Proposed Decvelopment**	750m from southern boundary

Description of existing view and potential receptors	This viewpoint is located on the public footpath forming the northen edge of Station Road, at an elevated location (bridge) over the existing railway on Station Hill, approximately 750m south of the Proposed Development. The view is considered to be representative of views experienced primarily by receptors on the footpath as thparapet walling associated with the bridge blocks views from passing cars. The existing view available (refer Volume III; Figure 20.6) from this location is generally panoramic in nature, though views to the left at this location are partially restricted in nature due to dense vegetation on more elevated land. This slightly elevated view is primarily comprised of existing built form associated with Fishguard harbour the existing ferry terminal facility. The foreground and middle ground consists of a railway line, a local road travelling towards Fishguard Harbour, the road and the existing infrastructure associated with ferry terminal and Fishguard Harbour. Views of more distant coastline form a prominant feature on the horizon from this veiwpoint. Streetlights and timber poles carrying overhead lines are visible throughout the view adding verticality.
Sensitivity	Transient receptors on the road at this location are judged to be of a low susceptibility to change in their views, though pedestrians on the footpath are judged to be on a high susceptibility to change in their views. The viewpoint does not represent a recognised stopping place and does not form part of a recognised tourist route, and the overall value of the view available is judged to be medium. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **small** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume

Viewpoint 1 – Station Hill	
	III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

Table 20-14: Viewpoint 2 – Ferry Port Entrance

Viewpoint 2 – Ferry Port Entrance			
Grid Reference	194657; 238164	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North-east	**Approx. distance to Proposed Decvelopment**	750m from southwestern boundary

Description of existing view and potential receptors	This viewpoint is located approximately 750m to the south-west of the Proposed Development site on the footpath, adjacent to Fishguard Pier Car Park, off the roundabout between Station Hill, the A40 and Wern Road. The view is representative of views experienced by transient road users and pedestrian receptors traveling along Fishguard Pier towards Fishguard Ferry terminal. The existing view available from this location (refer Volume III; Figure 20.6) is generally open and panoramic in nature, though views north are constrained by existing, elevated coastline. The foreground of the view is Fishguard Bay with vegetation and rock armour visible to the left as is the road leading to the Fishguard Ferry and Fishguard Harbour. Fishguard Pier and Fishguard Bay are the main visual draws to the viewpoint while streetlights along the road to the ferry provide verticality to the view.
Sensitivity	Transient receptors on the road at this location are judged to be of a medium susceptibility to change in their views, as the main focus of these receptors will be on the direction of travel and the view represented is predominantly experienced peripheral to the direction of travel. However, pedestrian receptors at this location are considered to be of a high susceptibility to change as the main focus would be the view of and across the bay. The viewpoint does not represent a recognised stopping place and does not form part of a recognised tourist route, and the overall value of the view available is judged to be medium. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **small** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with

Viewpoint 2 – Ferry Port Entrance	
	the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

Table 20-15: Viewpoint 3 – View from Ocean Lab

Viewpoint 3 – View from Ocean Lab			
Grid Reference	194657; 238164	**Viewpoint Location**	Volume III: Figure 20.6
Direction of View	North-east	**Approx. distance to Proposed Decvelopment**	830m from southern boundary

Description of existing view and potential receptors	This viewpoint is located at the entrance to Ocean Lab aquarium, adjacent to Fishguard Pier car park, approximately 830m south of the Proposed Development. The view is representative of views experienced by transient and recreational receptors traveling along Fishguard Pier and towards Fishguard Ferry as well as those visiting Ocean Lab. The existing view (refer Volume III; Figure 20.6) available from this location is partially restricted in nature to the left of the view due to elevated coastline with dense vegetation. However, more panoramic views are available centrally and to the right of the view. The immediate foreground of the view is formed by the car park with street furniture, while Fishguard Bay is visible in the middle distance with vegetation and rock armour visible to the left as is the road leading to the Fishguard Ferry and Fishguard Harbour. Fishguard Pier and Fishguard Bay are the main visual draws to the viewpoint while streetlights along the road to the ferry provide verticality to the view. Fishguard Bay Hotel is partially visible at lower elevation on the steep cliffs to the rear of the ferry terminal.
Sensitivity	Transient receptors on the road at this location are judged to be of a low susceptibility to change in their views at this location, however recreational receptors are considered to be of a high susceptibility to change as the main focus would be the view of the bay. The viewpoint does represent views from a recognised stopping place and the overall value of the view available is judged to be medium. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **small** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including

Viewpoint 3 – View from Ocean Lab	
	the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

Table 20-16: Viewpoint 4 – View from St. Theresa's Convent

Viewpoint 4 – View from St. Theresa's Convent			
Grid Reference	195150; 237641	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North	**Approx. distance to Proposed Decvelopment**	1.1km to southern boundary

Description of existing view and potential receptors	This viewpoint is located on a footpath at St. Theresa's Convent, accessed from Windyhill Road. The slightly elevated viewpoint is located approximately 1.1km south of the Proposed Development. The view is considered to be representative of views available to recreational and residential receptors in the immediate vicinity as well as those receptors who sit at St Theresa's Convent. This viewpoint is on elevated land and the existing view available from this location (refer Volume III; Figure 20.6) is generally open and panoramic in nature, though partially constrained in nature by topographical changes which hide views of the horizon to the left. The immediate foreground of the view contains views of Fishguard Bay, with Goodwick sea wall forming a prominent feature of the view. The existing Fishguard Harbour is visible, as is Fishguard Pier to the centre right of the viewpoint. Residential properties are visible on more elevated land forming the well vegetated backdrop to the view. Street lighting and existing infrastructure associated with Fishguard Harbour are visible are lower elevation across the whole of the view at mid-distance. Fishguard Bay Hotel is visible at lower elevation on the steep cliffs to the rear of the ferry terminal.
Sensitivity	Recreational and residential receptors at this location are judged to be of a high susceptibility to change in their views at this location. The viewpoint does represent a stopping place and does form part of a recognised route (Marine Walk), and the overall value of the view available is judged to be medium. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **negligible** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and

Viewpoint 4 – View from St. Theresa's Convent	
	long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

Table 20-17: Viewpoint 5 – View from Pantycelyn Road

Viewpoint 5 – View from Pantycelyn Road			
Grid Reference	195514; 237737	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North	**Approx. distance to Proposed Decvelopment**	1.05 km from southern boundary

Description of existing view and potential receptors	This viewpoint is located on the Pantycelyn, which can be access via the Windyhill Road. This viewpoint is approximately 1.05km south of the Proposed Development. The view is considered to be representative of views available to both transient receptors utilising the local road network and recreational and residential receptors in the immediate vicinity. This viewpoint is located on elevated land, to the south of the Proposed Development, which forms the southern edge to Fishguard Bay and the existing view (refer Volume III; Figure 20.6) available from this location is generally open and panoramic in nature. Existing elevated land forming the northern edge to Fishguard Bay forms the horizon and backdrop to Fishguard Bay and the existing harbour development. The immediate foreground of the view is Fishguard Bay, with Goodwick sea wall forming a prominent visual feature. The existing Fishguard Harbour is visible, as is Fishguard Pier to the centre right of the view, with rock armour and built form associated with the harbour forming a distinctive element of the view. Fishguard Bay Hotel is visible within the central portion of the view, at lower elevation on the steep cliffs to the rear of the ferry terminal. Residential properties are visible to the left of the view, extending across the central portion of the view, though generally visible at distance. Existing built form on more elevated land forming the backdrop of the view form a distinct visual draw due to their contrasting colour.
Sensitivity	Transient receptors on the road at this location are judged to be of a medium susceptibility to change in their views, as the main focus of these receptors will be on the direction of travel and the view represented is predominantly experienced peripheral to the direction of travel. However, pedestrian and recreational receptors at this location are judged to have a high susceptibility to change in their views.. The viewpoint does represent a stopping place and does form part of a recognised route (Marine Walk), and the overall value of the view available is judged to be medium. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **small** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.

Viewpoint 5 – View from Pantycelyn Road	
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

Table 20-18: Viewpoint 6 – View from Fishguard Fort

Viewpoint 6 – View from Fishguard Fort			
Grid Reference	196212; 237815	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North-west	**Approx. distance to Proposed Decvelopment**	1.4 km from southern boundary

Description of existing view and potential receptors	This viewpoint is located within Fishguard Fort (Castle Point Old Fort) approximately 1.4km south-east of the Proposed Development. The view, from this location are considered to be representative of views available to recreational receptors visiting this location or utilising the long distance walking route (Pembrokeshire Coast Path National Trail). Views available from this elevated location (refer Volume III; Figure 20.6) are generally open and panoramic in nature across Fishguard Bay with Goodwick sea wall forming a distinct visual element at mid distance across the central portion of the view. Elevated coastlines to the immediate north of Fishguard Bay form the horizon, with existing built form and vegetation cover perceived to locally elevate horizons. Fishguard Bay Hotel is visible within the central portion of the view, at lower elevation on the steep cliffs to the rear of the ferry terminal. Rock armour and built form associated with the harbour is perceived at lower elevation forming a defined edge to the bay and extends across the whole of the central portion of the view, though perceived at distance.
Sensitivity	Recreational receptors at this location are judged to be of a high susceptibility to change in their views, as the focus of the view from this location is across the bay towards Goodwick. The viewpoint does represent a stopping place and does form part of a recognised route (Pembrokeshire Coast Path National Trail), and the overall value of the view available is judged to be high. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **high**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **negligible** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume

Viewpoint 6 – View from Fishguard Fort	
	III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised **Minor**, long-term duration assessed as not significant effects are predicted to occur during the operational phase of the Proposed Development. Elements of the Proposed Development will be difficult to differentiate as a separate or new element of the view as the new facilities will blend with the existing ferry terminal infrastructure.

Table 20-19: Viewpoint 7 – View from Fishguard Bay Hotel

Viewpoint 7 – View from Fishguard Bay Hotel			
Grid Reference	194877; 238663	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	East	**Approx. distance to Proposed Decvelopment**	220m from western boundary

Description of existing view and potential receptors	This viewpoint is located at within the grounds Fishguard Bay Hotel, located off the Quay Road, approximately 220m from the western boundary of the Proposed Development site. The view is considered to be representative of views available to recreational receptors and patrons using Fishguard Bay Hotel. The existing view available from this location (refer Volume III; Figure 20.6) is constrained and screened by existing vegetation to the immediate north, east and west of the hotel. Distant horizons, formed by more elevated lands to the south, associated with the Pembrokeshire Coast National Park, are partially visible beyond intervening vegetation. Existing infrastructure associated with the ferry terminal and the wider harbour area is screened within the view by existing vegetation cover.
Sensitivity	Receptors at the Fishguard Bay Hotel are judged to be of a high susceptibility to change in their views. The viewpoint does represent views from a recognised location and from within a designated landscape area (Registered Historic Park and Garden) and the value of the view is judged to be high. Overall the sensitivity of the view is judged to be **high**.
Magnitude of Change – Construction Phase	During the construction phase, operations and machinery movements associated with the Proposed Development will not be visible in views availabe from this location due to screening effects of vegetation associated with Fishguard Bay Hotel. Overall, the magnitude of change during the construction phase of the Proposed Development is judged to be **No Change**.
Magnitude of Change – Operational Phase	The Proposed Development and associated infrastructure will be screened in views from this location due to screening effects of vegetation (refer Volume III; Figure 20.6). Overall, the magnitude of visual impact during the operational phase is judged to be **No Change**.
Significance of Visual Effect during Construction Phase	**No Change**
Significance of Visual Effect during Operational Phase	**No Change**

Table 20-20: Viewpoint 8 – View from Quay Road Footbridge

Viewpoint 8 – View from Quay Road Footbridge			
Grid Reference	194877; 238663	**Viewpoint Location**	Volume III; Figure 20.6
Direction of View	North-east	**Approx. distance to Proposed Decvelopment**	370m from western boundary

Description of existing view and potential receptors	This viewpoint is located on the pedestrian footbridge connecting Quay Road with pedestrain access / footpath adjacent to the main ferry terminal access. This elevated viewpoint is located approximately 370m south-west of the Proposed Development and is considered to be representative of views experienced by recreational receptors utilising the bridge link. The existing view available from this location (refer Volume III: Figure 20.6) is open and panoramic in nature, though views to the left are restricted due to elevated land with dense vegetation. The view available from this slightly elevated location is comprised primarily of existing ferry terminal infrastructure, though breakwater and jettys are visible across central portions of the view at varying distances. To the right of the view, elevated lands associated with the Pembrokeshire Coastline form a distinctive horizon.
Sensitivity	Recreational receptors at this location are judged to be of a high susceptibility to change in their views at this location. The viewpoint does not represent a recognised stopping place and does not form part of a recognised tourist route, and the overall value of the view available is judged to be medium as the view contains existing built form associated with the ferry terminal facility, visible at close distance. Overall, taking into account the receptor susceptibility and the value of the view the sensitivity is judged to be **medium**.
Magnitude of Change – Construction Phase	During the construction phase the main source of impact on the view will be the visibility of machinery and activities associated with the Proposed Development, which are predicted to be visible at distance within a minor portion of the available view from this location. Construction phase operations will be viewed well below existing horizons, and perceived against a similarly developed backdrop which aids integration. The magnitude of visual impact during the construction phase of the Proposed Scheme is judged to be localised and **small** as such operations will be perceived within a minor portion of the view, at distance and below perceived horizons.
Magnitude of Change – Operational Phase	During the operational phase, elements of the Proposed Development will be difficult to perceive within a minor portion of the overall view available from this location (refer Volume III; Figure 20.6). Viewed at distance, the Proposed Development, will be read as part of the overall infrastructure associated with the ferry terminal and wider harbour development, with the visual character of the view remaining unaltered. Existing elements of the view, including the large scale man-made structures will retain visual prominance, with middle distance and long-distance views remaining unaffected. Overall, the magnitude of visual impact during the operational phase is judged to be **negligible**.
Significance of Visual Effect during Construction Phase	Localised **minor**, short-term duration, assessed as not significant visual effects are predicted to be experienced during the construction phase of the Proposed Development.
Significance of Visual Effect during Operational Phase	Localised negligible to minor, assessed as **negligible,** long-term and not significant effects are predicted to occur during the operational phase of the Proposed Development. Whilst portions of the Proposed Development may be perceived within the view, they will be viewed as a very minor alteration to the existing character and composition of the view and will be easily absorbed into the view, being read as part of the overall infrastructure associated with the harbour development.

20.8.8 Summary of Predicted Visual Effects

Table 20-21: Summary of Predicted Visual Effects

Viewpoint		Predicted Construction Phase Effects	Predicted Operational Phase Effects
1	View south from Station Hill	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects
2	View southeast from Ferry Port Entrance	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects
3	View southwest from Ocean Lab	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects
4	View south from St. Theresa's Convent	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects
5	View north from Pantycelyn Road	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects
6	View from Fishguard Fort	Localised **minor**, short-term duration and not significant effects	Localised **minor,** long-term duration and not significant effects
7	View from Fishguard Bay Hotel	**No Change**	**No Change**
8	View from Quay Road Footbridge	Localised **minor**, short-term duration and not significant effects	Localised **negligible,** long-term duration and not significant effects

20.9 Mitigation

20.9.1 Construction Phase Mitigation Measures

No significant seascape, landscape or visual effects have been predicted to occur during the construction phase of the Proposed Development. As such it is considered that no additional mitigation measures over and above those included as part of Proposed Development will be required to mitigate predicted seascape, landscape and visual impacts arising during the construction phase of the Proposed Development.

20.9.2 Operational Phase Mitigation Measures

No significant seascape, landscape or visual effects have been predicted to occur during the operational phase of the Proposed Development. As such it is considered that no additional mitigation measures over and above those included as part of Proposed Development will be required to mitigate predicted seascape, landscape and visual impacts arising during the construction phase of the Proposed Development.

20.10 Limitations of the Assessment

20.10.1 Published baseline data

The assessment of effects on seascape, and landscape character has been undertaken with reference to available published data on seascape and landscape character.

20.10.2 Factors likely to affect visibility

The marine environment is often regarded as a flat surface, lacking in physical structures that could prevent distant views of remote objects. However, there are a variety of other factors that are likely to affect the ability to experience views within the marine environment. These include the acuity of the human eye, the effects of refraction of light, as well as meteorological which can effect on visibility, even at closer distances.

20.10.2.1 The influence of weather

Changing weather patterns and local climatic conditions will influence the visibility of the Proposed Development in terms of extent of view and colour/ contrast of new elements of the Proposed Development, and thus the perceived visual impact. There will be periods of lower visibility/ clarity as well as periods of higher visibility/ clarity depending on weather conditions which include humidity, temperature, presence or absence of air pollution, wave action resulting in sea spray, mist, fog, light reflection off water and the influence of sunlight upon the view.

20.11 Summary of Effects and Conclusion

The Proposed Development is located within a single National Landscape Character Area identified as West & North Pembrokeshire Coast NLCA 43. The identified NLCA has been assessed for both construction and operational phase effects associated with the Proposed Development. The NLCA has been predicted to experience localised, minor short-term effects assessed as not significant during the construction phase, restricted to areas contained within the Proposed Development site boundary only, with remaining portions of NLCA 43 predicted to experience no significant indirect effects. During the operational phase of the Proposed Development, negligible to minor, assessed as not significant effects are predicted as the Proposed Development easily integrate into the existing landscape and will not be perceived as a noticeable alteration.

Additionally, the Proposed Development is located within the Cardigan Bay (South) MCA, the Fishguard Coastal LCA as well as the Fishguard and Goodwick including Fishguard Harbour and the Quayside at Lower Town SCA. Like the NLCA mentioned above, the identified areas have been assessed for both construction and operational phase effects associated with the Proposed Development. These identified areas are predicted to experience localised, minor short-term effects assessed as not significant during the construction phase, restricted to areas contained within the Proposed Development site only, with surrounding areas predicted to experience no significant indirect effects. During the operational phase of the Proposed Development, negligible to minor assessed as not significant effects are predicted as the Proposed Development easily integrate into the existing landscape and will not be perceived as a noticeable alteration.

The Proposed Development has been assessed as not giving rise to any significant direct or indirect effects on any of the landscape designations including; National Parks, Historic Landscapes, Registered Parks & Gardens; Listed Buildings or Conservation Areas.

A total of 8 viewpoints have been assessed, for both construction and operational phases associated with the Proposed Development. None of the viewpoint's assessment are considered to experience significant effects during either the construction phase or operational phase of the Proposed Development, as whilst portions of the Proposed Development are predicted to be visible, visible elements of the Proposed Development will be difficult to discern and perceived as a minor alteration to the existing character and composition of the view. The Proposed Development is easily absorbed within views as the development type and form is of a similar nature to existing infrastructure elements visible in views.

It is noted that the Proposed Development is located within a robust harbour setting and is considered that the wider landscape and visual resources surrounding the Proposed Development site have the capacity to accommodate a development of this type and scale.

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Seascape Impact – MCA 16	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Seascape Impact – SCA 7	✓	✓	None	C: Small O: Negligible	Low	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Landscape Impact – NLCA 43	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Landscape Impact – LCA 3	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Landscape Impact – National Parks	✓	✓	None	C: None O: None	High	No Change	None	No Change	None
Landscape Impact – Historic Landscapes	✓	✓	None	C: None O: None	High	No Change	None	No Change	None
Landscape Impact – Heritage Coasts	✓	✓	None	C: None O: None	High	No Change	None	No Change	None
Landscape Impact – Registered Parks and Gardens	✓	✓	None	C: None O: None	High	No Change	None	No Change	None

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Landscape Impact – Listed Buildings / Conservation Areas	✓	✓	None	C: None O: None	High	No Change	None	No Change	None
Landscape Impact – Long Distance Footpaths	✓	✓	None	C: None O: None	High	No Change	None	No Change	None
Visual Impact – Viewpoint 1	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Visual Impact – Viewpoint 2	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Visual Impact – Viewpoint 3	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Visual Impact – Viewpoint 4	✓	✓	None	C: Negligible O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Visual Impact – Viewpoint 5	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None
Visual Impact – Viewpoint 6	✓	✓	None	C: Negligible O: Negligible	High	C: Minor Adverse O: Minor adverse	None	Minor	None

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Visual Impact – Viewpoint 7	✓	✓	None	C: No Change O: No Change	High	C: No Change O: No Change	None	None	None
Visual Impact – Viewpoint 8	✓	✓	None	C: Small O: Negligible	Medium	C: Minor Adverse O: Negligible adverse	None	Negligible	None

20.12 References

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20.13 List of Abbreviations / Acronyms

Acronym	Definition
ELC	European Landscape Convention
ES	Environmental Statement
FWNP	Future Wales – The National Plan 2040
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition
LCA	Landscape Character Assessment
LDP	Local Development Plan
MCA	Marine Character Area
NLCA	National Landscape Character Areas
PCCLDP	Pembrokeshire County Council Local Development Plan
PCNP	Pembrokeshire Coast National Park
SCA	Seascape Character Area
SLV	Seascape Landscape and Visual
SLVIA	Seascape, Landscape and Visual Impact Assessment
SVIA	Seascape/coastal and Visual Impact Assessment
ZTV	Zone of Theoretical Visibility

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 21 Waste Management

21 Waste Management

21.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") by wastes produced from the Proposed Development. This chapter considers the potential impacts from wastes that are generated from offshore and onshore activities during the construction and operational phases of the Proposed Development.

Waste is defined as '*any substance or object the holder discards, intends to discard or is required to discard*' under the Waste Framework Directive (European Directive 2006/12/EC as amended by Directive 2008/98/EC). Once a substance has become waste it will remain waste until it has been fully recovered and no longer poses a potential risk to the environment or human health.

Directive 2011/92/EU included waste as a criteria for assessment in EIA requiring an estimate of the quantities and types of waste produced during the construction and operation phases of projects.

The main objectives of this assessment are to:

- Undertake a desktop study to identify the main sources of non-hazardous and hazardous wastes that are expected to be generated from the Proposed Development;
- Assess the potential impact from the construction and operational phases of the Proposed Development from generated wastes; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES:

- Chapter 2: Project Description.

Other aspects relevant to waste management are addressed in the specific chapters of the ES, namely:

- Chapter 15: Air Quality and Climate – particulate matter/dust impacts from demolition and loading of wastes.
- Chapter 19: Traffic and Transport – impacts of any vehicle movements associated with hauling or removing wastes.

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

21.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely effects of the Proposed Development from the solid wastes generated from construction works and operational phase. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation;
- Identifies any limitations encountered in compiling the environmental information (Section 21.13);
- Presents an assessment of the potential likely significant effects from the management of wastes arising from the Proposed Development (Section 21.9) based on the information gathered and the analysis and assessments undertaken.

- Highlights any required management measures.

21.3 Study Area

The study area for wastes generated from the Proposed Development is the red line boundary. The assessment will consider solid waste arisings from the construction site and dredged sediment at the nearshore, any wastewater generated from project activities will be considered in Chapter 11.

The study area for the treatment and disposal of wastes not reused on the site will be Mid and South-West Wales as a sub-region of Wales.

21.4 Policy Context

A legislative review has been undertaken as part of this assessment that includes identifying relevant waste and environmental European Directives, National Regulations, National Policies and Strategies. The European Revised Waste Framework Directive (2008/98/EC) was amended in May 2018 and sets the framework for UK Waste Policy. The Waste (Circular Economy) (Amendment) Regulations 2020 made changes to UK legislation to transpose the revised Waste Framework Directive into English and Welsh legislation.

The UK legislative framework for the management of construction wastes comprises the following:

- Environmental Protection Act 1990;
- Environment Act 1995;
- Hazardous Waste (England and Wales) Regulations 2005 (as amended);
- Waste Management (England and Wales) Regulations 2006;
- Waste (Wales) Measure 2010;
- Waste (England and Wales) Regulations 2011 (as amended);
- Environmental Permitting (England and Wales) Regulations 2016 (as amended);
- Environment (Wales) Act 2016; and
- Waste (Circular Economy) (Amendment) Regulations 2020.

The Waste (England and Wales) Regulations 2011 place a duty on waste producers and all handlers of waste to manage waste in accordance with a hierarchy of options where this achieves the best overall environmental outcome (Defra, 2018a). The contractors involved in the Proposed Development will be required to demonstrate that they are applying the waste hierarchy.

The following waste strategy details the Welsh Governments current long-term framework for resource efficiency and managing wastes in Wales:

- Towards Zero Waste. One Wales: One Planet. The Overarching Waste Strategy Documents for Wales (Welsh Assembly Government, 2010).

The construction and demolition sector plan supporting the Towards Zero Waste Strategy covers the waste produced during construction, civil engineering and demolition projects. Its aims are to prevent waste and reduce waste and increase recycling from businesses in this sector. Additional waste planning guidance for Wales is set out in Technical Advice Note 21 (WAG, 2014).

The guidance document supported by the National Assembly for Wales on the classification and assessment of waste, Technical Guidance WM3 (Environment Agency, 2021) sets out how wastes are classified as non-hazardous and hazardous in line with the various hazard criteria.

All wastes generated from the Proposed Development will be classified in line with regulatory requirements and management plans will document how the different waste streams will be

handled, stored and managed. The management plans will include the responsibilities of staff and the site-specific procedures and tracking procedures to enable full traceability of wastes to treatment or disposal locations.

21.5 Consultation

No issues relevant to waste management were raised during consultation activities undertaken to date, including comments received on the Scoping Report. NRW note in the screening opinion that adequate disposal of sediment arisings will be required, including for offshore disposal identifying the disposal site and status. Information on the proposed disposal site is included in Table 21-8.

Chapter 5: Scoping and Consultation provides details of the types of consultation activities undertaken for the Project up to the end of January 2025 and the consultees that were contacted.

21.6 Methodology to inform the baseline

21.6.1 Desktop study

Information on wastes generated from the Proposed Development within the Waste Management Study Area was collected through a desktop review of existing studies and datasets, including:

- Infrastructure removal layout drawing.
- Indicative waste arisings data provided to the EIA team.

These sources provide the most up to date information and data for this assessment, although updated estimates on the expected volumes of wastes from the demolition of the existing infrastructure will be developed in due course.

21.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for waste management. The baseline data presented in this section is derived from Project information and expert judgement based on waste arisings from similar projects.

21.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following waste management specific guidance as follows:

- IEMA (2020) Guide to Materials and Waste in Environmental Impact Assessment: Guidance for a Proportionate Approach.

The method to be adopted in the assessment was detailed in the EIA Scoping Report. The methodology for assessing the significance of effects associated with the generation of waste is based upon an assessment of the quantity and types of waste that are likely to be produced during construction and operation of the replacement linkspan.

21.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity for waste management are based on those set out in the IEMA guidance (IEMA, 2020).

The criteria for defining impact magnitude in this chapter are outlined in the table below.

Table 21-1 Waste management: Magnitude of an impact definition

Assessment of Magnitude				
Inert and Non-Hazardous Waste Landfill Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce regional landfill void capacity baseline by <1%	Waste generated by development will reduce regional landfill void capacity baseline by 1-5%	Waste generated by the development will reduce regional landfill void capacity baseline by 6-10%.	Waste generated by the development will reduce landfill void capacity baseline by >10%.
Hazardous Waste Landfill Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce national landfill void capacity baseline by <0.1%	Waste generated by development will reduce national landfill void capacity baseline by <0.1-0.5%	Waste generated by the development will reduce national landfill void capacity baseline by >0.5-1%	Waste generated by the development will reduce national landfill void capacity baseline by >1%.

The criteria for defining receptor sensitivity in this chapter are outlined in Table 21-2 below.

Table 21-2 Waste management sensitivity matrix definition

Importance / Sensitivity of Resource or Receptor				
Across construction and or/operation phases, the baseline/future baseline regional non-hazardous landfill void capacity is expected to…				
Negligible	**Low**	**Medium**	**High**	**Very High**
Remain unchanged or is expected to increase through a committed change in capacity.	Reduce minimally: by <1% as a result of wastes forecast.	Reduce noticeable: by 1-5% as a result of wastes forecast.	Reduce considerably: by 6-10% as a result of wastes forecast.	Reduce very considerably (by >10%); end during construction or operations; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.

The significance of the effect upon waste arisings is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in Table 21-3. Where a range of significance of effect is presented in Table 21-3, the final assessment for each effect is based on calculated assessment and professional judgement.

Table 21-3 Waste: Matrix used for the assessment of the significance of the effect

	Magnitude of Impacts					
Sensitivity (or value) of Receptor		**No Change**	**Negligible**	**Minor**	**Moderate**	**Major**
	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Once the effect threshold has been determined, Table 21-4 provides how the Waste Topic Lead may determine whether environmental effects are potentially significant, or not. Where a threshold is 'slight or moderate', i.e., transcends the significant – or not - effect boundary, professional judgement has been used to determine a final outcome.

Table 21-4 Waste: Determination of overall significance of effect

Effect	Significance
Neutral	Not significant
Slight	
Moderate	Significant
Large	
Very Large	

21.8 Baseline Environment

Fishguard port provides the basic services for the operation of the Fishguard to Rosslare ferry service operated by Stena Line. The current waste arisings at the port are from the administrative buildings and the vessel-generated wastes routinely backloaded at the port from the ferry. These typically comprise municipal type wastes from the bins, separated recyclables and catering wastes including food. Currently the following non-hazardous wastes are segregated for recycling:

- Cardboard and paper
- Glass
- Cans and metal
- Plastics

Some hazardous wastes are also separated, including fluorescent tubes, oil filters, and oily rags and absorbents and stored separately. The existing operational wastes are managed in line with

approach set out in the current Port Waste Management Plan for the Fishguard Port (Stena Line, 2024) that complies with requirements for businesses in Wales to segregate recyclables.

A detailed description of the Proposed Development and construction sequence is provided in Chapter 2. The key project elements that will generate wastes will be the works removing existing infrastructure, construction activities, and operation of the new infrastructure.

Construction phase works comprise:

- Removal of existing infrastructure
- Dredging of soft material at the nearshore
- Pontoon Restraint/Guide piles
- Placement of scour protection
- Bankseat (optional)
- Concrete repairs
- Installation of pontoon
- Installation of replacement linkspan

Operational phase activities will be:

- Continuation of ferry services operated by Stena.
- Future offshore dredging to maintain access, where required.

The types of wastes that will be produced from the Proposed Development, their classification and indicative estimates of waste arisings are detailed in the next section.

21.8.1 Waste Arisings from Construction

The wastes that will be generated from these works can be classified as either non-hazardous or hazardous, depending on the properties of the waste types.

Non-hazardous Wastes

- Concrete and rubble – from removals and concrete repairs,
- Dredgings – mixtures of sand, gravel and clays from nearshore works.
- Food waste – from welfare facilities.
- General waste – mixed residual waste that cannot be recycled.
- Paper and cardboard – cardboard boxes from packaging and paper that can be recycled when not wet or contaminated.
- Plastic – various types of plastics that can be segregated and recycled (e.g. PET and HDPE).
- Reinforced concrete - assumed to be concrete and rebar.
- Scrap metal –metals that can be recycled.
- Tarmac residues – bitumen-based materials from removal of asphalt road surface on the existing deck.
- Wood - pallets and packing board.

Hazardous Wastes

- Batteries, lead acid – vehicle type batteries containing acid.

- Chemicals (liquids) – off-spec and out of date chemicals.
- Oil filters (used) – spent oil filters containing oils from plant and machinery maintenance.
- Oily rags – oil contaminated rags or soak-up materials.
- Used oil – from plant or machinery maintenance.

The initial site preparation will include the clearance of all legacy infrastructures before removal of the jack-up barge, linkspan ramps and equipment. Indicative quantities of wastes that will be generated from the Proposed Development are:

- Steel – 230 m^3
- Inert materials – 20 m^3

Further information and management options for these indicative wastes from the legacy infrastructure are provided in Table 21-8.

Dredgings

It is estimated that dredging will generate a maximum of 2,500 m^3 of silty sands and gravels. Sediment sampling previously undertaken confirmed that the sediment did not contain any hazardous substances so can be moved or redistributed within the vicinity or the works in line with proposed management strategy that will be agreed with the MMO (RPS, 2018). A further campaign of sediment sampling was undertaken in March 2025 confirming that no hazardous chemicals were present in locations that will be targeted for dredging and the results will feed into the development of the management strategy.

The proposed management strategy for the dredgings is redistribution within the footprint of Proposed Project (as detailed in Chapter 2 Project Description). No dredged material will be transferred for offshore disposed and no material will require management onshore.

21.8.2 Waste Arisings from Operation

The new Linkspan will provide for the two dockings per day for the ferry service running between Fishguard and Rosslare and the quantity of wastes backloaded from the routine ferry services and small number of other vessels using the port is expected to remain consistent in the medium-term.

Vessels using the new Linkspan during the operational phase will continue to backload ship-generated waste at the port in line with the Port Waste Management Plan for the Fishguard Port (Stena Line, 2024) that implements MARPOL requirements and UK Regulations. The plan includes provisions for the management of International Catering Waste and various waste streams that are segregated for recycling to minimise the quantity of residual waste requiring disposal.

The Port Waste Management Plan is periodically reviewed and updated to ensure any new requirements for the management of wastes are incorporated and the plan accurately details the required procedures and information on the specific companies responsible for collection and onwards management of the various wastes.

Periodic dredging within the port area and access channels may be required during the operational phase. No estimates of the quantities of dredged materials generated from future works have been considered as part of this assessment and it is assumed that where this is required separate permits will be applied for from the MMO based on the volume and offshore disposal locations available at that time.

21.8.3 Waste Capacity Baseline

To inform the assessment, the availability and capacity of local / regional waste infrastructure within the Study Area has been reviewed for the Mid and South-Wales region to reflect that the

transportation of waste should be minimised as far as practically possible. The most up-to-date information on the waste management permitted sites within the region was identified from data published by Natural Resources Wales (NRW, 2025) and Pembrokeshire Coast National Park Authority.

There are numerous waste treatment sites in the vicinity of the Proposed Development, including a number of Material Recycling Facilities (MRFs) and scrap metal recycling sites. The NRW locator indicates the following treatment sites within the vicinity of Fishguard:

- Metal recycling site – 4 sites within 75 km
- Construction and demolition waste MRF – 3 sites within 100km
- Industrial and commercial waste MRF – 3 sites within 50 km

These waste sites will facilitate diverting materials from landfill and provide opportunities to reuse and recycle materials from the Proposed Development. In addition to these sites, the inert waste landfills in the wider study area that could take those inert wastes from the Proposed Development are listed in. The NRW permit number and nearest town is also provided.

Table 21-5 Inert Waste Landfills in Mid and South-West Wales

Permit No.	Site Name	Town	Local Authority Area
CP3398FR	Pope Hill 2	Haverfordwest	Pembrokeshire
HP3598FM	Pope Hill 3	Pope Hill	Pembrokeshire
SP3998FQ	Pope Hill 1	Haverfordwest	Pembrokeshire
BP3598FJ	Glogue Quarry Landfill	Hermon	Pembrokeshire
LP3998FV	Blaencilgoed Farm	Narberth	Pembrokeshire
UP3098FG	Slade Cross	Cosheton	Pembrokeshire
KP3198FQ	Wogaston	Pembroke	Pembrokeshire
PP3798FV	Waunlwyd Farm	Cynwyl Elfed	Carmarthenshire
LP3298FS	Penrhos Depot Landfill	Llandysul	Ceredigion
MP3498FG	Pibwrlwyd Inert Landfill	Carmarthen	Carmarthenshire
BP3398FA	Penycoed Landfill	Carmarthen	Carmarthenshire
RP3799FD	Bwlch Y Wern Landfill	Builth Wells	Powys
PP3195CR	J A Bowen & Co, Landfill	Welshpool	Powys
PP3695CU	Kingswood Farm Landfill	Welshpool	Powys

Source: NRW (2025)

The non-hazardous landfills that can take general waste and various other mixed waste streams are detailed in

Table 21-6. The closest to the Proposed Development is in the vicinity of St Davids.

Table 21-6 Non-hazardous Waste Landfills in Mid and South-West Wales

Permit No.	Site Name	Town	Local Authority Area
TP3698FA	St Davids Landfill	St Davids	Pembrokeshire
AP3991SM	Land Off Trostre Link Road	Llanelli	Carmarthenshire
YP3895FY	Timet Landfill	Waunarlwydd	Swansea
PP3898FA	Penplas Farm	Swansea	Swansea
BP3898FM	Cwmrhydyceirw Quarry	Swansea	Swansea
CP3299FR	Cwrt Y Plyffin Landfill	Brecon	Powys

Source: NRW (2025)

The hazardous waste landfills currently permitted by Natural Resources Wales for the whole of Wales are included in Table 21-7. Capacity data for the remining landfill void space is not available from NRW.

Table 21-7 Hazardous Waste Landfills in Mid and South-West Wales

Permit No.	Site Name	Town	Local Authority Area
SP3298FT	Giants Grave Landfill	Neath	Neath Port Talbot
YP3199FE	Coedely Reclamation & Development Scheme	Tonyrefail	Rhondda Cynon Taff
GP3392EH	Trehir Quarry Landfill	Caerphilly	Caerphilly
BP3795FD	Ferry Road Landfill	Cardiff	Cardiff
CP3694FW	Penhesgyn Gors Landfill (area 2)	Menai Bridge	Isle of Anglesey
BP3394FH	W D A - Formerly Erie Electronic 1	Wrexham	Wrexham
BP3994FJ	W D A - Formerly Erie Electronic 2	Wrexham	Wrexham
BP3390VA	Standard Landfill Site	Buckley	Flintshire

Source: NRW (2025)

The latest predicted remaining landfill capacity for the Mid and South-West Wales Waste Planning region is 2.7 years (Pembrokeshire Coast National Park Authority, 2025) and in July 2022, the latest data available, the capacity available was around 155,000 tonnes for non-hazardous landfills (Mid & South-West Wales, 2023). Landfill is considered the worst-case scenario and would be the least desirable disposal option for wastes arising from the Proposed Development and reuse and recycling will be considered before this disposal option, as detailed in Section 21.9.2.

21.9 Impact Assessment

21.9.1 Do Nothing Scenario

If the Proposed Development did not go ahead, there would be no non-hazardous or hazardous wastes generated and so no impact on the local and regional waste management capacity. The do-nothing scenario has therefore not been considered further in the assessment.

21.9.2 Assessment of Construction Effects

There is the potential for quantities of materials to be deposited in landfill sites rather than being reused or recycled unless the SWMP is implemented and adhered to. The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in pollution incidents or contamination of land. Therefore, it is essential that all waste materials are dealt with in accordance with regional policies, national legislation, and that site management procedures are in place to ensure the appropriate procedures for waste segregation, storage, handling, and off-site transportation to approved waste facilities are implemented.

A number of different waste types are expected to be generated on-site and the proposed management methods, along with indicative quantities, are detailed in Table 21-8.

In terms of the overall impact of the construction phase of the Proposed Development, there is the potential for non-hazardous waste management to have a **Neutral or slight** effect, due to the increase in waste being generated and the potential for this waste to be sent to landfill for disposal. This would be a worst-case scenario as the intention of the Proposed Development will be to

achieve a higher rate of diversion from landfill through reuse, recycling and recovery throughout the construction phase as set out in the SWMP included as part of the draft CEMP. The quantities of waste expected to be generated have been reduced during the design process of the Project as less material will be removed from demolition works and reduced quantities of dredging is required.

For hazardous waste, the quantity of wastes requiring management is very small, so the Proposed Development has the potential to have a **Neutral or slight** effect. Hazardous wastes generated from the Proposed Development are unsuited to be landfilled so will be recycled or incinerated via approved waste contractors.

Table 21-8 Waste Streams Generated and Proposed Management Options

Project Activity	Waste Type	Classification	Management Option(s)	Management Strategy
Dredging	Sediment from dredging (silty sands and gravel)	Non-hazardous	Redistribution within the Proposed Project area	Dredged material (max. 2,500 m^3) will be redistributed to an approved area within the Proposed Development. Previous sediment sampling has confirmed target material as being non-hazardous in nature based on laboratory chemical analyses results.
Demolition and Construction	Soils and subsoil	Inert	Reuse	All excavated soils and subsoils will be stockpiled onsite and reused within the design.
	Concrete / reinforced concrete	Inert or non-hazardous	Re-use or recycle. Disposal at landfill (inert or non-hazardous)	A small quantity of concrete wastes may be produced from the removal of infrastructure, including partial demolition of the buffer dolphin towers. This is currently estimated to be around 60 m^3 and will weigh around 144 tonnes.
	Metals	Non-hazardous	Recycle	All metals shall be segregated for off-site recycling. Separately segregate ferrous and non-ferrous metals if sufficient quantity expected to be generated. Current estimate of 230 m^3 of scrap metal from construction works. The Principal Contractor will identify an approved scrap metal site for transfer of these materials.
	Plastics	Non-hazardous	Recycle	Plastics shall be segregated for off-site recycling. Separate bins should be deployed in welfare areas and a separate skip provided for hard plastics and film.
	Paper and cardboard	Non-hazardous	Recycle	Paper and cardboard shall be segregated for off-site recycling. Small quantities of paper and card are expected to be produced from the project.
	Wood	Non-hazardous	Reuse packing material, Recycle or send for energy recovery.	Pallets shall be returned to suppliers for reuse where possible. Wood waste will be segregated into a separate container so that off-site recycling can occur. Oily or chemical contaminated wood must be segregated and treated as a hazardous waste.
	Glass	Non-hazardous	Recycle	Glass will be segregated to facilitate recycling. Small quantities expected from welfare areas.

Project Activity	Waste Type	Classification	Management Option(s)	Management Strategy
	General waste (mixed)	Non-hazardous	Materials Recovery Facility, energy recovery or landfill	Residual waste must be placed into a skip labelled mixed waste. Investigations shall be undertaken to identify potential recovery options for all waste.
	Sewage waste	Non-hazardous	Transfer to wastewater treatment plant	From temporary toilets at the construction compound. Toilets for construction workforce to be periodically emptied by vacuum truck or discharged into the mains sewerage system where possible.
	Tarmac residues	Non-hazardous	Reuse / recycle	A small area of the existing deck will have the asphalt planed off and replaced with concrete. The waste residues are estimated to be 5 m^3.
	Chemicals (liquid)	Hazardous / non-hazardous (depending on properties)	Treated based on properties by specialist waste contractors	Small qualities of spent chemicals or out of date chemicals may arise during the construction works. These should be stored in the hazardous waste area where the MSDS indicates hazardous properties.
	Contaminated soils	Hazardous	Remediated and reused or landfilled	All contaminated soils or soak-up materials contaminated with chemicals will be stored preventing leakage of liquids. Only small quantities expected. Store with hazardous wastes.
	Oil filters	Hazardous	Drained of oils and metals recycled	Any oil filters from plant maintenance or transferred to shore from vessels must be stored in leak-proof containers to collect oil residues. Drained filters can be recycled.
	Used oils	Hazardous	Recycle	Used oil be collected and stored in the hazardous waste area and removed for re-processing by waste contractors.
	Batteries, lead-acid	Hazardous	Recycle	Must be segregated and stored in leak proof boxes and recycled by specialist contractors.
	Oily rags	Hazardous	Energy recovery	Segregated with other hazardous wastes.

21.9.3 Assessment of Operational Effects

The port operations will return to the baseline situation once works are complete and it is anticipated that due to recycling and reuse policies and procedures and the implementation of the Sustainability Strategy there will be no discernible effects to waste management once the replacement linkspan is operational. Therefore, the effect of the operational phase in relation to waste management has not been included in the impact assessment.

21.10 Mitigation

21.10.1 Construction Phase Mitigation Measures

Details of all waste types that will be produced from the Construction Phase of the Proposed Development will be documented in the Site Waste Management Plan (SWMP) that will form part of the Construction Environmental Management Plan (CEMP). An outline version of the CEMP, including an initial SWMP is provided in Appendix 2A of the ES.

All construction waste will be managed as part of the SWMP, which will be implemented by the Principal Contractor for the duration of the construction works. The SWMP will contain procedures for the management of waste and related pollution control measures and will be a live document subject to revision throughout the course of the construction works.

Specific waste management requirements will include the following:

- Strict adherence to waste regulatory requirements for the storage and handling on-site.
- No wastes shall be deposited outside the Proposed Developments red line boundary, unless it is at a facility that holds a valid environmental permit or suitable authorised exemption.
- Allocation of space on site for the storage of waste materials and ensure that storage areas and containers are clearly labelled (appropriate signage) so site workers know which wastes should be put there.
- Hazardous waste must be stored separately from non-hazardous wastes to avoid contamination.
- Segregate wastes into specific categories and provide separate containers for dry recyclables, such as paper and cardboard, plastic, glass, wood, and metal at welfare facilities within temporary works areas.
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned and all construction staff provided with training regarding the waste management procedures on commencement of the project.
- Identify proposed waste treatment and disposal methods for each of the waste streams and make a commitment to reuse and recycle specific percentages of the overall quantity generated to minimise wastes disposed of to landfill.
- Ensure that all Waste Contractors that remove waste from site have the appropriate authorisation (i.e. are registered waste carriers).
- Monitor the actual quantities of wastes produced during construction and update SWMP to allow comparison with waste arisings estimated prior to construction. Record the proposed waste management option for each waste produced.
- All wastes that are removed off-site must be described on a waste transfer note or hazardous waste consignment note (as appropriate) that tracks the movement of the waste to the specified disposal or recovery facility.

- The Principal Contractor will designate staff that are responsible for waste management and ensure that all contractor staff are aware of the appropriate reuse, recovery, or disposal routes for each waste.

The implementation of the SWMP will promote sustainable waste management practices by maximising waste prevention, re-use, recycling, and recovery opportunities for material destined for off-site waste management and will ensure all regulatory requirements are in compliance.

21.10.2 Operational Phase Mitigation Measures

No mitigation is proposed for the operational phase. The arrangements for the management of routine wastes from vessels and port activities will be detailed in the Port Waste Management Plan, which will be periodically reviewed and updated to ensure the information is up to date and all regulatory requirements for the management of vessel-generated wastes and the onshore management of these wastes are compliant.

21.11 Assessment of Residual Effects

The residual effects of the Proposed Development considering the mitigation measures are determined to be **Not Significant** for both non-hazardous and hazardous wastes. These are summarised in Table 21-9.

21.12 Cumulative Effects

The longlist of projects being considered as part of the cumulative effects assessment identifies two onshore projects within Pembrokeshire (application references NP/24/0164/OBS and NP/22/0133/OBS. These projects are a shellfish farm expansion and jetty birth maintenance project and are not expected to generate large quantities of waste that would requirement management in the vicinity of the Proposed Development.

The waste arising from the Proposed Development will be required to fully comply with the current legislation and there is sufficient capacity in the regional licenced waste facilities to conclude that the cumulative effect of Proposed Development and other projects on waste management are considered to be Negligible.

21.13 Limitations of the Assessment

There are no known limitations to the assessment presented in this chapter of the ES. Pre-demolition surveys will improve estimates of waste arisings from these works and the development of a detailed SWMP covering all wastes expected to be generated from the Proposed Development activities will allow all wastes to be managed in the most sustainable way and minimise wastes being disposed of to landfill.

21.14 Summary of Effects and Conclusion

By implementing the mitigation measures and by managing wastes in accordance with the waste hierarchy as required, wastes generated during the construction phase of the works associated with the upgrade of the linkspan will have no adverse effect on waste management in the area.

It is concluded that the replacement linkspan, which includes development and implementation of a detailed SWMP will have a neutral or slight effect on the environment in relation to waste management.

The residual effects of the Proposed Development considering the mitigation measures are determined to be **Not Significant** and are presented in Table 21-9.

Table 21-9 Residual Effects of the Proposed Development on Waste Management

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Reduction in inert or non-hazardous landfill capacity	✓	×	Manage waste in line with the waste hierarchy, maximising reuse and recycling to minimise landfill disposal	C: Negligible	C: Low	C: Neutral or slight	None	Not significant	Implementation of the final SWMP
Reduction of hazardous landfill capacity	✓	×	None	C: Negligible	C: Low	C: Neutral or slight	None	Not significant	Implementation of the final SWMP

21.15 References

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21.16 List of Abbreviations / Acronyms

CEMP Construction Environmental Management Plan

IEMA Institute of Environmental Management and Assessment

MMO Marine Management Organisation

MRF Material Recycling Facility

NRW Natural Resources Wales

SWMP Site Waste Management Plan

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 22 Climate Change

22 Climate Change

22.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as "the Proposed Development") on climate and the vulnerability of the Proposed Development to climatic factors. This chapter considers the potential impacts to climate from the Project during the construction and operational phases of the Proposed Development.

Directive 2011/92/EU included climate as a criteria for assessment in EIA both in terms of the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change (e.g. such as through flood risk or the risk of major accidents and/or disasters caused by climate change).

Climate relates to emissions of greenhouse gases (GHGs). Climate change will continue to cause impacts on the environment. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change.

As all GHG emissions are contributing to a global accumulation, the global climate is the ultimate receptor and the impacts of climate change will impact all aspects of the Environmental Impact Assessment (EIA) directive. Although GHG emissions to the atmosphere are localised, the impacts are transboundary, meaning no matter where the emissions are released, the social, economic and environmental impacts will be felt on a global scale. Potential effects to climate may arise during the construction phase, such as from emissions from traffic and NRMM[1]. Each of these potential sources has been identified and emissions have been evaluated using standard procedures.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing climate trends to assess current environmental baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on climate; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

Other aspects relevant to climate are addressed in the specific chapters of the ES, namely:

- Chapter 12: Flood Risk
- Chapter 19: Traffic and Transport

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

[1] Non-road mobile machinery is defined as any mobile machine, transportable equipment or vehicle that is not intended for carrying passengers or goods on the road. In this context it refers to machinery used for demolition and construction activities. Examples include, but are not limited to, excavators, telehandlers, cranes, piling rigs and power generators.

22.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on climate. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 22.8);
- Identifies any limitations encountered in compiling the environmental information (section 22.13);
- Presents an assessment of the potential likely significant effects on climate arising from the Proposed Development (section 22.7.3.2) based on the information gathered and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 22.12; and
- Highlights any necessary monitoring (section 22.10.3) and/or measures (see section 22.10.1 and section 22.10.2) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 22.9).

22.3 Study Area

In regard to Climate Change, the national environment (Wales) is included, where the receptor is the climate and the global atmosphere. Effects arising from the potential impacts on climate are considered to impact on a national level. National, regional and local data has been considered where relevant and available. Carbon dioxide (CO_2) emissions have a global climate warming effect. This is regardless of their rate of release, location, or the weather when released into the atmosphere. This is unlike pollutants that affect local air quality where the rate of release, location, and prevailing weather, as well as the amount of pollutant, determines the local concentrations and the impact.

Climate change impacts, such as extreme weather events, have a more localised impact, directly affecting specific local receptors. The Climate Change Study Area is thus concentrated on the Proposed Development and the associated 25km grid square from the UKCP18 database, as shown in Figure 22.1.

The Climate Change Study Area is therefore defined in terms of an assessment boundary for GHG assessment, which is the Project site and a geographical boundary for climate resilience (25km UK CP18 grid square). It is acknowledged that GHG emissions have a global impact and effect, and as such, this is reflected in the definition of sensitivity. In addition to the CCRA Study Area, in terms of baseline gathering, there will be two defined vicinities reported on throughout this assessment, one for the Local Authority area and then expanding to the whole country, including the national targets and sectoral emission ceilings as appropriate.

With regards to cumulative effects assessment (CEA), all developments that emit, avoid or sequester GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change and upon the Project. Consequently, cumulative effects due to other specific local development projects are not individually considered but are taken into account when considering the impact of the Project and the high sensitivity of the global receptor. As such, no specific study area beyond that of the Site Boundary is relevant for the CEA for climate change.

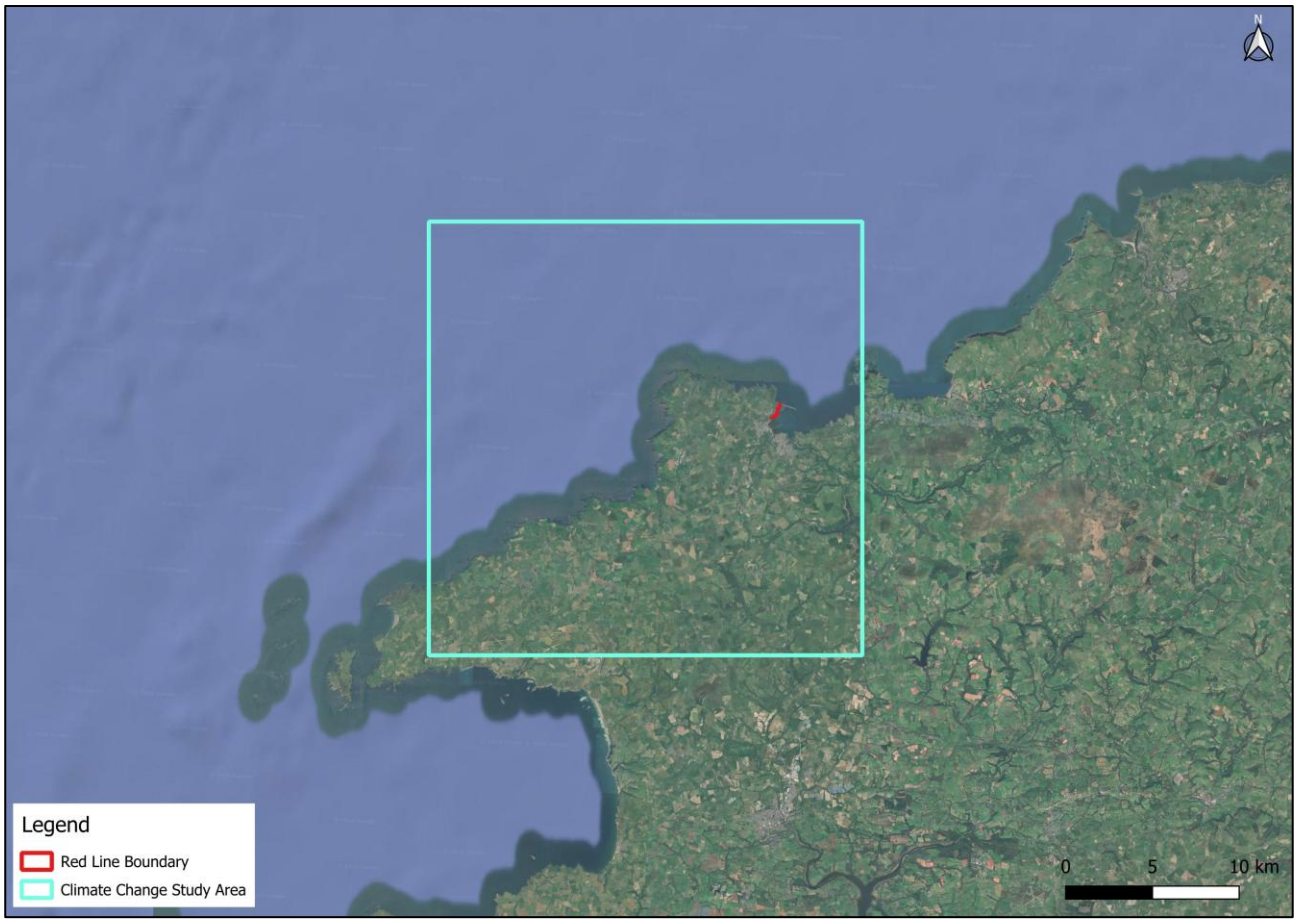

Figure 22.1: Climate Change Study Area

22.4 Policy Context

22.4.1 National legislation and policy

The applicable legislative framework for both GHG and Climate vulnerability is summarised in the following subsections.

22.4.1.1.1 United Nations Framework Convention on Climate Change

The UK is a member of the United Nations Framework Convention on Climate Change (UNFCCC) which drives international action on climate change. The UK has pledged to reduce emissions under the Paris Agreement, as a part of a joint pledge by members of the European Union (EU). This provides an overarching commitment by the UK.

Commitments include:

- Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
- take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases; and
- reach global peaking of greenhouse gas emissions as soon as possible.

Under Article 7 of the Paris Agreement, the UK has agreed to *"hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to*

climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2". Section 9 of Article 7 also states that "*each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions…".*

More recently (2018) the Intergovernmental Panel on Climate Change (IPCC) has released a special report which compared the likely climate impacts between a 1.5 degree and 2 degree warming scenario, and found that "*Climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C".*

22.4.1.1.2 The Climate Change Act 2008 (2050 Target Amendment)

As required by the UK Climate Change Act 2008, the Welsh government developed a Climate Change Adaptation Programme which focuses on key priority areas identified as requiring urgent adaptation over the next five years.

The 2019 amendment to the Climate Change Act 2008 established a legal requirement for reaching net zero GHG emissions in the UK economy by 2050, which is reflected in the UK Net Zero Strategy. The 2008 Act also created the Committee on Climate Change, with a responsibility for:

- Setting five-year carbon budgets;
- Advising and scrutinising the UK Government's associated climate change adaptation programmes; and
- Producing a national adaptation plan for the UK Government to implement.

22.4.1.1.3 Glasgow Climate Pact (2021)

The UK attended COP26 in 2021, from which one of the outcomes was the Glasgow Climate Pact (2021), the pact highlighted the impacts of human activities on the climate, and "stresses the urgency of enhancing ambition and action in relation to mitigation, adaptation and finance in this critical decade". The report also states that to keep global warming within 1.5 °C above pre-industrial levels there will need to be "rapid, deep and sustained reductions in global greenhouse gas emissions", including a phasedown of coal use.

22.4.1.1.4 The Environment (Wales) Act 2016 (Amendment of 2050 Emissions Target) Regulations 2021

The Environment (Wales) Act sets out the approach for the sustainable management of natural resources in Wales, which will help to mitigate for and adapt to the impacts of climate change. This includes strengthening the health of our natural resources to reduce the impacts of climate change on them, considering the services that natural resources provide and identifying opportunities to provide green growth. This new approach also enables resilience of ecosystems to be considered as part of the decision-making process for activities from the outset.

The purpose of Part 2 of the Environment (Wales) Act 2016 ("the Act") is to require the Welsh Ministers to meet targets for reducing emissions of greenhouse gases from Wales. Section 29 requires that the Welsh Ministers ensure that the net Welsh emissions account for the year 2050 is at a specified percentage lower than the baseline. These Regulations amend section 29 of the Act by altering the percentage amount in subsection (1). Section 29(1) imposes a duty on the Welsh Ministers as to the level of the "net Welsh emissions account" (the amount of Welsh emissions of greenhouse gases for a period adjusted by the amount of Welsh removals of those gases for that period) for the year 2050. The duty is to ensure that the net Welsh emissions account is lower than the "the baseline" (the baseline of net Welsh emissions of greenhouse gases against which the percentage amount in section 29(1) is applied) by a minimum percentage amount.

The amendment in these Regulations has the effect that the minimum percentage by which the net Welsh emissions account for the year 2050 must be lower than the baseline is increased from 80% to 100%.

22.4.1.1.5 The Climate Change (Interim Emissions Targets) (Wales) (Amendment) Regulations 2021

These Regulations make amendments to the Climate Change (Interim Emissions Targets) (Wales) Regulations 2018, which set the interim emissions targets under Part 2 of the Environment (Wales) Act 2016 ("the Act"). The purpose of Part 2 of the Act is to require the Welsh Ministers to meet targets for reducing emissions of greenhouse gases from Wales. Section 29 requires that the Welsh Ministers ensure that the net Welsh emissions account for the year 2050 is at least 100% lower than the baseline. Section 30 of the Act requires that the Welsh Ministers make regulations to set interim emissions targets for the years 2020, 2030 and 2040. These targets are expressed as a percentage below the baseline. Regulation 2 amends the Climate Change (Interim Emissions Targets) (Wales) Regulations 2018. The 2030 and 2040 targets are increased from "45%" to "63%" and "67%" to "89%", respectively, lower than the baseline. In accordance with section 32(1)(a) of the Act, the Welsh Ministers have satisfied themselves that the interim emissions targets are consistent with meeting the 2050 emissions target.

22.4.1.1.6 The Climate Change (Carbon Budget) (Wales) Regulations 2025

In March 2021, Senedd Cymru approved a net zero target for 2050. Net zero means balancing the greenhouse gas emissions with the number of gases we're removing from the atmosphere. Wales also has interim targets for 2030 and 2040, and a series of 5-year carbon budgets. The first carbon budget ran from 2016 to 2020. Wales have to set a carbon budget at least five years before the budgetary period begins. The targets and carbon budgets form Wales's statutory framework. They include Wales's share of emissions from international aviation and international shipping. For each carbon budget, they have to set a limit on how many international offsets Wales can use. A zero% (0%) limit means we must achieve the carbon budget by action taken in Wales.

The Climate Change (Carbon Budget) (Wales) Regulations 2025, coming into force on 5th December 2025, formally set the fourth carbon budget (2031–2035) for Wales, requiring an average 73% reduction in greenhouse gas emissions compared to the baseline. These regulations are essential for maintaining Wales' trajectory toward its 2050 net-zero goal.

A summary of the targets and carbon budgets approved by Senedd Cymru is detailed below in Table 22.1. For each carbon budget, Senedd Cymru have to set a limit on how many carbon credits (international offsets) Wales can use. A 0% limit means they must achieve the carbon budget by action taken in Wales.

Table 22.1: Targets and Carbon Budgets

Budget/target	Amount
Carbon budget 2 (2021-2025)	Average 37% reduction
Carbon budget 2 offset limit	0%
Carbon budget 3 (2026-2030)	Average 58% reduction
Carbon budget 3 carbon credit limit	0%
2030 target	63% reduction
Carbon budget 4 (2031-35)	Average 73% reduction
2040 target	89% reduction
2050 target	At least 100% reduction (net zero)

22.4.1.1.7 The Well-being of Future Generations (Wales) Act 2015 (Public Bodies) (Amendment) Regulations 2024

The Well-being of Future Generations Act requires public bodies in Wales to think about the long-term impact of their decisions, to work better with people, communities and each other, and to prevent persistent problems such as poverty, health inequalities and climate change.

The Act sets to provide understanding for the challenges that the world will be facing and have a clear picture of where we are heading. To do this, within the twelve months after a Senedd election, Ministers must publish a 'Future Trends Report' containing:

- Predictions of likely future trends in social, economic, environmental and cultural well-being of Wales; and
- Any related analytical data and information that the Welsh Ministers consider appropriate.

In preparing the report, Ministers must take account of the United Nations' sustainable development goals and the impact of climate change on Wales.

These Regulations add eight additional persons ("the additional public bodies") to the list of public bodies in section 6 of the Act: Welsh Ambulance Services University NHS Trust; Digital Health and Care Wales; Health Education and Improvement Wales; Social Care Wales; Welsh Revenue Authority; Transport for Wales (company number 09476013); Centre for Digital Public Services Limited (company number 09341679) and Qualifications Wales. This means that the additional public bodies will be liable to comply with Parts 2 and 3 of the Act.

22.4.1.1.8 The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018

The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018 establish a framework for addressing greenhouse gas emissions from international aviation and shipping in Wales. These regulations aim to ensure that emissions from these sectors are accounted for in the context of Wales' overall climate change commitments. They require the Welsh Government to report on emissions from international aviation and shipping and to take measures to mitigate their impact. The regulations align with broader UK and international efforts to reduce emissions and promote sustainable practices in the aviation and shipping industries, contributing to Wales' goals for reducing overall greenhouse gas emissions and addressing climate change.

22.4.1.1.9 Infrastructure Carbon Review

In 2013, the UK government published the Infrastructure Carbon Review, aiming to "*release the value of lower carbon solutions and to make carbon reduction part of the DNA of infrastructure in the UK*". Major infrastructure owners, operators and developers were invited to endorse, become signatories and make commitments under the review.

The review provided increased emphasis on 'capital carbon' (GHG emissions associated with raw materials, activities and transport for construction, repairs, replacement, refurbishment and de-construction of infrastructure) while acknowledging that 'operational carbon' (associated with energy consumption for the operation and use of infrastructure) will continue to dominate overall emissions to 2050 and beyond.

The Infrastructure Carbon Review highlighted the importance of assessing GHG emissions early in the lifecycle of an infrastructure scheme when there is the greatest carbon reduction potential. The assessment presented in this chapter provides an assessment of the Proposed Development early in its lifecycle.

22.4.1.1.10 Future Wales The National Plan 2040

Future Wales – the National Plan 2040 is a national development framework, setting the direction for development in Wales to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities.

The challenges of the climate emergency demand urgent action on carbon emissions and the planning system must help Wales lead the way in promoting and delivering a competitive, sustainable decarbonised society. The framework includes the following policies:

- **Policy 9 – Resilient Ecological Networks and Green Infrastructure**

  Identify areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development.

- **Policy 15 – National Forest**

  An increase in woodland cover is needed to help build the resilience of ecosystems, to secure the delivery of our climate change and decarbonisation aspirations, to provide places for recreation and well-being and to ensure that the productive potential of Welsh woodlands is maintained.

- **Policy 17 – Renewable and Low Carbon Energy and Associated Infrastructure**

  In determining planning applications for renewable and low carbon energy development, decision-makers must give significant weight to the need to meet Wales' international commitments and our target to generate 70% of consumed electricity by renewable means by 2030 in order to combat the climate emergency.

- **Policy 18 – Renewable and Low Carbon Energy Developments of National Significance**

  Proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance will be permitted subject to Policy 17.

22.4.1.1.11 Climate Adaptation Strategy for Wales

The Welsh Government published its second national climate adaptation plan in 2019, Prosperity for All: A Climate Conscious Wales. That five-year plan demonstrated commitment to tackling the climate emergency and set out the actions being taken by Welsh Government to prepare for and adapt to the risks and impacts arising from climate change. It was a step in a journey, and the new strategy was published in October 2024. The strategy has been directly informed by:

- The Climate Change Committee's third UK climate risk independent assessment (CCRA3-IA), published in June 2021.
- Our progress report on the Prosperity for All: A Climate Conscious Wales plan in December 2022.
- A specially commissioned independent assessment of progress and future priorities for climate adaptation in Wales in September 2023 from the Climate Change Committee.

The Climate Adaptation Strategy for Wales, outlines a comprehensive framework for enhancing the resilience of communities, ecosystems, and infrastructure to the impacts of climate change. The strategy emphasizes the need for proactive measures to address risks such as flooding, extreme weather events, and biodiversity loss. It promotes collaboration among government, businesses, and communities to implement adaptive practices, improve resource management, and integrate climate considerations into planning and decision-making processes. The strategy also highlights

the importance of monitoring and evaluating progress to ensure effective adaptation efforts, ultimately aiming to create a sustainable and resilient Wales in the face of ongoing climate challenges.

In 2023-24 Wales experienced the wettest winter since records began. In July 2022, a new maximum daily temperature was recorded in Wales of 37.1°C in Hawarden Airport, Flintshire. Even if we were able to reach net zero greenhouse gas emissions tomorrow, we would continue to see further global warming and changes to our climate at least until the 2050s. Winter rainfall is expected to increase by approximately 6% by the 2050s compared to the average in the period 1981-2000, while summer rainfall is expected to decrease by approximately 15% by the 2050s and by between 18% to 26% by the 2080s. Even under low to moderate global warming scenarios sea level for Cardiff is expected to rise by approximately 22-28 cm by the 2050s and by approximately 43-76 cm by the 2080s.

22.4.1.1.11.1 Climate-related risks

In summer 2021 the UK Climate Change Committee (CCC) published their latest report on Climate Risks and Impacts. This summary concluded that the climate change risks associated with Wales are:

- Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards
- Risks to soil health from increased flooding and drought
- Risks to natural carbon stores and sequestration from multiple hazards, leading to increased emissions
- Risks to crops, livestock and commercial trees from multiple climate hazards
- Risks to supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks
- Risks to people and the economy from climate related failure of the power system
- Risks to human health, well-being and productivity from increased exposure to heat in homes and other buildings
- Multiple risks to the UK from climate change impacts overseas.

22.4.1.1.11.2 Purpose and principles of this strategy

This strategy represents a new approach to considering the interrelated actions needed for addressing climate adaptation and resilience in Wales. In developing the approach to this strategy, The Welsh Government have sought to apply the following principles:

- A focus on delivery of climate adaptation outcomes
- A systems-based approach, addressing interdependencies between different sectors and stakeholders
- A wider perspective of collective action across Wales, recognising the needs and roles of different stakeholders in delivering climate adaptation
- Integration with other societal goals, such as decarbonisation, social justice and nature recovery.

Figure 22.2 illustrates the different elements of the strategy, including the action plans and the crosscutting issues they are aiming to address.

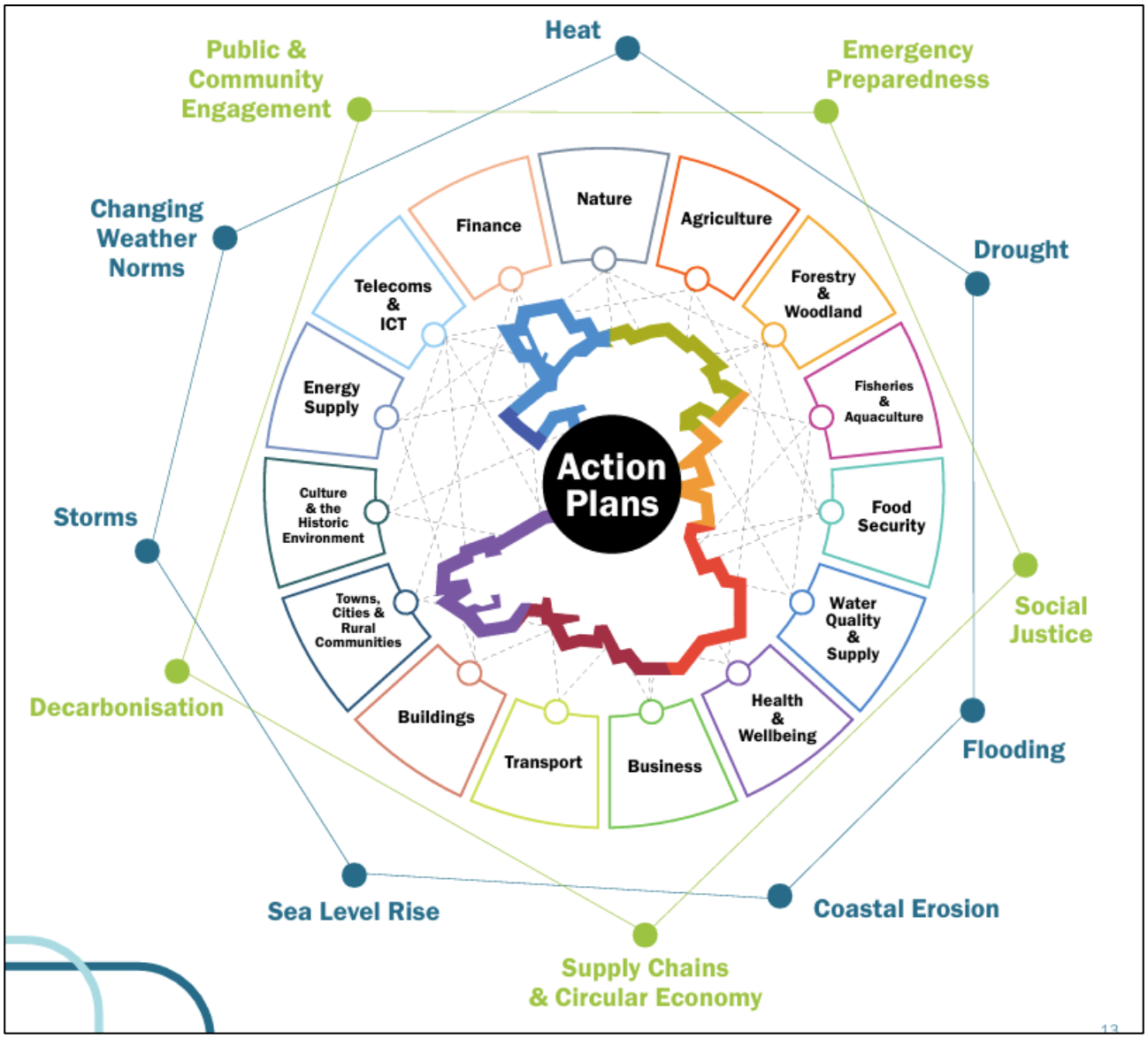

Figure 22.2: Climate Adaptation Strategy for Wales

22.4.1.1.12 Pembrokeshire County Council Local Development Plan

On the 28th February 2013, the Council adopted a Local Development Plan (LDP) for Pembrokeshire (excluding the area of the Pembrokeshire Coast National Park). Pembrokeshire County Council commenced review of its LDP on the 5th May 2017, however a new submission to the Welsh Government is not set until June 2025, with adoption scheduled for May 2026.

The Plan establishes a Vision based development strategy and policies to guide the development and use of land in Pembrokeshire from adoption. It provides the policy context for directing development to appropriate locations, conserving the natural, built and historic environment and providing a basis for rational and consistent decision-making on planning applications. The base date for the Plan's land use allocations is 2011.

Pembrokeshire is a predominantly rural county, with a strong maritime influence and has a history of development based on agriculture, tourism, defence, energy and port activities centred on the Milford Haven Waterway. The area is characterised by a series of distinct, yet interdependent settlements. The unique environment and strong sense of community is attractive to both residents and visitors and provides a distinctive sense of place. The Pembrokeshire Ports and the Haven Waterway are international assets, critical to the future energy security of the UK.

Just under half the total Pembrokeshire population of 117,100 (2010) live in the five main towns of **Fishguard**, Haverfordwest, Milford Haven, Pembroke and Pembroke Dock.

This LPL is broken down into General Policies (GN), with the following related to climate:

- **GN.2 Sustainable Design**

  It incorporates a resource efficient and climate responsive design through location, orientation, density, layout, land use, materials, water conservation and the use of sustainable drainage systems and waste management solutions; and,

- **GN.4 Resource Efficiency and Renewable and Low-carbon Energy Proposals**

  Development proposals should seek to minimise resource demand, improve resource efficiency and seek power generated from renewable resources, where appropriate. They will be expected to be well designed in terms of energy use.

22.5 Consultation

No specific comments regarding climate have been received during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project.

22.6 Methodology to inform the baseline

22.6.1 Desktop study

Information on climate within the Climate Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 22.2. These sources provide the most up to date data for this assessment.

Table 22.2 Summary of key desktop reports.

Title	Source	Year
State of Natural Resources Report 2025	Natural Resource Wales	2025
Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2023	UK National Atmospheric Emissions Inventory (NAEI)	2025
Inventory of Carbon and Energy (ICE) Database V4.0	Jones and Hammond	2024
HadUK-Grid Gridded Climate Observations on a 25km grid over the UK, v1.3.1.ceda (1836-2024)	Met Office; Hollis, D.; Carlisle, E.; Kendon, M.; Packman, S.; Doherty, A.	2025
Met Office UK Climate Averages	Met Office	1991 - 2020

22.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for climate. The baseline data presented in this section is derived from Welsh inventories, UKCP18 projections, and Met Office monitoring network, and may be taken as representative of the background conditions.

22.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology and the following climate specific guidance as follows:

- Design Manual for Roads and Bridges (DMRB) (June 2021) LA 114 – Climate;
- Formerly known as Institute of Environmental Management and Assessment (IEMA) - Institute of Sustainability and Environmental Professionals (ISEP) (2022) Guidance on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance', 2nd Edition; and,
- ISEP (2020) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation.

22.7.1.1 Design Manual for Roads and Bridges (DMRB)

DMRB guidance on climate change was published on June 2021 under the heading LA 114 – Climate. Although specifically related to highway schemes it can be referenced in this assessment with regard to emissions and also is aligned with guidance as presented in the ISEP Environmental Impact Assessment Guide to Assessing Greenhouse Gas (GHG) Emissions and Evaluating their Significance.

The LA 114 document was created to set out the requirements for assessing and reporting the effects of climate on highways (climate change resilience and adaptation), and the effect on climate of greenhouse gas from construction, operation and maintenance of road/highway[2] projects.

LA 114 advises to report on the likely additional and avoided GHG emissions at each life cycle stage of the project, in comparison with current and future baseline GHG emissions. The nature and scale of GHG emissions (positive, neutral or negative) and the likelihood of significant effects should be reported in accordance with the LA 114 guidance document.

Two main questions are posed in order to gain an understanding of the need to undertake further assessment, those are:

- are construction GHG emissions (or GHG-emitting activity), compared to the baseline scenario (i.e. when compared to GHG emissions and energy use associated with existing maintenance activities), increasing by >1%; and,
- during operation, will roads meet or exceed any of the following criteria:
  a. change of more than 10% in AADT;
  b. change of more than 10% to the number of heavy duty vehicles; and,
  c. change in daily average speed of more than 20 km/hr.

If the answer is 'yes' to either of these questions, then further assessment is recommended. In terms of the Proposed Development the answer is 'yes' to the construction GHG emissions increases but 'no' to the operational criteria. Therefore, the operational phase DMRB road assessment can be screened out as impacts are not deemed to be significant – although the approach to assessment is still set out and confirmation of screening out the operational phase assessment is detailed as required in this assessment.

The key anticipated GHG emissions sources during construction of the Proposed Development are presented in Table 22.3.

[2] Although specific to road schemes, the criteria for assessment is a useful gauge in determining whether an assessment is required for construction and operational phases of Proposed Developments.

Table 22.3: Anticipated GHG Emission Sources – Construction (DMRB)

Lifecycle stage	Activity	Primary emission sources
Product Stage	Raw material extraction and manufacturing of products/ materials Transport of products/ materials to site	Embodied GHG emissions Emissions from fuel used for the transportation of products/materials to site
Construction Process Stage	On-site construction activity Transport of construction workers Disposal of construction waste	GHG emissions from fuel consumption by vehicles, plant and equipment for construction of the Proposed Development Emissions from fuel used for worker commuting GHG emissions from fuel used for the transport and disposal of waste

22.7.1.1.1 Key Anticipated GHG Emission Sources – Operation

The key anticipated GHG emissions sources during the operational, maintenance and use phases of the Proposed Development are presented in Table 22.4.

Table 22.4: Key Anticipated GHG Emission Sources – Operation (DMRB)

Lifecycle stage	Activity	Primary emission sources
Operational stage	Vehicle journeys	GHG emissions from fuel consumption by vehicles

The operational phase does not meet criteria regarding emissions from vehicles and may be screened out.

22.7.1.2 Institute of Sustainability and Environmental Professionals (ISEP) - Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance

Formerly known as IEMA – ISEP published this guidance in 2022 to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation. The guidance indicates that a 'good practice' approach is advocated where GHG emissions are always considered and reported but at varying degrees of detail depending on the project.

The guidance sets out there are a number of different assessment methods available for measuring and quantifying the GHG emissions associated with the built environment, ranging from general guidance to form standards. The Guidance recognising that:

'Qualitative assessments are acceptable, for example: where data is unavailable or where mitigation measures are agreed early on in the design phase with design and engineering teams.'

The assessment in this chapter presents a qualitative assessments and discussion in terms of GHG emissions.

22.7.1.3 Institute of Sustainability and Environmental Professionals (ISEP) - Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation, June 2020

The Guide to Climate Change Resilience and Adaptation (June 2020) provides an updated framework for the effective consideration of climate change resilience and adaption in the assessment process). This document is a revision of the 2015 ISEP guidance on Climate Change Resilience and Adaption in assessment and reflects lessons learnt from emerging practice.

A step-by-step method presented within this guidance is set out below and has been given due cognizant within this chapter:

- **Step 0** – Building climate resilience into the project by considering incorporating resilience during the designs stage and by identifying appropriate mitigation measures (Please refer to Chapter 2 Proposed Description and Section 22.10.1.1);
- **Step 1** – Scoping for the Project; e.g. identify the climate change projections for use in the assessment and identify key climatic variables relevant to the project (Section 22.8);
- **Step 2** – Defining the future (climate) baseline; define future conditions using selected climate change projections (i.e. increase in rainfall, increase in mean summer temperature and wind strength) (Section 22.8.2);
- **Step 3** – Identifying and determining sensitivity of receptors (Section 22.9);
- **Step 4** – Reviewing and determining magnitude of the effect; consider probability and consequence to determine the magnitude of the effect (Section 22.9);
- **Step 5** – Determination of significance (Section 22.9);
- **Step 6** – Developing additional adaptation / mitigation measures (Section 22.10);
- **Step 7** (Development permitted) – Monitoring and adaptive management by implementing mitigation measures (Section 22.10.3).

Climate assessments produced in line with this guidance are to be proportionate in their approach and not include superfluous assessment that does not address likely material issues.

In lieu of a prescribed methodology, ISEP guidance on Climate Change Resilience and Adaptation (2020) has been prepared to assist practitioners with the effective consideration *"of both climate change resilience and adaptation in the assessment process"*.

The guidance stresses that climate change should be an integrated consideration within the assessment, by undertaking an assessment that is *"proportional to the evidence base available to support any assessment"* and focusses on impacts *"specific to project".*

22.7.2 Impact assessment criteria

22.7.2.1 Assessment of GHG Emissions

The significance of GHG impacts has been assessed in line with the DMRB LA114 with consideration as to how the GHG emissions arising from the Proposed Development contribute towards the respective Welsh carbon budgets, which have been set by the Welsh Government covering 2021 - 2050.

In March 2021, the Senedd passed a suite of regulations to increase Wales's decadal emissions targets from those set in 2018 and to set Carbon Budgets 2 and 3 in line with them. The targets and budgets set in law followed the CCC's recommendations:

- Carbon budget 2 (2021-2025) **Average 37% reduction**
- Carbon budget 2 carbon credit limit **0%**

- Carbon budget 3 (2026-2030) **Average 58% reduction**
- Carbon budget 3 carbon credit limit **0%**
- 2030 target **63% reduction**
- Carbon budget 4 (2031-35) **Average 73% reduction**
- 2040 target **89% reduction**
- 2050 target **At least 100% reduction (net zero)**

The budgets are expressed in percentages. As such the magnitude of emissions, in conjunction with guidance from ISEP's Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance and knowledge of similar developments have been used to inform the professional judgement of significance.

The main emissions sources of the Proposed Development that have been considered are:

- As with the majority of large engineering projects potential emissions to air are inevitable during the construction phase, arising from construction activities, transport of materials and the use of plant and equipment.
- other inputs, primarily electricity and heat load; and,
- The decommissioning of the Proposed Development. The decommissioning phase is not considered due to the long design life of the assets and given that emissions with the end of the life of this type of asset are relatively small and therefore unlikely to be significant.

22.7.2.2 Assessment of Climate Risks

HadUK-Grid is a suite of gridded climate variables derived from the UK land-surface observation network. Observations from meteorological stations have been interpolated onto a regular grid to produce complete, consistent coverage across the UK. A 25km resolution product is provided (derived from an underlying 1km x 1km dataset) to permit direct comparison with UKCP18 climate projections. The dataset covers multiple timescales (daily, monthly, seasonal and annual) and long-term averages for standard climatological reference periods. Available variables include maximum, minimum and mean air temperature; precipitation; sunshine duration; mean sea-level pressure; wind speed; relative humidity and vapour pressure; days of lying snow; and days of ground frost. The temporal extent of the dataset spans 1836 to 2024, with the start date dependent on the variable and the temporal resolution.

For this assessment, the HadUK-Grid product was used to derive baseline time-series and climatologies for the study area (including local temperature and precipitation statistics and observed sea-level trend context from nearby tide gauges reported in UKCP18). The observational baseline was compared with UKCP18 projections to produce bias-adjusted, site-relevant climate inputs for future hazard modelling and scenario testing.

22.7.2.3 Sensitive Receptors

Following identification of the future climate scenarios, the project receptors within the study area which are vulnerable to climate change may be identified as below:

- the construction process (e.g. workforce, plant, machinery etc);
- the assets and their operation, maintenance and refurbishment (e.g. structures, plant & equipment, etc); and,
- end-users (e.g. members of public, commercial operators etc).

22.7.3 Significance of Effects

22.7.3.1 General Approach

'Climate' is generally understood to mean the weather conditions prevailing over a long period of time and climate change refers to changes in recorded long term climate trends. Guidance is evolving and there is no prescribed way in which climate change should be incorporated into a project, however, some guidance has been prepared by ISEP, discussed further below, which sets out the two main approaches that can be taken to determine a project's climate change impact.

These involve identifying:

- The vulnerability of the development to climate change; and,
- The direct and indirect influence on the development on climate change.

The vulnerability of the development to climate change considers effects on the development as a receptor (this is referred to in ISEP Guidance as Climate Change Resilience and Adaptation). A high-level climate change risk and resilience assessment has been undertaken to identify the potential risks of climate change on the development and to high design measures to increase its resilience and adaptation to climate hazards, such as extreme hot and cold weather, intense rainfall, high winds and storm events.

Direct and indirect effects consider effects on environmental receptors as a result of the Proposed Development. Direct and indirect emissions can be defined as follows:

- Direct GHG emissions are emissions from sources that are owned or controlled by the operator. Examples include vehicular emissions, plant use (such as generators) and independent onsite energy generation (oil, gas and diesel);
- Indirect GHG emissions are emissions that are a consequence of the construction of operational activities of the development but are a result of procurement and / or activities controlled by another entity. Examples include energy generation and the manufacture of materials (known as 'embodied' carbon).

22.7.3.2 Significance of Effect

In the absence of any significance criteria or a defined threshold, it might be considered that all carbon emissions are significant and beneficial effects only arise if there is a net loss in carbon and emissions. As per the ISEP Guidelines, when evaluating significance, all new GHG emissions contribute to a significant negative environmental effect.

The significance of a project's emissions should be based on its net impact, which may be positive or negative, an assessment should ensure an assessment addresses the occurrence of GHGs by taking mitigating action. Whilst there is no single preferred method to evaluate significance of effects given this topic is emerging, the approach to determining the significance of effects has applied available guidance, standard industry practice and profession judgement.

There is currently no industry–wide agreed threshold of carbon emissions which, if exceeded, can be defined as significant or potentially significant. The 2022 ISEP Guidance acknowledges that all emissions could lead to cumulatively significant effects. The ISEP Guidance (2022) notes that the cumulative impact of carbon emissions arising from global human activity is considered major however, the contribution from individual developments, such as the Proposed Development in this project, could be considered negligible / low in the context of the UK's emissions since, in isolation, the quantity of carbon emissions from an individual development is likely to have limited potential to significantly increase atmospheric carbon emissions towards global environmental targets.

22.7.3.3 Climate Change Resilience

The identification and assessment of climate change resilience is an area of emerging practice. There is no single prescribed format for undertaking such assessments; therefore, the approach adopted to undertaking and reporting the assessment has drawn on good practice from other similar developments and studies.

The types of receptors considered vulnerable to climate change are:

- construction phase receptors (i.e. workforce, plant and machinery);
- the development's assets and their operation, maintenance and refurbishment (i.e. hardstand, structures, earthworks and drainage, etc.); and,
- end-users (i.e. members of public and commercial operators etc.).

Table 22.5 shows typical climate change impacts affecting a development. Relative humidity and solar radiation for this assessment will be considered under temperature.

Table 22.5: Climate Variables and Potential Impacts

Climate Variable	Potential Impacts
Change in average (air) temperature (annual, seasonal, monthly). Relative humidity Solar radiation	Prolonged warm periods, drought, change in growing season, soil moisture deficit, erosion, storm surge/tide Reduction in ice and snow Fog Increased UV radiation, deterioration, fading, brittleness
Extreme (air) temperature (frequency and magnitude)	Heatwaves, water availability / drought, fire risk
Change in average precipitation (annual, seasonal, monthly)	Water availability / drought, flooding (pluvial and fluvial), soil moisture deficit, erosion, snow, ice and hail
Extreme rainfall (frequency and magnitude)	Flooding (fluvial and pluvial), subsidence and reduced ground stability, erosion.
Sea level rise	Influence on tidal waters
Average wind speed change (annual, seasonal, monthly)	Increased wind loading resulting in damage, erosion
Gales and extreme winds (frequency and magnitude)	Storms, lightning strike

Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 22.6.

Table 22.6: Measure of Likelihood for Climate Change Resilience Assessment (Source: DMRB)

Likelihood Category	Description (probability and frequency of occurrence)
Very High	The event occurs multiple times during the lifetime of the project e.g. approximately annually, typically 60 events.

Likelihood Category	Description (probability and frequency of occurrence)
High	The event occurs several times during the lifetime of the project e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project.
Very low	The event may occur once during the lifetime of the project.

** The event is defined as the climate event (such as heatwave) and the hazard (such as overheated electrical equipment) occurring in combination.*

The consequence of an impact has been measured using the criteria detailed in Table 22.7 Measure of Consequence for Climate Change Resilience Assessment.

Table 22.7: Measure of Consequence for Climate Change Resilience Assessment (Source: DMRB)

Consequence of Impact	Description
Very Large Adverse	National level disruption lasting more than 1 week.
Large Adverse	National level disruption lasting more than one day but less than 1 week.
Moderate Adverse	Regional level disruption lasting more than one day but less than 1 week.
Minor Adverse	National level disruption lasting less than 1 day.
Negligible	Isolated disruption lasting less than 1 day.

The identification of likely significant effects on receptors has been undertaken using professional judgement by combining the measure of likelihood with the predicted consequence of impact, as shown in Table 22.8 'Significance Criteria for Climate Change Resilience Assessment.'

Table 22.8: Significance Criteria for Climate Change Resilience Assessment

Consequence of Impact	Measure of Likelihood				
	Very Low	Low	Medium	High	Very High
Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Minor	Not Significant	Not Significant	Not Significant	Significant	Significant
Moderate	Not Significant	Not Significant	Significant	Significant	Significant
Large	Not Significant	Significant	Significant	Significant	Significant
Very Large	Not Significant	Significant	Significant	Significant	Significant

The assessment of potential impacts and the Proposed Developments vulnerability takes into account the mitigation measures that have been designed into the Proposed Development, as discussed in the Mitigation section of this chapter.

The assessment also identifies and accounts for existing climate change resilience measures either already in place or in development for infrastructure and assets, for example, mitigation measures for potential flooding impacts on the Proposed Development.

22.8 Baseline Environment

22.8.1 Greenhouse Gases Existing Baseline

In the baseline (Do Minimum) scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. The GHG assessment will only consider instances in which the Proposed Development results in additional or avoided emissions in comparison to the baseline scenario and its assumed evolution. The baseline conditions therefore focus on those emissions sources subject to change between the baseline scenario and the Proposed Development.

22.8.1.1 Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2023

National Atmospheric Emissions Inventory published the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2023[3] on the 10th June 2025. This document presents an overview of the data, methods, and results of the analysis to derive greenhouse gas (GHG) emission inventories for England and the Devolved Administrations (DAs): Scotland, Wales, and Northern Ireland. The Welsh Government is committed to working with the UK Government, the other devolved administrations, the statutory, voluntary sector and business partners in Wales, and the community to tackle the threat of climate change. The Welsh Government Climate Change Strategy for Wales builds upon the targets and approach outlined in previous documents. It contains a number of specific proposals to enable Wales and the UK to meet targets set out by the Kyoto Protocol and Climate Change Act 2008. These proposals focus on helping people to make climate-friendly choices, leading by example by building climate change into Welsh Government decisions, and improving energy efficiency in the following areas:

- Transport
- Business
- Residential
- Waste
- Public
- Agriculture and land management

The overall aim of the strategy is to reduce the direct emissions of all greenhouse gases by 3% each year (including electricity consumption but excluding emissions from heavy industry and energy generation). However, many of the actions identified by the Climate Change Commission for Wales and laid out in the strategy documents will have wider benefits for Welsh communities. The creation of a low carbon economy will present business opportunities and create jobs across the country, and there are clear health and monetary savings to be made by individuals and organisations changing their behaviour.

22.8.1.1.1 Key Sources, Sinks And Trends

In 2023, Wales's GHG emissions are estimated to be 33.7 $MtCO_2e$ which represents an 8.8% share of total net UK GHG emissions in 2023. Wales has seen a decrease of 38% in GHG emissions between the Base Year and 2023. Emissions between 2022 and 2023 have decreased by 6%, as shown in Figure 22.3.

[3] https://naei.energysecurity.gov.uk/reports?title=&field_categories_target_id=13

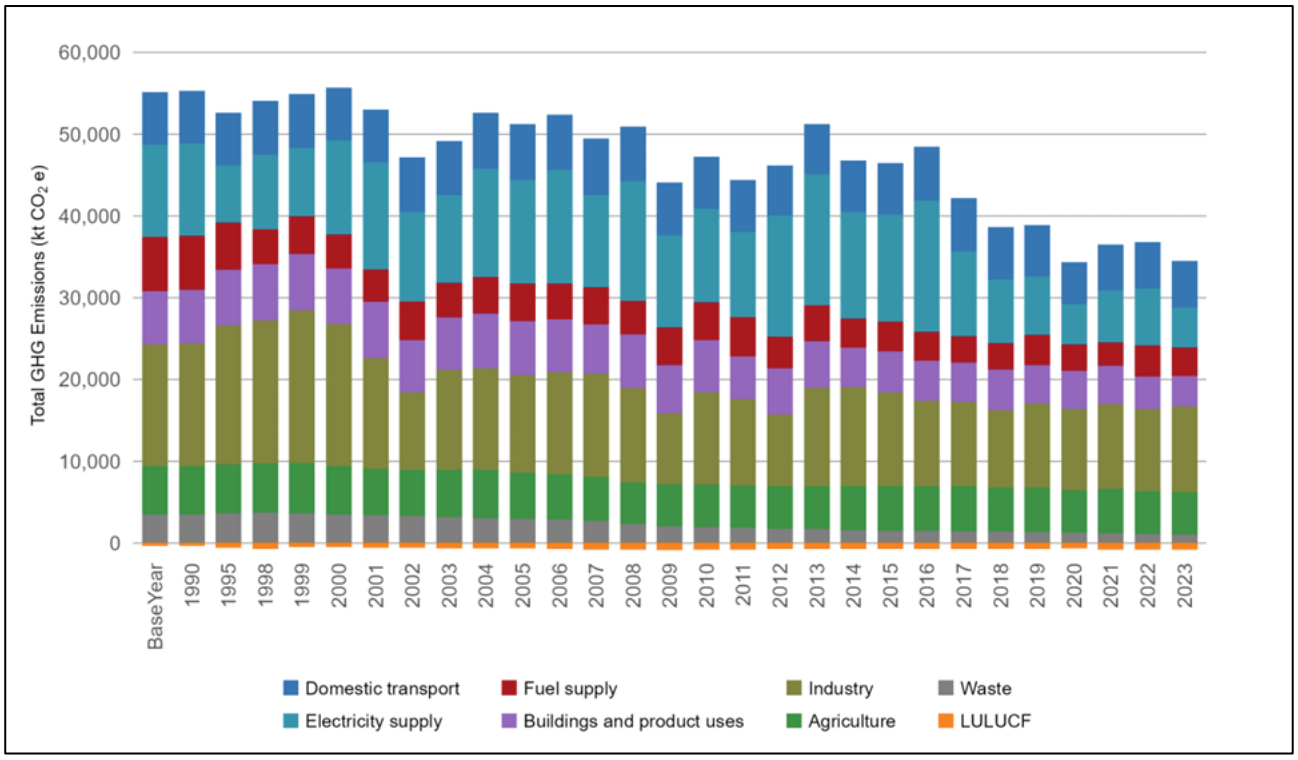

Figure 22.3: Wales GHG Emissions 1990-2023 ($ktCO_2e$)

Total greenhouse gas emissions for Wales fell by 38% from the baseline year to 2023 when international aviation and shipping are included. The decline is principally attributable to improved efficiency in electricity generation and in business heating (for buildings and processes), substitution of coal and other fuels with natural gas, emissions abatement in parts of the chemical sector, reduced emissions from anaerobic waste management, and fluctuations in manufacturing output (for example in iron and steel and bulk chemicals). As international aviation and shipping are counted within Wales's targets, all figures in the following section include the following sectors:

Industry (31% of 2023 inventory)

- Industry emissions have decreased by 30% between the base year and 2023, primarily owing to a large reduction in industrial fuel combustion between 1999 and 2002. Industrial fuel combustion accounts for 15% to the total emissions reduction in Wales since the base year and 84% of emissions from Industry in 2023. Between 2022 and 2023, emissions from industrial fuel combustion increased by 8%. Between the base year and 2023, emissions from industrial fuel combustion have decreased 26%. This is due to plant closures, fuel-switching to less carbon-intensive alternatives and improvements in efficiency of production.
- Emissions from iron and steel production account for 72% of the total industry emissions in 2023. Emissions have reduced by 10% in this category between the base year and 2023 and have increased 15% since 2022.

Domestic Transport (17% of 2023 inventory)

- Road transport emissions have decreased by 8% between the base year and 2023. Road transport emissions have not yet returned to pre COVID-19 levels following the significant increase in activity between 2020 and 2022, although there has been a decrease in emissions of 2% between 2022 and 2023. This sector includes emissions from passenger cars, Light- Duty Vehicles (LDVs), HGVs and buses, motorcycles and other road transport under CRT Category 1A3b.

Electricity Supply (15% of 2023 inventory)

- Power station emissions have decreased by 56% between the base year and 2023, following a number of closures and a switch in the fuel mix from coal to gas and renewables. Notably, since 2016 there has been a decrease in emissions from coal-fired power stations, with no emissions since 2020 following the closure of Aberthaw coal-fired power station. The reduction in emissions from coal-fired power stations contributes to around 58% of the reduction in emissions from electricity supply since 2016. Between 2022 and 2023, emissions from power stations sharply decreased by 29% which is likely due to reduced fossil fuel generation and a slight increase in renewable electricity generation in Wales with an overall decrease in electricity generation. in contrast to the previous two years which saw some increase in emissions between 2020 and 2022, owing to increased activity in recovery from the COVID-19 pandemic.

Agriculture (15% of 2023 inventory)

- Emissions in the agriculture sector have decreased by 13% between the base year and 2023, mainly a result of a general decline in livestock numbers and nitrogen fertiliser use.
- Emissions in the agriculture sector have decreased by 2% between 2022 and 2023. This is driven by a large decrease in emissions from livestock due to a 7% decrease is sheep and numbers between 2022 and 2023. However, this decrease is partly offset by increasing emissions from agricultural combustion and agricultural soils (due to an increase in fertiliser application) between 2022 and 2023.
- Despite this, livestock remain an important factor in agriculture emissions in Wales, with the largest source of emissions coming from enteric fermentation and the management of manure from livestock (collectively 79% of agricultural emissions for Wales in 2023).

Buildings and Product Uses (11% of 2023 inventory)

- The buildings and product uses sector is dominated by residential buildings (representing 8% of all emissions in the 2023 inventory). Between the base year and 2023, emissions have decreased by 47% in residential buildings driven by the trend in domestic combustion because of a change to the fuel mix from coal to natural gas, and energy efficiency measures. The residential sector accounts for 11% of the total reduction in emissions in Wales between the base year and 2023. Reductions in the residential sector were likely driven by higher energy prices resulting in reduced energy consumption.

Fuel Supply (10% of 2023 inventory)

- Refineries account for 68% of total fuel supply emissions in 2023. The closure of crude oil and specialist refineries between the base year and 2023 has contributed to a 34% reduction in emissions from refineries. An emissions increase of 51% from 2021 to 2022 is observed due to an increase in refinery combustion in Wales in 2022, however in 2023 this value reduced again by 2%.
- The closure of many deep coal mines has also played a significant role in reducing emissions from the base year (there was an 86% reduction in coal mining and handling emissions between 1990 and 2018). While the expansion of activities in the Aberpergwm Colliery in 2019 led to a large increase in emissions between 2018 and 2020, emissions from coal mining and handling decreased between 2020 and 2023 by 27%.

Waste (3% of 2023 inventory)

- Emissions from the Waste sector have shown a significant decline of 69% between the base year and 2023. Within this, landfill emissions have declined by 75% over the same period. Landfills have contributed 12% to the total emissions reduction in Wales between the base year and 2023. These reductions are largely due to the progressive introduction of methane capture and oxidation systems within landfill management.

LULUCF (a sink equivalent to 2% of 2023 inventory)

- Wales has been a net sink across the entire timeseries. The main influences on the emissions trends are emissions from cropland and settlements and removals from forest land. The decrease in emissions from cropland, peatland and settlements between the base year and 2023 and increased removals from forest land drive an overall increase in removals across the timeseries.

International Aviation & Shipping (0.2% & 0.9% of 2023 inventory respectively)

- GHG emissions from Wales have increased by 15% in international aviation and decreased by 44% in international shipping between the base year and 2023, but both are a minor component of total emissions in 2023. Emissions from shipping are greater than aviation in Wales and are driven by international heavy fuel oil freight transport resulting in a steady decline in emissions since 2011 due to reduced fuel use. Major declines in aviation emissions between 2019 and 2022 are primarily due to significantly reduced aviation activity as a result of the COVID-19 pandemic, although there has been a steady trend tending towards prepandemic levels with 2023 emissions amounting to 428% increase compared to 2021 emissions. Aviation emissions had been increasing sharply pre-pandemic; from 2015 to 2019 emissions increased by 72%.

22.8.1.1.2 Recent Trends

Emissions in Wales fell by 6% between 2022 and 2023. This continues a larger downward trend, with total emissions declining by 11% between 2018 and 2023. A major influence on the 2022–2023 change was variable activity at power stations. Power-station emissions fell by 29% in that period, following a 42% rise between 2020 and 2022. Domestic transport emissions rose after travel restrictions were lifted in 2020, but nevertheless showed an overall 2% reduction between 2022 and 2023. Emissions from residential buildings declined by 6% between 2022 and 2023, extending the reduction observed since 2021.

22.8.2 Climate Vulnerability and Resilience Existing Baseline

22.8.2.1 State of Natural Resources Report 2025 (SoNaRR) Natural Resources Wales

Since SoNaRR2020, Welsh carbon emissions have reduced slightly, although overall global carbon emissions continue to increase, thus also increasing the impacts from climate change to Wales. Average air and water temperatures continue to increase, with an increase in extreme events seen over the past five years.

The third Climate Change Risk Assessment for Wales was published in 2021, detailing 61 risks and opportunities to Wales from climate change. This has informed the second national adaptation plan, the Climate Adaptation Strategy for Wales, published in 2024.

Wales met the first carbon budget target to reduce greenhouse gas emissions in 2020, and is on track to meet the second budget in 2025, although this will be a greater challenge.

Wales is at a critical juncture as its economy continues to degrade the natural resources that support health, security and prosperity. It is among the most nature-depleted countries globally, with almost one in five species at risk of extinction. Climate change is already affecting all Welsh ecosystems, reducing resilience and amplifying other pressures. Pollution from wastewater, urban areas, transport, agriculture and abandoned mines is damaging freshwater environments, with only 40% of water bodies achieving good overall status. These impacts extend from rivers, lakes and groundwater into estuarine and marine systems, threatening biodiversity and coastal resilience.

Urgent action is required on both mitigation and adaptation to build resilience to future climate impacts. Adaptation measures include coastal realignment and creation of diverse ecosystems, while mitigation includes emissions reductions such as peatland restoration. Air quality has improved overall, but agricultural nitrogen emissions, including ammonia, remain high and continue to affect

sensitive habitats and public health. Historical contamination from industry and landfill, together with emerging pollutants such as microplastics and persistent chemicals, add long-term risks to soil and water security.

Current land-use decisions are intensifying these pressures. Construction to meet population needs often displaces farmland, coastal margins and urban green space, frequently in flood-vulnerable areas. Wales' consumption levels far exceed sustainable limits; if replicated globally, resource use would require more than two Earths, illustrating the scale of imported resources and associated impacts on other countries, which undermines the Globally Responsible Wales Wellbeing Goal.

Agricultural land dominates the landscape, yet its management generally provides only limited sustained nature-based benefits despite supplying critical food resources. Given that agriculture occupies over 90% of Wales' land area, substantial opportunities to improve sustainable resource management lie within Welsh farm ecosystems and practices. The Welsh Government's Sustainable Farming Scheme (SFS), starting on 1 January 2026, aims to deliver sustainable land-management outcomes that combine food production with environmental care, climate mitigation and adaptation, and increased resilience. The SFS represents a step change in agricultural land management.

22.8.2.1 Met Office UK Climate Averages

22.8.2.1.1 Aberporth Synoptic Climate Observing Site

UK weather stations report a mixture of snapshot hourly observations of the weather known as synoptic observations, and daily summaries of the weather known as climate observations. Observations from around 260 UK automatic (synoptic) stations are collected in real time; climate data from these stations also comes in straight after readings are taken. Climate observations from around 140 co-operating observers at manual climate stations are also received in slower time.

The nearest climate station to the Proposed Development is approximately 31km away and located at Aberporth Observing Site[4], as illustrated in Figure 22.4.

[4] https://www.metoffice.gov.uk/research/climate/maps-and-data/location-specific-long-term-averages/gckb8585x

Figure 22.4: Aberporth Observing Site

The climate observation averages recorded during the climate period 1991 – 2020 at the Aberporth Observing Site are summarised below in Table 22.9. These observations show that the maximum and minimum temperatures tend to increase between January to July and then decrease from August to December. The months of the year with the highest recorded temperatures are the summer months July (18.28°C) and August (18.26°C). The lowest minimum temperature at this location was observed in January (7.78°C), which also had the highest recorded days with air frost (4.50 days).

Sunshine hours increase from January to their peak in May (222.84 hours), then continue to decrease into December due to the seasonal changes. The month with the typical highest recorded rainfall is indicated to be November (117.15mm), however the highest number of days with rainfall greater than 1mm was seen in December (16 days). The month with the highest mean wind speed at 10 m was January (16.12knots).

It's important to note that these trends are based on the provided data for the specified climate period, and individual years may show variations.

Table 22.9: Aberporth Climate Period 1991 – 2020 (Met Office 2026)

Month	Maximum temperature (°C)	Minimum temperature (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1 mm (days)	Monthly mean wind speed at 10 m (knots)
January	7.78	3.38	4.50	62.39	90.11	15.33	16.12
February	7.87	3.25	3.80	82.40	67.44	11.77	15.65
March	9.40	4.21	1.77	132.35	57.15	11.30	13.98
April	11.63	5.73	0.37	180.91	54.22	11.10	12.09
May	14.32	8.16	0.00	222.84	54.70	10.27	11.04
June	16.65	10.69	0.00	216.13	60.37	9.63	10.52
July	18.28	12.50	0.00	202.23	66.54	10.67	10.39
August	18.26	12.66	0.00	179.61	75.37	11.63	10.92
September	16.66	11.22	0.00	148.68	70.57	12.07	12.02
October	13.61	8.91	0.00	103.85	106.99	14.97	13.80
November	10.51	6.16	0.57	61.89	117.15	17.17	15.05
December	8.45	4.10	3.50	50.94	106.52	16.20	15.84
Annual	**12.81**	**7.60**	**14.51**	**1644.22**	**927.13**	**152.11**	**13.11**

22.8.2.1.2 Wales – Climate Characteristics

Wales has a maritime climate dominated by highly unpredictable shifts in Atlantic air masses, which, combined with the diverse range of elevations, often cause local conditions to vary considerably from day to day. However, the shape of the coastline and the central spine of high ground from Snowdonia southwards to the Brecon Beacons introduce localised differences. Whilst some upland areas can experience harsh weather, the coasts enjoy more favourable conditions and areas in east Wales are more sheltered and hence similar to neighbouring English counties.

Temperature shows both a seasonal and a diurnal variation. In winter, temperatures are influenced to a very large extent by those of the surface of the surrounding sea, which reach their lowest values in late February or early March. Around the coasts February is therefore normally the coldest month, but inland there is little to choose between January and February. The January mean daily minimum temperatures vary from just above 0 °C in the higher parts of north and mid-Wales to 3 or 4 °C around the coast. The highest values occur in Pembrokeshire, due to the proximity of air from the relatively warm Atlantic.

Rainfall is caused by the condensation of the water in air that is being li ed and cooled to its dew point. Rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic Lows are more vigorous in autumn and winter and bring most of the rain that falls in these seasons. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rainfall is from showers and thunderstorms then. A further factor that greatly affects the rainfall distribution is altitude. Moist air that is forced to ascend hills may be cooled to the dew point, to produce cloud and rain. A map of average annual rainfall therefore looks similar to a topographic map. Rainfall in Wales varies widely, with the highest average annual totals being recorded in the central upland spine from Snowdonia to the Brecon Beacons. Snowdonia is the wettest area with average annual totals exceeding 3000 mm, comparable to those in the English Lake District or the western Highlands of Scotland. In contrast, places along the coast and, particularly, close to the border with England, are drier, receiving less than 1000 mm a year.

The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4 °C. The numbers of days with snow falling and snow lying increase with latitude and altitude, so values reflect topography. Snow is comparatively rare near sea level in Wales, but much more frequent over the hills. The average number of days each year when sleet or

snow falls varies from 10 or less in south-western coastal areas to over 30 in Snowdonia. Snow rarely lies on the ground at sea level before December or a er March, and the average number of days with snow lying in Wales varies from 5 or less around the coasts to over 20 in Snowdonia. These averages can be compared with parts of the Scottish Highlands, which have about 60 days with snow lying on average and with the coasts of SW England, with less than 3 days per year.

Wales is one of the windier parts of the UK, with the windiest areas being over the highest ground and along the coasts, particularly those facing directions between north-west and south. The strongest winds are associated with the passage of deep areas of low pressure close to or across the UK. The frequency and strength of these depressions is greatest in the winter half of the year, especially from November to February, and this is when mean speeds and gusts (short duration peak values) are strongest.

22.8.2.2 Future Wales The National Plan 2040

The climate is already changing and trends show the UK climate is continuing to warm and sea levels continue to rise. In terms of the future, the latest climate projections for Wales come from the 2018 UK Climate Projections and are detailed in Figure 22.5. State of the art modelling is used to provide detailed projections of climate change up to 2100 (and to 2300 on sea level rise). The projections show an increased chance of milder, wetter winters and hotter, drier summers, rising sea levels and an increase in the frequency and intensity of extreme weather events.

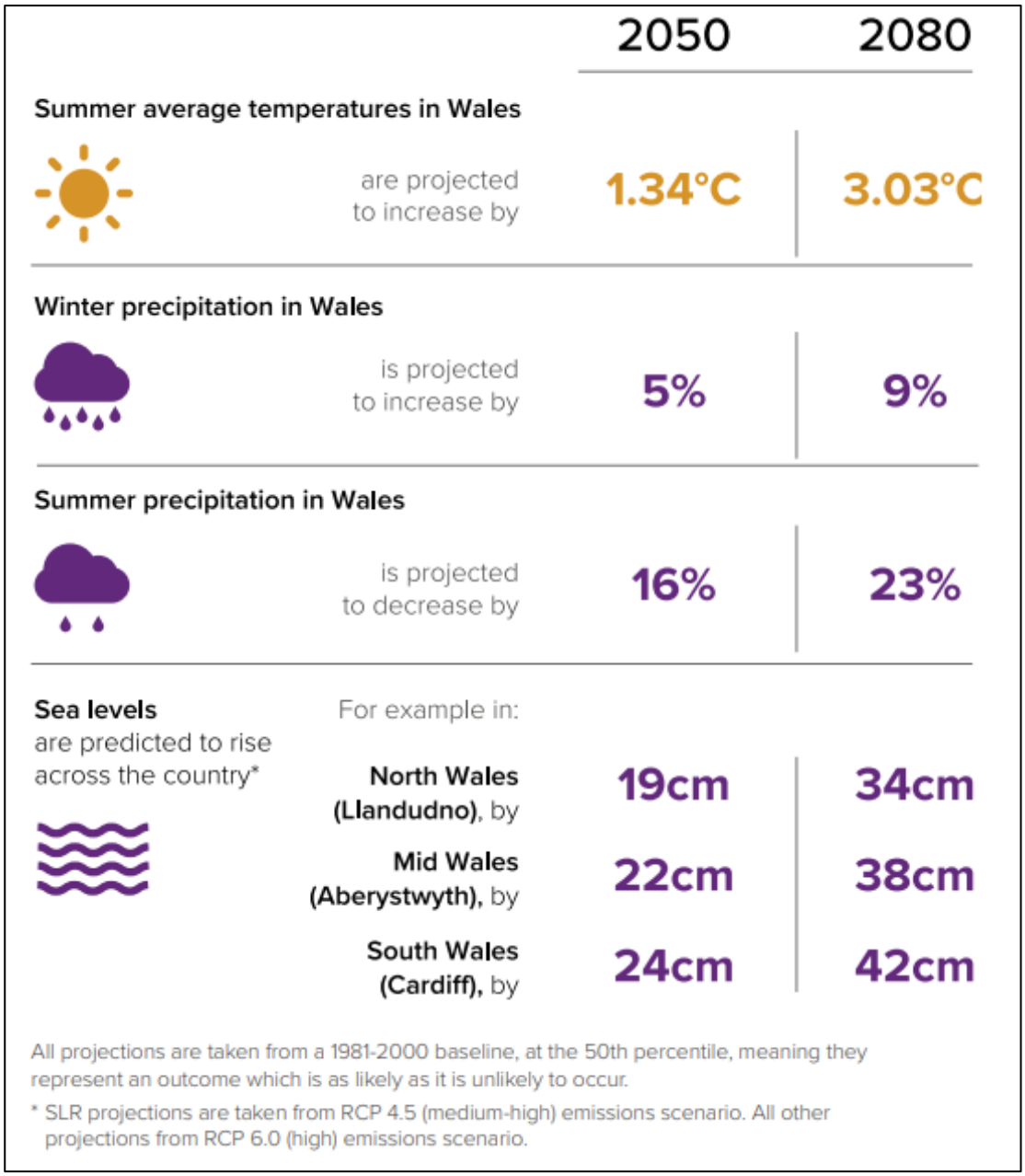

Figure 22.5: Climate change projections for Wales

Changes to our climate and weather patterns will have a significant impact on well-being on both current and future generations. Increasing temperatures and extreme weather events caused by climate change are putting pressure on ecosystems, infrastructure, built environment and our unique landscape and cultural heritage, which all contribute to social, economic and ecological resilience.

Climate change is an equality issue as it will disproportionately affect the most vulnerable communities in Wales and the wider world. This is despite the most vulnerable communities historically contributing the least to the problem of climate changing emissions. Vulnerable communities are more likely to be exposed to the risks and impacts of climate change without the ability to cope with or recover from those impacts.

22.8.2.3 Extreme Weather Events

In 2023, Wales had one of the driest periods on record for the May and June period, followed by the third wettest July in over 100 years. Wales has already experienced changes in its climate, and these

are projected to continue and intensify. A summary of some of the extreme weather events within Wales is detailed below[5]:

- **Storm Christoph 18 to 20 January 2021** - Storm Christoph brought some exceptionally wet weather to North Wales and northern England from 18 to 20 January. 100mm of rain or more fell across upland areas, and parts of Cheshire, Greater Manchester and Lancashire received around the January whole-month long-term average rainfall from this event. For north-west England and North Wales this was one of the wettest 3-day periods on record.
- **Severe winter weather and storm Darcy, February 2021** - The UK experienced a week of severe winter weather from 7 to 13 February, with easterly winds drawing a bitterly cold airflow from eastern Europe.
- **Extremes of temperature, March and April 2021** - The UK experienced a brief spell of unusual warmth at the end of March with temperatures across England and Wales widely reaching 20 to 22°C. 24.5°C was recorded at Kew Gardens, Greater London on 30th March, only the third day on record with a UK March temperature exceeding 24°C.
- **Storms Dudley, Eunice and Franklin, February 2022** - Three named storms affected the UK within the space of a week, the first time this has occurred since storm naming was introduced in 2015/2016. Two rare red warnings were issued for storm Eunice, the most severe and damaging storm to affect England and Wales since February 2014.
- **Unprecedented extreme heatwave, July 2022** - The UK experienced a brief but unprecedented extreme heatwave from 16 to 19 July 2022, as hot air moved north from the near-continent, with extreme temperatures recorded on both 18th and 19th. In Wales, on 18th July a new national record of 37.1°C was set at Hawarden Airport, Flintshire.
- **Prolonged spell of low temperatures, December 2022** - The UK experienced a prolonged spell of low temperatures accompanied by snowfalls from 8 to 18 December 2022 as an Arctic Maritime airmass brought hard frosts, with daytime temperatures struggling to rise above freezing and accompanied by widespread lying snow (although generally not deep). Daily minimum temperatures fell widely to between -5°C and -10°C across the UK on several nights – with hard frosts even in cities and coastal areas, and some locations below -10°C.
- **Storm Noa, 12 April 2023** - Storm Noa on 12 April 2023 was the second named storm of the 2022/2023 storm season. The storm was named by Meteo-France and brought widespread gusts of over 50Kt around coastlines of England and Wales. This was an unusually severe storm for the time of year; the most significant April wind storm to affect England and Wales since April 2013.
- **Storm Antoni, 5 August 2023 -** Storm Antoni brought strong winds and heavy rain to parts of England, Wales and Northern Ireland on 5 August 2023. The strongest winds were across South Wales and south-west England, with Berry Head (Devon) recording a gust of 68Kt (78mph).
- **Heatwave, September 2023** - In early September the UK experienced a significant heatwave with daily maximum temperatures exceeding 30°C somewhere in the UK for seven consecutive days from 4th to 10th and reaching 31 to 32°C across south-east England. On 10th, Faversham (Kent) recorded 33.5°C, making this, unusually, the hottest day of the year.
- **Storm Henk, 2 January 2024** - Storm Henk, the eighth storm of the 2023-2024 storm season, brought damaging winds and heavy rain to southern and central parts of England and Wales on 2 January 2024. Winds gusted widely at over 50Kt (58mph), even in inland locations, while Exeter Airport recorded a gust of 70Kt (81mph).
- **Storms Isha and Jocelyn, 21 to 24 January 2024** - Storms Isha and Jocelyn, the ninth and tenth named storms of the 2023-2024 storm season, arrived in quick succession in late January

[5] https://www.metoffice.gov.uk/weather/learn-about/past-uk-weather-events

2024. The storms were influenced by a powerful jet stream which was intensified by a large contrast in temperature across North America caused by a pool of cold air over Canada and the United States sinking south. Storm Isha brought widespread strong winds, particularly across the northern half of the UK, on 21 to 22 January 2024, where winds gusted at 60 to 70Kt (69 to 81mph).

- **Exceptionally wet weather, 21 to 23 May 2024** - From 21 to 23 May, parts of England, southern and eastern Scotland and North Wales experienced exceptionally wet weather from a slow-moving weather front associated with an area of low pressure centred off the east coast of the UK.
- **Storm Lilian, 23 August 2024** - Storm Lilian was the 12th and final named storm of the 2023-2024 storm season, the first time 'L' has been reached making this the most named storms in a season since the scheme was introduced in 2015. Lilian was the most significant August windstorm to affect the UK since storms Ellen and Francis in late August 2020, bringing strong winds and heavy rain to northern England and Wales, and parts of Scotland.
- **Storm Bert, 22 to 25 November 2024** - A deep Atlantic low pressure system, named Storm Bert, brought a spell of extremely wet and windy weather in late November. The weekend of Saturday 23rd to Sunday 24th was exceptionally wet across South Wales and south-west England with over 150mm falling in the wettest upland areas.
- **Storm Darragh, 6 to 7 December 2024** - Storm Darragh, the fourth named storm of the 2023/2024 storm season, brought very strong winds to western parts of England and Wales in early December. The Met Office issued a red warning for wind covering West Wales and both coasts of the Bristol Channel, with winds gusting at 60 to 70Kt (69 to 81mph) or higher in these areas.
- **Heavy rain, strong winds and snow, New Year 2024-2025** - The period from late December 2024 to early January 2025 brought some very wet and windy weather, with significant snowfalls across upland areas in the north. On 29 to 31 December, northern Scotland recorded its third-wettest 3-day period on record, while 31 December was the second-wettest day on record for the climate district of North-West England and North Wales.
- **Storm Éowyn, 24 January 2025** - Storm Éowyn, the fifth storm of the 2024/2025 season so far, hit the UK in late January. The Met Office issued a red warning for wind, meaning danger to life, with a wider amber warning area covering the northern half of the UK. Overall, this was the UK's most powerful wind storm for over a decade. Around 20 stations recorded 70Kt (81mph) wind speeds or more in Northern Ireland, central and southern Scotland, northern England, and North Wales.
- **Spring 2025** - The UK experienced an unprecedented season of warmth and sunshine in spring 2025. For most of the season, the UK's weather was dominated by high pressure, building either from the Azores or continental Europe, bringing prolonged spells of warm, dry, sunny weather. This was the UK's warmest, sunniest and sixth-driest spring in historical records. Arguably the most outstanding feature of spring 2025 was the exceptional sunshine: remarkably, the spring was sunnier than all but three historical summers.
- **Storm Amy, 3 to 4 October 2025** - Storm Amy, the first storm of the 2025/2026 season, hit north-western parts of the UK in early October. The strong winds were combined with heavy rain with 50 to 75mm or more falling widely across northern areas on the 3rd. 100 to 150mm or more of rain fell across western and northern upland areas of the UK in the first four days of the month. Gusts exceeded 70Kt (81mph) in parts of Wales with 74Kt (85mph) at Capel Curig (Conwy) and Lake Vyrnwy (Powys).
- **Storm Claudia, 14 November 2025 -** Storm Claudia, the third named storm of the 2025/2026 season, brought extensive heavy rainfall across England and Wales on 14 November. The storm was named by the Spanish meteorological agency (AEMet), with heavy rain and strong winds affecting Spain and Portugal during the preceding days. Parts of England and Wales received

the whole-month November average rainfall in six days from 9th to 14th, with the worst impacts in South Wales.

- **Storm Bram, 9 to 10 December 2025** - Storm Bram was the fourth named storm to affect the UK during the 2025/2026 season. It was named by the Western European storm naming group, which includes the UK. Previous storms Benjamin and Claudia were named by Meteo-France and AEMet, the French and Spanish meteorological agencies, which are not part of this naming group. Bram brought winds gusting at over 60Kt (69mph) in the worst affected locations, and up to 100mm of rain in the wettest areas falling on saturated ground. Overall this was a notable but not exceptional Atlantic winter storm.
- **Storm Goretti 8 to 9 January 2026** - Storm Goretti, named by Météo France, brought damaging winds to Cornwall and the Isles of Scilly on 8 to 9 January 2026. A gust of 86Kt (99mph) was recorded at St Mary's Airport, the highest wind speed recorded on the Isles of Scilly for 47 years, and this was one of the most impactful storms to affect the far south-west in recent decades. Goretti was a multihazard storm, also bringing widespread lying snow on the northern flank to much of Wales, parts of the West Midlands and the South Pennines.
- **Storm Chandra 26 to 27 January 2026** - Storm Chandra brought some exceptionally wet weather. Over 50mm of rain fell widely in the worst affected areas, with up to 100mm across high ground. Chandra formed part of a sequence of low pressure systems in late January, with the January whole-month average rainfall. In addition to the rain, Chandra and earlier storm Ingrid on 23 to 24 January brought some very strong winds gusting at 50 to 60Kt (58 to 69mph). Large waves battered exposed coastlines. The impact of this event was greatly exacerbated by the wet weather over the previous days – for example, south Wales received an average of over 10mm per day for five consecutive days in the run-up to storm Chandra.

22.8.2.4 Flood Risk & Climate Change

An increased flood risk, associated with climate change, has the potential to result in considerable impacts on riparian and coastal developments, higher sea levels have already been observed, while wetter winters are anticipated. There are approximately 273,000 properties across Wales at risk of flooding: 1 in every 7. Climate change is increasing the risks and impacts of flooding, with the number of properties at risk set to increase to approximately 350,000 by 2120, an increase of approximately 77,000 properties (approximately 28%). There could also be significant consequences for settlements that are close to lakes and artificial waterbodies (canals and reservoirs). Predicted impacts of climate change include an increase in the frequency and intensity of rainfall, an increase in peak flows in rivers, a rise in sea levels and increased storminess. These climate change effects are likely to increase pluvial, fluvial and coastal flooding and will require that future development be adaptable or resilient to future climatic changes and its associated impacts. Water management infrastructure should be developed with climate change in mind, in order to ensure that it is adaptable to climate change and can be safely exceeded.

The Welsh Government already invests an average of over £54 million per annum in flood and coastal risk management until 2020, but a longer term settlement would help for the strategic planning and adaptation. The Welsh Government has also committed to reviewing policy and putting in place new guidance and tools to increase Wales' capacity to manage coastal flooding and erosion. In September 2019, consultation on the future National Strategy for Flood and Coastal Erosion Risk Management closed and the Welsh Government will publish a new strategy in 2020. The primary goal of the strategy will be to ensure the risks to people and communities from flooding and coastal erosion are effectively managed.

Sea level rise caused by climate change, along with increased incidence of storms, means the risk of erosion and flooding of coastal communities is increasing. There are a number of communities which are already vulnerable to spring tides and coastal surges. With the projected sea level rises in the long term, some of those communities may become unsustainable.

Fishguard, located on the Pembrokeshire coast of Wales, is susceptible to tidal flooding due to its geographical position and the influence of sea level rise. According to the Environment Agency, the area is classified as having a medium to high risk of flooding from tidal sources, particularly during storm surges and high spring tides. Historical data indicates that significant tidal flooding events have occurred, notably in December 2013, when severe weather led to extensive flooding along the coast, affecting properties and infrastructure in Fishguard. The tidal range in Fishguard can reach approximately 5.2 meters, which, combined with adverse weather conditions, can exacerbate flooding risks. In response to these challenges, local authorities have implemented flood defence measures, including the construction of sea walls and the enhancement of drainage systems, to mitigate the impact of tidal flooding and protect the community. Continuous monitoring and assessment of tidal flood risks remain essential for effective management and preparedness in Fishguard.

22.8.2.1 Climate Vulnerability Future Baseline

The Met Office has developed the HadUK-Grid Gridded Climate Observations dataset (Met Office et al., 2025), which provides observed climate variable values at a 25km resolution. This dataset is derived from higher-resolution 1km data and spans the period from 1836 to 2024. For the purposes of this assessment, data from the baseline period of 1991–2020, specifically for the 25km grid cell covering the Study Area, have been utilised. This baseline period and spatial resolution facilitate comparison with future climate projections for the UK, known as the UK Climate Projections 2018 (UKCP18) (Met Office, 2018), which also use a 30-year baseline to project potential future climate changes.

The UKCP18 projections incorporate a set of greenhouse gas (GHG) concentration scenarios called representative concentration pathways (RCPs). These pathways reflect different assumptions regarding future population growth, economic development, and the extent of mitigation efforts aimed at reducing GHG emissions to meet international targets. The RCPs correspond to radiative forcing levels of 2.6, 4.5, 6.0, and 8.5 watts per square metre (W/m^2) by the year 2100, designated as RCP2.6, RCP4.5, RCP6.0, and RCP8.5, respectively. Each pathway results in a different range of projected global mean temperature increases throughout the 21st century, accounting for uncertainties such as climate sensitivity and ocean heat uptake rates (Met Office, 2018).

It is important to note that these RCPs represent a range of possible climate futures rather than specific forecasts or policy recommendations. The RCP2.6 scenario assumes substantial reductions in GHG emissions, offering a plausible likelihood of limiting global temperature rise to between 1.5°C and 2°C above pre-industrial levels. Conversely, RCP8.5 represents a high-emission scenario where GHG emissions continue to increase unchecked, potentially resulting in temperature increases exceeding 4°C by 2100.

Current and projected future climate conditions (in terms of temperature and precipitation) are summarised in Table 22.10 using the UKCP18 probabilistic dataset at 25km resolution for the grid cell centred on X187593 Y237423. The current climate baseline corresponds to the latest historic climate data from 1991 to 2020. Future climate projections are based on the high emissions scenario (RCP8.5) with a 50% probability of occurrence (median value) for successive 30-year periods: the 2030s (2020–2049), 2060s (2050–2079), and 2080s (2070–2099), which align with the expected operational lifespan of the Project.

Seasonal precipitation changes indicate a clear divergence between wetter winters and drier summers by the 2080s. Winter mean accumulated precipitation is projected to increase substantially by 25.0% by 2080-2099 compared to the baseline 359.1mm/year, suggesting significantly wetter winters. In contrast, summer mean accumulated precipitation is expected to decline sharply by 37.0% from the baseline 248.2mm/year in the same period, indicating much drier summers. This pattern highlights the increased likelihood of wetter winters coupled with drier summers.

Temperature metrics also show a consistent upward trend. The mean winter minimum temperature is projected to rise by 3.3°C, from a baseline of 3.4°C to approximately 6.7°C by the 2080s. Similarly,

the mean summer maximum temperature is expected to increase by 4.9°C, from 17.8°C to around 22.7°C. The annual mean temperature is projected to increase by 3.8°C, from 10.2°C to approximately 14.0°C, reflecting a steady warming trend throughout the year.

Table 22.10: Current Climate Conditions and Potential Future Changes at the Location of the Proposed Development

Climate Metric	Observed Baseline (1991-2020)	Projected Change (UKCP18)						
		RCP8.5 (50% probability) (2020 – 2039)	RCP8.5 (50% probability) (2030-2049)	RCP8.5 (50% probability) (2040–2059)	RCP8.5 (50% probability) (2050-2069)	RCP8.5 (50% probability) (2060-2079)	RCP8.5 (50% probability) (2070-2089)	RCP8.5 (50% probability) (2080-2099)
Mean Winter Minimum Temperature (°C)	3.4	+0.8	+1.2	+1.5	+1.9	+2.2	+2.7	+3.3
Mean Summer Maximum Temperature (°C)	17.8	+1.0	+1.3	+1.9	+2.4	+3.1	+4.1	+4.9
Annual Mean Temperature (°C)	10.2	+0.9	+1.2	+1.6	+2.0	+2.5	+3.2	+3.8
Winter Mean Accumulated Precipitation (mm/year and %)	359.1	+5.0	+7.0	+9.0	+14.0	+17.0	+21.0	+25.0
Summer Mean Accumulated Precipitation (mm/year and %)	248.2	-10.0	-14.0	-19.0	-25.0	-29.0	-33.0	-37.0

22.8.2.1.1 Sea Level Rise

Table 22.11 summarises the UKCP18 projections (marine simulations, 1981-2000) for changes in time-mean sea level anomaly (m) for the nearest coastal boundary to the Proposed Development (Fishguard) for the 2030 - 2100 period under RCP8.5. Sea level rise is projected that under the worst-case scenario, by the 2100s, there is a potential for sea level to rise by 1.13m.

Table 22.11: Projected Sea Level Rise for the Nearest Coastal Boundary under RCP8.5

Time slice	95th Percentile (m)
2030	0.20
2040	0.28
2050	0.39
2060	0.51
2070	0.64
2080	0.79
2090	0.96
2100	1.13

22.9 Impact Assessment

22.9.1 Do Nothing Scenario

In the event of a 'do-nothing' scenario, the site would remain 'as-is' with the undeveloped nature of the site. Without the Proposed Development, construction would not take place, and as such during construction emissions will not occur. The future baseline scenario involves no construction activities and therefore eliminates any additional operational emissions which then remain under the existing conditions.

22.9.2 Assessment of Construction Effects

The below definitions of the terms effect and impact are drawn from the glossary of the Highways Agency Design Manual for Roads and Bridges, which provides general guidance:

- **Impact:** Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact);
- **Effect:** Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.

The term impact is used when discussing impact magnitude – the original impact on a receptor. The term effect is used when talking about significance (as this is the result of the impact and the sensitivity of the receptor). The following are set out:

- Magnitude of impact;
- Sensitivity of receptor;
- Significance of effect.

In terms of the Proposed Development the following key aspects are summarised:

- **Increased frequency of extreme weather** - Damage, delay, health and safety impact, increased costs. The sensitivity of construction phase receptors is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term, adverse effect which is considered to be minor.
- **Increased temperatures, prolonged periods of hot weather** - Warm and dry conditions exacerbate dust generation and dispersions, health risks to construction workers. Appropriate

dust control measures will be put in place during the construction phase of the Proposed Development to aid in protection from fugitive dust dispersion and potential health impact on construction workers.

- **Increased precipitation, and intense periods of rainfall**. 1) Flooding of works and soil erosion; 2) Increased risk of contamination of waterbodies; 3) Disruption to supply of materials and goods; 4) Landslides. Appropriate assessment has been undertaken in relation to future flooding. Please refer to the FRA (submitted as part of the supporting documents) for full assessment details of future flood risk.

The sensitivity of construction phase receptors is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term, adverse effect which is considered to be negligible.

22.9.2.1 Construction Traffic

Traffic impact of the Proposed Development will be most onerous during the construction stage than the operational stage. The proposed construction traffic is expected to have a minimal impact on the surrounding highway network during the construction period, as even if all vehicles were to use a single approach route, the resulting impact would remain insignificant, falling within the 10% daily variance of traffic flows outlined in the Guidelines for Traffic Impact Assessments. According to these guidelines, a Traffic Impact Assessment is necessary only when traffic generated by a development exceeds certain thresholds, which in this case are not breached, indicating that the impacts, ranging from 3.4% to 1.8% on the approach routes, are negligible and do not require further analysis. The percentage impacts are based on existing traffic flows collected in 2025, and as the construction is expected to last for 12 months, any background traffic growth during this period will likely further reduce these percentage impacts.

22.9.2.2 Climate Change Resilience

During the construction process, receptors may be vulnerable to a range of climate risks. These are addressed by the mitigation measures in this chapter. Potential impacts during the construction phase could include:

- Inaccessible construction site due to severe weather events (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and,
- Damage to construction materials, plant and equipment, including damage, material storage areas and worksites, for example from stormy weather.

With regard to climate change risks to the Proposed Development during the construction period, it is considered reasonable that construction contractors would be able to adapt working methods if necessary.

For example, warmer winter conditions may extend the time certain construction activities such as concrete pouring can be carried out, while a greater chance of summer heatwave conditions may require adaptations such as shading work areas or increased attention to construction dust control measures. Effects are considered to be negligible and not significant.

22.9.2.3 Embodied Carbon

Embodied carbon refers to the emissions during the construction of a development rather than when it is operational – or the carbon footprint of a material. With the pressure on to decarbonise the built environment and deliver carbon neutral buildings ahead of the government's 2050 deadline, it's

becoming increasingly important for contractors and developers to tackle it appropriately. Some local authorities have also started to ask about the embodied carbon footprint of new developments, so understanding what it is and how to reduce it will be vital for projects moving forward.

Developing net zero carbon assets requires driving down embodied carbon to an absolute minimum. As industries commit to net zero pathways for their own emissions, they are now focusing on reducing the carbon footprint of developments. Less embodied carbon will mean a lower requirement for carbon sequestration. This is a vital step in reaching global emissions reduction targets. Reducing embodied carbon should be a priority for developers and contractors for many other reasons such as, mandated legal limits on embodied carbon, using fewer resources that can reduce costs and risk around resource availability.

The ICE database, which stands for "Inventory of Carbon and Energy," (ICE v4.1 Circular Ecology Oct 2025) is a resource that's used in the construction industry to assess and calculate the embodied carbon emissions associated with various building materials. These embodied carbon emissions represent the greenhouse gases emitted during the production, transportation, and assembly of construction materials. Understanding these emissions is crucial for sustainable and environmentally friendly construction practices.

The update to ICE V4.1 signifies that the database has gone through a revision, likely to include more recent and accurate data on the environmental impacts of construction materials. This update process is guided by the pareto principle, or the 80:20 rule. In the context of the ICE database, this means that the focus of the update has been on the main construction materials that are responsible for the majority (around 80%) of embodied carbon in construction projects. These materials are particularly significant because reducing their carbon footprint can have a substantial impact on the overall sustainability of construction projects.

The exact types of construction materials and their embodied carbon content are not known at this early stage of the Proposed Development, however Table 22.12 provides a summary of generalised construction materials and their embodied carbon content portrayed as worst case scenario.

Table 22.12: Summary by Material Types: Construction Embodied Only (Worst-Case Scenario)

Materials	Embodied Carbon -
Aggregates and Sand	0.00747 kgCO_2e/kg
Aluminium	6.67 kgCO_2e/kg
Asphalt and bitumen	50.68 kgCO_2e/kg per tonne
Cement	0.812 kgCO_2e/kg
Iron	2.032 kgCO_2e/kg
Steel	4.18 kgCO_2e/kg
Paint and coating	3.76 kgCO_2e/kg
Plastic	3.31 kgCO_2e/kg
Stone	0.079 kgCO_2e/kg

(Source: Embodied Carbon Footprint Database - Circular Ecology)

22.9.2.4 Dredging

Within the Proposed Development, shipping emissions will occur during the dredging process.

CO_2e Emissions fall under three Scopes

- Scope 1 emissions refer to those emissions produced directly as a result of works, such as the burning of fuel in machinery while on site.
- Scope 2 emissions are those that are indirectly generated as a result of the scheme such as the emissions associated with energy provided by a supplier, e.g., electricity from the mains.
- Scope 3 emissions then include all emission sources not covered by scope 1 and 2, such as the emissions produced as a result of fuel extraction, refinement, and delivery.

Given the capital dredging works do not require mains electricity supply, Scope 2 emissions are not relevant.

The estimation of CO_2e Emissions is therefore based on an assessment of Scope 1 and Scope 3 emissions.

From the UK Government Department for Environment, Food and Rural Affairs (DEFRA), GHG conversion factors for fuel types are available[6]. The GHG conversion factor for marine gas oil (MGO) is 3.11 litres/kgCO_2e which represents for every 3.11 litres of MGO burnt, 1 kg of CO_2e is produced. This conversion factor is for the GHGs produced when burnt, i.e., Scope 1 emissions.

The fuel type typically used for capital dredging campaigns is marine MGO, similar to diesel but with higher density, which is currently the Dredging Industry Standard.

DEFRA also provide a well-to-tank (WTT) emission factor for fuels. WTT conversion factor accounts for all GHG emissions released into the atmosphere from the production, processing, and delivery of the fuel, thus taking account of Scope 3 emissions. For the purpose of this assessment, the WTT conversion factor for MGO will be used which is 3.74 litres/kgCO_2e.

22.9.2.4.1 The Blue Carbon Potential of the Marine Protected Area Network

Blue carbon is an area of increased interest and research following the release of The Blue Carbon Potential of the Marine Protected Area Network in the Welsh Marine Environment[7]. Blue carbon is defined in the report as *"… the carbon accumulating in vegetated, tidally influenced coastal ecosystems such as tidal marshes, tidal forests (including mangroves), and seagrass meadows*".

Blue Carbon refers to carbon which is stored, or sequestered, in the ocean, its sediments, and vegetated habitats. Irish blue carbon systems include coastal systems, such as saltmarshes, seagrass and macroalgae, coastal and offshore sediments, and potentially cold-water corals.

From using the most relevant literature values for carbon storage and sequestration for Welsh habitats and calculating the habitat extents within each SAC Annex I feature, the blue carbon potential of Annex I features could be estimated. The total contribution of Welsh SAC Annex I features to carbon storage was estimated to be approximately 11 Mt of carbon in the top 10 cm of sediment. This accounts for almost 10% of the total carbon storage across all habitats in the Welsh National Marine Plan area. The rate of sequestration was approximately 12,300 t of carbon per year across the SAC network, which accounts for 47% of the total carbon sequestered within Welsh habitats. Annex I features which covered large spatial extents such as estuaries and large shallow inlets and bays contributed the most towards carbon storage and sequestration across the network, however designated saltmarsh features contributed the most towards blue carbon per unit area.

Overall, this study highlighted that SACs make an important contribution towards blue carbon in Welsh waters, particularly in terms of carbon sequestration, and therefore the continued protection of the blue carbon habitats associated with designated features is of high importance. The collection and incorporation of site-specific data into future estimates of blue carbon potential should be a priority in order to assess the variability of carbon storage and sequestration across the SAC network.

With any dredging activity, carbon which has accumulated in seabed sediment has the potential of being released into the atmosphere. The carbon released is difficult to quantify due to a significant number factors having to be accounted for and the limited research data currently available. It is however known that the majority of the area does not have a high abundance of vegetation, with one of the project principles to renourish this sediment. Consequently, Blue Carbon emission sources are not considered to be significant in this case.

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[6] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022

[7] //efaidnbmnnnibpcajpcglclefindmkaj/https://naturalresources.wales/media/695175/the-blue-carbon-potential-of-the-marine-protected-area-network-in-wales.pdf

22.9.2.5 Waste Management

Waste is defined as '"any substance or object which the holder discards or intends or is required to discard" under the Waste Framework Directive (European Directive 2006/12/EC as amended by Directive 2008/98/EC).

Once a substance has become waste it will remain waste until it has been fully recovered and no longer poses a potential risk to the environment or human health. From that moment onwards, the material ceases to be waste, and it is no longer subject to the same legislative controls.

This applies to waste used as aggregate or construction material in civil engineering applications and to exceed topsoils and sub-soils which need to be moved off-site. Waste recovery can be achieved when such waste is incorporated into a road, building or other infrastructure works, or in the case of inert waste, after processing if such a process is conducted following the criteria specified in the relevant quality protocols.

The principal objective of sustainable resource and waste management is to use material resources more efficiently, where the value of products, materials and resources are maintained in the economy for as long as possible and the generation of waste is minimised.

To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy (please refer to Figure 22.6).

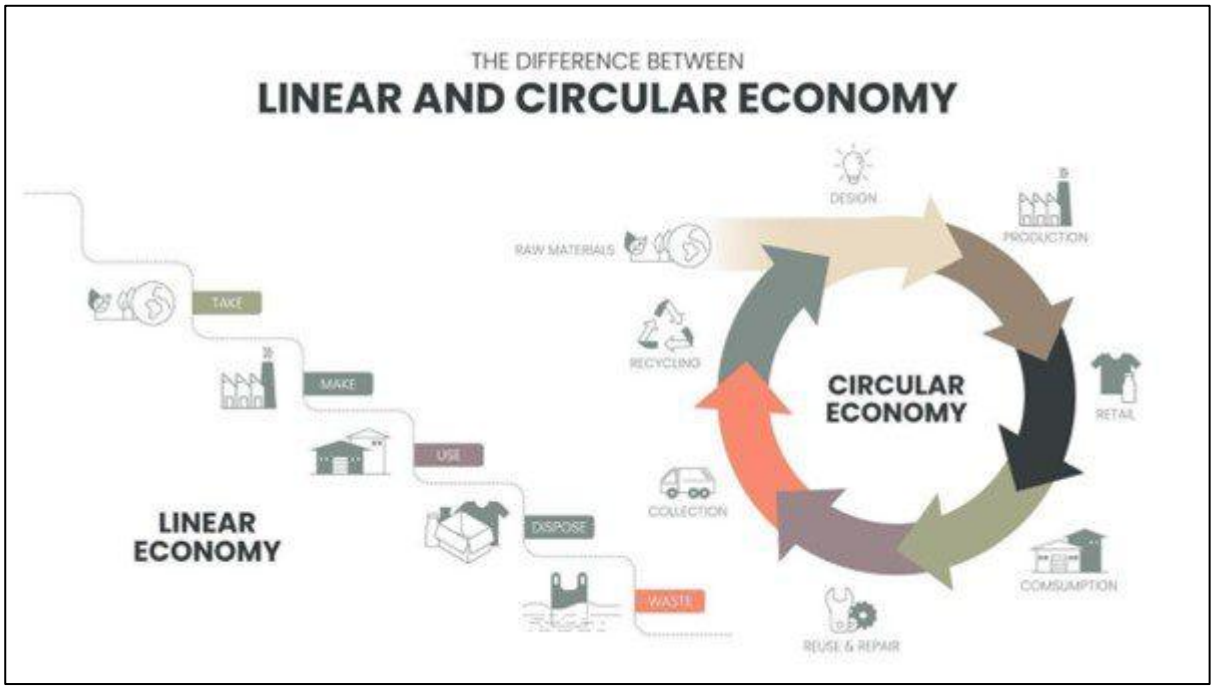

Figure 22.6: Circular Economy

In Wales, the waste hierarchy is both a guide to sustainable waste management and a legal requirement, enshrined in law through The Waste (England and Wales) (Amendment) Regulations 2014[8]. This hierarchy prioritizes waste prevention, followed by preparing for reuse, recycling, other forms of recovery (including energy recovery), and, as a last resort, disposal (e.g., landfill). The

[8] *Prevention, which offers the best outcomes for the environment, is at the top of the priority order; followed by preparing for re-use, recycling, other recovery and disposal, in descending order of environmental preference. The Waste Regulations 2014 transposed several aspects of the revised Waste Framework Directive (rWFD), with the aim to reduce the adverse impacts of the generation of waste and resource use on human health and the environment. The RPC considers the post-implementation review (PIR) to be fit for purpose.*

regulations emphasize the importance of reducing waste at the source and encourage the efficient use of resources throughout the lifecycle of materials. To minimise the construction impacts associated with the Proposed Development, the project will adopt an enhanced circular design that aligns with these regulations by integrating sustainability into its framework, improving material efficiency, utilizing secondary materials, and reducing waste. This approach includes retaining existing structures and reusing construction materials, thereby prioritizing circularity in the built environment and extending the life of buildings, their components, and materials in accordance with Welsh waste legislation.

In order to minimise the construction impacts associated within the construction phase of the Proposed Development, the adoption of an increased circular design that builds sustainability into design, improves material efficiency, utilise secondary materials and reduce waste. The project can provide this through retaining some of the existing structure and the reuse of construction materials.

22.9.3 Assessment of Operational Effects

22.9.3.1 Operational Traffic

The changes in regional emissions from traffic as a result of the Proposed Development were considered in the context of total UK emissions provided by the National Atmospheric Emissions Inventory (NAEI). The consideration of significance of the Proposed Development's impact on regional emissions was undertaken using professional judgement considering the change predicted and the sensitivity of the national (UK) total to change, with the outcome assessed as either Significant or Not Significant.

Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel size are not expected to increase above existing levels. The related number of generated vehicle movements are also not expected to increase above existing levels. Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed and no requirement for an assessment of operational effects.

22.9.3.2 Climate Change Resilience

The Proposed Development also has the potential to be impacted upon by a changing climate and, in particular, more frequent severe weather events, in the medium to longer-term. These are addressed by the mitigation measures in this chapter. Potential impacts on the Proposed Development during the operational phase include:

- Material and asset deterioration due to high temperatures;
- Health and safety risks to road users;
- Damage to roads from periods of heavy rainfall; and
- Flood risk (surface, groundwater, fluvial and snow/ice melt) on the road network and damage to drainage systems with the potential for increased runoff from adjacent land contributing to surface water flooding.

The application is outline and therefore no detailed drainage design has been prepared at this stage, however a Drainage Strategy has been prepared. A preliminary storm water drainage design has been completed for the new area. It is proposed to use ACO channels and connect to the existing storm water drainage network. The closest outfall will be encompassed by the new reclamation works, and so the drainage will connect to this and the outfall will be extended out. There is no increase in storm water runoff to the Port because of the development. An application will be made to the SuDs Approving Body (SAB) as part of the planning application.

With regard to climate change risks to the Proposed Development during the operational period effects are considered to be negligible and not significant following mitigation.

22.9.3.3 Shipping Emissions

While maritime transport plays an essential role in the Welsh economy and is one of the most energy-efficient modes of transport, it is also a large and growing source of greenhouse gas emissions. In 2018, global shipping emissions represented 1,076 million tonnes of CO_2, and were responsible for around 2.9% of global emissions caused by human activities.

The Welsh Government's National Marine Plan (NMP) includes specific targets and objectives related to emissions from shipping, reflecting broader commitments to reducing air pollution and greenhouse gas emissions. While the NMP may not always detail specific numerical targets for shipping emissions, it aligns with various legislative frameworks and initiatives aimed at reducing emissions from maritime activities. The plan supports the implementation of international agreements and regulations, such as those established by the International Maritime Organisation (IMO), which has set a target to reduce total annual greenhouse gas emissions from international shipping by at least 50% by 2050 compared to 2008 levels.

The NMP emphasises the need to improve air quality in Welsh waters and coastal areas, which includes reducing emissions of nitrogen oxides (NOx), sulphur oxides (SOx), and particulate matter (PM) from shipping activities, significant contributors to local air pollution. It encourages the adoption of cleaner technologies and fuels in the shipping industry, such as liquefied natural gas (LNG), hydrogen, and battery-electric systems, to reduce emissions and enhance environmental performance. Additionally, the plan calls for integration with local and regional plans that may set specific targets for emissions reductions from shipping, particularly in areas with high levels of maritime traffic. The advantage of shipping fuels is that marine engines have a much higher operational flexibility on a mix of fuels, and shipping fuels do not need to undergo as extensive refining processes as road and aviation fuels to be considered drop-in. It is important to note that there has been no consensus reached as to what alternative fuel, or fuel mix, is suitable for the maritime industry in the long term. The lifespan of shipping vessels can be quite lengthy meaning a decision made today can have long-term implications. In addition, retrofitting an existing ship to a transitory fuel such as liquefied natural gas (LNG) has considerable technical considerations.

Monitoring emissions from shipping and assessing the effectiveness of measures implemented to reduce them is also a key aspect of the NMP, ensuring compliance with both national and international targets. The plan promotes sustainable maritime practices that minimize environmental impacts, including emissions reductions through efficient vessel operations, better port management, and the implementation of best practices in shipping logistics. While the NMP does not always specify exact numerical targets for emissions from ships, it provides a framework that supports the reduction of shipping emissions in alignment with international standards and national air quality objectives. The emphasis on cleaner technologies, monitoring, and integration with local plans reflects a commitment to improving air quality and reducing the environmental impact of maritime activities in Wales. For the most precise and updated targets, it is advisable to consult the latest documents from the Welsh Government and relevant maritime authorities.

22.10 Mitigation

22.10.1 Construction Phase Mitigation Measures

Embodied carbon in the materials employed in the construction phase dominate the impact, in particular, those relating to cement/concrete and steel. As such, to mitigate these impacts mandatory use of the following commitments could be included:

- Concrete poured in-situ for the proposed development could consist of 50% (as a minimum) ground granulated blast-furnace slag (GGBS) cement blend as a minimum; and
- All reinforcing steel or structural employed on site could be 85% (as a minimum) recycled steel.

Final construction materials will be finalised through the detailed design phase and all efforts will be made to seek to achieve greater embodied reductions where possible based on industry practices and availability of material at the time of construction.

In addition to the above mitigation regarding material choices, there are associated vehicle movement, emissions and reuse of materials. With respect to vehicle emissions, the following can help in reducing the GHGs emission to the atmosphere such that impacts will be negligible and not significant:

- All aggregates required for pavement materials shall be secondary aggregates. Virgin aggregates shall only be employed where it is demonstrated that secondary aggregates are unsuitable for structural reasons and/or they are unavailable.
- Wherever available, the contractor shall secure construction materials from local/regional sources or sources locally to minimise material transport emissions and reduce life cycle carbon emissions associated with the construction materials.
- For electricity generation at the construction compounds, hydrogen generators or electrified plant shall be utilised over traditional diesel generators. This shall also apply to lower powered mobile plant, as appropriate.
- A regular maintenance schedule for all construction plant machinery shall be undertaken to maintain optimum machinery efficiency.
- Sustainable timber post fencing will be specified over steel in boundary treatments where possible.
- Engines will be turned off when machinery is not in use.
- The use of private vehicles by construction staff to access the site will be minimised through the encouragement of use of public transport, encouragement of car sharing, and maximising use of local labour to reduce transport emissions. To implement this, the contractor shall prepare a Mobility Management Plan for site staff.
- Ensuring exhaust emissions are maintained to comply with the appropriate manufacturer's limits (emissions to air controlled).
- The reuse of soil materials won from excavations.
- Only appropriately licensed waste carriers will be used in accordance with applicable legislation.
- It is important that waste arisings from the daily operations are managed appropriately in line with the waste management hierarchy in order to achieve good recycling performance and high landfill diversion.
- Segregation of waste will be carried out on site. This is very important and highly effective in regard to sustainable waste management. On-site segregation of waste materials into appropriate categories.
- All waste generated on site will be dealt with in accordance with the appropriate current legislation; The Waste Management (England and Wales) Regulations 2006 and The Hazardous Waste (Wales) Regulations 2005.
- Waste classification will be undertaken in accordance with The Waste Separation Requirements (Wales) Regulations 2023.
- A full record of waste transfer consignment notes will be kept on site of all material that is removed off-site for disposal to a licensed landfill. A copy of the consignment notes will be included within the Verification Report.
- Under The Contaminated Land (Wales) Regulations 2006 all those responsible for producing or handling wastes have legal requirements placed upon them for the safe keeping, transport and

subsequent recovery or disposal. Consequently, at the basic minimum, the Appointed Contractor shall ensure that all waste leaving site must have a Waste Transfer Note.

- All waste types and amounts will be recorded and reviewed at regular intervals, to allow for continuous analysis and review of procedures that will be made to reduce waste to landfill, increase the percentage of recycling and reduce waste overall as much as possible.

These measures will be implemented throughout by the appointed contractor.

22.10.1.1 Climate Change Resilience

With the design and mitigation measures proposed, the development is considered to be resilient to projected climate change. The resilience of the development to climate change impacts is qualitatively assessed, based on professional expertise and judgement.

The assessment of effects takes into account mitigation embedded in the specimen design of the Proposed Development that has been identified through liaison with the design team, and subsequently revied by discipline leads due to the nature of the cross-cutting issues identified. Table 22.13 sets out the mitigation measures that address climate risks.

Table 22.13: Climate Change Resilience Mitigation

Weather Event	Climate Hazard	Potential Impact	Mitigation
Precipitation	Changes in annual average; and Extreme precipitation events.	• Increase in volume of water from watercourses; • Drainage infrastructure overwhelmed leading to surface water flooding.	• The proposals provide for the discharge of all roads related run-off to existing surface watercourses. A preliminary storm water drainage design has been completed for the new area. It is proposed to use ACO channels and connect to the existing storm water drainage network. The closest outfall will be encompassed by the new reclamation works, and so the drainage will connect to this and the outfall will be extended out. There is no increase in storm water runoff to the Port because of the development. An application will be made to the SuDs Approving Body (SAB) as part of the planning application.
		• Waterlogging and erosion leading to destabilisation; • Greater mobilisation of pollutants in soil/ground causing premature deterioration of materials; • Damage to structures due to increased runoff;	• Mitigation measures that would be applied in line with a number of Technical Guidance Notes (TGNs), good practice guidance documents available from the Natural Resource Wales website and by organisations such as CIRIA for site environmental management. • Following flooding events or heavy rainfall, debris removal and channel clearing would be carried out (information included within the CEMP).
Temperature	Extreme temperature events	• Deformation and melting of paved surfaces.	• The materials proposed are standard materials which have been developed for use in the UK. Asphalt in its very nature is highly susceptible to temperature variations. The design team can take into account the traffic loading and likelihood for deformation and early failure. This is then mitigated, as far as practicable, by choosing the best asphalt mix, considering aggregate interlock and the use of

Weather Event	Climate Hazard	Potential Impact	Mitigation
			additives to withstand deformation as much as possible.
		• Loss of vegetation cover due to scorching leading to destabilisation	• Structures are designed in accordance with the Euro Codes, taking into account the requirements of the DMRB, for a design working life of 120 years.
		• Overheating of electronic equipment and fire • Faster rate of deterioration of materials from increase in UV radiation e.g., fading, brittleness	• Equipment will be designed and constructed of materials which will mitigate the effects of damage and corrosion from weather, salt and traffic pollution. Suitable weather protection will be provided where applicable.
Wind and Storms	Gales and extreme wind events; and Storms (hail, lightning)	• Damage from high winds and rain-infiltration into surfaces and materials; • Windborne dust and debris clogging drainage channels and requiring clearing; • Trees blown down and increase in debris;	• Structures are designed in accordance with the Euro Codes, taking into account the requirements of the DMRB, for a design working life of 120 years. • The ongoing maintenance would involve a wide range of planned and reactive activities and will include regulation inspection and cleaning of all surface water drainage features so to remove a build-up of roadside slit and debris, typically annually.

22.10.2 Operational Phase Mitigation Measures

No significant adverse effect on the development due to climate change during operation is predicted. No mitigation measures are therefore suggested.

22.10.3 Future Monitoring

No project specific monitoring is proposed for climate during the construction or operational phases of the Proposed Development.

22.11 Assessment of Residual Effects

22.11.1 Construction Phase

Following consideration of the essential mitigation measures identified in Section 22.10.1, it is concluded that there would be no residual significant effects.

22.11.2 Operational Phase

It has been identified that there would be no residual significant effects during the operational phase.

22.12 Cumulative Effects

22.12.1 In-combination effects

As stated by ISEP (ISEP, 2022), all GHG emissions are considered significant and therefore will contribute to climate change. The cumulative GHG emissions would not just be limited to the cumulative schemes listed, as the receptor of the GHG emissions assessment is the global climate, with the Wales National Carbon Budget used as a proxy. Consequentially, whilst any GHG emissions across the UK could be considered to have cumulative effects with the GHG emissions of the Proposed Development, the assessment methodology has by default already covered this wider perspective.

The cumulative impact of carbon emissions arising from global human activity is "High". This is true to the nature of climate change as a global, cumulative problem. As committed developments have been assessed through the cumulative vehicular transport scenarios, the potential inter-scheme cumulative effects during the operational phase of the development have already been considered.

It is assumed that all committed developments will be required to meet relevant standards for emissions reduction and to comply with related planning policy. On this basis, it is considered appropriate to assume that any applications that are consented include 'reasonable' measures to avoid, reduce and /or offset the generation of greenhouse gas emissions and therefore that no significant cumulative effects are anticipated.

22.12.2 Effects interactions

All environmental factors are inter-related to some extent. Interactions within the study area can be one-way interactions, two-way interactions and multiple-phase interactions may be influenced by the Proposed Development. An assessment of the interaction between environmental factors are required under Article 3(1)(e) of the EIA Directive –1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

a) Population and human health;
b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
c) Land, soil, water, air and climate;
d) Material assets, cultural heritage and the landscape;
e) The interaction between the factors referred to in points (a) to (d).

The interactions between impacts on different environmental factors will be considered, addressed and Climate is most likely to have an inter relationship with the following chapters:

- Chapter 12 Flood Risk– interaction between climate change and flooding. Flood risk assessments are presented in Chapter 12.
- Chapter 15 Air Quality – interaction between climate change and air quality emissions. Air Quality assessments are presented in Chapter 15.
- Chapter 19 Traffic & Transportation – emissions from vehicles during construction and operational phases. Traffic data details are presented in Chapter 19.

22.13 Limitations of the Assessment

To ensure transparency within the EIA process, the following limitations and assumptions have been identified in the subsections below.

22.13.1 Greenhouse Gases

- In EIA, there is currently no specific carbon emissions threshold, which, if exceeded, is considered significant. Professional judgement and current guidance have been used to derive findings in this assessment;
- This assessment has been completed based on current available information regarding the scale and nature of the Proposed Development. The type and quantities of materials and waste, planting schemes, excavation, and traffic data provided at this stage are not available at this design stage.

22.13.2 Climate Vulnerability and Resilience

- The UKCP18 projections have been used to infer future changes in a range of climate variables that may affect the resilience of the Proposed Development to climate change. At the time of writing, these represent the most up-to-date representation of future climate in the UK. However, the UKCP18 data currently available does not provide data for drought, snow and ice or wind;
- There are inherent uncertainties associated with climate projections and they are not predictions of the future. It is possible that future climate will differ from the future baseline climate against which the resilience of the Proposed Development has been assessed, depending on global emissions over the next century. A 'high' emissions scenario (RCP 8.5) using the 2080s time slice (2070 – 2099 - the longest temporal scale available through UKCP18) has been used to develop the baseline against which resilience has been assessed. This is consistent with the precautionary principle (i.e. 'worst case' scenario); and
- Any further research, analysis or decision-making should take account of the accuracies and uncertainties associated with climate projections. It is also important to note that the analysis is based on selected observational data, the results of climate model ensembles and a selected range of existing climate change research and literature available at the time of the assessment. Any future decision-making based on this analysis should consider the range of literature, evidence and research available at that time and any changes to this.

22.14 Summary of Effects and Conclusion

22.14.1 Greenhouse Gases

ISEP guidance suggests that all GHG emissions are significant in the absence of any significance criteria or defined threshold. In the absence of agreed thresholds for what level of GHG emissions is considered significant in an EIA context, ISEP guidance and professional judgement including previous experience of similar developments have been used to assess the magnitude of change based on schemes of a similar size and nature.

Based on professional judgement, the overall GHG emissions generated from the Proposed Development has been suitably mitigated to reduce the likelihood of such an event having a significant adverse impact. In short, the vulnerability of the works to climate change has been suitably mitigated and the potential impact is considered to be minor adverse for the construction and operational phase.

22.14.2 Climate Vulnerability and Resilience

Throughout the lifespan of the Proposed Development, climate variables over time are expected to become more inconsistent and intense. Precipitation is likely to increase in winter and decrease in summer, increasing the likelihood of flooding in winter and droughts in the summer.

In the absence of essential and embedded mitigation, effects during the construction and operation phase will be significant, particularly surrounding the impacts caused by increased precipitation and associated extreme events. This assessment has concluded that with all embedded and essential mitigation included, there are no significant residual potential impacts from the climate variables assessed in this Chapter.

Table 22.14 summarises the impacts and effects of the climate change for the Proposed Development.

Table 22.14: Summary of Effects and Conclusion

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Traffic	✓	✓	The project includes civil engineering works designed to accommodate modern vessels, which may incorporate cleaner technologies and fuels, further contributing to reduced carbon emissions. The overall aim is to create a more sustainable terminal that aligns with broader efforts to mitigate climate change and support the transition to lower-carbon maritime operations.	C: Low O: Low	C: High O: High	C: Minor adverse O: Minor adverse	None	None	Traffic
Carbon	✓	×	To address carbon emissions at the Stena Line ferry terminal in Fishguard, Wales, the proposed project involves replacing the existing temporary linkspan structure with a floating linkspan pontoon, which is expected to enhance operational efficiency and reduce the carbon footprint associated with ferry operations.	C: Low O: Low	C: High O: High	C: Minor O: N/A	None	C: None O: N/A	Carbon
Waste Management	✓	×	None	C: Low O: N/A	C: High O: N/A	C: Minor O: N/A	None	None	Waste Management
Shipping Emissions	×	✓	This upgrade aims to enhance operational efficiency and safety while facilitating future maintenance dredging, thereby ensuring that the terminal can accommodate modern vessels and potentially reduce emissions associated with ferry operations.	C: N/A O: Low	C:N/A O: High	C: N/A O: Minor adverse	None	None	Shipping Emissions

22.15 References

- Design Manual for Roads and Bridges (DMRB) LA 114 – Climate (June 2021)
- Future Wales The National Plan 2040
- ISEP Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022)
- ISEP Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2020)
- Met Office UK Climate Averages (https://www.metoffice.gov.uk/research/climate/maps-and-data/location-specific-long-term-averages)
- Our progress report on the Prosperity for All: A Climate Conscious Wales plan in December 2022.
- Pembrokeshire County Council Local Development Plan
- The Climate Change (Carbon Budgets) (Wales) (Amendment) Regulations 2021
- The Climate Change Act 2008 (2050 Target Amendment)
- The Climate Change Committee's third UK climate risk independent assessment (CCRA3-IA), published in June 2021.
- The UK National Atmospheric Emissions Inventory
- Wales' Greenhouse Gas Emissions 2021

22.16 List of Abbreviations / Acronyms

Abbreviation	Full form
CCC	Climate Change Committee
CCRA	Climate Change Risk Assessment
CEMP	Construction Environmental Management Plan
CO2	Carbon dioxide
DA	Devolved Administrations
DERA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETS	Emissions Trading Scheme
EU	European Union
GGBS	Ground Granulated Blast-Furnace Slag
GHGI	GHG inventory
GHGs	Greenhouse Gases
GN	General Policies
ICT	Information and Communication Technologies
IPCC	Intergovernmental Panel on Climate Change
ISEP	Institute of Sustainability and Environmental Professionals
LNG	Liquefied Natural Gas
LPD	Local Development Plan
LULUCF	Land Use, Land-Use Change and Forestry
MGO	Marine Gas Oil

Abbreviation	Full form
NAEI	National Atmospheric Emissions Inventory
NMP	National Marine Plan
RCP	Representative Concentration Pathways
SAB	SuDS Approving Body
SoNaRR	State of Natural Resources Report 2025
TGNs	Technical Guidance Notes
UKCP	UK Climate Projections
UNFCCC	United Nations Framework Convention on Climate Change
WTT	Well-To-Tank

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 23 Risk of Major Accidents and Disasters

1 Risk of Major Accidents and Disasters

1.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the expected effects of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) deriving from the vulnerability of the Proposed Development to risks of major accidents and/or disasters.

Based on professional judgement, major accidents or disasters are events or situations that have the potential to affect the Proposed Development causing immediate or delayed serious damage to one or more of the following: human health, welfare, and/or the environment. This assessment considers the risks of major accidents and disasters (hereafter referred to as major events) during construction and operation caused by natural hazards or manmade hazards (including operational failure).

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description
- Chapter 11: Water Quality;
- Chapter 12: Flood Risk;
- Chapter 19: Transportation
- Chapter 15: Air Quality

These chapters provide a broader environmental context to the risks associated with these event types. These chapters also outline the proposed measures to prevent or mitigate significant effects and details of the preparedness for, and proposed response to emergencies.

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

1.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide a high-level assessment of the expected significant adverse effects of the Project deriving from major accidents and disasters. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 23.8);
- Identifies any limitations encountered in compiling the environmental information;

- Presents a high-level impact assessment of the demolition, construction and operation phases of the Proposed Development based on the information gathered and the analysis and assessments undertaken in section 23.9.
- Highlights any necessary monitoring (section 23.10) and/or measures to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment.

1.3 Study Area

1.4 Policy Context

The consideration of risk of major accidents and/or disasters has followed the overall methodology and guidance relating to the EIA process and preparation as set out in Chapter 4 EIA methodology. This section summarises the legislation, policy, and guidance applicable to the major events assessment.

1.4.1 EU legislation and policy

The EIA Directive 2014/52/EU sets out the requirements to consider the vulnerability of a project (or Development) to either major accidents or disasters. The Directive requires

"a *high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment."*

Reg 5(2) and (3) of the EIA Regs:

5(2) The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the proposed development on the following factors —

(a)population and human health;

(b)biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(16) and Directive 2009/147/EC(17);

(c)land, soil, water, air and climate;

(d)material assets, cultural heritage and the landscape ; and

(e)the interaction between the factors referred to in sub-paragraphs (a) to (d).

(3) The effects referred to in paragraph (2) on the factors set out in that paragraph shall include—

(a)the operational effects of the proposed development, where the proposed development will have operational effects; and

(b)the expected effects deriving from the vulnerability of the proposed development to risks of major accidents or disasters that are relevant to the proposed development.

Schedule 4 para 5 of the EIA Regs –

5. A description of the likely significant effects of the development resulting from, inter alia:…

(d)the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);…

The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development…

Schedule 4 para 8 of the EIA Regs:

8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks to major accidents and/or disasters which are relevant to the development concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of the Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

1.4.1.1 European Union Guidance 2017 – Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)

The ‘European Union Guidance 2017 - Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report’ provides useful guidance on the key changes from Directive 2011/92/EU as amended by Directive 2014/52/EU specifically Annex IV point 8. It states that two key considerations relating to major events emerge under the new directive:

- The Project’s potential to cause either accidents or disasters or both; and,
- The vulnerability of the Project to either potential disasters or accidents or both.

The guidance goes on to state that, after risks have been identified and assessed, measures to control and manage their significant impacts should then be taken, to ensure compliance with existing minimum prevention standards, safety requirements, building codes and improved land

use planning, as well as others. It also states that measures should be captured in a coherent risk management plan that also includes sufficient preparedness and emergency planning measures.

1.4.1.2 Institute of Environmental Management and Assessment (IEMA), Major Accidents and Disasters in EIA: A Primer, September 2020

This primer from IEMA aims to increase appreciation of the major accidents and/or disasters EIA topic and its application. The document suggests an assessment methodology based on known current practice within the UK to date and identifies key terminology that can be used. It has been structured around a typical assessment approach and offers a proportionate method for considering major accidents and/or disasters through screening, scoping and assessment. Reference has been made to this document and the advice contained within in it in this Chapter.

1.4.2 National Legislation and Policy

1.4.2.1 Health and Safety at Work Act 1974

The Health and Safety at Work etc. Act 1974 provides the framework for the regulation of workplace health and safety in the UK. It places general duties on employers, people in control of premises, manufacturers, and employees. The overriding principle is that foreseeable risks to persons will be reduced so far as is reasonably practicable and that adequate evidence will be produced to demonstrate that this has been done, including:

- Securing the health, safety, and welfare of persons at work.
- Protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons at work.
- Controlling the keeping and use of explosive or highly flammable or otherwise dangerous substances, and generally preventing the unlawful acquisition, possession, and use of such substances.

1.4.2.2 Defra (2011) 'Guidelines for Environmental Risk Management Assessment and Management

The Defra (2011) 'Guidelines for Environmental Risk Assessment and Management' provide generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is provided which identifies four main components of risk assessment:

1. Formulating the problem

2. Carrying out an assessment of the risk

3. Identifying and appraising the management options available

4. Addressing the risk with a risk management strategy

1.4.2.3 Construction (Design and Management) Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM Regulations) place legal duties on almost all parties involved in construction work. The regulations place specific duties on clients, designers and contractors, so that health and safety is considered throughout the life of a construction project from its inception to its subsequent final demolition and removal.

Under the CDM Regulations, designers must avoid foreseeable risks so far as is reasonably practicable by: eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.

1.4.2.4 The Control of Major Accidents Hazards (COMAH) Regulations 2015

The principal aim of the regulations is to reduce the risks of potential major accidents involving dangerous substances, such as toxic substances (e.g. chlorine), flammable substances (eg liquefied petroleum gas), substances that are environmentally hazardous, and explosives.

If dangerous substances re used or stored at the site in quantities above certain thresholds, COMAH requires operators to take all measures necessary to prevent major accidents and limit the consequences for human health and the environment.

A major accident could involve a release of substance, fire or explosion resulting from uncontrolled developments involving one or more dangerous substance that causes serious danger to human health or the environment, whether immediate or delayed, inside or outside the site.

As part of Scotland's competent authority, it is SEPA's duty to ensure that business and industry adhere to the regulations, and to investigate and report on major incidents.

1.4.2.5 The Welsh Marine Plan 2019

The Welsh National Marine Plan was published in 2019 with the vision that Welsh seas are clean, healthy, safe, productive and biologically diverse. The Plan sets out areas of potential sector resource around the coastline identifying Fishguard as an aquaculture: water column area.

General Policy SOC 03 to ensure a strong, healthy and just society seeks that developments minimise the risk of causing or contributing to marine incidents. This policy relates the non-diffuse, point sources of pollution such as oil or chemical sills and focuses on activities that involve the use, transportation or storage of fuels in the marine environment (whether operationally or as part of

construction, maintenance or decommissioning). Proposals should consider the inherent risks of causing or contributing to a major incident and act to address these where possible.

Policy SOC 08 and 09 seeks that developments demonstrate resilience to coastal change and flooding. Proposals should appropriately assess the risk of coastal change and flooding.

1.5 Consultation

No consultation responses are associated with this chapter.

1.6 Methodology to inform the baseline

1.6.1 Desktop study

Information on Natural Disasters and Accidents within the Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 1-1 Summary of key desktop reports. These sources provide the most up to date data for this assessment.

Table 1-1 Summary of key desktop reports.

Title	Source	Year
British Geological Survey (BGS)	National Landslide Database	2020
Review of 2024: Multiple records broken in a year of mixed weather	Met Office	2024
Stena Line Fishguard – Rosslare timetable	Stenaline	2025
Public Information on establishments subject to COMAH 2015	Health & Safety Executive	2015
South Wales Gas Pipeline	www.Offshore-technology.com	2008

1.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for major accidents and disasters. The baseline data presented in this section is derived from the above sources and may be taken as representative of the background conditions.

1.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology Impact assessment criteria and as set out in Major Accidents and Disasters in EIA: A Primer (IEMA, 2020).

A methodology was adopted to systematically identify all potential risks, pathways for adverse effects to occur and suitable controls (for identified risks). This was broadly based on accepted technical risk assessment methods which allow the identification of risks, pathways, sensitive receptors and if required barriers/controls to mitigation risk to an acceptable level.

A review was undertaken of baseline conditions to identify existing facilities or natural features or scenarios (such as flooding) which could lead to risk events with associated major accident or hazard in combination with the Proposed Development. These developments were then screened to identify if any specific risk events required further consideration. This process also identified those, which could be screened out as not having a significant risk to retained proportionality and focus within the assessment.

The screening process considers if the risk event has a pathway and receptor so that if it occurred it would be expected to result in significant effects. Scoping was undertaken in more detail to determine whether there is potential for significant effects as a result of major accidents and disasters. The assessment stage provides further understanding on the likelihood of a risk event occurring and identifies the requirement for further mitigation.

1.7.1 Impact Assessment

Unlike other assessment within the EIA, the assessment does not deal with likely effects. The scope of this assessment focuses on potential events of low likelihood, which may reasonably occur, resulting in major negative impacts on receptors. This approach directs the assessment to focus on ‘low likelihood but potentially high consequence events’ such as a major spill, explosion or fire. Smaller incidents (spills, sediment loss) are addressed elsewhere in this EIA in the relevant topic chapters. This chapter focuses on major events only.

The IEMA (2020) approach defines a ‘*significant environmental effect’* as one which ‘*could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through major clean up and restoration’*.

The assessment then considered what activities could result in an adverse impact during construction / operation/ decommissioning and what barriers or embedded mitigation are in place to prevent the source pathway receptor risk from occurring. Finally, the assessment sought to identify

any 'escalation factors' which could compromise the integrity of embedded mitigation and therefore any significant residual risks and accordingly the need for further mitigation / monitoring.

This assessment does not explicitly consider the decommissioning stage of the Proposed Development on the basis that the assessment of construction stages effects (and the need for any mitigation) effectively forms a more conservative scenario.

1.7.2 Sensitivity of Receptor

The environmental receptors are identified as those listed within Article 3 of the EIA Directive.

1.7.3 Magnitude of Impact

In the context of this chapter, typical methods employed within EIA to define magnitude are not applicable. By definition, a major accident or disaster would be a significant effect on the environment. Accordingly, any risks that could result in a major accident or disaster without suitable mitigation, management or regulatory controls in place will be assessed as significant.

1.7.4 Significance of Effect

Following screening and scoping, the potential risk of identified hazards brought forward into the assessment are then evaluated using criteria outlined in Table 23.2 Classification of Likelihood of Occurrence, Table 23.3 Consequence of Impact and Table 23.4 Risk Matrix, which have been adapted from the following:

- National Risk Register 2025[1] (Cabinet Office, 2025); and
- Major Accidents and Disasters in EIA: A Primer (IEMA 2020)

Table 23.2 Classification of Likelihood of Occurrence

Score	Percentage Change	PHIA Yardstick Designation
1	<0.2%	Remote chance (0-5%)
2	0.2-1%	

[1] National Risk Register 2025 - GOV.UK

3	1-5%	
4	5-25%	Highly unlikely (5-25%)
5	>25%	Almost certain (95-100%) Highly likely (80-90%) Likely or probable (55-75%) Realistic probability (40-50%) Unlikely (25-35%)

Table 23.3 Consequence of Impact

Rating	Classification of Potential Impact (Cabinet Office, 2023)	Significance of Effects (IEMA 2020)	Description
1	Very Low Impact	Slight	Fatalities - 1-8 Casualties - 1-18 Economic cost - Millions of £
2	Low Impact	Moderate	Fatalities - 9-40 Casualties - 17-80 Economic cost - Tens of millions £
3	Moderate Impact	Significant	Fatalities - 41-200 Casualties - 81-400 Economic cost - Hundreds of millions £
4	High Impact	Very Significant	Fatalities - 201-1,000 Casualties - 400-2,000

			Economic cost - Billions of £
5	Very High Impact	Profound	Fatalities - >1,000 Casualties - >2,000 Economic cost - Tens of Billions £

Hazards scoped in are evaluated and categorised using a risk matrix, developed using the approach and information outlined in both the national risk assessment documents, provisions outlined in the IEMA primer, and the National Risk Register 2025.

This matrix is used to determine the level of significant of each risk for each hazard scenario. Risks have been grouped in three categories outlined in Table 23.4 Risk Matrix, red refers to 'high risk' scenarios that have an assessment score between 15 – 25, orange refers to 'Medium Risk' scenarios that score between 8 – 12, and green refers to 'Low Risk' scenarios scoring between 1 – 6.

Table 23.4 Risk Matrix

Likelihood	**Consequence of Impact**					
		1 – Slight	**2 – Moderate**	**3 – Significant**	**4 – Very Significant**	**5 – Profound**
	5 – Very Likely	5	10	15	20	25
	4 – Likely	4	8	12	16	20
	3 – Unlikely	3	6	9	12	16
	2 – Very Unlikely	2	4	6	8	10

	1 – Extremely Unlikely	1	2	3	4	5

1.8 Baseline Environment

1.8.1 Context

Major accident and disaster risk relevant to the baseline in the absence of the Proposed Development include incidents involving natural gas, extreme weather events, associated flooding, road traffic collisions and accidental spillages. Baseline 'without project' conditions are described in the relevant chapters as follows Chapter 11 Water Quality, Chapter 12 Flood Risk & Drainage, Chapter 22 Climate and Chapter 19 Traffic & Transportation and are not repeated in this chapter in full.

1.8.2 Baseline Conditions

A review was undertaken of baseline conditions to identify existing facilities or natural features or scenarios (such as natural gas or flooding) which could lead to risk events with associated major accident or hazard in combination with the Proposed Development. These developments were then screened to identify if any specific risk events required further consideration. This process also identified those, which could be screened out as not having a significant risk to retained proportionality and focus within the assessment.

The baseline assessment sought to identify features (or sources of risk) within the existing environment that could be sources for major accidents and hazards comprising:

- local features external to the order limits that contribute a potential source of hazard to the Proposed Development;
- existing infrastructure and the built environment;
- baseline major accident and natural disaster risks (that exist with or without the Proposed Development).

The wider EIA topic baselines have been used to consider sensitive receptors at risk from the effects of the Proposed Development deriving from its vulnerability to major accidents or disasters for instance:

- members of the public and local communities;

- the natural environment, including ecosystems, land and soil quality, air quality, surface and groundwater resources and landscape.

The main risk sources identified have been divided into the following categories:

- Existing infrastructure and facilities (on both how they may impact the Proposed Development and how the Proposed Development may impact them); and,
- Wider natural disaster and hazard risks – for instance flood risk.

1.8.2.1 Existing Environment

The land is within the existing harbour of Fishguard comprising approximately 5.4 hectares of the harbour to include an existing linkspan/pontoon, hinterland and within the bay foreshore. The Port was originally created in the 1910's by reclaiming land at the base of the headland and is enclosed by steep cliff faces. The harbour itself includes a breakwater, a RNLI Lifeboat station and pontoon for Stena line public and freight ferry for a twice daily service to Rosslare, Ireland and the Fishguard train station. The berth is also infrequently used by cruise vessels and historic steamboats. The site is accessed from the A40/Station Hill to the south.

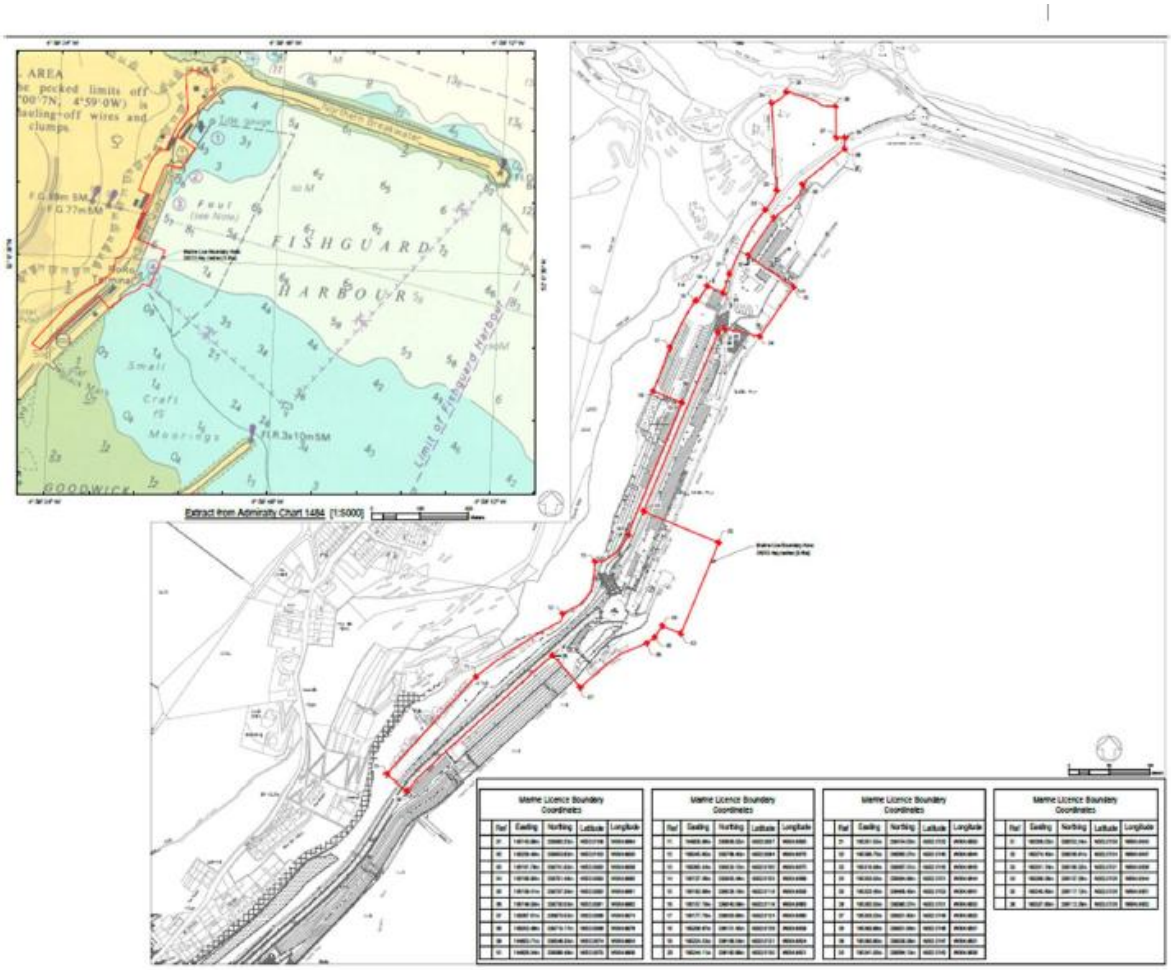

Figure 1-1 Site Location

1.8.2.2 COMAH Establishments

In Wales, the COMAH Regulations 2015 place an obligation on the operators of establishments that store, handle or process dangerous substances above certain thresholds to take all necessary measures to prevent major accidents and to limit the consequences for human health and the environment. Under the Regulations, a COMAH establishment may qualify as upper tier or lower tier, depending on the inventory of dangerous substances; sites that store, handle or process dangerous substances below a certain threshold do not qualify as establishments under the Regulations.

Lower Tier Establishment means an establishment where a dangerous substance is present in a quantity equal to or in excess of the quantity listed in the entry for that substance in *"column 2 of Part 1 or in column 2 of Part 2 of Schedule 1, but less than that listed in the entry for that substance in column 3 of Part 1 or in column 3 of Part 2 of Schedule 1, where applicable using the rule laid down in note 4 of Part 3 of that Schedule".*

There are no COMAH establishments located within 3km of Fishguard Harbour. There are 5 top tier COMAH sites located in Pembrokeshire,

Table 23.5 COMAH Establishments

Name	Tier	Location	Approx. Distance from Proposed Development
Puma	Upper Tier	Milford Haven	37km
Valero	Upper Tier	Pembroke	55km
Valero Pembrokeshire Oil Terminal	Upper Tier	Waterson	36km
Dragon LNG	Upper Tier	Waterson	36km
South Hook LNG	Upper Tier	Herbranston	38km

1.8.2.3 Offshore Infrastructure

There are no offshore gas pipelines directly linked to the Proposed Development location.

1.8.2.4 Onshore Infrastructure (built)

The South Wales gas pipeline owned by National Grid plc is 316km long stretching from Milford Haven approximately 37km to the south of the Proposed Development, to Tirley in Gloucestershire.

1.8.2.5 Shipping and Navigation

The existing harbour serves the south-west of Wales and is owned by Stena Line and Pembroke Council. Stena Line ferry terminal provides passage to Rosslare in Ireland. The harbour is also used by the RNLI who have a lifeboat station located on the quay, at the northern breakwater. Alongside the ferry route there are ad hoc cruise vessels frequenting the harbour.

Table 6 Indicative Cruise Vessel Programme

Fishguard Cruise Schedule – 14th January 2026

	Name of Ship	Line	Agents	Arr Date	Dep Date	Arr Time	Dep Time
1	AIDAluna	Aida	ISS	15 April 2026	15 April 2026	07:00	15:30
2	Le Laperouse	Ponant	GAC	19 April 2026	19 April 2026	07:00	17:30
3	Le Laperouse	Ponant	GAC	30 April 2026	30 April 2026	08:00	18:00
4	Ovation	Seabourn	Denholms	06 May 2026	06 May 2026	08:00	18:00
5	AIDAsol	Aida	ISS	21 May 2026	21 May 2026	07:00	15:30
6	L'Austral	Ponant	GAC	24 May 2026	24 May 2026	12:00	23:00
7	AIDAluna	Aida	ISS	24 May 2026	24 May 2026	08:00	18:00
8	Silver Spirit	Silverseas	Denholms	30 May 2026	30 May 2026	08:30	18:30
9	Marina	Oceana	Denholms	08 June 2026	08 June 2026	07:00	19:00
10	Corinthian	Grand Circle	GAC	11 June 2026	11 June 2026	09:00	19:00
11	Le Camplain	Ponant	GAC	15 June 2026	15 June 2026	09:00	19:00
12	PS Waverley	Waverley		17 June 2026	17 June 2026	12:00	22:00
13	Ovation	Seabourn	Denholms	01 July 2026	01 July 2026	08:00	18:00
14	MS Amadea	Bernhard Schulte	ISS	08 July 2026	08 July 2026	TBC	TBC
15	Corinthian	Grand Circle	GAC	19 July 2026	19 July 2026	09:00	19:00
16	Corinthian	Grand Circle	GAC	21 July 2026	21 July 2026	09:00	19:00
17	AIDAsol	Aida	ISS	23 July 2026	23 July 2026	07:00	15:30
18	Sliver Spirit	silverseas	Denholms	20 August 2026	20 August 2026	09:00	19:30
19	Corinthian	Grand Circle	GAC	28 August 2026	28 August 2026	09:00	19:00
20	Corinthian	Grand Circle	GAC	30 August 2026	30 August 2026	09:00	19:00
21	AIDAsol	Aida	ISS	03 September 2026	03 September 2026	07:00	15:30
22	My Seadream II	Seadream	Denholms	06 September 2026	06 September 2026	08:00	17:00
23	MV Nordstjernen	Nordstjernen	Vestland	08 September 2026	08 September 2026	09:00	18:00
24	Corinthian	Grand Circle	GAC	17 September 2026	17 September 2026	09:00	19:00
25	World Voyager	Atlas	Denholms	30 September 2026	30 September 2026	08:00	19:00

The Stena Line linking Wales and Ireland is operated by the vessel Stena Nordica which is a Ro-Pax ferry owned by Stena Line. The carrying capacity for this vessel is 699 passengers, 222 berths, 375 cars, 1949 lane metres and 4,768 Deadweight tonnage.

The Fishguard – Rosslare connection run with 2 crossings a day, with their timetables summarised below in

Table 23.7 Ferry Timetable

Departure	Arrival	Ferry
01:30 (Fishguard)	05:30 (Rosslare)	Stena Nordica
14:00 (Fishguard)	17:00 (Rosslare)	Stena Nordica

08:15 (Rosslare)	11:45 (Fishguard)	Stena Nordica
19:30 (Rosslare)	23:00 (Fishguard)	Stena Nordica

1.8.2.6 Natural Hazards

The future baseline for major accidents and disasters will evolve along a number of factors over the Proposed Development lifecycle. The anticipated impact on climate change on environmental conditions is considered further in Chapter 15 Air Quality and Chapter 22 Climate Change.

Climate change is predicted to lead to a number of changes including: an increase in peak rainfall intensities and resulting flood flows over time, with wetter winters and drier warmer summers; a rise in sea level. It is anticipated that there will be an increased frequency of lightning strikes and wind gusts. Climate change is expected to alter the prevalence of extreme weather conditions which could lead to disaster during different project phases (e.g. increased wind gusts impacting the construction phase or increased lightning strike frequency increasing risks during the operation and maintenance phase).

The magnitude of changes brought about by climate change is uncertain, but UK climate projections (UK CP18) are available until the end of the 21st century.

The effects of climate change on anticipated weather conditions within the construction phase are anticipated to be minimal.

There could be changes in land or water use in the surrounding environment; water use and climate change factors could impact the local ecology and associated environmental designations. These changes are anticipated to be gradual in nature and as there is minimal potential for major accidents during the all-project phases, this is unlikely to have a significant impact.

Wales's geographic position means it is less vulnerable to extreme disasters and hazards such as earthquakes or tsunamis, which might pose risk to projects/schemes of this nature and scale in other locations. However, in recent times there has been an increase in the number of severe weather events in the country, particularly those leading to flooding and flash flood incidents.

The effects of these weather events are wide ranging and include heavy rainfall resulting in flooding (pluvial, fluvial and coastal), damaging gusts due to violent winds, periods of extreme heat

resulting in gorse fires, roads melting, hose pipe ban, impact on delivery of services, and extreme cold resulting in extreme frost conditions and heavy snowfall in locations across the county.

Substantial development of technology during the lifetime of the Proposed Development is anticipated. This could include advances in power generation, power transmission, and decommissioning/maintenance techniques. These may reduce the risk posed to safety and the environment further. However, changes in technology may also introduce new hazards that would need to be managed at the appropriate time and through the appropriate process.

The framework in place is based upon risk assessment and risk management principles which are flexible and adaptable to changing context and environmental factors but will ensure that the risk of major accidents and disasters is reduced as low as reasonably practicable. Other potential extreme natural hazards such as earthquakes, volcanoes, tsunamis, etc. are not relevant to the baseline hazard conditions in the vicinity of the Proposed Development.

1.8.2.7 Extreme Weather Events

Wales has already experienced changes in climate, and these are projected to continue and intensify. Extreme weather is typically categorised as a weather event that significantly differs from usual or average weather patterns. The term “storm” is typically applied to severe atmospheric events, currently, however, there is no official meteorological definition.

Met Office records show that these events are becoming more frequent, with notable extreme events affecting Wales during 2024 as outlined in below in Table 23.8 Extreme Weather Events

Table 23.8 Extreme Weather Events

Event	Date	Impact
Storm Éowyn	January 2025	High wind speeds
Storm Claudia	November 2025	Heavy rainfall
Storm Bram	December 2025	Strong winds and heavy rainfall
Storm Goretti	January 2026	Damaging winds
Storm Chandra	January 2026	Heavy rainfall

Details on historic extreme weather events and their impact is considered further in Chapter 22 Climate Change.

1.8.2.8 Flooding

Fishguard/Goodwick are small towns on the shores of the Irish Sea. The are is located within the Pembrokeshire County Council and in proximity to the Pembrokeshire Coast Park. The main source of flooding is coastal flooding, however there are also risks from river and surface water flooding. Further details on flood risk and its impact is considered further in Chapter 12 Flood Risk.

1.8.2.9 Geohazards

Using the British Geological Survey (BGS) National Landslide Database, no landslides have been recorded in close proximity to the Proposed Development site. The nearest landslide event recorded was between Carmarthan and Fishguard Harbour in 2015. The trigger of this geohazard event is unknown. The environs of the Proposed Development is not considered to be at risk from geohazards such as landslides and Wales in general is not prone to seismic activity.

1.9 Impact Assessment

1.9.1 Do Nothing Scenario

With respect to the risk of major disasters and/or accidents, the ‘Do nothing’ scenario means that there are no changes to existing infrastructure or utilities as a result of the Proposed Development. Therefore, there would be a Neutral impact on the risk of major disasters and/or accidents under the ‘Do Nothing’ scenario.

1.9.2 Assessment of Construction Effects

Major accidents and disasters to which the Proposed Development may be vulnerable during construction and the outcomes of the assessment are summarised in each specific ‘area’ of the Proposed Development has been considered, both separately and together.

Site clearance and structures to be demolished in shown below in

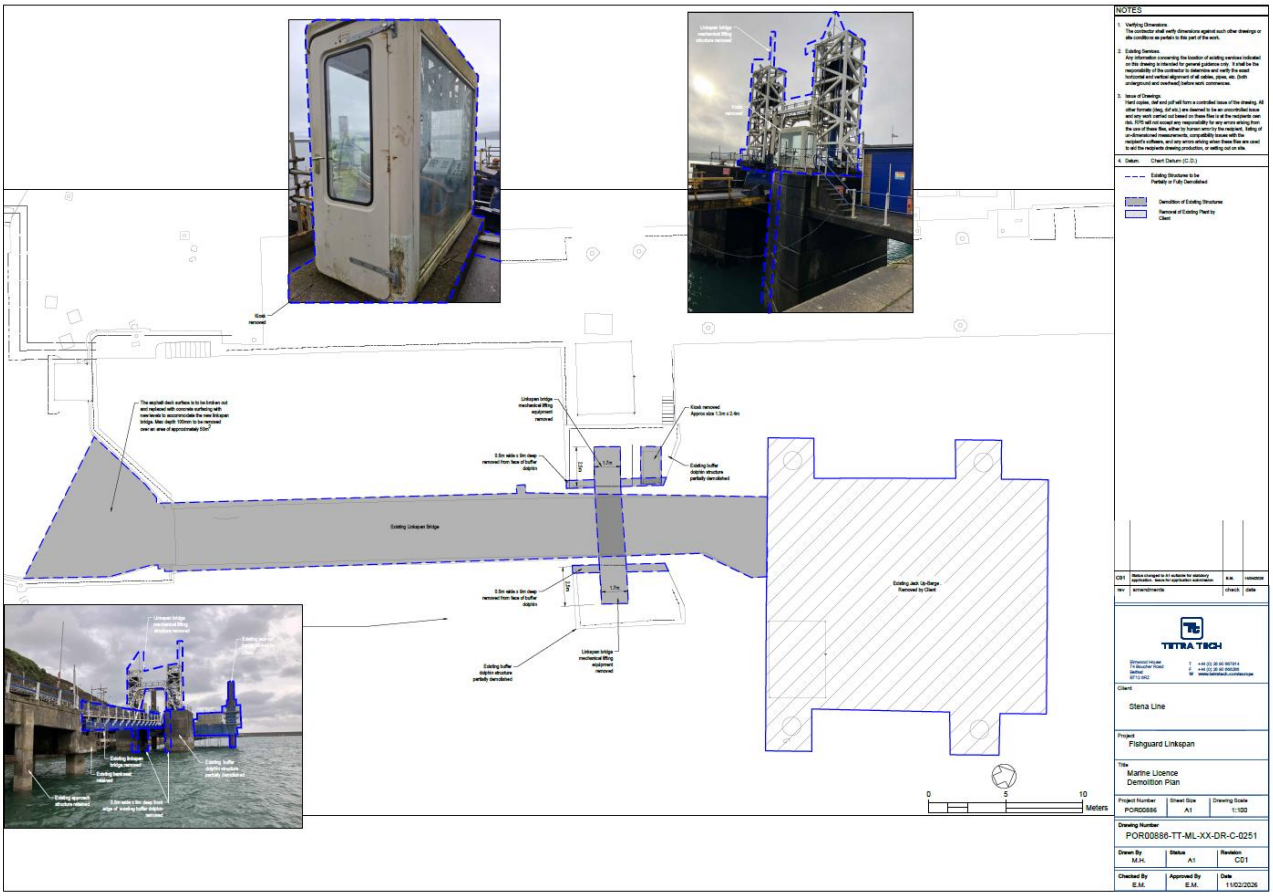

Figure 1-2 Site clearance and demolition.

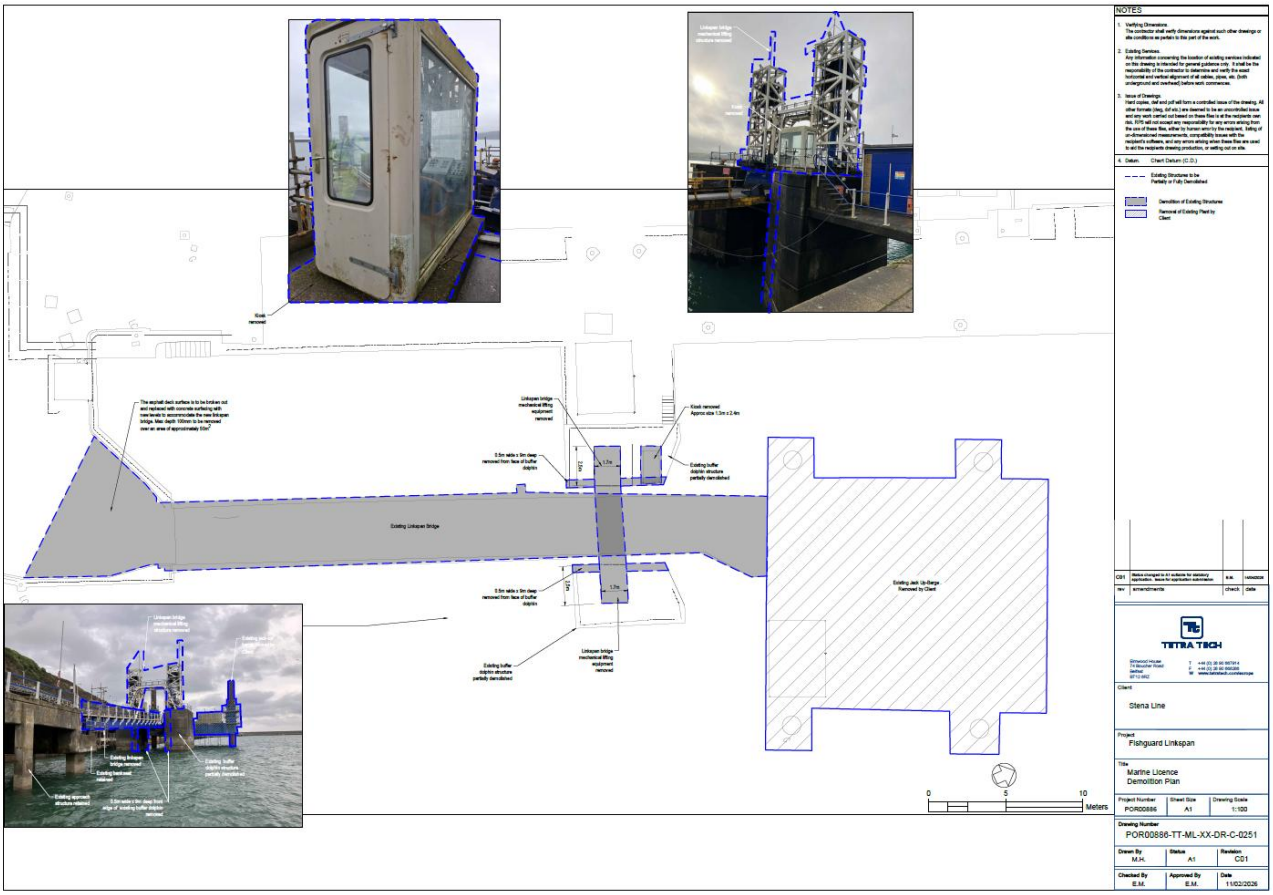

Figure 1-2 Site clearance and demolition

All risk events identified have been considered, but only those, which could impact a receptor and have the potential to be a major accident or disaster, have been included in the assessment. These are presented in Table 23.9 Construction Phase screening, risk events and mitigation and management measures.

Table 23.9 Construction Phase screening, risk events and mitigation and management measures

Feature	Source of Hazard	Consequence	Embedded Mitigation & Risk Management	Additional recommendation to reduce risk further	Risk Evaluation Likelihood	Potential Impact	Level of significance
Building Infrastructure	Construction plant collision risk or incidents during the process. Extreme weather has potential to impact construction.	Potential for injuries / fatality	Follow appropriate health and safety construction method statements. Employment of approved contractor (s). Construction will not be undertaken where weather warnings are in pace affecting Fishguard.	Further health and safety measures relating to construction plant are outlined in Appendix 2.A OCEMP.	3	1	3 – Low
Additional HGV traffic on road network	Additional HGV traffic mixing with other road users.	Potential injury or fatality to a member of the public	Traffic Management Plans if required for specific busy times during delivery or other sire activities. Assessment of Transport is provided in Chapter 19 of the EIA.	No further requirements	3	2	6 – Low

Flood Risk	Presence of construction materials, equipment and potential contaminants.	Potential release of contaminants onto environmental receptors (for instance surface water (rivers) or ground water) outside construction site	Mitigation measures will be adopted as set out in the Outline CEMP. An emergency response plan for the construction phase to minimise the consequences should the risk occur – this is set out in the CEMP and will be adopted by the appointed contractor. Please refer to Appendix 2.A Outline CEMP	No further requirements	2	3	6 – Low
Release of Pollutants into water bodies, water supply and sensitive ecological receptors	Proximity to Sea and Dredging.	Accidental spillage or release or contaminated materials, or sediment laden run off; effecting sea.	To minimise spillages all oils, solvents, paints and other potential contaminates used during construction will be stored within suitably designed bunded areas. All chemical and fuel filling locations will be contained within bunded areas. On site facilities including surface and foul	No further requirements	2	3	6 – Low

			water collection will be designed and provided at both site compounds to manage surface water and foul water arising from the compounds.				
Utilities – Risk of striking watermains supply	Construction ground works	Potential minor injury for nearby personnel and potential displacement of local residences and business in the event of flooding. Potential to disrupt water supply. Clean mains water supply so no potential for contamination.	Mitigation by avoidance will be the primary mitigation measure during the construction and operational phase of the Proposed Development. This will be applied to avoidance of utilities such as underground services and pipes. Construction will be made with utility providers to determine the location of services prior to commencement of works.	No further requirements	2	2	4 – Low

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Existing foul and storm water and existing combined sewer infrastructure	Incidents during construction ground works. Contractor error.	Potential release of contaminants onto environmental receptors (for instance surface water (rivers) or ground water) or sea water outside construction site	An Ecological Clerk of Works (EcoW) should be employed to provide advice both pre-construction and during construction in relation to relevant legislation relating to proposed works to provide advice on the timing of works and the implementation of mitigation and enhancement measures; to monitor identified works; and to produce site inspection reports. In accordance with BS 42020:2013 Biodiversity, and EcoW is a person who has the qualifications, training, skills, and relevant experience to undertake appropriate monitoring and to provide specialist advice	No further requirements	2	2	4 - Low

			to site personnel on the necessary working practises required to safeguard ecological features on site and to aid compliance with any consents and relevant wildlife legislation (BSI 2013).				
Shipping and Navigation Collision: risk of physical impacts from other existing navigation and shipping vessels (collision/Allison)	Other navigational and shipping vessels operating in the area	Physical damage to project vessels and infrastructure. Potential significant impact on water quality through fuel/chemical loss and subsequent impact on biodiversity.	Promulgation of information and warnings through Notice to Mariners and other appropriate Maritime Safety Information (MSI) dissemination methods. Project to undertake vessel traffic monitoring for all Project-related vessels throughout all phases of the Project. Safety zones and rolling advisory clearance distances to be implemented during	Adherence to Stena Lines existing vessel and navigational management.	2	3	6 - low

		Potential for loss of life or serious injury.	construction, decommissioning and major maintenance activities.				
Asbestos	Presence of asbestos in the building fabric	Potential risk to human health	Take reasonable steps to determine the location of materials likely to contain asbestos. Presume materials to contain asbestos, unless there are good reasons not to do so. Make and maintain a written record of the location of asbestos and presumed asbestos materials. Monitor the condition of asbestos and presumed asbestos materials. Assess the risk of exposure from the asbestos and presumed asbestos materials and document the actions necessary to manage the risk.	No further requirements	2	3	6 – low

1.9.3 Assessment of Operational Effects

Major accidents and natural disasters to which the Proposed Development may be vulnerable during operation (and maintenance) and the outcomes of the assessment are summarised in Table 23.10 Operational Phase Screening, Risk Events and Mitigation and Management Measures.

Each specific ‘area’ of the Proposed Development has been considered.

The table also includes the management and mitigation measures embedded in the Proposed Development to reduce these risks to as low as reasonably practicable. In all cases, compliance with legal and regulatory requirements is assumed as outlined in the embedded mitigation section.

Table 23.10 Operational Phase Screening, Risk Events and Mitigation and Management Measures

Feature	Source of Hazard	Consequence	Embedded Mitigation & Risk Management	Additional recommendation to reduce risk further	Risk Evaluation Likelihood	Potential Impact	Level of significance
Flood Risk	Extreme weather events	Potential damage to asset	Mitigation measures are required to ensure there is no increased risk to flooding to the Proposed Development or elsewhere once constructed.	No further requirements. Further detail in Chapter 12 – Flood Risk	2 – remote chance	3 – significant	6 – Low
	Land use has potential to increase flood patterns in area	Potential secondary effects on off-site environmental or anthropogenic receptors	Mitigation measures are required to ensure there is no increased risk of flooding to the Proposed Development or elsewhere once constructed.		2 – remote chance	3 – significant	6 – Low

Asset Failure	Risk of lightning strike leading to asset damage, including electrical failure, and potential subsequent fires/explosions.	A lightning strike could pose a major accident, harm to people and damage the infrastructure. A lightning strike could damage the distribution network, leading to damage to the national electricity transmission system. Lightning could also present a source of ignition to flammable materials. A subsequent major fire could harm people both offsite and onsite.	The engineering design of the Proposed Development will include appropriate electrical bonding and earthing systems. The design and maintenance of these systems will reduce the likelihood of a major accident being initiated by a lightning strike to a very low level.	Guidance is provided by the HSE on the management of potential ignition caused by lightning (HSE, 2014)	2 – Remote chance	3 – Significant	6 – Low
Navigation and shipping	Other navigation and	Physical damage to project vessels and	Project to undertake vessel traffic	No further requirements	2 – Remote chance	3 – Significant	6- Low

Collision: risk of physical impacts from other existing navigation and shipping vessels (collision/Allision) impacting on all phases	shipping vessels operating in the area	infrastructure. Potential significant impact on water quality through fuel/chemical loss and subsequent impact on biodiversity. Potential for loss of life or serious injury.	monitoring for all Project related vessels throughout all phases of the project. Safety zones and rolling advisory clearance distances to be implemented during major maintenance activities. Marker buoys and other aids to navigation. Development of an Emergency Response Cooperation Plan	Adherence to Stena Lines existing vessel and navigational management			

1.10 Mitigation – Construction/Operational and Future Monitoring

The assessment provided above has concluded that with the implementation of the measures included in the development (i.e. designed in and management measures, being the replacement of the existing linkspan pontoon or regulatory or industry standard practise requirement), that the development's vulnerability to risks of major accidents and/or natural disasters will not result in significant adverse effects on the environment. Therefore, no further measures are proposed.

1.11 Assessment of Residual Effects

There needs to be a general acceptance when conducting a major accident and/or disasters assessment that some risks, however unlikely, may still occur. Mitigation is therefore identified pre-event and post event to reduce the effects to an acceptable level. For those risks that cannot be completely designed out, emergency plans are available to provide the response in order to minimise the significance of any impacts. It is considered that there will not be any likely significant environmental effects arising from the vulnerability of the Proposed Development to major accidents and natural disasters, please refer to the Impact Assessment Section of this chapter for the assessment of effects.

1.12 Cumulative Effects

It is importance to consider effects, not just in isolation, but also cumulatively, as this may show that individually analysed impacts can become significant when they are added together, or with, other effects. The co-existence of impacts may increase or decrease their combined impact. Impacts that are considered to be insignificant, when assessed individually, may become significant when combined with other impacts. Cumulative effects can occur at different temporal and spatial scales. The spatial scale can be local, regional or global, while the frequency or temporal scale includes past, present, and future impacts on specific environment or region. Other projects can cumulatively increase the use of road network (both during construction and operational phases) but the management and control of the risk of accidents within this context is controlled by the design standards of the road and the governing authority (Transport for Wales).

There are no developments in close proximity that are considered to have a cumulative relationship with the Proposed Development. In summary, when considering the Proposed Development in combination with other proposed and consented developments within 5km of the Proposed Development, there will be no significant cumulative impacts.

1.12.1 In-combination effects

Future projects of large scale would need to conduct an EIA to ensure that there are no significant impacts as a result of the development.

1.12.2 Effects interactions

The EIA Regulations require that the EIA identifies , describes , and assesses the direct and indirect significant effects of the Proposed Development on population and human health, biodiversity, land, soil, water, air and climate, materials assets, cultural heritage and landscape and the interaction between these factors, arising from the vulnerability of the Proposed Development, there are interactions with Chapter 11 Water Quality, Chapter 12 Flood Risk, Chapter 22 Climate and Chapter 19 Traffic and Transport and Chapter 8 Marine Ecology. This is set out in Chapter 25: Interactions.

1.13 Limitations of the Assessment

The data used is the most up to date available information which can be obtained from the applicable data sources as cited. It is therefore considered that the data employed in the assessment is robust and sufficient for the purposes of the assessment presented. It is, considered that the information available provides a suitable basis for describing the baseline environment in relation to major accidents for EIA purposes.

1.14 Summary of Effects and Conclusion

Environmental effects associated with unplanned events that do not meet the definition of major accidents and/or natural disaster (e.g. minor leaks and spills that may be contained within construction sites) are addressed in the topic Chapters and not in this chapter.

1.15 References

- EIA Directive 2014/52/EU;
- European Union Guidance 2017 - Environmental Impact of Project Guidance on the preparation of the Environmental Impact Assessment Report';
- Institute of Environmental Management and Assessment (IEMA), Major Accidents and Disasters in EIA: A Primer, September 2020;
- Health and Safety at Work etc. Act 1974;
- Defra (2011) 'Guidelines for Environmental Risk Assessment and Management';
- The Construction (Design and Management) Regulations 205 (CDM Regulations);

- The Control of Major Accidents Hazards (COMAH) Regulations 2015; and
- The Welsh Marine Plan 2019
- National Risk Register 2025[2] (Cabinet Office, 2025);

[2] National Risk Register 2025 - GOV.UK

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 24 Shipping and Navigation

24 Shipping and Navigation

24.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as “the Proposed Development”) on shipping and navigation and the vulnerability of the Proposed Development to shipping and navigation factors. This chapter considers the potential impacts on shipping and navigation from the Project during the construction and operational phases of the Proposed Development.

The main objectives of this assessment are to:

- Undertake a desktop study of the existing shipping and navigation patterns to assess current environmental baseline conditions locally and nationally;
- Assess the potential impact of the proposed construction and operation phases of the Proposed Development on shipping and navigation; and
- Recommend mitigation measures in relation to the proposed construction and operational and phases, if necessary, and predict residual impacts.

The assessment presented is informed by the following key chapters of the ES

- Chapter 2: Project Description

Other aspects relevant to shipping and navigation are addressed in the specific chapters of the ES, namely:

- Chapter 23: Major Disasters and Accidents

The details and competencies of the specialist who prepared this chapter can be found in Chapter 1: Introduction of this ES.

24.2 Purpose of this chapter

The primary purpose of the ES chapter is to provide an assessment of the likely direct and indirect significant effects of the Project on climate. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 24.8);
- Identifies any limitations encountered in compiling the environmental information (section 24.13);
- Presents an assessment of the potential likely significant effects on shipping and navigation arising from the Proposed Development (section 24.14) based on the information gathered

and the analysis and assessments undertaken. An assessment of potential cumulative impacts is provided in section 24.12.

- Highlights any necessary monitoring (section 24.10.2) and/or measures to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (section 24.11).

24.3 Study Area

The shipping and navigation study area is considered to include water within Figure 24-1 Admiralty Chart of the Proposed Development seaward of the Mean High-Water Springs (MHWS). A wider shipping and navigation study area to consider cumulative impacts is defined as the Irish sea, including waters with 5km of the Proposed Development. This study area provides a local context to the analysis by capturing the relevant vessel routes and movements within and in proximity to the Proposed Development.

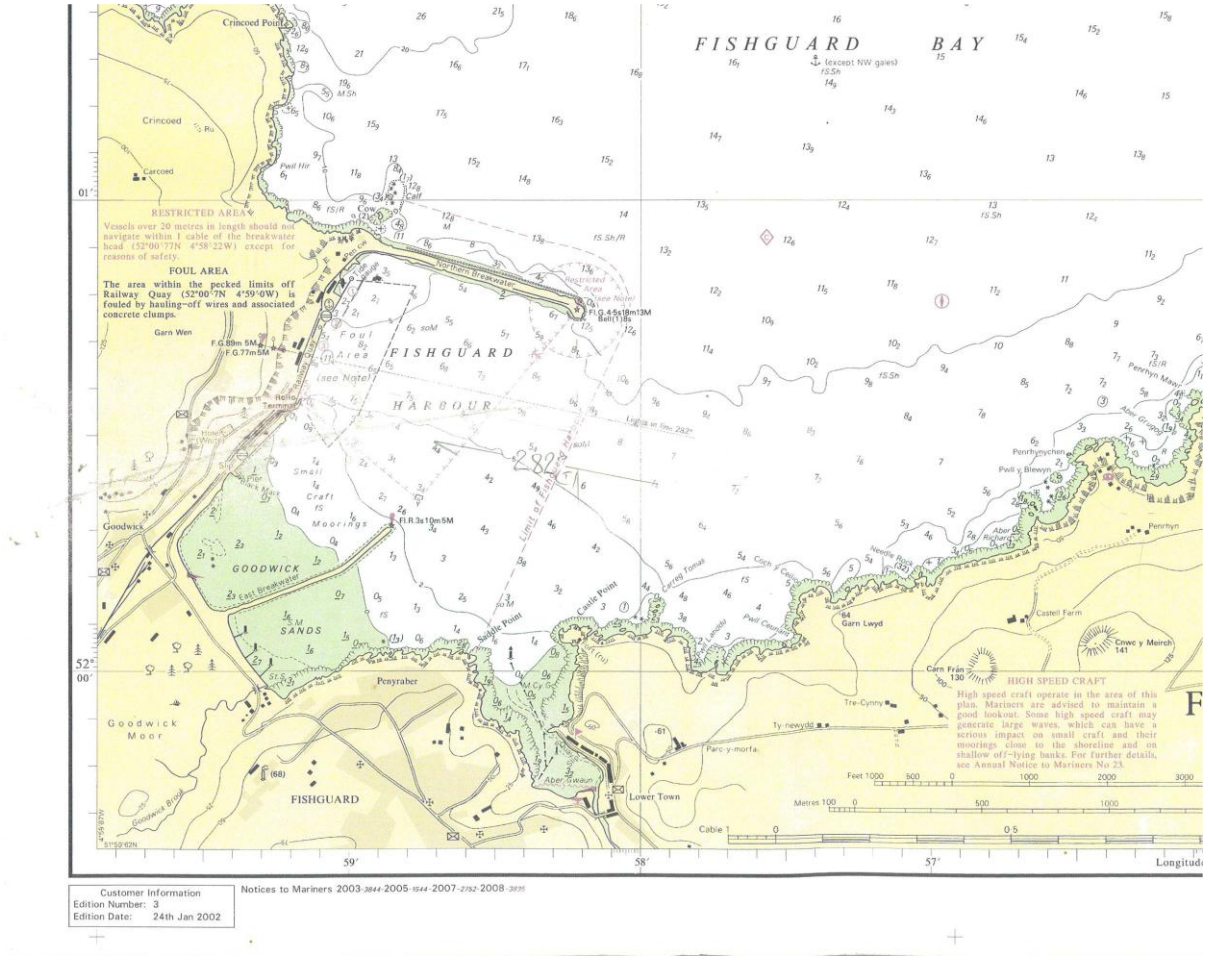

Figure 24-1 Admiralty Chart

24.4 Policy Context

24.4.1 EU legislation and Policy

- United Nations Convention on the Law of the Sea (UNCLOS) (United Nations) (UN), 1982;

24.4.2 National Legislation and Policy

- Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (International Maritime Organisation (IMO), 1972/77);
- Safety of Life at Sea (SOLAS) Chapter V (IMO, 1974)
- UK Martine Policy Statement (HM Government), 2011; and
- Wales National Marine Plan (Welsh Government)

24.5 Consultation

Table summarises the issues raised relevant to shipping and navigation, which have been identified during consultation activities undertaken to date, together with how these issues have been considered in the preparation of this ES chapter. Chapter 5: Scoping and Consultation provides details on the types of consultation activities undertaken for the Project between 5th November 2024 and 18th March 2025 and the consultees that were contacted.

Table 24-1: Summary of key consultation issues raised during consultation activities undertaken for the Project relevant to shipping and navigation.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
31.01.25	NRW PS Scoping Opinion	Requirement for shipping & navigation to be scoped in	Chapter 24 (this chapter)
31.01.25	NRW PS Scoping Opinion	Navigation Safety Plan & Vessel Management Plan	Stena Lines existing Navigational Safety and Vessel Management of Fishguard Harbour will apply

31.01.25	NRW PS Scoping Opinion	Consider impact on recreational users	Chapter 24, section 1.8 considers the baseline environment

24.6 Methodology to inform the baseline

24.6.1 Desktop study

Information on shipping and navigation within the Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in. These sources provide the most up to date data for this assessment.

Table 24-2 Summary of key desktop reports.

Title	Source	Year
Admiralty charts – Latest nautical charts for the study area	UKHO	2025
Incident Data – Locations and details of maritime accidents reported to MAIB	MAIB	
Incident Data – Locations and details of maritime incidents responded to by RNLI.	RLNI	

24.6.2 Site-specific surveys

No site-specific baseline surveys were undertaken as part of the assessment for shipping and navigation.

24.7 Assessment Methodology

The methodology and associated impact assessment had regard to the general guidance regarding the undertaking of an EIA, as presented in Chapter 4: Environmental Impact Assessment Process and Methodology.

24.7.1 Impact assessment criteria

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Chapter 4: Environmental Impact Assessment Process and Methodology.

The criteria for defining impact magnitude in this chapter are outlined in below.

Table 24-3 Definition of terms relating to the magnitude of an impact.

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

The criteria for defining receptor sensitivity in this chapter are outlined in below.

Table 24-4 Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition

High	High importance and rarity, national scale, and limited potential for substitution. Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.
Low	Low or medium importance and rarity, local scale Those affected are able to adapt with relative ease and maintain pre-impact status.
Negligible	Very low importance and rarity, local scale Those affected are able to adapt easily and maintain pre-impact status.

The significance of the effect upon shipping and navigation is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 24-5. Where a range of significance of effect is presented in Table 24-5, the final assessment for each effect is based on calculated assessment and professional judgement.

For the purposes of this assessment, any effects with a significance level of slight or less have been concluded to be not significant in terms of the EIA Regulations.

Table 24-5 Matrix used for the assessment of the significance of the effect.

Magnitude of Change	**Sensitivity of Receptor / Receiving Environment to Change / Effect**				
		High	**Medium**	**Low**	**Negligible**
	High	**Major**	**Major**	**Moderate**	Negligible
	Medium	**Major**	**Moderate**	Minor	Negligible
	Low	**Moderate**	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

24.8 Baseline Environment

List and reference baseline studies and surveys undertaken (please see notes above on correct approach to quotes/referencing).

24.8.1 Navigational Features

The Proposed Development is located at Fishguard Port. The port is owned by the Fishguard &Rosslare Railway Harbour Company, a 100% owned and controlled by Stena Line Ports Limited. The port is primarily use and business is for passenger and freight ferry services to Rosslare in Ireland, with limited other vessels such a cruise ships calling on ad-hoc base. There is a RNLI station located in the northern part of the port, away from the ferry terminal. There is no Traffic Management Systems (VTS) but a limited Local Port Services (LPS) is provided at Fishguard to disseminate information to vessels.

No aggregate extraction, oil and gas or offshore wind farm licences or proposals are identified in the study area.

24.8.2 Vessel Traffic Activities

The existing harbour serves the south-west of Wales and is owned by Stena Line and Pembroke Council.

The Stena Line linking Wales and Ireland is operated by the vessel Stena Nordica which is a Ro-Pax ferry owned by Stena Line. The carrying capacity for this vessel is 699 passengers, 222 berths, 375 cars, 1949 lane metres and 4,768 Deadweight tonnage. There were 1400 commercial vessel transits that intersected the Proposed Development footprint over a 12-month period. The Stena ferry between Fishguard and Rosslare undertakes 4 crossings (2 round trips) per day and accounts for all the commercial movements as noted above.

The Stena ferry route from Fishguard to Rosslare timetable is summarised below Table 24-6 Ferry Timetable.

Table 24-6 Ferry Timetable

Departure	Arrival	Ferry
01:30 (Fishguard)	05:30 (Rosslare)	Stena Nordica
14:00 (Fishguard)	17:00 (Rosslare)	Stena Nordica

08:15 (Rosslare)	11:45 (Fishguard)	Stena Nordica
19:30 (Rosslare)	23:00 (Fishguard)	Stena Nordica

Small craft moorings lie to the south of the site as shown in Figure 24-3 Construction area and existing slipways. There are no commercial fishing activities undertaken with the limits and no fishing is permitted within the ferry operation and proposed development area.

Alongside the ferry route there are ad hoc cruise vessels frequenting the harbour of approximately 25 per annum as shown below in Figure 24-2 Indicative Cruise Vessel Programme.

Fishguard Cruise Schedule – 14th January 2026

	Name of Ship	Line	Agents	Arr Date	Dep Date	Arr Time	Dep Time
1	AIDAluna	Aida	ISS	15 April 2026	15 April 2026	07:00	15:30
2	Le Laperouse	Ponant	GAC	19 April 2026	19 April 2026	07:00	17:30
3	Le Laperouse	Ponant	GAC	30 April 2026	30 April 2026	08:00	18:00
4	Ovation	Seabourn	Denholms	06 May 2026	06 May 2026	08:00	18:00
5	AIDAsol	Aida	ISS	21 May 2026	21 May 2026	07:00	15:30
6	L'Austral	Ponant	GAC	24 May 2026	24 May 2026	12:00	23:00
7	AIDAluna	Aida	ISS	24 May 2026	24 May 2026	08:00	18:00
8	Silver Spirit	Silverseas	Denholms	30 May 2026	30 May 2026	08:30	18:30
9	Marina	Oceana	Denholms	08 June 2026	08 June 2026	07:00	19:00
10	Corinthian	Grand Circle	GAC	11 June 2026	11 June 2026	09:00	19:00
11	Le Camplain	Ponant	GAC	15 June 2026	15 June 2026	09:00	19:00
12	PS Waverley	Waverley		17 June 2026	17 June 2026	12:00	22:00
13	Ovation	Seabourn	Denholms	01 July 2026	01 July 2026	08:00	18:00
14	MS Amadea	Bernhard Schulte	ISS	08 July 2026	08 July 2026	TBC	TBC
15	Corinthian	Grand Circle	GAC	19 July 2026	19 July 2026	09:00	19:00
16	Corinthian	Grand Circle	GAC	21 July 2026	21 July 2026	09:00	19:00
17	AIDAsol	Aida	ISS	23 July 2026	23 July 2026	07:00	15:30
18	Sliver Spirit	silverseas	Denholms	20 August 2026	20 August 2026	09:00	19:30
19	Corinthian	Grand Circle	GAC	28 August 2026	28 August 2026	09:00	19:00
20	Corinthian	Grand Circle	GAC	30 August 2026	30 August 2026	09:00	19:00
21	AIDAsol	Aida	ISS	03 September 2026	03 September 2026	07:00	15:30
22	My Seadream II	Seadream	Denholms	06 September 2026	06 September 2026	08:00	17:00
23	MV Nordstjernen	Nordstjernen	Vestland	08 September 2026	08 September 2026	09:00	18:00
24	Corinthian	Grand Circle	GAC	17 September 2026	17 September 2026	09:00	19:00
25	World Voyager	Atlas	Denholms	30 September 2026	30 September 2026	08:00	19:00

Figure 24-2 Indicative Cruise Vessel Programme

24.8.3 Marine Accidents

No unique accidents were recorded in the Marine Accident Investigation Branch (MAIB) database within 3 nautical miles of the Proposed Development. No collisions were reported.

The RLNI database identified no casualties and responded to no incidents within 1Km of the Proposed Development.

24.9 Impact Assessment

24.9.1 Do Nothing Scenario

As per EIA protocol, the likely evolution of the existing shipping and navigation within Fishguard Harbour in the absence of the Proposed Development (i.e. the 'Do Nothing Scenario') has been assessed. Given that the Proposed Development is located within an active harbour with Stena Line's existing operational ferry crossing, it is likely that this will continue under a Do Nothing Scenario, and that the current shipping arrangements will persist.

24.9.2 Assessment of Construction Effects

Impacts identified for the construction phase of the Proposed Development for shipping and navigation are listed below.

24.9.2.1 Ferry Shutdown

The existing Stena line ferry service will be temporarily shutdown for 2 months and there are no plans for alternative ferry crossings. The planned shutdown is during the low season and it is considered that customers will utilise alternative ferry crossings or means of transport or delay travel. The impact is predicted to be of short term duration, temporary, and high reversibility. It is predicted that the impact will affect the receptors (Stena Line customers on the Fishguard – Rosslare route) directly, however the overall magnitude is considered to be low. The effect will, therefore, be of tolerable adverse significance, which is not significant in EIA terms.

24.9.2.2 Risk of Physical Impacts

There is risk of physical impacts on existing navigation and shipping vessels from collision and Allison and the ferry is operational for 6 months of the construction phase. As per Chapter 2: Project Description and the contractor's methodology, these works include a phase of dredging and demolitions.

The area marked red in Figure 24-3 Construction area and existing slipways below, indicates working area during construction. The area is clear of the ferry operation and away from small boat channels from public quays and moorings to the harbour entrance. This area is on the edge of an existing prohibited anchorage area for non-ferry traffic as marked on Admiralty Chart 1484- Plans in Cardigan Bay – Fishguard Bay.

Figure 24-3 Construction area and existing slipways

The area is to be marked by two cardinal marks, to the east and south as shown in Figure 24-4 Cardinal Markers below.

Local Notice to Mariners issued by Harbour Master giving direction to keep clear of the area, promulgated to:

- Master of Ferry
- RNLI
- Fishguard Bay Yacht Club, Lower town Fishguard.
- Fishguard Rowing Club
- Port Users Group
- Posted at public slip ways as marked.

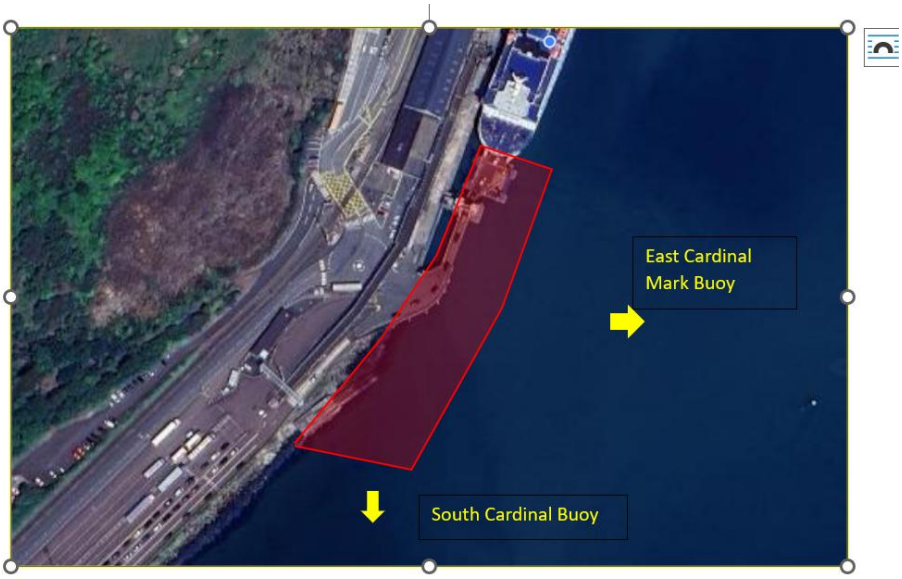

Figure 24-4 Cardinal Markers

Fishguard is a working harbour with a harbour master and existing areas prohibiting non-ferry traffic are in place. The sensitivity of the receptors therefore is considered medium due to limited other vessel movements. The magnitude of impact is predicted to be of local spatial extent, short term duration and infrequent and overall considered to be low. The significance of effect will therefore be of minor adverse significance, which is not significant in EIA terms.

24.9.3 Assessment of Operational Effects

Following construction, the existing ferry service is return to its habitual schedule of crossings.

24.10 Mitigation

24.10.1 Construction Phase Mitigation Measures

The ferry downtime is planned to coincide with low season winter months, therefore avoiding busy high season demand. Therefore, there will be no commercial vessel movements during these 2 months.

The area is clear of the ferry operation and away from small boat channels from public quays and moorings to the harbour entrance.

The area is on the edge of an existing prohibited anchorage area for non-ferry traffic as marked on Admiralty Chart 1484- Plans in Cardigan Bay – Fishguard Bay.

The area is to be marked by 2 cardinal marks, to the east and south as shown in Figure 24-4 Cardinal Markers above as safety zones.

Advance warning to mariners will be issued by the Harbour Master to keep clear of the area.

24.10.2 Operational Phase Mitigation Measures and future monitoring

There are no planned changes to the route or frequency of ferry crossings and therefore no further measures are proposed.

24.11 Assessment of Residual Effects

Mitigation is identified pre-event and post event to reduce the effects to an acceptable level. For those risks that cannot be completely designed out, emergency plans are available to provide the response in order to minimise the significance of any impacts. It is considered that there will not be any likely significant environmental effects arising from the vulnerability of the Proposed Development to shipping and navigation.

24.12 Cumulative Effects

There are no developments in close proximity that are considered to have a cumulative relationship with the Proposed Development. In summary, when considering the Proposed Development in combination with other proposed and consented developments within 5km of the Proposed Development, there will be no significant cumulative impacts.

24.12.1 In-combination effects

Future projects of large scale would need to conduct an EIA to ensure that there are no significant impacts as a result of the development.

24.12.2 Effects interactions

The EIA Regulations require that the EIA identifies, describes, and assesses the direct and indirect significant effects of the Proposed Development on population and human health, biodiversity, land, soil, water, air and climate, materials assets, cultural heritage and landscape and the interaction between these factors, arising from the vulnerability of the Proposed Development. This is set out in Chapter 25: Interactions of this EIA document.

24.13 Limitations of the Assessment

The data used is the most up to date available information from Stena Line. It is considered that the data employed in the assessment is robust and sufficient for the purposes of the assessment provided. It is, considered that the information available from Stena Line provides a suitable basis

for describing the baseline environment in relation to shipping and navigation with Fishguard Harbour.

24.14 Summary of Effects and Conclusion

A summary of the assessment of significance for the impacts as identified is presented below in Table 24-7 Summary of Impact.

Table 24-7 Summary of Impact

Description of impact	Phase C	Phase O	Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Risk of physical impacts from other existing navigation and shipping vessels (collision/Allison)	✓	×	Promulgation of information and warnings through Notice to Mariners and other appropriate Maritime Safety Information (MSI) dissemination methods. Project to undertake vessel traffic monitoring for all Project related vessels throughout all phases of the Project Safety zones/Cardinal marks	C: minor O: None	C: medium O: None	C: slight adverse O: None	Adherence to Stena Lines existing vessel and navigational management	None	None
Ferry Shutdown	✓	×	Shutdown over the low season	C:minor O: None	C: Medium O: None	C:slight adverse O:None			

Fishguard Linkspan Replacement

Environmental Impact Assessment

Volume I Main Text

Chapter 25 Interactions

25 Interactions

25.1 Introduction

This chapter of the Environmental Statement (ES) presents the assessment of the potential impacts of the Fishguard Linkspan Replacement (hereafter referred to as the "Proposed Development") in relation to interactive effects during the construction and operational phases. The potential for interaction of effects has been assessed as part of the impact assessment process in the following ES Volume I Chapters:

Chapter 7: Population and Human Health

Chapter 8: Marine Biodiversity

Chapter 9: Terrestrial Ecology

Chapter 10: Coastal Processes

Chapter 11: Water Quality

Chapter 12: Flood Risk Assessment

Chapter 13: Noise and Vibration

Chapter 14: Underwater Acoustics

Chapter 15: Air Quality

Chapter 16: Cultural Heritage

Chapter 17: Soils and Geology

Chapter 18: Land Use & Material Assets

Chapter 19: Traffic & Transport

Chapter 20: Landscape & Visual

Chapter 21: Waste Management

Chapter 22: Climate

Chapter 23: Risk of Major Accidents and Disasters

Chapter 24: Shipping & Navigation

The detailed technical information which underpins the impact assessments presented in this chapter is contained within Chapter 2: Project Description and within the technical ES chapters and their supporting appendices. These chapters provide a detailed characterisation of the physical, biological and human environment of the Proposed Development, based on desk-based data

sources and/or site-specific surveys, including information on receptors of importance and of conservation value.

25.2 Legislation

Part 3 of the Marine Works (Environmental Impact Assessment) Regulations requires that the interaction between human beings, fauna, flora, soil, water, air, climate, the landscape, material assets and cultural heritage is identified, described and assessed in the ES.

25.3 Assessment Methodology

The assessment of interactive effects has considered likely significant effects that may arise during construction and operational phases of the Proposed Development. The assessment of interaction of effects has been undertaken on a qualitative basis by each of the environmental specialist leads based on best scientific knowledge. There is no standard method for assessing interactive effects on receptors and therefore professional judgment has been used to inform the assessment. The ES coordination team facilitated data exchange and subsequent assessment review by the relevant specialists to inform the assessment of interactive effects. This was undertaken throughout the specialist impact assessment process.

25.4 Interactions Matrix

The likely relevant interactions between factors are identified in Figure 25-1 Interactions Matrix. The effects matrix identifies the factors in the left-hand column, which have the potential to impact on other factors listed in the top row of the matrix. Where a cross ‘x ‘exists, this indicates that the Proposed Development results in an interaction between the two factors. The purpose of the matrix is to identify the likely interactive effects of significance. A description of the interactive effect is provided along with a reference to where the assessment has been completed in chapters 7-24.

	Population & Human Health	Marine Biodiversity	Terrestrial Ecology	Coastal Processes	Water Quality	Flood Risk	Noise	Underwater Acoustics	Air Quality	Cultural Heritage	Soils & Geology	Land Use & Material Assets	Traffic & Transport	Landscape & Visual	Waste Mgmt.	Climate	Accidents & Disasters	Shipping & Navigation
Population & Human Health					X		X		X				X	X		X		
Marine Biodiversity				X	X			X										
Terrestrial Ecology																		
Coastal Processes		X			X													
Water Quality	X	X		X							X						X	
Flood Risk																X	X	
Noise	X												X					
Underwater Acoustics		X																
Air Quality	X										X		X		X	X		
Cultural Heritage														X				
Soils & Geology					X				X				X		X			
Land Use & Material Assets																		
Traffic & Transport	X						X		X		X				X	X	X	
Landscape & Visual	X									X								
Waste Mgmt.									X		X		X					

	Population & Human Health	Marine Biodiversity	Terrestrial Ecology	Coastal Processes	Water Quality	Flood Risk	Noise	Underwater Acoustics	Air Quality	Cultural Heritage	Soils & Geology	Land Use & Material Assets	Traffic & Transport	Landscape & Visual	Waste Mgmt.	Climate	Accidents & Disasters	Shipping & Navigation
Climate	X					X			X				X					
Accidents & Disasters					X	X							X					X
Shipping & Navigation																	X	

Figure 25-1 Interactions Matrix

25.5 Description of Interactions

As indicated in the matrix (Figure 25-1 Interactions Matrix) there are linkage between the topic-specific chapters presented within this ES, whereby the effects assessed in one chapter have the potential to result in secondary effects on another receptor (e.g. impacts on water quality have the potential to result in secondary effects on biodiversity with respect to the ecological status of the receiving water bodies). These are summarised in the following sections under each topic heading.

25.5.1 Population and Human Health

The potential impacts to population and human health during the construction and operational phases of the Proposed Development have been assessed in Chapter 7: Population and Human Health. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between population and human health and the following topics:

- Water Quality

During construction, there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels.

Pollution of surface water or groundwater bodies which are subsequently used as a potable source could pose a risk to public health. Bathing water quality at the nearshore may be temporarily affected by activities of the pontoon installation and construction of related supporting structures. The key health outcomes relevant to this determinant of health arise from toxicological exposure by skin contact, accidental swallowing of water or inhalation and can cause a wide range of acute or chronic illnesses.

For the Proposed Development, although nearshore works would result in some dispersion in relation to bathing water, the use of standard good practice mitigation measures to avoid and contain spills or appropriately respond to historic contamination encountered ensures the magnitude of any impact would be low. It is considered unlikely that any increased suspended sediment concentrations would be directly harmful or could have secondary effects, e.g. via toxic algal blooms. The level of exposure to any contaminants would likely be very low, short-term and associated with one-off events.

The significance of the population health effect for this determinant of health is minor adverse (not significant). Water quality is expected to be well within standards for bathing and drinking water and the changes are not expected to affect delivery of health policy or influence inequalities.

- Noise & Vibration

Construction of the Proposed Development has the potential to result in noise nuisance from construction activities, particularly night-time noise that may be detrimental to population health where sleep is disturbed to a high degree.

Environmental noise can initiate physiological stress responses in an individual that leads to a cascade of effects including a rise in heart rate and in levels of stress hormones. These responses influence risk factors for cardiometabolic health issues including blood pressure, blood sugar and blood fats and long-term exposure may affect mental health and lead to diseases such as diabetes, heart attack, and stroke. Night-time noise may disrupt the total sleep time and the required physiological and mental restoration in an individual even at low levels.

Construction noise impacts of the Proposed Development are considered to result in a minor adverse (not significant) effect on population health. This assessment conclusion reflects that although the scientific literature indicates a clear association between elevated and sustained noise disturbance and reduced health outcome, the changes would result in a very limited effect in the health baseline of the site-specific populations. The temporary and localised construction noise effects are not expected to affect health inequalities.

- Air Quality

The scientific literature indicates that there is an association between air quality emissions and health and wellbeing effects. Environmental air pollution is associated with increased risk of respiratory and cardiovascular diseases. This can include dust and air pollutants (particularly NO_2, $PM_{2.5}$ and PM_{10}) from construction activities and plant/vehicle emissions.

Occasionally, weather conditions may coincide with construction activities to generate high levels of dust. This can cause temporary annoyance, and for people with existing poor health, higher levels of coarse dust in the air it can exacerbate some conditions (e.g. asthma). For the Proposed Development a comprehensive set of mitigation measures and dust monitoring will be implemented during the construction phase to minimise construction dust impacts as detailed in Chapter 15: Air Quality.

- Landscape and Visual

The proposals have the potential to impact on the landscape and visual resources perceived by human beings which contributes to overall well being and quality of life. Changes to visual amenity such as the introduction of built structures or alterations to natural views can affect psychological health. Degraded visual environments may reduce opportunities for outdoor activity and diminish residential satisfaction, and erode community identity, especially in areas dependent on tourism or

with strong ties to the land. Conversely, the preservation or enhancement of landscape quality can support mental health, promote social cohesion, and encourage active lifestyles.

For the Proposed Development, a total of 8 viewpoints has been assessed for both construction and operational phases. None of the viewpoint's assessment are considered to experience significant effects during either the construction phase or operational phase of the Proposed Development, as whilst portions of the Proposed Development are predicted to be visible, visible elements of the Proposed Development will be difficult to discern and perceived as a minor alteration to the existing character and composition of the view.

- Traffic & Transport

The interaction between air quality and traffic health effects, particularly through emissions from construction vehicles and potential changes in local traffic patterns, has been considered. The potential for adverse health outcomes from combined exposure to traffic related air and noise pollution is considered limited. These effects are not expected to result in significant health effects, either individually or in combination, given the assessed individual effects results and the mitigation measures in place.

- Climate

Dredging activities can release carbon from seabed sediments, but significant emissions from this source are not expected due to limited vegetation and ongoing sediment renourishment efforts. Meanwhile, maritime transport, vital to the Welsh economy, is a growing source of greenhouse gas emissions, contributing to global shipping emissions of 1,076 $MtCO_2e$ in 2018.

Overall, the population health effects associated with climate change include heat-related disorders (e.g. heat stress and lower work capacity), respiratory disorders (e.g. worsened asthma), infectious diseases, food insecurity (e.g., lower crop yields), population migration and injury and mental stress associated with natural disorders (e.g. flooding or fires). Research also correlates UHIs with poor air quality, suggesting that elevated levels of air pollutants in urban areas due to heat-induced atmospheric reactions can worsen respiratory and other cardiovascular issues.

Chapter 22: Climate Change concludes the vulnerability of the works to climate change has been suitably mitigated and the potential impact is considered to be minor adverse for the construction and operational phase.

25.5.2 Marine Biodiversity

The potential impacts to marine biodiversity during the construction and operational phases of the Proposed Development have been assessed in Chapter 8: Marine Biodiversity. As identified in

Figure 25-1 Interactions Matrix, interactive effects exist between marine biodiversity and the following topics:

- Underwater acoustics

Fish and Shellfish Ecology

Various piling and construction activities will occur as part of the construction phase of the Proposed Development, which can cause auditory injury and behavioural change to fish and shellfish. Impact piling (i.e. an impulsive noise source) will only take place in connection with the installation of support piles, each of which will require less than half an hour of impact piling each, for a total maximal duration of two hours of impact piling spread over two days. The impact is predicted to affect the receptor directly, but to be of local spatial extent, short term duration, intermittent and high reversibility.

The underwater noise modelling (detailed in Chapter 14: Underwater Acoustics) concluded that the noise producing activities at the Proposed Development will be limited both spatially and temporally, with impacts upon fish receptors not predicted to occur over large ranges.

Marine Mammals

The results of the noise modelling indicated that impact piling of the support piles had the greatest potential for an adverse effect on marine mammals out of the different piling scenarios involved with the construction of the Proposed Development. Mitigation measures detailed in Chapter 8: Marine Biodiversity are therefore proposed to ensure that the risk of any auditory injuries in marine mammals is reduced to negligible.

- Water Quality

Benthic habitats and species

Benthic habitats and species can be sensitive to toxic contamination, when concentrations of contaminants exceed sensitivity thresholds. Release of sediment bound contaminants during construction can occur through the resuspension of sediment during dredging which can lead to the release and mobilisation of sediment-bound contaminants into the water column. Given that the overall level of contamination in the proposed dredge area is low, the period of dredging is temporally limited, and the extent of sediment dispersal considered to be spatially limited, changes in water quality are likely to be minimal, if at all.

Fish and Shellfish Ecology

The potential release of contaminants during construction activities may result in them becoming available for uptake by any fish shellfish in the water column or at the seabed. There is also an indirect risk to some fish species, as sediment-bound contaminants may be temporarily

bioaccumulated in the tissues of their prey. Given that the overall level of contamination in the proposed dredge area is low, the period of dredging is temporally limited, and the extent of sediment dispersal considered to be spatially limited, changes in water quality are likely to be minimal, if at all.

25.5.3 Terrestrial Ecology

The potential impacts to terrestrial ecology during the construction and operational phases of the Proposed Development have been assessed in Chapter 9: Terrestrial Ecology. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between terrestrial ecology and the following topics:

- Noise

Otter

During the 12-month construction period there will be increased human activity in the harbour, quayside development areas. Noise, vibration and dredging activities could disturb otter using the aquatic environment in the harbour. Temporary behavioural changes in otter behaviour are expected within the harbour, especially when construction activities generating underwater noise are undertaken outside of the core daytime working hours. The anticipated effect would be the displacement of animals to alternative foraging habitat for the duration of the higher noise generating activities.

Otters are more likely to use the harbour for foraging during nighttime periods when there would be much less construction activity. Consequently, outside of the working hours foraging habitat within the harbour would remain available for use otter during the 12-month construction period. Potential effects are limited to indirect disturbance of individuals hunting (primarily at night) at the eastern section of the open water dock. With alternative feeding opportunities along the coastline and in the rivers and brooks that flow into Fishguard Bay.

Chapter 9: Terrestrial Ecology concludes the magnitude of the impact on the otter population from construction related impacts is predicted to be low. The sensitivity of the application site for the otter is low and the overall effect on otter population is assessed as minor adverse, which is considered to be not significant. During the operational phase the potential magnitude of effects is negligible and equivalent to existing operations. The significance is classified as negligible with no change to the current baseline conditions. This is considered to be not significant.

Wintering and Passage Birds

During the construction period of the Proposed Development wintering and passage birds using the harbour could be affected by noise. Chapter 9: Terrestrial Ecology concludes the magnitude of

the effect on the assemblage of wintering bird species is predicted to be low. The sensitivity of the receptor is low (important in a local context). This could result in a minor adverse effect on the assemblage and individual species, which is considered to be not significant. During the operational phase use of the ferry terminal would have a negligible magnitude effect on the assemblage of birds using the harbour. The significance is classified as negligible which is not significant.

25.5.4 Coastal Processes

The potential impacts from coastal processes during the construction and operational phases of the Proposed Development have been assessed in Chapter 10: Coastal Processes. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between coastal processes and the following topics:

- Cultural Heritage

The Proposed Development has the potential to impact on cultural heritage remains on the seabed by modifying the sedimentation and erosion regime at Fishguard Port. The assessment does not however identify any likely significant coastal process effects.

- Flood Risk

Modelling of the Proposed Development on coastal processes is described in Chapter 10. This has demonstrated that there is a limited spatial change to tides, waves, and sedimentation processes within Fishguard Harbour as a result of the Proposed Developments' bathymetric changes. The change in risk of potential coastal flooding due to the Proposed Development at neighbouring sites is considered to be negligible and no mitigation is required.

- Water Quality

Coastal processes involve the movement of sediments along the shoreline and in the water column. Activities such as dredging or construction can disrupt these natural sediment dynamics. Increased sedimentation can lead to elevated turbidity levels.

Based on the low level of contamination in the sediments that are to be dredged and the coastal process modelling, which has demonstrated that the sediment plumes and subsequent deposition from the dredging activities will remain very localised, there is no potential for significant effects on bathing waters.

From an operational standpoint, ongoing maintenance dredging is not expected to significantly impact the water body. Furthermore, the introduction of new structures has been shown to have a negligible effect on the coastal processes of the Cardigan Bay South Coastal Water Body.

Consequently, the impact on the supporting hydromorphological conditions of the water body is deemed insignificant.

25.5.5 Water Quality

The potential impacts to water quality during the construction and operational phases of the Proposed Development have been assessed in Chapter 11: Water Quality. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between water quality and the following topics:

- Population and Human Health

See section 25.5.1 for interactive effects with water quality.

- Marine Biodiversity

See section 25.5.1 for interactive effects with marine biodiversity.

- Coastal Processes

See section 25.5.4 for interactive effects with water quality.

- Soils, Geology and Hydrogeology

Potential contamination issues may arise during construction from with the use of fuel storage tanks, vehicles and the use of paints and oils. In addition, suspended sediment due to run off from stripped construction areas, stockpiled earth and the dewatering of excavations can have a severe negative impact on water quality which can impact biodiversity receptors. If allowed to enter surface watercourses this run off can give rise to high suspended solids and lead to detrimental impacts on ecological receptors. The dredging of marine sediments will have a minor effect due to the irreversible loss of a high proportion of local low fertility sediments.

- Major Accidents and Disasters

In the event of a major accident or disaster there is a risk of releasing pollutants into water bodies, water supply and sensitive ecological receptors. This will adversely impact on water quality. To minimise spillages all oils, solvents, paints and other potential contaminates used during construction will be stored within suitably designed bunded areas. All chemical and fuel filling locations will be contained within bunded areas. On site facilities including surface and foul water collection will be designed and provided at both site compounds to manage surface water and foul water arising from the compounds. Chapter 23 concludes the significance of the effect is low.

25.5.6 Flood Risk

The potential impacts from flood risk during the construction and operational phases of the Proposed Development have been assessed in Chapter 12: Flood Risk. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between flood risk and the following topics:

- Climate

An increased flood risk, associated with climate change, has the potential to result in considerable impacts on riparian and coastal developments, higher sea levels have already been observed, while wetter winters are anticipated. Predicted impacts of climate change include an increase in the frequency and intensity of rainfall, an increase in peak flows in rivers, a rise in sea levels and increased storminess. These climate change effects are likely to increase pluvial, fluvial and coastal flooding and will require that future development be adaptable or resilient to future climatic changes and its associated impacts.

Fishguard, located on the Pembrokeshire coast of Wales, is susceptible to tidal flooding due to its geographical position and the influence of sea level rise. During the construction and operational phases of the Proposed Development, there is a potential impact from flooding, including surface, groundwater, fluvial, and snow/ice melt. This could affect the road network and damage drainage systems, as increased runoff from adjacent land may contribute to surface water flooding.

Chapter 22: Climate Change concludes the vulnerability of the works to climate change has been suitably mitigated and the potential impact is considered to be minor adverse for the construction and operational phase.

- Coastal Processes

See section 25.5.4 for interactive effects with coastal processes.

- Major Accidents and Disasters

In the event of a flood, there is a risk that contaminants could be released from the construction site into environmental receptors, such as surface water bodies or groundwater resulting in a pollution event. Mitigation measures to reduce this risk which are outlined in the Outline Construction Environmental Management Plan (CEMP) will be implemented, including an emergency response plan specifically designed for the construction phase. Chapter 23 concludes the significance of the effect is low.

25.5.7 Noise and Vibration

The potential impacts from noise and vibration during the construction and operational phases of the Proposed Development have been assessed in Chapter 13: Noise and Vibration. As identified in Table 25 1, interactive effects exist between noise and vibration and the following topics:

- Terrestrial ecology

See section 25.5.3 for interactive effects with terrestrial ecology.

- Traffic and Transport

There is an interaction between noise and traffic through the generation of construction traffic. Chapter 3 Project Description states “Transport by road will be minimal – there is no estimated impact on the road transport network”. Therefore, there is no construction traffic noise impact associated with the proposed development and scoped out of the noise assessment. The traffic flows generated by Fishguard Port relate to the number vessel sailings and the times of the sailings. Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel sizes will not increase above existing levels, therefore the number of vehicle movements generated by the Port are also not expected to increase above existing levels, resulting in a negligible traffic impact in the operational phase of the Proposed Development.

- Population and Human Health

See section 25.5.1 for interactive effects with population and human health.

25.5.8 Underwater Acoustics

The potential impacts from underwater acoustics during the construction and operational phases of the Proposed Development have been assessed in Chapter 14: Underwater Acoustics. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between underwater acoustics and the following topics:

- Marine Biodiversity

See section 25.5.2 for interactive effects with marine biodiversity.

25.5.9 Air Quality

The potential impacts to air quality during the construction and operational phases of the Proposed Development have been assessed in Chapter 15: Air Quality. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between air quality and the following topics:

- Population and Human Health

See section 25.5.1 for interactive effects with population and human health.

- Traffic and Transport

Potential air quality effects during the construction phase can occur due to dust emissions and from construction traffic movements, with the pollutants of most concern being nitrogen dioxide (NO2) and particulate matter (PM10 and PM2.5). Chapter 15: Air Quality concludes that due to the nature and scale of the project the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is negligible.

Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel size are not expected to increase above existing levels. The related number of generated vehicle movements are also not expected to increase above existing levels. Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed.

- Climate

The generation of road traffic due to construction phase deliveries of materials, removal of waste and redistribution of other road users has the potential to impact air quality including an increase in the emissions of Greenhouse Gases that contribute towards global warming. Chapter 15: Air Quality concludes that due to the nature and scale of the project the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is negligible.

- Waste Management

Demolition works and loading of wastes associated with the Proposed Development have the potential to cause fugitive dust emissions. The air quality impact assessment identifies this as a likely significant effect during the construction phase. Mitigation measures are therefore proposed which to control dust during the construction phase and reduce the risk of dust emissions from demolition works to negligible/not significant.

- Soils, Geology and Hydrogeology

Excavation works and exposure of soils during the construction phase can influence air quality. The movement of soils during the construction phase may result in the spread of dust and mud onto surrounding land and public roads, however no likely significant effects have been predicted.

25.5.10 Cultural Heritage

The potential impacts to cultural heritage during the construction and operational phases of the Proposed Development have been assessed in Chapter 16: Cultural Heritage. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between cultural heritage and the following topic:

- Seascape, Landscape and Visual

Archaeological and cultural heritage contribute to the landscape characteristics of an area. Developments can sometimes infringe upon the amenity use and visual setting of a cultural heritage feature and as a result lead to unacceptable impacts. The introduction of the Proposed Development will not negatively impact upon any inter-relationships between monuments located within the local landscape. No change will be realised to views of the ferry port both from The Fishguard Bay Hotel (Cadw 12345) and the Registered Park and Garden.

25.5.11 Soils, Geology and Hydrogeology

The potential impacts to Soils during the construction and operational phases of the Proposed Development have been assessed in Chapter 17: Soils and Contamination. As identified in Table 25 1, interactive effects exist between Soils and Contamination and the following topics:

- Water Quality

See section 25.5.5 for interactive effects with water quality.

- Traffic and Transportation

There is potential for generation of contaminated soils at construction phase, which will be removed from the port by road transport if not suitable for re-use on site. The soils and contamination assessment does not however identify any likely significant effects.

- Air Quality

See section 25.5.9 for interactive effects with air quality.

- Waste

Improper management of waste can lead to soil and contamination through leachate, spills, or improper disposal methods. This can have direct implications for soil quality. However, Chapter 21: Waste Management concludes that this can be managed by implementing appropriate mitigation measures and by managing wastes in accordance with the waste hierarchy as required.

It is estimated that dredging will generate around 2,500 m3 of silty sands and gravel. Sediment sampling previously undertaken confirmed that the sediment did not contain any hazardous substances so is classified as non-hazardous waste. Higher levels of contaminants were identified at one sampling location but this was confirmed as being at depth beyond proposed works. This dredge is to be displaced to an existing scour pocket.

25.5.12 Traffic & Transport

The potential impacts to traffic and transport during the construction and operational phases of the Proposed Development have been assessed in Chapter 19: Traffic and Transport. As identified in Table 25 1, interactive effects exist between traffic and transport and the following topics:

- Population and Human Health

See section 25.5.1 for interactive effects with population and human health.

- Noise

See section 25.5.7 for interactive effects with noise.

- Air Quality

See section 25.5.9 for interactive effects with air quality.

- Climate Change

Road traffic and shipping vessels have the potential to impact air quality including an increase in the emissions of Greenhouse Gases that contribute towards global warming. Once the replacement Linkspan is constructed and operational, the vessel numbers and vessel size are not expected to increase above existing levels. The related number of generated vehicle movements are also not expected to increase above existing levels. Therefore, there will be no traffic impact associated with the replacement Linkspan scheme once construction is completed and no requirement for an assessment of operational effects.

- Waste Management

During the construction phase of the Proposed Development there will be an increase in the vehicle movements associated with hauling or removing wastes. An assessment of the proposed construction traffic indicates that it will have a minimal impact upon the surrounding highway network during the construction period.

- Major Accidents and Disasters

Additional HGV traffic mixing with other road users has the potential to cause injury or fatality to a member of the public. Proposed mitigation measures to reduce the risk include the implementation of a traffic management plan for specific busy times during delivery or other site activities. Chapter 23 concludes the significance of the effect is low.

25.5.13 Seascape, Landscape and Visual

The potential impacts to seascape, landscape and visual during the construction and operational phases of the Proposed Development have been assessed in Chapter 20: Seascape, Landscape

and Visual. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between seascape, landscape and visual and the following topics:

- Population and Human Health

See section 25.5.1 for interactive effects with population and human health.

- Cultural Heritage

See section 25.5.10 for interactive effects with seascape, landscape and visual.

25.5.14 Waste Management

The potential impacts from waste management during the construction and operational phases of the Proposed Development have been assessed in Chapter 21: Waste Management. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between waste management and the following topics:

- Air Quality

See section 25.5.9 for interactive effects with air quality.

- Traffic and Transport

See section 25.5.12 for interactive effects with traffic.

25.5.15 Climate Change

The potential impacts to Climate Change during the construction and operational phases of the Proposed Development have been assessed in Chapter 22: Climate Change. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between climate change and the following topics:

- Air Quality

See section 25.5.9 for interactive effects with air quality.

- Flood Risk

See section 25.5.6 for interactive effects with flood risk.

- Traffic and Transport

See section 25.5.13 for interactive effects with traffic and transport.

- Population and Human Health

See section 25.5.1 for interactive effects with population and human health.

25.5.16 Risk of Accidents and Disasters

The potential impacts from major accidents and disasters during the construction and operational phases of the Proposed Development have been assessed in Chapter 23: Risk of Major Accidents and Disasters. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between waste management and the following topics:

- Water Quality

See section 25.5.5 for interactive effects with water quality.

- Flood Risk

See section 25.5.6 for interactive effects with flood risk.

- Traffic and Transport

See section 25.5.12 for interactive effects with traffic.

- Shipping and Navigation

There is a risk of physical impacts from existing navigation and shipping vessels, including collisions. Such incidents could result in physical damage to project vessels and infrastructure. Additionally, there is a potential for significant impacts on water quality due to fuel or chemical spills, which could adversely affect local biodiversity. Furthermore, these collisions pose a serious risk of loss of life or serious injury. Chapter 23 details mitigation measures to reduce the risk concludes the significance of the effect is low.

25.5.17 Shipping and Navigation

The potential impacts to Shipping and Navigation during the construction and operational phases of the Proposed Development have been assessed in Chapter 24: Shipping and Navigation. As identified in Figure 25-1 Interactions Matrix, interactive effects exist between shipping and navigation and the following topics:

- Major Accidents and Disasters

See section 25.5.9 for interactive effects with major accidents and disasters.